



Flying Horse North Master Development Drainage Plan

March 09, 2022

Revised: July 28, 2022

HR Green Project No: 211030.01

Prepared For:

Mr. Drew Balsick

Vice President / Project Manager

Flying Horse Development, LLC

2138 Flying Horse Club Drive

Colorado Springs, CO 80921

(719) 785-3237

Prepared By:

HR Green Development, LLC

Contact: Gregory Panza, PE

gpanza@hrgreen.com

720-602-4956

PCD File No. SKP223

Table of Contents

Engineer's Statement	1
Developer's Statement	1
El Paso County:	1
Master Development Drainage Plan – Flying Horse North	2
I. General Purpose, Location and Description	2
a. Purpose and Scope	2
b. DBPS Investigations	2
c. Stakeholder Process	2
d. Agency Jurisdictions	2
e. General Project Description	2
f. Data Sources	3
g. Applicable Criteria and Standards	4
II. Project Characteristics	4
a. Location in Drainage Basin, Offsite Flows, Size	4
b. Compliance with DBPS	4
c. Site Characteristics	5
d. Major Drainage Ways and Structures	5
e. Existing and proposed land uses	5
III. Hydrologic Analysis	6
a. Major Basins and subbasins	6
Major Basin Description	6
Subbasin Description	10
b. Methodology	15
c. Basin Hydrology	16
IV. Hydraulic Analysis	18
a. Major Drainageways	18
V. Environmental Evaluations	18
a. Significant Existing or Potential Wetland and Riparian Areas Impacts	18
b. Stormwater Quality Considerations and Proposed Practices	19
c. Permitting Requirements	19
d. 4-Step Process	19

VI.	Alternatives Evaluation	20
VII.	Selected Plan.....	20
a.	Plan Hydrology	20
b.	System Improvements	20
VIII.	Drawings	24
IX.	Summary	24
X.	References	25

List of Tables

Figure 1 - Site Map	3
---------------------------	---

Appendices

- A. Maps & Exhibits
- B. Hydrology Calculations
- C. SWMM Calculations
- D. Pond Calculations
- E. Proposed Culvert Calculations
- F. Referenced Report Excerpts
- G. Site Drainage Maps



Engineer's Statement

This report and plan for the drainage design of the development, Flying Horse North, was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the *El Paso County Drainage Criteria* Manual and is in conformity with the master plan of the drainage basin. I understand that El Paso County does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Gregory Panza, PE Date

State of Colorado No. 37081

For and on behalf of HR Green Development, LLC

Developer's Statement

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

Flying Horse Development, LLC

By: _____

Title: _____

Address: _____

El Paso County:

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

Jennifer Irvine, P.E.

County Engineer/ECM Administrator

Date

Master Development Drainage Plan – Flying Horse North

I. General Purpose, Location and Description

a. Purpose and Scope

The Purpose of this Master Development Drainage Plan (MDDP) is to describe the onsite and offsite drainage patterns, existing and proposed storm infrastructure as it relates to preliminary water quality and stormwater detention, areas tributary to the site and the planned storm water management for the Flying Horse North development for Filings No. 2, 3 and remaining filings. Flying Horse North Filing No. 1 combined Preliminary Drainage Report (PDR) and Final Drainage Report (FDR) was previously written by Classic Engineering and included in Appendix F. The items discussed in this report are preliminary in nature and final drainage calculations and design will be required as development proceeds. This report provides a general drainage concept and guidance for future development of Flying Horse North.

b. DBPS Investigations

Flying Horse North is split by the Arkansas River Basin and South Platte Basin. Within each of those river basins, the site stretches across the Black Squirrel Basin and East Cherry Creek Drainage Basins.

The Black Squirrel Drainage Basin Planning Study (DBPS) Preliminary Design Report prepared by URS Corporation was reviewed to determine existing plans and constraints that would influence the design of the Flying Horse North Development. The proposed plans for Flying Horse North are in general conformance with the DBPS.

Currently Flying Horse North Filing 1 is located within a major portion of the Black Squirrel Creek Drainage Basin of the development. A Preliminary Drainage Report and Final Drainage Report for this area was prepared in June 2018 by Classic Consulting and it is the intent of this MDDP to follow the general drainage approach for this area where densities for the development will remain similar to the report.

For the portion of Flying Horse North which lies within the East Cherry Creek Drainage Basin, a DBPS does not currently exist and the MDDP will comply with standard El Paso County regulations regarding drainage within this corridor.

c. Stakeholder Process

There are no amendments to the current DBPS.

d. Agency Jurisdictions

Listed below are the jurisdictions that this project will conform to:

El Paso County

Federal Emergency Management Agency

e. General Project Description

Flying Horse North is in El Paso County. The development is bordered by Highway 83 to the west, Black Forest Road to the east, Cathedral Pines to the south, and High Forest Ranch to the north. The area contains approximately 1,459 acres within the whole Section 36, Township 11 South, Range 66 West of

the Sixth Principal Meridian, and a portion of Section 30 and 31, Township 11 South, and Range 65 West of the Sixth Principal Meridian.

This MDDP will cover approximately 912.5 acres of 973 residential units, which is shown in the figure below. This development will include estate lots, low through high density residential lots, commercial development, an 18-acre hotel site, open space and park areas, fitness center and a clubhouse.

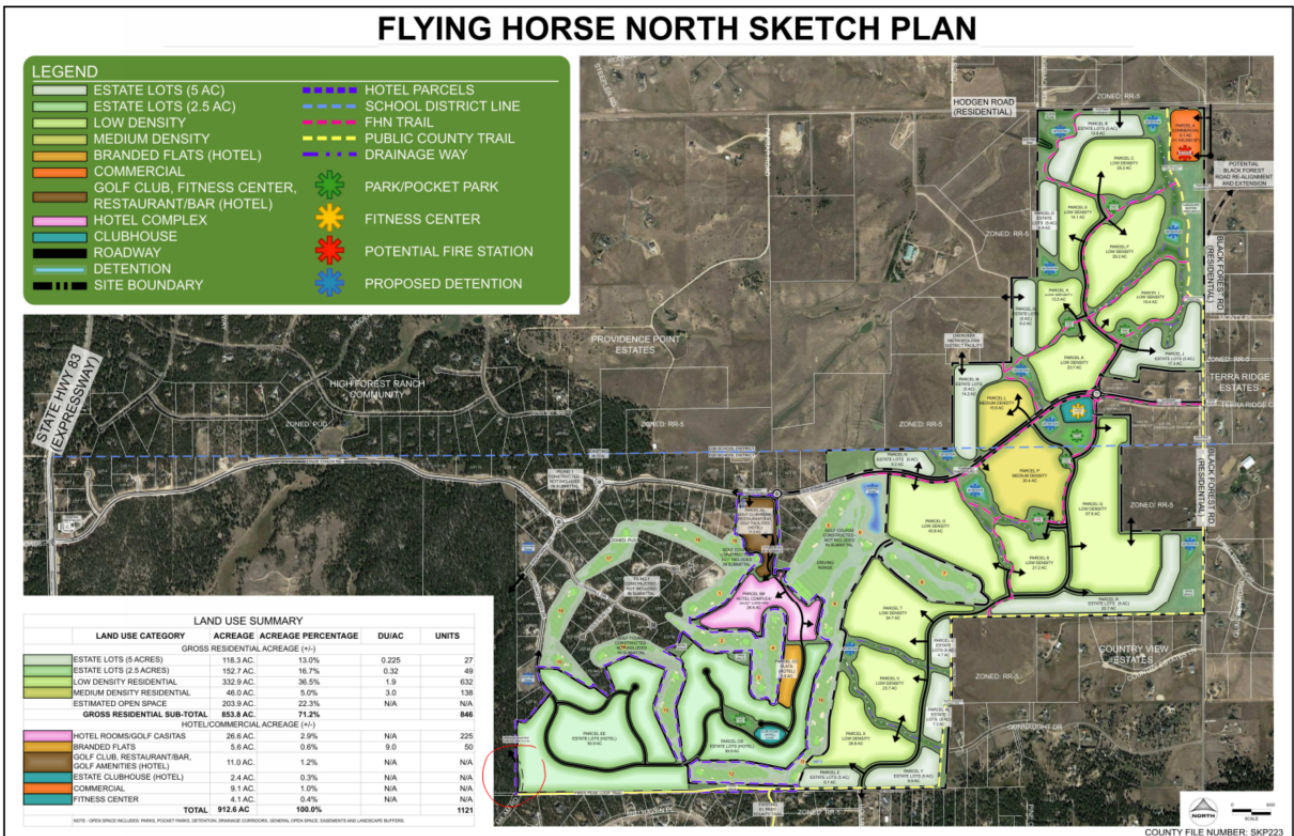


Figure 1 - Site Map

f. Data Sources

Listed Below are the technical resources reviewed in the preparation of this MDDP:

El Paso County Drainage Criteria Manual (DCM)

Mile High Flood District

NOAA Atlas 14

NRCS Soil Survey for El Paso County Area, Colorado

FEMA FIRM 08041C0305G and FIRM 08041C0315G (eff. 12/7/2018)

El Paso County Assessor Property Records

Preliminary Drainage Report for Flying Horse North Preliminary Plan and Final Drainage Report for Flying Horse North Filing No. 1 – June 2018

Flying Horse North Irrigation Reservoir Embankment Design Report – August 2018

g. Applicable Criteria and Standards

Per the DBPS and El Paso County Criteria Manual, flows from the proposed site will be limited to historic flows to maintain the stability of the existing channels within the drainage basins. The master plan follows the Drainage Criteria Manual for El Paso County which refers to the City of Colorado Springs Drainage Criteria Manuals as amended.

II. Project Characteristics

a. Location in Drainage Basin, Offsite Flows, Size

Flying Horse North is located within both the Black Squirrel Drainage Basin and East Cherry Creek Basin. Predominantly, the existing Filing No.1 and part of the proposed Filing No. 2 is located within the Black Squirrel Drainage Basin. This drainage basin encompasses 10.9 square miles of mostly forested area and generally slopes from east to west and outfalls into Monument Creek. Black Squirrel is a sub-basin of the Arkansas River. The remaining filings and part of Filing No. 2 is located within the East Cherry Creek Basin. There is not a current planning study of the drainage basin, but generally it slopes from southwest to northeast. The basin eventually flows into the South Platte River.

As the site generally lies at the top of each of the respective basins, minimal offsite flows are conveyed onto the site. The Black Squirrel Creek Drainage basin has no offsite flow come onto the site sans those flows generated as part of Filing 1 of Flying Horse North. The development which is within the Black Squirrel Creek Drainage Basin is unchanged from the FDR shown in Filing 1.

For the East Cherry Creek basin, 4 drainage basins are conveyed onto the site on the southwestern portion of the basin. These basins are labeled A, C, F and Q. The respective contributing flows from these basins is shown in the table below:

Basin Name	Acreage	5 Year Flow (cfs)	100 Year Flow (cfs)
A	18.99	20.84	43.83
C	36.39	33.36	71.27
F	25.25	24.27	51.63
Q	72.29	64.68	137.80

These four basins are generally conveyed through the development via natural drainage ways. The proposed ponds discussed later within this report have been sized to pass through the offsite flows.

b. Compliance with DBPS

This MDDP is in general conformance with the guidelines outlined in the Black Squirrel DBPS and current drainage flows of the East Cherry Creek Basin. Flying Horse North will construct multiple full spectrum detention facilities to limit the effects of development and mimic natural flow patterns.

Existing downstream infrastructure is currently limited to the historic drainage channels and minimal downstream improvements exist. As such, the site follows the DBPS and restricts offsite flow rates to not exceed historic flow rates. The sites ultimate outfalls will generally be along the same historic tributaries. Although outfall rates will be at or below historic, the cumulative volume of runoff will increase and therefore downstream facilities may see an increase in the duration of flows. This may provide a net benefit to the downstream facilities by providing more water to assist with the sustenance of vegetation however it should be noted that increased volume may expedite potential erosion or channel movement.

c. Site Characteristics

Per the NRCS web soil survey, the site is made up entirely of Type B soils. The ridge line between the Arkansas River and South Platte River Basins creates different soil environments for each. The portion of site that is within the Black Squirrel Drainage Basin, which includes Flying Horse North Filing No. 2 and No. 3, are predominately Elbeth sandy loam. The remaining filings are within the East Cherry Creek Basin which consists of Peyton sandy loam and Peyton-Pring complex. See Appendix A for the NRCS soil map.

Current ground cover varies between the two basins as well. Filings No. 2 and 3 are predominantly covered by Ponderosa Pine trees as a part of Black Forest and pasture. The remaining filings are short-to mid-grass prairie grasslands and former farmland which consists of non-native weeds and grasses. This portion of the site has very few, if any, trees and a minimal number of shrubs are found on the site.

d. Major Drainage Ways and Structures

No major drainage ways exist within the development; however, small tertiary tributaries are within the site currently and function to convey flows to unnamed tributaries of the East Cherry Creek and Black Squirrel Creek. Additionally, as part of the Flying Horse North Filing 1 development, a large irrigation pond was built for water storage and flood control. This drains to the north and to the aforementioned unnamed tributary.

Existing minor drainage channels within the site are planned to be maintained to the maximum extent possible within parkways and greenways with the development. These will continue to be used for conveyance of storm drainage flows.

The Franktown Parker Dam (080130) is located near the northwest corner of site. The dam is designated as a jurisdictional dam and has a low hazard class. It is located along East Cherry Creek. See Appendix A for characteristics and location of dam.

e. Existing and proposed land uses

The existing site is open rangeland on the eastern portion of the site and the western site is single family homes on large (~2.5 acre) home site within a heavily forested area. As part of Filing 1, a road was constructed along with facilities to support a golf course. Structures, outside of the homes are scattered throughout the overall development which will either be removed as part of the project or were built as part of Filing 1. The proposed development will consist of estate, low and medium lots, along with a future hotel site and multiple green spaces and small parks. The current land plan assumes approximately 897 dwelling units will be constructed on the site, not including an approximate 225 provided the proposed hotel.

Land Use	MAX DU/AC
Estate Lots (2.5 Acres)	0.32
Estate Lots (5 Acres)	0.2
Low	1.9
Medium	3.0

- Review Land Development Code Chapter 8 Section 8.4.2.B.1.e.i, Per this section approved Base Flood Elevation data shall be shown on the plat when this portion of the sketch plan develops. Establishing the BFE likely involves a LOMR process.

III. Hydrology

a. Major Drainage Basins

Unresolved. State the requirement to establish a BFE through FEMA's LOMR process for future subdivision platting at the northern section of the plat per the above referenced section of the LDC.

- Previous basin study: Black Squirrel Drainage Basin Planning Study
- Per FEMA FIRM 08041C0305G and 08041C0315G (eff. 12/7/2018), Flying Horse North has no major channels within its boundaries.
- There is a large irrigation pond that accounts for water storage and water control on the east side of the site.

The site has been divided into several major drainage basins per where each basin is tributary to a full spectrum detention pond facility. These basins and associated sub basins are described in more detail in the next section of this report.

Existing Subbasin Description

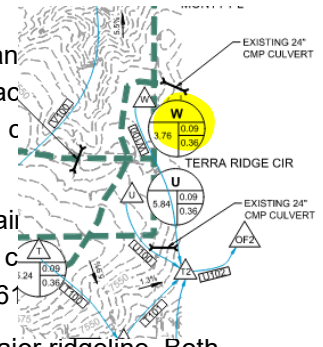
The site's flows are split by the major ridgeline of the Arkansas River Basin and South Platte Basin. Within the South Platte Basin, flow is generally carried northeast throughout the site. On the other side of the ridgeline, the Arkansas River Basin flows in a southwest direction. Subbasin IDs with single letters are part of the South Platte Basin and Subbasin IDs with double letters are part of the Arkansas River Basin.

- Subbasin A is located off site and on the southeast corner. The basin drains towards the northwest and towards Subbasin B1. The basin is 18.99 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 20.84 cfs and 43.83 cfs respectively.
- Subbasin B is located north of Subbasin A. The basin drains towards the northwest into a natural drainageway that flows directly to an existing irrigation pond. The basin is 59.74 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 103.48 cfs and 221.28 cfs respectively.
- Subbasin C is located off site and on the southeast corner. The basin drains towards the northwest and towards Subbasin B2. The basin is 36.39 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 33.36 cfs and 71.27 cfs respectively.
- Subbasin D is located north of Subbasin B. The basin drains towards the northwest and towards the existing irrigation pond. The basin is 38.84 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 31.56 cfs and 67.84 cfs respectively.
- Subbasin E is in a central location of the site and includes the existing irrigation pond. The basin drains towards the north and towards existing irrigation pond. The basin is 106.53 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 223.69 cfs and 483.10 cfs respectively.
- Subbasin F is located off site and on the southeast corner. The basin drains towards the northwest and towards Subbasin G. The basin is 25.25 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 24.27 cfs and 51.63 cfs respectively.
- Subbasin G is directly north of Subbasin D and east of Subbasin E. The basin drains towards the northwest and towards Subbasin E with the irrigation pond. The basins consist of the existing golf

course. The basin is 52.19 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 79.17 cfs and 166.51 cfs respectively.

- Subbasin H is located directly downstream of Subbasin E and on the north side of Stagecoach Rd. The basin drains towards the north through a natural drainageway. There are existing lots on the west side of the basin. The basin is 20.63 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 18.59 cfs and 39.78 cfs respectively.
- Subbasin I is located west of Subbasin E and northeast of the major ridgeline between basins. The basin drains towards the northwest and towards an existing culvert. There are existing lots on the west side of the basin. The basin is 31.93 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 34.58 cfs and 72.63 cfs respectively.
- Subbasin J is located downstream of Subbasin I. The basin drains towards the northeast to an unnamed tributary of the East Cherry Creek. The basin is 28.47 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 56.31 cfs and 120.46 cfs respectively.
- Subbasin K is located south of proposed section of Stagecoach Rd. The basin drains towards the northwest and into an existing 48" culvert. The basin is 93.15 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 92.05 cfs and 195.43 cfs respectively.
- Subbasin L is downstream of Subbasin K and is located on the north side of the proposed section of Stagecoach Rd. The basin drains towards the northwest to a natural drainageway of East Cherry Creek. The basin is 16.39 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 107.58 cfs and 228.73 cfs respectively.
- Subbasin M is located on the east side of the site and between Subbasin N and V1. The basin drains towards the northwest and into an existing 30" culvert. The basin is 13.85 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 11.48 cfs and 24.61 cfs respectively.
- Subbasin N is located south of Subbasin O and north of proposed Stagecoach Rd. The basin drains towards the northwest to a nearby unnamed tributary and eventually East Cherry Creek. The basin is 49.00 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 64.68 cfs and 143.11 cfs respectively.
- Subbasin O is located south of Subbasin P. The basin drains towards the northwest and towards the north. The basin is 24.76 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 22.69 cfs and 48.54 cfs respectively.
- Subbasin P is in the northeast corner of the site and downstream of Subbasin O. The basin drains towards the northeast to an unnamed tributary of East Cherry Creek. The basin is 43.80 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 38.52 cfs and 82.17 cfs respectively.
- Subbasin Q is located off site and on the southeast corner. The basin drains towards the northeast and towards Subbasin R. The basin is 72.29 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 64.68 cfs and 137.80 cfs respectively.

- Subbasin R is located on the east side of site adjacent to Black Forest Rd. The basin drains towards the northeast. The basin is 54.98 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 108.65 cfs and 232.13 cfs respectively.
- Subbasin S is located north of Subbasin Q. The basin drains towards Subbasin R. The basin is 24.36 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 25.99 cfs and 54.65 cfs respectively. **Update. No basin V2 in the map**
- Subbasin T is located off site and on the southeast corner. The basin drains towards the southeast and towards Black Forest Rd. The basin is 5.24 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 4.04 cfs and 8.68 cfs respectively.
- Subbasin U is located east of subbasin V2 and is composed of existing 2.5 acre lots. The basin drains offsite towards the southeast and follows historic drainage patterns. The basin is 5.86 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 4.15 cfs and 8.95 cfs respectively.
- Subbasin V is located on the east side of the site in between Subbasin M and Subbasin W. The basin is 38.57 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 29.63 cfs and 61.15 cfs respectively. **Add Sub-basin W**
- Subbasin X is located on the northeastern corner of the site. The basin drains towards an unnamed tributary of East Cherry Creek. The basin is 190.88 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 167.76 cfs and 361.15 cfs respectively.
- Subbasins AA and CC are located on the west side of the site along the major ridgeline. Both basins were developed in Filing No. 1 and are included in the analysis to provide a better understanding for the flows draining towards Black Squirrel Creek. The basins drain towards the southwest. The basins are 33.8 acres and 37.15 acres, with a composite impervious value of 10% and 10% and runoff rates for the 5 and 100 year of 38.76 cfs and 80.22 cfs and 6.53 cfs and 13.57 cfs respectively.
- Subbasin BB is located downstream of Subbasin AA. The basin drains towards the southwest and towards Subbasin GG. A section of the area of the basin was developed in Filing No. 1 and consists of 2.5-acre lots. The basin is 37.15 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 40.62 cfs and 84.15 cfs respectively.
- Subbasin DD is located west and downstream of Subbasin EE. The basin drains towards the west. A portion developed in Filing No. 1 consists of the Flying Horse North Golf Course and 2.5-acre lots. The basin is 70.07 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 58.42 cfs and 123.69 cfs respectively.
- Subbasin EE is upstream of subbasin DD. The basin drains towards the west. A portion of the area was developed in Filing No. 1 consists of the Flying Horse North Golf Course and 2.5-acre lots. The basin is 69.47 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 81.16 cfs and 167.45 cfs respectively.
- Subbasin FF is located downstream of Subbasins DD and EE. The basin drains towards the southwest. The north half consists of 2.5-acre lots and part of the Flying Horse North Golf Course

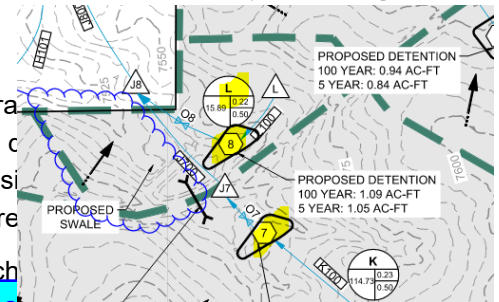


constructed during Filing No. 1. The basin is 17.62 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 162.77 cfs and 340.42 cfs respectively.

- Subbasin GG located downstream of Subbasin FF. The basin drains towards the southwest and towards an existing detention pond developed in Filing No. 1. The basin is 16.35 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 14.93 cfs and 31.99 cfs respectively.
- Subbasin HH is located on the west side of the site. The basin drains towards the west and to an unnamed tributary of Black Squirrel Creek. The basin is 12.61 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 13.01 cfs and 27.42 cfs respectively.
- Subbasin II is located in the southwest corner of site. The basin drains towards the west and to an unnamed tributary of Black Squirrel Creek. The basin is 97.53 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 81.77 cfs and 175.60 cfs respectively.
- Subbasin JJ is in the southcentral part of the site. The basin drains towards the south and to an unnamed tributary of Black Squirrel Creek. The basin is 8.9 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 9.74 cfs and 20.50 cfs respectively.
- Subbasin KK is in the southcentral part of the site. The basin drains towards the south and to an unnamed tributary of Black Squirrel Creek. A portion of the area is occupied by the existing Flying Horse Golf Course. The basin is 8.12 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 7.51 cfs and 15.99 cfs respectively.
- Subbasin LL is in the southcentral part of the site. The basin drains towards the south and to an unnamed tributary of Black Squirrel Creek. The basin is 6.1 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 6.88 cfs and 14.48 cfs respectively.

Proposed Subbasin Description

- Subbasin A is located off site and on the southeast corner. The basin drains towards the northwest and towards Subbasin B1. The basin is 18.99 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 20.84 cfs and 43.83 cfs respectively.
- Subbasin B1 is located north of Subbasin A. The basin drains towards the northwest and towards proposed Detention Pond 11. Current planning documents call for low density dwelling units. The basin is 59.74 acres, with a composite impervious value of 29.83% and runoff rates for the 5 and 100 year of 66.93 cfs and 133.69 cfs respectively.
- Subbasin B2 is located northeast of Subbasin B1. The basin drains towards the northwest and towards the proposed Detention Pond 11. Current planning documents call for low density dwelling units. The basin is 19.99 acres, with a composite impervious value of 24.55% and runoff rates for the 5 and 100 year of 17.99 cfs and 37.14 cfs respectively.
- Subbasin C is located off site and on the southeast corner. The basin drains towards the northwest and towards Subbasin B2. The basin is 36.39 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 35.31 cfs and 75.28 cfs respectively.
- Subbasin D is located north of north of Subbasins B1 and B2. The basin drains towards the northwest and towards Detention Pond 15. Current planning documents call for low density dwelling units. The basin is 40.87 acres, with a composite impervious value of 37.20% and runoff rates for the 5 and 100 year of 61.12 cfs and 117.38 cfs respectively.
- Subbasin E is in a central location of the site and includes the existing irrigation pond. The basin drains towards the north and towards existing irrigation pond. Current planning documents call for two small parking lots. The basin is 106.53 acres, with a composite impervious value of 14.35% and runoff rates for the 5 and 100 year of 74.68 cfs and 157.91 cfs respectively.
- Subbasin F is located off site and on the southeast corner. The basin drains towards the northwest and towards Subbasin G. The basin is 25.25 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 24.27 cfs and 51.63 cfs respectively.
- Subbasin G is directly north of Subbasin D and east of Subbasin E. The basin drains towards the northwest and towards Subbasin E. Current planning documents call for a small amount of low density dwelling units, where most of the basin consist of the existing golf course. The basin is 31.45 acres, with a composite impervious value of 12.48% and runoff rates for the 5 and 100 year of 27.18 cfs and 57.12 cfs respectively.
- Subbasin H is located located directly downstream of Subbasin E and on the north side of Stagecoach Rd. The basin drains towards the north and towards Detention Pond 10. Current planning documents call for medium density dwelling units. There are existing lots on the west side of the basin. The basin is 21.96 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 17.86 cfs and 37.8 cfs respectively.
- Subbasin I is located west of Subbasin E and northeast of the major ridgeline between basins. The basin drains towards the northwest and towards proposed Detention Pond 16. There are existing lots on the west side of the basin. Current planning documents call for a commercial golf club. The basin is 28.99 acres, with a composite impervious value of 34.66% and runoff rates for the 5 and 100 year of 40.37 cfs and 78.06 cfs respectively



- Subbasin J is located downstream of Subbasin I. The basin drains into an unnamed tributary of the East Cherry Creek. Current planning documents call for medium density dwelling units, potential fitness center, and a park. The basin is 28.07 acres, with a composite impervious value of 24.82% and runoff rates for the 5 and 100 year of 24.25 cfs and 51.19 cfs respectively.
- Subbasin K is located south of proposed section of Stagecoach Rd.

Elaborate on the narrative regarding how WQ/Detention will be provided for this portion of Basin L. From the contours shown, this is unlikely to drain into Pond 8.

Unresolved. Pond 7 is upstream of basin L

Current planning documents call for high, medium density dwelling units. The basin is 114.73 acres, with a composite impervious value of 20.71% and runoff rates for the 5 and 100 year of 200.94 cfs and 411.24 cfs respectively.

Subbasin L is located north side of the proposed section of Stagecoach Rd.

The basin drains towards the northwest into proposed Detention Pond 7.

Current planning documents call for medium density dwelling units. The basin is 15.89 acres, with a composite impervious value of 24.82% and runoff rates for the 5 and 100 year of 15.97 cfs and 32.4 cfs respectively. The pond will discharge at predevelopment rates into an unnamed tributary of the East Cherry Creek via the ponds outlet structure.

- Subbasin M is located on the east side of the site and between Subbasin N and V1. The basin drains towards the northwest and towards proposed Detention Pond 6. Detention Pond 6 outlets into a culvert under proposed Stagecoach Rd. and eventually to Subbasin N. Current planning documents call for medium density dwelling units, potential fitness center, and a park. The basin is 26.83 acres, with a composite impervious value of 33.19% and runoff rates for the 5 and 100 year of 46.54 cfs and 89.08 cfs respectively.
- Subbasin N is located south of Subbasin O and North of proposed Stagecoach Rd. The basin drains towards the northwest towards proposed Detention Pond 5. Detention Pond 5 outlets to a nearby unnamed tributary and eventually East Cherry Creek. Current planning documents call for medium density dwelling units along with a pocket park. The basin is 41.57 acres, with a composite impervious value of 29.60% and runoff rates for the 5 and 100 year of 73.48 cfs and 141.24 cfs respectively.
- Subbasin O is located south of Subbasin P. The basin drains towards the northwest and towards Detention Pond 3. Current planning documents call for medium density dwelling units. The basin is 52.52 acres, with a composite impervious value of 30.10% and runoff rates for the 5 and 100 year of 63.86 cfs and 127.4 cfs respectively. The pond will discharge at predevelopment rates and into Pond 1 via a swale.
- Subbasin P is in the northeast corner of the site and downstream of Subbasin O. The basin drains towards the northeast to proposed Detention Pond 1. Current planning documents call for low density dwelling units. The basin is 43.71 acres, with a composite impervious value of 20.71% and runoff rates for the 5 and 100 year of 40 cfs and 82.83 cfs respectively. The pond will discharge at predevelopment rates into an unnamed tributary of the East Cherry Creek via the ponds outlet structure.
- Subbasin Q is located off site and on the southeast corner. The basin drains towards the northeast and towards Subbasin R. The basin is 72.29 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 64.68 cfs and 137.8 cfs respectively.

- Subbasin R is located on the east side of site adjacent to Black Forest Rd. The basin drains towards the northeast and towards Detention Pond 9. Current planning documents call for low density and 1-acre lots. The basin is 76.38 acres, with a composite impervious value of 21.81% and runoff rates for the 5 and 100 year of 56.59 cfs and 116.06 cfs respectively. The pond will discharge at predevelopment rates into an unnamed tributary of the East Cherry Creek via the ponds outlet structure.
- Subbasin S is located north of Subbasin Q. The basin drains towards the southeast and overland towards Subbasin R. Current planning documents call for low density dwelling units. The basin is 21.67 acres, with a composite impervious value of 40.88% and runoff rates for the 5 and 100 year of 30.83 cfs and 58.96 cfs respectively.
- Subbasin T is located off site and on the southeast corner. The basin drains towards the southeast and towards Black Forest Rd. The basin is 5.24 acres, with a composite impervious value of 2.00% and runoff rates for the 5 and 100 year of 4.04 cfs and 8.68 cfs respectively.
- Subbasin U is located east of subbasin V2 and is composed of existing 2.5 acre lots. The basin drains offsite towards the southeast and follows historic drainage patterns. The basin is 5.86 acres, with a composite impervious value of 2% and runoff rates for the 5 and 100 year of 4.96 cfs and 10.51 cfs respectively.
- Subbasin V1 is located on the east side of the site in between Subbasin M and V2. The basin drains towards the north and towards Subbasin X3 via culvert. Current planning documents call for low density dwelling units. The basin is 11.57 acres, with a composite impervious value of 38.62% and runoff rates for the 5 and 100 year of 13.99 cfs and 27.67 cfs respectively.
- Subbasin V2 is located south of subbasin X3 and proposed Stagecoach Rd. The basin drains towards the north and towards subbasin X3. The flows are directed through a culvert and eventually to Detention Pond 4. There are no proposed dwelling unit for the area, as there are existing 2.5 acre lots that cover the basin. The basin is 15.34 acres, with a composite impervious value of 15.00% and runoff rates for the 5 and 100 year of 16.15 cfs and 33.25 cfs respectively.
- Subbasin W is located on the north side of subbasin U. The basin drains offsite to the southeast. The basin is 3.76 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 3.58 cfs and 7.46 cfs respectively.
- Subbasin X1 is located on the northeastern corner of the site. The basin drains north towards proposed Detention Pond 2. Current planning documents call for low density dwelling units, potential fire station and a pocket park. The basin is 76.38 acres, with a composite impervious value of 29.50% and runoff rates for the 5 and 100 year of 80.91 cfs and 163.27 cfs respectively. The pond will discharge at predevelopment rates into an unnamed tributary of the East Cherry Creek via the ponds outlet structure.
- Subbasin X2 is located south of Subbasin X1 The basin drains towards the northeast towards proposed Detention Pond 4. Current planning documents call for low density dwelling units along with a pocket park. The basin is 36.33 acres, with a composite impervious value of 33.33% and runoff rates for the 5 and 100 year of 41.46 cfs and 82.46 cfs respectively.
- Subbasin X3 is located south of Subbasin X2. The basin drains towards the north and towards Detention Pond 4. Current planning documents call for low density dwelling units and a pocket

- park. The basin is 65.75 acres, with a composite impervious value of 13.53% and runoff rates for the 5 and 100 year of 47.59 cfs and 100.73 cfs respectively.
- Subbasins AA and CC are located on the west side of the site along the major ridgeline. Both basins were developed in Filing No. 1 and are included in the analysis to provide a better understanding for the flows draining towards Black Squirrel Creek. The basins drain towards the southwest. The basins are 33.8 acres and 37.15 acres, with a composite impervious value of 10% and 10% and runoff rates for the 5 and 100 year of 39.23 cfs and 81.18 cfs and 6.53 cfs and 13.57 cfs respectively.
 - Subbasin BB is located downstream of Subbasin AA. The basin drains towards the southwest and towards Subbasin GG. Current planning documents call for a small portion of 2.5-acre estate lots. The remaining area of the basin was developed in Filing No. 1 and consists of 2.5-acre lots. The basin is 37.15 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 40.62 cfs and 84.15 cfs respectively.
 - Subbasin DD is located west and downstream of Subbasin EE1. The basin drains towards the west. Current planning documents call for 2.5-acre estate lots and a 2.4-acre clubhouse. The portion that was developed in Filing No. 1 consists of the Flying Horse North Golf Course and 2.5-acre lots. The basin is 69.5 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 57.78 cfs and 122.41 cfs respectively.
 - Subbasin EE1 is located west of Subbasins EE2 and EE3. The basin drains towards the west. Current planning documents call for a small section of 2.5-acre estate lots. The remaining portion consists of the Flying Horse North Golf Course constructed in Filing No. 1. The portion that was developed in Filing No. 1 consists of the Flying Horse North Golf Course and 2.5-acre lots. The basin is 50.87 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 53.25 cfs and 110.3 cfs respectively.
 - Subbasin EE2 is located along the west side of the major ridgeline. The basin drains towards the southeast and entirely towards proposed Detention Pond 13. Current planning documents call for a hotel complex/golf casitas. The basin is 16.36 acres, with a composite impervious value of 75.00% and runoff rates for the 5 and 100 year of 35.71 cfs and 63.62 cfs respectively. The pond will discharge at predevelopment rates into a swale via the ponds outlet structure.
 - Subbasin EE3 is located south of Subbasin EE2. The basin drains towards the west and Subbasin EE2. Current planning documents call for high density dwelling units. The basin is 16.36 acres, with a composite impervious value of 55.00% and runoff rates for the 5 and 100 year of 10.38 cfs and 19.33 cfs respectively.
 - Subbasin FF is located downstream of Subbasins DD and EE. The basin drains towards the southwest. Current planning documents call for 2.5-acre estate lots on the south side of the basin. The north half consists of 2.5-acre lots and part of the Flying Horse North Golf Course constructed during Filing No. 1. The basin is 18.1 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 20.78 cfs and 43.07 cfs respectively.
 - Subbasin GG located downstream of Subbasin FF. The basin drains towards the southwest and towards an existing detention pond developed in Filing No. 1. Current planning documents call for

2.5-acre estate lots. The basin is 16.35 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 15.49 cfs and 32.48 cfs respectively.

- Subbasin HH is located on the west side of the site. The basin drains towards the west and to an unnamed tributary of Black Squirrel Creek. Current planning documents call for 2.5-acre estate lots. The basin is 12.7 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 13.56 cfs and 28.16 cfs respectively. Per El Paso County Engineering Criteria Manual – Appendix I Section 1.7.1.B, large lot single family sites greater than or equal to 2.5 acres in size and that have a maximum imperviousness of less than 20% are excluded from water quality capture volume (WQCV).
- Subbasin II1 is located in the southwest corner of site. The basin drains towards the west and to proposed Detention Pond 14. Current planning documents call for 2.5-acre estate lots. The basin is 50.43 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 34.94 cfs and 74.39 cfs respectively. The pond will discharge at predevelopment rates into an unnamed tributary of Black Squirrel Creek via the ponds outlet structure
- Subbasin II2 is located north of Subbasin II1 and downstream of Subbasin II3 in the southwest corner of site. The basin drains towards the west and to Subbasin II1 via a proposed culvert. Current planning documents call for 2.5-acre estate lots. The basin is 23.13 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 28.04 cfs and 57.88 cfs respectively.
- Subbasin II3 is located north of Subbasin II1. The basin drains towards the west and to Subbasin II2 via a proposed culvert. Current planning documents call for 2.5-acre estate lots. The basin is 23.97 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 28.32 cfs and 58.65 cfs respectively.
- Subbasin JJ is in the southcentral part of the site. The basin drains towards the south and to an unnamed tributary of Black Squirrel Creek. Current planning documents call for low density and 1-acre dwelling units. The basin is 8.9 acres, with a composite impervious value of 20.70% and runoff rates for the 5 and 100 year of 11.49 cfs and 22.8 cfs respectively.
- Subbasin LL is in the southcentral part of the site. The basin drains towards the south and to an unnamed tributary of Black Squirrel Creek. Current planning documents call for low density and 1-acre dwelling units. The basin is 6.2 acres, with a composite impervious value of 12.09% and runoff rates for the 5 and 100 year of 7.36 cfs and 15.07 cfs respectively.
- Subbasin KK is in the southcentral part of the site. The basin drains towards the south and to an unnamed tributary of Black Squirrel Creek. Current planning documents call for 2.5 acre lots. The rest of the area is occupied by the existing Flying Horse Golf Course. The basin is 8.4 acres, with a composite impervious value of 10.00% and runoff rates for the 5 and 100 year of 8.14 cfs and 16.95 cfs respectively.

The above-mentioned basins are large planning area basins and as drainage reports are developed for the individual developed parcels additional drainage reports and calculations will be required. It is expected that storm drainage infrastructure consisting of inlets, storm sewer and open drainage channels will be constructed as the property develops.

- Although mentioned above, offsite basins include basins A, C, F, and Q. Flow contributing to the site from these basins will be routed through the proposed detention ponds. Flow rates are shown below.

Offsite Flow Summary					
Basin Description	Ultimate Design Point	Basin Area (ac)	Receiving Detention Pond	5 Year Peak Runoff (cfs)	100 Year Peak Runoff (cfs)
A	A	18.99	Pond 11	20.84	43.83
C	C	36.39	Pond 11	33.36	71.27
F	F	25.25	Irr. Pond	24.27	51.63
Q	Q	72.29	Pond 9	64.68	137.80

b. Methodology

Design rainfall was determined utilizing Table 6-2 from the City of Colorado Springs Drainage Criteria Manual to determine the 5-year and 100-year rainfall values for the 1-hour events. The 1-hour rainfall depths are 1.5 and 2.52 in/hr respectively.

Composite percent impervious calculations were completed for each subbasin based on the density of lots and can be found in Appendix B. The El Paso County Drainage Criteria Manual Table 5-1 was used for reference when correlating land use to percent impervious values and located in Appendix F. Impervious values for 5-Acre Lots, 2.5-Acre Lots, Medium Density, Low Density, and Commercial Lots had impervious values of 10%, 15%, 45%, 55% and 75% respectively. The rainfall and percent impervious values were then used as inputs into the Colorado Urban Hydrograph Procedure (CUHP) spreadsheets to determine runoff values for both pre-development and post-development site.

CUHP is an evolution of the Snyder unit hydrograph and is calibrated for use along the Colorado Front Range. 1 Hour rainfall amounts are input into the program to produce a storm hyetograph that is then used to calculate a storm hydrograph for each basin depending on the subbasins properties including slope, length, shape, impervious area, pervious depression storage area, and various infiltration rates. Tabular hydrographs are then computed and can be used in EPA SWMM. The CUHP results are included within Appendix B.

EPA SWMM was used to determine flow routing via the kinematic wave method. Subbasins were routed to their respective design points and detention ponds for both the developed and predeveloped condition to determine peak runoff amounts for the 5-year and 100-year storm events. Information from these models along with information and calculations performed in the Mile High Flood District BMP spreadsheets was used to determine pond sizing calculations and release rates.

c. Basin Hydrology

A summary of the flows for both the predeveloped and developed cases for each basin, subbasin and Pond are found on next page along with the full computation found in Appendix B.

Existing SWMM Basin Summary				
Basin Description	Basin Area (ac)	% Impervious	5 Year Peak Runoff (cfs)	100 Year Peak Runoff (cfs)
A	18.99	2.00	20.84	43.83
B	59.74	2.00	103.48	221.48
C	34.87	2.00	33.36	71.27
D	38.84	2.00	31.56	67.84
E	127.86	2.00	223.69	483.10
F	25.25	2.00	24.27	51.63
G	52.19	2.00	79.17	166.51
H	20.63	2.00	18.59	39.78
I	31.93	2.00	34.58	72.63
J	28.47	2.00	56.31	120.46
K	93.14	2.00	92.05	195.43
L	16.39	2.00	107.58	228.73
M	13.87	2.00	11.48	24.61
N	49.00	2.00	68.16	143.11
O	24.76	2.00	22.69	48.54
P	43.80	2.00	38.52	82.17
Q	72.29	2.00	64.68	137.80
R	54.98	2.00	108.65	232.13
S	24.36	2.00	25.99	48.54
T	5.24	2.00	4.04	8.68
U	5.48	2.00	4.15	8.95
V	38.47	2.00	29.63	63.92
W	3.76	2.00	3.45	7.33
X	190.88	2.00	167.76	361.56
AA	33.49	10.00	38.76	80.22
BB	37.15	10.00	40.62	84.15
CC	6.33	10.00	6.53	13.57
DD	70.06	10.00	58.42	123.69
EE	69.47	10.00	81.16	167.45
FF	17.62	2.00	162.77	340.42
GG	16.35	2.00	14.93	31.99
HH	12.61	2.00	13.01	27.42
II	97.53	2.00	81.77	175.59
JJ	8.72	2.00	9.74	20.50
KK	8.12	2.00	7.51	15.99
LL	6.10	2.00	6.88	14.48

Proposed SWMM Basin and Pond Summary						
Basin Description	Basin Area (ac)	% Impervious	5 Year Peak Runoff (cfs)	100 Year Peak Runoff (cfs)	5 Year Pond Volume (ac-ft)	100 Year Pond Volume (ac-ft)
P	43.71	20.71%	40.00	82.83		
Pond 1					1.03	1.97
X1	76.38	29.50%	80.91	163.27		
Pond 2					6.56	8.80
O	52.52	30.10%	63.86	127.40		
Pond 3					3.79	6.37
X2	36.33	33.33%	41.46	82.46		
X3	61.99	13.53%	47.59	100.73		
V2	15.34	15.00%	16.15	33.25		
V1	11.57	38.62%	13.99	27.67		
Pond 4					7.21	7.35
N	41.57	29.60%	73.48	141.24		
Pond 5					1.86	2.55
M	26.83	33.19%	46.54	89.09		
Pond 6					0.84	0.94
K	114.73	38.03%	200.94	382.30		
Pond 7					8.38	12.59
L	15.89	24.82%	15.97	32.40		
Pond 8					1.05	1.09
S	21.67	40.88%	30.83	58.96		
R	56.16	21.81%	56.59	116.06		
Q	72.29	2.00%	64.68	137.80		
Pond 9					6.28	10.31
H	21.96	10.00%	17.86	37.80		
Pond 10					0.66	0.94
B2	19.99	24.55%	17.99	37.14		
B1	59.74	29.83%	66.93	133.69		
A	18.99	2.00%	20.84	43.83		
C	36.39	2.00%	35.31	75.28		
Pond 11					1.94	3.23
J	28.07	10.00%	24.25	51.19		
Existing Pond 12						
EE2	16.36	75.00%	35.71	63.62		
EE3	6.67	55.00%	10.38	19.93		
Pond 13					1.33	1.61
II3	23.97	10.0%	28.32	58.65		
II2	23.13	10.0%	28.04	116.62		
II1	50.43	10.0%	34.94	74.39		
Pond 14					1.06	3.99
D	40.87	37.20%	61.12	117.38		
Pond 15					1.94	3.23
E	106.53	14.35%	74.68	157.91		

I	26.99	34.66%	40.37	78.06		
Pond 16					1.40	1.79
JJ	8.9	20.70%	11.49	22.8		
KK	8.4	12.09%	8.14	16.95		
LL	6.2	10.00%	7.36	15.07		
Pond 17					1.09	1.23
G	31.45	12.48%	37.69	107.75		
Irrigation Pond						
JJ	8.90	20.70%	11.06	28.04		
LL	6.2	12.09%	5.85	15.68		
KK	8.4	10.00%	5.9	16.72		
Natural Drainage Way						
DD	69.5	10.0%	42.26	120.76		
EE1	50.87	10.0%	42.6	154.16		
Existing Flying Horse North Detention Pond 6						
CC	6.33	10.0%	4.74	13.39		
FF	18.1	10.0%	100.02	325.29		
Existing Flying Horse North Detention Pond 7						
GG	16.35	10.0%	11.25	32.04		
AA	33.8	10.0%	28.57	80.08		
BB	37.15	10.0%	29.52	83.01		
Existing Flying Horse North Detention Pond 8						
HH	12.7	10.0%	9.86	27.77		
Natural Drainage Way						
T	5.24	2.00%	2.92	8.56		
U	5.86	10.0%	3.63	10.37		
W	3.76	10.0%	2.6	7.36		
Natural Drainage Way						

IV. Hydraulic Analysis

a. Major Drainageways

There are no major drainage ways exist within the development; however, small tertiary tributaries are within the site currently and function to convey flows to unnamed tributaries of the East Cherry Creek and Black Squirrel Creek.

V. Environmental Evaluations

a. Significant Existing or Potential Wetland and Riparian Areas Impacts

As part of this work, the developer has engaged Bristlecone Ecology, LLC to perform environmental studies of the site that will be submitted with the planning documents. Major information in the report concerning wetlands concludes that there is a wetland associated with Black Squirrel Creek. Black Squirrel Creek is known to be a jurisdictional stream.

At this time, there are no improvements proposed for Black Squirrel Creek. The minimal impact to the stream will keep the natural habitat intact and the natural function of the Creek as it is to maintain the wetland habitat.

b. Stormwater Quality Considerations and Proposed Practices

As part of the development, full spectrum detention facilities will be installed to provide water quality for the development. The facilities will be designed using El Paso County criteria and provide stormwater quality by slowing the release of stormwater captured by the ponds and allowing solids to settle out. Additionally, when possible, the existing natural drainage ways will be used to convey stormwater to more closely mimic the natural hydrologic and hydraulic cycle. Some of the drainage ways will be used to convey water to the ponds and others will receive water from the ponds and in both scenarios will provide additional water quality benefits.

On site practices for the homes, schools, churches, and other buildings should use means such that impervious areas drain across pervious area to allow for infiltration during the minor events. This would include discharge of the gutters onto landscape areas vs. directly connecting to storm sewer and as discussed above as well using natural ditches and swales where it is logical and makes sense to convey stormwater in lieu of storm sewer piping.

c. Permitting Requirements

When work infringes upon the wetlands or floodplain a 404 Permit will be required. If the work within the waterways is minimal, it will likely be covered under a nationwide 404 permit; it is however possible that an individual permits will be required.

The Colorado Department of Public Health and Environment will require permits for any disturbance that exceed 1 acre of land. Should groundwater be encountered, a dewatering permit will also be required.

El Paso County will require an Erosion and Stormwater Quality Control Permit and any other construction permits required to complete the construction of the site.

Should development occur which effects the floodplain, FEMA will require a permit for work withing the floodplain prior to the commencement of any construction or development within any special flood hazard area (SFHA). If the infrastructure is to be installed within the channel the designer shall route the design through the proper FEMA channels whether that be with a no rise certification or via the CLOMR/LOMR process should a more major improvement within the floodplain be proposed. At this time the project does not propose any direct development within the floodplain however storm infrastructure will discharge into the existing FEMA channel.

d. 4-Step Process

In accordance with the Engineering Criteria Manual I.7.2.A and DCM V2, this site has implemented the four-step process to minimize adverse impacts of urbanization. The four-step process includes reducing runoff volumes, stabilizing drainageways, treating the water quality capture volume, and considering the need for Industrial Commercial BMPs.

Step 1 – Reducing Runoff Volumes: The development of the project site includes a variety of land uses including open and vegetated areas interspersed to help disconnect imperious areas and reduce runoff volumes.

Step 2 – Stabilize Drainageways: Altered drainage ways will be designed in a manner that provides water quality benefits through infiltration and the removal of pollutants via phytoremediation. Vegetation will also be selected to stabilize the drainage ways by reducing the velocity of flows and decreasing any scour. Should the final drainage ways require, grade control structures may be implemented to further reduce flow velocities and protect against erosion. These improvements will help stabilize drainageways.

Step 3 – Provide WQCV: Runoff from this development is treated through capture and slow release of the WQCV via detention ponds that are designed per current El Paso County DCM V2.

Step 4 – Consider the need for Industrial and Commercial BMP's: A site specific storm water quality and erosion control plan and narrative will be prepared with subsequent land use approvals prepared in conjunction with the report prior to any construction. Site specific temporary source control BMPs as well as permanent BMPs are detailed in this plan and narrative. Guidelines detailed in the El Paso DCM V2 4.2 pertaining to the covering and storage handline and spill containment and control shall be followed as necessary.

VI. Alternatives Evaluation

The current selected plan for drainage follows the DPBS for the Black Squirrel Basin and will not require an evaluation of alternatives.

VII. Selected Plan

a. Plan Hydrology

This MDDP schematically addressed on-site and off-site drainage patterns using the existing topography and proposed land use plan for the overall drainage design. Individual preliminary and final drainage reports will better define the planning areas as the site is developed.

The overall site is divided into several separate major basins. Basin sizes range from 35 acres to 181 acres in size. Basins A through V2 drain and eventually discharge into an unnamed tributary of the Arkansas River. Basins AA through LL drain towards unnamed tributaries of Black Squirrel Creek.

The sub-basins are described in additional detail above.

b. System Improvements

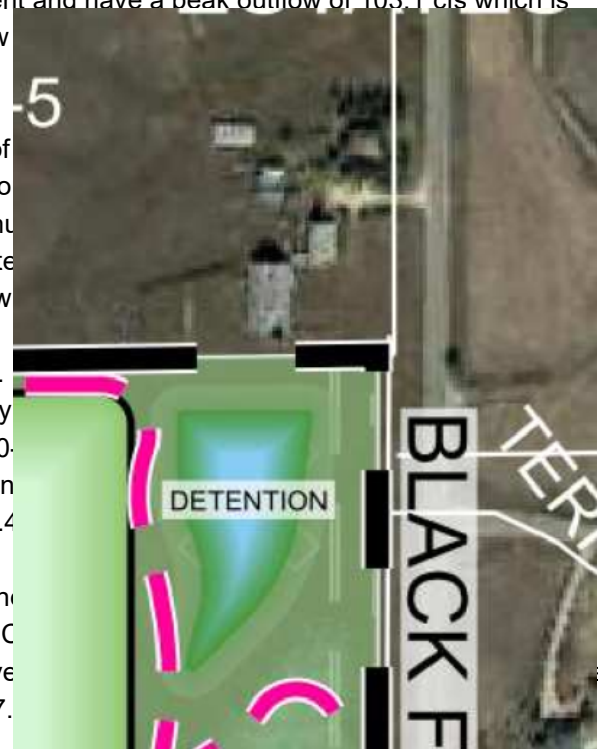
The site plans propose the construction of 15 separate full spectrum detention facilities and utilize the capacity of 2 existing full spectrum detention facilities. The ponds are preliminarily sized to ensure that the 5-year and 100-year release rates are equal to or less than the historic rates. For the PDR and FDR, the consultant will need to use a routing software to accurately model the routed hydrographs for ponds upstream of the irrigation pond. The irrigation pond has a 12 hr drain time for WQCV. All drains times must be within 72 hours for the 5-year storm or within 120 hours for storm events greater than the 5-year storm per Senate Bill 15-212.

- Pond 1 is located in the northwest corner of the site and discharges into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 1.97 ac-ft during the 100-year event and have a peak outflow of 81.7 cfs which is slightly below the predevelopment peak outflow of 81.0 cfs. The 5-year storage volume is 1.03 ac-ft with a peak outflow of 24.9 cfs.

- Pond 2 is located to the east of Pond 1 and discharges into another unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 8.8 ac-ft during the 100-year event and have a peak outflow of 74.6 cfs which is slightly below the predevelopment peak outflow of 81.0 cfs. The 5-year storage volume is 6.56 ac-ft with a peak outflow of 27.8 cfs.
- Pond 3 is located on the eastern portion of the site and south of Pond 1. The pond discharges into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 6.37 ac-ft during the 100-year event and have a peak outflow of 46.1 cfs which is slightly below the predevelopment peak outflow of 48.5 cfs. The 5-year storage volume is 3.79 ac-ft with a peak outflow of 22.7 cfs.
- Pond 4 is located near the eastern portion of the site adjacent to Black Forest Rd. The pond discharges into a natural drainage way, which outlets into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 7.35 ac-ft during the 100-year event and have a peak outflow of 198.8 cfs which is slightly below the predevelopment peak flow rate of 231.6 cfs. The 5-year storage volume is 7.12 ac-ft with a peak outflow of 70.6 cfs.
- Pond 5 is located in the northwest portion of the site. The pond discharges natural drainageway, which outlets into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 2.5 ac-ft during the 100-year event and have a peak outflow of 103.1 cfs which is greater than the predevelopment peak outflow of 39.4 cfs.
- Pond 6 is located near the northwest corner of the site. The pond discharges into a natural drainageway which outlets into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 7 ac-ft during the 100-year event and have a peak outflow of 65.4 cfs.

- Is there potential issues with Pond 9 location? Existing house is directly downstream.

Unresolved. Expand on the Pond 9 description to address previous comment.



- Pond 8 is located near the central portion of the site. The pond discharges into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 0.94 ac-ft during the 100-year event and have a peak outflow of 32.7 cfs which is greater than the predevelopment peak outflow of 11.4 cfs.
- Pond 9 is located near the southeast corner of the site just and adjacent to Black Forest Road. The pond discharges into a natural drainageway just south of East Cherry Creek. The pond is planned to store a maximum of 10.31 ac-ft during the 100-year event and have a peak outflow of 103.1 cfs which is greater than the predevelopment peak outflow of 39.4 cfs.

220.7 cfs which is lower than the predevelopment peak outflow of 282.3 cfs. The 5-year storage volume is 6.28 ac-ft with a peak outflow of 94.8 cfs.

- Pond 10 is located on the north central portion of the site and north of Stagecoach Road. The pond discharges into an unnamed tributary of East Cherry Creek. The pond is planned to store a maximum of 0.94 ac-ft during the 100-year event and have a peak outflow of 33.9 cfs which is lower than the predevelopment peak outflow of 39.2 cfs. The 5-year storage volume is 0.68 ac-ft with a peak outflow of 13.6 cfs.
- Pond 11 is located near the central portion of the site. The pond discharges into a natural drainageway which eventually discharges into the Irrigation Pond. The pond is planned to store a maximum of 6.83 ac-ft during the 100-year event and have a peak outflow of 230.0 cfs which is above than the predevelopment peak outflow of 221.3 cfs. The 5-year storage volume is 3.66 ac-ft with a peak outflow of 98.4 cfs.
- Existing Pond 12 is designed in the Classic Homes Filing No. 1 FDR and located near the northwest corner of the site and north of Stagecoach Road. The pond discharges into an unnamed tributary of East Cherry Creek. The pond is planned to have a peak outflow of 45.0 cfs.
- Pond 13 is located central portion of the site and just west of the major ridgeline between the two basins. The pond discharges into a natural drainageway to an existing pond of Filing No. 1, which ultimately outlets to Black Squirrel Creek. The pond is planned to store a maximum of 1.8 ac-ft during the 100-year event and have a peak outflow of 54.2 cfs which lower than the predevelopment peak outflow of 55.0. The 5-year storage volume is 1.3 ac-ft with a peak outflow of 17.2 cfs.
- Pond 14 is located near the southwest corner of the site just east of the Black Squirrel Creek. The pond discharges into a natural drainageway of Black Squirrel Creek. The pond is planned to store a maximum of 3.99 ac-ft during the 100-year event and have a peak outflow of 152.3 cfs which is slightly lower than the predevelopment peak outflow of 173.0 cfs. The 5-year storage volume is 1.06 ac-ft with a peak outflow of 59.0 cfs.
- Pond 15 is near the central portion of the site. The pond discharges into a natural drainageway which eventually discharges into the existing Irrigation Pond. The pond is planned to store a maximum of 3.23 ac-ft during the 100- year event and have a peak outflow of 68.4 cfs which is slightly above the predevelopment peak of 67.8 cfs. The 5-year storage volume is 1.94 ac-ft with a peak outflow of 30.9 cfs.
- Pond 16 is near the central portion of the site. The pond discharges into a culvert and goes under Stagecoach Road, which eventually discharges into an existing drainageway of East Cherry Creek. The pond is planned to store a maximum of 5.40 ac-ft during the 100-year event and have a peak outflow of 63.8 cfs which is slightly below the predevelopment peak of 71.2 cfs. The 5 year storage volume is 4.66 ac-ft with a peak outflow of 24.3 cfs.

- Pond 17 is near the central portion of the site. The pond discharges into a natural drainageway which eventually discharges into an existing drainageway of Black Squirrel Creek. The pond is planned to store a maximum of 1.23 ac-ft during the 100 year event and have a peak outflow of 49.6 cfs which is slightly below the predevelopment peak of 49.9 cfs. The 5 year storage volume is 1.09 ac-ft with a peak outflow of 16.8 cfs..
- The existing Irrigation Pond is in the central portion of site and just south of existing Stagecoach Road. The pond discharges towards an unnamed tributary of East Cherry Creek. The irrigation pond was design and subsequently built as part of the Filing 1 project. Storage Volumes for the pond assumed different upstream development conditions and therefore the pond will receive a higher volume of water during the storm events however the rate into the pond will be reduced. The irrigation pond will store 35.92 ac-ft during the 100-year event with a peak outflow of 274.73 cfs and the 5 year storage volume is 19.67 ac-ft with a peak outflow of 114.0 cfs.

The site plans propose the construction of 2 culverts in the southwest corner of site that navigates flow under roads to proposed Detention Pond 14. Analyses were completed by flow master and calculations can be found in Appendix E.

- Culvert 1 carries flow from Subbasin II3 to Subbasin II2 in the southwest corner of site. Each of the basins consist of the Flying Horse Golf Course and 2.5-acre estate lots. The culvert is 36" RCP at a 1% slope and designed for the 100-year event. The culvert will have a peak outflow of 58.65 cfs, where the pipe is 72% full.
- Culvert 2 carries flow from Subbasin II2 to Subbasin II1 in the southwest corner of site. Each of the basins consist of the Flying Horse Golf Course and 2.5-acre estate lots. The culvert is 42" RCP at a 2% slope and designed for the 100-year event. The culvert will have a peak outflow of 116.62 cfs, where the pipe is 68% full.

The culverts sizes should be refined in the PDR and FDR. Energy dissipation calcs can also be performed later within the design.

Overall runoff from the site will by and large match or be less than predevelopment peak flows sans those for outfall 5 which is slightly greater than predevelopment flows. The volume of water will increase however as the drainage channels are designs, continuous simulation models will be done to see the effects of prolonged runoff rates. Predevelopment and post development flows for the 5-year and 100-year events are summarized in the following table for the 5 site outfalls.

OUTFALL	Predevelopment		Postdevelopment*	
	5 year	100 year	5 year	100 year
1	320.31	725.59	183.76	705.93
2	145.46	311.00	80.36	242.18
3	167.76	361.56	70.06	271.49
4	346.26	733.92	230.07	646.46
5	24.12	50.88	16.85	45.91

*Values to be refined with Preliminary and Final Drainage Reports for each filing

VIII. Drawings

Please refer to the appendices for vicinity maps and drainage basin maps.

IX. Summary

Flying Horse North is a large master planned community consisting of various densities of dwelling units to include single family homes, multifamily homes, parks, institutional sites, and commercial areas. Due to development increased runoff will occur. To mitigate downstream impacts, 16 large full spectrum detention facilities will be built to reduce the runoff rate to near historic levels. These detention facilities will provide water quality enhancements to account for the increased urbanization of the upstream catchment areas. The ponds are preliminarily sized to ensure that the 5-year and 100-year release rates are equal to or less than the historic rates. For the PDR and FDR, the consultant will need to use a routing software to accurately model the routed hydrographs for ponds upstream of the irrigation pond. The irrigation pond has a 12 hour drain time for WQCV. All drains times must be within 72 hours for the 5-year storm or within 120 hours for storm events greater than the 5-year storm per Senate Bill 15-212.

Additional analysis will be required and completed to review the hydraulics of the proposed major drainage channels and be included in future submittals. The proposed design, as described in this report, is not anticipated to cause any adverse impact to downstream properties however as noted previously due to the increased volume of water, downstream tributaries will see increases in the volume of flow. It is advised that low impact design be considered when designing and developing each filing. This shall include those items listed in the four-step process above and any additional measures that are within reason to disconnect impervious areas and increase infiltration. This will alleviate the additional volume of water due to development. Although the rate will remain at or below historic levels, the amount of time the channels will see water will increase which may cause more channel movement than historic. Downstream planning efforts should allow for the natural migration and movement of the channel by continuing to provide large floodplain areas to allow movement of the channel.

X. References

El Paso County – Drainage Criteria Manual, 2014

City of Colorado Springs – Drainage Criteria Manual, May 2014

Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018

Preliminary Drainage Report for Flying Horse North Preliminary Plan and Final Drainage Report for Flying Horse North Filing No. 1, Classic Consulting Engineers and Surveyors, November 2017

Flying Horse North Irrigation Reservoir Embankment Design Report, Classic Consulting Engineers and Surveyors, August 2018

Black Squirrel Drainage Basin Planning Study (DBPS), URS Consultants, January 1989

Appendix A



Douglas County

Elbert County

Elbert County

Lincoln County

Pueblo County

Teller County
Fremont County

Drainage Basins

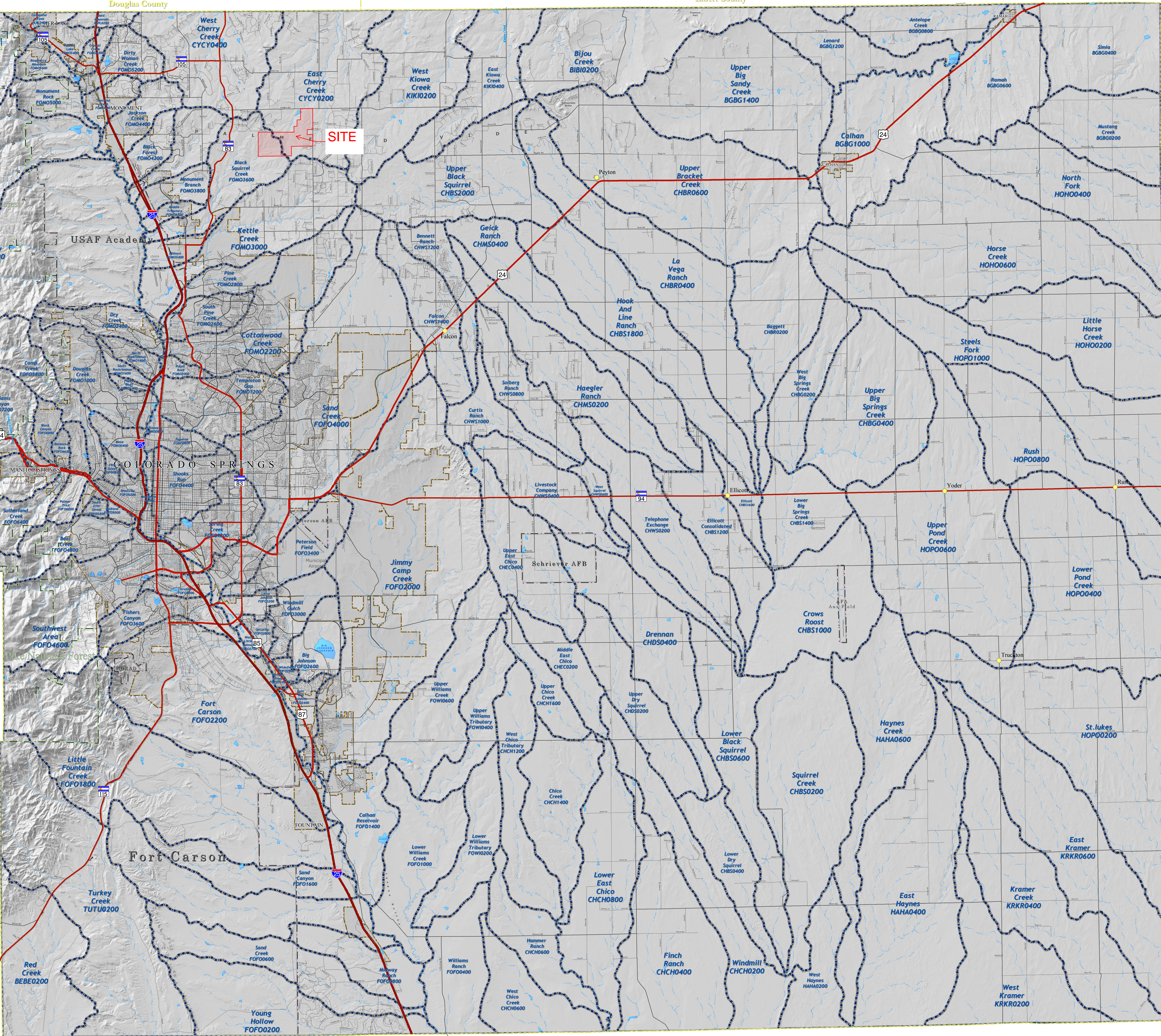
El Paso County Colorado Legend

- Drainage Basins (Source: Muter Engineering Company 1988)
- US Interstate Highways
- US Highways
- Colorado State Highways
- Major Roadways
- Local Streets & Roads
- Creeks
 - Perennial
 - Intermittent
- Lakes & Reservoirs
- Summits
- Unincorporated Urban Areas
- Incorporated Cities
- Military
- Forest
- County Lines

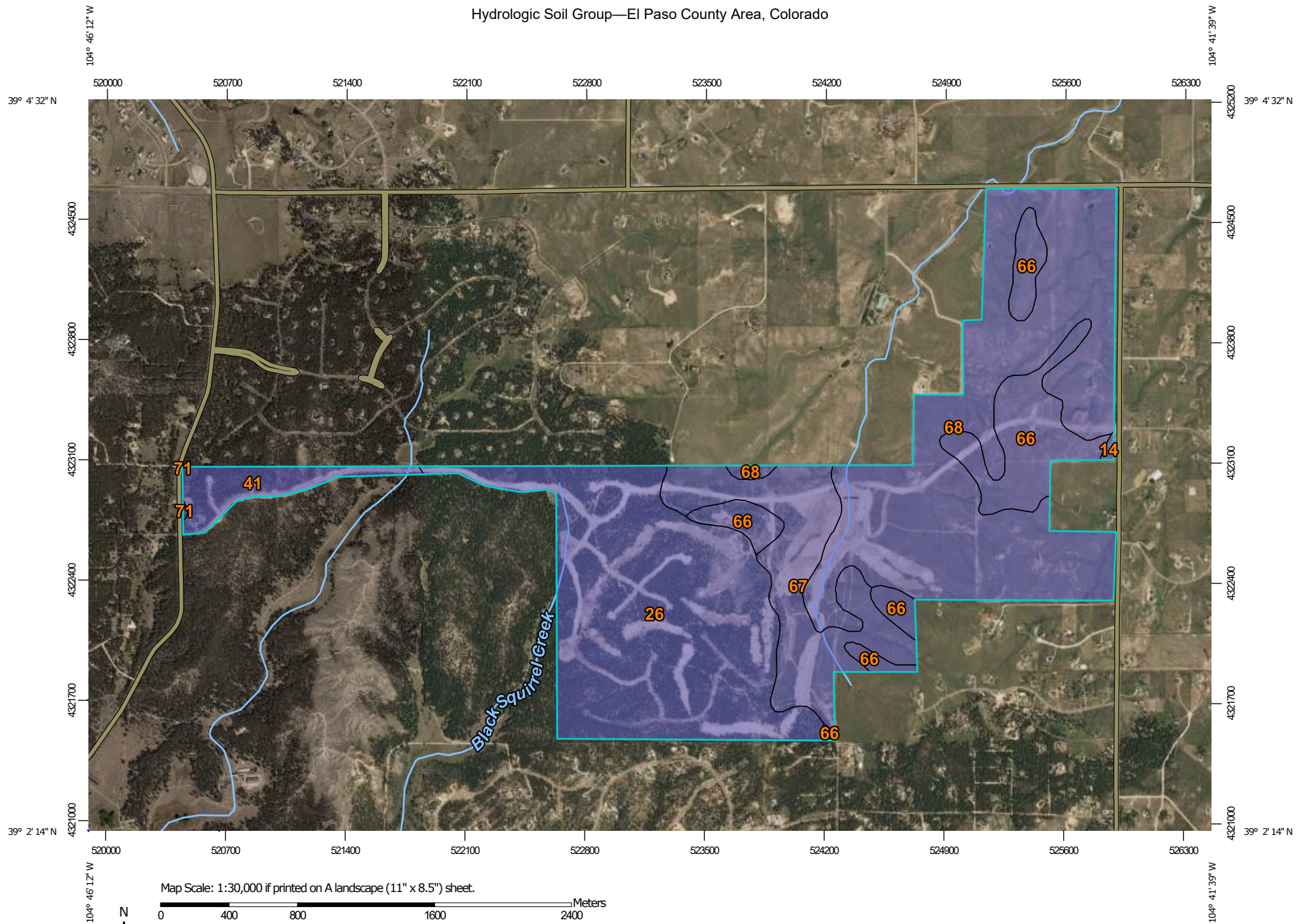


0 0.5 1 2 3 4 5
Miles

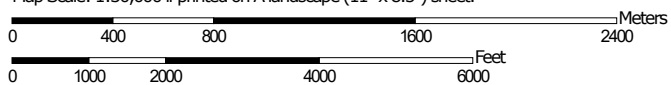
COPYRIGHT 2007 by the Board of County Commissioners, El Paso County, Colorado. All rights reserved. No part of this document or data contained herein may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission of the Board of County Commissioners, El Paso County, Colorado. This document was prepared from the best data available at the time of printing. El Paso County, Colorado, makes no claim as to the completeness or accuracy of the data contained herein.



Hydrologic Soil Group—El Paso County Area, Colorado



Map Scale: 1:30,000 if printed on A landscape (11" x 8.5") sheet.



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




**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

1/27/2022
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines


 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 19, 2018—May 26, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
14	Brussett loam, 1 to 3 percent slopes	B	1.9	0.1%
26	Elbeth sandy loam, 8 to 15 percent slopes	B	474.2	33.7%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	53.4	3.8%
66	Peyton sandy loam, 1 to 5 percent slopes	B	160.9	11.4%
67	Peyton sandy loam, 5 to 9 percent slopes	B	182.8	13.0%
68	Peyton-Pring complex, 3 to 8 percent slopes	B	533.4	37.9%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	0.6	0.0%
Totals for Area of Interest			1,407.3	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Dam Overview

Dam Name

Administration Type

NID ID

WDID

Physical Status

Hazard Class

Stream

Last Inspection Result

FRANKTOWN PARKER FPE-2 (080130)

Jurisdictional Dam

CO00274

Active

Low

EAST CHERRY CR

Conditionally Satisfactory (04/11/2018)

▼ Location

Division

Water District

County

Downstream Town

Town Distance


1

8

EL PASO

FRANKTOWN

25



Q40	Q160	Section	Township	Range	PM	UTM X	UTM Y	Latitude	Longitude	Location Accuracy
NE	NW	30	11.0 S	65.0 W	S	524990.8	4324584.3	39.070004	-104.711118	GPS

▼ Dam Details

Primary Name

EAP

EAP Date

Primary Contact

EAP Inundation Map

Inundation Map Date

EL PASO COUNTY

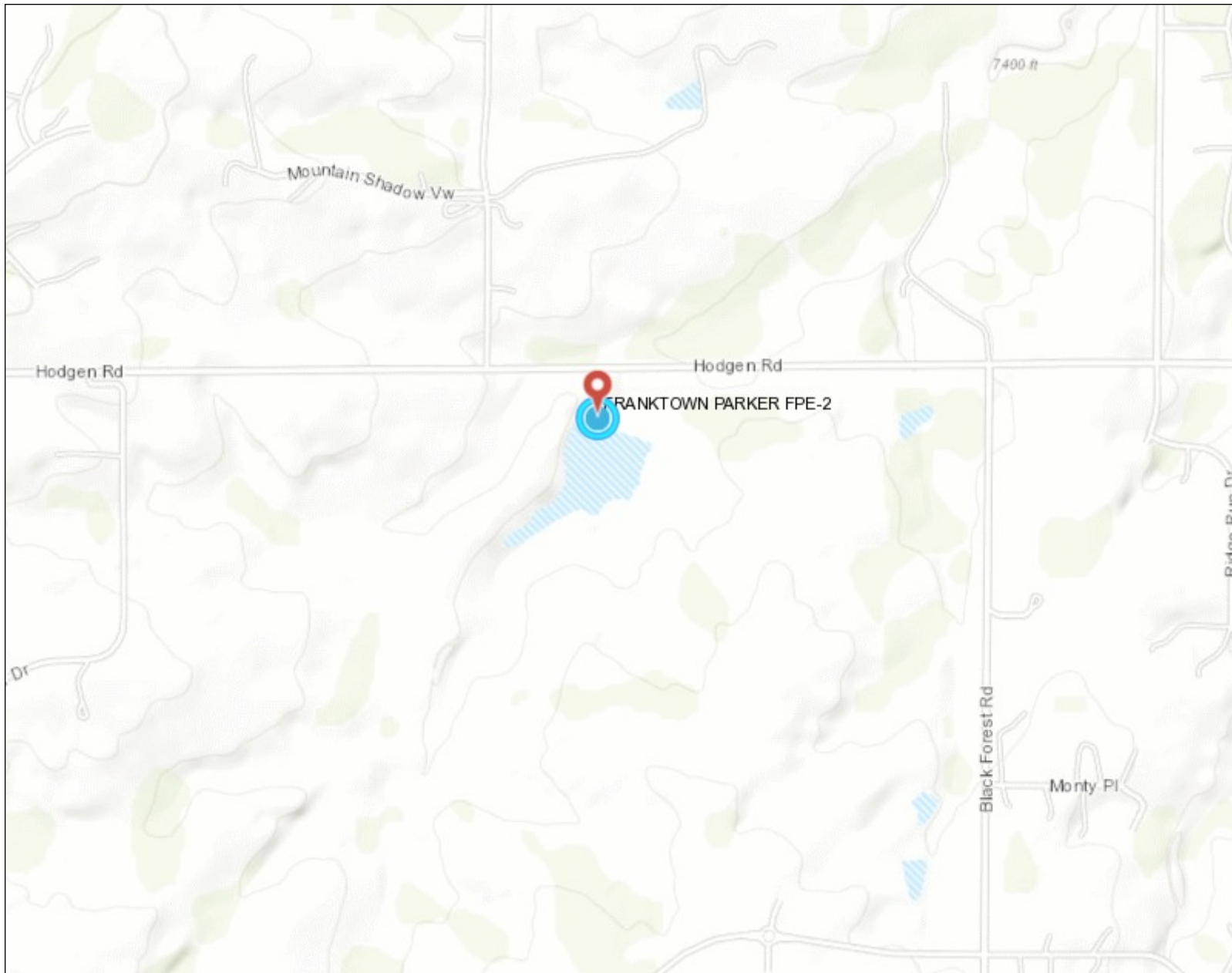
Not Required

STEVE JACOBSEN

No



Map Viewer



Legend

Jurisdictional Dam

- High
- Significant
- Low
- NPH

■ Non Jurisdictional Dam

□ County

Location



Notes

2,339 0 1,169 2,339 Feet

1: 14,032



This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

Date Prepared: 9/22/2021 11:42:36 AM

Appendix B

Basin Description	Park/Open Space	5 Acre	2.5 Acre	Low Density	Med Density	Commercial	Total Impervious	Total Acreage	Composite Percent Impervious	Predominant Soil Group	5 Year C Factor	100 Year C Factor
Impervious Percentage	10%	10%	15%	45%	55%	75%						
P	15.55	14.78	0.00	13.38	0.00	0.00	9.05	43.71	20.71%	B	0.15	0.41
						Pond 1		43.71	20.71%			
X1	38.32	3.30	0.00	25.66	0.00	9.10	22.53	76.38	29.50%	B	0.24	0.47
						Pond 2		76.38	29.50%			
O	13.17	0.00	10.72	28.63	0.00	0.00	15.81	52.52	30.10%	B	0.19	0.44
						Pond 3		52.52	30.10%			
X2	12.11	0.00	0.00	24.22	0.00	0.00	12.11	36.33	33.33%	B	0.19	0.44
X3	38.88	16.85	0.00	6.26	0.00	0.00	8.39	61.99	13.53%	B	0.13	0.40
V2	0.00	0.00	15.34	0.00	0.00	0.00	2.30	15.34	15.00%	B		
V1	2.11	0.00	0.00	9.46	0.00	0.00	4.47	11.57	38.62%	B	0.20	0.45
						Pond 4		125.23	20.85%			
N	10.44	11.52	0.00	6.77	12.84	0.00	12.30	41.57	29.60%	B	0.19	0.46
						Pond 5		41.57	29.60%			
M	14.55	0.00	0.00	1.24	6.94	4.10	8.91	26.83	33.19%	B	0.28	0.52
						Pond 6		26.83	33.19%			
K	26.45	2.93	0.00	61.89	23.46	0.00	43.69	114.73	38.08%	B	0.21	0.47
						Pond 7		114.73	38.08%			
L	6.93	5.54	0.00	0.00	2.72	0.00	2.74	15.19	18.06%	B	0.15	0.42
						Pond 8		15.19	18.06%			
S	2.31	0.24	0.00	19.12	0	0.00	8.86	21.67	40.88%	B	0.21	0.45
R	26.63	16.11	0.00	21.77	0.00	0.00	14.07	64.51	21.81%	B	0.15	0.41
						Pond 9		86.18	21.81%			
H	17.65	4.31	0.00	0.00	0.00	0.00	2.20	21.96	10.00%	B	0.12	0.39
						Pond 10		21.96	10.00%			
B2	7.20	4.48	0.00	8.31	0.00	0.00	4.91	19.99	24.55%	B	0.16	0.42
B1	12.86	13.03	0.00	33.85	0.00	0.00	17.82	59.74	29.83%	B	0.18	0.43
						Pond 11		79.73	28.51%			
J	28.07	0.00	0.00	0.00	0.00	0.00	2.81	28.07	10.00%	B	0.12	0.39
						Existing Pond 12						
I	17.99	0.00	0.00	0.00	0.00	11.00	10.05	28.99	34.66%	B	0.38	0.58
						Pond 16		57.06	22.53%			
EE2	0.00	0.00	0.00	0.00	0.00	16.36	12.27	16.36	75.00%	B	0.81	0.88
EE3	0.00	0.00	0.00	0.00	6.67	0.00	3.67	6.67	55.00%	B	0.30	0.58
						Pond 13		23.03	69.21%			
II2	0.00	23.13	0.00	0.00	0.00	0.00	2.31	23.13	10.00%	B	0.12	0.39
II3	0.00	23.97	0.00	0.00	0.00	0.00	2.40	23.97	10.00%	B	0.12	0.39
II1	15.77	34.66	0.00	0.00	0.00	0.00	5.04	50.43	10.00%	B	0.12	0.39
						Pond 14		97.53	10.00%			
D	4.41	4.70	0.00	31.76	0.00	0.00	15.20	40.87	37.20%	B	0.20	0.44
						Pond 15		40.87	37.20%			
E	99.63	8.80	0.00	1.72	0.00	6.90	16.79	117.05	14.35%	B	0.16	0.42
G	25.81	3.41	0.00	2.23	0.00	0.00	3.93	31.45	12.48%	B	0.13	0.39
						Irrigation Pond		148.50	13.95%			
JJ	1.86	4.32	0.00	2.72	0.00	0.00	1.84	8.90	20.70%	B	0.15	0.41
LL	4.39	1.44	0.00	0.37	0.00	0.00	0.75	6.20	12.09%	B	0.13	0.39
						Pond 17		15.10	17.16%			
KK	5.98	2.42	0.00	0.00	0.00	0.00	0.84	8.40	10.00%	B	0.12	0.39
AA	0.00	33.88	0.00	0.00	0.00	0.00	3.39	33.88	10.00%	B	0.12	0.39
BB	0.00	37.15	0.00	0.00	0.00	0.00	3.72	37.15	10.00%	B	0.12	0.39
CC	0.00	6.33	0.00	0.00	0.00	0.00	0.63	6.33	10.00%	B	0.12	0.39
DD	0.00	69.5	0.00	0.00	0.00	0.00	6.95	69.50	10.00%	B	0.12	0.39
FF	0.00	18.1	0.00	0.00	0.00	0.00	1.81	18.10	10.00%	B	0.12	0.39
GG	0.00	16.35	0.00	0.00	0.00	0.00	1.64	16.35	10.00%	B	0.12	0.39
HH	0.00	12.7	0.00	0.00	0.00	0.00	1.27	12.70	10.00%	B	0.12	0.39

*2% imperviousness for all, and runoff coefficients are .09 and .36 for 5 and 100 yr respectively

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
1	P	0.156	0.139	37.1	5.47	19.3	3.87	9.1	55	158,994	1.36	215,685	40.0	39	215,259	0.89
2	X	0.156	0.249	50.8	11.22	26.4	7.93	18.7	176	692,894	1.36	939,952	50.0	139	939,989	0.73
3	O	0.156	0.108	34.9	4.39	18.2	3.10	7.3	33	89,879	1.36	121,926	40.0	23	121,661	0.92
4	N	0.156	0.147	25.7	4.39	13.4	3.10	7.3	89	177,870	1.36	241,291	35.0	57	240,676	1.16
5	W	0.156	0.046	33.7	2.70	17.5	1.90	4.5	5	13,649	1.36	18,515	35.0	3	18,246	0.92
6	M	0.156	0.083	40.0	4.05	20.8	2.86	6.7	16	50,348	1.36	68,300	40.0	11	68,114	0.83
7	V	0.156	0.132	45.0	6.05	23.4	4.27	10.1	40	140,009	1.36	189,931	45.0	30	189,854	0.77
8	U	0.156	0.055	44.5	3.37	23.2	2.38	5.6	6	19,892	1.36	26,985	40.0	4	26,889	0.76
9	L	0.156	0.090	32.6	3.74	17.0	2.64	6.2	24	59,496	1.36	80,709	35.0	16	80,352	0.96
10	K	0.156	0.196	32.6	6.40	17.0	4.52	10.7	134	338,098	1.36	458,650	40.0	92	458,862	0.99
11	S	0.156	0.107	28.6	3.85	14.9	2.72	6.4	40	88,427	1.36	119,956	35.0	26	119,542	1.07
12	R	0.156	0.154	42.5	6.54	22.1	4.62	10.9	61	199,577	1.36	270,738	45.0	44	270,785	0.80
13	G	0.156	0.151	29.3	4.89	15.2	3.46	8.2	83	189,450	1.36	257,000	35.0	55	256,005	1.05
14	D	0.156	0.132	41.6	5.71	21.6	4.04	9.5	44	140,989	1.36	191,260	40.0	32	191,160	0.81
15	B	0.156	0.160	40.3	6.46	20.9	4.56	10.8	70	216,856	1.36	294,178	40.0	50	294,255	0.84
16	E	0.156	0.221	50.4	10.04	26.2	7.10	16.7	119	464,132	1.36	629,622	50.0	93	629,347	0.73
17	H	0.156	0.099	35.7	4.22	18.6	2.98	7.0	27	74,887	1.36	101,588	40.0	19	101,348	0.90
18	J	0.156	0.115	42.2	5.22	21.9	3.69	8.7	32	103,346	1.36	140,195	40.0	23	139,959	0.80
19	I	0.156	0.121	28.1	4.11	14.6	2.90	6.8	53	115,906	1.36	157,233	35.0	35	156,699	1.08
20	JJ	0.156	0.067	26.0	2.84	13.5	2.01	4.7	16	31,654	1.36	42,940	35.0	10	42,323	1.12
21	LL	0.156	0.057	25.2	2.61	13.1	1.84	4.4	11	22,143	1.36	30,038	35.0	7	29,402	1.13
22	KK	0.156	0.065	33.9	3.20	17.6	2.26	5.3	11	29,476	1.36	39,985	35.0	8	39,724	0.92
23	EE	0.126	0.142	26.2	4.37	13.6	3.09	7.3	124	252,176	1.37	346,639	35.0	81	345,618	1.17
24	DD	0.126	0.143	41.4	6.04	21.5	4.27	10.1	79	254,318	1.37	349,583	40.0	58	349,629	0.83
25	CC	0.126	0.048	29.8	2.61	15.5	1.84	4.3	10	22,978	1.37	31,585	35.0	7	31,056	1.03
26	AA	0.126	0.102	26.1	3.55	13.6	2.51	5.9	60	121,569	1.37	167,107	35.0	39	166,376	1.16
27	BB	0.126	0.107	28.4	3.84	14.8	2.72	6.4	61	134,855	1.37	185,370	35.0	41	184,724	1.09
28	FF	0.156	0.092	26.9	3.41	14.0	2.41	5.7	31	63,961	1.36	86,766	35.0	20	86,304	1.11
29	II	0.156	0.200	40.7	7.75	21.2	5.48	12.9	112	354,034	1.36	480,268	45.0	82	479,975	0.84
30	HH	0.156	0.080	29.6	3.31	15.4	2.34	5.5	20	45,774	1.36	62,096	35.0	13	61,731	1.03
31	GG	0.156	0.089	34.8	3.89	18.1	2.75	6.5	22	59,351	1.36	80,512	40.0	15	80,308	0.91
(OS1) 32	A	0.156	0.096	27.3	3.51	14.2	2.48	5.8	33	68,934	1.36	93,513	35.0	21	93,026	1.10
(OS2) 33	C	0.156	0.126	32.9	4.68	17.1	3.31	7.8	50	126,578	1.36	171,711	40.0	33	171,254	0.96
(OS3) 34	F	0.156	0.109	32.6	4.22	17.0	2.98	7.0	36	91,658	1.36	124,339	35.0	24	123,917	0.96
(OS4) 35	Q	0.156	0.175	37.1	6.48	19.3	4.58	10.8	91	262,413	1.36	355,978	40.0	65	355,849	0.89
(OS5) 36	T	0.156	0.054	43.6	3.29	22.7	2.33	5.5	6	19,021	1.36	25,803	40.0	4	25,686	0.77

Printouts for Storm Hydrographs

flow in cfs

time in minutes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	(OS) 32	(OS) 33	(OS) 34	(OS) 35	(OS) 36
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.09	0.14	0.03	0.16	0.15	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00
20	2.82	3.48	2.02	5.45	0.37	1.04	1.85	0.40	1.58	5.79	2.64	2.56	4.88	2.14	2.98	2.78	1.69	1.68	3.39	1.11	0.80	0.79	10.09	4.91	0.93	5.44	5.37	2.13	3.81	1.40	1.45	2.24	2.89	2.27	3.89	0.39
25	18.80	27.13	13.04	35.04	2.31	6.66	12.64	2.53	9.97	40.01	16.73	17.76	30.60	14.43	20.61	21.20	10.87	11.12	21.63	6.95	5.00	4.96	51.39	26.67	4.61	27.07	26.92	13.35	27.49	8.77	8.19	14.08	18.75	14.54	26.98	2.48
30	32.20	67.65	20.11	53.34	3.24	10.00	22.93	3.63	14.51	74.95	24.38	33.73	49.31	25.32	38.86	50.45	16.51	18.62	32.22	9.54	6.81	7.00	76.33	46.83	6.28	37.57	38.42	18.76	57.40	12.34	13.56	19.93	29.68	22.02	50.95	3.55
35	37.59	103.16	22.47	56.97	3.45	11.18	27.54	4.01	15.71	89.75	25.99	41.20	54.90	29.98	47.20	73.62	18.37	21.73	34.58	9.74	6.88	7.51	81.16	55.57	6.53	38.76	40.62	19.51	74.33	13.01	14.88	20.84	33.29	24.27	61.71	3.91
40	38.83	124.37	22.69	54.61	3.41	11.48	29.34	4.15	15.53	92.05	25.21	43.97	53.65	31.56	50.01	85.68	18.59	22.78	33.51	9.35	6.59	7.45	77.77	58.42	6.34	37.09	39.28	18.79	80.97	12.66	14.93	20.11	33.36	24.13	64.68	4.04
45	37.82	134.83	22.01	51.22	3.31	11.24	29.63	4.12	15.02	88.60	24.01	44.21	51.36	31.41	49.79	91.24	18.06	22.66	31.84	8.81	6.19	7.22	72.99	58.09	6.07	34.82	37.29	17.75	81.77	12.11	14.48	19.03	32.21	23.30	63.33	3.99
50	36.92	138.66	21.39	48.22	3.22	11.07	29.11	4.08	14.53	85.11	22.86	43.25	49.03	30.77	48.59	92.81	17.59	22.25	30.23	8.36	5.87	7.02	68.67	56.74	5.80	32.88	35.42	16.82	79.60	11.60	14.09	18.08	31.10	22.51	61.61	3.95
55	35.74	137.39	20.54	45.47	3.08	10.79	28.60	4.00	13.83	81.17	21.71	42.31	46.51	30.07	47.34	91.29	16.94	21.76	28.69	7.89	5.53	6.72	64.77	55.32	5.52	31.00	33.58	15.93	77.56	11.03	13.52	17.10	29.67	21.44	59.64	3.87
60	34.38	134.37	19.77	42.83	2.98	10.46	28.03	3.92	13.34	77.66	20.74	41.24	44.46	29.23	45.88	89.61	16.31	21.20	27.35	7.45	5.20	6.49	61.11	53.67	5.29	29.23	32.01	15.13	75.26	10.57	13.03	16.27	28.53	20.65	57.32	3.79
65	33.42	132.08	19.22	40.10	2.90	10.20	27.40	3.84	12.93	74.96	19.77	40.09	42.52	28.38	44.42	88.22	15.87	20.61	26.02	6.99	4.85	6.30	57.32	52.02	5.07	27.41	30.44	14.29	72.80	10.13	12.67	15.41	27.63	19.99	55.57	3.70
70	32.67	129.88	18.71	37.41	2.81	10.01	26.80	3.77	12.51	72.41	18.77	39.24	40.53	27.84	43.51	86.72	15.48	20.23	24.62	6.54	4.51	6.12	53.59	50.94	4.83	25.62	28.81	13.44	71.13	9.67	12.33	14.52	26.74	19.34	54.26	3.64
75	31.65	127.10	17.97	35.03	2.68	9.74	26.26	3.69	11.89	69.15	17.47	38.39	37.93	27.21	42.48	84.83	14.90	19.78	22.87	6.12	4.25	5.85	49.74	4.51	23.92	26.77	12.49	69.50	9.04	11.83	13.46	25.49	18.39	52.62	3.56	
80	30.26	123.94	17.01	32.95	2.52	9.38	25.58	3.59	11.12	64.89	16.30	37.25	35.20	26.33	41.03	82.83	14.15	19.16	21.39	5.76	4.00	5.50	46.93	48.09	4.19	22.48	24.99	11.74	67.30	8.39	11.18	12.65	23.91	17.21	50.36	3.45
85	28.72	121.14	16.00	31.11	2.36	8.99	24.82	3.48	10.38	60.44	15.46	35.96	33.28	25.36	39.37	80.95	13.35	18.48	20.30	5.45	3.78	5.16	44.35	46.24	3.97	21.26	23.69	11.14	64.70	7.96	10.51	12.01	22.31	16.05	47.81	3.34
90	27.15	118.36	15.07	29.45	2.25	8.59	24.03	3.36	9.91	57.34	14.78	34.60	31.83	24.34	37.64	79.04	12.58	17.77	19.38	5.18	3.58	4.90	42.04	44.32	3.81	20.16	22.63	10.60	61.93	7.63	9.92	11.45	21.23	15.32	45.18	3.22
95	25.76	115.47	14.48	27.89	2.17	8.19	23.21	3.25	9.57	55.17	14.17	33.22	30.55	23.30	35.88	77.07	12.06	17.04	18.54	4.91	3.38	4.72	39.89	42.36	3.66	19.13	21.66	10.11	59.10	7.33	9.55	10.93	20.47	14.78	42.76	3.10
100	24.47	111.99	13.76	25.59	2.05	7.68	22.11	3.07	9.04	52.49	13.19	31.42	28.66	21.96	33.75	74.65	11.44	16.07	17.25	4.50	3.08	4.47	36.69	39.91	3.42	17.53	20.14	9.32	55.77	6.85	9.05	10.11	19.39	13.98	40.69	2.92
105	23.25	107.68	13.03	23.18	1.94	7.29	20.84	2.89	8.52	49.42	12.22	29.45	26.63	20.67	31.92	71.64	10.86	15.10	15.93	4.09	2.78	4.22	33.37	37.57	3.18	15.93	18.62	8.54	52.60	6.38	8.58	9.29	18.28	13.17	38.65	2.75
110	22.12	102.88	12.36	20.87	1.84	6.96	19.64	2.74	8.03	46.45	11.29	28.01	24.69	19.70	30.45	68.33	10.32	14.39	14.66	3.70	2.49	4.00	30.18	35.79	2.96	14.41	17.17	7.80	50.08	5.93	8.13	8.51	17.23	12.40	36.77	2.62
115	21.09	97.87	11.73	18.77	1.74	6.68	18.78	2.63	7.57	43.67	10.42	26.86	22.88	18.89	29.15	64.92	9.81	13.81	13.48	3.34	2.23	3.79	27.10	34.30	2.75	13.00	15.81	7.10	47.91	5.51	7.72	7.77	16.25	11.69	35.02	2.51
120	20.02	92.74	11.06	16.98	1.63	6.37	18.02	2.52	7.07	40.83	9.47	25.73	20.95	18.08	27.85	61.47	9.27	13.22	12.20	3.00	2.04	3.55	24.35	32.80	2.52	11.64	14.33	6.36	45.79	5.05	7.27	6.99	15.20	10.92	33.25	2.41
125	18.19	87.18	9.84	14.26	1.43	5.79	16.80	2.31	6.15	36.37	7.85	23.93	17.76	16.70	25.74	57.84	8.28	12.19	10.08	2.47	1.68	3.11	20.41	30.34	2.11	9.65	11.84	5.22	42.65	4.23	6.44	5.71	13.37	9.54	30.40	2.20
130	16.10	81.27	8.57	11.64	1.23	5.20	15.35	2.11	5.23	31.03	6.35	21.72	14.40	15.09	23.17	53.82	7.25	11.04	8.20	2.02	1.37	2.69	16.72	27.41	1.72	7.90	9.59	4.27	38.62	3.44	5.60	4.67	11.43	8.12	26.93	2.00
135	14.09	75.08	7.37	9.43	1.04	4.64	13.95	1.92	4.38	25.87	5.19	19.58	11.69	13.55	20.67	49.59	6.28	9.94	6.71	1.65	1.11	2.29	13.59	24.59	1.39	6.43	7.85	3.50	34.54	2.79	4.81	3.83	9.59	6.79	23.57	1.82
140	12.23	68.95	6.26	7.64	0.88	4.11	12.63	1.74	3.59	21.12	4.29	17.55	9.66	12.10	18.33	45.49	5.39	8.91	5.53	1.34	0.90	1.92	11.07	21.94	1.15	5.24	6.48	2.87	30.66	2.30	4.08	3.15	7.89	5.57	20.43	1.64
145	10.54	63.10	5.24	6.18	0.72	3.63	11.41	1.57	2.92	17.15	3.54	15.68	7.99	10.77	16.17	41.61	4.56	7.96	4.55	1.09	0.73	1.58	8.98	19.50	0.96	4.26	5.35	2.34	27.08	1.91	3.41	2.58	6.38	4.52	17.57	1.48
150	8.94	57.66	4.29	4.97	0.59	3.19	10.29	1.42	2.42	14.19	2.92	13.96	6.61	9.54	14.19	38.02	3.79	7.08	3.74	0.88	0.58	1.29	7.27	17.24	0.80	3.44	4.41	1.91	23.82	1.59	2.79	2.11	5.28	3.75	14.90	1.32
155	7.45	52.70	3.52	3.94	0.49	2.76	9.24	1.27	2.03	11.87	2.39	12.36	5.44	8.39	12.32	34.76	3.08	6.25	3.05	0.70	0.46	1.07	5.80	15.13	0.66	2.75	3.60	1.54	20.77	1.31	2.29	1.71	4.43	3.14	12.39	1.18
160	6.09	48.12	2.95	3.08	0.41	2.37	8.26	1.13	1.70	9.93	1.94	10.85	4.44	7.30	10.57	31.71	2.56	5.48	2.46	0.55	0.36	0.90	4.57	13.14	0.54	2.16	2.91	1.22	17.90	1.07	1.92	1.36	3.71	2.63	10.11	1.05
165	5.05	43.81	2.48	2.39	0.35	1.99	7.34	1.01	1.41	8.24	1.55	9.43	3.58	6.28	8.92	28.85	2.16	4.75	1.96	0.43	0.28	0.76	3.56	11.27	0.44	1.69	2.33	0.96	15.20	0.87	1.62	1.08	3.09	2.19	8.40	0.92
170	4.26	39.79	2.08	1.87	0.29	1.63	6.46	0.88	1.17	6.78	1.24	8.08	2.86	5.30	7.36	26.17	1.81	4.05	1.55	0.34	0.22	0.63	2.79	9.47	0.35	1.32	1.85	0.76	12.62	0.70	1.35	0.85	2.55	1.80		

Printouts for Unit Hydrographs

flow in cfs

Time in minutes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
39.76	49.06	28.60	76.96	5.22	14.75	26.15	5.87	22.26	81.67	37.29	36.07	66.04	30.25	41.99	39.19	23.94	23.71	47.89	15.74	11.33	11.17	107.22	51.61	9.97	58.05	57.18	30.05	53.69	19.76	20.44	31.63	40.75	32.05	54.93	5.58	
10	55.25	123.67	32.97	87.90	5.06	16.13	40.17	5.70	23.14	133.15	39.11	60.03	82.91	43.80	69.03	92.20	26.85	31.61	52.30	14.92	10.63	10.97	122.04	79.24	9.54	58.05	59.91	29.61	104.26	19.40	21.75	31.56	49.33	35.88	90.59	5.57
15	53.29	166.57	31.07	76.87	4.64	15.40	39.51	5.47	21.34	129.81	34.97	59.77	76.40	42.74	68.35	117.24	25.32	30.70	46.81	12.61	8.81	10.12	107.50	77.64	8.45	50.00	53.49	25.72	111.71	17.35	20.34	27.62	46.27	33.34	89.42	5.33
20	48.43	175.94	27.34	62.15	3.94	14.04	37.47	5.08	18.11	115.02	28.83	56.50	62.48	39.91	68.38	10.53	7.41	8.67	87.14	10.53	7.11	8.67	87.14	72.71	7.11	41.14	44.08	21.25	106.50	14.45	17.76	22.80	39.96	28.49	82.36	4.92
25	41.10	171.04	23.52	52.03	3.51	12.12	34.06	4.51	15.87	95.79	24.86	50.76	54.23	35.31	56.39	113.46	19.30	25.33	32.96	8.84	6.16	7.64	73.43	64.46	6.18	34.61	37.96	18.04	95.61	12.56	15.40	19.43	34.92	24.71	70.05	4.34
30	36.83	159.70	20.83	43.09	3.08	11.00	29.73	4.07	13.84	83.65	20.88	44.14	45.98	31.11	49.29	104.67	17.17	22.44	27.54	7.44	5.22	6.72	60.70	56.54	5.26	28.89	31.84	15.03	81.93	10.67	13.63	16.15	30.02	21.56	62.04	3.93
35	32.57	141.91	18.15	37.24	2.66	9.87	27.20	3.72	11.82	71.50	18.19	40.04	39.41	28.12	44.31	91.79	15.04	20.33	24.00	6.44	4.48	5.80	52.76	51.07	4.60	25.06	27.75	13.14	73.81	9.27	11.86	14.17	25.72	18.42	54.87	3.58
40	28.31	126.24	15.94	31.38	2.39	8.74	24.66	3.36	10.61	62.60	15.86	35.94	34.63	25.12	39.33	83.42	13.17	18.21	20.83	5.44	3.73	5.18	44.82	45.60	4.05	21.24	24.17	11.25	65.70	8.16	10.47	12.19	22.83	16.46	47.71	3.23
45	25.55	115.80	14.36	25.53	2.13	7.82	22.13	3.01	9.41	55.65	13.53	31.85	29.86	22.12	34.52	76.41	11.91	16.10	17.67	4.44	2.99	4.64	36.88	40.14	3.50	17.41	20.58	9.36	57.58	7.04	9.42	10.21	20.32	14.61	42.69	2.87
50	23.06	105.35	12.78	19.68	1.88	7.15	19.80	2.75	8.22	48.70	11.20	28.82	25.08	20.28	31.63	69.40	10.66	14.74	14.50	3.43	2.26	4.09	28.94	36.73	2.95	13.58	16.99	7.47	52.30	5.92	8.37	8.23	17.81	12.76	38.56	2.64
55	20.58	94.91	11.20	16.53	1.62	6.48	18.32	2.54	7.03	41.75	8.87	26.43	20.30	18.52	28.74	62.39	9.40	13.49	11.34	2.91	2.01	3.55	23.55	33.54	2.40	11.26	13.40	5.95	47.64	4.80	7.32	6.43	15.29	10.91	34.42	2.43
60	18.09	86.04	9.62	14.58	1.37	5.81	16.83	2.32	5.83	34.80	7.51	24.05	16.30	16.77	25.84	57.15	8.14	12.25	9.83	2.58	1.77	3.05	20.90	30.35	1.95	9.99	11.44	5.32	42.99	3.89	6.28	5.77	12.78	9.06	30.28	2.22
65	15.60	80.12	8.04	12.63	1.12	5.14	15.34	2.11	4.69	27.85	6.73	21.66	14.71	15.01	22.59	53.14	6.88	11.00	8.77	2.24	1.52	2.45	18.26	27.16	1.76	8.71	10.25	4.69	38.33	3.52	5.23	5.11	10.26	7.24	26.15	2.00
70	13.12	74.21	6.58	10.68	0.98	4.47	13.86	1.90	4.29	24.82	5.96	19.28	13.11	13.26	20.06	49.14	5.63	9.76	7.72	1.91	1.27	2.13	15.61	23.96	1.58	7.43	9.05	4.06	33.68	3.15	4.33	4.45	9.20	6.63	22.01	1.79
75	10.92	68.30	6.06	8.73	0.90	3.80	12.37	1.69	3.89	22.50	5.18	16.90	11.52	11.50	17.17	45.13	5.07	8.51	6.66	1.57	1.02	1.95	12.96	20.77	1.39	6.16	7.85	3.43	29.02	2.77	3.98	3.79	8.36	6.01	18.13	1.58
80	10.09	62.38	5.53	6.78	0.81	3.21	10.89	1.48	3.49	20.18	4.40	14.51	9.93	9.75	14.28	41.13	4.65	7.27	5.61	1.34	0.78	1.77	10.32	17.58	1.21	4.88	6.66	2.80	24.37	2.40	3.63	3.13	7.53	5.39	16.75	1.37
85	9.26	56.47	5.01	4.83	0.73	2.99	9.40	1.26	3.09	17.87	3.63	12.13	8.34	8.50	13.06	37.12	4.23	6.23	4.55	0.91	0.53	1.59	7.67	15.36	1.03	3.61	5.46	2.17	21.53	2.03	3.28	2.47	6.69	4.78	15.37	1.16
90	8.43	50.56	4.48	2.88	0.65	2.76	8.00	1.12	2.70	15.55	2.85	11.33	6.75	7.92	12.10	33.12	3.81	5.81	3.50	0.57	0.28	1.41	5.02	14.30	0.84	2.33	4.27	1.54	19.98	1.66	2.93	1.81	5.85	4.16	13.99	1.07
95	7.60	44.64	3.95	0.93	0.56	2.54	7.50	1.05	2.30	13.23	2.07	10.53	5.15	7.33	11.14	29.11	3.39	5.40	2.44	0.24	0.03	1.22	2.38	13.24	0.66	1.05	3.07	0.91	18.43	1.28	2.59	1.15	5.01	3.55	12.61	1.00
100	6.77	37.73	3.43	0.00	0.48	2.32	7.01	0.98	1.90	10.92	1.30	9.74	3.56	6.75	10.17	25.10	2.97	4.98	1.39	0.00	0.00	1.04	0.00	12.17	0.48	0.00	1.87	0.28	16.88	0.91	2.24	0.49	4.17	2.93	11.23	0.93
105	5.94	34.43	2.90		0.39	2.09	6.51	0.91	1.50	8.60	0.52	8.94	1.97	6.16	9.21	22.90	2.55	4.57	0.33			0.86		11.11	0.29		0.68	0.00	15.33	0.54	1.89	0.00	3.34	2.31	9.85	0.85
110	5.11	32.46	2.37		0.31	1.87	6.02	0.84	1.10	6.28	0.00	8.15	0.38	5.58	8.24	21.57	2.14	4.15	0.00			0.68		10.04	0.11		0.00		13.78	0.17	1.54		2.50	1.70	8.48	0.78
115	4.29	30.48	1.85		0.22	1.64	5.52	0.77	0.70	3.97		7.36	0.00	4.99	7.28	20.23	1.72	3.74			0.50		8.98	0.00				12.22	0.00	1.19		1.66	1.08	7.10	0.71	
120	3.46	28.51	1.32		0.14	1.42	5.03	0.70	0.31	1.65		6.56		4.41	6.32	18.90	1.30	3.32			0.32		7.92					10.67		0.84		0.82	0.47	5.72	0.64	
125	2.63	26.54	0.79		0.05	1.20	4.53	0.62	0.00	0.00		5.77		3.82	5.35	17.56	0.88	2.91			0.13		6.85					9.12		0.49		0.00	0.00	4.34	0.57	
130	1.80	24.57	0.27		0.00	0.97	4.04	0.55				4.97		3.24	4.39	16.23	0.46	2.49			0.00		5.79					7.57		0.14			2.96	0.50		
135	0.97	22.60	0.00			0.75	3.54	0.48				4.18		2.65	3.43	14.89	0.04	2.08					4.72					6.02		0.00			1.58	0.43		
140	0.14	20.63				0.53	3.05	0.41				3.38		2.07	2.46	13.56	0.00	1.66					3.66					4.47					0.20	0.36		
145	0.00	18.66				0.30	2.55	0.34				2.59		1.48	1.50	12.22		1.25					2.60					2.92					0.00	0.29		
150		16.69				0.08	2.06	0.27				1.79		0.90	0.53	10.89		0.83					1.53					1.36						0.00	0.22	
155		14.72				0.00	1.56	0.20				1.00		0.31	0.00	9.55		0.42					0.47					0.00						0.15		
160		12.74					1.07	0.13				0.20		0.00		8.22		0.00					0.00					0.00						0.08		
165		10.77					0.57	0.06				0.00				6.88		0.00					0.00											0.01		
170		8.80					0.08									5.54																				
175		6.83					0.00									4.21																				
180		4.86														2.87																				
185		2.89														1.54																				
190		0.92														0.20																				
195		0.00														0.00																				

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f.)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
1	P	0.156	0.139	37.5	5.52	19.5	3.90	9.2	55	158,994	2.54	403,480	45.0	82	402,649	1.88
2	X	0.156	0.249	50.8	11.22	26.4	7.93	18.7	176	692,894	2.54	1,758,362	55.0	299	1,758,430	1.56
3	O	0.156	0.108	34.9	4.39	18.2	3.10	7.3	33	89,879	2.54	228,086	45.0	49	227,590	1.96
4	N	0.156	0.147	25.7	4.39	13.4	3.10	7.3	89	177,870	2.54	451,382	40.0	119	450,230	2.43
5	W	0.156	0.046	33.7	2.70	17.5	1.90	4.5	5	13,649	2.54	34,637	45.0	7	34,132	1.95
6	M	0.156	0.083	40.0	4.05	20.8	2.86	6.7	16	50,348	2.54	127,769	45.0	25	127,421	1.77
7	V	0.156	0.132	45.0	6.05	23.4	4.27	10.1	40	140,009	2.54	355,302	50.0	64	355,159	1.66
8	U	0.156	0.055	44.5	3.37	23.2	2.38	5.6	6	19,892	2.54	50,481	50.0	9	50,301	1.63
9	L	0.156	0.090	32.6	3.74	17.0	2.64	6.2	24	59,496	2.54	150,983	45.0	33	150,313	2.03
10	K	0.156	0.196	32.6	6.40	17.0	4.52	10.7	134	338,098	2.54	857,993	45.0	195	858,390	2.10
11	S	0.156	0.107	28.6	3.85	14.9	2.72	6.4	40	88,427	2.54	224,401	40.0	55	223,627	2.24
12	R	0.156	0.154	42.5	6.54	22.1	4.62	10.9	61	199,577	2.54	506,469	50.0	95	506,557	1.73
13	G	0.156	0.151	29.3	4.89	15.2	3.46	8.2	83	189,450	2.54	480,767	40.0	115	478,906	2.21
14	D	0.156	0.132	41.6	5.71	21.6	4.04	9.5	44	140,989	2.54	357,789	50.0	68	357,603	1.75
15	B	0.156	0.160	40.3	6.46	20.9	4.56	10.8	70	216,856	2.54	550,317	50.0	107	550,461	1.80
16	E	0.156	0.221	50.4	10.04	26.2	7.10	16.7	119	464,132	2.54	1,177,830	55.0	200	1,177,315	1.56
17	H	0.156	0.099	35.7	4.22	18.6	2.98	7.0	27	74,887	2.54	190,041	45.0	40	189,591	1.93
18	J	0.156	0.115	42.2	5.22	21.9	3.69	8.7	32	103,346	2.54	262,262	50.0	49	261,821	1.72
19	I	0.156	0.121	28.1	4.11	14.6	2.90	6.8	53	115,906	2.54	294,135	40.0	73	293,135	2.27
20	JJ	0.156	0.067	26.0	2.84	13.5	2.01	4.7	16	31,654	2.54	80,327	40.0	20	79,174	2.35
21	LL	0.156	0.057	25.2	2.61	13.1	1.84	4.4	11	22,143	2.54	56,192	40.0	14	55,003	2.37
22	KK	0.156	0.065	33.9	3.20	17.6	2.26	5.3	11	29,476	2.54	74,800	45.0	16	74,311	1.97
23	EE	0.126	0.142	26.2	4.37	13.6	3.09	7.3	124	252,176	2.55	643,212	40.0	167	641,316	2.41
24	DD	0.126	0.143	41.4	6.04	21.5	4.27	10.1	79	254,318	2.55	648,674	50.0	124	648,759	1.77
25	CC	0.126	0.048	29.8	2.61	15.5	1.84	4.3	10	22,978	2.55	58,608	40.0	14	57,626	2.14
26	AA	0.126	0.102	26.1	3.55	13.6	2.51	5.9	60	121,569	2.55	310,079	40.0	80	308,721	2.40
27	BB	0.126	0.107	28.4	3.84	14.8	2.72	6.4	61	134,855	2.55	343,966	40.0	84	342,767	2.27
28	FF	0.156	0.092	26.9	3.41	14.0	2.41	5.7	31	63,961	2.54	162,313	40.0	41	161,448	2.33
29	II	0.156	0.200	40.7	7.75	21.2	5.48	12.9	112	354,034	2.54	898,434	50.0	176	897,885	1.80
30	HH	0.156	0.080	29.6	3.31	15.4	2.34	5.5	20	45,774	2.54	116,162	40.0	27	115,480	2.17
31	GG	0.156	0.089	34.8	3.89	18.1	2.75	6.5	22	59,351	2.54	150,614	45.0	32	150,232	1.96
(OS1) 32	A	0.156	0.096	27.3	3.51	14.2	2.48	5.8	33	68,934	2.54	174,933	40.0	44	174,023	2.31
(OS2) 33	C	0.156	0.126	32.9	4.68	17.1	3.31	7.8	50	126,578	2.54	321,218	45.0	71	320,363	2.04
(OS3) 34	F	0.156	0.109	32.6	4.22	17.0	2.98	7.0	36	91,658	2.54	232,600	45.0	52	231,811	2.04
(OS4) 35	Q	0.156	0.175	37.1	6.48	19.3	4.58	10.8	91	262,413	2.54	665,926	45.0	138	665,685	1.91
(OS5) 36	T	0.156	0.054	43.6	3.29	22.7	2.33	5.5	6	19,021	2.54	48,270	45.0	9	48,050	1.66

Printouts for Storm Hydrographs

flow in cfs

time in minutes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	(OS) 32	(OS) 33	(OS) 34	(OS) 35	(OS) 36
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.03	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.30	0.15	0.03	0.16	0.16	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00
20	1.89	2.38	1.38	3.72	0.25	0.71	1.27	0.27	1.08	3.96	1.80	1.75	3.19	1.46	2.03	0.01	1.16	1.15	2.32	0.76	0.55	0.54	7.65	3.74	0.71	4.12	4.06	1.45	2.60	0.96	0.99	1.53	1.97	1.55	2.66	0.27
25	16.40	23.27	11.67	31.36	2.09	5.97	11.15	2.27	8.96	35.21	15.03	15.61	27.27	12.78	18.13	18.26	9.73	9.88	19.40	6.27	4.51	4.47	46.24	23.73	4.17	24.47	24.30	12.02	23.96	7.90	8.25	12.67	16.74	13.02	23.73	2.23
30	46.39	82.49	31.11	83.11	5.29	15.71	32.52	5.84	23.19	104.57	38.93	46.73	74.46	36.52	54.05	62.80	25.75	27.54	50.82	15.77	11.30	11.39	117.59	65.65	10.19	60.28	60.63	30.58	75.91	20.11	21.51	32.35	45.26	34.42	70.80	5.73
35	69.09	162.29	43.09	112.51	6.85	21.45	50.22	7.76	30.80	163.84	51.46	74.27	105.37	55.21	85.40	118.83	35.33	40.44	68.13	19.89	14.14	14.83	157.98	100.15	12.94	77.20	79.49	39.31	129.02	25.98	28.91	41.83	63.63	46.99	111.84	7.58
40	79.29	228.50	47.69	119.24	7.31	23.88	59.12	8.60	33.21	190.17	54.65	88.38	115.21	64.18	101.04	161.25	39.04	46.53	72.63	20.50	14.48	15.91	167.45	116.87	13.57	80.22	84.15	41.02	159.97	27.42	31.57	43.83	70.43	51.30	131.63	8.38
45	82.17	269.90	48.54	116.29	7.33	24.61	63.10	8.94	33.30	195.43	53.91	94.33	114.54	67.65	107.03	185.35	39.78	48.88	71.58	20.00	14.10	15.99	163.51	123.33	13.42	78.17	82.85	40.16	173.37	27.13	31.99	42.98	71.27	51.63	137.80	8.68
50	81.25	291.70	47.63	110.46	7.19	24.40	63.92	8.95	32.51	190.88	51.86	95.25	110.85	67.84	107.33	197.23	39.11	48.99	68.72	19.05	13.40	15.66	155.55	123.69	12.96	74.34	79.58	38.34	175.60	26.20	31.38	41.09	69.62	50.40	136.63	8.66
55	79.05	298.70	45.92	103.36	6.90	23.83	62.86	8.79	31.10	182.94	48.99	93.36	105.15	66.39	104.83	199.80	37.78	47.99	64.82	17.87	12.55	15.04	145.67	120.92	12.30	69.64	75.09	36.02	171.77	24.83	30.22	38.64	66.70	48.22	132.78	8.50
60	76.42	295.79	44.16	97.30	6.64	23.21	61.68	8.64	29.77	174.34	46.62	91.15	99.88	64.72	101.85	196.92	36.40	46.87	61.58	16.89	11.83	14.46	137.37	117.73	11.75	65.74	71.38	34.16	167.01	23.70	29.07	36.69	63.80	46.12	128.07	8.34
65	73.96	290.36	42.71	91.72	6.44	22.60	60.50	8.47	28.80	167.42	44.59	88.91	95.63	63.02	98.84	193.71	35.23	45.71	58.78	15.97	11.13	14.01	129.80	114.52	11.29	62.13	68.18	32.47	162.06	22.77	28.15	34.94	61.58	44.56	123.64	8.17
70	70.19	283.34	40.17	82.29	6.01	21.38	57.96	8.04	26.84	157.83	40.73	84.99	88.34	60.00	94.15	188.90	33.18	43.50	53.61	14.24	9.85	13.09	116.95	109.09	10.34	55.61	62.18	29.24	154.87	20.87	26.41	31.58	57.69	41.62	117.58	7.74
75	66.02	272.60	37.49	72.93	5.58	20.23	54.96	7.65	24.81	145.94	36.70	80.47	80.03	56.82	89.00	181.26	31.05	41.23	48.13	12.66	8.73	12.16	103.92	103.23	9.39	49.45	55.95	26.09	146.57	18.94	24.64	28.21	53.39	38.46	110.47	7.36
80	61.15	258.84	34.27	64.19	5.06	18.83	51.86	7.19	22.34	132.25	32.32	75.67	70.77	53.28	83.31	171.84	28.47	38.69	42.31	11.16	7.71	11.03	91.36	96.80	8.31	43.49	49.24	22.91	137.53	16.73	22.47	24.76	48.29	34.68	102.36	6.91
85	56.07	244.43	31.03	57.10	4.55	17.44	48.66	6.74	19.98	117.95	28.79	70.59	62.77	49.58	77.20	162.34	25.89	36.06	37.72	9.96	6.88	9.94	81.33	89.99	7.40	38.78	43.89	20.47	127.70	14.89	20.34	22.13	43.20	30.98	93.67	6.47
90	51.21	230.90	27.97	51.11	4.10	16.12	45.60	6.32	17.94	105.45	26.03	65.68	56.63	46.02	71.30	153.30	23.42	33.55	34.07	8.96	6.17	8.95	72.93	83.45	6.71	34.85	39.67	18.46	118.03	13.48	18.34	19.98	38.74	27.79	85.33	6.05
95	46.51	218.06	25.37	45.94	3.75	14.82	42.70	5.92	16.43	95.87	23.76	60.99	51.70	42.59	65.61	144.76	21.25	31.13	31.03	8.08	5.53	8.17	65.81	77.15	6.15	31.43	36.18	16.75	108.79	12.35	16.67	18.16	35.37	25.43	77.34	5.64
100	42.49	206.00	23.45	41.20	3.48	13.60	39.86	5.52	15.23	88.43	21.73	56.41	47.40	39.25	60.11	136.79	19.60	28.77	28.31	7.28	4.95	7.58	59.27	71.05	5.66	28.31	33.06	15.18	99.82	11.35	15.42	16.51	32.72	23.55	70.60	5.25
105	39.54	194.57	21.89	38.78	3.25	12.57	37.10	5.13	14.16	82.02	19.88	52.00	43.50	36.19	55.32	129.13	18.31	26.54	25.82	6.53	4.40	7.07	53.18	65.47	5.21	25.40	30.21	13.74	91.76	10.45	14.40	14.99	30.42	21.89	65.62	4.86
110	37.14	183.51	20.51	32.57	3.04	11.80	34.42	4.77	13.20	76.26	18.14	48.19	39.87	33.71	51.72	121.71	17.18	24.69	23.47	5.81	3.87	6.61	47.39	60.98	4.80	22.62	27.51	12.36	85.40	9.60	13.49	13.54	28.36	20.39	61.56	4.52
115	35.03	172.69	19.25	28.63	2.84	11.17	32.16	4.48	12.30	70.94	16.49	45.38	36.42	31.81	48.83	114.41	16.16	23.30	21.24	5.13	3.39	6.19	41.92	57.52	4.40	20.01	24.95	11.05	80.46	8.80	12.66	12.16	26.44	19.00	57.98	4.26
120	33.10	162.09	18.08	25.18	2.66	10.60	30.46	4.26	11.45	65.89	14.92	43.10	33.15	30.21	46.31	107.29	15.21	22.14	19.12	4.52	2.98	5.79	36.87	54.60	4.02	17.61	22.53	9.82	76.26	8.04	11.89	10.85	24.63	17.67	54.71	4.06
125	30.13	150.76	16.11	20.40	2.33	9.64	28.28	3.90	9.97	58.65	12.28	39.99	28.03	27.86	42.76	99.67	13.59	20.39	15.63	3.57	2.38	5.08	29.64	50.43	3.36	13.99	18.48	7.82	70.86	6.71	10.54	8.69	21.68	15.45	50.01	3.71
130	26.78	138.93	14.06	16.20	2.01	8.67	25.84	3.56	8.50	50.11	9.71	36.34	22.47	25.22	38.56	91.83	11.94	18.50	12.29	2.83	1.89	4.40	23.52	45.64	2.72	11.09	14.59	6.15	64.23	5.41	9.19	6.81	15.56	13.18	44.39	3.37
135	23.58	127.73	12.12	12.81	1.71	7.75	23.52	3.24	7.10	41.73	7.59	32.83	17.56	22.70	34.49	84.33	10.37	16.69	9.66	2.26	1.50	3.74	18.65	41.04	2.15	8.82	11.43	4.88	57.58	4.25	7.91	5.40	15.56	11.00	38.96	3.06
140	20.61	117.21	10.30	10.14	1.43	6.90	21.35	2.94	5.80	33.86	6.06	29.50	13.92	20.32	30.66	77.35	8.91	14.99	7.72	1.79	1.19	3.14	14.82	36.71	1.69	7.01	9.12	3.90	51.26	3.36	6.71	4.32	12.76	8.97	33.88	2.77
145	17.86	107.39	8.60	8.04	1.16	6.12	19.33	2.67	4.60	26.82	4.85	26.43	11.14	18.15	27.16	70.84	7.54	13.43	6.17	1.42	0.93	2.56	11.73	32.74	1.35	5.55	7.30	3.10	45.44	2.69	5.59	3.44	10.15	7.11	29.18	2.50
150	15.24	98.30	6.97	6.29	0.92	5.38	17.49	2.41	3.61	21.07	3.89	23.65	8.94	16.14	23.90	64.85	6.22	12.00	4.94	1.12	0.73	2.03	9.27	29.08	1.09	4.38	5.85	2.47	40.11	2.16	4.52	2.74	7.95	5.59	24.73	2.26
155	12.73	90.01	5.52	4.88	0.73	4.67	15.78	2.17	2.90	16.90	3.10	21.00	7.15	14.23	20.80	59.40	4.98	10.63	3.92	0.87	0.57	1.60	7.23	25.59	0.87	3.42	4.66	1.94	35.05	1.73	3.57	2.16	6.37	4.49	20.46	2.02
160	10.34	82.42	4.37	3.80	0.59	3.99	14.16	1.95	2.34	13.64	2.44	18.48	5.68	12.40	17.82	54.36	3.92	9.33	3.08	0.68	0.44	1.29	5.61	22.26	0.70	2.66	3.67	1.51	30.20	1.38	2.83	1.69	5.14	3.62	16.42	1.80
165	8.18	75.36	3.51	2.97	0.47	3.33	12.61	1.73	1.88	10.95	1.92	16.06	4.46	10.65	14.97	49.68	3.13	8.08	2.40	0.53	0.35	1.04	4.41	19.05	0.55	2.09	2.87	1.18	25.55	1.09	2.28	1.32	4.14	2.91	12.91	1.58
170	6.47	68.75	2.83	2.36	0.38	2.69	11.12	1.52	1.50																											

Printouts for Unit Hydrographs

flow in cfs

Time in minutes	Time in minutes																																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
39.06	49.06	28.60	76.96	5.22	14.75	26.15	5.87	22.26	81.67	37.29	36.07	66.04	30.25	41.99	39.19	23.94	23.71	47.89	15.74	11.33	11.17	107.22	51.61	9.97	58.05	57.18	30.05	53.69	19.76	20.44	31.63	40.75	32.05	54.93	5.58	
10	54.67	123.67	32.97	87.90	5.06	16.13	40.17	5.70	23.14	133.15	39.11	60.03	82.91	43.80	69.03	92.20	26.85	31.61	52.30	14.92	10.63	10.97	122.04	79.24	9.54	58.05	59.91	29.61	104.26	19.40	21.75	31.56	49.33	35.88	90.59	5.57
15	52.81	166.57	31.07	76.87	4.64	15.40	39.51	5.47	21.34	129.81	34.97	59.77	76.40	42.74	68.35	117.24	25.32	30.70	46.81	12.61	8.81	10.12	107.50	77.64	8.45	50.00	53.49	25.72	111.71	17.35	20.34	27.62	46.27	33.34	89.42	5.33
20	48.16	175.94	27.34	62.15	3.94	14.04	37.47	5.08	18.11	115.02	28.83	56.50	62.48	48.81	38.38	10.53	7.41	8.67	87.14	72.71	7.11	41.14	44.08	21.25	106.50	14.45	17.76	22.80	39.96	28.49	82.36	4.92	4.34			
25	40.07	171.04	23.52	52.03	3.51	12.12	34.06	4.51	15.87	95.79	24.86	50.76	54.23	35.31	56.39	113.46	19.30	25.33	32.96	8.84	6.16	7.64	73.43	64.46	6.18	34.61	37.98	18.04	95.61	12.56	15.40	19.43	34.32	24.71	70.05	4.93
30	36.70	159.70	20.83	43.09	3.08	11.00	29.73	4.07	13.84	83.65	20.88	44.14	45.98	31.11	49.29	104.67	17.17	22.44	27.54	7.44	5.22	6.72	60.70	56.54	5.26	28.89	31.84	15.03	81.93	10.67	13.63	16.15	30.02	21.56	62.04	3.93
35	32.53	141.91	18.15	37.24	2.66	9.87	27.20	3.72	11.82	71.50	18.19	40.04	39.41	28.12	44.31	91.79	15.04	20.33	24.00	6.44	4.48	5.80	52.76	51.07	4.60	25.06	27.75	13.14	73.81	9.27	11.86	14.17	25.72	18.42	54.87	3.58
40	28.36	126.24	15.94	31.38	2.39	8.74	24.66	3.36	10.61	62.60	15.86	35.94	34.63	25.12	39.33	83.42	13.17	18.21	20.83	5.44	3.73	5.18	44.82	45.60	4.05	21.24	24.17	11.25	65.70	8.16	10.47	12.19	22.83	16.46	47.71	3.23
45	25.51	115.80	14.36	25.53	2.13	7.82	22.13	3.01	9.41	55.65	13.53	31.85	29.86	22.12	34.52	76.41	11.91	16.10	17.67	4.44	2.99	4.64	36.88	40.14	3.50	17.41	20.58	9.36	57.58	7.04	9.42	10.21	20.32	14.61	42.69	2.87
50	23.07	105.35	12.78	19.68	1.88	7.15	19.80	2.75	8.22	48.70	11.20	28.82	25.08	20.28	31.63	69.40	10.66	14.74	14.50	3.43	2.26	4.09	28.94	36.73	2.95	13.58	16.99	7.47	52.30	5.92	8.37	8.23	17.81	12.76	38.56	2.64
55	20.64	94.91	11.20	16.53	1.62	6.48	18.32	2.54	7.03	41.75	8.87	26.43	20.30	18.52	28.74	62.39	9.40	13.49	11.34	2.91	2.01	3.55	23.55	33.54	2.40	11.26	13.40	5.95	47.64	4.80	7.32	6.43	15.29	10.91	34.42	2.43
60	18.21	86.04	9.62	14.58	1.37	5.81	16.83	2.32	5.83	34.80	7.51	24.05	16.30	16.77	25.84	57.15	8.14	12.25	9.83	2.58	1.77	3.00	20.90	30.35	1.95	9.99	11.44	5.32	42.99	3.89	6.28	5.77	12.78	9.06	30.28	2.22
65	15.77	80.12	8.04	12.63	1.12	5.14	15.34	2.11	4.69	27.85	6.73	21.66	14.71	15.01	22.59	53.14	6.88	11.00	8.77	2.24	1.52	2.45	18.26	27.16	1.76	8.71	10.25	4.69	38.33	3.52	5.23	5.11	10.26	7.24	26.15	2.00
70	13.34	74.21	6.58	10.68	0.98	4.47	13.86	1.90	4.29	24.82	5.96	19.28	13.11	13.26	20.06	49.14	5.63	9.76	7.72	1.91	1.27	2.13	15.61	23.96	1.58	7.43	9.05	4.06	33.68	3.15	4.33	4.45	9.20	6.63	22.01	1.79
75	10.93	68.30	6.06	8.73	0.90	3.80	12.37	1.69	3.89	22.50	5.18	16.90	11.52	11.50	17.17	45.13	5.07	8.51	6.66	1.57	1.02	1.95	12.96	20.77	1.39	6.16	7.85	3.43	29.02	2.77	3.98	3.79	8.36	6.01	18.13	1.58
80	10.12	62.38	5.53	6.78	0.81	3.21	10.89	1.48	3.49	20.18	4.40	14.51	9.93	9.75	14.28	41.13	4.65	7.27	5.61	1.34	0.78	1.77	10.32	17.58	1.21	4.88	6.66	2.80	24.37	2.40	3.63	3.13	7.53	5.39	16.75	1.37
85	9.31	56.47	5.01	4.83	0.73	2.99	9.40	1.26	3.09	17.87	3.63	12.13	8.34	8.50	13.06	37.12	4.23	6.23	4.55	0.91	0.53	1.59	7.67	15.36	1.03	3.61	5.46	2.17	21.53	2.03	3.28	2.47	6.69	4.78	15.37	1.16
90	8.50	50.56	4.48	2.88	0.65	2.76	8.00	1.12	2.70	15.55	2.85	11.33	6.75	7.92	12.10	33.12	3.81	5.81	3.50	0.57	0.28	1.41	5.02	14.30	0.84	2.33	4.27	1.54	19.98	1.66	2.93	1.81	5.85	4.16	13.99	1.07
95	7.68	44.64	3.95	0.93	0.56	2.54	7.50	1.05	2.30	13.23	2.07	10.53	5.15	7.33	11.14	29.11	3.39	5.40	2.44	0.24	0.03	1.22	2.38	13.24	0.66	1.05	3.07	0.91	18.43	1.28	2.59	1.15	5.01	3.55	12.61	1.00
100	6.87	38.73	3.43	0.00	0.48	2.32	7.01	0.98	1.90	10.92	1.30	9.74	3.56	6.75	10.17	25.10	2.97	4.98	1.39	0.00	0.00	1.04	0.00	12.17	0.48	0.00	1.87	0.28	16.88	0.91	2.24	0.49	4.17	2.93	11.23	0.93
105	6.06	34.43	2.90		0.39	2.09	6.51	0.91	1.50	8.60	0.52	8.94	1.97	6.16	9.21	22.90	2.55	4.57	0.33			0.86		11.11	0.29		0.68	0.00	15.33	0.54	1.89	0.00	3.34	2.31	9.85	0.85
110	5.25	32.46	2.37		0.31	1.87	6.02	0.84	1.10	6.28	0.00	8.15	0.38	5.58	8.24	21.57	2.14	4.15	0.00			0.68		10.04	0.11		0.00		13.78	0.17	1.54		2.50	1.70	8.48	0.78
115	4.44	30.48	1.85		0.22	1.64	5.52	0.77	0.70	3.97		7.36	0.00	4.99	7.28	20.23	1.72	3.74				0.50		8.98	0.00				12.22	0.00	1.19		1.66	1.08	7.10	0.71
120	3.63	28.51	1.32		0.14	1.42	5.03	0.70	0.31	1.65		6.56		4.41	6.32	18.90	1.30	3.32				0.32		7.92					10.67		0.84		0.82	0.47	5.72	0.64
125	2.82	26.54	0.79		0.05	1.20	4.53	0.62	0.00	0.00		5.77		3.82	5.35	17.56	0.88	2.91				0.13		6.85					9.12		0.49		0.00	0.00	4.34	0.57
130	2.01	24.57	0.27		0.00	0.97	4.04	0.55				4.97		3.24	4.39	16.23	0.46	2.49				0.00		5.79					7.57		0.14		2.96	0.50		
135	1.19	22.60	0.00			0.75	3.54	0.48				4.18		2.65	3.43	14.89	0.04	2.08					4.72						6.02		0.00			1.58	0.43	
140	0.38	20.63				0.53	3.05	0.41				3.38		2.07	2.46	13.56	0.00	1.66					3.66						4.47					0.20	0.36	
145	0.00	18.66				0.30	2.55	0.34				2.59		1.48	1.50	12.22		1.25					2.60						2.92					0.00	0.29	
150		16.69				0.08	2.06	0.27				1.79		0.90	0.53	10.89		0.83					1.53						1.36						0.22	
155		14.72				0.00	1.56	0.20				1.00		0.31	0.00	9.55		0.42					0.47						0.00					0.15		
160		12.74					1.07	0.13				0.20		0.00		8.22		0.00					0.00											0.08		
165		10.77					0.57	0.06				0.00				6.88		0.00					6.88											0.01		
170		8.80					0.08									5.54																				
175		6.83					0.00									4.21																			0.00	
180		4.86														2.87																				
185		2.89														1.54																				
190		0.92														0.20																				
195		0.00														0.00																				

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
C1	P	0.109	0.109	37.4	4.63	19.5	3.27	7.7	55	158,667	1.40	221,934	40.0	40	221,363	0.92
C2	X1	0.100	0.155	31.9	5.30	16.6	3.75	8.8	112	277,259	1.42	393,306	35.0	81	392,534	1.06
C3	O	0.099	0.133	26.4	4.19	13.7	2.96	7.0	93	190,648	1.42	270,701	35.0	64	269,846	1.22
C4	X2	0.097	0.119	29.1	4.16	15.1	2.94	6.9	59	131,878	1.43	188,214	35.0	41	187,567	1.14
C5	X3	0.120	0.131	46.9	6.23	24.4	4.40	10.4	62	225,024	1.38	311,107	45.0	48	311,075	0.77
C6	N	0.100	0.118	15.2	2.87	7.9	2.03	4.8	129	150,899	1.42	214,092	30.0	73	208,706	1.77
C7	V2	0.118	0.069	30.0	3.10	15.6	2.19	5.2	24	55,684	1.39	77,171	35.0	16	76,523	1.05
C8	U	0.156	0.056	40.0	3.23	20.8	2.28	5.4	7	21,272	1.36	28,856	40.0	5	28,711	0.82
C9	M	0.097	0.104	15.7	2.75	8.2	1.94	4.6	80	97,393	1.43	138,967	30.0	47	135,178	1.73
C10	V1	0.094	0.078	26.5	3.09	13.8	2.18	5.1	20	41,999	1.44	60,441	35.0	14	59,892	1.21
C11	L	0.105	0.069	32.9	3.24	17.1	2.29	5.4	23	57,681	1.41	81,214	35.0	16	80,597	1.01
C12	K	0.094	0.217	16.6	4.26	8.6	3.01	7.1	324	416,470	1.44	598,839	30.0	201	596,187	1.75
C13	R	0.108	0.122	33.0	4.58	17.1	3.23	7.6	80	203,861	1.40	285,653	35.0	57	284,875	1.01
C14	H	0.126	0.085	42.1	4.24	21.9	3.00	7.1	24	79,715	1.37	109,575	40.0	18	109,307	0.81
C15	J	0.126	0.095	38.9	4.33	20.2	3.06	7.2	34	101,894	1.37	140,063	40.0	24	139,728	0.86
C16	I	0.096	0.110	22.0	3.36	11.4	2.38	5.6	62	105,234	1.43	150,503	30.0	40	149,058	1.39
C17	E	0.119	0.167	54.0	8.41	28.1	5.95	14.0	92	386,704	1.38	535,352	50.0	75	534,977	0.70
C18	G	0.122	0.098	39.3	4.44	20.4	3.14	7.4	38	114,164	1.38	157,567	40.0	27	157,168	0.86
C19	D	0.095	0.134	20.3	3.59	10.5	2.54	6.0	94	148,358	1.44	213,029	30.0	61	211,555	1.50
C20	B2	0.105	0.076	38.3	3.74	19.9	2.65	6.2	24	72,564	1.41	102,126	40.0	18	101,809	0.90
C21	B1	0.100	0.140	29.6	4.67	15.4	3.30	7.8	95	216,856	1.42	307,783	35.0	67	306,584	1.12
C22	W	0.156	0.046	33.7	2.70	17.5	1.90	4.5	5	13,649	1.36	18,515	35.0	3	18,246	0.92
C23	S	0.093	0.107	21.8	3.29	11.3	2.32	5.5	47	78,662	1.44	113,604	30.0	31	112,488	1.42
B1	JJ	0.109	0.053	22.5	2.42	11.7	1.71	4.0	19	32,307	1.40	45,188	30.0	11	43,903	1.29
B2	LL	0.122	0.047	24.1	2.37	12.5	1.68	4.0	12	22,506	1.38	31,043	30.0	7	30,181	1.19
B3	KK	0.126	0.055	32.6	2.87	16.9	2.03	4.8	12	30,492	1.37	41,914	35.0	8	41,402	0.97
B4	EE1	0.126	0.124	30.2	4.37	15.7	3.09	7.3	79	184,658	1.37	253,830	35.0	53	252,727	1.05
B5	DD	0.126	0.142	41.6	6.04	21.6	4.27	10.1	78	252,285	1.37	346,789	40.0	58	346,842	0.83
B6	II3	0.126	0.088	25.0	3.19	13.0	2.25	5.3	45	87,011	1.37	119,605	35.0	28	118,504	1.18
B7	II2	0.126	0.087	23.9	3.09	12.4	2.18	5.1	45	83,962	1.37	115,413	30.0	28	114,044	1.21
B8	II1	0.126	0.123	53.3	6.54	27.7	4.62	10.9	44	183,061	1.37	251,634	50.0	35	251,692	0.69
B9	CC	0.126	0.048	29.8	2.61	15.5	1.84	4.3	10	22,978	1.37	31,585	35.0	7	31,056	1.03
B10	AA	0.126	0.103	26.0	3.55	13.5	2.51	5.9	61	122,694	1.37	168,654	35.0	39	167,923	1.16
B11	BB	0.126	0.107	28.4	3.84	14.8	2.72	6.4	61	134,855	1.37	185,370	35.0	41	184,724	1.09
B12	FF	0.126	0.078	26.0	3.05	13.5	2.15	5.1	33	65,703	1.37	90,315	35.0	21	89,406	1.15
B13	GG	0.126	0.074	33.9	3.43	17.6	2.43	5.7	23	59,351	1.37	81,583	35.0	15	81,214	0.95
B14	HH	0.126	0.066	28.7	2.96	14.9	2.09	4.9	21	46,101	1.37	63,370	35.0	14	62,681	1.07
B15	EE2	0.078	0.121	11.6	2.58	6.0	1.83	4.3	66	59,387	1.52	90,334	30.0	36	86,502	2.18
B16	EE3	0.086	0.073	19.8	2.61	10.3	1.84	4.3	16	24,212	1.48	35,738	30.0	10	34,826	1.56
OS1	A	0.156	0.096	27.3	3.51	14.2	2.48	5.8	33	68,934	1.36	93,513	35.0	21	93,026	1.10
OS2	C	0.156	0.128	32.3	4.68	16.8	3.31	7.8	53	132,096	1.36	179,196	35.0	35	178,684	0.97
OS3	F	0.156	0.109	32.6	4.22	17.0	2.98	7.0	36	91,658	1.36	124,339	35.0	24	123,917	0.96
OS4	Q	0.156	0.175	37.1	6.48	19.3	4.58	10.8	91	262,413	1.36	355,978	40.0	65	355,849	0.89
OS5	T	0.156	0.054	43.6	3.29	22.7	2.33	5.5	6	19,021	1.36	25,803	40.0	4	25,686	0.77

Printouts for Storm Hydrographs

[illegible]

Printouts for Unit Hydrographs

Time in hrs	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32	C33	C34	C35	C36	C37	C38	C39	C40	C41	C42	C43	C44	C45	C46	C47	C48	C49	C50
1	54.34	82.91	81.25	52.25	39.08	128.52	21.97	6.81	80.02	20.40	22.44	284.52	66.66	21.54	29.37	30.68	39.45	32.05	90.88	21.13	77.75	5.22	46.13	18.51	12.02	12.10	68.24	51.37	44.80	45.37	26.45	9.97	58.83	57.18	32.68	22.09	20.71	65.48	31.79	31.63	43.36	35.05	54.93	5.58						
2	45.47	111.91	92.69	57.68	61.90	103.08	23.22	6.76	64.93	19.54	22.07	302.60	79.27	24.30	23.58	58.21	81.91	37.74	88.53	24.18	93.85	5.06	43.70	16.90	11.11	11.73	78.07	78.03	42.87	42.87	43.98	9.54	58.81	59.31	21.14	22.14	19.91	44.42	14.74	31.56	52.46	35.88	90.59	5.57						
3	51.97	105.69	80.26	52.17	61.19	74.64	20.77	6.40	47.60	16.76	20.25	215.59	74.24	23.37	32.06	45.83	92.45	35.73	68.11	22.89	86.21	4.64	34.34	13.46	8.99	10.68	71.58	76.75	35.84	34.89	44.04	8.45	50.57	53.49	26.44	20.49	17.54	29.78	10.86	27.62	49.05	33.34	89.42	5.33						
4	46.86	90.99	65.31	42.92	55.89	17.36	5.80	35.82	13.93	17.14	158.26	64.06	21.58	29.12	37.74	90.83	32.56	54.51	20.59	70.54	3.94	28.24	11.16	7.60	9.01	59.07	71.92	29.73	29.09	42.66	7.11	41.60	44.08	21.99	17.62	14.65	20.12	8.59	22.80	42.01	28.49	82.36	4.92							
5	55.16	77.37	55.15	37.17	51.70	41.56	15.13	5.04	27.23	11.77	15.15	124.60	55.11	24.60	30.19	86.81	27.89	43.59	17.83	21.58	9.03	6.27	7.98	51.60	63.84	24.43	23.71	61.38	34.95	37.96	18.45	15.44	12.65	12.27	6.98	19.43	35.14	24.71	70.25	24.71	70.25	24.71	70.25	24.71						
6	36.04	67.19	45.65	31.41	47.04	27.23	12.90	4.58	18.65	9.86	13.25	90.94	48.22	17.04	22.63	25.47	80.44	35.21	35.74	16.05	52.31	3.08	19.01	7.67	5.32	6.96	44.13	55.98	20.76	20.14	36.78	5.26	29.19	31.84	15.50	13.59	10.64	9.05	5.65	16.15	31.47	21.56	62.04	3.93						
7	31.91	57.01	39.75	27.17	47.02	21.44	11.21	4.11	14.03	8.59	11.34	62.31	41.33	15.42	20.21	20.76	71.71	22.64	27.90	14.28	44.86	2.66	15.43	6.30	4.49	5.98	37.83	50.60	17.77	16.98	32.84	4.60	25.29	27.75	13.42	11.74	9.34	5.83	4.32	14.17	26.80	18.42	54.87	3.58						
8	27.79	50.72	33.86	23.81	39.27	16.66	9.89	3.64	11.17	7.31	10.20	51.09	36.71	13.81	17.78	16.05	65.58	19.96	20.65	12.51	39.51	2.39	11.85	4.94	3.67	5.37	33.47	45.21	14.77	13.81	30.46	4.05	21.40	24.17	11.33	10.46	8.15	2.61	3.10	12.19	23.91	16.46	47.71	3.23						
9	25.19	44.82	27.96	20.45	35.52	11.88	8.57	3.27	8.31	6.04	9.07	39.87	32.68	12.21	15.99	12.03	60.54	17.90	16.67	11.35	34.15	2.13	8.97	3.67	2.85	4.76	29.10	39.83	11.78	10.65	28.11	3.50	17.50	20.58	9.25	9.37	6.96	0.00	2.66	10.21	21.18	14.61	42.69	2.87						
10	25.77	38.93	22.06	17.08	31.70	7.11	7.25	2.99	5.45	4.76	7.94	28.65	28.64	11.25	14.51	10.46	15.55	16.31	14.05	10.30	28.79	1.88	7.78	3.21	2.38	4.15	24.74	36.41	8.39	8.55	25.92	2.95	13.61	16.98	7.16	8.27	5.77	0.00	2.22	8.23	18.45	12.76	38.56	2.64						
15	50.34	33.03	17.80	13.72	29.25	2.33	5.93	2.71	2.59	3.89	6.80	17.43	24.61	10.30	13.11	8.89	50.78	14.73	11.44	9.24	23.44	1.67	6.59	2.76	2.01	3.54	20.37	33.27	7.93	7.50	23.42	2.40	11.36	13.40	6.05	7.17	4.58	1.77	6.43	15.72	10.91	34.42	2.43							
20	17.91	27.14	15.84	11.27	27.05	0.00	4.74	2.43	0.00	3.46	5.67	6.21	20.58	9.34	11.68	7.32	46.02	13.15	8.82	9.19	18.65	1.37	5.40	2.30	1.73	2.93	16.01	30.31	6.93	6.45	21.53	1.95	10.06	11.44	5.36	6.07	3.89	1.33	5.77	12.99	9.06	30.28	2.22							
25	15.49	22.03	13.87	10.14	24.85	0.00	4.29	2.15	3.04	4.34	0.00	16.54	8.38	10.24	5.75	43.15	11.57	6.21	7.14	16.88	1.12	4.20	1.85	1.46	2.89	14.41	26.98	5.93	5.39	20.15	1.76	8.76	10.25	4.66	4.97	3.50	0.89	5.11	10.46	7.24	26.15	2.00								
30	13.06	20.07	11.90	9.02	22.65	0.00	3.85	1.87	2.61	4.15	0.00	14.82	7.43	8.81	4.18	40.28	8.99	3.60	6.09	15.07	0.98	3.01	1.39	1.19	2.18	12.96	23.84	4.94	4.34	16.26	1.58	7.46	9.05	3.97	4.30	3.10	0.77	4.45	5.55	6.63	22.01	1.79								
35	10.84	18.10	9.94	7.90	20.45	0.00	3.41	1.59	2.19	3.78	0.00	13.47	6.47	7.37	2.61	37.41	8.40	0.98	5.03	13.29	0.90	1.82	0.94	0.91	1.98	11.50	20.70	3.94	3.28	17.39	1.39	6.16	8.75	3.27	3.94	2.71	0.00	3.79	8.64	6.01	18.13	1.58								
40	10.04	16.14	7.97	6.78	18.24	0.00	2.97	1.35	1.76	3.40	0.00	12.13	5.51	6.49	1.04	34.55	7.28	0.00	4.59	11.50	0.81	0.62	0.49	0.64	1.78	10.05	17.55	2.94	2.23	16.00	1.21	4.86	6.66	2.57	3.57	2.31	0.00	3.13	7.73	5.39	16.75	1.37								
45	9.23	14.17	6.01	5.66	16.04	0.00	2.53	1.26	2.14	3.34	0.02	10.78	4.78	6.01	0.00	31.68	6.75	0.00	4.24	9.72	0.73	0.00	0.03	0.36	1.57	8.59	15.25	1.94	1.18	14.62	1.03	3.56	5.46	1.88	3.21	1.91	0.00	2.47	6.83	4.78	15.37	1.16								
50	8.42	12.21	4.04	4.54	13.84	0.00	2.09	1.16	2.02	2.44	0.00	9.44	4.46	5.51	0.00	23.89	7.93	0.61	3.89	7.93	0.61	0.00	0.00	0.00	1.37	7.14	14.20	0.94	0.12	11.24	0.84	3.84	4.27	1.18	2.84	1.51	0.00	2.14	5.92	4.01	13.99	1.07								
55	7.61	10.24	2.07	3.42	12.15	0.00	1.65	1.07	0.49	2.27	0.00	8.09	4.14	5.05	0.00	25.94	5.70	0.00	3.54	6.15	0.56	0.00	1.17	5.68	13.15	0.00	0.00	11.86	0.06	0.97	3.07	0.49	2.47	1.12	0.00	1.15	5.01	3.55	12.61	1.00										
60	6.80	8.28	0.11	2.30	11.42	0.00	1.21	0.98	0.07	1.89	0.00	6.75	3.82	4.57	0.00	23.08	5.17	0.00	3.19	4.36	0.48	0.00	0.96	4.23	12.10	0.00	0.00	10.48	0.48	0.00	1.87	0.00	2.11	0.72	0.00	0.49	4.10	2.93	11.23	0.93										
65	5.99	6.31	0.00	1.17	10.68	0.00	0.77	0.88	0.00	1.51	0.00	5.40	3.50	4.09	0.00	20.21	4.64	0.00	2.84	2.58	0.39	0.00	0.76	2.77	11.00	0.00	0.00	9.09	0.29	0.00	0.68	0.00	1.74	0.33	0.00	0.19	2.31	9.85	0.85											
70	5.18	4.35	0.05	0.95	9.95	0.00	0.31	0.79	0.45	1.14	0.00	4.06	3.18	3.62	0.00	18.11	4.12	0.00	2.49	0.79	0.31	0.55	1.32	10.01	0.00	0.00	8.49	0.11	0.00	0.68	0.00	1.38	0.00	0.00	0.28	1.70	8.48	0.78												
75	4.37	2.38	0.00	0.21	0.00	0.00	0.69	0.00	0.76	0.00	0.76	2.71	2.86	3.14	0.00	17.16	3.59	0.00	2.13	0.10	0.21	0.35	0.00	8.96	0.00	0.00	7.17	1.08	0.00	0.00	0.00	1.01	0.00	0.00	0.00	1.08	7.10	0.71												
80	3.56	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.37	2.54	2.66	0.00	16.20	3.06	0.00	1.78	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00									
125	2.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
130	1.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
135	1.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
140	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
145	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
150	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.																								

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f.)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
C1	P	0.109	0.109	37.4	4.63	19.5	3.27	7.7	55	158,667	2.57	407,452	45.0	83	406,404	1.90
C2	X1	0.100	0.155	31.9	5.30	16.6	3.75	8.8	112	277,259	2.58	715,935	45.0	163	714,529	2.14
C3	O	0.099	0.133	26.4	4.19	13.7	2.96	7.0	93	190,648	2.58	492,472	40.0	127	490,916	2.43
C4	X2	0.097	0.119	29.1	4.16	15.1	2.94	6.9	59	131,878	2.59	341,350	40.0	82	340,177	2.27
C5	X3	0.120	0.131	46.9	6.23	24.4	4.40	10.4	62	225,024	2.56	575,240	50.0	101	575,182	1.62
C6	N	0.100	0.118	15.2	2.87	7.9	2.03	4.8	129	150,899	2.58	389,674	35.0	141	379,871	3.40
C7	V2	0.118	0.069	30.0	3.10	15.6	2.19	5.2	24	55,684	2.56	142,481	40.0	33	141,285	2.17
C8	U	0.126	0.047	39.1	2.90	20.3	2.05	4.8	7	21,272	2.55	54,257	45.0	11	53,777	1.79
C9	M	0.097	0.104	15.7	2.75	8.2	1.94	4.6	80	97,393	2.59	252,068	35.0	89	245,194	3.32
C10	V1	0.094	0.078	26.5	3.09	13.8	2.18	5.1	20	41,999	2.60	109,069	40.0	28	108,078	2.39
C11	L	0.105	0.069	32.9	3.24	17.1	2.29	5.4	23	57,681	2.57	148,506	40.0	32	147,376	2.04
C12	K	0.094	0.217	16.6	4.26	8.6	3.01	7.1	324	416,470	2.60	1,081,182	35.0	382	1,076,395	3.33
C13	R	0.108	0.122	33.0	4.58	17.1	3.23	7.6	80	203,861	2.57	523,871	45.0	116	522,444	2.07
C14	H	0.126	0.085	42.1	4.24	21.9	3.00	7.1	24	79,715	2.55	203,324	45.0	38	202,827	1.72
C15	J	0.126	0.095	38.9	4.33	20.2	3.06	7.2	34	101,894	2.55	259,896	45.0	51	259,274	1.82
C16	I	0.096	0.110	22.0	3.36	11.4	2.38	5.6	62	105,234	2.59	272,611	35.0	78	269,994	2.69
C17	E	0.119	0.167	54.0	8.41	28.1	5.95	14.0	92	386,704	2.56	989,065	55.0	158	988,371	1.48
C18	G	0.122	0.098	39.3	4.44	20.4	3.14	7.4	38	114,164	2.55	291,648	45.0	57	290,911	1.82
C19	D	0.095	0.134	20.3	3.59	10.5	2.54	6.0	94	148,358	2.59	384,936	35.0	117	382,272	2.87
C20	B2	0.105	0.076	38.3	3.74	19.9	2.65	6.2	24	72,564	2.57	186,792	45.0	37	186,213	1.86
C21	B1	0.100	0.140	29.6	4.67	15.4	3.30	7.8	95	216,856	2.58	560,078	40.0	134	557,898	2.24
C22	W	0.126	0.038	32.9	2.47	17.1	1.74	4.1	5	13,649	2.55	34,813	40.0	7	34,153	1.98
C23	S	0.093	0.107	21.8	3.29	11.3	2.32	5.5	47	78,662	2.60	204,568	35.0	59	202,558	2.72
B1	JJ	0.109	0.053	22.5	2.42	11.7	1.71	4.0	19	32,307	2.57	82,963	35.0	23	80,603	2.56
B2	LL	0.122	0.047	24.1	2.37	12.5	1.68	4.0	12	22,506	2.55	57,481	40.0	15	55,886	2.43
B3	KK	0.126	0.055	32.6	2.87	16.9	2.03	4.8	12	30,492	2.55	77,774	40.0	17	76,823	2.02
B4	EE1	0.126	0.124	30.2	4.37	15.7	3.09	7.3	79	184,658	2.55	470,997	40.0	110	468,951	2.17
B5	DD	0.126	0.142	41.6	6.04	21.6	4.27	10.1	78	252,285	2.55	643,489	50.0	122	643,587	1.76
B6	II3	0.126	0.088	25.0	3.19	13.0	2.25	5.3	45	87,011	2.55	221,934	40.0	59	219,892	2.45
B7	II2	0.126	0.087	23.9	3.09	12.4	2.18	5.1	45	83,962	2.55	214,157	40.0	58	211,616	2.50
B8	II1	0.126	0.123	53.3	6.54	27.7	4.62	10.9	44	183,061	2.55	466,923	50.0	74	467,031	1.48
B9	CC	0.126	0.048	29.8	2.61	15.5	1.84	4.3	10	22,978	2.55	58,608	40.0	14	57,626	2.14
B10	AA	0.126	0.103	26.0	3.55	13.5	2.51	5.9	61	122,694	2.55	312,949	40.0	81	311,592	2.40
B11	BB	0.126	0.107	28.4	3.84	14.8	2.72	6.4	61	134,855	2.55	343,966	40.0	84	342,767	2.27
B12	FF	0.126	0.078	26.0	3.05	13.5	2.15	5.1	33	65,703	2.55	167,585	40.0	43	165,899	2.38
B13	GG	0.126	0.074	33.9	3.43	17.6	2.43	5.7	23	59,351	2.55	151,382	45.0	32	150,699	1.99
B14	HH	0.126	0.066	28.7	2.96	14.9	2.09	4.9	21	46,101	2.55	117,587	40.0	28	116,310	2.22
B15	EE2	0.078	0.121	11.6	2.58	6.0	1.83	4.3	66	59,387	2.66	157,718	35.0	64	151,027	3.89
B16	EE3	0.086	0.073	19.8	2.61	10.3	1.84	4.3	16	24,212	2.62	63,519	35.0	19	61,897	2.90
OS1	A	0.156	0.096	27.3	3.51	14.2	2.48	5.8	33	68,934	2.54	174,933	40.0	44	174,023	2.31
OS2	C	0.156	0.128	32.3	4.68	16.8	3.31	7.8	53	132,096	2.54	335,220	45.0	75	334,263	2.07
OS3	F	0.156	0.109	32.6	4.22	17.0	2.98	7.0	36	91,658	2.54	232,600	45.0	52	231,811	2.04
OS4	Q	0.156	0.175	37.1	6.48	19.3	4.58	10.8	91	262,413	2.54	665,926	45.0	138	665,685	1.91
OS5	T	0.156	0.054	43.6	3.29	22.7	2.33	5.5	6	19,021	2.54	48,270	45.0	9	48,050	1.66

Printouts for Storm Hydrographs

[illegible]

Printouts for Unit Hydrographs

flow in cfs																																																			
time in minutes	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32	C33	C34	C35	C36	C37	C38	C39	C40	C41	C42	C43	C44	C45	C46	C47	C48	C49	C50	
5	45.34	82.91	82.65	52.25	39.08	128.52	23.97	7.03	80.02	20.40	22.44	284.52	66.66	21.54	29.37	60.88	39.45	32.05	90.88	23.13	77.75	5.35	46.13	18.51	12.02	12.10	68.24	51.02	44.80	45.37	26.45	9.97	58.83	57.18	32.68	22.09	20.71	65.48	15.79	31.63	43.36	32.05	54.93	5.58							
10	54.47	111.91	91.29	57.68	61.90	103.08	23.22	6.89	64.93	19.54	22.07	302.60	79.27	24.30	33.58	58.21	81.91	37.34	88.53	24.18	93.85	5.16	43.70	16.90	11.11	11.73	78.07	78.33	42.87	42.87	43.98	9.54	58.81	59.91	31.15	22.14	19.91	44.42	14.04	31.56	52.46	35.88	90.59	5.57							
15	51.97	105.69	80.26	52.17	61.19	74.64	20.77	6.49	47.60	16.76	20.25	215.59	74.24	23.37	32.06	45.83	92.45	35.73	68.11	22.89	86.21	4.68	34.34	13.46	8.99	10.68	71.58	76.75	35.84	34.89	44.04	8.45	50.57	53.49	26.44	20.49	17.54	29.78	10.86	27.62	49.05	33.34	89.42	5.33							
20	46.86	90.99	65.31	42.92	58.42	55.89	17.36	5.82	35.82	13.93	17.14	158.26	64.06	21.58	29.12	37.74	90.81	32.56	54.51	20.58	70.75	3.97	28.20	11.16	7.60	9.01	59.07	71.92	39.73	29.09	42.66	7.11	41.60	44.08	21.99	17.62	14.65	20.12	8.59	22.80	42.03	28.49	82.36	4.92							
25	40.16	77.37	55.15	37.17	53.70	41.56	15.13	5.09	27.23	11.77	15.15	124.60	55.11	18.94	25.06	30.19	86.81	27.99	43.59	17.82	61.53	3.53	22.58	9.03	6.22	7.98	51.60	63.84	24.63	23.71	40.24	6.18	34.95	37.96	18.45	15.44	12.65	12.27	6.98	19.43	36.14	24.71	70.05	4.34							
30	36.04	67.19	45.65	31.41	47.04	27.23	12.90	4.60	18.65	9.86	13.25	90.94	48.22	17.04	22.63	25.47	80.44	25.31	35.74	16.05	52.31	3.08	19.01	7.67	5.32	6.96	44.13	55.98	20.76	20.14	36.78	5.26	29.19	31.84	15.50	13.59	10.64	9.05	5.65	16.15	31.47	21.56	62.04	3.93							
35	31.91	57.01	39.75	27.17	43.02	21.44	11.21	4.11	14.03	8.59	11.34	62.31	41.33	15.42	20.21	20.76	71.71	22.64	27.90	14.28	44.86	2.65	15.43	6.30	4.49	5.98	37.83	50.60	17.77	16.98	32.81	4.60	25.29	27.75	13.42	11.74	9.34	5.83	4.32	14.17	26.80	18.42	54.87	3.58							
40	27.79	50.72	33.86	23.81	39.27	16.66	9.89	3.61	11.17	7.31	10.20	51.09	36.71	13.81	17.78	16.05	65.58	19.96	20.06	12.51	39.51	2.39	11.85	4.94	3.67	5.37	33.47	45.21	14.77	13.81	30.46	4.05	21.40	24.17	11.33	10.46	8.15	2.61	3.10	12.19	23.91	16.46	47.71	3.23							
45	25.19	44.82	27.96	20.45	35.52	11.88	8.57	3.28	8.31	6.04	9.07	39.87	32.68	12.21	15.99	12.03	60.64	17.90	16.67	11.35	34.15	2.12	8.97	3.67	2.85	4.76	29.10	39.83	11.78	10.65	28.11	3.50	17.50	20.58	9.25	9.37	6.96	0.00	2.66	10.21	21.18	14.61	42.69	2.87							
50	22.77	38.93	22.06	17.08	31.76	7.11	7.25	2.99	5.45	4.76	7.94	28.65	28.64	11.25	14.55	10.46	55.71	16.31	14.05	10.30	28.79	1.85	7.78	3.21	2.28	4.15	24.74	36.41	8.93	8.55	25.77	2.95	13.61	16.99	7.16	8.27	5.77	2.22	8.23	18.45	12.76	38.56	2.64								
55	20.34	33.03	17.80	13.72	29.25	2.33	5.93	2.69	2.59	3.89	6.80	17.43	24.61	10.30	13.11	8.89	50.78	14.73	11.44	9.24	23.44	1.59	6.59	2.76	2.01	3.54	20.37	33.27	7.93	7.50	23.42	2.40	11.36	13.40	6.05	7.17	4.58	1.77	6.43	15.72	10.91	34.42	2.43								
60	17.91	27.14	15.84	11.27	27.05	0.00	4.74	2.40	0.00	3.46	5.67	6.21	20.58	9.34	11.68	7.32	46.02	13.15	8.82	8.19	28.65	1.32	5.40	2.30	1.73	2.93	16.01	30.13	6.93	6.45	21.53	1.95	10.06	11.44	5.36	6.07	3.89	1.33	5.77	12.99	9.06	30.28	2.22								
65	15.49	22.03	13.87	10.14	24.85		4.29	2.10		3.04	4.54	0.00	16.54	8.38	10.24	5.75	43.15	11.57	6.21	7.14	16.86	1.07	4.20	1.85	1.46	2.39	14.41	26.98	5.93	5.39	20.15	1.76	8.76	10.25	4.66	4.97	3.50	0.89	5.11	10.46	7.24	26.15	2.00								
70	13.06	20.07	11.90	9.02	22.65		3.85	1.81		2.61	4.15		14.82	7.43	8.81	4.18	40.28	9.99	3.60	6.09	15.07	0.98	3.01	1.39	1.19	2.18	12.96	23.84	4.94	4.34	18.77	1.58	7.46	9.05	3.97	4.30	3.10		0.44	4.45	9.55	6.63	22.01	1.79							
75	10.84	18.10	9.94	7.90	20.45		3.41	1.51		2.19	3.78		13.47	6.47	7.37	2.61	37.41	8.40	0.98	5.03	13.29	0.89	1.82	0.94	0.91	1.98	11.50	20.70	3.94	3.28	17.39	1.39	6.16	7.85	3.27	3.94	2.71	0.00	3.79	8.64	6.01	18.13	1.58								
80	10.04	16.14	7.97	6.78	18.24		2.97	1.34		1.76	3.40		12.13	5.51	6.49	1.04	34.55	7.28	0.00	4.59	11.50	0.80	0.62	0.49	0.64	1.78	10.05	17.55	2.94	2.23	16.00	1.21	4.86	6.66	2.57	3.57	2.31	0.00	3.13	7.73	5.39	16.75	1.37								
85	9.23	14.17	6.01	5.66	16.04		2.53	1.25		1.34	3.02		10.78	4.78	6.01	0.00	31.68	6.75		4.24	9.72	0.71	0.00	0.03	0.36	1.57	8.59	15.25	1.94	1.18	14.62	1.03	3.56	5.46	1.88	3.21	1.91		2.47	6.83	4.78	15.37	1.16								
90	8.42	12.21	4.04	4.54	13.84		2.09	1.15		0.92	2.64		9.44	4.46	5.53		28.81	6.23		3.89	7.93	0.62		0.00	0.09	1.37	7.14	14.20	0.94	0.12	13.24	0.84	2.26	4.27	1.18	2.84	1.52		1.81	5.92	4.16	13.99	1.07								
95	7.61	10.24	2.07	3.42	12.15		1.65	1.05		0.49	2.27		8.09	4.14	5.05		25.94	5.70		3.54	6.15	0.53		0.00	0.17	5.68	13.15	0.00	0.00	11.86	0.66	0.97	3.07	0.49	2.47	1.12		1.15	5.01	3.55	12.61	1.00									
100	6.80	8.28	0.11	2.30	11.42		1.21	0.95		0.07	1.89		6.75	3.82	4.57		23.08	5.17		3.19	4.36	0.44			0.96	4.23	12.10			10.48	0.48	0.00	1.87	0.00	2.11	0.72		0.49	4.10	2.93	11.23	0.93									
105	5.99	6.31	0.00	1.17	10.88		0.77	0.85		0.00	1.51		5.40	3.50	4.09		20.21	4.64		2.84	2.58	0.36			0.76	2.77	11.06			9.09	0.29	0.68			1.74	0.33	0.00	0.19	2.31	9.85	0.85										
110	5.18	4.35		0.05	9.95		0.33	0.75			1.14		4.06	3.18	3.62		18.11	4.12		2.49	0.79	0.27			0.55	1.32	10.01			8.49	0.11					1.38	0.00		2.28	1.70	8.48	0.78									
115	4.37	2.38		0.00	9.21		0.00	0.66			0.76		2.71	2.86	3.14		17.16	3.59		2.13	0.00	0.18			0.35	0.00	8.96										1.01		1.37	1.08	7.10	0.71									
120	3.56	0.42			8.48		0.56	0.42			0.38		1.37	2.54	2.66		16.20	3.06		1.78	0.09				0.15														0.65		0.46	0.47	5.72	0.64							
125	2.76	0.00			7.75		0.46	0.00			0.00		0.02	2.23	2.18		15.25	2.54		1.43	0.00				0.00														0.28		0.00	0.00	4.34	0.57							
130	1.95				7.01		0.36				0.00		0.00				1.91	1.70		1.08																					0.65		2.86	0.50							
135	1.14				6.28		0.26							1.59	1.22		13.33	1.48		0.73																					4.77		6.18	0.43							
140	0.33				5.55		0.16							1.27	0.75		12.38	0.95		0.38																					3.72		5.72	0.30							
145	0.00				4.81		0.07							0.95	0.27		11.42	0.43		0.03																					2.68		5.26	0.20							
150					4.08		0.00							0.63	0.00		10.47	0.00		0.00																					1.63		4.80	0.00							
155					3.34									0.31			9.51			0.58																															

Appendix C

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

 NOTE: The summary statistics displayed in this report are
 based on results found at every computational time step,
 not just on results from each reporting time step.

 Analysis Options

Flow Units CFS

Process Models:

Rainfall/Runoff NO
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO

Flow Routing Method KINWAVE

Starting Date 01/01/2022 00:00:00

Ending Date 01/01/2022 06:00:00

Antecedent Dry Days 0.0

Report Time Step 00:05:00

Routing Time Step 30.00 sec

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10 ⁶ gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	164.959	53.754
External Outflow	152.095	49.563
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	12.843	4.185
Continuity Error (%)	0.013	

Highest Flow Instability Indexes

Link SP101 (3)
Link SP103 (3)
Link SP102 (2)

Routing Time Step Summary

Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
A	JUNCTION	0.00	0.00	7625.00	0 00:00	0.00
AA	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
B	JUNCTION	0.00	0.00	7570.00	0 00:00	0.00
BB	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
BB1	JUNCTION	0.00	0.00	7385.00	0 00:00	0.00
BB2	JUNCTION	0.00	0.00	7365.00	0 00:00	0.00
C	JUNCTION	0.00	0.00	7635.00	0 00:00	0.00
CC	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
D	JUNCTION	0.00	0.00	7575.00	0 00:00	0.00
DD	JUNCTION	0.00	0.00	7500.00	0 00:00	0.00
E	JUNCTION	0.00	0.00	7572.00	0 00:00	0.00
EE	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
F	JUNCTION	0.00	0.00	7633.00	0 00:00	0.00
FF	JUNCTION	0.00	0.00	7430.00	0 00:00	0.00
G	JUNCTION	0.00	0.00	7565.00	0 00:00	0.00
GG	JUNCTION	0.00	0.00	7420.00	0 00:00	0.00
H1	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
HH	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
I	JUNCTION	0.00	0.00	7595.00	0 00:00	0.00
II	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
II1	JUNCTION	0.00	0.00	7375.00	0 00:00	0.00
BB3	JUNCTION	0.00	0.00	7330.00	0 00:00	0.00
J	JUNCTION	0.00	0.00	7560.00	0 00:00	0.00
JJ	JUNCTION	0.00	0.00	7575.00	0 00:00	0.00

K	JUNCTION	0.00	0.00	7585.00	0	00:00	0.00
KK	JUNCTION	0.00	0.00	7590.00	0	00:00	0.00
L	JUNCTION	0.00	0.00	7548.00	0	00:00	0.00
LL	JUNCTION	0.00	0.00	7580.00	0	00:00	0.00
LL1	JUNCTION	0.00	0.00	7525.00	0	00:00	0.00
M	JUNCTION	0.00	0.00	7590.00	0	00:00	0.00
N	JUNCTION	0.00	0.00	7535.00	0	00:00	0.00
O	JUNCTION	0.00	0.00	7525.00	0	00:00	0.00
P	JUNCTION	0.00	0.00	7480.00	0	00:00	0.00
Q	JUNCTION	0.00	0.00	7585.00	0	00:00	0.00
R	JUNCTION	0.00	0.00	7596.00	0	00:00	0.00
S	JUNCTION	0.00	0.00	7598.00	0	00:00	0.00
SP1	JUNCTION	0.00	0.00	7495.00	0	00:00	0.00
SP2	JUNCTION	0.00	0.00	7490.00	0	00:00	0.00
SP3	JUNCTION	0.00	0.00	7435.00	0	00:00	0.00
T	JUNCTION	0.00	0.00	7583.00	0	00:00	0.00
T1	JUNCTION	0.00	0.00	7565.00	0	00:00	0.00
U	JUNCTION	0.00	0.00	7567.00	0	00:00	0.00
T2	JUNCTION	0.00	0.00	7555.00	0	00:00	0.00
V	JUNCTION	0.00	0.00	7577.00	0	00:00	0.00
X	JUNCTION	0.00	0.00	7500.00	0	00:00	0.00
W	JUNCTION	0.00	0.00	7546.00	0	00:00	0.00
H	JUNCTION	0.00	0.00	7560.00	0	00:00	0.00
OF2	OUTFALL	0.00	0.00	7550.00	0	00:00	0.00
OF1	OUTFALL	0.00	0.00	7430.00	0	00:00	0.00
OF3	OUTFALL	0.00	0.00	7435.00	0	00:00	0.00
OF5	OUTFALL	0.00	0.00	7520.00	0	00:00	0.00
OF4	OUTFALL	0.00	0.00	7325.00	0	00:00	0.00
IRR_POND	STORAGE	2.17	3.25	7533.25	0	02:12	3.25

Node Inflow Summary

Total	Flow		Maximum	Maximum		Lateral	
Inflow	Balance		Lateral	Total	Time of Max	Inflow	
Volume	Error		Inflow	Inflow	Occurrence	Volume	
Node		Type	CFS	CFS	days hr:min	10^6 gal	10^6
gal	Percent						

A		JUNCTION	20.84	20.84	0 00:35	0.696	

0.696	0.000					
AA		JUNCTION	38.76	38.76	0 00:35	1.24
1.24	0.000					
B		JUNCTION	50.01	103.48	0 00:40	2.2
4.18	0.000					
BB		JUNCTION	40.62	40.62	0 00:35	1.38
1.38	0.000					
BB1		JUNCTION	0.00	242.15	0 00:35	0
8.7	0.000					
BB2		JUNCTION	0.00	257.03	0 00:35	0
9.31	0.000					
C		JUNCTION	33.36	33.36	0 00:40	1.28
1.28	0.000					
CC		JUNCTION	6.53	6.53	0 00:35	0.232
0.232	0.000					
D		JUNCTION	31.56	31.56	0 00:40	1.43
1.43	0.000					
DD		JUNCTION	58.42	58.42	0 00:40	2.62
2.62	0.000					
E		JUNCTION	92.81	223.69	0 00:45	4.71
10.3	0.000					
EE		JUNCTION	81.16	81.16	0 00:35	2.59
2.59	0.000					
F		JUNCTION	24.27	24.27	0 00:35	0.927
0.927	0.000					
FF		JUNCTION	19.51	162.77	0 00:35	0.646
6.08	0.000					
G		JUNCTION	54.90	79.17	0 00:35	1.91
2.84	0.000					
GG		JUNCTION	14.93	14.93	0 00:40	0.601
0.601	0.000					
H1		JUNCTION	0.00	133.51	0 02:08	0
9.72	0.000					
HH		JUNCTION	13.01	13.01	0 00:35	0.462
0.462	0.000					
I		JUNCTION	34.58	34.58	0 00:35	1.17
1.17	0.000					
II		JUNCTION	81.77	81.77	0 00:45	3.59
3.59	0.000					
II1		JUNCTION	0.00	81.77	0 00:45	0
3.59	0.000					
BB3		JUNCTION	0.00	346.26	0 00:40	0
13.4	0.000					
J		JUNCTION	22.78	56.31	0 00:35	1.05
2.22	0.000					
JJ		JUNCTION	9.74	9.74	0 00:35	0.317
0.317	0.000					
K		JUNCTION	92.05	92.05	0 00:40	3.43
3.43	0.000					
KK		JUNCTION	7.51	7.51	0 00:35	0.297

0.297	0.000					
L		JUNCTION	15.71	107.58	0 00:40	0.601
4.03	0.000					
LL		JUNCTION	6.88	6.88	0 00:35	0.22
0.22	0.000					
LL1		JUNCTION	0.00	24.12	0 00:35	0
0.834	0.000					
M		JUNCTION	11.48	11.48	0 00:40	0.509
0.509	0.000					
N		JUNCTION	56.97	68.16	0 00:35	1.8
2.31	0.000					
O		JUNCTION	22.69	22.69	0 00:40	0.91
0.91	0.000					
P		JUNCTION	38.52	38.52	0 00:40	1.61
1.61	0.000					
Q		JUNCTION	64.68	64.68	0 00:40	2.66
2.66	0.000					
R		JUNCTION	44.21	108.65	0 00:40	2.03
4.69	0.000					
S		JUNCTION	25.99	25.99	0 00:35	0.894
0.894	0.000					
SP1		JUNCTION	0.00	207.17	0 01:51	0
16	0.000					
SP2		JUNCTION	0.00	281.79	0 00:40	0
19.2	0.000					
SP3		JUNCTION	0.00	320.31	0 00:40	0
20.8	0.000					
T		JUNCTION	4.04	4.04	0 00:40	0.192
0.192	0.000					
T1		JUNCTION	0.00	137.90	0 00:40	0
5.77	0.000					
U		JUNCTION	4.15	4.15	0 00:40	0.201
0.201	0.000					
T2		JUNCTION	0.00	145.46	0 00:40	0
6.11	0.000					
V		JUNCTION	29.63	29.63	0 00:45	1.42
1.42	0.000					
X		JUNCTION	138.66	167.76	0 00:50	7.03
8.45	0.000					
W		JUNCTION	3.45	3.45	0 00:35	0.136
0.136	0.000					
H		JUNCTION	18.59	18.59	0 00:40	0.758
0.758	0.000					
OF2		OUTFALL	0.00	145.46	0 00:40	0
6.11	0.000					
OF1		OUTFALL	0.00	320.31	0 00:40	0
20.8	0.000					
OF3		OUTFALL	0.00	167.76	0 00:50	0
8.45	0.000					
OF5		OUTFALL	0.00	24.12	0 00:35	0

0.834	0.000						
OF4		OUTFALL	0.00	346.26	0	00:40	0
13.4	0.000						
IRR_POND		STORAGE	0.00	298.49	0	00:40	0
13.2	0.052						

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

of Max		Maximum	Average	Avg	Evap	Exfil	Maximum	Max	Time
Occurrence	Storage Unit	Outflow	Volume	Pcnt	Pcnt	Pcnt	Volume	Pcnt	
hr:min	CFS		1000 ft3	Full	Loss	Loss	1000 ft3	Full	days
IRR_POND			718.772	33	0	0	1098.529	50	0
02:12	126.25								

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OF2	75.42	50.15	145.46	6.111
OF1	98.06	131.34	320.31	20.806
OF3	83.19	62.87	167.76	8.451
OF5	64.44	8.01	24.12	0.834
OF4	74.72	110.64	346.26	13.357
System	79.17	363.02	989.13	49.559

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
A100	DUMMY	20.84	0 00:35			
AA100	DUMMY	38.76	0 00:35			
B100	DUMMY	103.48	0 00:40			
BB100	DUMMY	40.62	0 00:35			
BB101	DUMMY	242.15	0 00:35			
BB102	DUMMY	257.03	0 00:35			
C100	DUMMY	33.36	0 00:40			
CC100	DUMMY	6.53	0 00:35			
D100	DUMMY	31.56	0 00:40			
DD100	DUMMY	58.42	0 00:40			
E100	DUMMY	223.69	0 00:45			
EE100	DUMMY	81.16	0 00:35			
EE101	DUMMY	162.77	0 00:35			
F100	DUMMY	24.27	0 00:35			
G100	DUMMY	79.17	0 00:35			
GG100	DUMMY	14.93	0 00:40			
H101	DUMMY	133.51	0 02:08			
HH100	DUMMY	13.01	0 00:35			
I100	DUMMY	34.58	0 00:35			
II100	DUMMY	81.77	0 00:45			
II101	DUMMY	81.77	0 00:45			
J100	DUMMY	56.31	0 00:35			
JJ100	DUMMY	9.74	0 00:35			
K100	DUMMY	92.05	0 00:40			
KK100	DUMMY	7.51	0 00:35			
L100	DUMMY	107.58	0 00:40			
LL100	DUMMY	6.88	0 00:35			
M100	DUMMY	11.48	0 00:40			
N100	DUMMY	68.16	0 00:35			
O100	DUMMY	22.69	0 00:40			
BB103	DUMMY	346.26	0 00:40			
OF5	DUMMY	24.12	0 00:35			
P100	DUMMY	38.52	0 00:40			
Q100	DUMMY	64.68	0 00:40			
R100	DUMMY	108.65	0 00:40			
S100	DUMMY	25.99	0 00:35			
SP101	DUMMY	207.17	0 01:51			
SP102	DUMMY	281.79	0 00:40			
SP103	DUMMY	320.31	0 00:40			

T100	DUMMY	4.04	0	00:40
T101	DUMMY	137.90	0	00:40
U100	DUMMY	4.15	0	00:40
U101	DUMMY	145.46	0	00:40
V100	DUMMY	29.63	0	00:45
W100	DUMMY	3.45	0	00:35
X100	DUMMY	167.76	0	00:50
H100	DUMMY	18.59	0	00:40
IRR_OUTLET	DUMMY	126.25	0	02:12

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Mon Jul 18 10:52:15 2022
 Analysis ended on: Mon Jul 18 10:52:15 2022
 Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options

Flow Units CFS

Process Models:

Rainfall/Runoff NO
RDII NO
Snowmelt NO
Groundwater NO
Flow Routing YES
Ponding Allowed NO
Water Quality NO

Flow Routing Method KINWAVE

Starting Date 01/01/2022 00:00:00

Ending Date 01/01/2022 06:00:00

Antecedent Dry Days 0.0

Report Time Step 00:05:00

Routing Time Step 30.00 sec

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10 ⁶ gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	308.214	100.436
External Outflow	294.043	95.818
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	14.142	4.608
Continuity Error (%)	0.009	

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
A	JUNCTION	0.00	0.00	7625.00	0 00:00	0.00
AA	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
B	JUNCTION	0.00	0.00	7570.00	0 00:00	0.00
BB	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
BB1	JUNCTION	0.00	0.00	7385.00	0 00:00	0.00
BB2	JUNCTION	0.00	0.00	7365.00	0 00:00	0.00
C	JUNCTION	0.00	0.00	7635.00	0 00:00	0.00
CC	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
D	JUNCTION	0.00	0.00	7575.00	0 00:00	0.00
DD	JUNCTION	0.00	0.00	7500.00	0 00:00	0.00
E	JUNCTION	0.00	0.00	7572.00	0 00:00	0.00
EE	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
F	JUNCTION	0.00	0.00	7633.00	0 00:00	0.00
FF	JUNCTION	0.00	0.00	7430.00	0 00:00	0.00
G	JUNCTION	0.00	0.00	7565.00	0 00:00	0.00
GG	JUNCTION	0.00	0.00	7420.00	0 00:00	0.00
H1	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
HH	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
I	JUNCTION	0.00	0.00	7595.00	0 00:00	0.00
II	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
II1	JUNCTION	0.00	0.00	7375.00	0 00:00	0.00
BB3	JUNCTION	0.00	0.00	7330.00	0 00:00	0.00
J	JUNCTION	0.00	0.00	7560.00	0 00:00	0.00
JJ	JUNCTION	0.00	0.00	7575.00	0 00:00	0.00
K	JUNCTION	0.00	0.00	7585.00	0 00:00	0.00
KK	JUNCTION	0.00	0.00	7590.00	0 00:00	0.00

L	JUNCTION	0.00	0.00	7548.00	0	00:00	0.00
LL	JUNCTION	0.00	0.00	7580.00	0	00:00	0.00
LL1	JUNCTION	0.00	0.00	7525.00	0	00:00	0.00
M	JUNCTION	0.00	0.00	7590.00	0	00:00	0.00
N	JUNCTION	0.00	0.00	7535.00	0	00:00	0.00
O	JUNCTION	0.00	0.00	7525.00	0	00:00	0.00
P	JUNCTION	0.00	0.00	7480.00	0	00:00	0.00
Q	JUNCTION	0.00	0.00	7585.00	0	00:00	0.00
R	JUNCTION	0.00	0.00	7596.00	0	00:00	0.00
S	JUNCTION	0.00	0.00	7598.00	0	00:00	0.00
SP1	JUNCTION	0.00	0.00	7495.00	0	00:00	0.00
SP2	JUNCTION	0.00	0.00	7490.00	0	00:00	0.00
SP3	JUNCTION	0.00	0.00	7435.00	0	00:00	0.00
T	JUNCTION	0.00	0.00	7583.00	0	00:00	0.00
T1	JUNCTION	0.00	0.00	7565.00	0	00:00	0.00
U	JUNCTION	0.00	0.00	7567.00	0	00:00	0.00
T2	JUNCTION	0.00	0.00	7555.00	0	00:00	0.00
V	JUNCTION	0.00	0.00	7577.00	0	00:00	0.00
X	JUNCTION	0.00	0.00	7500.00	0	00:00	0.00
W	JUNCTION	0.00	0.00	7546.00	0	00:00	0.00
H	JUNCTION	0.00	0.00	7560.00	0	00:00	0.00
OF2	OUTFALL	0.00	0.00	7550.00	0	00:00	0.00
OF1	OUTFALL	0.00	0.00	7430.00	0	00:00	0.00
OF3	OUTFALL	0.00	0.00	7435.00	0	00:00	0.00
OF5	OUTFALL	0.00	0.00	7520.00	0	00:00	0.00
OF4	OUTFALL	0.00	0.00	7325.00	0	00:00	0.00
IRR_POND	STORAGE	2.90	4.82	7534.82	0	01:51	4.82

Node Inflow Summary

Total	Flow		Maximum	Maximum		Lateral	
Inflow	Balance		Lateral	Total	Time of Max	Inflow	
Volume	Error		Inflow	Inflow	Occurrence	Volume	
Node		Type	CFS	CFS	days hr:min	10^6 gal	10^6
gal	Percent						

A		JUNCTION	43.83	43.83	0 00:40	1.3	
1.3	0.000						
AA		JUNCTION	80.22	80.22	0 00:40	2.31	

2.31	0.000						
B		JUNCTION	107.33	221.28	0 00:45	4.12	
7.82	0.000						
BB		JUNCTION	84.15	84.15	0 00:40	2.56	
2.56	0.000						
BB1		JUNCTION	0.00	503.29	0 00:40	0	
16.2	0.000						
BB2		JUNCTION	0.00	534.86	0 00:40	0	
17.3	0.000						
C		JUNCTION	71.27	71.27	0 00:45	2.4	
2.4	0.000						
CC		JUNCTION	13.57	13.57	0 00:40	0.431	
0.431	0.000						
D		JUNCTION	67.84	67.84	0 00:50	2.67	
2.67	0.000						
DD		JUNCTION	123.69	123.69	0 00:50	4.85	
4.85	0.000						
E		JUNCTION	199.80	483.10	0 00:50	8.81	
19.3	0.000						
EE		JUNCTION	167.45	167.45	0 00:40	4.8	
4.8	0.000						
F		JUNCTION	51.63	51.63	0 00:45	1.73	
1.73	0.000						
FF		JUNCTION	41.02	340.42	0 00:45	1.21	
11.3	0.000						
G		JUNCTION	115.21	166.51	0 00:40	3.58	
5.32	0.000						
GG		JUNCTION	31.99	31.99	0 00:45	1.12	
1.12	0.000						
H1		JUNCTION	0.00	323.27	0 01:49	0	
21.4	0.000						
HH		JUNCTION	27.42	27.42	0 00:40	0.864	
0.864	0.000						
I		JUNCTION	72.63	72.63	0 00:40	2.19	
2.19	0.000						
II		JUNCTION	175.60	175.60	0 00:50	6.72	
6.72	0.000						
II1		JUNCTION	0.00	175.60	0 00:50	0	
6.72	0.000						
BB3		JUNCTION	0.00	733.92	0 00:45	0	
24.9	0.000						
J		JUNCTION	48.99	120.46	0 00:45	1.96	
4.15	0.000						
JJ		JUNCTION	20.50	20.50	0 00:40	0.592	
0.592	0.000						
K		JUNCTION	195.43	195.43	0 00:45	6.42	
6.42	0.000						
KK		JUNCTION	15.99	15.99	0 00:45	0.556	
0.556	0.000						
L		JUNCTION	33.30	228.73	0 00:45	1.12	

7.55	0.000						
LL		JUNCTION	14.48	14.48	0	00:40	0.411
0.411	0.000						
LL1		JUNCTION	0.00	50.88	0	00:40	0
1.56	0.000						
M		JUNCTION	24.61	24.61	0	00:45	0.953
0.953	0.000						
N		JUNCTION	119.24	143.11	0	00:40	3.37
4.32	0.000						
O		JUNCTION	48.54	48.54	0	00:45	1.7
1.7	0.000						
P		JUNCTION	82.17	82.17	0	00:45	3.01
3.01	0.000						
Q		JUNCTION	137.80	137.80	0	00:45	4.98
4.98	0.000						
R		JUNCTION	95.25	232.13	0	00:45	3.79
8.77	0.000						
S		JUNCTION	54.65	54.65	0	00:40	1.67
1.67	0.000						
SP1		JUNCTION	0.00	515.49	0	01:15	0
33.1	0.000						
SP2		JUNCTION	0.00	653.32	0	01:09	0
39.1	0.000						
SP3		JUNCTION	0.00	725.59	0	01:06	0
42.1	0.000						
T		JUNCTION	8.68	8.68	0	00:45	0.359
0.359	0.000						
T1		JUNCTION	0.00	294.73	0	00:45	0
10.8	0.000						
U		JUNCTION	8.95	8.95	0	00:50	0.376
0.376	0.000						
T2		JUNCTION	0.00	311.00	0	00:45	0
11.4	0.000						
V		JUNCTION	63.92	63.92	0	00:50	2.66
2.66	0.000						
X		JUNCTION	298.70	361.56	0	00:55	13.2
15.8	0.000						
W		JUNCTION	7.33	7.33	0	00:45	0.255
0.255	0.000						
H		JUNCTION	39.78	39.78	0	00:45	1.42
1.42	0.000						
OF2		OUTFALL	0.00	311.00	0	00:45	0
11.4	0.000						
OF1		OUTFALL	0.00	725.59	0	01:06	0
42.1	0.000						
OF3		OUTFALL	0.00	361.56	0	00:55	0
15.8	0.000						
OF5		OUTFALL	0.00	50.88	0	00:40	0
1.56	0.000						
OF4		OUTFALL	0.00	733.92	0	00:45	0

24.9	0.000						
IRR_POND		STORAGE	0.00	644.35	0	00:50	0
24.6	0.038						

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

of Max		Average	Avg	Evap	Exfil	Maximum	Max	Time
Maximum	Maximum	Volume	Pcnt	Pcnt	Pcnt	Volume	Pcnt	
Occurrence	Outflow	1000 ft3	Full	Loss	Loss	1000 ft3	Full	days
Storage Unit	CFS							
hr:min								
IRR_POND		988.180	45	0	0	1697.949	78	0
01:51	306.06							

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OF2	76.53	92.46	311.00	11.432
OF1	98.33	265.29	725.59	42.145
OF3	83.75	116.84	361.56	15.810
OF5	64.58	14.95	50.88	1.559
OF4	74.86	205.58	733.92	24.865
System	79.61	695.11	2117.11	95.811

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
A100	DUMMY	43.83	0 00:40			
AA100	DUMMY	80.22	0 00:40			
B100	DUMMY	221.28	0 00:45			
BB100	DUMMY	84.15	0 00:40			
BB101	DUMMY	503.29	0 00:40			
BB102	DUMMY	534.86	0 00:40			
C100	DUMMY	71.27	0 00:45			
CC100	DUMMY	13.57	0 00:40			
D100	DUMMY	67.84	0 00:50			
DD100	DUMMY	123.69	0 00:50			
E100	DUMMY	483.10	0 00:50			
EE100	DUMMY	167.45	0 00:40			
EE101	DUMMY	340.42	0 00:45			
F100	DUMMY	51.63	0 00:45			
G100	DUMMY	166.51	0 00:40			
GG100	DUMMY	31.99	0 00:45			
H101	DUMMY	323.27	0 01:49			
HH100	DUMMY	27.42	0 00:40			
I100	DUMMY	72.63	0 00:40			
II100	DUMMY	175.60	0 00:50			
II101	DUMMY	175.60	0 00:50			
J100	DUMMY	120.46	0 00:45			
JJ100	DUMMY	20.50	0 00:40			
K100	DUMMY	195.43	0 00:45			
KK100	DUMMY	15.99	0 00:45			
L100	DUMMY	228.73	0 00:45			
LL100	DUMMY	14.48	0 00:40			
M100	DUMMY	24.61	0 00:45			
N100	DUMMY	143.11	0 00:40			
O100	DUMMY	48.54	0 00:45			
BB103	DUMMY	733.92	0 00:45			
OF5	DUMMY	50.88	0 00:40			
P100	DUMMY	82.17	0 00:45			
Q100	DUMMY	137.80	0 00:45			
R100	DUMMY	232.13	0 00:45			
S100	DUMMY	54.65	0 00:40			
SP101	DUMMY	515.49	0 01:15			
SP102	DUMMY	653.32	0 01:09			
SP103	DUMMY	725.59	0 01:06			
T100	DUMMY	8.68	0 00:45			
T101	DUMMY	294.73	0 00:45			

U100	DUMMY	8.95	0	00:50
U101	DUMMY	311.00	0	00:45
V100	DUMMY	63.92	0	00:50
W100	DUMMY	7.33	0	00:45
X100	DUMMY	361.56	0	00:55
H100	DUMMY	39.78	0	00:45
IRR_OUTLET	DUMMY	306.06	0	01:51

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Mon Jul 18 10:53:23 2022

Analysis ended on: Mon Jul 18 10:53:23 2022

Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.

Analysis Options

Flow Units CFS

Process Models:

Rainfall/Runoff NO

RDII NO

Snowmelt NO

Groundwater NO

Flow Routing YES

Ponding Allowed NO

Water Quality NO

Flow Routing Method KINWAVE

Starting Date 01/01/2005 00:00:00

Ending Date 01/01/2005 06:00:00

Antecedent Dry Days 0.0

Report Time Step 00:05:00

Routing Time Step 30.00 sec

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10 ⁶ gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	167.014	54.424
External Outflow	135.513	44.159
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	32.666	10.645
Continuity Error (%)	-0.697	

Highest Flow Instability Indexes

Link J1200 (3)
 Link J1300 (3)
 Link SP104 (3)
 Link SP101 (2)
 Link 07 (2)

Routing Time Step Summary

Minimum Time Step : 30.00 sec
 Average Time Step : 30.00 sec
 Maximum Time Step : 30.00 sec
 Percent in Steady State : 0.00
 Average Iterations per Step : 1.00
 Percent Not Converging : 0.00

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
A	JUNCTION	0.00	0.00	7625.00	0 00:00	0.00
AA	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
B1	JUNCTION	0.53	1.73	7576.73	0 00:35	1.73
B2	JUNCTION	0.55	1.60	7576.60	0 00:40	1.60
BB	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
BB1	JUNCTION	0.54	1.41	7386.41	0 00:49	1.41
BB2	JUNCTION	0.00	0.00	7365.00	0 00:00	0.00
BB3	JUNCTION	0.00	0.00	7330.00	0 00:00	0.00
C	JUNCTION	0.00	0.00	7635.00	0 00:00	0.00
CC	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
D	JUNCTION	0.00	0.00	7609.00	0 00:00	0.00
DD	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
E	JUNCTION	0.62	1.37	7573.37	0 00:50	1.37
EE1	JUNCTION	0.42	1.02	7476.02	0 00:53	1.02
EE2	JUNCTION	0.00	0.00	7550.00	0 00:00	0.00
EE3	JUNCTION	0.18	0.74	7575.74	0 00:30	0.73
F	JUNCTION	0.00	0.00	7633.00	0 00:00	0.00
FF	JUNCTION	0.54	1.41	7431.41	0 00:48	1.41
G	JUNCTION	0.44	1.26	7566.26	0 00:40	1.26
GG	JUNCTION	0.00	0.00	7420.00	0 00:00	0.00
H	JUNCTION	0.00	0.00	7530.00	0 00:00	0.00
HH	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
I	JUNCTION	0.00	0.00	7595.00	0 00:00	0.00

II1	JUNCTION	0.33	0.75	7495.75	0	00:50	0.75
II2	JUNCTION	0.32	1.13	7451.13	0	00:35	1.13
II3	JUNCTION	0.20	0.71	7515.71	0	00:35	0.71
IRR_J	JUNCTION	0.00	0.00	7528.00	0	00:00	0.00
J10	JUNCTION	0.00	0.00	7520.00	0	00:00	0.00
J11	JUNCTION	0.00	0.00	7565.00	0	00:00	0.00
J12	JUNCTION	0.08	0.23	7545.23	0	01:04	0.22
J13	JUNCTION	0.31	0.74	7520.74	0	01:00	0.74
J14	JUNCTION	0.00	0.00	7375.00	0	00:00	0.00
J15	JUNCTION	0.00	0.00	7552.00	0	00:00	0.00
J2	JUNCTION	0.55	1.24	7436.24	0	01:46	1.24
J3	JUNCTION	0.82	1.35	7496.35	0	01:51	1.35
J4	JUNCTION	0.55	1.24	7466.24	0	01:42	1.24
J5	JUNCTION	0.30	0.53	7525.53	0	01:29	0.53
J6	JUNCTION	0.30	0.53	7570.53	0	01:27	0.53
J7	JUNCTION	0.40	1.23	7546.23	0	00:37	1.22
J8	JUNCTION	0.40	1.23	7526.23	0	00:38	1.23
J9	JUNCTION	0.00	0.00	7550.00	0	00:00	0.00
JJ	JUNCTION	0.00	0.00	7575.00	0	00:00	0.00
K	JUNCTION	0.32	1.48	7586.48	0	00:30	1.46
KK	JUNCTION	0.00	0.00	7590.00	0	00:00	0.00
L	JUNCTION	0.00	0.00	7548.00	0	00:00	0.00
LL	JUNCTION	0.00	0.00	7580.00	0	00:00	0.00
M	JUNCTION	0.20	0.96	7590.96	0	00:30	0.95
N	JUNCTION	0.35	1.63	7536.63	0	00:30	1.62
O	JUNCTION	0.00	0.00	7559.00	0	00:00	0.00
P	JUNCTION	0.00	0.00	7500.37	0	00:00	0.00
Q	JUNCTION	0.00	0.00	7585.00	0	00:00	0.00
R	JUNCTION	0.00	0.00	7576.00	0	00:00	0.00
S	JUNCTION	0.00	0.00	7598.00	0	00:00	0.00
SP1	JUNCTION	0.50	0.82	7510.82	0	00:39	0.82
SP2	JUNCTION	0.83	1.39	7496.39	0	00:48	1.38
SP3	JUNCTION	0.87	1.34	7491.34	0	02:06	1.34
SP4	JUNCTION	0.54	0.88	7420.88	0	01:06	0.88
T	JUNCTION	0.00	0.00	7583.00	0	00:00	0.00
T1	JUNCTION	0.00	0.00	7565.00	0	00:00	0.00
T2	JUNCTION	0.00	0.00	7555.00	0	00:00	0.00
U	JUNCTION	0.00	0.00	7567.00	0	00:00	0.00
V1	JUNCTION	0.00	0.00	7598.00	0	00:00	0.00
V2	JUNCTION	0.19	0.61	7565.61	0	00:35	0.61
W	JUNCTION	0.00	0.00	7546.00	0	00:00	0.00
X1	JUNCTION	0.00	0.00	7485.00	0	00:00	0.00
X2	JUNCTION	0.30	1.00	7506.00	0	00:35	0.99
X3	JUNCTION	0.38	1.01	7501.01	0	00:40	1.01
I2	JUNCTION	0.00	0.00	7577.00	0	00:00	0.00
P12	JUNCTION	0.00	0.00	7550.00	0	00:00	0.00
LL1	JUNCTION	0.00	0.00	0.00	0	00:00	0.00
OF3	OUTFALL	0.00	0.00	7431.00	0	00:00	0.00
OF1	OUTFALL	0.53	0.88	7415.88	0	01:07	0.88
OF2	OUTFALL	0.00	0.00	7550.00	0	00:00	0.00

OF4	OUTFALL	0.00	0.00	7325.00	0	00:00	0.00
OF5	OUTFALL	0.00	0.00	7520.00	0	00:00	0.00
IRR_POND	STORAGE	2.04	3.13	7533.13	0	02:26	3.13
P1	STORAGE	2.52	3.53	7428.53	0	01:24	3.53
P10	STORAGE	3.00	4.85	7529.85	0	01:31	4.85
P11	STORAGE	3.04	5.09	7575.09	0	01:18	5.08
P13	STORAGE	2.85	3.99	7528.99	0	01:00	3.99
P14	STORAGE	2.97	4.54	7404.54	0	01:01	4.54
P15	STORAGE	2.80	4.26	7559.26	0	01:11	4.26
P2	STORAGE	5.57	7.19	7443.19	0	02:07	7.19
P3	STORAGE	4.48	6.33	7516.33	0	01:51	6.33
P4	STORAGE	4.93	7.13	7476.13	0	01:42	7.12
P5	STORAGE	3.20	4.68	7534.68	0	00:56	4.68
P6	STORAGE	3.85	5.74	7579.74	0	01:27	5.74
P7	STORAGE	4.50	7.59	7557.59	0	00:37	7.54
P8	STORAGE	4.01	6.15	7540.15	0	02:03	6.15
P9	STORAGE	3.74	5.58	7575.58	0	01:28	5.58
P16	STORAGE	3.37	4.66	7604.66	0	01:04	4.66
P17	STORAGE	4.41	5.85	7566.85	0	01:15	5.85

Node Inflow Summary

Total	Flow		Maximum	Maximum	Lateral		
Inflow	Balance		Lateral	Total	Time of Max	Inflow	
Volume	Error		Inflow	Inflow	Occurrence	Volume	
Node		Type	CFS	CFS	days hr:min	10^6 gal	10^6
gal	Percent						

A		JUNCTION	20.84	20.84	0 00:35	0.696	
0.696	0.000						
AA		JUNCTION	39.23	39.23	0 00:35	1.26	
1.26	0.000						
B1		JUNCTION	66.93	87.77	0 00:35	2.29	
2.99	0.000						
B2		JUNCTION	17.99	53.23	0 00:40	0.762	
2.1	0.000						
BB		JUNCTION	40.62	40.62	0 00:35	1.38	
1.38	0.000						
BB1		JUNCTION	0.00	214.28	0 00:41	0	

8.75	0.000						
BB2		JUNCTION	0.00	229.61	0	00:40	0
9.36	0.000						
BB3		JUNCTION	0.00	307.27	0	00:48	0
13.3	0.000						
C		JUNCTION	35.31	35.31	0	00:35	1.34
1.34	0.000						
CC		JUNCTION	6.53	6.53	0	00:35	0.232
0.232	0.000						
D		JUNCTION	61.12	61.12	0	00:30	1.58
1.58	0.000						
DD		JUNCTION	57.78	57.78	0	00:40	2.59
2.59	0.000						
E		JUNCTION	74.68	74.68	0	00:50	4
4	0.000						
EE1		JUNCTION	53.25	60.58	0	00:53	1.89
2.62	0.000						
EE2		JUNCTION	35.71	35.71	0	00:30	0.647
0.647	0.000						
EE3		JUNCTION	10.38	10.38	0	00:30	0.26
0.26	0.000						
F		JUNCTION	24.27	24.27	0	00:35	0.927
0.927	0.000						
FF		JUNCTION	20.78	139.72	0	00:48	0.669
6.11	0.000						
G		JUNCTION	27.18	51.31	0	00:40	1.18
2.1	0.000						
GG		JUNCTION	15.49	15.49	0	00:35	0.607
0.607	0.000						
H		JUNCTION	17.86	17.86	0	00:40	0.818
0.818	0.000						
HH		JUNCTION	13.56	13.56	0	00:35	0.469
0.469	0.000						
I		JUNCTION	40.37	40.37	0	00:30	1.11
1.11	0.000						
II1		JUNCTION	34.94	34.94	0	00:50	1.88
1.88	0.000						
II2		JUNCTION	28.04	56.21	0	00:35	0.853
1.74	0.000						
II3		JUNCTION	28.32	28.32	0	00:35	0.886
0.886	0.000						
IRR_J		JUNCTION	0.00	114.18	0	02:26	0
7.97	0.000						
J10		JUNCTION	0.00	124.52	0	02:25	0
8.74	0.000						
J11		JUNCTION	0.00	98.74	0	01:18	0
4.78	0.000						
J12		JUNCTION	0.00	24.66	0	01:04	0
0.985	-0.000						
J13		JUNCTION	0.00	17.17	0	01:00	0

0.729	0.000						
J14		JUNCTION	0.00	76.43	0	01:01	0
3.44	0.000						
J15		JUNCTION	0.00	30.95	0	01:11	0
1.38	0.000						
J2		JUNCTION	0.00	95.68	0	02:04	0
5.46	0.000						
J3		JUNCTION	0.00	22.74	0	01:51	0
1.57	0.000						
J4		JUNCTION	0.00	70.77	0	01:42	0
3.92	0.000						
J5		JUNCTION	0.00	49.82	0	00:58	0
2.19	0.000						
J6		JUNCTION	0.00	12.23	0	01:27	0
0.847	0.000						
J7		JUNCTION	0.00	180.87	0	00:37	0
4.34	0.000						
J8		JUNCTION	0.00	182.92	0	00:38	0
4.88	0.000						
J9		JUNCTION	0.00	94.99	0	01:28	0
4.83	0.000						
JJ		JUNCTION	11.49	11.49	0	00:30	0.328
0.328	0.000						
K		JUNCTION	200.94	200.94	0	00:30	4.46
4.46	0.000						
KK		JUNCTION	8.14	8.14	0	00:35	0.31
0.31	0.000						
L		JUNCTION	15.97	15.97	0	00:35	0.603
0.603	0.000						
LL		JUNCTION	7.36	7.36	0	00:30	0.226
0.226	0.000						
M		JUNCTION	46.54	46.54	0	00:30	1.01
1.01	0.000						
N		JUNCTION	73.48	73.48	0	00:30	1.56
1.56	0.000						
O		JUNCTION	63.86	63.86	0	00:35	2.02
2.02	0.000						
P		JUNCTION	40.00	40.00	0	00:40	1.66
1.66	0.000						
Q		JUNCTION	64.68	64.68	0	00:40	2.66
2.66	0.000						
R		JUNCTION	56.59	120.84	0	00:40	2.13
4.79	0.000						
S		JUNCTION	30.83	30.83	0	00:30	0.841
0.841	0.000						
SP1		JUNCTION	0.00	189.85	0	00:39	0
14.6	0.000						
SP2		JUNCTION	0.00	223.43	0	00:48	0
16.7	0.000						
SP3		JUNCTION	0.00	212.45	0	01:03	0

18.1	0.000						
SP4		JUNCTION	0.00	240.49	0	01:06	0
19.4	0.000						
T		JUNCTION	4.04	4.04	0	00:40	0.192
0.192	0.000						
T1		JUNCTION	0.00	98.27	0	01:27	0
5.02	0.000						
T2		JUNCTION	0.00	104.34	0	01:26	0
5.37	0.000						
U		JUNCTION	4.81	4.81	0	00:40	0.215
0.215	0.000						
V1		JUNCTION	13.99	13.99	0	00:35	0.448
0.448	0.000						
V2		JUNCTION	16.15	16.15	0	00:35	0.572
0.572	0.000						
W		JUNCTION	3.45	3.45	0	00:35	0.136
0.136	0.000						
X1		JUNCTION	80.91	80.91	0	00:35	2.94
2.94	0.000						
X2		JUNCTION	41.46	41.46	0	00:35	1.4
1.4	0.000						
X3		JUNCTION	47.59	76.22	0	00:40	2.33
3.35	0.000						
I2		JUNCTION	0.00	24.36	0	01:04	0
0.936	0.000						
P12		JUNCTION	0.30	0.30	0	00:00	0.0485
0.0484	0.000						
LL1		JUNCTION	0.00	16.85	0	01:15	0
0.663	0.000						
OF3		OUTFALL	0.00	95.68	0	02:04	0
5.46	0.000						
OF1		OUTFALL	0.00	240.43	0	01:07	0
19.4	0.000						
OF2		OUTFALL	0.00	104.34	0	01:26	0
5.37	0.000						
OF4		OUTFALL	0.00	307.27	0	00:48	0
13.3	0.000						
OF5		OUTFALL	0.00	16.85	0	01:15	0
0.663	0.000						
IRR_POND		STORAGE	0.00	243.77	0	01:09	0
12.3	0.046						
P1		STORAGE	0.00	40.00	0	00:40	0
1.66	0.117						
P10		STORAGE	0.00	17.86	0	00:40	0
0.818	0.062						
P11		STORAGE	0.00	139.15	0	00:38	0
5.09	0.072						
P13		STORAGE	0.00	45.11	0	00:30	0
0.907	0.149						
P14		STORAGE	0.00	87.41	0	00:41	0

3.62	0.147						
P15		STORAGE	0.00	61.12	0	00:30	0
1.58	0.081						
P2		STORAGE	0.00	80.91	0	00:35	0
2.94	0.039						
P3		STORAGE	0.00	63.86	0	00:35	0
2.02	0.027						
P4		STORAGE	0.00	116.70	0	00:41	0
4.75	0.055						
P5		STORAGE	0.00	72.03	0	00:32	0
1.56	0.175						
P6		STORAGE	0.00	46.22	0	00:31	0
1.01	0.049						
P7		STORAGE	0.00	200.43	0	00:31	0
4.46	0.122						
P8		STORAGE	0.00	15.97	0	00:35	0
0.603	0.032						
P9		STORAGE	0.00	148.40	0	00:40	0
5.63	0.062						
P16		STORAGE	0.00	40.37	0	00:30	0
1.11	0.188						
P17		STORAGE	0.00	26.64	0	00:35	0
0.864	0.119						

No nodes were flooded.

of Max	Maximum	Average	Avg	Evap	Exfil	Maximum	Max	Time
Occurrence	Outflow	Volume	Pcnt	Pcnt	Pcnt	Volume	Pcnt	
Storage Unit		1000 ft3	Full	Loss	Loss	1000 ft3	Full	days
hr:min	CFS							

IRR_POND		674.845	31	0	0	1055.638	48	0
02:26	114.18							

P1		32.632	11	0	0	57.543	19	0
01:24	29.38							
P10		13.875	13	0	0	29.668	27	0
01:31	13.64							
P11		69.800	15	0	0	160.007	35	0
01:18	98.74							
P13		33.097	13	0	0	58.073	23	0
01:00	17.17							
P14		31.811	14	0	0	62.216	28	0
01:01	76.43							
P15		41.957	28	0	0	85.004	57	0
01:11	30.95							
P2		202.937	43	0	0	286.797	61	0
02:06	27.93							
P3		99.633	29	0	0	165.333	49	0
01:50	22.74							
P4		136.283	35	0	0	230.559	59	0
01:42	70.77							
P5		44.714	16	0	0	81.028	30	0
00:56	39.47							
P6		42.385	22	0	0	77.410	40	0
01:27	12.23							
P7		26.618	25	0	0	63.403	60	0
00:37	180.87							
P8		22.504	21	0	0	43.356	41	0
02:02	6.50							
P9		152.526	23	0	0	274.350	42	0
01:27	94.99							
P16		37.021	17	0	0	61.293	29	0
01:03	24.36							
P17		31.286	38	0	0	47.674	58	0
01:14	16.85							

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OF3	98.06	34.46	95.68	5.458
OF1	93.61	128.25	240.43	19.393
OF2	98.33	33.80	104.34	5.371
OF4	98.47	83.41	307.27	13.270
OF5	96.39	4.25	16.85	0.663
System	96.97	284.18	707.87	44.155

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth
A100	DUMMY	20.84	0 00:35			
AA100	DUMMY	39.23	0 00:35			
B100	CONDUIT	87.22	0 00:37	4.63	0.29	0.58
B200	CONDUIT	53.15	0 00:42	3.55	0.23	0.53
BB100	DUMMY	40.62	0 00:35			
BB101	DUMMY	214.28	0 00:41			
BB102	DUMMY	229.61	0 00:40			
BB103	DUMMY	307.27	0 00:48			
C100	DUMMY	35.31	0 00:35			
C900	CONDUIT	46.22	0 00:31	7.08	0.08	0.32
CC100	DUMMY	6.53	0 00:35			
D100	DUMMY	61.12	0 00:30			
DD100	DUMMY	57.78	0 00:40			
E100	CONDUIT	74.39	0 00:53	6.43	0.16	0.46
EE100	CONDUIT	60.55	0 00:55	8.40	0.09	0.34
EE101	CONDUIT	139.71	0 00:49	10.28	0.18	0.47
EE200	DUMMY	35.71	0 00:30			
EE300	CONDUIT	10.11	0 00:33	9.87	0.28	0.36
F100	DUMMY	24.27	0 00:35			
G100	CONDUIT	50.38	0 00:45	5.08	0.13	0.42
GG100	DUMMY	15.49	0 00:35			
H100	DUMMY	17.86	0 00:40			
H101	DUMMY	124.52	0 02:25			
HH100	DUMMY	13.56	0 00:35			
I100	DUMMY	40.37	0 00:30			
II100	CONDUIT	34.92	0 00:51	7.77	0.12	0.38
II200	CONDUIT	56.13	0 00:37	7.64	0.26	0.57
II300	CONDUIT	28.31	0 00:36	8.19	0.09	0.36
IRR_J100	DUMMY	114.18	0 02:26			
J1100	DUMMY	98.74	0 01:18			
J1200	CONDUIT	22.46	0 01:23	2.08	0.01	0.05
J1300	CONDUIT	17.08	0 01:06	4.66	0.10	0.37
J1400	DUMMY	76.43	0 01:01			
J1500	DUMMY	30.95	0 01:11			
J300	CONDUIT	22.56	0 02:06	2.06	0.16	0.45
J400	CONDUIT	70.72	0 01:46	5.83	0.08	0.31
J500	DUMMY	49.82	0 00:58			
J600	CONDUIT	12.23	0 01:29	5.66	0.05	0.26
J700	CONDUIT	180.84	0 00:38	23.78	0.02	0.25

J800	DUMMY	182.92	0	00:38			
J900	DUMMY	94.99	0	01:28			
JJ100	DUMMY	11.49	0	00:30			
JP20	DUMMY	95.68	0	02:04			
K100	CONDUIT	200.43	0	00:31	13.74	0.20	0.49
L100	DUMMY	15.97	0	00:35			
LL100	DUMMY	7.36	0	00:30			
N100	CONDUIT	72.03	0	00:32	4.31	0.25	0.54
O100	DUMMY	63.86	0	00:35			
P100	DUMMY	40.00	0	00:40			
Q100	DUMMY	64.68	0	00:40			
R100	DUMMY	120.84	0	00:40			
S100	DUMMY	30.83	0	00:30			
SP101	CONDUIT	186.49	0	00:44	3.96	0.05	0.20
SP102	CONDUIT	208.08	0	01:03	2.46	0.12	0.33
SP103	CONDUIT	212.07	0	01:06	6.78	0.02	0.11
SP104	CONDUIT	240.43	0	01:07	4.59	0.04	0.18
SP206	DUMMY	104.34	0	01:26			
T100	DUMMY	4.04	0	00:40			
T101	DUMMY	98.27	0	01:27			
U100	DUMMY	4.81	0	00:40			
V100	DUMMY	13.99	0	00:35			
V200	CONDUIT	16.01	0	00:38	5.98	0.07	0.30
W100	DUMMY	3.45	0	00:35			
X100	DUMMY	80.91	0	00:35			
X200	CONDUIT	41.01	0	00:38	5.96	0.08	0.33
X300	CONDUIT	76.15	0	00:41	9.36	0.09	0.34
I200	DUMMY	24.36	0	01:04			
O12	DUMMY	0.30	0	00:00			
KK100	DUMMY	8.14	0	00:35			
LL200	DUMMY	16.85	0	01:15			
IRR_OUTLET	DUMMY	114.18	0	02:26			
O1	DUMMY	29.38	0	01:24			
O10	DUMMY	13.64	0	01:31			
O11	DUMMY	98.74	0	01:18			
O13	DUMMY	17.17	0	01:00			
O14	DUMMY	76.43	0	01:01			
O2	DUMMY	27.93	0	02:07			
O3	DUMMY	22.74	0	01:51			
O5	DUMMY	39.47	0	00:56			
O6	DUMMY	12.23	0	01:27			
O7	DUMMY	180.87	0	00:37			
O8	DUMMY	6.50	0	02:03			
O9	DUMMY	94.99	0	01:28			
O16	DUMMY	24.36	0	01:04			
O15	DUMMY	30.95	0	01:11			
O17	DUMMY	16.85	0	01:15			
O4	DUMMY	70.77	0	01:42			

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Thu Jul 28 14:53:53 2022
Analysis ended on: Thu Jul 28 14:53:53 2022
Total elapsed time: < 1 sec

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units CFS

Process Models:

Rainfall/Runoff NO

RDII NO

Snowmelt NO

Groundwater NO

Flow Routing YES

Ponding Allowed NO

Water Quality NO

Flow Routing Method KINWAVE

Starting Date 01/01/2005 00:00:00

Ending Date 01/01/2005 06:00:00

Antecedent Dry Days 0.0

Report Time Step 00:05:00

Routing Time Step 30.00 sec

*****	Volume	Volume
Flow Routing Continuity	acre-feet	10 ⁶ gal
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	328.826	107.153
External Outflow	290.042	94.514
Flooding Loss	2.515	0.820
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	37.312	12.159
Continuity Error (%)	-0.317	

Highest Flow Instability Indexes

Link J700 (3)
 Link 07 (3)
 Link J1300 (2)
 Link J1200 (2)
 Link J500 (2)

Routing Time Step Summary

Minimum Time Step : 30.00 sec
 Average Time Step : 30.00 sec
 Maximum Time Step : 30.00 sec
 Percent in Steady State : 0.00
 Average Iterations per Step : 1.00
 Percent Not Converging : 0.00

Node Depth Summary

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
A	JUNCTION	0.00	0.00	7625.00	0 00:00	0.00
AA	JUNCTION	0.00	0.00	7525.00	0 00:00	0.00
B1	JUNCTION	0.67	2.37	7577.37	0 00:40	2.37
B2	JUNCTION	0.71	2.22	7577.22	0 00:45	2.21
BB	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
BB1	JUNCTION	0.69	2.09	7387.09	0 00:52	2.08
BB2	JUNCTION	0.00	0.00	7365.00	0 00:00	0.00
BB3	JUNCTION	0.00	0.00	7330.00	0 00:00	0.00
C	JUNCTION	0.00	0.00	7635.00	0 00:00	0.00
CC	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
D	JUNCTION	0.00	0.00	7609.00	0 00:00	0.00
DD	JUNCTION	0.00	0.00	7495.00	0 00:00	0.00
E	JUNCTION	0.81	1.91	7573.91	0 00:55	1.91
EE1	JUNCTION	0.52	1.57	7476.57	0 00:52	1.57
EE2	JUNCTION	0.00	0.00	7550.00	0 00:00	0.00
EE3	JUNCTION	0.23	1.05	7576.05	0 00:35	1.04
F	JUNCTION	0.00	0.00	7633.00	0 00:00	0.00
FF	JUNCTION	0.69	2.09	7432.09	0 00:51	2.08
G	JUNCTION	0.57	1.76	7566.76	0 00:45	1.76
GG	JUNCTION	0.00	0.00	7420.00	0 00:00	0.00
H	JUNCTION	0.00	0.00	7530.00	0 00:00	0.00
HH	JUNCTION	0.00	0.00	7410.00	0 00:00	0.00
I	JUNCTION	0.00	0.00	7595.00	0 00:00	0.00

II1	JUNCTION	0.44	1.08	7496.08	0	00:50	1.08
II2	JUNCTION	0.41	1.55	7451.55	0	00:40	1.55
II3	JUNCTION	0.26	0.99	7515.99	0	00:40	0.99
IRR_J	JUNCTION	0.00	0.00	7528.00	0	00:00	0.00
J10	JUNCTION	0.00	0.00	7520.00	0	00:00	0.00
J11	JUNCTION	0.00	0.00	7565.00	0	00:00	0.00
J12	JUNCTION	0.36	0.54	7545.54	0	00:55	0.54
J13	JUNCTION	0.39	1.25	7521.25	0	00:51	1.24
J14	JUNCTION	0.00	0.00	7375.00	0	00:00	0.00
J15	JUNCTION	0.00	0.00	7552.00	0	00:00	0.00
J2	JUNCTION	0.76	2.02	7437.02	0	01:15	2.02
J3	JUNCTION	1.10	1.84	7496.84	0	01:39	1.84
J4	JUNCTION	0.75	2.02	7467.02	0	01:12	2.02
J5	JUNCTION	0.41	0.99	7525.99	0	01:07	0.99
J6	JUNCTION	0.41	0.99	7570.99	0	01:05	0.99
J7	JUNCTION	0.46	1.36	7546.36	0	00:31	1.36
J8	JUNCTION	0.46	1.37	7526.37	0	00:32	1.36
J9	JUNCTION	0.00	0.00	7550.00	0	00:00	0.00
JJ	JUNCTION	0.00	0.00	7575.00	0	00:00	0.00
K	JUNCTION	0.41	1.98	7586.98	0	00:35	1.96
KK	JUNCTION	0.00	0.00	7590.00	0	00:00	0.00
L	JUNCTION	0.00	0.00	7548.00	0	00:00	0.00
LL	JUNCTION	0.00	0.00	7580.00	0	00:00	0.00
M	JUNCTION	0.26	1.30	7591.30	0	00:35	1.29
N	JUNCTION	0.44	2.18	7537.18	0	00:35	2.17
O	JUNCTION	0.00	0.00	7559.00	0	00:00	0.00
P	JUNCTION	0.00	0.00	7500.37	0	00:00	0.00
Q	JUNCTION	0.00	0.00	7585.00	0	00:00	0.00
R	JUNCTION	0.00	0.00	7576.00	0	00:00	0.00
S	JUNCTION	0.00	0.00	7598.00	0	00:00	0.00
SP1	JUNCTION	0.85	1.43	7511.43	0	01:14	1.43
SP2	JUNCTION	1.37	2.40	7497.40	0	01:16	2.38
SP3	JUNCTION	1.33	2.37	7492.37	0	01:20	2.37
SP4	JUNCTION	0.87	1.61	7421.61	0	01:22	1.60
T	JUNCTION	0.00	0.00	7583.00	0	00:00	0.00
T1	JUNCTION	0.00	0.00	7565.00	0	00:00	0.00
T2	JUNCTION	0.00	0.00	7555.00	0	00:00	0.00
U	JUNCTION	0.00	0.00	7567.00	0	00:00	0.00
V1	JUNCTION	0.00	0.00	7598.00	0	00:00	0.00
V2	JUNCTION	0.24	0.85	7565.85	0	00:40	0.85
W	JUNCTION	0.00	0.00	7546.00	0	00:00	0.00
X1	JUNCTION	0.00	0.00	7485.00	0	00:00	0.00
X2	JUNCTION	0.38	1.37	7506.37	0	00:40	1.36
X3	JUNCTION	0.50	1.44	7501.44	0	00:46	1.43
I2	JUNCTION	0.00	0.00	7577.00	0	00:00	0.00
P12	JUNCTION	0.00	0.00	7550.00	0	00:00	0.00
LL1	JUNCTION	0.00	0.00	0.00	0	00:00	0.00
OF3	OUTFALL	0.00	0.00	7431.00	0	00:00	0.00
OF1	OUTFALL	0.87	1.61	7416.61	0	01:22	1.60
OF2	OUTFALL	0.00	0.00	7550.00	0	00:00	0.00

OF4	OUTFALL	0.00	0.00	7325.00	0	00:00	0.00
OF5	OUTFALL	0.00	0.00	7520.00	0	00:00	0.00
IRR_POND	STORAGE	2.76	4.57	7534.57	0	02:06	4.57
P1	STORAGE	2.80	4.52	7429.52	0	01:07	4.52
P10	STORAGE	3.39	5.83	7530.83	0	01:09	5.83
P11	STORAGE	3.68	7.59	7577.59	0	01:11	7.59
P13	STORAGE	3.01	4.81	7529.81	0	00:51	4.80
P14	STORAGE	3.99	8.57	7408.57	0	01:10	8.57
P15	STORAGE	3.14	5.82	7560.82	0	01:09	5.82
P2	STORAGE	6.20	8.76	7444.76	0	01:38	8.76
P3	STORAGE	5.54	8.81	7518.81	0	01:39	8.81
P4	STORAGE	5.49	8.80	7477.80	0	01:12	8.79
P5	STORAGE	3.36	5.72	7535.72	0	00:52	5.70
P6	STORAGE	4.75	7.78	7581.78	0	01:05	7.78
P7	STORAGE	4.94	10.00	7560.00	0	00:55	10.00
P8	STORAGE	4.50	7.09	7541.09	0	01:14	7.09
P9	STORAGE	4.37	7.80	7577.80	0	01:17	7.79
P16	STORAGE	3.53	5.40	7605.40	0	00:55	5.40
P17	STORAGE	4.59	6.39	7567.39	0	00:53	6.39

Node Inflow Summary

Total	Flow		Maximum	Maximum		Lateral	
Inflow	Balance		Lateral	Total	Time of Max	Inflow	
Volume	Error		Inflow	Inflow	Occurrence	Volume	
Node		Type	CFS	CFS	days hr:min	10^6 gal	10^6
gal	Percent						

A		JUNCTION	43.83	43.83	0 00:40	1.3	
1.3	0.000						
AA		JUNCTION	81.18	81.18	0 00:40	2.33	
2.33	0.000						
B1		JUNCTION	133.69	177.52	0 00:40	4.17	
5.47	0.000						
B2		JUNCTION	37.14	112.42	0 00:45	1.39	
3.89	0.000						
BB		JUNCTION	84.15	84.15	0 00:40	2.56	
2.56	0.000						
BB1		JUNCTION	0.00	483.72	0 00:50	0	

16.3	0.000						
BB2		JUNCTION	0.00	515.49	0	00:50	0
17.4	0.000						
BB3		JUNCTION	0.00	646.46	0	00:51	0
24.8	0.000						
C		JUNCTION	75.28	75.28	0	00:45	2.5
2.5	0.000						
CC		JUNCTION	13.57	13.57	0	00:40	0.431
0.431	0.000						
D		JUNCTION	117.38	117.38	0	00:35	2.86
2.86	0.000						
DD		JUNCTION	122.41	122.41	0	00:50	4.81
4.81	0.000						
E		JUNCTION	157.91	157.91	0	00:55	7.39
7.39	0.000						
EE1		JUNCTION	110.30	156.68	0	00:52	3.51
4.92	0.000						
EE2		JUNCTION	63.62	63.62	0	00:35	1.13
1.13	0.000						
EE3		JUNCTION	19.33	19.33	0	00:35	0.463
0.463	0.000						
F		JUNCTION	51.63	51.63	0	00:45	1.73
1.73	0.000						
FF		JUNCTION	43.07	330.28	0	00:51	1.24
11.4	-0.000						
G		JUNCTION	57.12	108.76	0	00:45	2.18
3.91	0.000						
GG		JUNCTION	32.48	32.48	0	00:45	1.13
1.13	0.000						
H		JUNCTION	37.80	37.80	0	00:45	1.52
1.52	0.000						
HH		JUNCTION	28.16	28.16	0	00:40	0.87
0.87	0.000						
I		JUNCTION	78.06	78.06	0	00:35	2.02
2.02	0.000						
II1		JUNCTION	74.39	74.39	0	00:50	3.49
3.49	0.000						
II2		JUNCTION	57.88	116.26	0	00:40	1.58
3.23	0.000						
II3		JUNCTION	58.65	58.65	0	00:40	1.64
1.64	0.000						
IRR_J		JUNCTION	0.00	274.80	0	02:06	0
18.3	0.000						
J10		JUNCTION	0.00	292.64	0	02:03	0
19.7	0.000						
J11		JUNCTION	0.00	230.44	0	01:11	0
9.06	0.000						
J12		JUNCTION	0.00	108.72	0	00:55	0
9.1	0.000						
J13		JUNCTION	0.00	54.35	0	00:51	0

1.41	0.000						
J14		JUNCTION	0.00	155.08	0	01:10	0
6.54	0.000						
J15		JUNCTION	0.00	68.43	0	01:09	0
2.65	0.000						
J2		JUNCTION	0.00	271.49	0	01:15	0
11.8	0.000						
J3		JUNCTION	0.00	46.10	0	01:39	0
3.15	0.000						
J4		JUNCTION	0.00	199.13	0	01:12	0
7.87	0.000						
J5		JUNCTION	0.00	139.06	0	01:02	0
4.27	0.000						
J6		JUNCTION	0.00	47.71	0	01:05	0
1.65	0.000						
J7		JUNCTION	0.00	234.87	0	00:31	0
7.11	0.000						
J8		JUNCTION	0.00	259.47	0	01:14	0
8.15	0.000						
J9		JUNCTION	0.00	221.14	0	01:17	0
9.59	0.000						
JJ		JUNCTION	22.80	22.80	0	00:35	0.603
0.603	0.000						
K		JUNCTION	382.30	382.30	0	00:35	8.05
8.05	0.000						
KK		JUNCTION	16.95	16.95	0	00:40	0.575
0.575	0.000						
L		JUNCTION	32.40	32.40	0	00:40	1.1
1.1	0.000						
LL		JUNCTION	15.07	15.07	0	00:40	0.418
0.418	0.000						
M		JUNCTION	89.08	89.08	0	00:35	1.83
1.83	0.000						
N		JUNCTION	141.24	141.24	0	00:35	2.84
2.84	0.000						
O		JUNCTION	127.40	127.40	0	00:40	3.67
3.67	0.000						
P		JUNCTION	82.83	82.83	0	00:45	3.04
3.04	0.000						
Q		JUNCTION	137.80	137.80	0	00:45	4.98
4.98	0.000						
R		JUNCTION	116.06	253.86	0	00:45	3.91
8.89	0.000						
S		JUNCTION	58.96	58.96	0	00:35	1.52
1.52	0.000						
SP1		JUNCTION	0.00	511.89	0	01:14	0
36.8	0.000						
SP2		JUNCTION	0.00	618.35	0	01:16	0
40.8	0.000						
SP3		JUNCTION	0.00	641.31	0	01:20	0

43.3	0.000						
SP4		JUNCTION	0.00	706.05	0	01:22	0
46	0.000						
T		JUNCTION	8.68	8.68	0	00:45	0.359
0.359	0.000						
T1		JUNCTION	0.00	228.33	0	01:17	0
9.95	0.000						
T2		JUNCTION	0.00	242.18	0	01:16	0
10.6	0.000						
U		JUNCTION	10.51	10.51	0	00:45	0.402
0.402	0.000						
V1		JUNCTION	27.67	27.67	0	00:40	0.808
0.808	0.000						
V2		JUNCTION	33.25	33.25	0	00:40	1.06
1.06	0.000						
W		JUNCTION	7.46	7.46	0	00:40	0.255
0.255	0.000						
X1		JUNCTION	163.27	163.27	0	00:45	5.34
5.34	0.000						
X2		JUNCTION	82.46	82.46	0	00:40	2.54
2.54	0.000						
X3		JUNCTION	100.73	158.96	0	00:46	4.3
6.17	0.000						
I2		JUNCTION	0.00	63.72	0	00:55	0
1.84	0.000						
P12		JUNCTION	45.00	45.00	0	00:00	7.27
7.27	0.000						
LL1		JUNCTION	0.00	49.55	0	00:53	0
1.39	0.000						
OF3		OUTFALL	0.00	271.49	0	01:15	0
11.8	0.000						
OF1		OUTFALL	0.00	705.93	0	01:22	0
45.9	0.000						
OF2		OUTFALL	0.00	242.18	0	01:16	0
10.6	0.000						
OF4		OUTFALL	0.00	646.46	0	00:51	0
24.8	0.000						
OF5		OUTFALL	0.00	49.55	0	00:53	0
1.39	0.000						
IRR_POND		STORAGE	0.00	550.27	0	01:07	0
23	0.038						
P1		STORAGE	0.00	82.83	0	00:45	0
3.04	0.095						
P10		STORAGE	0.00	37.80	0	00:45	0
1.52	0.076						
P11		STORAGE	0.00	287.54	0	00:46	0
9.37	0.043						
P13		STORAGE	0.00	81.59	0	00:35	0
1.59	0.115						
P14		STORAGE	0.00	184.37	0	00:47	0

6.72	0.071						
P15		STORAGE	0.00	117.38	0	00:35	0
2.86	0.060						
P2		STORAGE	0.00	163.27	0	00:45	0
5.34	0.041						
P3		STORAGE	0.00	127.40	0	00:40	0
3.67	0.027						
P4		STORAGE	0.00	240.47	0	00:46	0
8.71	0.064						
P5		STORAGE	0.00	139.56	0	00:37	0
2.84	0.133						
P6		STORAGE	0.00	88.72	0	00:36	0
1.83	0.087						
P7		STORAGE	0.00	381.85	0	00:36	0
8.05	0.051						
P8		STORAGE	0.00	32.40	0	00:40	0
1.1	0.111						
P9		STORAGE	0.00	309.44	0	00:45	0
10.4	0.048						
P16		STORAGE	0.00	78.06	0	00:35	0
2.02	0.131						
P17		STORAGE	0.00	54.80	0	00:40	0
1.6	0.221						

Node Flooding Summary

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10 ⁶ gal	Maximum Ponded Volume 1000 ft ³
P7	0.39	144.38	0 00:37	0.819	0.000

Storage Volume Summary

of Max Occurrence	Maximum Outflow	Average Volume	Avg Pcnt	Evap Pcnt	Exfil Pcnt	Maximum Volume	Max Pcnt	Time
----------------------	--------------------	-------------------	-------------	--------------	---------------	-------------------	-------------	------

Storage Unit hr:min CFS	1000 ft3	Full	Loss	Loss	1000 ft3	Full	days
----------------------------	----------	------	------	------	----------	------	------

IRR_POND	937.643	43	0	0	1601.097	73	0
02:06 274.80							
P1	40.419	13	0	0	86.546	29	0
01:06 73.03							
P10	17.750	16	0	0	40.965	37	0
01:09 33.90							
P11	102.795	23	0	0	298.174	65	0
01:10 230.44							
P13	36.773	14	0	0	78.989	31	0
00:51 54.35							
P14	58.001	26	0	0	174.628	77	0
01:09 155.08							
P15	53.042	36	0	0	140.809	95	0
01:09 68.43							
P2	240.111	51	0	0	385.792	82	0
01:38 74.57							
P3	143.247	42	0	0	277.490	82	0
01:39 46.10							
P4	163.739	42	0	0	320.570	82	0
01:11 199.13							
P5	49.222	18	0	0	111.726	41	0
00:52 103.73							
P6	61.785	32	0	0	127.676	65	0
01:05 47.71							
P7	33.332	32	0	0	105.140	100	0
00:36 234.87							
P8	27.994	26	0	0	56.030	53	0
01:14 24.60							
P9	198.987	31	0	0	450.202	69	0
01:17 221.14							
P16	40.266	19	0	0	77.891	37	0
00:55 63.72							
P17	33.643	41	0	0	55.496	68	0
00:52 49.55							

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
--------------	----------------------	--------------------	--------------------	-----------------------------

OF3	98.19	74.32	271.49	11.790
OF1	93.47	303.87	705.93	45.881
OF2	98.47	66.67	242.18	10.607
OF4	98.47	156.12	646.46	24.839
OF5	96.53	8.92	49.55	1.391

System	97.03	609.90	1777.26	94.507

Link Flow Summary

Link	Type	Maximum Flow CFS	Time of Max Occurrence days hr:min	Maximum Veloc ft/sec	Max/ Full Flow	Max/ Full Depth

A100	DUMMY	43.83	0 00:40			
AA100	DUMMY	81.18	0 00:40			
B100	CONDUIT	176.88	0 00:42	5.55	0.58	0.79
B200	CONDUIT	112.09	0 00:47	4.28	0.49	0.74
BB100	DUMMY	84.15	0 00:40			
BB101	DUMMY	483.72	0 00:50			
BB102	DUMMY	515.49	0 00:50			
BB103	DUMMY	646.46	0 00:51			
C100	DUMMY	75.28	0 00:45			
C900	CONDUIT	88.72	0 00:36	8.38	0.14	0.43
CC100	DUMMY	13.57	0 00:40			
D100	DUMMY	117.38	0 00:35			
DD100	DUMMY	122.41	0 00:50			
E100	CONDUIT	157.49	0 00:58	7.78	0.34	0.64
EE100	CONDUIT	156.62	0 00:53	10.75	0.22	0.52
EE101	CONDUIT	330.14	0 00:52	12.84	0.43	0.70
EE200	DUMMY	63.62	0 00:35			
EE300	CONDUIT	19.07	0 00:39	11.63	0.53	0.52
F100	DUMMY	51.63	0 00:45			
G100	CONDUIT	107.69	0 00:51	6.18	0.28	0.58
GG100	DUMMY	32.48	0 00:45			
H100	DUMMY	37.80	0 00:45			
H101	DUMMY	292.64	0 02:03			
HH100	DUMMY	28.16	0 00:40			
I100	DUMMY	78.06	0 00:35			
II100	CONDUIT	74.41	0 00:56	9.49	0.25	0.54
II200	CONDUIT	116.09	0 00:42	9.17	0.54	0.77
II300	CONDUIT	58.55	0 00:41	9.88	0.20	0.50
IRR_J100	DUMMY	274.80	0 02:06			
J1100	DUMMY	230.44	0 01:11			
J1200	CONDUIT	107.12	0 01:04	3.63	0.03	0.13
J1300	CONDUIT	53.90	0 00:55	6.31	0.33	0.62

J1400	DUMMY	155.08	0	01:10			
J1500	DUMMY	68.43	0	01:09			
J300	CONDUIT	45.89	0	01:51	2.49	0.32	0.61
J400	CONDUIT	198.78	0	01:15	7.55	0.21	0.51
J500	DUMMY	139.06	0	01:02			
J600	CONDUIT	47.66	0	01:07	8.11	0.19	0.49
J700	CONDUIT	238.60	0	00:32	25.63	0.03	0.27
J800	DUMMY	259.47	0	01:14			
J900	DUMMY	221.14	0	01:17			
JJ100	DUMMY	22.80	0	00:35			
JP20	DUMMY	271.49	0	01:15			
K100	CONDUIT	381.85	0	00:36	16.23	0.38	0.66
L100	DUMMY	32.40	0	00:40			
LL100	DUMMY	15.07	0	00:40			
N100	CONDUIT	139.56	0	00:37	5.09	0.48	0.72
O100	DUMMY	127.40	0	00:40			
P100	DUMMY	82.83	0	00:45			
Q100	DUMMY	137.80	0	00:45			
R100	DUMMY	253.86	0	00:45			
S100	DUMMY	58.96	0	00:35			
SP101	CONDUIT	511.87	0	01:16	5.57	0.14	0.35
SP102	CONDUIT	600.43	0	01:20	3.41	0.36	0.59
SP103	CONDUIT	640.21	0	01:22	9.89	0.05	0.21
SP104	CONDUIT	705.93	0	01:22	6.50	0.11	0.32
SP206	DUMMY	242.18	0	01:16			
T100	DUMMY	8.68	0	00:45			
T101	DUMMY	228.33	0	01:17			
U100	DUMMY	10.51	0	00:45			
V100	DUMMY	27.67	0	00:40			
V200	CONDUIT	33.09	0	00:43	7.22	0.14	0.43
W100	DUMMY	7.46	0	00:40			
X100	DUMMY	163.27	0	00:45			
X200	CONDUIT	81.91	0	00:43	7.13	0.16	0.45
X300	CONDUIT	158.95	0	00:47	11.36	0.19	0.48
I200	DUMMY	63.72	0	00:55			
O12	DUMMY	45.00	0	00:00			
KK100	DUMMY	16.95	0	00:40			
LL200	DUMMY	49.55	0	00:53			
IRR_OUTLET	DUMMY	274.80	0	02:06			
O1	DUMMY	73.03	0	01:07			
O10	DUMMY	33.90	0	01:09			
O11	DUMMY	230.44	0	01:11			
O13	DUMMY	54.35	0	00:51			
O14	DUMMY	155.08	0	01:10			
O2	DUMMY	74.57	0	01:38			
O3	DUMMY	46.10	0	01:39			
O5	DUMMY	103.73	0	00:52			
O6	DUMMY	47.71	0	01:05			
O7	DUMMY	234.87	0	00:31			
O8	DUMMY	24.60	0	01:14			

09	DUMMY	221.14	0	01:17
016	DUMMY	63.72	0	00:55
015	DUMMY	68.43	0	01:09
017	DUMMY	49.55	0	00:53
04	DUMMY	199.13	0	01:12

Conduit Surcharge Summary

No conduits were surcharged.

Analysis begun on: Thu Jul 28 14:48:24 2022

Analysis ended on: Thu Jul 28 14:48:24 2022

Total elapsed time: < 1 sec



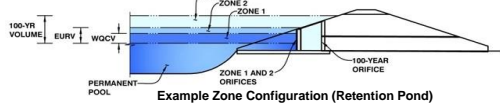
Appendix D

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Flying Horse North Drainage Plan**

Basin ID: **Pond 1**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	43.71	acres
Watershed Length =	2,540	ft
Watershed Length to Centroid =	870	ft
Watershed Slope =	0.046	ft/ft
Watershed Imperviousness =	34.30%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

Water Quality Capture Volume (WQCV) =	0.598	acre-feet
Excess Urban Runoff Volume (EURV) =	1.555	acre-feet
2-yr Runoff Volume (P1 = 0.92 in.) =	0.962	acre-feet
5-yr Runoff Volume (P1 = 1.2 in.) =	1.511	acre-feet
10-yr Runoff Volume (P1 = 1.45 in.) =	2.197	acre-feet
25-yr Runoff Volume (P1 = 1.69 in.) =	3.278	acre-feet
50-yr Runoff Volume (P1 = 2.15 in.) =	4.893	acre-feet
100-yr Runoff Volume (P1 = 2.49 in.) =	6.323	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	8.741	acre-feet
Approximate 2-yr Detention Volume =	0.872	acre-feet
Approximate 5-yr Detention Volume =	1.277	acre-feet
Approximate 10-yr Detention Volume =	1.875	acre-feet
Approximate 25-yr Detention Volume =	2.178	acre-feet
Approximate 50-yr Detention Volume =	2.590	acre-feet
Approximate 100-yr Detention Volume =	3.122	acre-feet

Optional User Overrides

		acre-feet
		acre-feet
	0.92	inches
	1.20	inches
	1.45	inches
		inches
	2.15	inches
	2.49	inches
		inches

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.598	acre-feet
Zone 2 Volume (5-year - Zone 1) =	0.679	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.845	acre-feet
Total Detention Basin Volume =	3.122	acre-feet
Initial Surge Volume (ISV) =	200	ft ³
Initial Surge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.004	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{LW}) =	2	

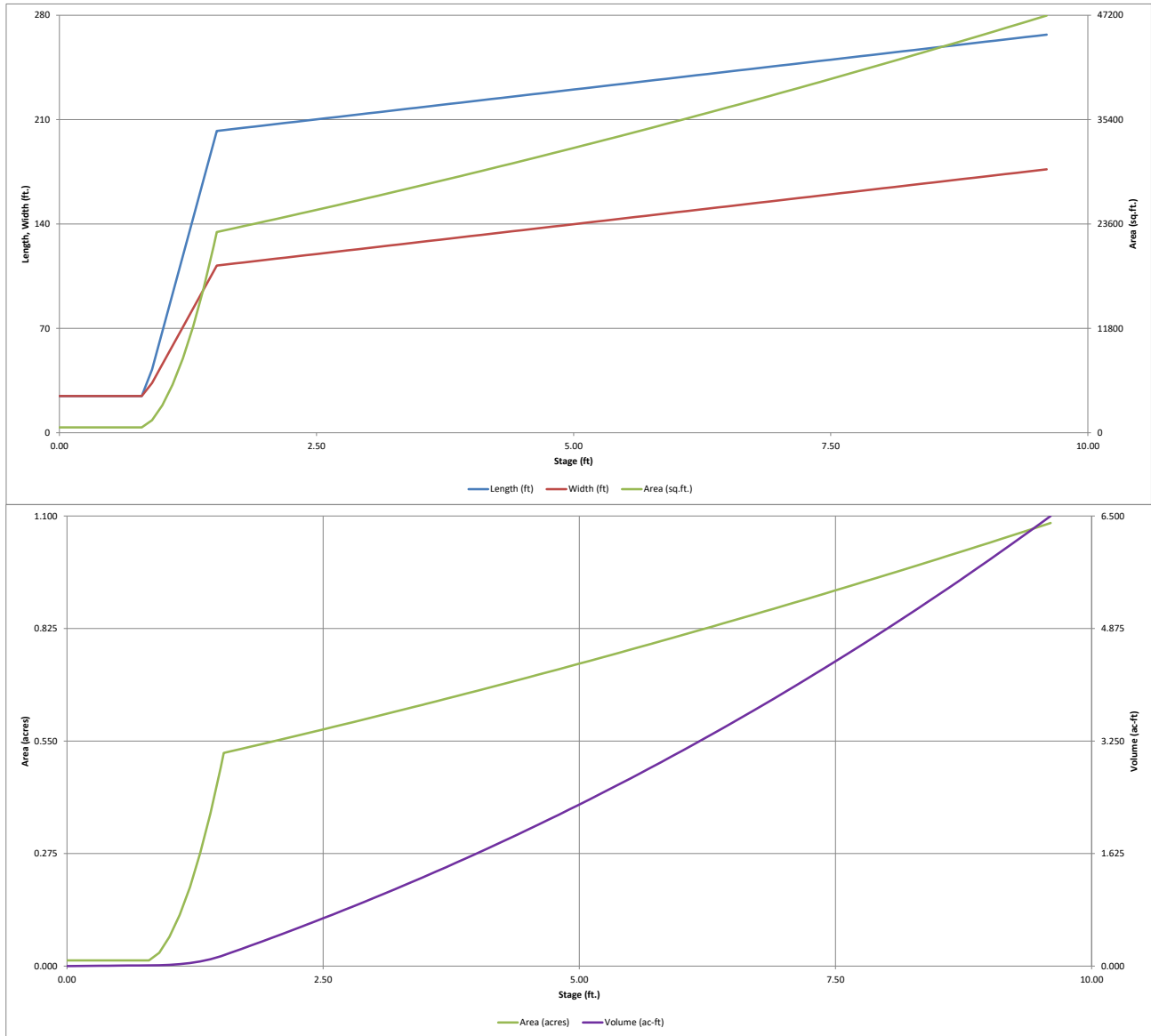
Initial Surge Area (A _{ISV}) =	606	ft ²
Surcharge Volume Length (L _{ISV}) =	24.6	ft
Surcharge Volume Width (W _{ISV}) =	24.6	ft
Depth of Basin Floor (H _{FLOOR}) =	0.70	ft
Length of Basin Floor (L _{FLOOR}) =	202.4	ft
Width of Basin Floor (W _{FLOOR}) =	112.1	ft
Area of Basin Floor (A _{FLOOR}) =	22,695	ft ²
Volume of Basin Floor (V _{FLOOR}) =	6,302	ft ³
Depth of Main Basin (H _{MAIN}) =	4.47	ft
Length of Main Basin (L _{MAIN}) =	238.2	ft
Width of Main Basin (W _{MAIN}) =	147.9	ft
Area of Main Basin (A _{MAIN}) =	35,221	ft ²
Volume of Main Basin (V _{MAIN}) =	128,421	ft ³
Calculated Total Basin Volume (V _{total}) =	3.104	acre-feet

Depth Increment = 0.10 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		24.6	24.6	606		0.014		
ISV	0.33		24.6	24.6	606		0.014	200	0.005
	0.40		24.6	24.6	606		0.014	242	0.006
	0.50		24.6	24.6	606		0.014	303	0.007
	0.60		24.6	24.6	606		0.014	364	0.008
	0.70		24.6	24.6	606		0.014	424	0.010
	0.80		24.6	24.6	606		0.014	485	0.011
	0.90		42.4	33.4	1,415		0.032	572	0.013
	1.00		67.8	45.9	3,110		0.071	793	0.018
	1.10		93.2	58.4	5,440		0.125	1,215	0.028
	1.20		118.6	70.9	8,405		0.193	1,902	0.044
	1.30		144.0	83.4	12,005		0.276	2,917	0.067
	1.40		169.4	95.9	16,240		0.373	4,324	0.099
	1.50		194.8	108.4	21,110		0.485	6,186	0.142
Floor	1.53		202.4	112.1	22,695		0.521	6,843	0.157
	1.60		203.0	112.7	22,871		0.525	8,438	0.194
	1.70		203.8	113.5	23,124		0.531	10,738	0.247
	1.80		204.6	114.3	23,379		0.537	13,063	0.300
	1.90		205.4	115.1	23,635		0.543	15,414	0.354
	2.00		206.2	115.9	23,892		0.548	17,790	0.408
	2.10		207.0	116.7	24,150		0.554	20,192	0.464
	2.20		207.8	117.5	24,409		0.560	22,620	0.519
	2.30		208.6	118.3	24,670		0.566	25,074	0.576
Zone 1 (WQCV)	2.34		208.9	118.6	24,775		0.569	26,063	0.598
	2.40		209.4	119.1	24,932		0.572	27,554	0.633
	2.50		210.2	119.9	25,196		0.578	30,060	0.690
	2.60		211.0	120.7	25,461		0.584	32,593	0.748
	2.70		211.8	121.5	25,726		0.591	35,153	0.807
	2.80		212.6	122.3	25,994		0.597	37,739	0.866
	2.90		213.4	123.1	26,262		0.603	40,351	0.926
	3.00		214.2	123.9	26,532		0.609	42,991	0.987
	3.10		215.0	124.7	26,803		0.615	45,658	1.048
	3.20		215.8	125.5	27,075		0.622	48,352	1.110
	3.30		216.6	126.3	27,349		0.628	51,073	1.172
	3.40		217.4	127.1	27,624		0.634	53,822	1.236
Zone 2 (5-year)	3.47		217.9	127.6	27,817		0.639	55,762	1.280
	3.50		218.2	127.9	27,900		0.641	56,598	1.299
	3.60		219.0	128.7	28,178		0.647	59,402	1.364
	3.70		219.8	129.5	28,457		0.653	62,233	1.429
	3.80		220.6	130.3	28,737		0.660	65,093	1.494
	3.90		221.4	131.1	29,018		0.666	67,981	1.561
	4.00		222.2	131.9	29,300		0.673	70,897	1.628
	4.10		223.0	132.7	29,584		0.679	73,841	1.695
	4.20		223.8	133.5	29,870		0.686	76,814	1.763
	4.30		224.6	134.3	30,156		0.692	79,815	1.832
	4.40		225.4	135.1	30,444		0.699	82,845	1.902
	4.50		226.2	135.9	30,733		0.706	85,904	1.972
	4.60		227.0	136.7	31,023		0.712	88,991	2.043
	4.70		227.8	137.5	31,315		0.719	92,108	2.115
	4.80		228.6	138.3	31,607		0.726	95,254	2.187
	4.90		229.4	139.1	31,902		0.732	98,430	2.260
	5.00		230.2	139.9	32,197		0.739	101,635	2.333
	5.10		231.0	140.7	32,494		0.746	104,869	2.407
	5.20		231.8	141.5	32,792		0.753	108,134	2.482
	5.30		232.6	142.3	33,091		0.760	111,428	2.558
	5.40		233.4	143.1	33,391		0.767	114,752	2.634
	5.50		234.2	143.9	33,693		0.773	118,106	2.711
	5.60		235.0	144.7	33,996		0.780	121,490	2.789
	5.70		235.8	145.5	34,301		0.787	124,905	2.867
	5.80		236.6	146.3	34,606		0.794	128,351	2.947
	5.90		237.4	147.1	34,913		0.801	131,827	3.026
	6.00		238.2	147.9	35,221		0.809	135,333	3.107
Zone 3 (100-year)	6.02		238.3	148.0	35,283		0.810	136,038	3.123
	6.10		239.0	148.7	35,531		0.816	138,871	3.188
	6.20		239.8	149.5	35,842		0.823	142,440	3.270
	6.30		240.6	150.3	36,154		0.830	146,039	3.353
	6.40		241.4	151.1	36,467		0.837	149,670	3.436
	6.50		242.2	151.9	36,782		0.844	153,333	3.520
	6.60		243.0	152.7	37,098		0.852	157,027	3.605
	6.70		243.8	153.5	37,415		0.859	160,752	3.690
	6.80		244.6	154.3	37,733		0.866	164,510	3.777
	6.90		245.4	155.1	38,053		0.874	168,299	3.864
	7.00		246.2	155.9	38,374		0.881	172,120	3.951
	7.10		247.0	156.7	38,696		0.888	175,974	4.040
	7.20		247.8	157.5	39,020		0.896	179,860	4.129
	7.30		248.6	158.3	39,345		0.903	183,778	4.219
	7.40		249.4	159.1	39,671		0.911	187,728	4.310
	7.50		250.2	159.9	39,998		0.918	191,712	4.401
	7.60		251.0	160.7	40,327		0.926	195,728	4.493
	7.70		251.8	161.5	40,657		0.933	199,777	4.586
	7.80		252.6	162.3	40,988		0.941	203,860	4.680
	7.90		253.4	163.1	41,321		0.949	207,975	4.774
	8.00		254.2	163.9	41,654		0.956	212,124	4.870
	8.10		255.0	164.7	41,989		0.964	216,306	4.966
	8.20		255.8	165.5	42,326		0.972	220,522	5.062
	8.30		256.6	166.3	42,663		0.979	224,771	5.160
	8.40		257.4	167.1	43,002		0.987	229,054	5.258
	8.50		258.2	167.9	43,343		0.995	233,372	5.357
	8.60		259.0	168.7	43,684		1.003	237,723	5.457
	8.70		259.8	169.5	44,027		1.011	242,108	5.558
	8.80		260.6	170.3	44,371		1.019	246,528	5.660
	8.90		261.4	171.1	44,716		1.027	250,983	5.762
	9.00		262.2	171.9	45,063		1.034	255,472	5.865
	9.10		263.0	172.7	45,411		1.042	259,995	5.969
	9.20		263.8	173.5	45,760		1.051	264,554	6.073
	9.30		264.6	174.3	46,110		1.059	269,147	6.179
	9.40		265.4	175.1	46,462		1.067	273,776	6.285
	9.50		266.2	175.9	46,815		1.075	278,440	6.392
	9.60		267.0	176.7	47,169		1.083	283,139	6.500

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

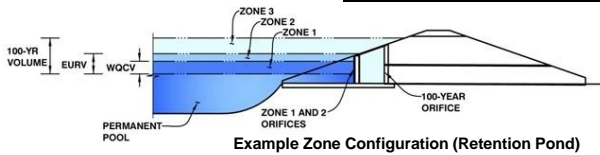


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North Drainage Plan

Basin ID: Pond 1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.34	0.598	Orifice Plate
Zone 2 (5-year)	3.47	0.679	Weir&Pipe (Circular)
Zone 3 (100-year)	6.02	1.845	Weir&Pipe (Restrict)
Total (all zones)		3.122	

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 ft²
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 = 2.34 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 9.40 inches
Orifice Plate: Orifice Area per Row = 2.12 sq. inches (diameter = 1-5/8 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = 1.472E-02 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	0.78	1.56					
Orifice Area (sq. inches)	2.12	2.12	2.12					

	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
Depth at top of Zone using Vertical Orifice =	N/A	N/A
Vertical Orifice Diameter =	N/A	N/A

ft (relative to basin bottom at Stage = 0 ft)
ft (relative to basin bottom at Stage = 0 ft)
inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = Not Selected ft²
Vertical Orifice Centroid = Not Selected feet

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

	Zone 2 Weir	Zone 3 Weir
Overflow Weir Front Edge Height, Ho =	2.34	3.47
Overflow Weir Front Edge Length =	6.00	6.00
Overflow Weir Grate Slope =	0.00	0.00
Horiz. Length of Weir Sides =	6.00	6.00
Overflow Grate Type =	Type C Grate	Type C Grate
Debris Clogging % =	50%	50%

ft (relative to basin bottom at Stage = 0 ft)
feet
H:V
feet
%
%

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = 2.34 feet
Overflow Weir Slope Length = 6.00 feet
Grate Open Area / 100-yr Orifice Area = 9.49
Overflow Grate Open Area w/o Debris = 25.06 ft²
Overflow Grate Open Area w/ Debris = 12.53 ft²

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

	Zone 2 Circular	Zone 3 Restrictor
Depth to Invert of Outlet Pipe =	2.50	2.70
Circular Orifice Diameter or Pipe Diameter =	22.00	36.00
Restrictor Plate Height Above Pipe Invert =		33.00

ft (distance below basin bottom at Stage = 0 ft)
inches
inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = 2.64 ft²
Outlet Orifice Centroid = 0.92 feet
Half-Central Angle of Restrictor Plate on Pipe = N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 5.00 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 27.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.93 feet
Stage at Top of Freeboard = 6.93 feet
Basin Area at Top of Freeboard = 0.88 acres
Basin Volume at Top of Freeboard = 3.89 acre-ft

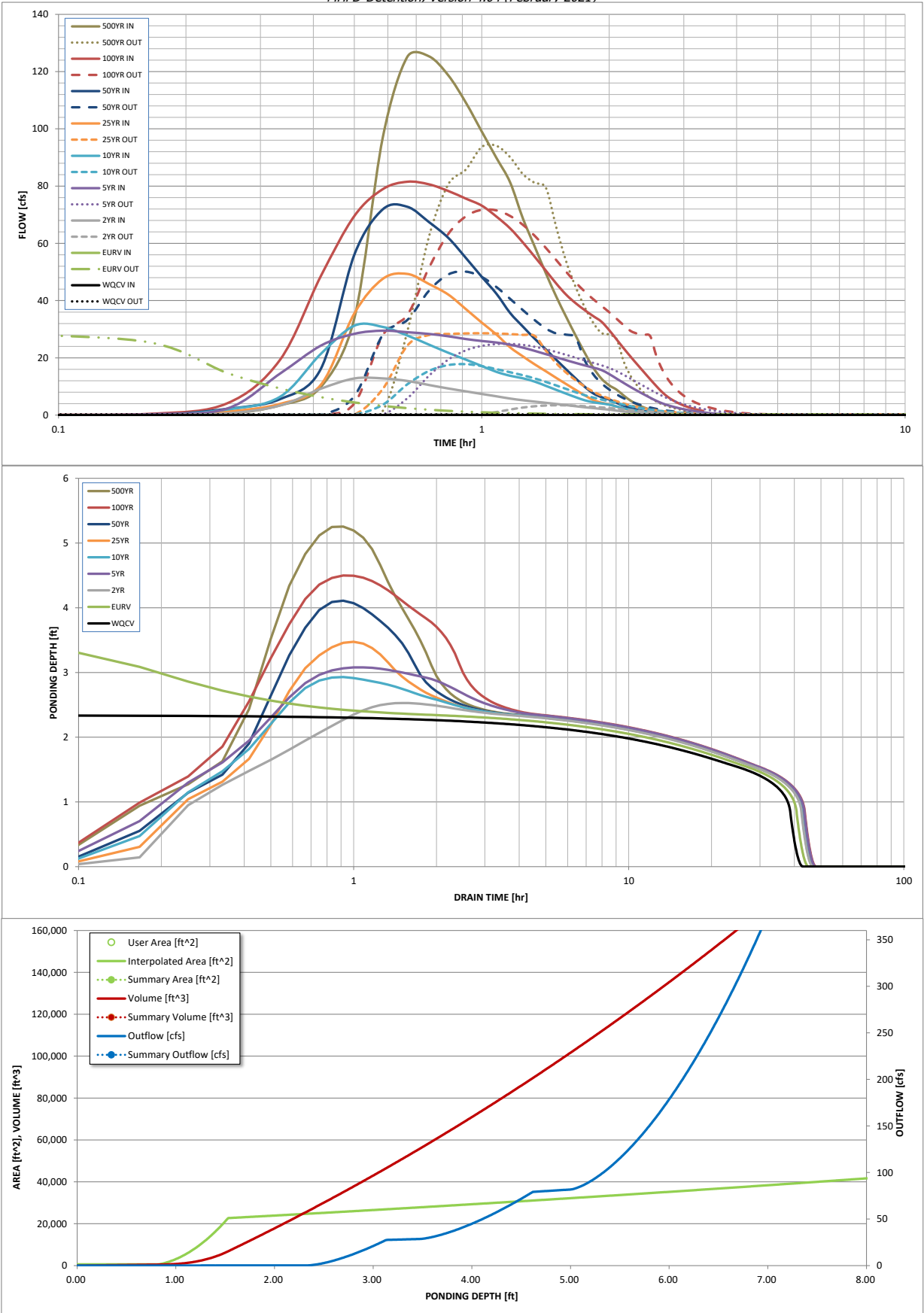
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.92	1.20	1.45	1.69	2.15	2.49	3.14
One-Hour Rainfall Depth (in) =	0.598	1.555	0.962	1.511	2.197	3.278	4.893	6.323	8.741
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.962	3.851	2.197	3.278	4.893	9.206	8.741
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.5	3.9	11.5	26.5	44.5	60.8	86.2
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.64	0.26	0.61	1.02	1.85	1.97
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	12.8	29.5	31.3	49.3	72.8	81.5	125.3
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	3.4	24.9	17.8	28.6	50.1	71.7	94.0
Peak Inflow Q (cfs) =	N/A	N/A	0.9	1.6	1.1	1.1	1.1	0.9	1.1
Peak Outflow Q (cfs) =	0.3	33.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Structure Controlling Flow =	Overflow Weir 1	Overflow Weir 2	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Spillway
Max Velocity through Grate 1 (fps) =	N/A	1.17	0.13	1.0	0.7	1.1	1.2	1.2	1.3
Max Velocity through Grate 2 (fps) =	N/A	0.44	N/A	N/A	N/A	0.0	0.8	1.6	2.0
Time to Drain 97% of Inflow Volume (hours) =	38	37	41	34	37	34	30	22	22
Time to Drain 99% of Inflow Volume (hours) =	40	41	43	41	42	40	39	36	35
Maximum Ponding Depth (ft) =	2.34	3.90	2.53	3.08	2.93	3.48	4.11	4.50	5.25
Area at Maximum Ponding Depth (acres) =	0.57	0.67	0.58	0.61	0.60	0.64	0.68	0.70	0.76
Maximum Volume Stored (acre-ft) =	0.598	1.561	0.702	1.030	0.938	1.280	1.695	1.965	2.520

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)



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: ...[SWM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00
	0:10:00	0.00	0.00	0.00	0.33	0.00	0.00	0.06	0.49	0.51
	0:15:00	0.00	0.00	0.60	2.28	1.96	1.28	2.18	4.09	3.39
	0:20:00	0.00	0.00	3.35	14.46	6.37	3.91	5.55	19.23	9.84
	0:25:00	0.00	0.00	9.22	24.28	21.41	10.60	16.17	48.59	33.82
	0:30:00	0.00	0.00	12.81	28.40	31.25	35.56	56.08	69.57	96.85
	0:35:00	0.00	0.00	12.83	29.49	30.81	47.58	71.86	78.91	125.12
	0:40:00	0.00	0.00	11.94	28.96	27.81	49.32	72.78	81.52	125.34
	0:45:00	0.00	0.00	10.52	28.36	24.63	45.81	67.44	80.62	118.69
	0:50:00	0.00	0.00	9.31	27.54	21.78	42.11	61.92	78.29	109.19
	0:55:00	0.00	0.00	8.31	26.58	19.39	37.05	54.93	75.63	99.04
	1:00:00	0.00	0.00	7.39	25.89	17.15	32.31	48.29	73.17	89.80
	1:05:00	0.00	0.00	6.57	25.36	15.10	28.14	42.37	69.34	81.30
	1:10:00	0.00	0.00	5.78	24.60	13.74	23.67	35.68	65.22	68.77
	1:15:00	0.00	0.00	5.19	23.58	12.87	20.54	30.96	60.34	58.88
	1:20:00	0.00	0.00	4.72	22.44	11.71	17.74	26.69	55.32	49.58
	1:25:00	0.00	0.00	4.30	21.29	10.22	15.33	22.96	50.50	41.35
	1:30:00	0.00	0.00	3.90	20.22	8.81	12.98	19.31	45.93	34.25
	1:35:00	0.00	0.00	3.50	19.18	7.48	10.83	15.93	42.03	27.75
	1:40:00	0.00	0.00	3.10	18.23	6.26	8.80	12.80	39.09	21.80
	1:45:00	0.00	0.00	2.74	17.37	5.19	6.92	9.92	36.69	16.59
	1:50:00	0.00	0.00	2.47	16.59	4.51	5.28	7.60	34.59	12.76
	1:55:00	0.00	0.00	2.15	15.76	4.08	4.33	6.29	32.67	10.41
	2:00:00	0.00	0.00	1.92	14.33	3.68	3.77	5.47	29.67	8.86
	2:05:00	0.00	0.00	1.57	12.73	2.99	2.96	4.27	26.39	6.77
	2:10:00	0.00	0.00	1.26	11.19	2.37	2.26	3.25	23.24	5.00
	2:15:00	0.00	0.00	1.00	9.75	1.86	1.75	2.49	20.31	3.66
	2:20:00	0.00	0.00	0.80	8.45	1.45	1.34	1.88	17.59	2.65
	2:25:00	0.00	0.00	0.63	7.22	1.11	1.02	1.42	15.00	1.96
	2:30:00	0.00	0.00	0.49	6.07	0.84	0.78	1.08	12.51	1.47
	2:35:00	0.00	0.00	0.39	5.01	0.63	0.58	0.80	10.17	1.11
	2:40:00	0.00	0.00	0.30	4.14	0.48	0.44	0.60	8.06	0.85
	2:45:00	0.00	0.00	0.23	3.47	0.37	0.34	0.46	6.38	0.65
	2:50:00	0.00	0.00	0.17	2.93	0.27	0.25	0.34	5.13	0.48
	2:55:00	0.00	0.00	0.12	2.46	0.19	0.18	0.24	4.15	0.34
	3:00:00	0.00	0.00	0.08	2.06	0.13	0.12	0.16	3.36	0.22
	3:05:00	0.00	0.00	0.05	1.73	0.07	0.07	0.09	2.73	0.12
	3:10:00	0.00	0.00	0.03	1.45	0.04	0.04	0.05	2.23	0.06
	3:15:00	0.00	0.00	0.01	1.20	0.01	0.01	0.01	1.81	0.02
	3:20:00	0.00	0.00	0.00	0.98	0.00	0.00	0.00	1.48	0.00
	3:25:00	0.00	0.00	0.00	0.79	0.00	0.00	0.00	1.20	0.00
	3:30:00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.97	0.00
	3:35:00	0.00	0.00	0.00	0.48	0.00	0.00	0.00	0.76	0.00
	3:40:00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.59	0.00
	3:45:00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.43	0.00
	3:50:00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.30	0.00
	3:55:00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.19	0.00
	4:00:00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.11	0.00
	4:05:00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.05	0.00
	4:10:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

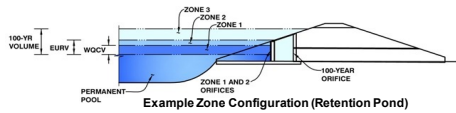
0 5:50:00 0

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Flying Horse North MDDP

Basin ID: Pond 2



Watershed Information

Selected BMP Type =	EDB
Watershed Area =	76.38 acres
Watershed Length =	3,200 ft
Watershed Length to Centroid =	1,813 ft
Watershed Slope =	0.046 ft/ft
Watershed Imperviousness =	29.50% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	100.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building

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

Water Quality Capture Volume (WQCV) =	0.954 acre-feet
Excess Urban Runoff Volume (EURV) =	2.309 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.348 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	3.828 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	5.193 acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	7.260 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	8.821 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	10.908 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	14.934 acre-feet
Approximate 2-yr Detention Volume =	1.649 acre-feet
Approximate 5-yr Detention Volume =	2.363 acre-feet
Approximate 10-yr Detention Volume =	3.460 acre-feet
Approximate 25-yr Detention Volume =	4.023 acre-feet
Approximate 50-yr Detention Volume =	4.239 acre-feet
Approximate 100-yr Detention Volume =	5.021 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
	inches
	inches
	inches
	inches
	inches
	inches

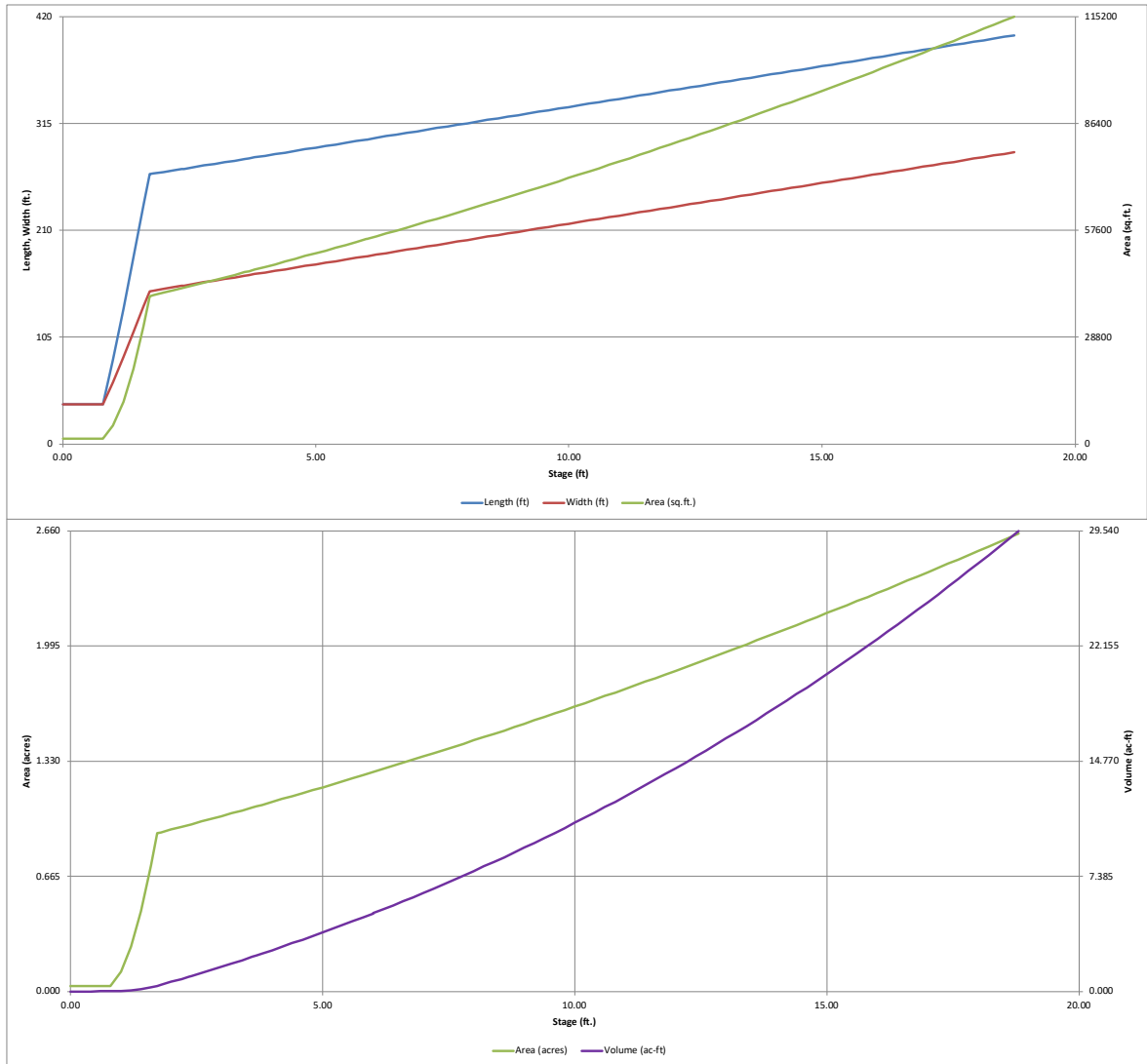
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.954 acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.355 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.712 acre-feet
Total Detention Basin Volume =	5.021 acre-feet
Initial Surcharge Volume (ISV) =	500 ft ³
Initial Surcharge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H _{total}) =	6.00 ft
Depth of Trickle Channel (H _{tr}) =	0.50 ft
Slope of Trickle Channel (S _{tr}) =	0.004 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 ft:H
Basin Length-to-Width Ratio (R _{L/W}) =	2
Initial Surcharge Area (A _{ISV}) =	1,515 ft ²
Surcharge Volume Length (L _{ISV}) =	38.9 ft
Surcharge Volume Width (W _{ISV}) =	38.9 ft
Depth of Basin Floor (H _{floor}) =	0.89 ft
Length of Basin Floor (L _{floor}) =	265.0 ft
Width of Basin Floor (W _{floor}) =	150.2 ft
Area of Basin Floor (A _{floor}) =	39,794 ft ²
Volume of Basin Floor (V _{floor}) =	14,559 ft ³
Depth of Main Basin (H _{main}) =	4.28 ft
Length of Main Basin (L _{main}) =	299.2 ft
Width of Main Basin (W _{main}) =	184.4 ft
Area of Main Basin (A _{main}) =	55,182 ft ²
Volume of Main Basin (V _{main}) =	202,353 ft ³
Calculated Total Basin Volume (V _{total}) =	5.008 acre-feet

Depth Increment =	0.20	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		38.9	38.9	1,515		0.035		
ISV	0.33		38.9	38.9	1,515		0.035	500	0.011
	0.40		38.9	38.9	1,515		0.035	606	0.014
	0.60		38.9	38.9	1,515		0.035	909	0.021
	0.80		38.9	38.9	1,515		0.035	1,212	0.028
	1.00		82.1	60.2	4,941		0.113	1,780	0.041
Floor	1.20		132.9	85.2	11,320		0.260	3,364	0.077
	1.40		183.7	110.2	20,240		0.465	6,478	0.149
	1.60		234.5	135.2	31,699		0.728	11,629	0.267
	1.72		265.0	150.2	39,794		0.914	15,910	0.365
	1.80		265.6	150.8	40,060		0.920	19,104	0.439
Zone 1 (WQCV)	2.00		267.2	152.4	40,729		0.935	27,183	0.624
	2.20		268.8	154.0	41,403		0.950	35,396	0.813
	2.35		270.0	155.2	41,912		0.962	41,644	0.956
	2.40		270.4	155.6	42,082		0.966	43,744	1.004
	2.60		272.0	157.2	42,766		0.982	52,229	1.199
Zone 2 (EURV)	2.80		273.6	158.8	43,456		0.998	60,851	1.397
	3.00		275.2	160.4	44,150		1.014	69,612	1.598
	3.20		276.8	162.0	44,850		1.030	78,512	1.802
	3.40		278.4	163.6	45,554		1.046	87,552	2.010
	3.60		280.0	165.2	46,264		1.062	96,734	2.221
	3.69		280.7	165.9	46,585		1.069	100,912	2.317
	3.80		281.6	166.8	46,979		1.078	106,058	2.435
	4.00		283.2	168.4	47,699		1.095	115,526	2.652
	4.20		284.8	170.0	48,424		1.112	125,138	2.873
	4.40		286.4	171.6	49,155		1.128	134,896	3.097
	4.60		288.0	173.2	49,890		1.145	144,800	3.324
	4.80		289.6	174.8	50,631		1.162	154,852	3.555
	5.00		291.2	176.4	51,376		1.179	165,053	3.789
	5.20		292.8	178.0	52,127		1.197	175,403	4.027
	5.40		294.4	179.6	52,883		1.214	185,904	4.268
Zone 3 (100-year)	5.60		296.0	181.2	53,644		1.232	196,557	4.512
	5.80		297.6	182.8	54,410		1.249	207,362	4.760
	6.00		299.2	184.4	55,182		1.267	218,321	5.012
	6.01		299.3	184.5	55,220		1.268	218,873	5.025
	6.20		300.8	186.0	55,958		1.285	229,435	5.267
	6.40		302.4	187.6	56,739		1.303	240,705	5.526
	6.60		304.0	189.2	57,526		1.321	252,131	5.788
	6.80		305.6	190.8	58,318		1.339	263,716	6.054
	7.00		307.2	192.4	59,115		1.357	275,459	6.324
	7.20		308.8	194.0	59,917		1.375	287,362	6.597
	7.40		310.4	195.6	60,724		1.394	299,426	6.874
	7.60		312.0	197.2	61,536		1.413	311,652	7.155
	7.80		313.6	198.8	62,353		1.431	324,041	7.439
	8.00		315.2	200.4	63,176		1.450	336,593	7.727
	8.20		316.8	202.0	64,003		1.469	349,311	8.019
8.40		318.4	203.6	64,836		1.488	362,195	8.315	
8.60		320.0	205.2	65,674		1.508	375,246	8.614	
8.80		321.6	206.8	66,517		1.527	388,465	8.918	
9.00		323.2	208.4	67,365		1.546	401,853	9.225	
9.20		324.8	210.0	68,218		1.566	415,411	9.537	
9.40		326.4	211.6	69,076		1.586	429,141	9.852	
9.60		328.0	213.2	69,940		1.606	443,042	10.171	
9.80		329.6	214.8	70,808		1.626	457,117	10.494	
10.00		331.2	216.4	71,682		1.646	471,366	10.821	
10.20		332.8	218.0	72,561		1.666	485,790	11.152	
10.40		334.4	219.6	73,445		1.686	500,390	11.487	
10.60		336.0	221.2	74,334		1.706	515,168	11.827	
10.80		337.6	222.8	75,228		1.727	530,124	12.170	
11.00		339.2	224.4	76,127		1.748	545,260	12.517	
11.20		340.8	226.0	77,032		1.768	560,576	12.869	
11.40		342.4	227.6	77,941		1.789	576,073	13.225	
11.60		344.0	229.2	78,856		1.810	591,752	13.585	
11.80		345.6	230.8	79,775		1.831	607,615	13.949	
12.00		347.2	232.4	80,700		1.853	623,663	14.317	
12.20		348.8	234.0	81,630		1.874	639,896	14.690	
12.40		350.4	235.6	82,565		1.895	656,315	15.067	
12.60		352.0	237.2	83,506		1.917	672,922	15.448	
12.80		353.6	238.8	84,451		1.939	689,718	15.834	
13.00		355.2	240.4	85,401		1.961	706,703	16.224	
13.20		356.8	242.0	86,357		1.982	723,879	16.618	
13.40		358.4	243.6	87,318		2.005	741,246	17.017	
13.60		360.0	245.2	88,283		2.027	758,806	17.420	
13.80		361.6	246.8	89,254		2.049	776,560	17.827	
14.00		363.2	248.4	90,231		2.071	794,508	18.239	
14.20		364.8	250.0	91,212		2.094	812,652	18.656	
14.40		366.4	251.6	92,198		2.117	830,993	19.077	
14.60		368.0	253.2	93,189		2.139	849,532	19.503	
14.80		369.6	254.8	94,186		2.162	868,269	19.933	
15.00		371.2	256.4	95,188		2.185	887,207	20.367	
15.20		372.8	258.0	96,194		2.208	906,345	20.807	
15.40		374.4	259.6	97,206		2.232	925,685	21.251	
15.60		376.0	261.2	98,223		2.255	945,228	21.699	
15.80		377.6	262.8	99,245		2.278	964,974	22.153	
16.00		379.2	264.4	100,273		2.302	984,926	22.611	
16.20		380.8	266.0	101,305		2.326	1,005,084	23.074	
16.40		382.4	267.6	102,343		2.349	1,025,449	23.541	
16.60		384.0	269.2	103,385		2.373	1,046,021	24.013	
16.80		385.6	270.8	104,433		2.397	1,066,803	24.490	
17.00		387.2	272.4	105,486		2.422	1,087,795	24.972	
17.20		388.8	274.0	106,544		2.446	1,108,998	25.459	
17.40		390.4	275.6	107,607		2.470	1,130,413	25.951	
17.60		392.0	277.2	108,675		2.495	1,152,041	26.447	
17.80		393.6	278.8	109,749		2.519	1,173,883	26.949	
18.00		395.2	280.4	110,827		2.544	1,195,941	27.455	
18.20		396.8	282.0	111,911		2.569	1,218,214	27.966	
18.40		398.4	283.6	112,999		2.594	1,240,705	28.483	
18.60		400.0	285.2	114,093		2.619	1,263,414	29.004	
18.80		401.6	286.8	115,192		2.644	1,286,343	29.530	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

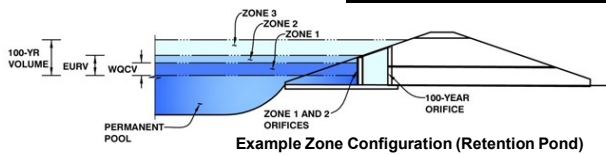


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North MDDP

Basin ID: Pond 2



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.35	0.954	Orifice Plate
Zone 2 (EURV)	3.69	1.355	Circular Orifice
Zone 3 (100-year)	6.01	2.712	Weir&Pipe (Restrict)
Total (all zones)		5.021	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = 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 = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (use rectangular openings)

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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	0.78	1.57					
Orifice Area (sq. inches)	3.41	3.41	3.41					

	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)

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

Calculated Parameters for Vertical Orif
Zone 2 Circular = ft²
Not Selected = ft²
Vertical Orifice Centroid = feet
Not Selected = feet

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

Zone 3 Weir = ft (relative to basin bottom at Stage = 0 ft)
Not Selected = ft
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Type =
Debris Clogging % = %

Calculated Parameters for Overflow W
Zone 3 Weir = ft
Not Selected = ft
Height of Grate Upper Edge, H₁ = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area = %
Overflow Grate Open Area w/o Debris = %
Overflow Grate Open Area w/ Debris = %

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

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl
Zone 3 Restrictor = ft²
Not Selected = ft²
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = degrees

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

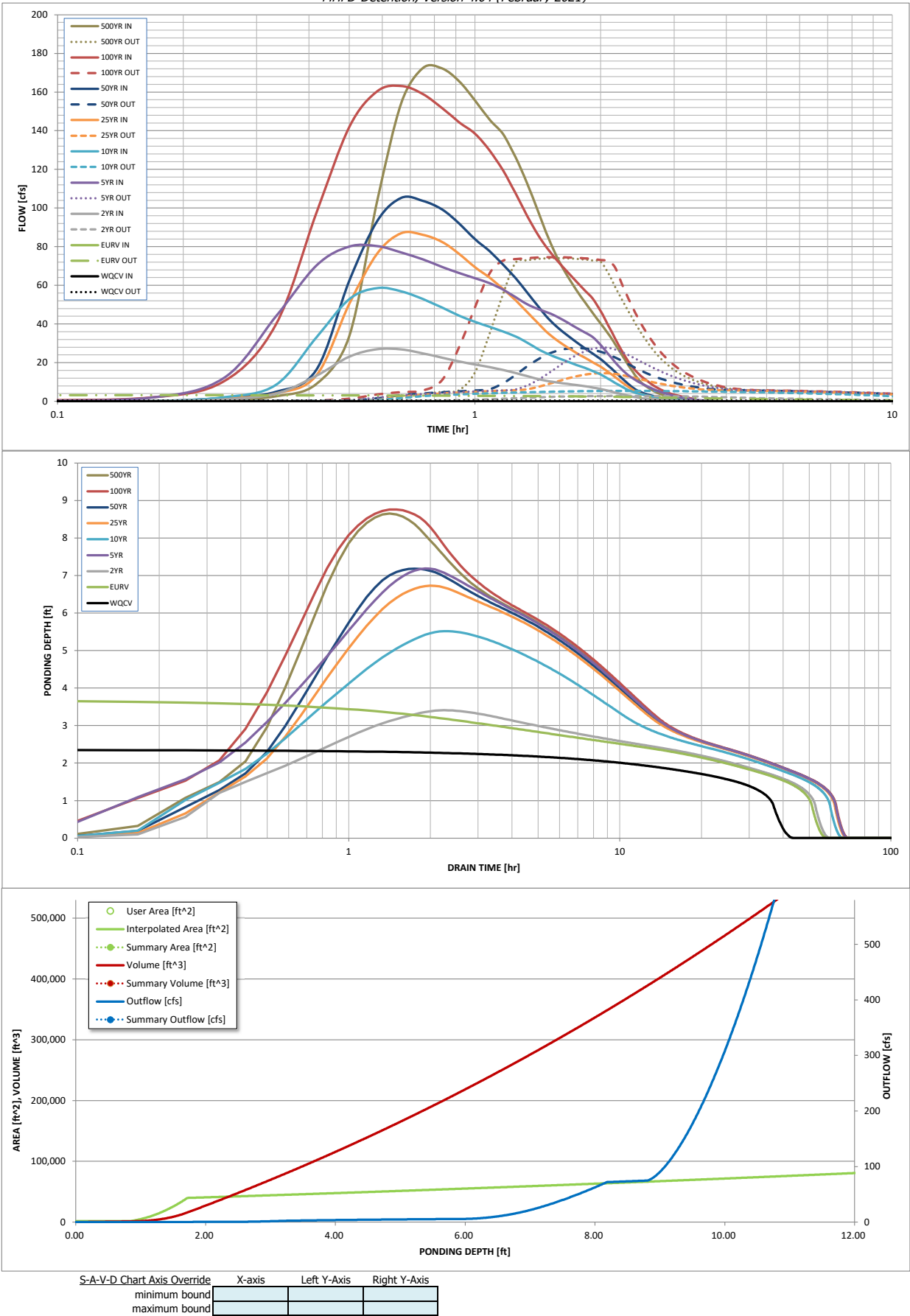
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.954	2.309	2.348	3.828	5.193	7.260	8.821	10.908
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.348	9.011	5.193	7.260	8.821	16.404
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	7.6	21.4	32.6	58.3	73.3	93.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	N/A	27.9	N/A	N/A	N/A	81.0
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.37	0.43	0.76	0.96	1.06
Peak Inflow Q (cfs) =	N/A	N/A	26.9	80.3	58.6	87.0	105.2	163.2
Peak Outflow Q (cfs) =	0.4	3.2	2.8	27.8	5.4	14.5	27.5	74.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.2	0.2	0.4	0.9
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.7	N/A	0.3	0.7	2.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	37	49	50	49	52	51	49	41
Time to Drain 99% of Inflow Volume (hours) =	40	52	54	59	58	59	59	55
Maximum Ponding Depth (ft) =	2.35	3.69	3.41	7.19	5.52	6.72	7.18	8.76
Area at Maximum Ponding Depth (acres) =	0.96	1.07	1.05	1.37	1.22	1.33	1.37	1.52
Maximum Volume Stored (acre-ft) =	0.956	2.317	2.010	6.569	4.402	5.947	6.556	8.842

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)



DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.32	0.00
	0:10:00	0.00	0.00	0.00	1.80	0.00	0.00	0.11	1.90	0.37
	0:15:00	0.00	0.00	0.97	11.97	2.02	1.37	1.76	10.22	2.60
	0:20:00	0.00	0.00	3.87	43.79	8.48	4.07	4.83	39.58	8.88
	0:25:00	0.00	0.00	13.19	70.16	32.99	13.33	16.21	97.23	33.67
	0:30:00	0.00	0.00	23.12	80.09	52.87	50.35	62.29	141.84	103.95
	0:35:00	0.00	0.00	26.92	80.26	58.60	76.45	93.34	160.45	154.46
	0:40:00	0.00	0.00	26.87	76.94	56.82	86.98	105.24	163.15	172.38
	0:45:00	0.00	0.00	24.83	73.40	52.91	86.09	103.73	158.97	172.22
	0:50:00	0.00	0.00	22.58	69.54	48.53	82.51	99.35	151.80	165.57
	0:55:00	0.00	0.00	20.60	66.38	44.34	76.24	91.93	144.38	155.67
	1:00:00	0.00	0.00	18.99	63.71	41.14	69.38	83.89	138.52	145.77
	1:05:00	0.00	0.00	17.72	61.08	38.56	64.02	77.70	129.85	138.29
	1:10:00	0.00	0.00	16.21	57.80	36.08	58.18	70.80	119.57	126.35
	1:15:00	0.00	0.00	14.59	53.88	33.59	52.31	63.81	107.76	112.87
	1:20:00	0.00	0.00	13.00	50.24	30.43	46.20	56.32	96.06	98.23
	1:25:00	0.00	0.00	11.52	47.71	27.01	40.35	49.12	86.02	84.46
	1:30:00	0.00	0.00	10.40	45.81	24.37	35.06	42.76	78.34	73.27
	1:35:00	0.00	0.00	9.62	43.38	22.31	31.09	37.98	72.21	64.70
	1:40:00	0.00	0.00	8.98	40.71	20.50	27.87	34.07	66.82	57.64
	1:45:00	0.00	0.00	8.41	38.11	18.84	25.07	30.63	61.95	51.34
	1:50:00	0.00	0.00	7.85	35.67	17.29	22.53	27.51	57.40	45.60
	1:55:00	0.00	0.00	7.14	33.13	15.68	20.18	24.61	53.06	40.22
	2:00:00	0.00	0.00	6.38	29.16	13.87	17.91	21.82	46.73	35.16
	2:05:00	0.00	0.00	5.48	24.64	11.73	15.27	18.55	39.57	29.60
	2:10:00	0.00	0.00	4.57	20.28	9.56	12.56	15.20	32.54	24.00
	2:15:00	0.00	0.00	3.69	16.43	7.53	9.93	11.96	26.09	18.60
	2:20:00	0.00	0.00	2.87	13.45	5.75	7.44	8.92	20.54	13.70
	2:25:00	0.00	0.00	2.15	11.17	4.48	5.23	6.32	16.29	9.92
	2:30:00	0.00	0.00	1.65	9.34	3.63	3.85	4.72	13.11	7.39
	2:35:00	0.00	0.00	1.33	7.79	2.98	2.91	3.60	10.56	5.56
	2:40:00	0.00	0.00	1.09	6.44	2.43	2.24	2.78	8.46	4.15
	2:45:00	0.00	0.00	0.90	5.28	1.98	1.71	2.13	6.74	3.06
	2:50:00	0.00	0.00	0.73	4.30	1.59	1.33	1.65	5.35	2.23
	2:55:00	0.00	0.00	0.60	3.49	1.26	1.02	1.26	4.27	1.62
	3:00:00	0.00	0.00	0.49	2.84	1.00	0.79	0.98	3.48	1.22
	3:05:00	0.00	0.00	0.40	2.27	0.78	0.63	0.78	2.82	0.97
	3:10:00	0.00	0.00	0.33	1.78	0.61	0.49	0.61	2.27	0.77
	3:15:00	0.00	0.00	0.26	1.36	0.47	0.39	0.48	1.78	0.61
	3:20:00	0.00	0.00	0.20	1.00	0.36	0.30	0.36	1.35	0.47
	3:25:00	0.00	0.00	0.15	0.71	0.27	0.22	0.27	0.99	0.34
	3:30:00	0.00	0.00	0.11	0.48	0.19	0.16	0.19	0.68	0.24
	3:35:00	0.00	0.00	0.08	0.30	0.12	0.11	0.13	0.42	0.15
	3:40:00	0.00	0.00	0.05	0.16	0.07	0.06	0.08	0.23	0.09
	3:45:00	0.00	0.00	0.02	0.06	0.03	0.03	0.04	0.10	0.04
	3:50:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.01
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

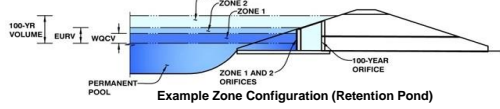
0 5:50:00 0.72

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Flying Horse North**

Basin ID: **Pond 3**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	52.52	acres
Watershed Length =	2,370	ft
Watershed Length to Centroid =	1,179	ft
Watershed Slope =	0.033	ft/ft
Watershed Imperviousness =	30.10%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

Water Quality Capture Volume (WQCV) =	0.664	acre-feet
Excess Urban Runoff Volume (EURV) =	1.623	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.643	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	2.665	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	3.605	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	5.023	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	6.095	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	7.524	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	10.289	acre-feet
Approximate 2-yr Detention Volume =	1.161	acre-feet
Approximate 5-yr Detention Volume =	1.661	acre-feet
Approximate 10-yr Detention Volume =	2.421	acre-feet
Approximate 25-yr Detention Volume =	2.807	acre-feet
Approximate 50-yr Detention Volume =	2.958	acre-feet
Approximate 100-yr Detention Volume =	3.496	acre-feet

Optional User Overrides

		acre-feet
		acre-feet
	1.19	inches
	1.50	inches
	1.75	inches
	2.00	inches
	2.25	inches
	2.52	inches
		inches

Define Zones and Basin Geometry

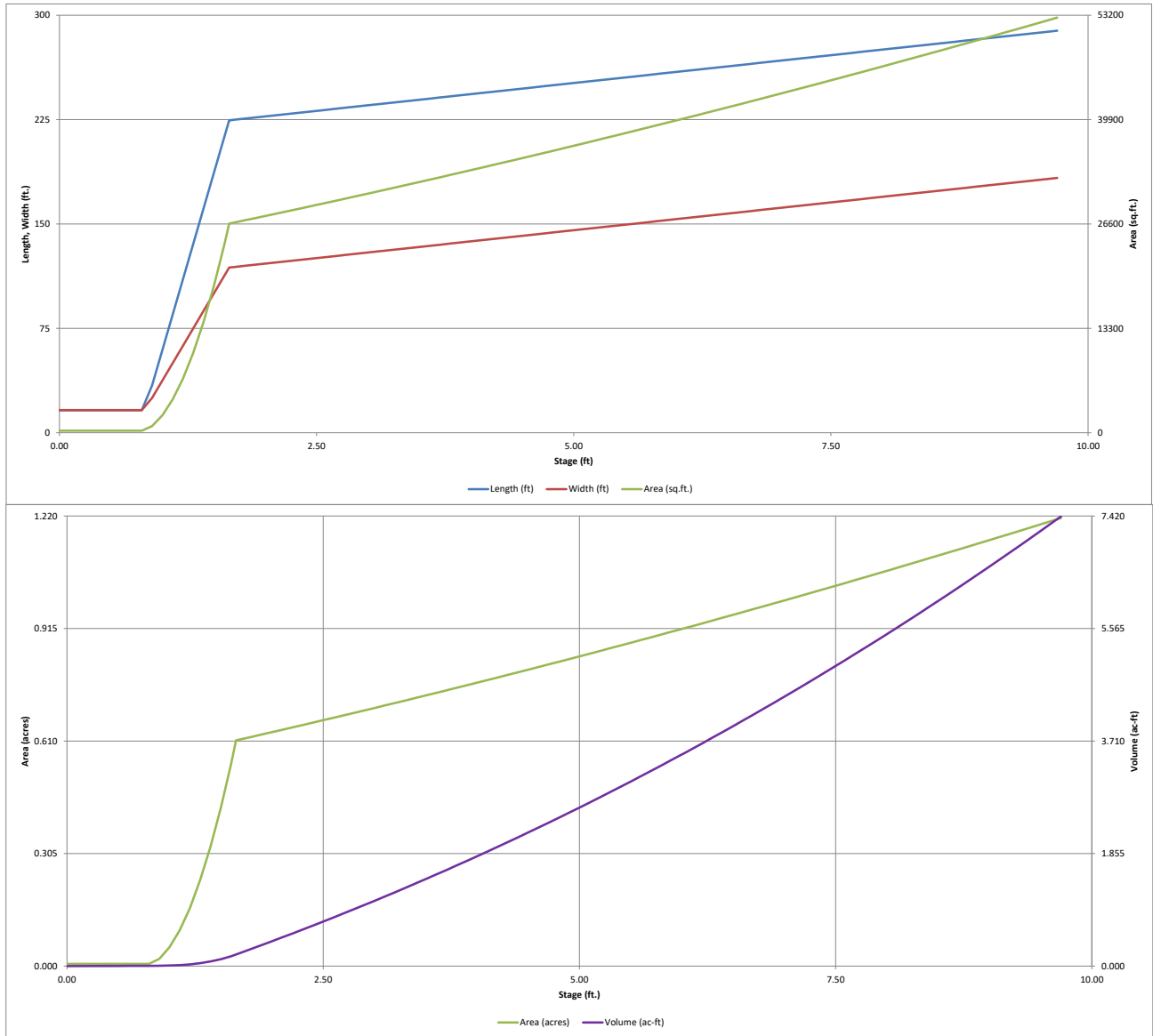
Zone 1 Volume (WQCV) =	0.664	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.958	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.873	acre-feet
Total Detention Basin Volume =	3.496	acre-feet
Initial Surge Volume (ISV) =	87	ft ³
Initial Surge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.004	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{L/W}) =	2	

Initial Surge Area (A _{ISV}) =	263	ft ²
Surcharge Volume Length (L _{ISV}) =	16.2	ft
Surcharge Volume Width (W _{ISV}) =	16.2	ft
Depth of Basin Floor (H _{FLOOR}) =	0.82	ft
Length of Basin Floor (L _{FLOOR}) =	224.5	ft
Width of Basin Floor (W _{FLOOR}) =	118.7	ft
Area of Basin Floor (A _{FLOOR}) =	26,652	ft ²
Volume of Basin Floor (V _{FLOOR}) =	8,081	ft ³
Depth of Main Basin (H _{MAIN}) =	4.35	ft
Length of Main Basin (L _{MAIN}) =	259.3	ft
Width of Main Basin (W _{MAIN}) =	153.5	ft
Area of Main Basin (A _{MAIN}) =	39,807	ft ²
Volume of Main Basin (V _{MAIN}) =	143,597	ft ³
Calculated Total Basin Volume (V _{total}) =	3.487	acre-feet

Depth Increment =	0.10	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		16.2	16.2	263		0.006		
ISV	0.33		16.2	16.2	263		0.006	87	0.002
	0.40		16.2	16.2	263		0.006	105	0.002
	0.50		16.2	16.2	263		0.006	132	0.003
	0.60		16.2	16.2	263		0.006	158	0.004
	0.70		16.2	16.2	263		0.006	184	0.004
	0.80		16.2	16.2	263		0.006	210	0.005
	0.90		34.0	25.0	849		0.019	255	0.006
	1.00		59.4	37.5	2,226		0.051	404	0.009
	1.10		84.8	50.0	4,237		0.097	722	0.017
	1.20		110.2	62.5	6,884		0.158	1,273	0.029
	1.30		135.6	75.0	10,166		0.233	2,120	0.049
	1.40		161.0	87.5	14,082		0.323	3,327	0.076
	1.50		186.4	100.0	18,634		0.428	4,957	0.114
	1.60		211.8	112.5	23,821		0.547	7,075	0.162
Floor	1.65		224.5	118.7	26,652		0.612	8,336	0.191
	1.70		224.9	119.1	26,790		0.615	9,672	0.222
	1.80		225.7	119.9	27,066		0.621	12,365	0.284
	1.90		226.5	120.7	27,343		0.628	15,085	0.346
	2.00		227.3	121.5	27,621		0.634	17,833	0.409
	2.10		228.1	122.3	27,901		0.641	20,610	0.473
	2.20		228.9	123.1	28,182		0.647	23,414	0.538
	2.30		229.7	123.9	28,464		0.653	26,246	0.603
Zone 1 (WQCV)	2.40		230.5	124.7	28,748		0.660	29,107	0.668
	2.50		231.3	125.5	29,032		0.666	31,996	0.735
	2.60		232.1	126.3	29,319		0.673	34,913	0.801
	2.70		232.9	127.1	29,606		0.680	37,859	0.869
	2.80		233.7	127.9	29,895		0.686	40,834	0.937
	2.90		234.5	128.7	30,185		0.693	43,838	1.006
	3.00		235.3	129.5	30,476		0.700	46,871	1.076
	3.10		236.1	130.3	30,768		0.706	49,933	1.146
	3.20		236.9	131.1	31,062		0.713	53,025	1.217
	3.30		237.7	131.9	31,357		0.720	56,146	1.289
	3.40		238.5	132.7	31,653		0.727	59,296	1.361
	3.50		239.3	133.5	31,951		0.733	62,477	1.434
	3.60		240.1	134.3	32,250		0.740	65,687	1.508
	3.70		240.9	135.1	32,550		0.747	68,927	1.582
Zone 2 (EURV)	3.76		241.4	135.6	32,731		0.751	70,885	1.627
	3.80		241.7	135.9	32,852		0.754	72,197	1.657
	3.90		242.5	136.7	33,154		0.761	75,497	1.733
	4.00		243.3	137.5	33,458		0.768	78,828	1.810
	4.10		244.1	138.3	33,764		0.775	82,189	1.887
	4.20		244.9	139.1	34,070		0.782	85,580	1.965
	4.30		245.7	139.9	34,378		0.789	89,003	2.043
	4.40		246.5	140.7	34,687		0.796	92,456	2.122
	4.50		247.3	141.5	34,998		0.803	95,940	2.202
	4.60		248.1	142.3	35,309		0.811	99,456	2.283
	4.70		248.9	143.1	35,622		0.818	103,002	2.365
	4.80		249.7	143.9	35,936		0.825	106,580	2.447
	4.90		250.5	144.7	36,252		0.832	110,189	2.530
	5.00		251.3	145.5	36,569		0.840	113,830	2.613
	5.10		252.1	146.3	36,887		0.847	117,503	2.698
	5.20		252.9	147.1	37,206		0.854	121,208	2.783
	5.30		253.7	147.9	37,527		0.862	124,945	2.868
	5.40		254.5	148.7	37,849		0.869	128,713	2.955
	5.50		255.3	149.5	38,172		0.876	132,514	3.042
	5.60		256.1	150.3	38,497		0.884	136,348	3.130
	5.70		256.9	151.1	38,822		0.891	140,214	3.219
	5.80		257.7	151.9	39,149		0.899	144,112	3.308
	5.90		258.5	152.7	39,478		0.906	148,044	3.399
Zone 3 (100-year)	6.00		259.3	153.5	39,807		0.914	152,008	3.490
	6.01		259.4	153.6	39,840		0.915	152,406	3.499
	6.10		260.1	154.3	40,138		0.921	156,005	3.581
	6.20		260.9	155.1	40,470		0.929	160,036	3.674
	6.30		261.7	155.9	40,804		0.937	164,099	3.767
	6.40		262.5	156.7	41,139		0.944	168,196	3.861
	6.50		263.3	157.5	41,475		0.952	172,327	3.956
	6.60		264.1	158.3	41,812		0.960	176,491	4.052
	6.70		264.9	159.1	42,151		0.968	180,690	4.148
	6.80		265.7	159.9	42,490		0.975	184,922	4.245
	6.90		266.5	160.7	42,832		0.983	189,188	4.343
	7.00		267.3	161.5	43,174		0.991	193,488	4.442
	7.10		268.1	162.3	43,518		0.999	197,823	4.541
	7.20		268.9	163.1	43,863		1.007	202,192	4.642
	7.30		269.7	163.9	44,209		1.015	206,595	4.743
	7.40		270.5	164.7	44,556		1.023	211,033	4.845
	7.50		271.3	165.5	44,905		1.031	215,506	4.947
	7.60		272.1	166.3	45,255		1.039	220,014	5.051
	7.70		272.9	167.1	45,607		1.047	224,557	5.155
	7.80		273.7	167.9	45,959		1.055	229,126	5.260
	7.90		274.5	168.7	46,313		1.063	233,749	5.366
	8.00		275.3	169.5	46,668		1.071	238,398	5.473
	8.10		276.1	170.3	47,025		1.080	243,083	5.580
	8.20		276.9	171.1	47,383		1.088	247,804	5.689
	8.30		277.7	171.9	47,742		1.096	252,560	5.798
	8.40		278.5	172.7	48,102		1.104	257,352	5.908
	8.50		279.3	173.5	48,464		1.113	262,180	6.019
	8.60		280.1	174.3	48,827		1.121	267,045	6.131
	8.70		280.9	175.1	49,191		1.129	271,946	6.243
	8.80		281.7	175.9	49,556		1.138	276,883	6.356
	8.90		282.5	176.7	49,923		1.146	281,857	6.471
	9.00		283.3	177.5	50,291		1.155	286,868	6.586
	9.10		284.1	178.3	50,660		1.163	291,915	6.701
	9.20		284.9	179.1	51,031		1.172	297,000	6.818
	9.30		285.7	179.9	51,403		1.180	302,121	6.936
	9.40		286.5	180.7	51,776		1.189	307,280	7.054
	9.50		287.3	181.5	52,150		1.197	312,477	7.173
	9.60		288.1	182.3	52,526		1.206	317,710	7.294
	9.70		288.9	183.1	52,903		1.214	322,982	7.415

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

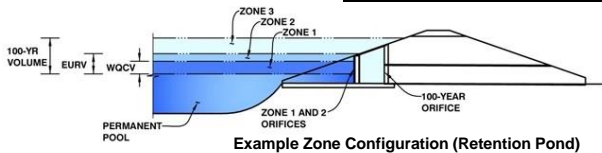


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)

Project: Flying Horse North

Basin ID: Pond 3



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.40	0.664	Orifice Plate
Zone 2 (EURV)	3.76	0.958	Rectangular Orifice
Zone 3 (100-year)	6.01	1.873	Weir&Pipe (Restrict)
Total (all zones)		3.496	

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 ft²
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 = 2.36 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 9.40 inches
Orifice Plate: Orifice Area per Row = 2.20 sq. inches (diameter = 1-11/16 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = 1.528E-02 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	0.79	1.57					
Orifice Area (sq. inches)	2.20	2.20	2.20					

	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)

Invert of Vertical Orifice = 2.43 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = 3.66 ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height = 3.00 inches
Vertical Orifice Width = 34.00 inches

Calculated Parameters for Vertical Orifice
Zone 2 Rectangular Not Selected
Vertical Orifice Area = 0.71 ft²
Vertical Orifice Centroid = 0.13 feet

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

Overflow Weir Front Edge Height, H_o = 3.76 ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 3.60 feet
Overflow Weir Gate Slope = 3.00 H:V
Horiz. Length of Weir Sides = 3.00 feet
Overflow Gate Type = Type C Gate
Debris Clogging % = 50%

Calculated Parameters for Overflow Weir
Zone 3 Weir Not Selected
Height of Gate Upper Edge, H_u = 4.76 feet
Overflow Weir Slope Length = 3.16 feet
Gate Open Area / 100-yr Orifice Area = 2.48
Overflow Gate Open Area w/o Debris = 7.92 ft²
Overflow Gate Open Area w/ Debris = 3.96 ft²

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

Depth to Invert of Outlet Pipe = 1.00 ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 28.00 inches
Restrictor Plate Height Above Pipe Invert = 19.60 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Zone 3 Restrictor Not Selected
Outlet Orifice Area = 3.20 ft²
Outlet Orifice Centroid = 0.91 feet
Half-Central Angle of Restrictor Plate on Pipe = 1.98 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 8.80 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 42.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.95 feet
Stage at Top of Freeboard = 10.75 feet
Basin Area at Top of Freeboard = 1.31 acres
Basin Volume at Top of Freeboard = 8.74 acre-ft

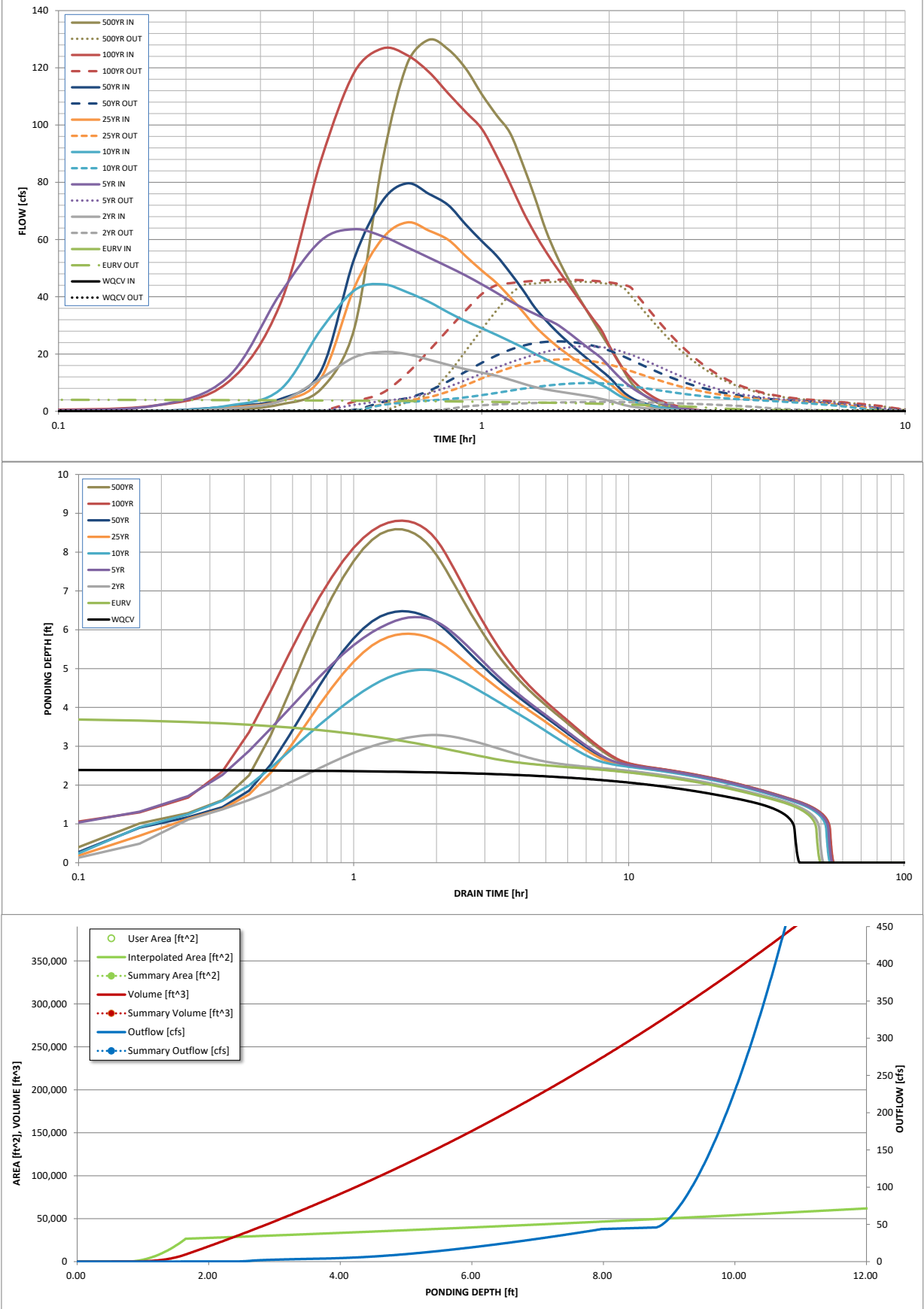
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.664	1.623	1.643	2.665	3.605	5.023	6.095	7.524	10.289
CUHP Runoff Volume (acre-ft) =	0.664	1.623	1.643	2.665	3.605	5.023	6.095	7.524	10.289
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.643	6.195	3.605	5.023	6.095	11.270	10.289
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	5.7	16.0	24.2	43.4	54.4	69.3	96.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		22.7				48.5	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	0.43	0.46	0.83	1.04	0.92	1.84
Peak Inflow Q (cfs) =	N/A	N/A	20.7	63.6	44.4	66.0	79.6	126.8	129.8
Peak Outflow Q (cfs) =	0.3	4.1	3.3	22.7	9.9	18.1	24.4	46.1	45.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.4	0.4	0.4	0.9	0.5
Structure Controlling Flow =	Plate	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway	Outlet Plate 1
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	2.0	0.5	1.4	2.2	4.6	4.6
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	44	45	38	43	40	38	30	31
Time to Drain 99% of Inflow Volume (hours) =	40	47	48	48	49	49	48	44	45
Maximum Ponding Depth (ft) =	2.40	3.76	3.29	6.33	4.97	5.90	6.48	8.81	8.59
Area at Maximum Ponding Depth (acres) =	0.66	0.75	0.72	0.94	0.84	0.91	0.95	1.14	1.12
Maximum Volume Stored (acre-ft) =	0.668	1.627	1.275	3.786	2.580	3.390	3.928	6.368	6.108

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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: ...[SWM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.33	0.00
	0:10:00	0.00	0.00	0.00	1.83	0.00	0.00	0.11	1.89	0.35
	0:15:00	0.00	0.00	0.91	11.64	1.89	1.28	1.63	9.87	2.36
	0:20:00	0.00	0.00	3.46	40.91	7.45	3.55	4.20	37.13	7.71
	0:25:00	0.00	0.00	11.48	59.62	28.51	11.54	14.03	87.57	29.01
	0:30:00	0.00	0.00	18.87	63.61	42.26	43.25	53.46	118.46	87.82
	0:35:00	0.00	0.00	20.73	61.11	44.37	60.48	73.62	126.79	121.47
	0:40:00	0.00	0.00	19.96	57.24	41.59	65.99	79.62	124.39	129.80
	0:45:00	0.00	0.00	18.03	53.69	38.23	63.11	75.94	118.52	126.42
	0:50:00	0.00	0.00	16.23	50.46	34.54	59.90	72.01	111.04	119.71
	0:55:00	0.00	0.00	14.69	47.42	31.48	54.16	65.22	104.53	110.75
	1:00:00	0.00	0.00	13.49	44.36	29.00	49.17	59.44	98.67	103.46
	1:05:00	0.00	0.00	12.42	41.41	26.70	44.83	54.37	89.30	97.18
	1:10:00	0.00	0.00	11.05	38.52	24.44	39.84	48.42	79.54	86.29
	1:15:00	0.00	0.00	9.67	36.09	22.31	34.83	42.42	69.99	74.89
	1:20:00	0.00	0.00	8.49	34.04	20.16	29.85	36.33	62.24	63.32
	1:25:00	0.00	0.00	7.64	32.21	18.16	26.08	31.81	55.82	54.62
	1:30:00	0.00	0.00	7.02	30.50	16.38	22.93	27.98	50.32	47.61
	1:35:00	0.00	0.00	6.48	28.09	14.79	20.27	24.73	45.34	41.70
	1:40:00	0.00	0.00	5.97	25.54	13.34	17.87	21.79	40.71	36.37
	1:45:00	0.00	0.00	5.47	23.07	11.96	15.71	19.14	36.32	31.50
	1:50:00	0.00	0.00	4.98	20.78	10.64	13.66	16.61	32.17	26.90
	1:55:00	0.00	0.00	4.34	18.57	9.24	11.69	14.19	28.35	22.58
	2:00:00	0.00	0.00	3.69	15.62	7.71	9.81	11.89	22.96	18.59
	2:05:00	0.00	0.00	2.93	12.84	5.99	7.59	9.15	18.22	14.08
	2:10:00	0.00	0.00	2.21	10.46	4.61	5.47	6.57	14.45	10.15
	2:15:00	0.00	0.00	1.69	8.53	3.67	3.96	4.83	11.50	7.51
	2:20:00	0.00	0.00	1.35	6.94	2.99	2.97	3.67	9.12	5.66
	2:25:00	0.00	0.00	1.10	5.63	2.43	2.27	2.82	7.22	4.23
	2:30:00	0.00	0.00	0.90	4.51	1.97	1.74	2.17	5.65	3.15
	2:35:00	0.00	0.00	0.73	3.57	1.58	1.34	1.67	4.39	2.31
	2:40:00	0.00	0.00	0.59	2.79	1.24	1.03	1.28	3.45	1.66
	2:45:00	0.00	0.00	0.47	2.19	0.97	0.78	0.97	2.73	1.21
	2:50:00	0.00	0.00	0.38	1.71	0.75	0.60	0.75	2.18	0.93
	2:55:00	0.00	0.00	0.31	1.30	0.58	0.47	0.58	1.71	0.74
	3:00:00	0.00	0.00	0.25	0.95	0.45	0.37	0.46	1.29	0.59
	3:05:00	0.00	0.00	0.19	0.66	0.35	0.29	0.35	0.93	0.46
	3:10:00	0.00	0.00	0.15	0.44	0.26	0.22	0.27	0.63	0.34
	3:15:00	0.00	0.00	0.11	0.27	0.18	0.16	0.19	0.39	0.24
	3:20:00	0.00	0.00	0.07	0.14	0.12	0.11	0.13	0.20	0.16
	3:25:00	0.00	0.00	0.05	0.05	0.07	0.07	0.08	0.08	0.09
	3:30:00	0.00	0.00	0.02	0.01	0.04	0.04	0.04	0.01	0.05
	3:35:00	0.00	0.00	0.01	0.00	0.01	0.01	0.02	0.00	0.01
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

0 5:50:00 0

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

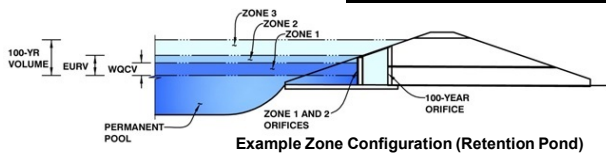
[illegible]

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North MDDP

Basin ID: Pond 4



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.90	1.201	Orifice Plate
Zone 2 (5-year)	4.54	1.398	Weir&Pipe (Circular)
Zone 3 (100-year)	8.10	3.853	Weir&Pipe (Restrict)
Total (all zones)		6.452	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = 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 = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (use rectangular openings)

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.51	3.03					
Orifice Area (sq. inches)	5.55	5.55	5.55					

	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)

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

Calculated Parameters for Vertical Orif
Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Type =
Debris Clogging % = %

Calculated Parameters for Overflow W
Height of Grate Upper Edge, H_u = ft
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris =
Overflow Grate Open Area w/ Debris =

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter or Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe =

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

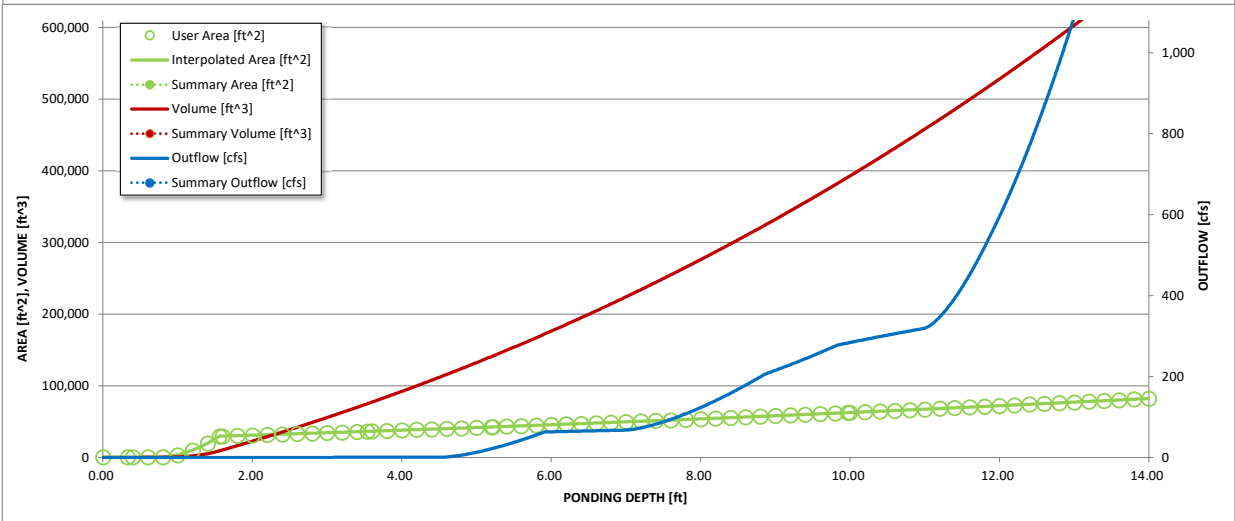
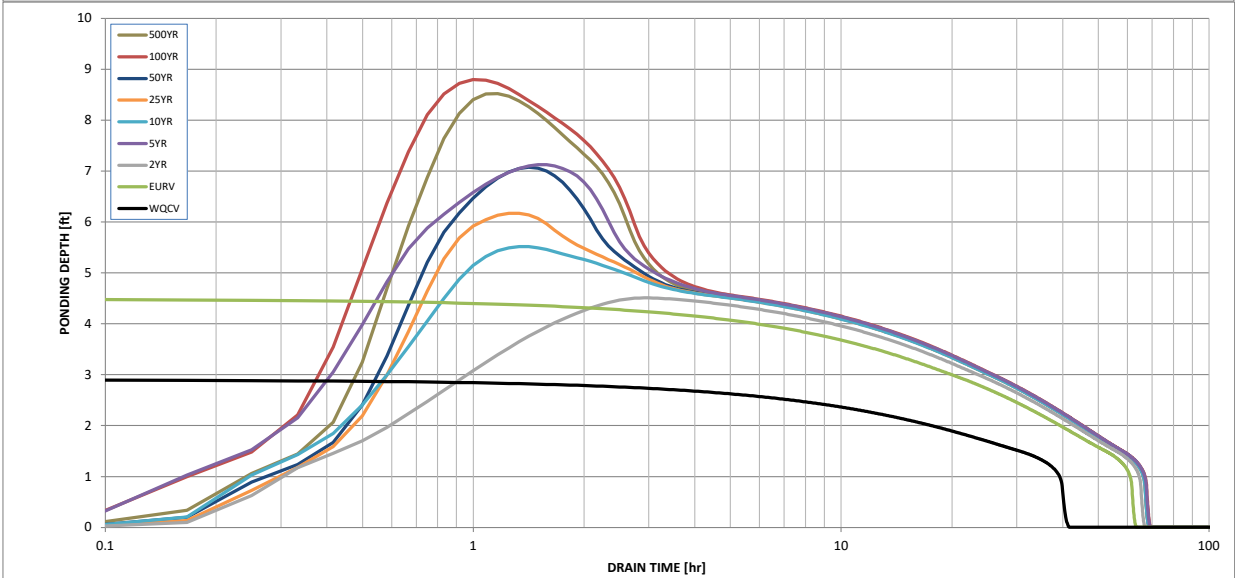
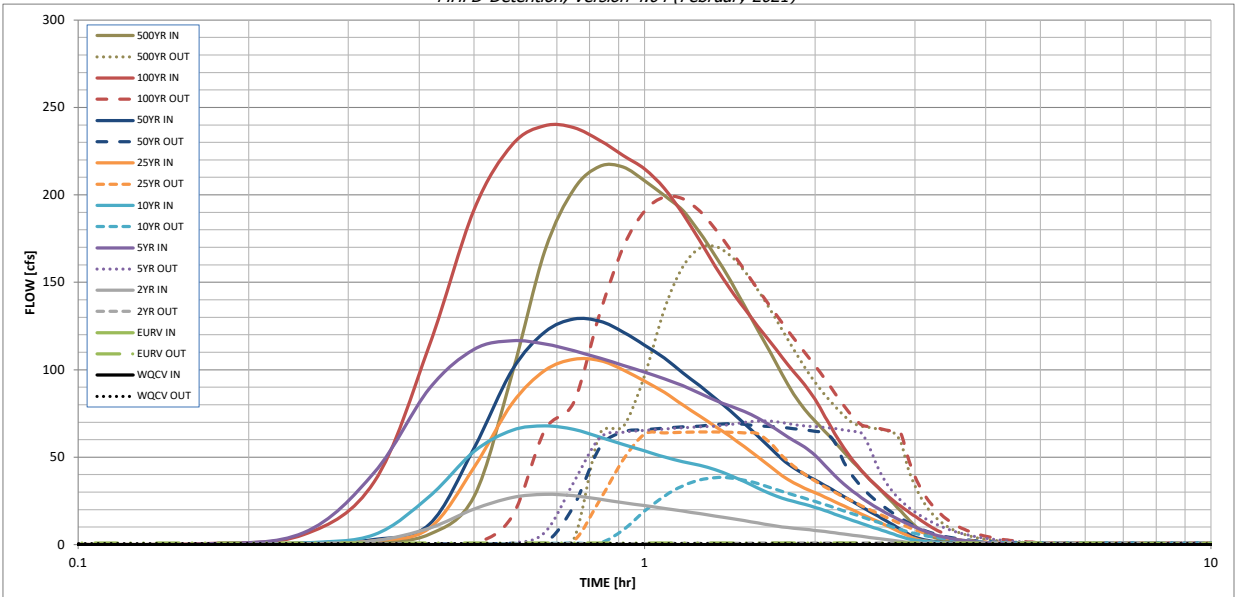
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	1.201	2.555	2.764	4.915	6.951	10.216	12.579	15.835
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.764	14.585	6.951	10.216	12.579	26.746
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	10.7	29.9	46.0	84.0	105.5	134.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		69.9				231.6
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.09	0.60	0.39	0.72	0.90	1.97
Peak Inflow Q (cfs) =	N/A	N/A	28.7	116.6	67.8	106.0	128.9	239.6
Peak Outflow Q (cfs) =	0.5	0.9	0.9	70.6	38.3	64.4	69.2	198.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.8	0.8	0.7	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 2	Overflow Weir 1	Outlet Plate 1	Overflow Weir 2	Overflow Weir 2
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	2.7	1.5	2.5	2.7	2.9
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	0.1	N/A	N/A	0.0	3.0
Time to Drain 97% of Inflow Volume (hours) =	38	58	61	48	56	52	50	38
Time to Drain 99% of Inflow Volume (hours) =	40	61	64	60	64	62	60	54
Maximum Ponding Depth (ft) =	2.90	4.49	4.51	7.12	5.52	6.17	7.07	8.79
Area at Maximum Ponding Depth (acres) =	0.79	0.92	0.92	1.16	1.01	1.07	1.15	1.32
Maximum Volume Stored (acre-ft) =	1.203	2.560	2.569	5.284	3.543	4.228	5.226	7.349

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

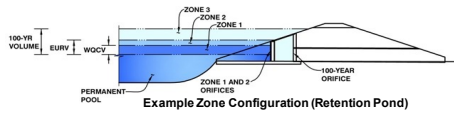
Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	0:10:00	0.00	0.00	0.00	0.36	0.00	0.00	0.06	0.49	0.18
	0:15:00	0.00	0.00	0.48	6.73	0.99	0.67	0.88	5.67	1.32
	0:20:00	0.00	0.00	2.13	41.21	5.65	2.26	2.89	35.90	5.82
	0:25:00	0.00	0.00	9.38	89.05	27.50	9.26	11.47	113.64	27.45
	0:30:00	0.00	0.00	20.30	111.59	53.20	44.07	55.13	191.47	97.49
	0:35:00	0.00	0.00	26.92	116.56	65.38	80.67	99.67	228.61	167.89
	0:40:00	0.00	0.00	28.75	114.74	67.85	99.55	121.59	239.57	203.14
	0:45:00	0.00	0.00	27.97	110.81	65.87	105.99	128.94	238.45	216.31
	0:50:00	0.00	0.00	25.92	106.63	61.53	105.24	127.82	231.20	215.91
	0:55:00	0.00	0.00	23.93	102.54	57.32	99.95	121.53	222.57	208.11
	1:00:00	0.00	0.00	22.26	98.67	53.59	93.45	114.06	214.84	199.58
	1:05:00	0.00	0.00	20.71	94.84	50.07	87.10	106.71	203.76	191.23
	1:10:00	0.00	0.00	19.18	90.87	47.47	79.98	98.34	189.33	178.69
	1:15:00	0.00	0.00	17.72	86.57	45.43	73.58	90.88	174.06	165.11
	1:20:00	0.00	0.00	16.34	82.55	42.85	67.61	83.67	159.11	151.09
	1:25:00	0.00	0.00	15.00	79.15	39.55	61.79	76.45	146.10	136.67
	1:30:00	0.00	0.00	13.68	76.09	36.01	55.97	69.25	135.00	122.93
	1:35:00	0.00	0.00	12.39	72.49	32.45	50.28	62.20	125.07	109.91
	1:40:00	0.00	0.00	11.15	68.09	29.09	44.69	55.31	115.83	97.41
	1:45:00	0.00	0.00	10.11	63.64	26.50	39.42	48.83	107.08	86.08
	1:50:00	0.00	0.00	9.38	59.52	24.62	35.39	43.95	98.86	77.49
	1:55:00	0.00	0.00	8.76	55.77	22.98	32.29	40.17	91.43	70.60
	2:00:00	0.00	0.00	8.13	51.08	21.28	29.70	36.99	83.00	64.62
	2:05:00	0.00	0.00	7.45	45.18	19.40	27.11	33.76	73.06	58.71
	2:10:00	0.00	0.00	6.72	39.50	17.45	24.54	30.53	63.57	52.86
	2:15:00	0.00	0.00	6.01	34.58	15.56	22.07	27.42	55.20	47.30
	2:20:00	0.00	0.00	5.34	30.40	13.75	19.69	24.44	48.18	42.08
	2:25:00	0.00	0.00	4.70	26.78	12.05	17.43	21.62	42.28	37.24
	2:30:00	0.00	0.00	4.09	23.59	10.43	15.25	18.91	37.20	32.58
	2:35:00	0.00	0.00	3.50	20.73	8.90	13.13	16.27	32.73	28.03
	2:40:00	0.00	0.00	2.92	18.16	7.42	11.04	13.68	28.74	23.55
	2:45:00	0.00	0.00	2.35	15.85	5.98	8.99	11.15	25.16	19.13
	2:50:00	0.00	0.00	1.80	13.75	4.59	6.98	8.65	21.91	14.79
	2:55:00	0.00	0.00	1.28	11.84	3.38	5.04	6.26	18.95	10.72
	3:00:00	0.00	0.00	0.92	10.10	2.62	3.40	4.29	16.20	7.55
	3:05:00	0.00	0.00	0.72	8.49	2.13	2.42	3.11	13.61	5.49
	3:10:00	0.00	0.00	0.59	7.01	1.76	1.78	2.31	11.16	4.04
	3:15:00	0.00	0.00	0.49	5.74	1.45	1.33	1.75	8.92	2.96
	3:20:00	0.00	0.00	0.41	4.74	1.19	1.01	1.34	7.06	2.16
	3:25:00	0.00	0.00	0.33	3.97	0.96	0.79	1.03	5.65	1.55
	3:30:00	0.00	0.00	0.27	3.35	0.77	0.60	0.79	4.58	1.10
	3:35:00	0.00	0.00	0.22	2.82	0.60	0.47	0.61	3.73	0.82
	3:40:00	0.00	0.00	0.18	2.36	0.46	0.37	0.48	3.04	0.64
	3:45:00	0.00	0.00	0.15	1.96	0.35	0.29	0.37	2.45	0.50
	3:50:00	0.00	0.00	0.11	1.61	0.27	0.22	0.29	1.98	0.40
	3:55:00	0.00	0.00	0.09	1.31	0.20	0.17	0.22	1.60	0.31
	4:00:00	0.00	0.00	0.06	1.06	0.15	0.13	0.16	1.30	0.23
	4:05:00	0.00	0.00	0.04	0.85	0.10	0.09	0.11	1.05	0.16
	4:10:00	0.00	0.00	0.03	0.67	0.06	0.06	0.07	0.85	0.10
	4:15:00	0.00	0.00	0.01	0.52	0.03	0.03	0.04	0.67	0.06
	4:20:00	0.00	0.00	0.01	0.39	0.01	0.02	0.02	0.51	0.03
	4:25:00	0.00	0.00	0.00	0.28	0.00	0.00	0.01	0.38	0.01
	4:30:00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.27	0.00
	4:35:00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.18	0.00
	4:40:00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.12	0.00
	4:45:00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.07	0.00
	4:50:00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.04	0.00
	4:55:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00
	5:00:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	5:05:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	5:10:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MHFD-Detention, Version 4.04 (February 2021)

Basin ID: Pond 4



Selected BMP Type =	EDB	
Watershed Area =	117.41	acres
Watershed Length =	4,350	ft
Watershed Length to Centroid =	2,200	ft
Watershed Slope =	0.036	ft/ft
Watershed Imperviousness =	21.76%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQC Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

Optional User Overrides

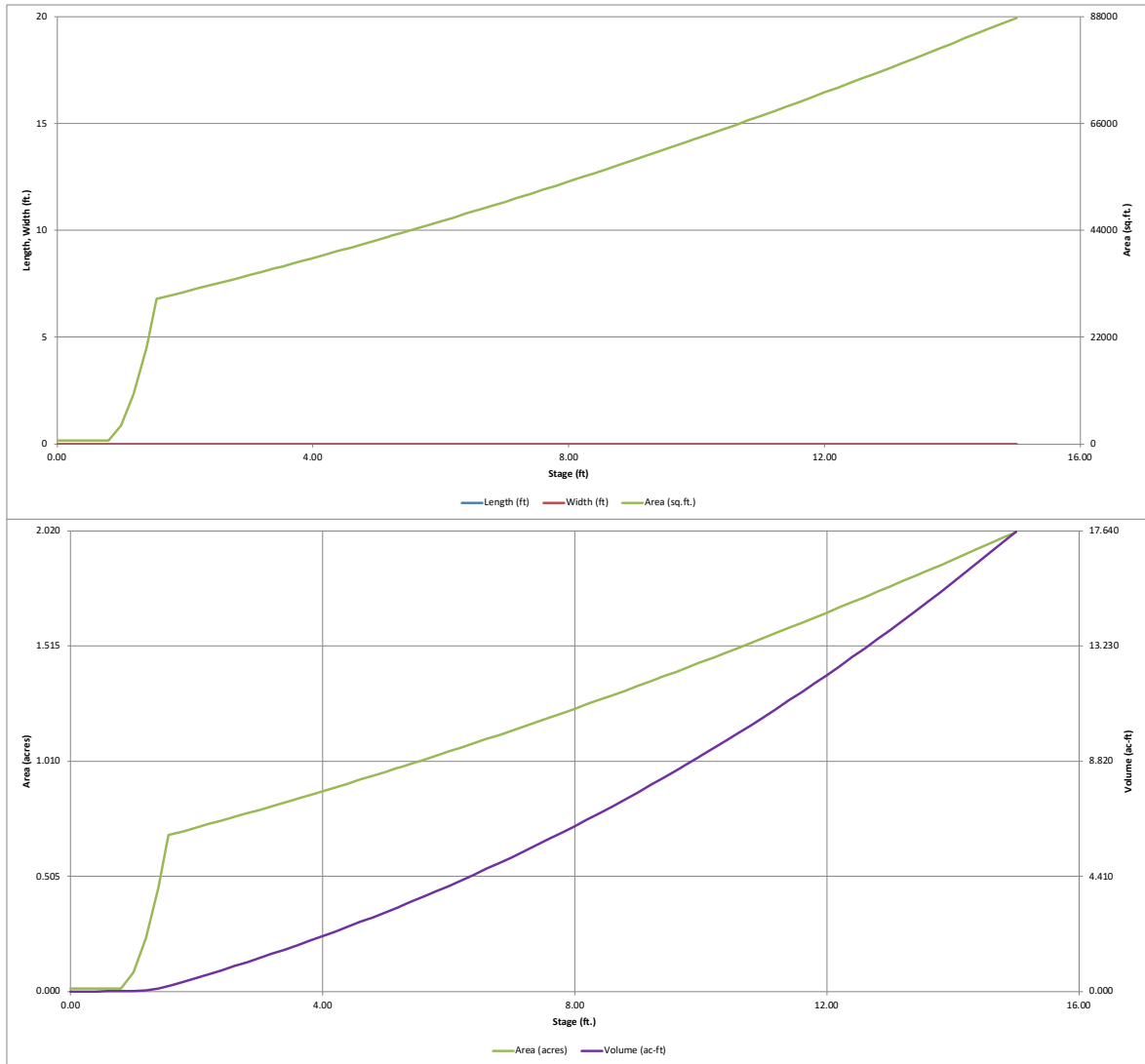
Water Quality Capture Volume (WQCV) =	1,201	acre-feet
Excess Urban Runoff Volume (EURV) =	2,555	acre-feet
2-yr Runoff Volume ($P1 = 1.19$ in.) =	2,764	acre-feet
5-yr Runoff Volume ($P1 = 1.5$ in.) =	4,915	acre-feet
10-yr Runoff Volume ($P1 = 1.75$ in.) =	6,951	acre-feet
25-yr Runoff Volume ($P1 = 2$ in.) =	10,216	acre-feet
50-yr Runoff Volume ($P1 = 2.25$ in.) =	12,579	acre-feet
100-yr Runoff Volume ($P1 = 2.52$ in.) =	15,835	acre-feet
500-yr Runoff Volume ($P1 = 3.14$ in.) =	21,570	acre-feet
Approximate 2-yr Detention Volume =	1,768	acre-feet
Approximate 5-yr Detention Volume =	2,599	acre-feet
Approximate 10-yr Detention Volume =	4,104	acre-feet
Approximate 25-yr Detention Volume =	5,007	acre-feet
Approximate 50-yr Detention Volume =	5,288	acre-feet
Approximate 100-yr Detention Volume =	6,452	acre-feet

Zone 1 Volume (WQV_1) =	1.201	acre-feet
Zone 2 Volume (5-year - Zone 1) =	1.398	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.853	acre-feet
Total Detention Basin Volume =	6.452	acre-feet
Initial Surcharge Volume (ISV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{TAD}) =	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_{SV}) =	user	ft
Surcharge Volume Width (W_{SV}) =	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

FHN POND4 MHFD, Basin

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

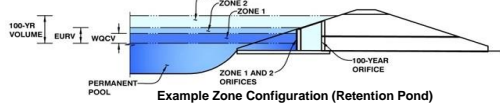


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Flying Horse North**

Basin ID: **Pond 5**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	Note: L / W Ratio < 1
Watershed Area =	41.57 acres	L / W Ratio = 0.52
Watershed Length =	967 ft	
Watershed Length to Centroid =	450 ft	
Watershed Slope =	0.045 ft/ft	
Watershed Imperviousness =	29.60% percent	
Percentage Hydrologic Soil Group A =	0.0% percent	
Percentage Hydrologic Soil Group B =	100.0% percent	
Percentage Hydrologic Soil Groups C/D =	0.0% percent	
Target WQCV Drain Time =	40.0 hours	
Location for 1-hr Rainfall Depths =	User Input	

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

Water Quality Capture Volume (WQCV) =	0.520 acre-feet	Optional User Overrides	
Excess Urban Runoff Volume (EURV) =	1.261 acre-feet		
2-yr Runoff Volume (P1 = 1.19 in.) =	1.226 acre-feet	1.19 inches	
5-yr Runoff Volume (P1 = 1.5 in.) =	1.996 acre-feet	1.50 inches	
10-yr Runoff Volume (P1 = 1.75 in.) =	2.708 acre-feet	1.75 inches	
25-yr Runoff Volume (P1 = 2 in.) =	3.784 acre-feet	2.00 inches	
50-yr Runoff Volume (P1 = 2.25 in.) =	4.596 acre-feet	2.25 inches	
100-yr Runoff Volume (P1 = 2.52 in.) =	5.681 acre-feet	2.52 inches	
500-yr Runoff Volume (P1 = 3.14 in.) =	7.783 acre-feet		
Approximate 2-yr Detention Volume =	0.901 acre-feet		
Approximate 5-yr Detention Volume =	1.291 acre-feet		
Approximate 10-yr Detention Volume =	1.889 acre-feet		
Approximate 25-yr Detention Volume =	2.195 acre-feet		
Approximate 50-yr Detention Volume =	2.313 acre-feet		
Approximate 100-yr Detention Volume =	2.738 acre-feet		

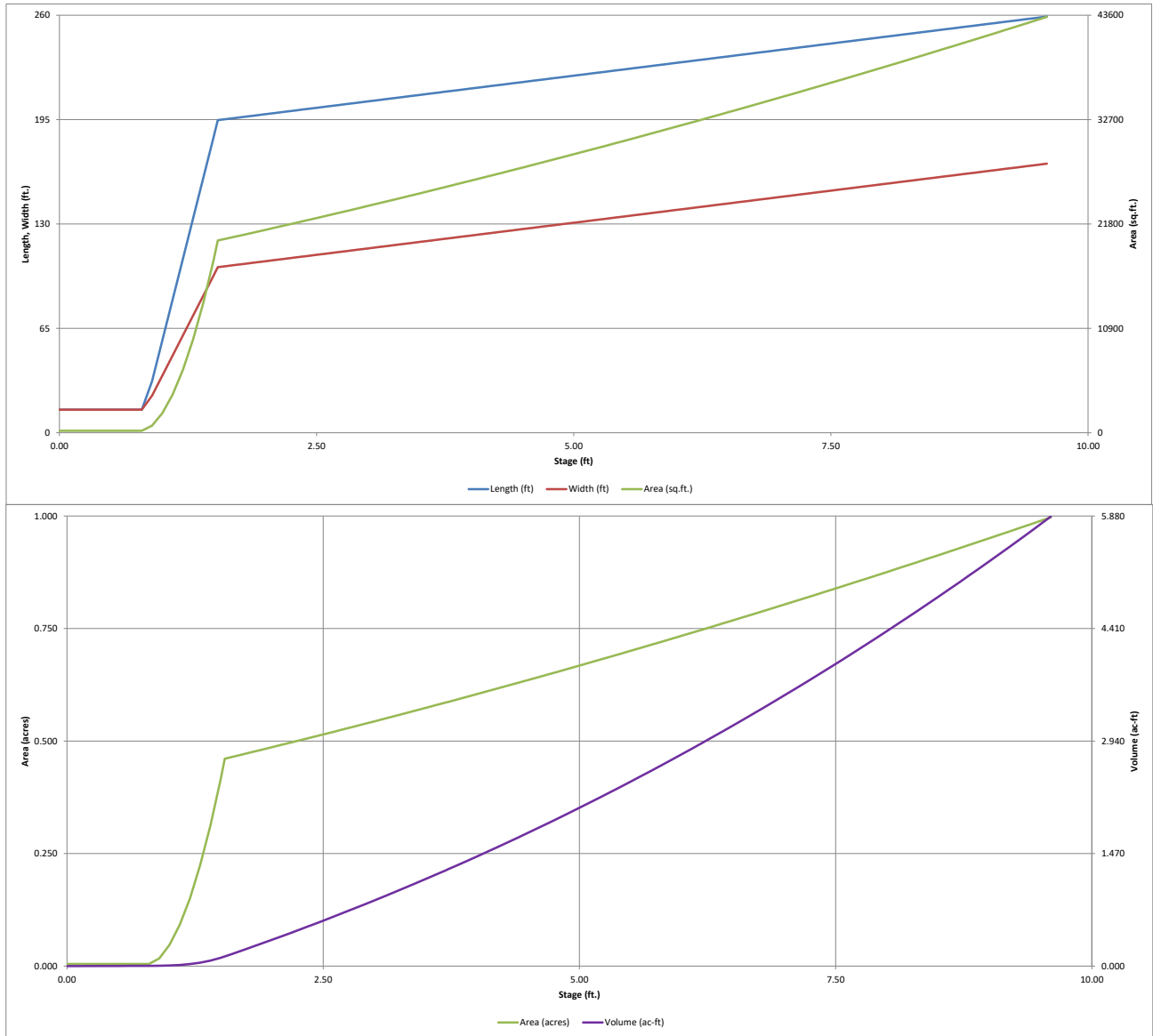
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.520 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.741 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.477 acre-feet
Total Detention Basin Volume =	2.738 acre-feet
Initial Surge Volume (ISV) =	68 ft ³
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H _{total}) =	6.00 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.004 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 H:V
Basin Length-to-Width Ratio (R _{LW}) =	2
Initial Surge Area (A _{ISV}) =	206 ft ²
Surcharge Volume Length (L _{ISV}) =	14.4 ft
Surcharge Volume Width (W _{ISV}) =	14.4 ft
Depth of Basin Floor (H _{FLOOR}) =	0.71 ft
Length of Basin Floor (L _{FLOOR}) =	194.7 ft
Width of Basin Floor (W _{FLOOR}) =	103.1 ft
Area of Basin Floor (A _{FLOOR}) =	20,074 ft ²
Volume of Basin Floor (V _{FLOOR}) =	5,281 ft ³
Depth of Main Basin (H _{MAIN}) =	4.46 ft
Length of Main Basin (L _{MAIN}) =	230.4 ft
Width of Main Basin (W _{MAIN}) =	138.8 ft
Area of Main Basin (A _{MAIN}) =	31,973 ft ²
Volume of Main Basin (V _{MAIN}) =	115,040 ft ³
Calculated Total Basin Volume (V _{total}) =	2.766 acre-feet

Depth Increment =	0.10	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		14.4	14.4	206		0.005		
ISV	0.33		14.4	14.4	206		0.005	68	0.002
	0.40		14.4	14.4	206		0.005	82	0.002
	0.50		14.4	14.4	206		0.005	103	0.002
	0.60		14.4	14.4	206		0.005	124	0.003
	0.70		14.4	14.4	206		0.005	144	0.003
	0.80		14.4	14.4	206		0.005	165	0.004
	0.90		32.1	23.1	742		0.017	202	0.005
	1.00		57.5	35.6	2,049		0.047	337	0.008
	1.10		82.9	48.1	3,990		0.092	633	0.015
	1.20		108.3	60.6	6,566		0.151	1,156	0.027
	1.30		133.7	73.1	9,777		0.224	1,968	0.045
	1.40		159.1	85.6	13,623		0.313	3,132	0.072
	1.50		184.5	98.1	18,104		0.416	4,713	0.108
Floor	1.54		194.7	103.1	20,074		0.461	5,477	0.126
	1.60		195.2	103.6	20,217		0.464	6,685	0.153
	1.70		196.0	104.4	20,457		0.470	8,719	0.200
	1.80		196.8	105.2	20,698		0.475	10,777	0.247
	1.90		197.6	106.0	20,940		0.481	12,859	0.295
	2.00		198.4	106.8	21,184		0.486	14,965	0.344
	2.10		199.2	107.6	21,428		0.492	17,095	0.392
	2.20		200.0	108.4	21,674		0.498	19,250	0.442
	2.30		200.8	109.2	21,922		0.503	21,430	0.492
Zone 1 (WQCV)	2.36		201.3	109.7	22,071		0.507	22,750	0.522
	2.40		201.6	110.0	22,170		0.509	23,635	0.543
	2.50		202.4	110.8	22,420		0.515	25,864	0.594
	2.60		203.2	111.6	22,671		0.520	28,119	0.646
	2.70		204.0	112.4	22,924		0.526	30,399	0.698
	2.80		204.8	113.2	23,177		0.532	32,704	0.751
	2.90		205.6	114.0	23,433		0.538	35,034	0.804
	3.00		206.4	114.8	23,689		0.544	37,390	0.858
	3.10		207.2	115.6	23,946		0.550	39,772	0.913
	3.20		208.0	116.4	24,205		0.556	42,180	0.968
	3.30		208.8	117.2	24,465		0.562	44,613	1.024
	3.40		209.6	118.0	24,727		0.568	47,073	1.081
	3.50		210.4	118.8	24,989		0.574	49,558	1.138
	3.60		211.2	119.6	25,253		0.580	52,071	1.195
	3.70		212.0	120.4	25,519		0.586	54,609	1.254
Zone 2 (EURV)	3.72		212.1	120.5	25,572		0.587	55,120	1.265
	3.80		212.8	121.2	25,785		0.592	57,174	1.313
	3.90		213.6	122.0	26,053		0.598	59,766	1.372
	4.00		214.4	122.8	26,322		0.604	62,385	1.432
	4.10		215.2	123.6	26,592		0.610	65,031	1.493
	4.20		216.0	124.4	26,864		0.617	67,704	1.554
	4.30		216.8	125.2	27,137		0.623	70,404	1.616
	4.40		217.6	126.0	27,411		0.629	73,131	1.679
	4.50		218.4	126.8	27,687		0.636	75,886	1.742
	4.60		219.2	127.6	27,963		0.642	78,668	1.806
	4.70		220.0	128.4	28,242		0.648	81,479	1.870
	4.80		220.8	129.2	28,521		0.655	84,317	1.936
	4.90		221.6	130.0	28,801		0.661	87,183	2.001
	5.00		222.4	130.8	29,083		0.668	90,077	2.068
	5.10		223.2	131.6	29,367		0.674	93,000	2.135
	5.20		224.0	132.4	29,651		0.681	95,950	2.203
	5.30		224.8	133.2	29,937		0.687	98,930	2.271
	5.40		225.6	134.0	30,224		0.694	101,938	2.340
	5.50		226.4	134.8	30,512		0.700	104,975	2.410
	5.60		227.2	135.6	30,802		0.707	108,040	2.480
	5.70		228.0	136.4	31,092		0.714	111,135	2.551
	5.80		228.8	137.2	31,385		0.720	114,259	2.623
	5.90		229.6	138.0	31,678		0.727	117,412	2.695
Zone 3 (100-year)	5.96		230.1	138.5	31,855		0.731	119,318	2.739
	6.00		230.4	138.8	31,973		0.734	120,594	2.768
	6.10		231.2	139.6	32,269		0.741	123,806	2.842
	6.20		232.0	140.4	32,566		0.748	127,048	2.917
	6.30		232.8	141.2	32,864		0.754	130,320	2.992
	6.40		233.6	142.0	33,164		0.761	133,621	3.068
	6.50		234.4	142.8	33,465		0.768	136,953	3.144
	6.60		235.2	143.6	33,768		0.775	140,314	3.221
	6.70		236.0	144.4	34,071		0.782	143,706	3.299
	6.80		236.8	145.2	34,376		0.789	147,128	3.378
	6.90		237.6	146.0	34,682		0.796	150,581	3.457
	7.00		238.4	146.8	34,990		0.803	154,065	3.537
	7.10		239.2	147.6	35,299		0.810	157,579	3.618
	7.20		240.0	148.4	35,609		0.817	161,125	3.699
	7.30		240.8	149.2	35,920		0.825	164,701	3.781
	7.40		241.6	150.0	36,233		0.832	168,309	3.864
	7.50		242.4	150.8	36,547		0.839	171,948	3.947
	7.60		243.2	151.6	36,862		0.846	175,618	4.032
	7.70		244.0	152.4	37,178		0.853	179,320	4.117
	7.80		244.8	153.2	37,496		0.861	183,054	4.202
	7.90		245.6	154.0	37,815		0.868	186,819	4.289
	8.00		246.4	154.8	38,135		0.875	190,617	4.376
	8.10		247.2	155.6	38,457		0.883	194,446	4.464
	8.20		248.0	156.4	38,780		0.890	198,308	4.553
	8.30		248.8	157.2	39,104		0.898	202,202	4.642
	8.40		249.6	158.0	39,429		0.905	206,129	4.732
	8.50		250.4	158.8	39,756		0.913	210,088	4.823
	8.60		251.2	159.6	40,084		0.920	214,080	4.915
	8.70		252.0	160.4	40,413		0.928	218,105	5.007
	8.80		252.8	161.2	40,744		0.935	222,163	5.100
	8.90		253.6	162.0	41,075		0.943	226,254	5.194
	9.00		254.4	162.8	41,408		0.951	230,378	5.289
	9.10		255.2	163.6	41,743		0.958	234,536	5.384
	9.20		256.0	164.4	42,079		0.966	238,727	5.480
	9.30		256.8	165.2	42,415		0.974	242,951	5.577
	9.40		257.6	166.0	42,754		0.981	247,210	5.675
	9.50		258.4	166.8	43,093		0.989	251,502	5.774
	9.60		259.2	167.6	43,434		0.997	255,828	5.873

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

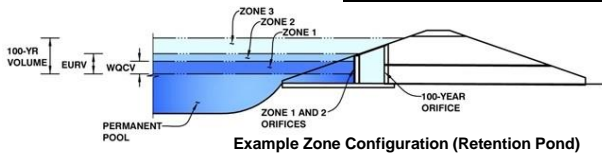


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)

Project: Flying Horse North

Basin ID: Pond 5



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.36	0.520	Orifice Plate
Zone 2 (EURV)	3.72	0.741	Circular Orifice
Zone 3 (100-year)	5.96	1.477	Weir&Pipe (Restrict)
Total (all zones)		2.738	

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 ft²
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 = 2.36 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 9.40 inches
Orifice Plate: Orifice Area per Row = 1.77 sq. inches (diameter = 1-1/2 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = 1.229E-02 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	0.79	1.57					
Orifice Area (sq. inches)	1.77	1.77	1.77					

	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)

Invert of Vertical Orifice = 2.38 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = 3.59 ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = 24.00 inches

Calculated Parameters for Vertical Orifice
Zone 2 Circular Not Selected
Vertical Orifice Area = 3.14 ft²
Vertical Orifice Centroid = 1.00 feet

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

Overflow Weir Front Edge Height, H_o = 4.00 ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 6.00 feet
Overflow Weir Grate Slope = 0.00 H:V
Horiz. Length of Weir Sides = 6.00 feet
Overflow Grate Type = Type C Grate
Debris Clogging % = 50%

Calculated Parameters for Overflow Weir
Zone 3 Weir Not Selected
Height of Grate Upper Edge, H_u = 4.00 feet
Overflow Weir Slope Length = 6.00 feet
Grate Open Area / 100-yr Orifice Area = 2.41
Overflow Grate Open Area w/o Debris = 25.06 ft²
Overflow Grate Open Area w/ Debris = 12.53 ft²

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

Depth to Invert of Outlet Pipe = 1.00 ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 48.00 inches
Restrictor Plate Height Above Pipe Invert = 37.00 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Zone 3 Restrictor Not Selected
Outlet Orifice Area = 10.39 ft²
Outlet Orifice Centroid = 1.70 feet
Half-Central Angle of Restrictor Plate on Pipe = 2.14 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 7.00 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 60.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.80 feet
Stage at Top of Freeboard = 8.80 feet
Basin Area at Top of Freeboard = 0.94 acres
Basin Volume at Top of Freeboard = 5.10 acre-ft

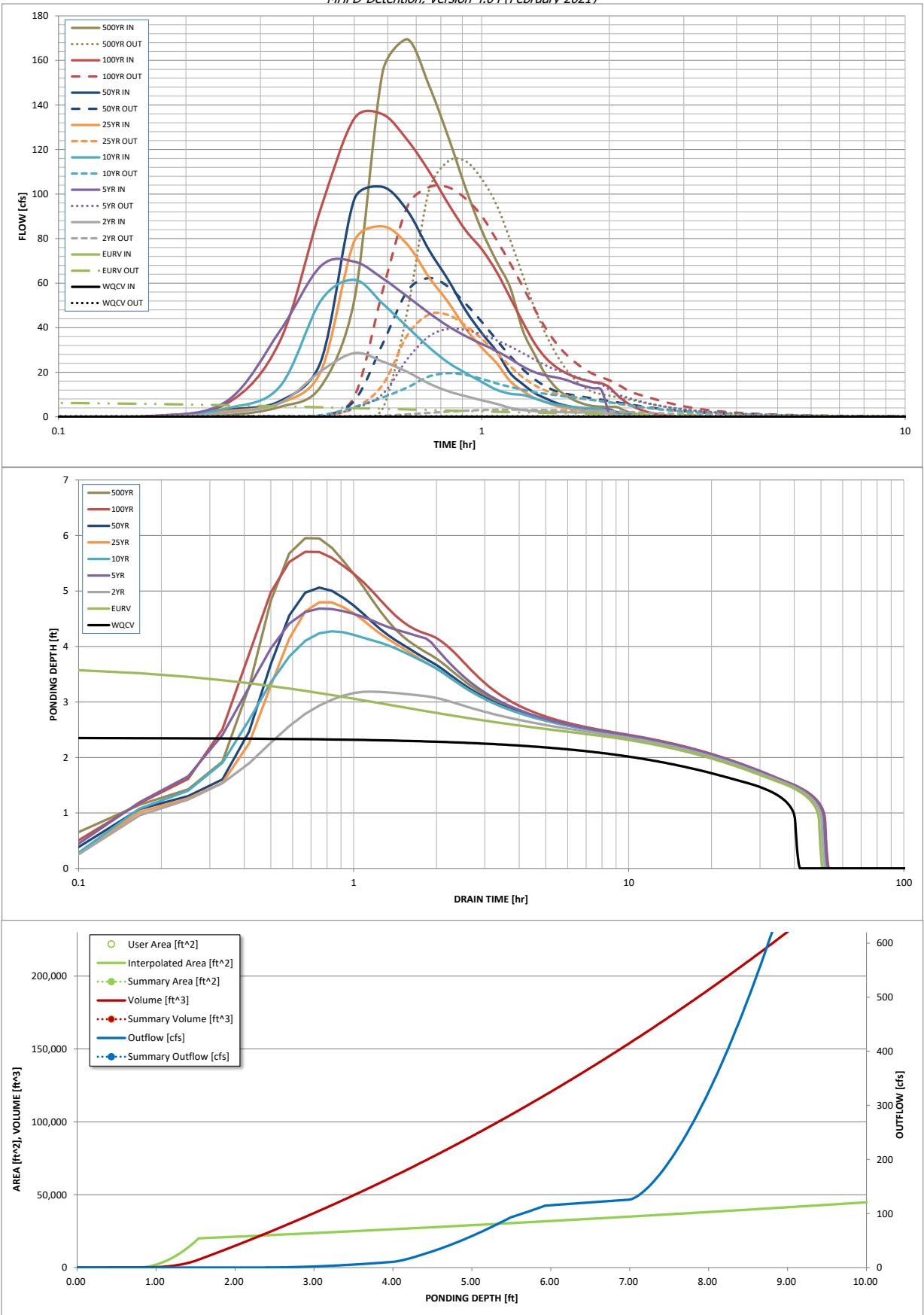
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.520	1.261	1.226	1.996	2.708	3.784	4.596	5.681	7.783
CUHP Runoff Volume (acre-ft) =	N/A	N/A	1.226	4.578	2.708	3.784	4.596	8.724	7.783
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	9.0	25.3	37.9	62.0	78.4	99.1	137.2
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.22	0.96	0.91	1.49	1.89	2.81	3.30
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	28.6	69.6	61.5	85.5	103.2	135.8	169.5
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	3.2	39.4	19.6	45.9	62.2	103.1	114.7
Peak Inflow Q (cfs) =	N/A	N/A	N/A	1.0	0.5	0.7	0.8	0.9	0.8
Peak Outflow Q (cfs) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.9	0.2	1.1	1.7	3.2	3.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	45	46	37	42	39	37	28	29
Time to Drain 99% of Inflow Volume (hours) =	40	48	49	46	48	47	46	42	43
Maximum Ponding Depth (ft) =	2.36	3.72	3.19	4.68	4.27	4.80	5.06	5.70	5.95
Area at Maximum Ponding Depth (acres) =	0.51	0.59	0.55	0.65	0.62	0.65	0.67	0.71	0.73
Maximum Volume Stored (acre-ft) =	0.522	1.265	0.957	1.858	1.598	1.929	2.108	2.551	2.732

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)



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: ...[SWM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.27	0.00	0.00	0.22	0.40	0.70
	0:15:00	0.00	0.00	1.84	7.09	3.80	2.57	3.17	6.01	4.42
	0:20:00	0.00	0.00	6.21	38.48	13.58	6.05	7.03	33.89	13.57
	0:25:00	0.00	0.00	20.49	67.67	52.13	20.37	24.85	93.63	52.58
	0:30:00	0.00	0.00	28.59	69.63	61.49	78.91	97.73	133.95	154.89
	0:35:00	0.00	0.00	24.76	62.10	50.77	85.48	103.19	135.78	169.46
	0:40:00	0.00	0.00	20.16	54.00	40.35	77.39	92.60	124.29	148.88
	0:45:00	0.00	0.00	14.94	46.63	31.22	62.69	74.92	110.29	125.63
	0:50:00	0.00	0.00	11.44	40.64	24.29	51.40	61.39	95.61	102.47
	0:55:00	0.00	0.00	9.23	36.18	19.62	39.56	47.65	83.59	83.62
	1:00:00	0.00	0.00	7.39	32.69	15.61	30.99	37.59	75.22	69.81
	1:05:00	0.00	0.00	5.81	29.50	12.14	24.16	29.44	65.17	58.06
	1:10:00	0.00	0.00	4.00	26.06	10.35	16.01	19.65	53.50	38.75
	1:15:00	0.00	0.00	3.01	22.56	9.76	11.60	14.65	42.49	27.91
	1:20:00	0.00	0.00	2.54	20.01	8.24	8.40	10.62	32.94	18.76
	1:25:00	0.00	0.00	2.28	18.54	6.59	6.53	8.22	26.39	12.92
	1:30:00	0.00	0.00	2.14	17.63	5.51	4.92	6.21	22.26	9.46
	1:35:00	0.00	0.00	2.04	16.51	4.77	3.94	4.98	19.57	7.13
	1:40:00	0.00	0.00	1.96	14.95	4.30	3.32	4.19	17.72	5.64
	1:45:00	0.00	0.00	1.92	13.73	3.97	2.92	3.68	16.45	4.78
	1:50:00	0.00	0.00	1.90	12.82	3.73	2.73	3.44	15.55	4.51
	1:55:00	0.00	0.00	1.59	12.02	3.37	2.61	3.29	14.99	4.39
	2:00:00	0.00	0.00	1.38	1.90	2.81	2.56	3.23	13.30	4.39
	2:05:00	0.00	0.00	0.92	1.25	1.86	1.68	2.12	9.94	2.89
	2:10:00	0.00	0.00	0.60	0.80	1.20	1.10	1.38	7.23	1.87
	2:15:00	0.00	0.00	0.39	0.49	0.76	0.70	0.88	5.23	1.18
	2:20:00	0.00	0.00	0.24	0.30	0.46	0.43	0.53	3.73	0.71
	2:25:00	0.00	0.00	0.14	0.19	0.27	0.26	0.32	2.62	0.42
	2:30:00	0.00	0.00	0.07	0.10	0.13	0.14	0.16	1.85	0.21
	2:35:00	0.00	0.00	0.03	0.04	0.04	0.05	0.06	1.26	0.07
	2:40:00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.81	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

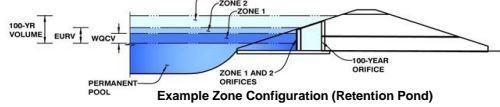
[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Flying Horse North**

Basin ID: **Pond 5**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	Note: L / W Ratio < 1
Watershed Area =	41.57 acres	L / W Ratio = 0.52
Watershed Length =	967 ft	
Watershed Length to Centroid =	450 ft	
Watershed Slope =	0.045 ft/ft	
Watershed Imperviousness =	29.60% percent	
Percentage Hydrologic Soil Group A =	0.0% percent	
Percentage Hydrologic Soil Group B =	100.0% percent	
Percentage Hydrologic Soil Groups C/D =	0.0% percent	
Target WQCV Drain Time =	40.0 hours	
Location for 1-hr Rainfall Depths =	User Input	

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

Water Quality Capture Volume (WQCV) =	0.520 acre-feet	Optional User Overrides	
Excess Urban Runoff Volume (EURV) =	1.261 acre-feet		
2-yr Runoff Volume (P1 = 1.19 in.) =	1.226 acre-feet	1.19 inches	
5-yr Runoff Volume (P1 = 1.5 in.) =	1.996 acre-feet	1.50 inches	
10-yr Runoff Volume (P1 = 1.75 in.) =	2.708 acre-feet	1.75 inches	
25-yr Runoff Volume (P1 = 2 in.) =	3.784 acre-feet	2.00 inches	
50-yr Runoff Volume (P1 = 2.25 in.) =	4.596 acre-feet	2.25 inches	
100-yr Runoff Volume (P1 = 2.52 in.) =	5.681 acre-feet	2.52 inches	
500-yr Runoff Volume (P1 = 3.14 in.) =	7.783 acre-feet		
Approximate 2-yr Detention Volume =	0.901 acre-feet		
Approximate 5-yr Detention Volume =	1.291 acre-feet		
Approximate 10-yr Detention Volume =	1.889 acre-feet		
Approximate 25-yr Detention Volume =	2.195 acre-feet		
Approximate 50-yr Detention Volume =	2.313 acre-feet		
Approximate 100-yr Detention Volume =	2.738 acre-feet		

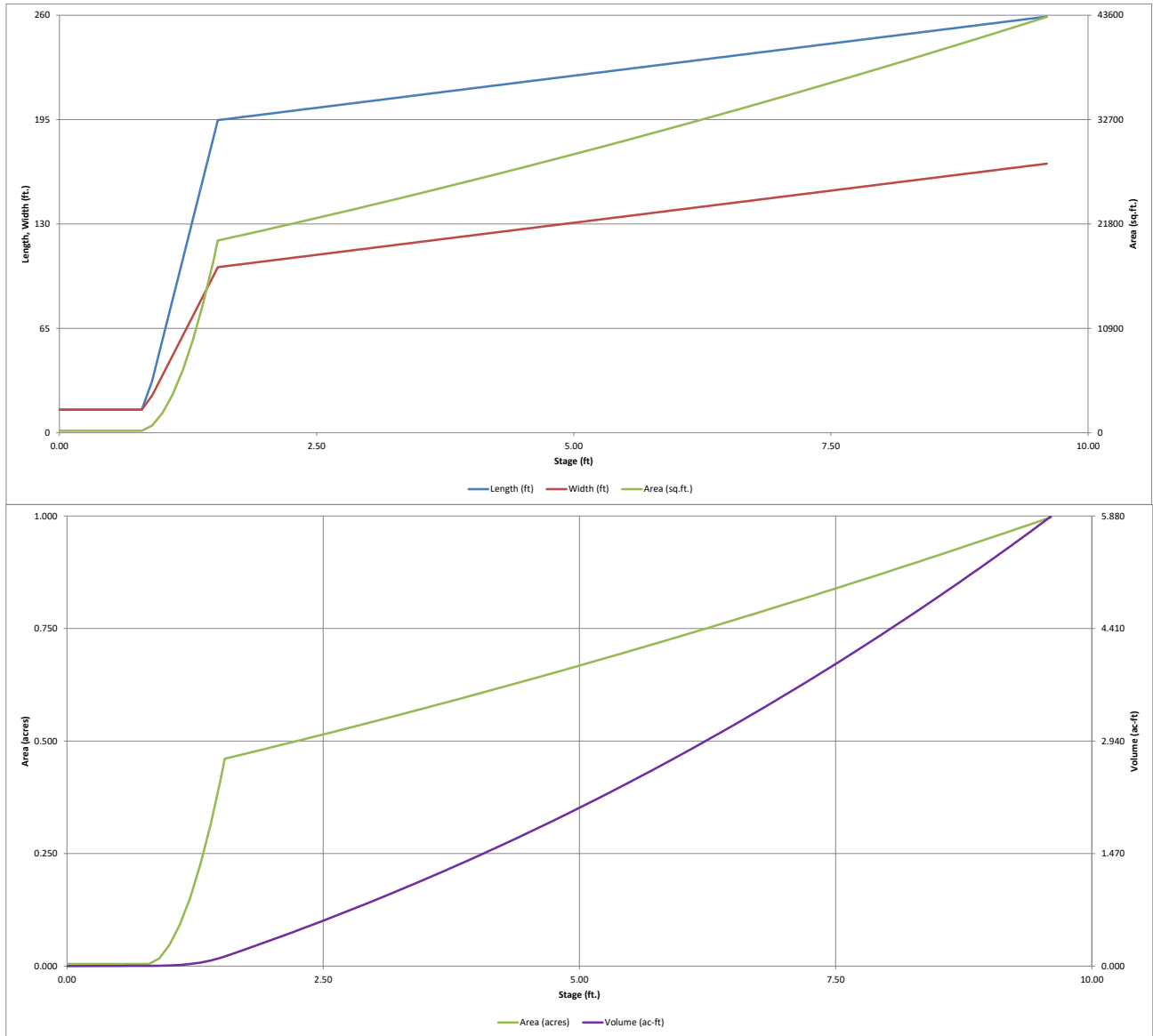
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.520 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.741 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.477 acre-feet
Total Detention Basin Volume =	2.738 acre-feet
Initial Surge Volume (ISV) =	68 ft ³
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H _{total}) =	6.00 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.004 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 H:V
Basin Length-to-Width Ratio (R _{LW}) =	2
Initial Surge Area (A _{ISV}) =	206 ft ²
Surcharge Volume Length (L _{ISV}) =	14.4 ft
Surcharge Volume Width (W _{ISV}) =	14.4 ft
Depth of Basin Floor (H _{FLOOR}) =	0.71 ft
Length of Basin Floor (L _{FLOOR}) =	194.7 ft
Width of Basin Floor (W _{FLOOR}) =	103.1 ft
Area of Basin Floor (A _{FLOOR}) =	20,074 ft ²
Volume of Basin Floor (V _{FLOOR}) =	5,281 ft ³
Depth of Main Basin (H _{MAIN}) =	4.46 ft
Length of Main Basin (L _{MAIN}) =	230.4 ft
Width of Main Basin (W _{MAIN}) =	138.8 ft
Area of Main Basin (A _{MAIN}) =	31,973 ft ²
Volume of Main Basin (V _{MAIN}) =	115,040 ft ³
Calculated Total Basin Volume (V _{total}) =	2.766 acre-feet

Depth Increment =	0.10	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		14.4	14.4	206		0.005		
ISV	0.33		14.4	14.4	206		0.005	68	0.002
	0.40		14.4	14.4	206		0.005	82	0.002
	0.50		14.4	14.4	206		0.005	103	0.002
	0.60		14.4	14.4	206		0.005	124	0.003
	0.70		14.4	14.4	206		0.005	144	0.003
	0.80		14.4	14.4	206		0.005	165	0.004
	0.90		32.1	23.1	742		0.017	202	0.005
	1.00		57.5	35.6	2,049		0.047	337	0.008
	1.10		82.9	48.1	3,990		0.092	633	0.015
	1.20		108.3	60.6	6,566		0.151	1,156	0.027
	1.30		133.7	73.1	9,777		0.224	1,968	0.045
	1.40		159.1	85.6	13,623		0.313	3,132	0.072
	1.50		184.5	98.1	18,104		0.416	4,713	0.108
Floor	1.54		194.7	103.1	20,074		0.461	5,477	0.126
	1.60		195.2	103.6	20,217		0.464	6,685	0.153
	1.70		196.0	104.4	20,457		0.470	8,719	0.200
	1.80		196.8	105.2	20,698		0.475	10,777	0.247
	1.90		197.6	106.0	20,940		0.481	12,859	0.295
	2.00		198.4	106.8	21,184		0.486	14,965	0.344
	2.10		199.2	107.6	21,428		0.492	17,095	0.392
	2.20		200.0	108.4	21,674		0.498	19,250	0.442
	2.30		200.8	109.2	21,922		0.503	21,430	0.492
Zone 1 (WQCV)	2.36		201.3	109.7	22,071		0.507	22,750	0.522
	2.40		201.6	110.0	22,170		0.509	23,635	0.543
	2.50		202.4	110.8	22,420		0.515	25,864	0.594
	2.60		203.2	111.6	22,671		0.520	28,119	0.646
	2.70		204.0	112.4	22,924		0.526	30,399	0.698
	2.80		204.8	113.2	23,177		0.532	32,704	0.751
	2.90		205.6	114.0	23,433		0.538	35,034	0.804
	3.00		206.4	114.8	23,689		0.544	37,390	0.858
	3.10		207.2	115.6	23,946		0.550	39,772	0.913
	3.20		208.0	116.4	24,205		0.556	42,180	0.968
	3.30		208.8	117.2	24,465		0.562	44,613	1.024
	3.40		209.6	118.0	24,727		0.568	47,073	1.081
	3.50		210.4	118.8	24,989		0.574	49,558	1.138
	3.60		211.2	119.6	25,253		0.580	52,071	1.195
	3.70		212.0	120.4	25,519		0.586	54,609	1.254
Zone 2 (EURV)	3.72		212.1	120.5	25,572		0.587	55,120	1.265
	3.80		212.8	121.2	25,785		0.592	57,174	1.313
	3.90		213.6	122.0	26,053		0.598	59,766	1.372
	4.00		214.4	122.8	26,322		0.604	62,385	1.432
	4.10		215.2	123.6	26,592		0.610	65,031	1.493
	4.20		216.0	124.4	26,864		0.617	67,704	1.554
	4.30		216.8	125.2	27,137		0.623	70,404	1.616
	4.40		217.6	126.0	27,411		0.629	73,131	1.679
	4.50		218.4	126.8	27,687		0.636	75,886	1.742
	4.60		219.2	127.6	27,963		0.642	78,668	1.806
	4.70		220.0	128.4	28,242		0.648	81,479	1.870
	4.80		220.8	129.2	28,521		0.655	84,317	1.936
	4.90		221.6	130.0	28,801		0.661	87,183	2.001
	5.00		222.4	130.8	29,083		0.668	90,077	2.068
	5.10		223.2	131.6	29,367		0.674	93,000	2.135
	5.20		224.0	132.4	29,651		0.681	95,950	2.203
	5.30		224.8	133.2	29,937		0.687	98,930	2.271
	5.40		225.6	134.0	30,224		0.694	101,938	2.340
	5.50		226.4	134.8	30,512		0.700	104,975	2.410
	5.60		227.2	135.6	30,802		0.707	108,040	2.480
	5.70		228.0	136.4	31,092		0.714	111,135	2.551
	5.80		228.8	137.2	31,385		0.720	114,259	2.623
	5.90		229.6	138.0	31,678		0.727	117,412	2.695
Zone 3 (100-year)	5.96		230.1	138.5	31,855		0.731	119,318	2.739
	6.00		230.4	138.8	31,973		0.734	120,594	2.768
	6.10		231.2	139.6	32,269		0.741	123,806	2.842
	6.20		232.0	140.4	32,566		0.748	127,048	2.917
	6.30		232.8	141.2	32,864		0.754	130,320	2.992
	6.40		233.6	142.0	33,164		0.761	133,621	3.068
	6.50		234.4	142.8	33,465		0.768	136,953	3.144
	6.60		235.2	143.6	33,768		0.775	140,314	3.221
	6.70		236.0	144.4	34,071		0.782	143,706	3.299
	6.80		236.8	145.2	34,376		0.789	147,128	3.378
	6.90		237.6	146.0	34,682		0.796	150,581	3.457
	7.00		238.4	146.8	34,990		0.803	154,065	3.537
	7.10		239.2	147.6	35,299		0.810	157,579	3.618
	7.20		240.0	148.4	35,609		0.817	161,125	3.699
	7.30		240.8	149.2	35,920		0.825	164,701	3.781
	7.40		241.6	150.0	36,233		0.832	168,309	3.864
	7.50		242.4	150.8	36,547		0.839	171,948	3.947
	7.60		243.2	151.6	36,862		0.846	175,618	4.032
	7.70		244.0	152.4	37,178		0.853	179,320	4.117
	7.80		244.8	153.2	37,496		0.861	183,054	4.202
	7.90		245.6	154.0	37,815		0.868	186,819	4.289
	8.00		246.4	154.8	38,135		0.875	190,617	4.376
	8.10		247.2	155.6	38,457		0.883	194,446	4.464
	8.20		248.0	156.4	38,780		0.890	198,308	4.553
	8.30		248.8	157.2	39,104		0.898	202,202	4.642
	8.40		249.6	158.0	39,429		0.905	206,129	4.732
	8.50		250.4	158.8	39,756		0.913	210,088	4.823
	8.60		251.2	159.6	40,084		0.920	214,080	4.915
	8.70		252.0	160.4	40,413		0.928	218,105	5.007
	8.80		252.8	161.2	40,744		0.935	222,163	5.100
	8.90		253.6	162.0	41,075		0.943	226,254	5.194
	9.00		254.4	162.8	41,408		0.951	230,378	5.289
	9.10		255.2	163.6	41,743		0.958	234,536	5.384
	9.20		256.0	164.4	42,079		0.966	238,727	5.480
	9.30		256.8	165.2	42,415		0.974	242,951	5.577
	9.40		257.6	166.0	42,754		0.981	247,210	5.675
	9.50		258.4	166.8	43,093		0.989	251,502	5.774
	9.60		259.2	167.6	43,434		0.997	255,828	5.873

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

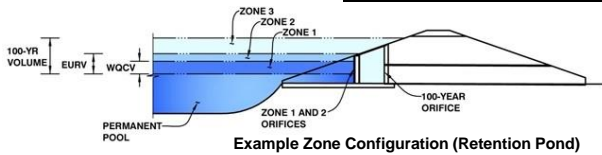


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Flying Horse North

Basin ID: Pond 5



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.36	0.520	Orifice Plate
Zone 2 (EURV)	3.72	0.741	Circular Orifice
Zone 3 (100-year)	5.96	1.477	Weir&Pipe (Restrict)
Total (all zones)		2.738	

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 ft²
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 = 2.36 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 9.40 inches
Orifice Plate: Orifice Area per Row = 1.77 sq. inches (diameter = 1-1/2 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = 1.229E-02 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	0.79	1.57					
Orifice Area (sq. inches)	1.77	1.77	1.77					

	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)

Invert of Vertical Orifice = 2.38 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = 3.59 ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = 24.00 inches

Calculated Parameters for Vertical Orifice
Zone 2 Circular Not Selected
Vertical Orifice Area = 3.14 ft²
Vertical Orifice Centroid = 1.00 feet

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

Overflow Weir Front Edge Height, H_o = 4.00 ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 6.00 feet
Overflow Weir Grate Slope = 0.00 H:V
Horiz. Length of Weir Sides = 6.00 feet
Overflow Grate Type = Type C Grate
Debris Clogging % = 50%

Calculated Parameters for Overflow Weir
Zone 3 Weir Not Selected
Height of Grate Upper Edge, H_u = 4.00 feet
Overflow Weir Slope Length = 6.00 feet
Grate Open Area / 100-yr Orifice Area = 2.41
Overflow Grate Open Area w/o Debris = 25.06 ft²
Overflow Grate Open Area w/ Debris = 12.53 ft²

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

Depth to Invert of Outlet Pipe = 1.00 ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 48.00 inches
Restrictor Plate Height Above Pipe Invert = 37.00 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Zone 3 Restrictor Not Selected
Outlet Orifice Area = 10.39 ft²
Outlet Orifice Centroid = 1.70 feet
Half-Central Angle of Restrictor Plate on Pipe = 2.14 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 7.00 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 60.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.80 feet
Stage at Top of Freeboard = 8.80 feet
Basin Area at Top of Freeboard = 0.94 acres
Basin Volume at Top of Freeboard = 5.10 acre-ft

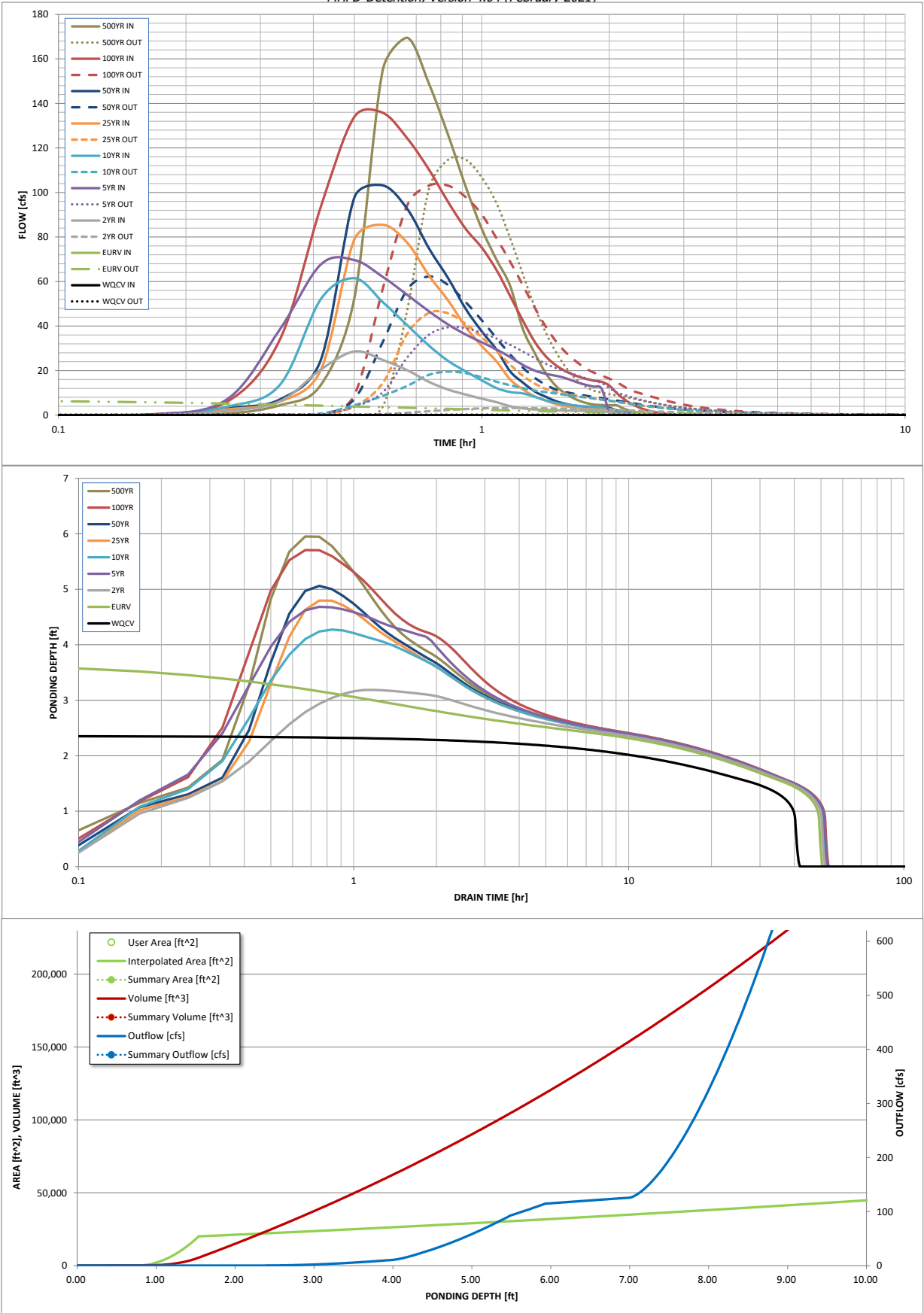
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.520	1.261	1.226	1.996	2.708	3.784	4.596	5.681	7.783
CUHP Runoff Volume (acre-ft) =	N/A	N/A	1.226	4.578	2.708	3.784	4.596	8.724	7.783
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	9.0	25.3	37.9	62.0	78.4	99.1	137.2
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.22	0.96	0.91	1.49	1.89	2.81	3.30
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	28.6	69.6	61.5	85.5	103.2	135.8	169.5
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	3.2	39.4	19.6	45.9	62.2	103.1	114.7
Peak Inflow Q (cfs) =	N/A	N/A	N/A	1.0	0.5	0.7	0.8	0.9	0.8
Peak Outflow Q (cfs) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.9	0.2	1.1	1.7	3.2	3.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	45	46	37	42	39	37	28	29
Time to Drain 99% of Inflow Volume (hours) =	40	48	49	46	48	47	46	42	43
Maximum Ponding Depth (ft) =	2.36	3.72	3.19	4.68	4.27	4.80	5.06	5.70	5.95
Area at Maximum Ponding Depth (acres) =	0.51	0.59	0.55	0.65	0.62	0.65	0.67	0.71	0.73
Maximum Volume Stored (acre-ft) =	0.522	1.265	0.957	1.858	1.598	1.929	2.108	2.551	2.732

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)



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: ...[SWM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

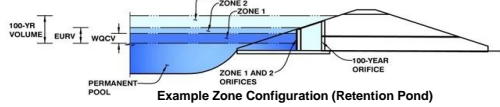
	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.27	0.00	0.00	0.22	0.40	0.70
	0:15:00	0.00	0.00	1.84	7.09	3.80	2.57	3.17	6.01	4.42
	0:20:00	0.00	0.00	6.21	38.48	13.58	6.05	7.03	33.89	13.57
	0:25:00	0.00	0.00	20.49	67.67	52.13	20.37	24.85	93.63	52.58
	0:30:00	0.00	0.00	28.59	69.63	61.49	78.91	97.73	133.95	154.89
	0:35:00	0.00	0.00	24.76	62.10	50.77	85.48	103.19	135.78	169.46
	0:40:00	0.00	0.00	20.16	54.00	40.35	77.39	92.60	124.29	148.88
	0:45:00	0.00	0.00	14.94	46.63	31.22	62.69	74.92	110.29	125.63
	0:50:00	0.00	0.00	11.44	40.64	24.29	51.40	61.39	95.61	102.47
	0:55:00	0.00	0.00	9.23	36.18	19.62	39.56	47.65	83.59	83.62
	1:00:00	0.00	0.00	7.39	32.69	15.61	30.99	37.59	75.22	69.81
	1:05:00	0.00	0.00	5.81	29.50	12.14	24.16	29.44	65.17	58.06
	1:10:00	0.00	0.00	4.00	26.06	10.35	16.01	19.65	53.50	38.75
	1:15:00	0.00	0.00	3.01	22.56	9.76	11.60	14.65	42.49	27.91
	1:20:00	0.00	0.00	2.54	20.01	8.24	8.40	10.62	32.94	18.76
	1:25:00	0.00	0.00	2.28	18.54	6.59	6.53	8.22	26.39	12.92
	1:30:00	0.00	0.00	2.14	17.63	5.51	4.92	6.21	22.26	9.46
	1:35:00	0.00	0.00	2.04	16.51	4.77	3.94	4.98	19.57	7.13
	1:40:00	0.00	0.00	1.96	14.95	4.30	3.32	4.19	17.72	5.64
	1:45:00	0.00	0.00	1.92	13.73	3.97	2.92	3.68	16.45	4.78
	1:50:00	0.00	0.00	1.90	12.82	3.73	2.73	3.44	15.55	4.51
	1:55:00	0.00	0.00	1.59	12.02	3.37	2.61	3.29	14.99	4.39
	2:00:00	0.00	0.00	1.38	1.90	2.81	2.56	3.23	13.30	4.39
	2:05:00	0.00	0.00	0.92	1.25	1.86	1.68	2.12	9.94	2.89
	2:10:00	0.00	0.00	0.60	0.80	1.20	1.10	1.38	7.23	1.87
	2:15:00	0.00	0.00	0.39	0.49	0.76	0.70	0.88	5.23	1.18
	2:20:00	0.00	0.00	0.24	0.30	0.46	0.43	0.53	3.73	0.71
	2:25:00	0.00	0.00	0.14	0.19	0.27	0.26	0.32	2.62	0.42
	2:30:00	0.00	0.00	0.07	0.10	0.13	0.14	0.16	1.85	0.21
	2:35:00	0.00	0.00	0.03	0.04	0.04	0.05	0.06	1.26	0.07
	2:40:00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.81	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Flying Horse North Master Drainage Plan**

Basin ID: **Pond 6**



Watershed Information

Selected BMP Type =	EDB
Watershed Area =	26.83 acres
Watershed Length =	1,140 ft
Watershed Length to Centroid =	570 ft
Watershed Slope =	0.039 ft/ft
Watershed Imperviousness =	33.19% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	100.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

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

Water Quality Capture Volume (WQCV) =	0.360 acre-feet
Excess Urban Runoff Volume (EURV) =	0.921 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.903 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	1.424 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	1.899 acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	2.602 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	3.143 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	3.855 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	5.243 acre-feet
Approximate 2-yr Detention Volume =	0.666 acre-feet
Approximate 5-yr Detention Volume =	0.945 acre-feet
Approximate 10-yr Detention Volume =	1.349 acre-feet
Approximate 25-yr Detention Volume =	1.543 acre-feet
Approximate 50-yr Detention Volume =	1.623 acre-feet
Approximate 100-yr Detention Volume =	1.899 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

Define Zones and Basin Geometry

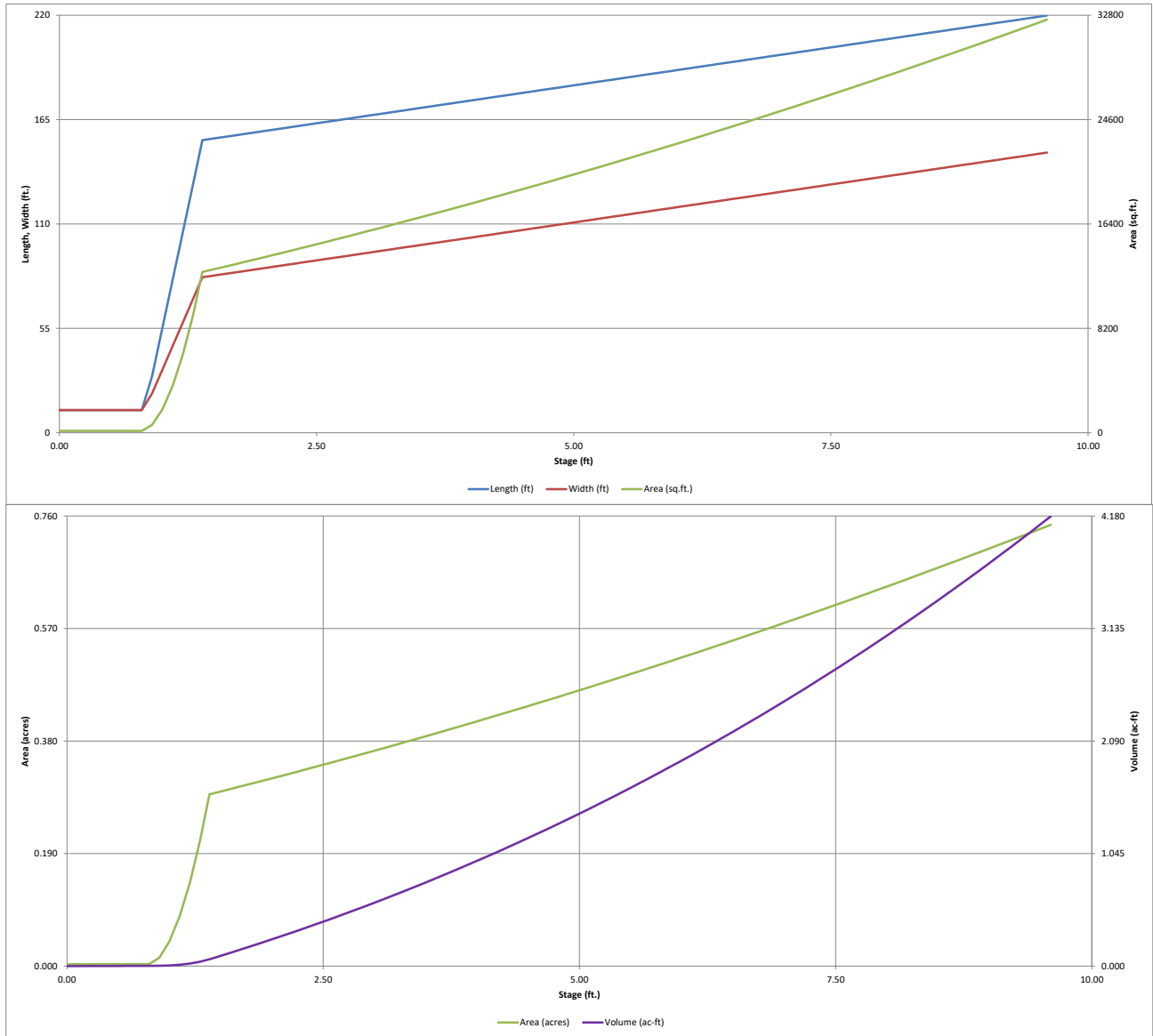
Zone 1 Volume (WQCV) =	0.360 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.561 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.978 acre-feet
Total Detention Basin Volume =	1.899 acre-feet
Initial Surge Volume (ISV) =	47 ft ³
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H _{total}) =	6.00 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.004 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 H:V
Basin Length-to-Width Ratio (R _{L/W}) =	2

Initial Surge Area (A _{ISV}) =	143 ft ²
Surcharge Volume Length (L _{ISV}) =	11.9 ft
Surcharge Volume Width (W _{ISV}) =	11.9 ft
Depth of Basin Floor (H _{FLOOR}) =	0.56 ft
Length of Basin Floor (L _{FLOOR}) =	154.2 ft
Width of Basin Floor (W _{FLOOR}) =	81.9 ft
Area of Basin Floor (A _{FLOOR}) =	12,634 ft ²
Volume of Basin Floor (V _{FLOOR}) =	2,636 ft ³
Depth of Main Basin (H _{MAIN}) =	4.61 ft
Length of Main Basin (L _{MAIN}) =	191.1 ft
Width of Main Basin (W _{MAIN}) =	118.8 ft
Area of Main Basin (A _{MAIN}) =	22,702 ft ²
Volume of Main Basin (V _{MAIN}) =	80,325 ft ³
Calculated Total Basin Volume (V _{total}) =	1.907 acre-feet

Depth Increment =	0.10	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		11.9	11.9	143		0.003		
ISV	0.33		11.9	11.9	143		0.003	47	0.001
	0.40		11.9	11.9	143		0.003	57	0.001
	0.50		11.9	11.9	143		0.003	71	0.002
	0.60		11.9	11.9	143		0.003	86	0.002
	0.70		11.9	11.9	143		0.003	100	0.002
	0.80		11.9	11.9	143		0.003	114	0.003
	0.90		29.7	20.7	615		0.014	143	0.003
	1.00		55.1	33.2	1,830		0.042	260	0.006
	1.10		80.5	45.7	3,679		0.084	530	0.012
	1.20		105.9	58.2	6,164		0.142	1,017	0.023
	1.30		131.3	70.7	9,283		0.213	1,784	0.041
Floor	1.39		154.2	81.9	12,634		0.290	2,766	0.064
	1.40		154.3	82.0	12,653		0.290	2,893	0.066
	1.50		155.1	82.8	12,842		0.295	4,168	0.096
	1.60		155.9	83.6	13,033		0.299	5,461	0.125
	1.70		156.7	84.4	13,226		0.304	6,774	0.156
	1.80		157.5	85.2	13,419		0.308	8,107	0.186
	1.90		158.3	86.0	13,614		0.313	9,458	0.217
	2.00		159.1	86.8	13,810		0.317	10,829	0.249
	2.10		159.9	87.6	14,007		0.322	12,220	0.281
	2.20		160.7	88.4	14,206		0.326	13,631	0.313
	2.30		161.5	89.2	14,406		0.331	15,062	0.346
Zone 1 (WQCV)	2.35		161.9	89.6	14,506		0.333	15,784	0.362
	2.40		162.3	90.0	14,607		0.335	16,512	0.379
	2.50		163.1	90.8	14,810		0.340	17,983	0.413
	2.60		163.9	91.6	15,013		0.345	19,474	0.447
	2.70		164.7	92.4	15,218		0.349	20,986	0.482
	2.80		165.5	93.2	15,425		0.354	22,518	0.517
	2.90		166.3	94.0	15,632		0.359	24,071	0.553
	3.00		167.1	94.8	15,841		0.364	25,644	0.589
	3.10		167.9	95.6	16,051		0.368	27,239	0.625
	3.20		168.7	96.4	16,263		0.373	28,855	0.662
	3.30		169.5	97.2	16,475		0.378	30,492	0.700
	3.40		170.3	98.0	16,689		0.383	32,150	0.738
	3.50		171.1	98.8	16,905		0.388	33,829	0.777
	3.60		171.9	99.6	17,121		0.393	35,531	0.816
	3.70		172.7	100.4	17,339		0.398	37,254	0.855
	3.80		173.5	101.2	17,558		0.403	38,999	0.895
Zone 2 (EURV)	3.87		174.0	101.8	17,712		0.407	40,233	0.924
	3.90		174.3	102.0	17,778		0.408	40,765	0.936
	4.00		175.1	102.8	18,000		0.413	42,554	0.977
	4.10		175.9	103.6	18,223		0.418	44,365	1.018
	4.20		176.7	104.4	18,447		0.423	46,199	1.061
	4.30		177.5	105.2	18,673		0.429	48,055	1.103
	4.40		178.3	106.0	18,900		0.434	49,934	1.146
	4.50		179.1	106.8	19,128		0.439	51,835	1.190
	4.60		179.9	107.6	19,357		0.444	53,759	1.234
	4.70		180.7	108.4	19,588		0.450	55,706	1.279
	4.80		181.5	109.2	19,820		0.455	57,677	1.324
	4.90		182.3	110.0	20,053		0.460	59,670	1.370
	5.00		183.1	110.8	20,287		0.466	61,687	1.416
	5.10		183.9	111.6	20,523		0.471	63,728	1.463
	5.20		184.7	112.4	20,760		0.477	65,792	1.510
	5.30		185.5	113.2	20,998		0.482	67,880	1.558
	5.40		186.3	114.0	21,238		0.488	69,992	1.607
	5.50		187.1	114.8	21,479		0.493	72,127	1.656
	5.60		187.9	115.6	21,721		0.499	74,287	1.705
	5.70		188.7	116.4	21,964		0.504	76,472	1.756
	5.80		189.5	117.2	22,209		0.510	78,680	1.806
	5.90		190.3	118.0	22,455		0.515	80,914	1.858
Zone 3 (100-year)	5.98		190.9	118.7	22,653		0.520	82,718	1.899
	6.00		191.1	118.8	22,702		0.521	83,171	1.909
	6.10		191.9	119.6	22,951		0.527	85,454	1.962
	6.20		192.7	120.4	23,201		0.533	87,762	2.015
	6.30		193.5	121.2	23,452		0.538	90,094	2.068
	6.40		194.3	122.0	23,704		0.544	92,452	2.122
	6.50		195.1	122.8	23,958		0.550	94,835	2.177
	6.60		195.9	123.6	24,213		0.556	97,244	2.232
	6.70		196.7	124.4	24,469		0.562	99,678	2.288
	6.80		197.5	125.2	24,727		0.568	102,137	2.345
	6.90		198.3	126.0	24,985		0.574	104,623	2.402
	7.00		199.1	126.8	25,245		0.580	107,135	2.459
	7.10		199.9	127.6	25,507		0.586	109,672	2.518
	7.20		200.7	128.4	25,769		0.592	112,236	2.577
	7.30		201.5	129.2	26,033		0.598	114,826	2.636
	7.40		202.3	130.0	26,298		0.604	117,443	2.696
	7.50		203.1	130.8	26,565		0.610	120,086	2.757
	7.60		203.9	131.6	26,833		0.616	122,756	2.818
	7.70		204.7	132.4	27,102		0.622	125,452	2.880
	7.80		205.5	133.2	27,372		0.628	128,176	2.943
	7.90		206.3	134.0	27,644		0.635	130,927	3.006
	8.00		207.1	134.8	27,916		0.641	133,705	3.069
	8.10		207.9	135.6	28,191		0.647	136,510	3.134
	8.20		208.7	136.4	28,466		0.653	139,343	3.199
	8.30		209.5	137.2	28,743		0.660	142,203	3.265
	8.40		210.3	138.0	29,021		0.666	145,092	3.331
	8.50		211.1	138.8	29,300		0.673	148,008	3.398
	8.60		211.9	139.6	29,581		0.679	150,952	3.465
	8.70		212.7	140.4	29,862		0.686	153,924	3.534
	8.80		213.5	141.2	30,145		0.692	156,924	3.602
	8.90		214.3	142.0	30,430		0.699	159,953	3.672
	9.00		215.1	142.8	30,715		0.705	163,010	3.742
	9.10		215.9	143.6	31,002		0.712	166,096	3.813
	9.20		216.7	144.4	31,291		0.718	169,211	3.885
	9.30		217.5	145.2	31,580		0.725	172,354	3.957
	9.40		218.3	146.0	31,871		0.732	175,527	4.030
	9.50		219.1	146.8	32,163		0.738	178,728	4.103
	9.60		219.9	147.6	32,456		0.745	181,959	4.177

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

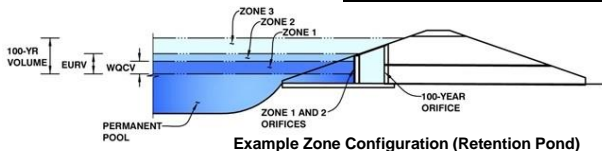


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 6



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.35	0.360	Orifice Plate
Zone 2 (EURV)	3.87	0.561	Circular Orifice
Zone 3 (100-year)	5.98	0.978	Weir&Pipe (Restrict)
Total (all zones)		1.899	

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 ft²
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 = 2.35 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 9.40 inches
Orifice Plate: Orifice Area per Row = 1.27 sq. inches (diameter = 1-1/4 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = 8.819E-03 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	0.78	1.57					
Orifice Area (sq. inches)	1.27	1.27	1.27					

	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)

Invert of Vertical Orifice = 2.35 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = 3.87 ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = 12.00 inches

Calculated Parameters for Vertical Orifice
Zone 2 Circular Not Selected
Vertical Orifice Area = 0.79 ft²
Vertical Orifice Centroid = 0.50 feet

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

Overflow Weir Front Edge Height, H_o = 4.20 ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 1.50 feet
Overflow Weir Grate Slope = 0.00 H:V
Horiz. Length of Weir Sides = 1.50 feet
Overflow Grate Type = Type C Grate
Debris Clogging % = 50%

Calculated Parameters for Overflow Weir
Zone 3 Weir Not Selected
Height of Grate Upper Edge, H_u = 4.20 feet
Overflow Weir Slope Length = 1.50 feet
Grate Open Area / 100-yr Orifice Area = 0.39
Overflow Grate Open Area w/o Debris = 1.57 ft²
Overflow Grate Open Area w/ Debris = 0.78 ft²

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

Depth to Invert of Outlet Pipe = 1.00 ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 30.00 inches
Restrictor Plate Height Above Pipe Invert = 23.00 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Zone 3 Restrictor Not Selected
Outlet Orifice Area = 4.04 ft²
Outlet Orifice Centroid = 1.05 feet
Half-Central Angle of Restrictor Plate on Pipe = 2.13 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 7.30 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 29.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.93 feet
Stage at Top of Freeboard = 9.23 feet
Basin Area at Top of Freeboard = 0.72 acres
Basin Volume at Top of Freeboard = 3.91 acre-ft

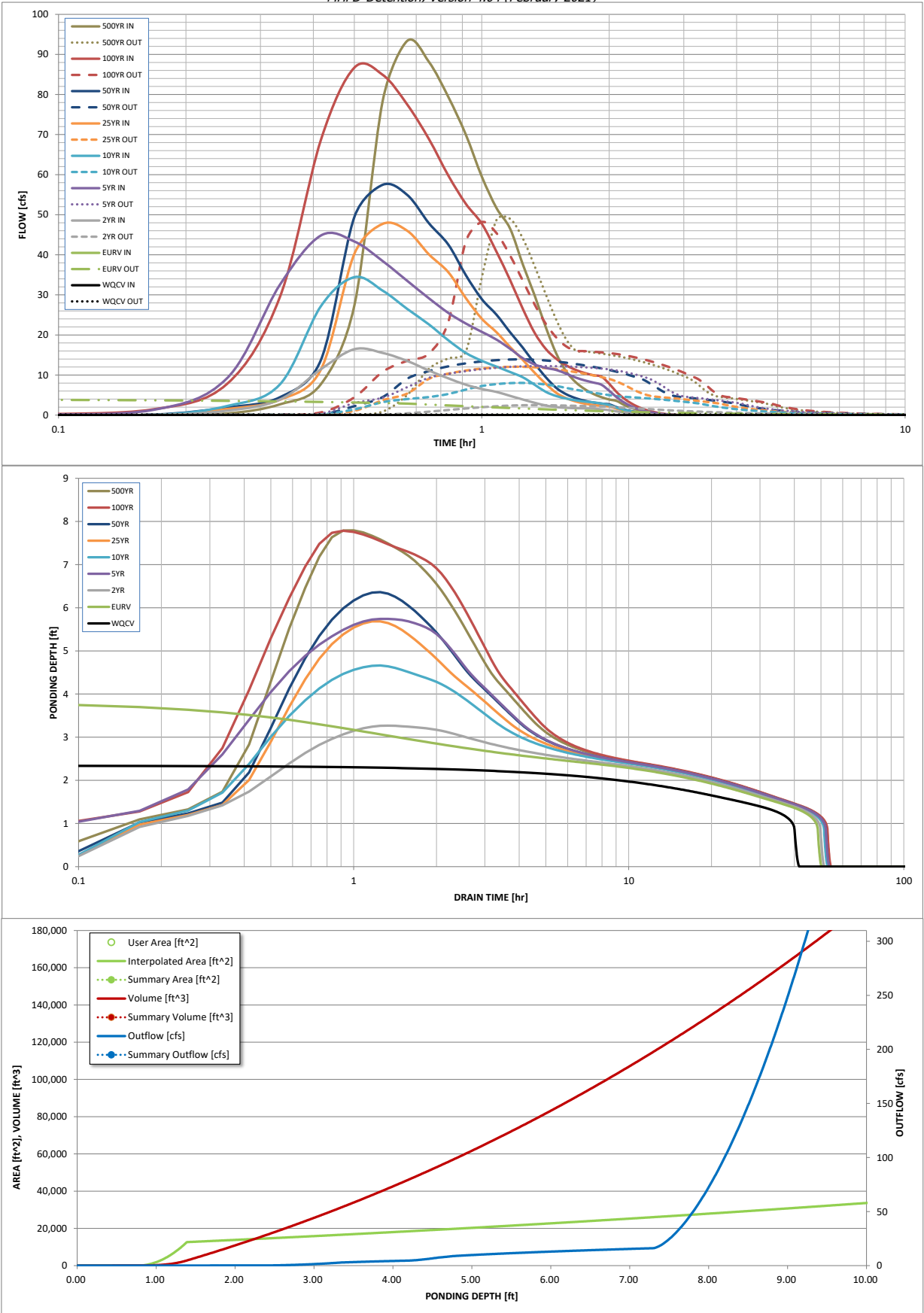
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.360	0.921	0.903	1.424	1.899	2.602	3.143	3.855	5.243
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.903	3.107	1.899	2.602	3.143	5.635	5.243
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.3	11.6	17.2	30.3	37.9	47.5	65.9
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.16	0.43	0.64	1.13	1.41	1.77	2.46
Peak Inflow Q (cfs) =	N/A	N/A	16.5	44.8	34.4	47.7	57.5	86.7	93.4
Peak Outflow Q (cfs) =	0.2	4.0	2.5	12.2	8.0	12.1	13.9	48.2	49.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.5	0.4	0.4	1.0	0.7
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	3.5	1.7	3.4	4.2	5.4	5.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	44	46	38	43	40	38	30	31
Time to Drain 99% of Inflow Volume (hours) =	40	48	49	47	48	48	47	44	44
Maximum Ponding Depth (ft) =	2.35	3.87	3.27	5.74	4.66	5.68	6.36	7.79	7.79
Area at Maximum Ponding Depth (acres) =	0.33	0.41	0.38	0.51	0.45	0.50	0.54	0.63	0.63
Maximum Volume Stored (acre-ft) =	0.362	0.924	0.685	1.776	1.261	1.745	2.101	2.930	2.936

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)



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: ...[SWM]Outflow hydrographs[Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.09	0.00
	0:10:00	0.00	0.00	0.00	1.28	0.00	0.00	0.13	1.42	0.41
	0:15:00	0.00	0.00	1.10	9.19	2.27	1.53	1.91	7.77	2.68
	0:20:00	0.00	0.00	3.88	32.51	7.65	3.83	4.46	29.44	7.72
	0:25:00	0.00	0.00	11.46	44.81	27.18	11.35	13.73	68.64	27.37
	0:30:00	0.00	0.00	16.45	43.32	34.42	40.25	49.45	86.70	78.42
	0:35:00	0.00	0.00	15.52	38.43	31.05	47.72	57.47	84.90	93.38
	0:40:00	0.00	0.00	13.51	33.50	26.49	46.00	54.93	77.48	88.14
	0:45:00	0.00	0.00	11.12	29.15	22.63	40.10	47.88	68.88	79.41
	0:50:00	0.00	0.00	9.18	25.51	18.68	35.67	42.56	59.79	70.00
	0:55:00	0.00	0.00	7.60	22.86	15.52	29.20	34.93	52.73	59.52
	1:00:00	0.00	0.00	6.52	20.78	13.55	24.05	28.95	47.77	51.66
	1:05:00	0.00	0.00	5.79	18.84	12.11	20.68	25.05	40.76	46.51
	1:10:00	0.00	0.00	4.81	16.55	10.75	16.99	20.66	33.68	37.61
	1:15:00	0.00	0.00	3.90	14.19	9.44	13.77	16.83	26.52	29.85
	1:20:00	0.00	0.00	3.08	12.64	7.58	10.57	12.86	20.51	21.91
	1:25:00	0.00	0.00	2.40	11.79	5.80	7.81	9.45	16.51	15.33
	1:30:00	0.00	0.00	2.00	11.26	4.76	5.55	6.78	14.04	10.88
	1:35:00	0.00	0.00	1.82	10.33	4.13	4.22	5.21	12.41	8.22
	1:40:00	0.00	0.00	1.74	9.38	3.70	3.41	4.23	11.29	6.50
	1:45:00	0.00	0.00	1.68	8.67	3.39	2.88	3.58	10.51	5.31
	1:50:00	0.00	0.00	1.64	8.14	3.18	2.53	3.16	9.96	4.49
	1:55:00	0.00	0.00	1.43	7.59	2.90	2.31	2.88	9.61	3.90
	2:00:00	0.00	0.00	1.25	6.09	2.51	2.16	2.68	7.83	3.53
	2:05:00	0.00	0.00	0.94	4.45	1.84	1.59	1.97	5.73	2.57
	2:10:00	0.00	0.00	0.69	3.20	1.32	1.15	1.42	4.16	1.84
	2:15:00	0.00	0.00	0.51	2.27	0.94	0.82	1.02	3.00	1.33
	2:20:00	0.00	0.00	0.37	1.57	0.68	0.59	0.73	2.12	0.96
	2:25:00	0.00	0.00	0.26	1.08	0.48	0.41	0.51	1.48	0.67
	2:30:00	0.00	0.00	0.18	0.73	0.33	0.29	0.36	1.02	0.47
	2:35:00	0.00	0.00	0.12	0.48	0.22	0.20	0.25	0.66	0.32
	2:40:00	0.00	0.00	0.08	0.28	0.14	0.13	0.16	0.39	0.20
	2:45:00	0.00	0.00	0.04	0.15	0.07	0.07	0.09	0.20	0.11
	2:50:00	0.00	0.00	0.02	0.07	0.03	0.03	0.04	0.09	0.04
	2:55:00	0.00	0.00	0.01	0.02	0.01	0.01	0.01	0.03	0.01
	3:00:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

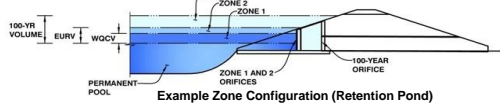
[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Flying Horse North Master Drainage Plan**

Basin ID: **Pond 7**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	Note: L / W Ratio < 1
Watershed Area =	114.73 acres	L / W Ratio = 0.57
Watershed Length =	1,683 ft	
Watershed Length to Centroid =	1,362 ft	
Watershed Slope =	0.040 ft/ft	
Watershed Imperviousness =	38.80% percent	
Percentage Hydrologic Soil Group A =	0.0% percent	
Percentage Hydrologic Soil Group B =	100.0% percent	
Percentage Hydrologic Soil Groups C/D =	0.0% percent	
Target WQCV Drain Time =	40.0 hours	
Location for 1-hr Rainfall Depths =	User Input	

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

Water Quality Capture Volume (WQCV) =	1.689 acre-feet	Optional User Overrides
Excess Urban Runoff Volume (EURV) =	4.663 acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	4.575 acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	6.891 acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	8.978 acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	11.989 acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	14.328 acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	17.379 acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	23.422 acre-feet	
Approximate 2-yr Detention Volume =	3.427 acre-feet	
Approximate 5-yr Detention Volume =	4.799 acre-feet	
Approximate 10-yr Detention Volume =	6.641 acre-feet	
Approximate 25-yr Detention Volume =	7.450 acre-feet	
Approximate 50-yr Detention Volume =	7.822 acre-feet	
Approximate 100-yr Detention Volume =	8.992 acre-feet	

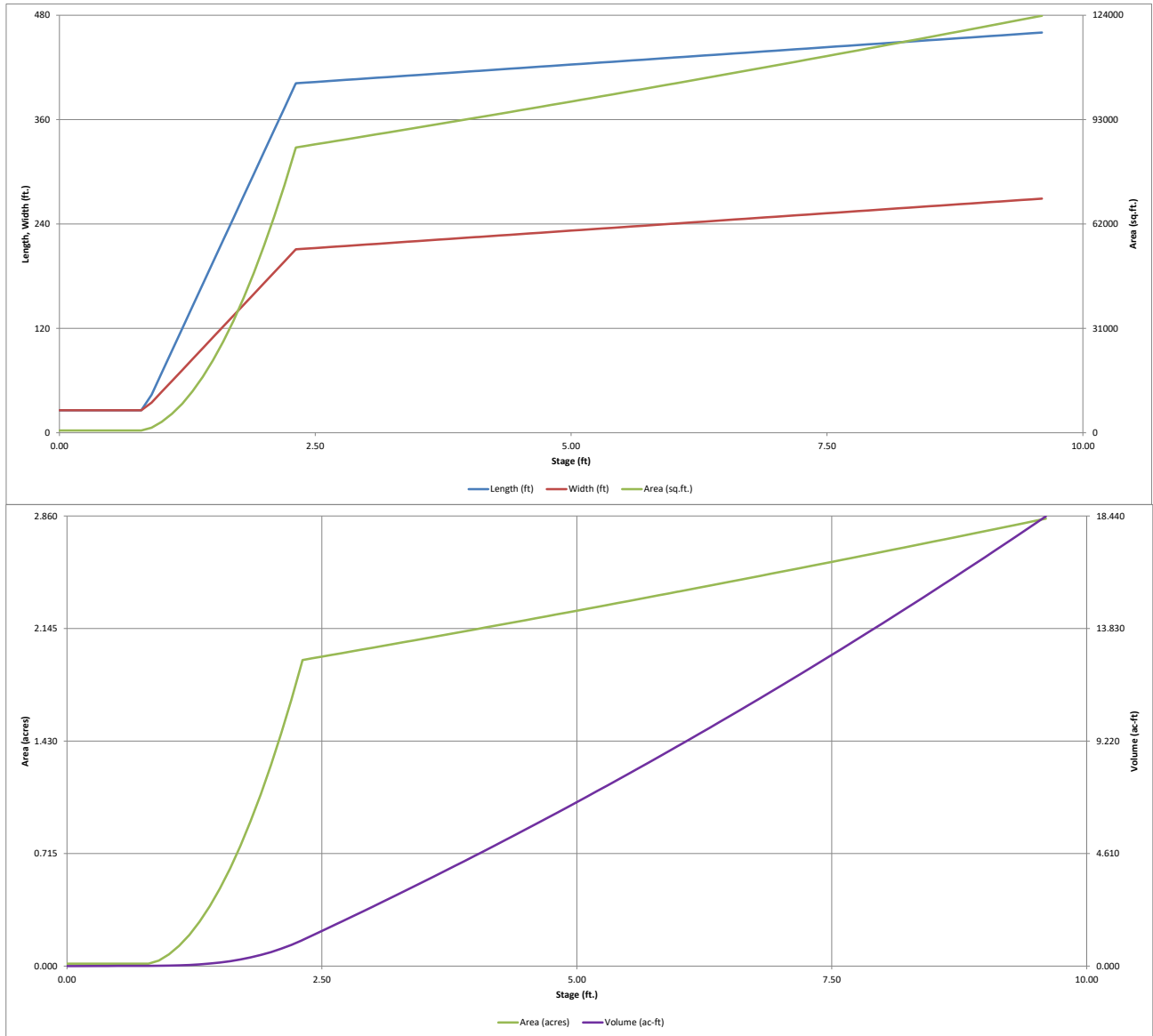
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.689 acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.974 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	4.329 acre-feet
Total Detention Basin Volume =	8.992 acre-feet
Initial Surge Volume (ISV) =	221 ft ³
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H _{total}) =	6.00 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.004 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 H:V
Basin Length-to-Width Ratio (L _W) =	2
Initial Surge Area (A _{ISV}) =	669 ft ²
Surcharge Volume Length (L _{ISV}) =	25.9 ft
Surcharge Volume Width (W _{ISV}) =	25.9 ft
Depth of Basin Floor (H _{FLOOR}) =	1.48 ft
Length of Basin Floor (L _{FLOOR}) =	401.8 ft
Width of Basin Floor (W _{FLOOR}) =	210.9 ft
Area of Basin Floor (A _{FLOOR}) =	84,720 ft ²
Volume of Basin Floor (V _{FLOOR}) =	45,839 ft ³
Depth of Main Basin (H _{MAIN}) =	3.69 ft
Length of Main Basin (L _{MAIN}) =	431.3 ft
Width of Main Basin (W _{MAIN}) =	240.4 ft
Area of Main Basin (A _{MAIN}) =	103,677 ft ²
Volume of Main Basin (V _{MAIN}) =	347,004 ft ³
Calculated Total Basin Volume (V _{total}) =	9.031 acre-feet

Depth Increment =	0.10	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		25.9	25.9	669		0.015		
ISV	0.33		25.9	25.9	669		0.015	221	0.005
	0.40		25.9	25.9	669		0.015	268	0.006
	0.50		25.9	25.9	669		0.015	334	0.008
	0.60		25.9	25.9	669		0.015	401	0.009
	0.70		25.9	25.9	669		0.015	468	0.011
	0.80		25.9	25.9	669		0.015	535	0.012
	0.90		43.6	34.6	1,510		0.035	630	0.014
	1.00		69.0	47.1	3,253		0.075	862	0.020
	1.10		94.4	59.6	5,630		0.129	1,301	0.030
	1.20		119.8	72.1	8,642		0.198	2,010	0.046
	1.30		145.2	84.6	12,289		0.282	3,051	0.070
	1.40		170.6	97.1	16,571		0.380	4,489	0.103
	1.50		196.0	109.6	21,488		0.493	6,386	0.147
	1.60		221.4	122.1	27,040		0.621	8,807	0.202
	1.70		246.8	134.6	33,228		0.763	11,815	0.271
	1.80		272.2	147.1	40,050		0.919	15,474	0.355
	1.90		297.6	159.6	47,507		1.091	19,847	0.456
	2.00		323.0	172.1	55,599		1.276	24,997	0.574
	2.10		348.4	184.6	64,326		1.477	30,988	0.711
	2.20		373.8	197.1	73,688		1.692	37,883	0.870
	2.30		399.2	209.6	83,685		1.921	45,746	1.050
Floor	2.31		401.8	210.9	84,720		1.945	46,588	1.070
	2.40		402.5	211.6	85,162		1.955	54,233	1.245
	2.50		403.3	212.4	85,654		1.966	62,774	1.441
	2.60		404.1	213.2	86,147		1.978	71,364	1.638
Zone 1 (WQCV)	2.63		404.3	213.4	86,295		1.981	73,950	1.698
	2.70		404.9	214.0	86,641		1.989	80,003	1.837
	2.80		405.7	214.8	87,137		2.000	88,692	2.036
	2.90		406.5	215.6	87,634		2.012	97,431	2.237
	3.00		407.3	216.4	88,132		2.023	106,219	2.438
	3.10		408.1	217.2	88,632		2.035	115,057	2.641
	3.20		408.9	218.0	89,133		2.046	123,945	2.845
	3.30		409.7	218.8	89,635		2.058	132,884	3.051
	3.40		410.5	219.6	90,138		2.069	141,872	3.257
	3.50		411.3	220.4	90,643		2.081	150,911	3.464
	3.60		412.1	221.2	91,149		2.092	160,001	3.673
	3.70		412.9	222.0	91,656		2.104	169,141	3.883
	3.80		413.7	222.8	92,165		2.116	178,332	4.094
	3.90		414.5	223.6	92,675		2.128	187,574	4.306
	4.00		415.3	224.4	93,186		2.139	196,867	4.519
Zone 2 (EURV)	4.07		415.9	224.9	93,544		2.147	203,403	4.669
	4.10		416.1	225.2	93,698		2.151	206,211	4.734
	4.20		416.9	226.0	94,212		2.163	215,607	4.950
	4.30		417.7	226.8	94,727		2.175	225,054	5.167
	4.40		418.5	227.6	95,243		2.186	234,552	5.385
	4.50		419.3	228.4	95,760		2.198	244,103	5.604
	4.60		420.1	229.2	96,279		2.210	253,705	5.824
	4.70		420.9	230.0	96,799		2.222	263,358	6.046
	4.80		421.7	230.8	97,321		2.234	273,064	6.269
	4.90		422.5	231.6	97,843		2.246	282,823	6.493
	5.00		423.3	232.4	98,367		2.258	292,633	6.718
	5.10		424.1	233.2	98,892		2.270	302,496	6.944
	5.20		424.9	234.0	99,419		2.282	312,412	7.172
	5.30		425.7	234.8	99,947		2.294	322,380	7.401
	5.40		426.5	235.6	100,476		2.307	332,401	7.631
	5.50		427.3	236.4	101,006		2.319	342,475	7.862
	5.60		428.1	237.2	101,538		2.331	352,602	8.095
	5.70		428.9	238.0	102,070		2.343	362,783	8.328
	5.80		429.7	238.8	102,605		2.355	373,016	8.563
	5.90		430.5	239.6	103,140		2.368	383,304	8.799
Zone 3 (100-year)	5.99		431.2	240.3	103,623		2.379	392,608	9.013
	6.00		431.3	240.4	103,677		2.380	393,644	9.037
	6.10		432.1	241.2	104,215		2.392	404,039	9.275
	6.20		432.9	242.0	104,754		2.405	414,487	9.515
	6.30		433.7	242.8	105,294		2.417	424,990	9.756
	6.40		434.5	243.6	105,836		2.430	435,546	9.999
	6.50		435.3	244.4	106,379		2.442	446,157	10.242
	6.60		436.1	245.2	106,924		2.455	456,822	10.487
	6.70		436.9	246.0	107,469		2.467	467,542	10.733
	6.80		437.7	246.8	108,016		2.480	478,316	10.981
	6.90		438.5	247.6	108,565		2.492	489,145	11.229
	7.00		439.3	248.4	109,114		2.505	500,029	11.479
	7.10		440.1	249.2	109,665		2.518	510,968	11.730
	7.20		440.9	250.0	110,217		2.530	521,962	11.983
	7.30		441.7	250.8	110,770		2.543	533,012	12.236
	7.40		442.5	251.6	111,325		2.556	544,116	12.491
	7.50		443.3	252.4	111,881		2.568	555,277	12.747
	7.60		444.1	253.2	112,438		2.581	566,493	13.005
	7.70		444.9	254.0	112,997		2.594	577,764	13.264
	7.80		445.7	254.8	113,556		2.607	589,092	13.524
	7.90		446.5	255.6	114,117		2.620	600,476	13.785
	8.00		447.3	256.4	114,680		2.633	611,915	14.048
	8.10		448.1	257.2	115,243		2.646	623,411	14.312
	8.20		448.9	258.0	115,808		2.659	634,964	14.577
	8.30		449.7	258.8	116,374		2.672	646,573	14.843
	8.40		450.5	259.6	116,942		2.685	658,239	15.111
	8.50		451.3	260.4	117,510		2.698	669,962	15.380
	8.60		452.1	261.2	118,080		2.711	681,741	15.651
	8.70		452.9	262.0	118,652		2.724	693,578	15.922
	8.80		453.7	262.8	119,224		2.737	705,471	16.195
	8.90		454.5	263.6	119,798		2.750	717,422	16.470
	9.00		455.3	264.4	120,373		2.763	729,431	16.745
	9.10		456.1	265.2	120,949		2.777	741,497	17.022
	9.20		456.9	266.0	121,527		2.790	753,621	17.301
	9.30		457.7	266.8	122,106		2.803	765,803	17.580
	9.40		458.5	267.6	122,686		2.816	778,042	17.861
	9.50		459.3	268.4	123,268		2.830	790,340	18.144
	9.60		460.1	269.2	123,851		2.843	802,696	18.427

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

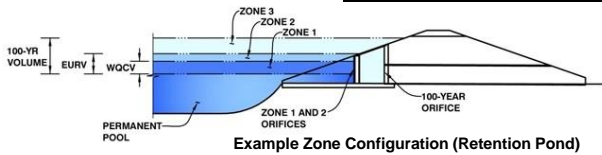


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 7



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.63	1.689	Orifice Plate
Zone 2 (EURV)	4.07	2.974	Weir&Pipe (Circular)
Zone 3 (100-year)	5.99	4.329	Weir&Pipe (Restrict)
Total (all zones)		8.992	

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 ft²
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 = 2.65 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 10.60 inches
Orifice Plate: Orifice Area per Row = 5.17 sq. inches (use rectangular openings)

Calculated Parameters for Plate
WQ Orifice Area per Row = 3.590E-02 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	0.88	1.77					
Orifice Area (sq. inches)	5.17	5.17	5.17					

	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
Vertical Orifice Area = N/A ft²
Vertical Orifice Centroid = N/A feet

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

	Zone 2 Weir	Zone 3 Weir	
Overflow Weir Front Edge Height, H _o =	4.50	4.70	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.00	10.00	feet
Overflow Weir Grate Slope =	0.00	4.00	H:V
Horiz. Length of Weir Sides =	6.00	12.00	feet
Overflow Grate Type =	Type C Grate	Type C Grate	
Debris Clogging % =	50%	50%	%

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = 4.50 feet
Overflow Weir Slope Length = 6.00 feet
Grate Open Area / 100-yr Orifice Area = 3.54
Overflow Grate Open Area w/o Debris = 25.06 ft²
Overflow Grate Open Area w/ Debris = 12.53 ft²

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

	Zone 2 Circular	Zone 3 Restrictor	
Depth to Invert of Outlet Pipe =	2.50	2.70	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter or Pipe Diameter =	36.00	72.00	inches
Restrictor Plate Height Above Pipe Invert =		60.00	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = 7.07 ft²
Outlet Orifice Centroid = 1.50 feet
Half-Central Angle of Restrictor Plate on Pipe = N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 7.80 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 119.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.98 feet
Stage at Top of Freeboard = 9.78 feet
Basin Area at Top of Freeboard = 2.87 acres
Basin Volume at Top of Freeboard = 18.94 acre-ft

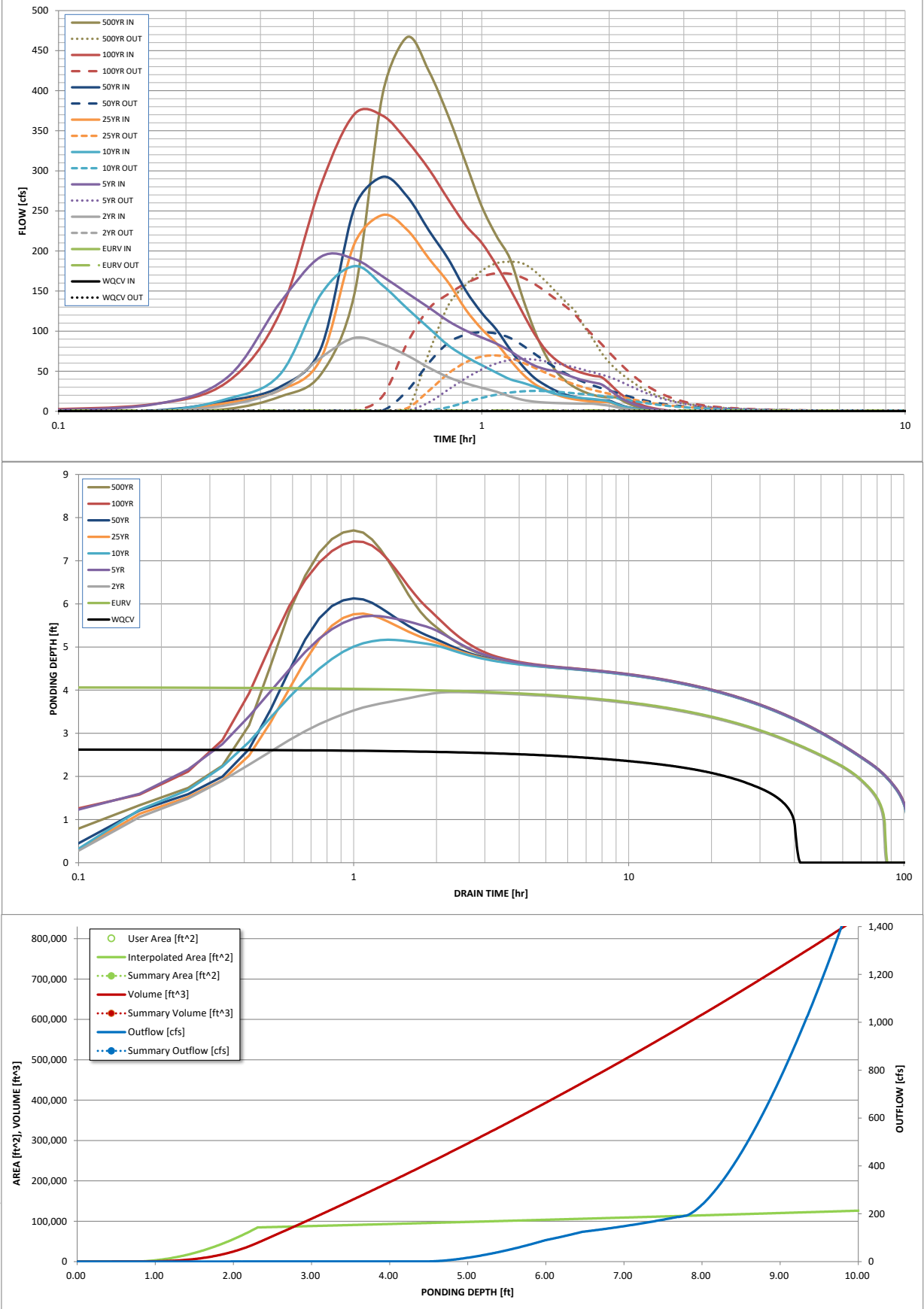
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	1.689	4.663	4.575	6.891	8.978	11.989	14.328	17.379	23.422
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.575	13.698	8.978	11.989	14.328	24.727	23.422
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	19.1	53.5	79.8	138.4	173.6	217.5	301.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		65.3				191.6	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.17	0.57	0.70	1.21	1.51	1.67	2.63
Peak Inflow Q (cfs) =	N/A	N/A	91.6	192.8	181.1	244.9	292.5	370.7	466.9
Peak Outflow Q (cfs) =	0.7	0.9	0.9	65.4	25.4	69.6	98.6	172.2	186.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.3	0.5	0.6	0.9	0.6
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	2.1	0.8	2.2	3.0	3.9	4.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	0.1	0.0	0.1	0.2	0.9	1.0
Time to Drain 97% of Inflow Volume (hours) =	38	80	80	90	94	91	89	82	83
Time to Drain 99% of Inflow Volume (hours) =	40	84	83	99	100	99	98	95	95
Maximum Ponding Depth (ft) =	2.63	4.07	3.95	5.73	5.17	5.77	6.13	7.45	7.70
Area at Maximum Ponding Depth (acres) =	1.98	2.15	2.13	2.35	2.28	2.35	2.39	2.56	2.59
Maximum Volume Stored (acre-ft) =	1.698	4.669	4.413	8.375	7.081	8.493	9.323	12.594	13.264

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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: ...[SWMM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	1.15	0.00
	0:10:00	0.00	0.00	0.00	8.35	0.00	0.00	0.87	8.80	2.79
	0:15:00	0.00	0.00	7.53	41.96	15.37	10.35	12.91	36.23	18.14
	0:20:00	0.00	0.00	26.66	135.18	45.76	26.13	30.39	122.53	46.04
	0:25:00	0.00	0.00	66.84	192.81	145.94	65.52	78.49	282.20	146.25
	0:30:00	0.00	0.00	91.59	189.89	181.09	208.88	253.77	370.69	396.24
	0:35:00	0.00	0.00	83.49	168.08	156.84	244.93	292.46	368.77	466.90
	0:40:00	0.00	0.00	69.51	147.36	128.13	226.22	267.84	337.06	424.31
	0:45:00	0.00	0.00	54.32	129.31	103.79	190.55	225.54	301.99	368.42
	0:50:00	0.00	0.00	42.53	112.57	82.17	160.69	189.97	264.23	309.75
	0:55:00	0.00	0.00	34.81	100.65	68.10	126.75	150.57	231.91	255.54
	1:00:00	0.00	0.00	29.24	91.99	57.54	102.55	122.63	210.05	218.61
	1:05:00	0.00	0.00	24.37	84.30	48.10	84.65	101.75	182.04	189.95
	1:10:00	0.00	0.00	18.53	75.10	39.94	63.92	77.12	152.54	140.96
	1:15:00	0.00	0.00	14.20	64.91	35.46	46.28	56.24	122.62	100.15
	1:20:00	0.00	0.00	11.95	56.89	30.57	33.94	41.44	96.04	69.57
	1:25:00	0.00	0.00	10.84	52.28	25.28	26.43	32.25	76.32	49.57
	1:30:00	0.00	0.00	10.26	49.65	21.53	20.77	25.24	63.82	37.19
	1:35:00	0.00	0.00	9.94	45.63	19.01	16.94	20.45	55.99	29.25
	1:40:00	0.00	0.00	9.68	41.44	17.27	14.62	17.52	50.64	23.93
	1:45:00	0.00	0.00	9.50	38.27	16.09	13.10	15.56	46.97	20.37
	1:50:00	0.00	0.00	9.40	35.96	15.24	12.09	14.28	44.36	18.18
	1:55:00	0.00	0.00	8.11	33.53	13.98	11.56	13.59	42.55	17.39
	2:00:00	0.00	0.00	7.01	27.14	12.28	11.24	13.17	34.89	17.03
	2:05:00	0.00	0.00	5.02	19.98	8.67	8.06	9.43	25.68	12.26
	2:10:00	0.00	0.00	3.38	14.45	5.83	5.40	6.30	18.63	8.24
	2:15:00	0.00	0.00	2.27	10.39	3.91	3.64	4.25	13.59	5.54
	2:20:00	0.00	0.00	1.48	7.28	2.54	2.37	2.76	9.71	3.59
	2:25:00	0.00	0.00	0.92	5.00	1.60	1.52	1.76	6.81	2.28
	2:30:00	0.00	0.00	0.53	3.43	0.95	0.94	1.09	4.77	1.39
	2:35:00	0.00	0.00	0.26	2.28	0.48	0.50	0.57	3.20	0.72
	2:40:00	0.00	0.00	0.10	1.39	0.18	0.20	0.22	1.96	0.26
	2:45:00	0.00	0.00	0.02	0.74	0.03	0.03	0.03	1.04	0.02
	2:50:00	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.45	0.00
	2:55:00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.15	0.00
	3:00:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.00
	3:05:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

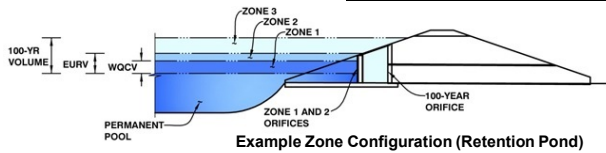
[illegible]

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North MDDP

Basin ID: Pond 8



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.39	0.178	Orifice Plate
Zone 2 (EURV)	3.67	0.221	Circular Orifice
Zone 3 (100-year)	5.97	0.543	Weir&Pipe (Restrict)
Total (all zones)		0.942	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = 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 = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 7/8 inch)

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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	0.80	1.59					
Orifice Area (sq. inches)	0.65	0.65	0.65					

	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)

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

Calculated Parameters for Vertical Orif
Zone 2 Circular = ft²
Not Selected = ft²
Vertical Orifice Centroid = feet
Not Selected = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Gate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Gate Type =
Debris Clogging % = %

Calculated Parameters for Overflow W
Zone 3 Weir = ft
Not Selected = ft
Height of Gate Upper Edge, H_u = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area = N/A
Overflow Gate Open Area w/o Debris = N/A
Overflow Gate Open Area w/ Debris = N/A

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl
Zone 3 Restrictor = ft²
Not Selected = ft²
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

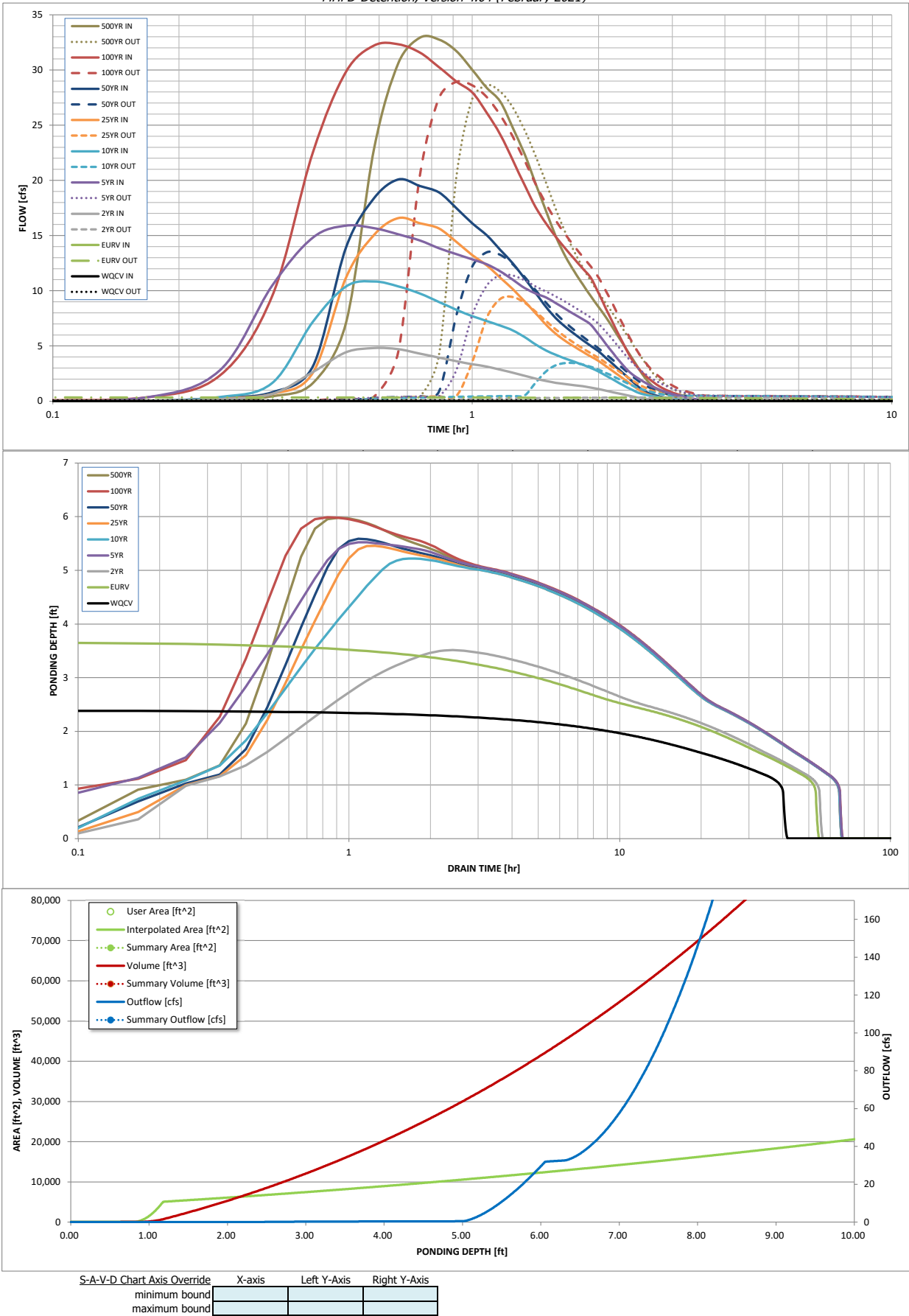
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	N/A	N/A	0.416	0.713	0.991	1.426	1.746	2.181
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.416	1.850	0.991	1.426	1.746	3.383
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.6	4.6	6.9	12.4	15.5	19.9
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	11.1	11.1	11.1	11.1	11.1	11.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	0.10	0.70	0.44	0.78	0.98	2.06
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	4.8	15.9	10.8	16.6	20.1	32.3
Peak Inflow Q (cfs) =	0.1	0.3	0.3	11.4	3.5	9.4	13.5	28.9
Peak Outflow Q (cfs) =	N/A	N/A	N/A	1.0	0.5	0.8	0.9	0.9
Ratio Peak Outflow to Predevelopment Q =	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Structure Controlling Flow =	N/A	N/A	N/A	0.8	0.2	0.6	0.9	2.1
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Gate 2 (fps) =	39	49	51	48	55	51	49	38
Time to Drain 97% of Inflow Volume (hours) =	40	52	54	59	62	60	59	54
Time to Drain 99% of Inflow Volume (hours) =	2.39	3.67	3.51	5.52	5.22	5.46	5.58	5.99
Maximum Ponding Depth (ft) =	0.15	0.19	0.19	0.26	0.25	0.26	0.27	0.28
Area at Maximum Ponding Depth (acres) =	0.179	0.399	0.369	0.821	0.741	0.802	0.837	0.946
Maximum Volume Stored (acre-ft) =								

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

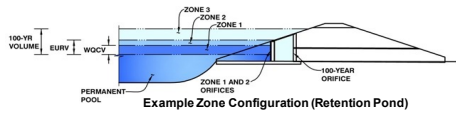
	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.06	0.00
	0:10:00	0.00	0.00	0.00	0.34	0.00	0.00	0.02	0.34	0.07
	0:15:00	0.00	0.00	0.18	2.78	0.37	0.25	0.31	2.31	0.44
	0:20:00	0.00	0.00	0.66	10.46	1.64	0.65	0.80	9.50	1.64
	0:25:00	0.00	0.00	2.63	14.81	7.18	2.58	3.15	22.52	7.13
	0:30:00	0.00	0.00	4.43	15.89	10.39	11.21	13.94	29.84	22.90
	0:35:00	0.00	0.00	4.81	15.66	10.85	15.07	18.39	32.21	30.64
	0:40:00	0.00	0.00	4.71	15.11	10.40	16.58	20.07	32.32	32.92
	0:45:00	0.00	0.00	4.31	14.56	9.75	16.12	19.49	31.57	32.76
	0:50:00	0.00	0.00	3.95	13.85	8.98	15.64	18.90	30.25	31.70
	0:55:00	0.00	0.00	3.62	13.31	8.27	14.42	17.48	28.95	30.01
	1:00:00	0.00	0.00	3.35	12.85	7.71	13.24	16.11	27.97	28.37
	1:05:00	0.00	0.00	3.13	12.39	7.26	12.28	15.01	26.11	27.13
	1:10:00	0.00	0.00	2.85	11.75	6.83	11.17	13.71	24.14	24.72
	1:15:00	0.00	0.00	2.57	10.98	6.41	10.13	12.46	21.80	22.36
	1:20:00	0.00	0.00	2.30	10.25	5.80	9.02	11.10	19.55	19.70
	1:25:00	0.00	0.00	2.04	9.75	5.13	7.96	9.80	17.56	17.19
	1:30:00	0.00	0.00	1.82	9.39	4.59	6.91	8.50	16.06	14.90
	1:35:00	0.00	0.00	1.66	8.88	4.19	6.09	7.51	14.87	13.13
	1:40:00	0.00	0.00	1.55	8.36	3.86	5.46	6.74	13.83	11.76
	1:45:00	0.00	0.00	1.45	7.87	3.57	4.94	6.10	12.89	10.57
	1:50:00	0.00	0.00	1.35	7.42	3.30	4.47	5.53	12.01	9.51
	1:55:00	0.00	0.00	1.22	6.93	3.01	4.05	5.01	11.18	8.53
	2:00:00	0.00	0.00	1.10	6.06	2.68	3.65	4.51	9.79	7.61
	2:05:00	0.00	0.00	0.95	5.17	2.31	3.17	3.91	8.39	6.58
	2:10:00	0.00	0.00	0.81	4.34	1.94	2.70	3.34	7.04	5.61
	2:15:00	0.00	0.00	0.67	3.57	1.60	2.25	2.78	5.79	4.67
	2:20:00	0.00	0.00	0.53	2.90	1.28	1.82	2.25	4.63	3.76
	2:25:00	0.00	0.00	0.41	2.39	0.98	1.40	1.73	3.63	2.89
	2:30:00	0.00	0.00	0.30	2.01	0.74	1.01	1.25	2.90	2.09
	2:35:00	0.00	0.00	0.22	1.68	0.59	0.70	0.88	2.34	1.50
	2:40:00	0.00	0.00	0.18	1.40	0.48	0.51	0.65	1.89	1.11
	2:45:00	0.00	0.00	0.15	1.16	0.39	0.38	0.49	1.51	0.82
	2:50:00	0.00	0.00	0.12	0.96	0.32	0.29	0.37	1.21	0.60
	2:55:00	0.00	0.00	0.10	0.78	0.26	0.22	0.29	0.97	0.44
	3:00:00	0.00	0.00	0.08	0.64	0.21	0.17	0.22	0.78	0.32
	3:05:00	0.00	0.00	0.07	0.52	0.16	0.13	0.17	0.64	0.23
	3:10:00	0.00	0.00	0.05	0.42	0.13	0.10	0.13	0.52	0.17
	3:15:00	0.00	0.00	0.04	0.32	0.10	0.08	0.10	0.42	0.14
	3:20:00	0.00	0.00	0.03	0.25	0.08	0.06	0.08	0.32	0.11
	3:25:00	0.00	0.00	0.03	0.18	0.06	0.05	0.06	0.24	0.09
	3:30:00	0.00	0.00	0.02	0.13	0.04	0.04	0.05	0.18	0.06
	3:35:00	0.00	0.00	0.01	0.08	0.03	0.03	0.04	0.12	0.05
	3:40:00	0.00	0.00	0.01	0.05	0.02	0.02	0.02	0.07	0.03
	3:45:00	0.00	0.00	0.01	0.03	0.01	0.01	0.02	0.04	0.02
	3:50:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North MDDP

Basin ID: Pond 8



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	15.89 acres
Watershed Length =	1,507 ft
Watershed Length to Centroid =	741 ft
Watershed Slope =	0.040 ft/ft
Watershed Imperviousness =	24.82% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	100.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

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

Water Quality Capture Volume (WQCV) =	0.178 acre-feet
Excess Urban Runoff Volume (EURV) =	0.399 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.416 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.713 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.991 acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	1.426 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	1.746 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	2.181 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	3.010 acre-feet
Approximate 2-yr Detention Volume =	0.280 acre-feet
Approximate 5-yr Detention Volume =	0.407 acre-feet
Approximate 10-yr Detention Volume =	0.620 acre-feet
Approximate 25-yr Detention Volume =	0.740 acre-feet
Approximate 50-yr Detention Volume =	0.781 acre-feet
Approximate 100-yr Detention Volume =	0.942 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

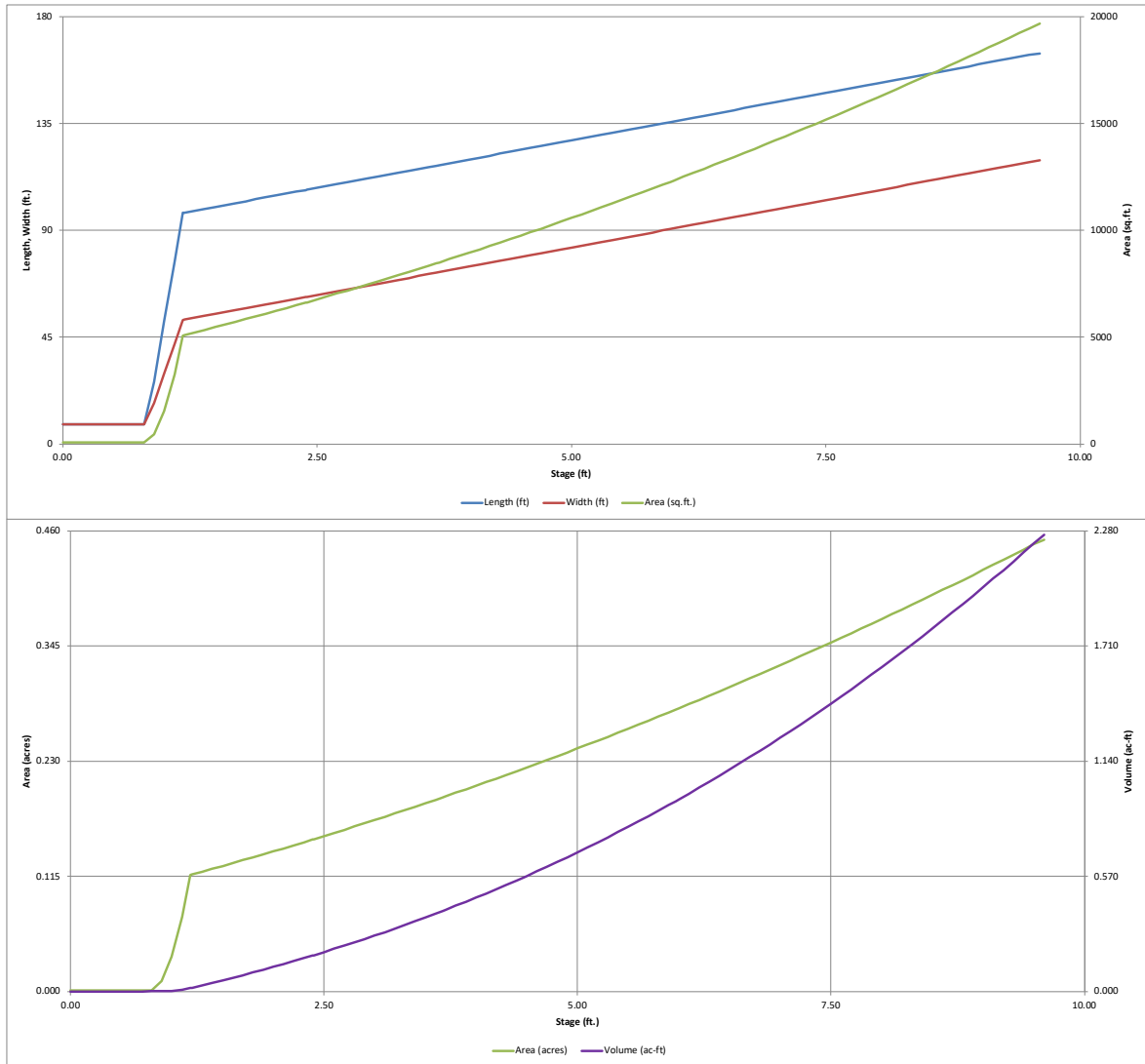
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.178 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.221 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.543 acre-feet
Total Detention Basin Volume =	0.942 acre-feet
Initial Surge Volume (ISV) =	23 ft ³
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H _{total}) =	6.00 ft
Depth of Trickle Channel (H _{tr}) =	0.50 ft
Slope of Trickle Channel (S _{tr}) =	0.004 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 ft:H
Basin Length-to-Width Ratio (R _{L/W}) =	2
Initial Surge Area (A _{ISV}) =	70 ft ²
Surge Volume Length (L _{ISV}) =	8.4 ft
Surge Volume Width (W _{ISV}) =	8.4 ft
Depth of Basin Floor (H _{floor}) =	0.35 ft
Length of Basin Floor (L _{floor}) =	97.3 ft
Width of Basin Floor (W _{floor}) =	52.1 ft
Area of Basin Floor (A _{floor}) =	5,073 ft ²
Volume of Basin Floor (V _{floor}) =	670 ft ³
Depth of Main Basin (H _{main}) =	4.82 ft
Length of Main Basin (L _{main}) =	135.8 ft
Width of Main Basin (W _{main}) =	90.7 ft
Area of Main Basin (A _{main}) =	12,321 ft ²
Volume of Main Basin (V _{main}) =	40,648 ft ³
Calculated Total Basin Volume (V _{total}) =	0.950 acre-feet

Depth Increment =	0.10	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		8.4	8.4	70		0.002		
ISV	0.33		8.4	8.4	70		0.002	23	0.001
	0.40		8.4	8.4	70		0.002	28	0.001
	0.50		8.4	8.4	70		0.002	35	0.001
	0.60		8.4	8.4	70		0.002	42	0.001
	0.70		8.4	8.4	70		0.002	49	0.001
	0.80		8.4	8.4	70		0.002	56	0.001
	0.90		26.2	17.1	449		0.010	75	0.002
Floor	1.00		51.6	29.6	1,528		0.035	168	0.004
	1.10		77.0	42.1	3,243		0.074	402	0.009
	1.18		97.3	52.1	5,073		0.116	732	0.017
	1.20		97.4	52.3	5,096		0.117	833	0.019
	1.30		98.2	53.1	5,217		0.120	1,349	0.031
	1.40		99.0	53.9	5,339		0.123	1,877	0.043
	1.50		99.8	54.7	5,462		0.125	2,417	0.055
	1.60		100.6	55.5	5,586		0.128	2,969	0.068
	1.70		101.4	56.3	5,711		0.131	3,534	0.081
	1.80		102.2	57.1	5,838		0.134	4,111	0.094
	1.90		103.0	57.9	5,966		0.137	4,702	0.108
	2.00		103.8	58.7	6,096		0.140	5,305	0.122
	2.10		104.6	59.5	6,226		0.143	5,921	0.136
	2.20		105.4	60.3	6,358		0.146	6,550	0.150
Zone 1 (WQCV)	2.30		106.2	61.1	6,492		0.149	7,192	0.165
	2.39		107.0	61.8	6,613		0.152	7,782	0.179
	2.40		107.0	61.9	6,626		0.152	7,848	0.180
	2.50		107.8	62.7	6,762		0.155	8,518	0.196
	2.60		108.6	63.5	6,899		0.158	9,201	0.211
	2.70		109.4	64.3	7,037		0.162	9,898	0.227
	2.80		110.2	65.1	7,177		0.165	10,608	0.244
	2.90		111.0	65.9	7,318		0.168	11,333	0.260
	3.00		111.8	66.7	7,460		0.171	12,072	0.277
	3.10		112.6	67.5	7,604		0.175	12,825	0.294
	3.20		113.4	68.3	7,748		0.178	13,593	0.312
	3.30		114.2	69.1	7,894		0.181	14,375	0.330
	3.40		115.0	69.9	8,042		0.185	15,172	0.348
	3.50		115.8	70.7	8,190		0.188	15,983	0.367
	3.60		116.6	71.5	8,340		0.191	16,810	0.386
Zone 2 (EURV)	3.67		117.2	72.1	8,446		0.194	17,397	0.399
	3.70		117.4	72.3	8,491		0.195	17,651	0.405
	3.80		118.2	73.1	8,644		0.198	18,508	0.425
	3.90		119.0	73.9	8,798		0.202	19,380	0.445
	4.00		119.8	74.7	8,953		0.206	20,268	0.465
	4.10		120.6	75.5	9,109		0.209	21,171	0.486
	4.20		121.4	76.3	9,266		0.213	22,089	0.507
	4.30		122.2	77.1	9,425		0.216	23,024	0.529
	4.40		123.0	77.9	9,585		0.220	23,975	0.550
	4.50		123.8	78.7	9,747		0.224	24,941	0.573
	4.60		124.6	79.5	9,909		0.227	25,924	0.595
	4.70		125.4	80.3	10,073		0.231	26,923	0.618
	4.80		126.2	81.1	10,239		0.235	27,939	0.641
	4.90		127.0	81.9	10,405		0.239	28,971	0.665
	5.00		127.8	82.7	10,573		0.243	30,020	0.689
5.10		128.6	83.5	10,742		0.247	31,085	0.714	
5.20		129.4	84.3	10,912		0.251	32,168	0.738	
5.30		130.2	85.1	11,084		0.254	33,268	0.764	
5.40		131.0	85.9	11,257		0.258	34,385	0.789	
5.50		131.8	86.7	11,431		0.262	35,519	0.815	
5.60		132.6	87.5	11,607		0.266	36,671	0.842	
5.70		133.4	88.3	11,783		0.271	37,841	0.869	
5.80		134.2	89.1	11,961		0.275	39,028	0.896	
5.90		135.0	89.9	12,141		0.279	40,233	0.924	
Zone 3 (100-year)	5.97		135.6	90.5	12,267		0.282	41,087	0.943
	6.00		135.8	90.7	12,321		0.283	41,456	0.952
	6.10		136.6	91.5	12,503		0.287	42,697	0.980
	6.20		137.4	92.3	12,686		0.291	43,957	1.009
	6.30		138.2	93.1	12,871		0.295	45,235	1.038
	6.40		139.0	93.9	13,057		0.300	46,531	1.068
	6.50		139.8	94.7	13,244		0.304	47,846	1.098
	6.60		140.6	95.5	13,432		0.308	49,180	1.129
	6.70		141.4	96.3	13,621		0.313	50,532	1.160
	6.80		142.2	97.1	13,812		0.317	51,904	1.192
	6.90		143.0	97.9	14,004		0.321	53,295	1.223
	7.00		143.8	98.7	14,198		0.326	54,705	1.256
	7.10		144.6	99.5	14,392		0.330	56,135	1.289
	7.20		145.4	100.3	14,588		0.335	57,584	1.322
	7.30		146.2	101.1	14,786		0.339	59,052	1.356
	7.40		147.0	101.9	14,984		0.344	60,541	1.390
	7.50		147.8	102.7	15,184		0.349	62,049	1.424
	7.60		148.6	103.5	15,385		0.353	63,578	1.460
	7.70		149.4	104.3	15,587		0.358	65,126	1.495
	7.80		150.2	105.1	15,791		0.363	66,695	1.531
	7.90		151.0	105.9	15,996		0.367	68,284	1.568
	8.00		151.8	106.7	16,202		0.372	69,894	1.605
	8.10		152.6	107.5	16,410		0.377	71,525	1.642
	8.20		153.4	108.3	16,618		0.382	73,176	1.680
	8.30		154.2	109.1	16,828		0.386	74,849	1.718
	8.40		155.0	109.9	17,040		0.391	76,542	1.757
	8.50		155.8	110.7	17,252		0.396	78,257	1.797
	8.60		156.6	111.5	17,466		0.401	79,992	1.836
	8.70		157.4	112.3	17,681		0.406	81,750	1.877
	8.80		158.2	113.1	17,898		0.411	83,529	1.918
8.90		159.0	113.9	18,115		0.416	85,329	1.959	
9.00		159.8	114.7	18,334		0.421	87,152	2.001	
9.10		160.6	115.5	18,555		0.426	88,996	2.043	
9.20		161.4	116.3	18,776		0.431	90,863	2.086	
9.30		162.2	117.1	18,999		0.436	92,752	2.129	
9.40		163.0	117.9	19,223		0.441	94,663	2.173	
9.50		163.8	118.7	19,449		0.446	96,596	2.218	
9.60		164.6	119.5	19,675		0.452	98,553	2.262	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

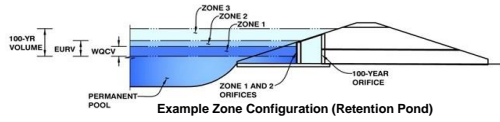


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Flying Horse North MDDP**

Basin ID: **Pond 9**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	86.18 acres
Watershed Length =	2,354 ft
Watershed Length to Centroid =	1,434 ft
Watershed Slope =	0.039 ft/ft
Watershed Imperviousness =	21.81% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	100.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

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

Water Quality Capture Volume (WQCV) =	0.883 acre-feet
Excess Urban Runoff Volume (EURV) =	1.880 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.026 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	3.599 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	5.087 acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	7.473 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	9.201 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	11.580 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	16.065 acre-feet
Approximate 2-yr Detention Volume =	1.301 acre-feet
Approximate 5-yr Detention Volume =	1.913 acre-feet
Approximate 10-yr Detention Volume =	3.018 acre-feet
Approximate 25-yr Detention Volume =	3.681 acre-feet
Approximate 50-yr Detention Volume =	3.888 acre-feet
Approximate 100-yr Detention Volume =	4.742 acre-feet

Optional User Overrides

acre-feet	
acre-feet	
inches	1.19
inches	1.50
inches	1.75
inches	2.00
inches	2.25
inches	2.52
inches	

Define Zones and Basin Geometry

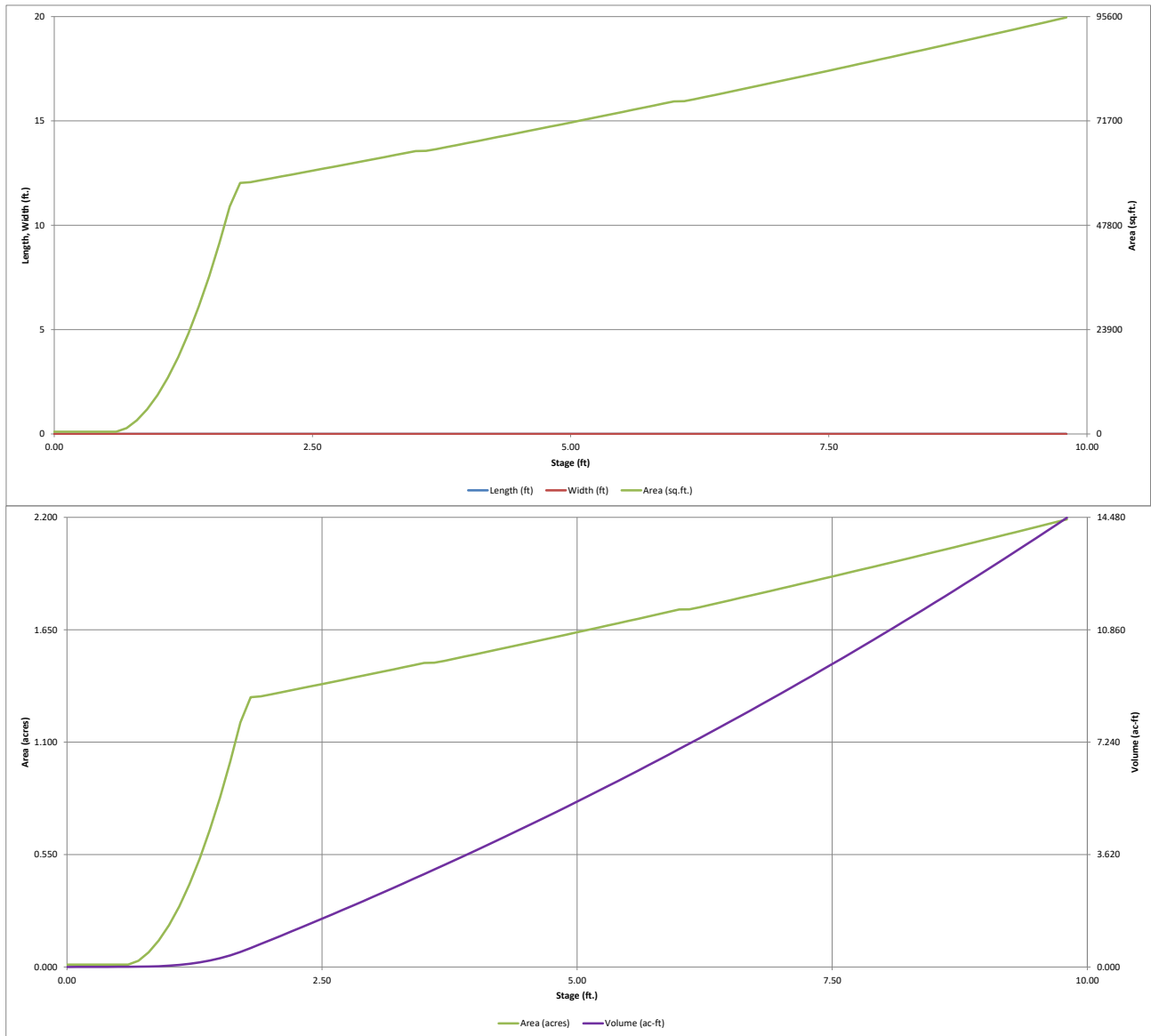
Zone 1 Volume (V _{Q1}) =	0.883 acre-feet
Zone 2 Volume (5-year - Zone 1) =	1.030 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.829 acre-feet
Total Detention Basin Volume =	4.742 acre-feet
Initial Surge Volume (ISV) =	user ft ³
Initial Surge Depth (ISD) =	user ft
Total Available Detention Depth (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 (L _W) =	user

Initial Surge 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 =	0.10	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	--	--	--	510	0.012		
	--	0.10	--	--	--	510	0.012	51	0.001
	--	0.20	--	--	--	510	0.012	102	0.002
	--	0.30	--	--	--	510	0.012	153	0.004
	--	0.40	--	--	--	510	0.012	204	0.005
	--	0.50	--	--	--	510	0.012	255	0.006
	--	0.60	--	--	--	510	0.012	306	0.007
	--	0.70	--	--	--	1,331	0.031	398	0.009
	--	0.80	--	--	--	3,124	0.072	620	0.014
	--	0.90	--	--	--	5,648	0.130	1,059	0.024
	--	1.00	--	--	--	8,903	0.204	1,786	0.041
	--	1.10	--	--	--	12,887	0.296	2,876	0.066
	--	1.20	--	--	--	17,602	0.404	4,400	0.101
	--	1.30	--	--	--	23,047	0.529	6,433	0.148
	--	1.40	--	--	--	29,222	0.671	9,046	0.208
	--	1.50	--	--	--	36,128	0.829	12,314	0.283
	--	1.60	--	--	--	43,764	1.005	16,308	0.374
	--	1.70	--	--	--	52,130	1.197	21,103	0.484
	--	1.80	--	--	--	57,500	1.320	26,584	0.610
	--	1.90	--	--	--	57,673	1.324	32,343	0.742
	--	2.00	--	--	--	58,107	1.334	38,132	0.875
	--	2.10	--	--	--	58,542	1.344	43,964	1.009
	--	2.20	--	--	--	58,979	1.354	49,840	1.144
	--	2.30	--	--	--	59,418	1.364	55,760	1.280
	--	2.40	--	--	--	59,858	1.374	61,724	1.417
	--	2.50	--	--	--	60,299	1.384	67,732	1.555
	--	2.60	--	--	--	60,742	1.394	73,784	1.694
	--	2.70	--	--	--	61,187	1.405	79,880	1.834
	--	2.80	--	--	--	61,632	1.415	86,021	1.975
	--	2.90	--	--	--	62,080	1.425	92,207	2.117
	--	3.00	--	--	--	62,529	1.435	98,437	2.260
	--	3.10	--	--	--	62,979	1.446	104,713	2.404
	--	3.20	--	--	--	63,431	1.456	111,033	2.549
	--	3.30	--	--	--	63,884	1.467	117,399	2.695
	--	3.40	--	--	--	64,338	1.477	123,810	2.842
	--	3.50	--	--	--	64,795	1.487	130,267	2.991
	--	3.60	--	--	--	64,840	1.489	136,748	3.139
	--	3.70	--	--	--	65,252	1.498	143,253	3.289
	--	3.80	--	--	--	65,711	1.509	149,801	3.439
	--	3.90	--	--	--	66,172	1.519	156,395	3.590
	--	4.00	--	--	--	66,634	1.530	163,036	3.743
	--	4.10	--	--	--	67,097	1.540	169,722	3.896
	--	4.20	--	--	--	67,562	1.551	176,455	4.051
	--	4.30	--	--	--	68,029	1.562	183,235	4.206
	--	4.40	--	--	--	68,497	1.572	190,061	4.363
	--	4.50	--	--	--	68,966	1.583	196,934	4.521
	--	4.60	--	--	--	69,437	1.594	203,854	4.680
	--	4.70	--	--	--	69,909	1.605	210,822	4.840
	--	4.80	--	--	--	70,383	1.616	217,836	5.001
	--	4.90	--	--	--	70,858	1.627	224,898	5.163
	--	5.00	--	--	--	71,335	1.638	232,008	5.326
	--	5.10	--	--	--	71,813	1.649	239,165	5.490
	--	5.20	--	--	--	72,293	1.660	246,371	5.656
	--	5.30	--	--	--	72,774	1.671	253,624	5.822
	--	5.40	--	--	--	73,257	1.682	260,926	5.990
	--	5.50	--	--	--	73,741	1.693	268,275	6.159
	--	5.60	--	--	--	74,227	1.704	275,674	6.329
	--	5.70	--	--	--	74,714	1.715	283,121	6.500
	--	5.80	--	--	--	75,202	1.726	290,617	6.672
	--	5.90	--	--	--	75,692	1.738	298,161	6.845
	--	6.00	--	--	--	76,184	1.749	305,755	7.019
	--	6.10	--	--	--	76,233	1.750	313,376	7.194
	--	6.20	--	--	--	76,677	1.760	321,021	7.370
	--	6.30	--	--	--	77,171	1.772	328,714	7.546
	--	6.40	--	--	--	77,667	1.783	336,456	7.724
	--	6.50	--	--	--	78,164	1.794	344,247	7.903
	--	6.60	--	--	--	78,663	1.806	352,089	8.083
	--	6.70	--	--	--	79,163	1.817	359,980	8.264
	--	6.80	--	--	--	79,665	1.829	367,921	8.446
	--	6.90	--	--	--	80,168	1.840	375,913	8.630
	--	7.00	--	--	--	80,673	1.852	383,955	8.814
	--	7.10	--	--	--	81,179	1.864	392,048	9.000
	--	7.20	--	--	--	81,687	1.875	400,191	9.187
	--	7.30	--	--	--	82,196	1.887	408,385	9.375
	--	7.40	--	--	--	82,707	1.899	416,630	9.565
	--	7.50	--	--	--	83,219	1.910	424,927	9.755
	--	7.60	--	--	--	83,732	1.922	433,274	9.947
	--	7.70	--	--	--	84,247	1.934	441,673	10.139
	--	7.80	--	--	--	84,764	1.946	450,124	10.333
	--	7.90	--	--	--	85,282	1.958	458,626	10.529
	--	8.00	--	--	--	85,801	1.970	467,180	10.725
	--	8.10	--	--	--	86,322	1.982	475,786	10.923
	--	8.20	--	--	--	86,845	1.994	484,445	11.121
	--	8.30	--	--	--	87,368	2.006	493,155	11.321
	--	8.40	--	--	--	87,894	2.018	501,918	11.522
	--	8.50	--	--	--	88,421	2.030	510,734	11.725
	--	8.60	--	--	--	88,949	2.042	519,603	11.928
	--	8.70	--	--	--	89,479	2.054	528,524	12.133
	--	8.80	--	--	--	90,010	2.066	537,498	12.339
	--	8.90	--	--	--	90,543	2.079	546,526	12.547
	--	9.00	--	--	--	91,077	2.091	555,607	12.755
	--	9.10	--	--	--	91,612	2.103	564,741	12.965
	--	9.20	--	--	--	92,149	2.115	573,930	13.176
	--	9.30	--	--	--	92,688	2.128	583,171	13.388
	--	9.40	--	--	--	93,228	2.140	592,467	13.601
	--	9.50	--	--	--	93,770	2.153	601,817	13.816
	--	9.60	--	--	--	94,313	2.165	611,221	14.032
	--	9.70	--	--	--	94,857	2.178	620,680	14.249
	--	9.80	--	--	--	95,403	2.190	630,193	14.467

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

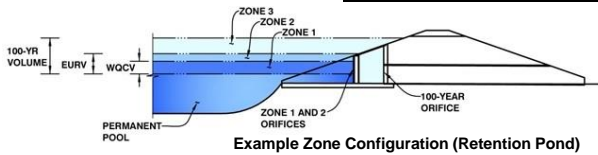


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Flying Horse North MDDP

Basin ID: Pond 9



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.01	0.883	Orifice Plate
Zone 2 (5-year)	2.76	1.030	Weir&Pipe (Restrict)
Zone 3 (100-year)	4.64	2.829	Weir&Pipe (Restrict)
Total (all zones)		4.742	

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 ft²
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 = 2.36 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 9.40 inches
Orifice Plate: Orifice Area per Row = 3.45 sq. inches (use rectangular openings)

Calculated Parameters for Plate
WQ Orifice Area per Row = 2.396E-02 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	0.79	1.57					
Orifice Area (sq. inches)	3.45	3.45	3.45					

	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)

Invert of Vertical Orifice = Not Selected Not Selected ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = Not Selected Not Selected ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = Not Selected Not Selected inches

Calculated Parameters for Vertical Orifice
Not Selected Not Selected ft²
Vertical Orifice Centroid = Not Selected Not Selected feet

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

Overflow Weir Front Edge Height, H_o = Zone 2 Weir 3.10 Zone 3 Weir 4.10 ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 4.00 8.00 feet
Overflow Weir Grate Slope = 0.00 4.00 H:V
Horiz. Length of Weir Sides = 6.00 12.00 feet
Overflow Grate Type = Type C Grate Type C Grate
Debris Clogging % = 50% 50% %

Calculated Parameters for Overflow Weir
Zone 2 Weir 3.10 Zone 3 Weir 7.10 feet
Overflow Weir Slope Length = 6.00 12.37 feet
Grate Open Area / 100-yr Orifice Area = 1.82 2.92
Overflow Grate Open Area w/o Debris = 16.70 68.87 ft²
Overflow Grate Open Area w/ Debris = 8.35 34.44 ft²

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

Depth to Invert of Outlet Pipe = Zone 2 Restrictor 2.30 Zone 3 Restrictor 2.60 ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 42.00 66.00 inches
Restrictor Plate Height Above Pipe Invert = 38.00 64.00 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = Zone 2 Restrictor 9.16 Zone 3 Restrictor 23.55 ft²
Outlet Orifice Centroid = 1.67 2.73 feet
Half-Central Angle of Restrictor Plate on Pipe = 2.51 2.79 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 7.80 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 113.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.98 feet
Stage at Top of Freeboard = 9.78 feet
Basin Area at Top of Freeboard = 2.19 acres
Basin Volume at Top of Freeboard = 14.42 acre-ft

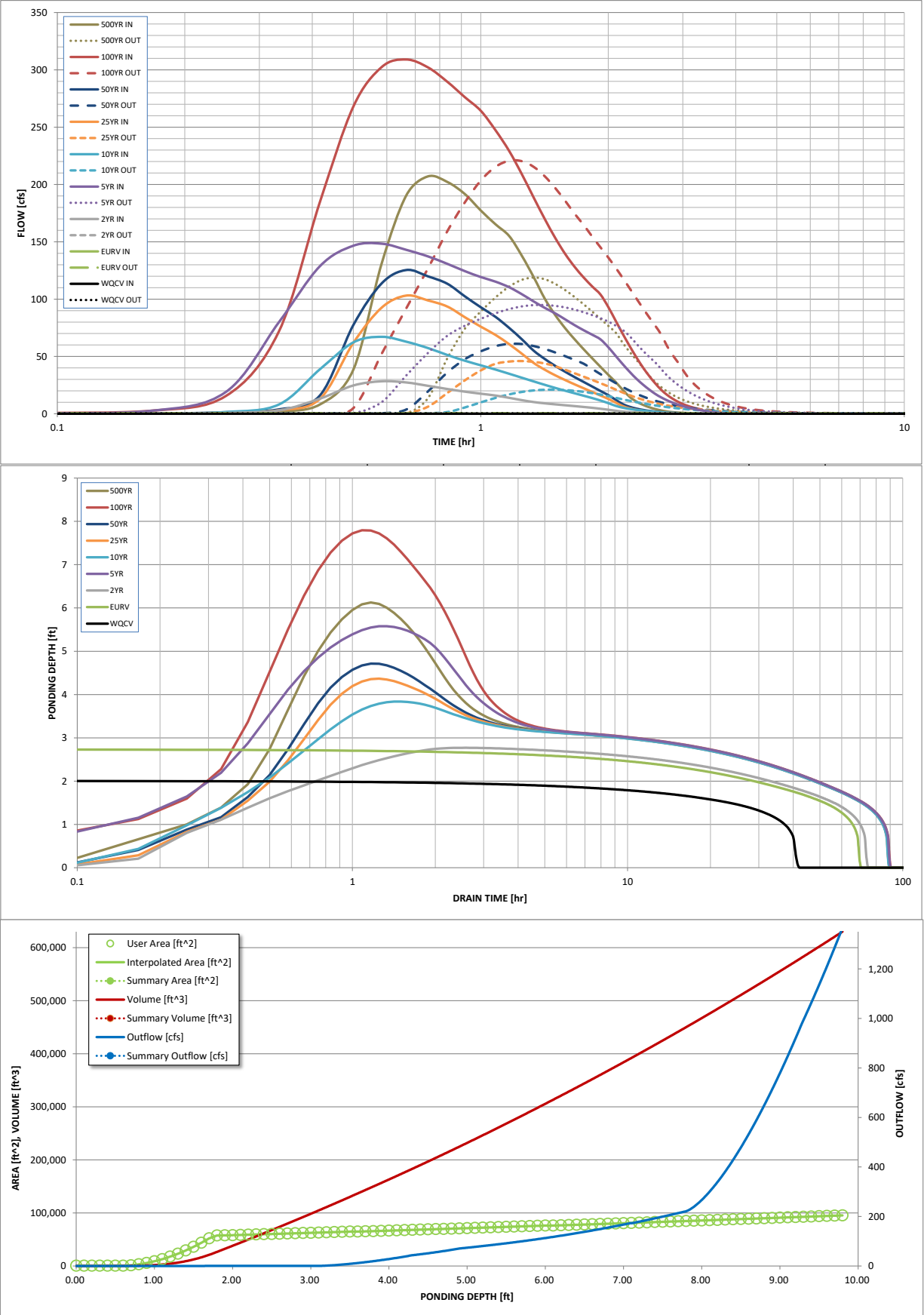
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.883	1.880	2.026	3.599	5.087	7.473	9.201	11.580	16.065
CUHP Runoff Volume (acre-ft) =	N/A	N/A	2.026	17.291	5.087	7.473	9.201	31.926	16.065
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	11.0	30.3	46.1	81.0	101.4	129.3	179.9
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	N/A	95.0				282.3	
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	0.13	1.10	0.53	0.94	1.18	3.28	2.09
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	28.4	148.4	67.1	103.1	125.4	309.0	207.1
Peak Inflow Q (cfs) =	0.4	0.5	0.5	94.8	21.0	46.0	61.0	220.7	118.9
Peak Outflow Q (cfs) =	N/A	N/A	N/A	1.0	0.5	0.6	0.6	0.8	0.7
Ratio Peak Outflow to Predevelopment Q =	Plate	Plate	Plate	Overflow Weir 2	Overflow Weir 1	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 1
Structure Controlling Flow =	N/A	N/A	N/A	4.5	1.2	2.7	3.4	6.1	4.9
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.3	N/A	0.0	0.1	1.7	0.5
Max Velocity through Grate 2 (fps) =	38	65	69	61	78	74	71	46	62
Time to Drain 97% of Inflow Volume (hours) =	40	68	72	78	84	83	82	70	78
Time to Drain 99% of Inflow Volume (hours) =	2.01	2.74	2.77	5.58	3.84	4.37	4.71	7.79	6.13
Maximum Ponding Depth (ft) =	1.33	1.41	1.41	1.70	1.51	1.57	1.61	1.94	1.75
Area at Maximum Ponding Depth (acres) =	0.889	1.890	1.932	6.278	3.484	4.300	4.856	10.314	7.229
Maximum Volume Stored (acre-ft) =									

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)



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: ...[SWM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.48	0.00
	0:10:00	0.00	0.00	0.00	2.62	0.00	0.00	0.09	2.67	0.28
	0:15:00	0.00	0.00	0.76	19.04	1.55	1.04	1.33	15.51	1.92
	0:20:00	0.00	0.00	2.95	79.68	8.04	2.99	3.82	71.52	8.06
	0:25:00	0.00	0.00	13.17	128.64	38.75	12.89	15.88	184.41	38.44
	0:30:00	0.00	0.00	24.71	146.60	62.28	61.82	77.38	267.93	131.08
	0:35:00	0.00	0.00	28.36	148.36	67.13	92.57	113.75	302.41	190.37
	0:40:00	0.00	0.00	27.34	143.02	62.88	103.09	125.40	309.03	207.06
	0:45:00	0.00	0.00	24.41	137.31	57.36	98.90	119.90	302.18	202.23
	0:50:00	0.00	0.00	21.63	130.82	51.33	93.57	113.46	289.65	191.70
	0:55:00	0.00	0.00	19.31	124.44	46.31	84.26	102.47	276.21	177.33
	1:00:00	0.00	0.00	17.53	119.29	42.27	75.99	92.91	264.30	165.28
	1:05:00	0.00	0.00	15.91	115.25	38.56	68.79	84.53	247.33	155.08
	1:10:00	0.00	0.00	13.92	110.41	34.92	60.71	74.92	229.27	137.88
	1:15:00	0.00	0.00	11.89	104.32	31.47	52.43	65.01	209.03	119.21
	1:20:00	0.00	0.00	10.24	97.99	28.23	44.33	55.03	188.58	100.29
	1:25:00	0.00	0.00	9.11	92.36	25.24	38.41	47.78	169.75	85.97
	1:30:00	0.00	0.00	8.22	87.52	22.52	33.51	41.71	153.19	74.48
	1:35:00	0.00	0.00	7.43	82.28	20.08	29.37	36.58	139.26	64.85
	1:40:00	0.00	0.00	6.68	77.25	17.85	25.63	31.93	128.04	56.24
	1:45:00	0.00	0.00	5.94	72.85	15.74	22.26	27.74	118.85	48.37
	1:50:00	0.00	0.00	5.22	68.94	13.70	19.04	23.75	111.03	40.97
	1:55:00	0.00	0.00	4.38	64.94	11.58	15.95	19.92	104.07	34.02
	2:00:00	0.00	0.00	3.55	58.11	9.29	13.00	16.27	93.16	27.58
	2:05:00	0.00	0.00	2.64	50.37	6.91	9.71	12.19	80.96	20.65
	2:10:00	0.00	0.00	1.92	43.04	5.27	6.60	8.35	69.34	14.54
	2:15:00	0.00	0.00	1.47	36.34	4.21	4.68	6.04	58.65	10.55
	2:20:00	0.00	0.00	1.17	30.41	3.40	3.43	4.48	48.94	7.79
	2:25:00	0.00	0.00	0.94	25.39	2.74	2.56	3.37	40.27	5.71
	2:30:00	0.00	0.00	0.75	21.07	2.19	1.91	2.52	32.86	4.14
	2:35:00	0.00	0.00	0.60	17.30	1.72	1.45	1.92	26.42	2.94
	2:40:00	0.00	0.00	0.47	14.29	1.33	1.08	1.43	20.94	2.04
	2:45:00	0.00	0.00	0.37	11.86	1.02	0.80	1.06	16.66	1.43
	2:50:00	0.00	0.00	0.30	9.83	0.77	0.62	0.81	13.31	1.09
	2:55:00	0.00	0.00	0.24	8.11	0.59	0.48	0.63	10.64	0.85
	3:00:00	0.00	0.00	0.19	6.68	0.45	0.37	0.49	8.52	0.68
	3:05:00	0.00	0.00	0.14	5.47	0.34	0.29	0.37	6.87	0.53
	3:10:00	0.00	0.00	0.11	4.47	0.25	0.21	0.28	5.54	0.39
	3:15:00	0.00	0.00	0.07	3.61	0.17	0.15	0.20	4.47	0.28
	3:20:00	0.00	0.00	0.05	2.87	0.11	0.10	0.13	3.60	0.18
	3:25:00	0.00	0.00	0.03	2.23	0.06	0.06	0.08	2.85	0.11
	3:30:00	0.00	0.00	0.01	1.69	0.03	0.03	0.04	2.21	0.05
	3:35:00	0.00	0.00	0.00	1.25	0.01	0.01	0.01	1.67	0.02
	3:40:00	0.00	0.00	0.00	0.88	0.00	0.00	0.00	1.20	0.00
	3:45:00	0.00	0.00	0.00	0.58	0.00	0.00	0.00	0.82	0.00
	3:50:00	0.00	0.00	0.00	0.36	0.00	0.00	0.00	0.52	0.00
	3:55:00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.29	0.00
	4:00:00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.16	0.00
	4:05:00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.06	0.00
	4:10:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

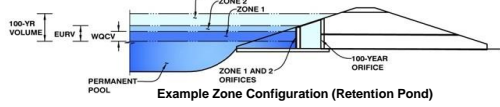
[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Flying Horse North Master Drainage Plan**

Basin ID: **Pond 10**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	21.96	acres
Watershed Length =	1,715	ft
Watershed Length to Centroid =	1,346	ft
Watershed Slope =	0.056	ft/ft
Watershed Imperviousness =	10.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

Water Quality Capture Volume (WQCV) =	0.123	acre-feet
Excess Urban Runoff Volume (EURV) =	0.206	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.293	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.647	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	1.000	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	1.630	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	2.059	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	2.677	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	3.804	acre-feet
Approximate 2-yr Detention Volume =	0.132	acre-feet
Approximate 5-yr Detention Volume =	0.207	acre-feet
Approximate 10-yr Detention Volume =	0.429	acre-feet
Approximate 25-yr Detention Volume =	0.599	acre-feet
Approximate 50-yr Detention Volume =	0.627	acre-feet
Approximate 100-yr Detention Volume =	0.810	acre-feet

Optional User Overrides

		acre-feet
		acre-feet
	1.19	inches
	1.50	inches
	1.75	inches
	2.00	inches
	2.25	inches
	2.52	inches
		inches

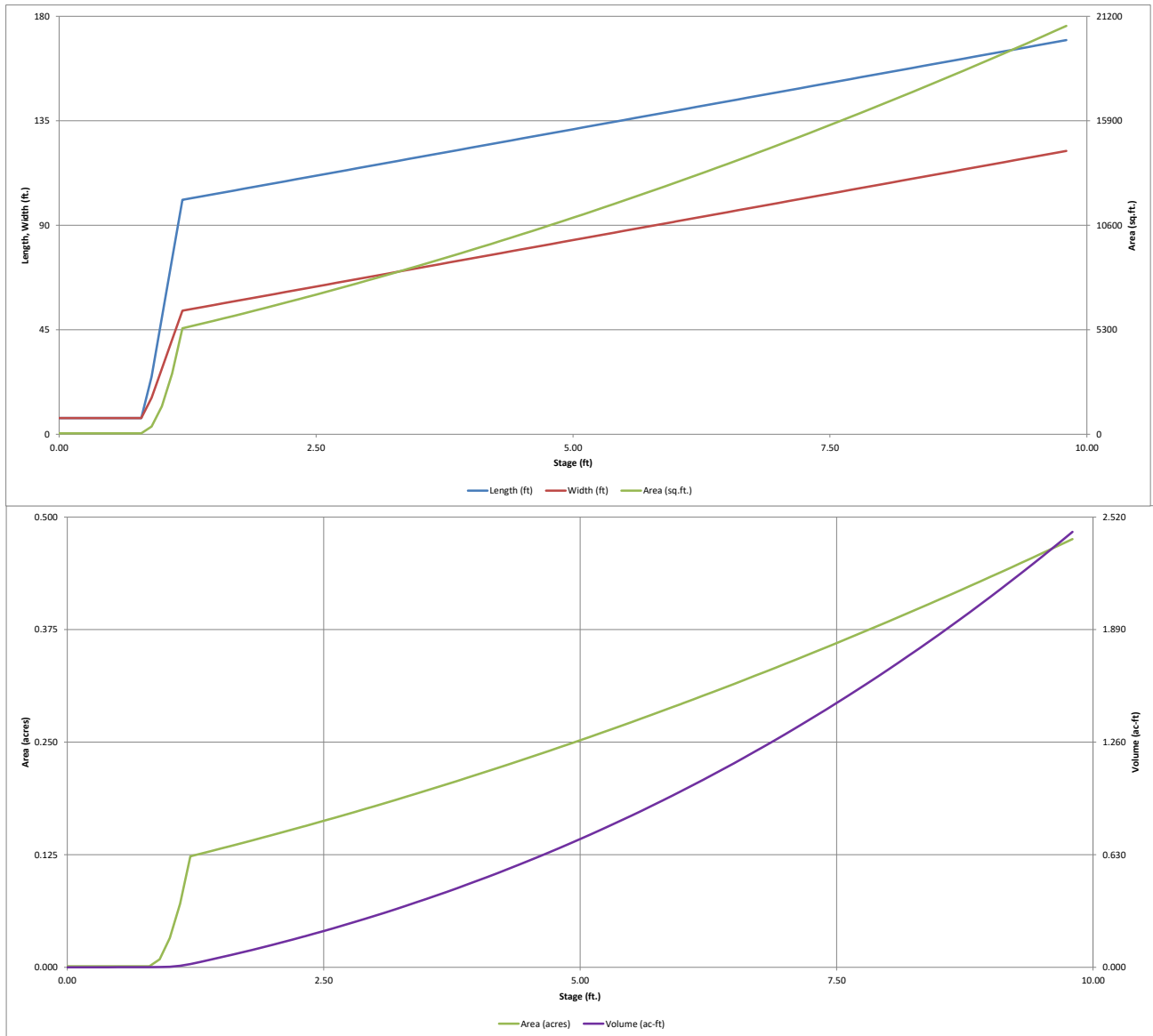
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.123	acre-feet
Zone 2 Volume (5-year - Zone 1) =	0.084	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.603	acre-feet
Total Detention Basin Volume =	0.810	acre-feet
Initial Surge Volume (ISV) =	16	ft ³
Initial Surge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.004	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{LW}) =	2	
Initial Surge Area (A _{ISV}) =	49	ft ²
Surcharge Volume Length (L _{ISV}) =	7.0	ft
Surcharge Volume Width (W _{ISV}) =	7.0	ft
Depth of Basin Floor (H _{FLOOR}) =	0.37	ft
Length of Basin Floor (L _{FLOOR}) =	100.9	ft
Width of Basin Floor (W _{FLOOR}) =	53.2	ft
Area of Basin Floor (A _{FLOOR}) =	5,372	ft ²
Volume of Basin Floor (V _{FLOOR}) =	732	ft ³
Depth of Main Basin (H _{MAIN}) =	4.80	ft
Length of Main Basin (L _{MAIN}) =	139.3	ft
Width of Main Basin (W _{MAIN}) =	91.6	ft
Area of Main Basin (A _{MAIN}) =	12,767	ft ²
Volume of Main Basin (V _{MAIN}) =	42,274	ft ³
Calculated Total Basin Volume (V _{total}) =	0.988	acre-feet

Depth Increment =	0.10	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		7.0	7.0	49		0.001		
ISV	0.33		7.0	7.0	49		0.001	16	0.000
	0.40		7.0	7.0	49		0.001	19	0.000
	0.50		7.0	7.0	49		0.001	24	0.001
	0.60		7.0	7.0	49		0.001	29	0.001
	0.70		7.0	7.0	49		0.001	34	0.001
	0.80		7.0	7.0	49		0.001	39	0.001
	0.90		24.7	15.7	389		0.009	54	0.001
	1.00		50.1	28.2	1,415		0.032	139	0.003
	1.10		75.5	40.7	3,076		0.071	358	0.008
Floor	1.20		100.9	53.2	5,372		0.123	775	0.018
	1.30		101.7	54.0	5,496		0.126	1,319	0.030
	1.40		102.5	54.8	5,622		0.129	1,874	0.043
	1.50		103.3	55.6	5,748		0.132	2,443	0.056
	1.60		104.1	56.4	5,876		0.135	3,024	0.069
	1.70		104.9	57.2	6,005		0.138	3,618	0.083
	1.80		105.7	58.0	6,135		0.141	4,225	0.097
	1.90		106.5	58.8	6,267		0.144	4,845	0.111
	2.00		107.3	59.6	6,400		0.147	5,479	0.126
	2.10		108.1	60.4	6,534		0.150	6,125	0.141
	2.20		108.9	61.2	6,670		0.153	6,785	0.156
	2.30		109.7	62.0	6,806		0.156	7,459	0.171
Zone 1 (WQCV)	2.32		109.9	62.2	6,834		0.157	7,596	0.174
	2.40		110.5	62.8	6,945		0.159	8,147	0.187
	2.50		111.3	63.6	7,084		0.163	8,848	0.203
	2.60		112.1	64.4	7,224		0.166	9,564	0.220
	2.70		112.9	65.2	7,366		0.169	10,293	0.236
	2.80		113.7	66.0	7,510		0.172	11,037	0.253
Zone 2 (5-year)	2.90		114.5	66.8	7,654		0.176	11,795	0.271
	3.00		115.3	67.6	7,800		0.179	12,568	0.289
	3.10		116.1	68.4	7,947		0.182	13,355	0.307
	3.20		116.9	69.2	8,095		0.186	14,157	0.325
	3.30		117.7	70.0	8,245		0.189	14,974	0.344
	3.40		118.5	70.8	8,395		0.193	15,806	0.363
	3.50		119.3	71.6	8,548		0.196	16,653	0.382
	3.60		120.1	72.4	8,701		0.200	17,516	0.402
	3.70		120.9	73.2	8,856		0.203	18,393	0.422
	3.80		121.7	74.0	9,012		0.207	19,287	0.443
	3.90		122.5	74.8	9,169		0.210	20,196	0.464
	4.00		123.3	75.6	9,327		0.214	21,121	0.485
	4.10		124.1	76.4	9,487		0.218	22,061	0.506
	4.20		124.9	77.2	9,648		0.221	23,018	0.528
	4.30		125.7	78.0	9,811		0.225	23,991	0.551
	4.40		126.5	78.8	9,974		0.229	24,980	0.573
	4.50		127.3	79.6	10,139		0.233	25,986	0.597
	4.60		128.1	80.4	10,306		0.237	27,008	0.620
	4.70		128.9	81.2	10,473		0.240	28,047	0.644
	4.80		129.7	82.0	10,642		0.244	29,103	0.668
	4.90		130.5	82.8	10,812		0.248	30,176	0.693
	5.00		131.3	83.6	10,983		0.252	31,265	0.718
	5.10		132.1	84.4	11,156		0.256	32,372	0.743
	5.20		132.9	85.2	11,330		0.260	33,497	0.769
	5.30		133.7	86.0	11,505		0.264	34,638	0.795
	5.40		134.5	86.8	11,681		0.268	35,798	0.822
	5.50		135.3	87.6	11,859		0.272	36,975	0.849
	5.60		136.1	88.4	12,038		0.276	38,169	0.876
	5.70		136.9	89.2	12,218		0.280	39,382	0.904
	5.80		137.7	90.0	12,400		0.285	40,613	0.932
Zone 3 (100-year)	5.90		138.5	90.8	12,583		0.289	41,862	0.961
	5.98		139.2	91.5	12,730		0.292	42,875	0.984
	6.00		139.3	91.6	12,767		0.293	43,130	0.990
	6.10		140.1	92.4	12,952		0.297	44,416	1.020
	6.20		140.9	93.2	13,139		0.302	45,720	1.050
	6.30		141.7	94.0	13,327		0.306	47,043	1.080
	6.40		142.5	94.8	13,516		0.310	48,386	1.111
	6.50		143.3	95.6	13,707		0.315	49,747	1.142
	6.60		144.1	96.4	13,899		0.319	51,127	1.174
	6.70		144.9	97.2	14,092		0.324	52,527	1.206
	6.80		145.7	98.0	14,286		0.328	53,945	1.238
	6.90		146.5	98.8	14,482		0.332	55,384	1.271
	7.00		147.3	99.6	14,679		0.337	56,842	1.305
	7.10		148.1	100.4	14,877		0.342	58,320	1.339
	7.20		148.9	101.2	15,076		0.346	59,817	1.373
	7.30		149.7	102.0	15,277		0.351	61,335	1.408
	7.40		150.5	102.8	15,479		0.355	62,873	1.443
	7.50		151.3	103.6	15,683		0.360	64,431	1.479
	7.60		152.1	104.4	15,887		0.365	66,009	1.515
	7.70		152.9	105.2	16,093		0.369	67,608	1.552
	7.80		153.7	106.0	16,300		0.374	69,228	1.589
	7.90		154.5	106.8	16,509		0.379	70,868	1.627
	8.00		155.3	107.6	16,718		0.384	72,530	1.665
	8.10		156.1	108.4	16,929		0.389	74,212	1.704
	8.20		156.9	109.2	17,142		0.394	75,916	1.743
	8.30		157.7	110.0	17,355		0.398	77,640	1.782
	8.40		158.5	110.8	17,570		0.403	79,387	1.822
	8.50		159.3	111.6	17,786		0.408	81,154	1.863
	8.60		160.1	112.4	18,004		0.413	82,944	1.904
	8.70		160.9	113.2	18,222		0.418	84,755	1.946
	8.80		161.7	114.0	18,442		0.423	86,588	1.988
	8.90		162.5	114.8	18,664		0.428	88,444	2.030
	9.00		163.3	115.6	18,886		0.434	90,321	2.073
	9.10		164.1	116.4	19,110		0.439	92,221	2.117
	9.20		164.9	117.2	19,335		0.444	94,143	2.161
	9.30		165.7	118.0	19,561		0.449	96,088	2.206
	9.40		166.5	118.8	19,789		0.454	98,056	2.251
	9.50		167.3	119.6	20,018		0.460	100,046	2.297
	9.60		168.1	120.4	20,248		0.465	102,059	2.343
	9.70		168.9	121.2	20,480		0.470	104,096	2.390
	9.80		169.7	122.0	20,712		0.475	106,155	2.437

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

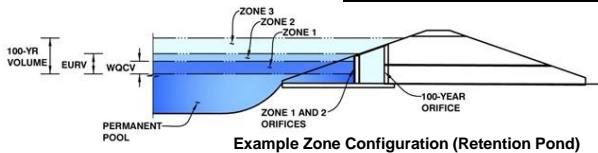


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 10



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.98	0.123	Orifice Plate
Zone 2 (5-year)	2.53	0.084	Circular Orifice
Zone 3 (100-year)	5.36	0.603	Weir&Pipe (Restrict)
Total (all zones)		0.810	

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 ft²
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 = 1.98 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 8.80 inches
Orifice Plate: Orifice Area per Row = 0.45 sq. inches (diameter = 3/4 inch)

Calculated Parameters for Plate
WQ Orifice Area per Row = 3.125E-03 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	0.66	1.32					
Orifice Area (sq. inches)	0.45	0.45	0.45					

	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)

Invert of Vertical Orifice = 1.98 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = 2.53 ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = 18.00 inches

Calculated Parameters for Vertical Orifice
Zone 2 Circular Not Selected
Vertical Orifice Area = 1.77 ft²
Vertical Orifice Centroid = 0.75 feet

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

Overflow Weir Front Edge Height, H_o = 4.70 ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 3.00 feet
Overflow Weir Grate Slope = 0.00 H:V
Horiz. Length of Weir Sides = 3.00 feet
Overflow Grate Type = Type C Grate
Debris Clogging % = 50%

Calculated Parameters for Overflow Weir
Zone 3 Weir Not Selected
Height of Grate Upper Edge, H_u = 4.70 feet
Overflow Weir Slope Length = 3.00 feet
Grate Open Area / 100-yr Orifice Area = 1.55
Overflow Grate Open Area w/o Debris = 6.26 ft²
Overflow Grate Open Area w/ Debris = 3.13 ft²

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

Depth to Invert of Outlet Pipe = 1.00 ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 36.00 inches
Restrictor Plate Height Above Pipe Invert = 20.00 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Zone 3 Restrictor Not Selected
Outlet Orifice Area = 4.03 ft²
Outlet Orifice Centroid = 0.95 feet
Half-Central Angle of Restrictor Plate on Pipe = 1.68 radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 6.70 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 26.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.94 feet
Stage at Top of Freeboard = 8.64 feet
Basin Area at Top of Freeboard = 0.42 acres
Basin Volume at Top of Freeboard = 1.92 acre-ft

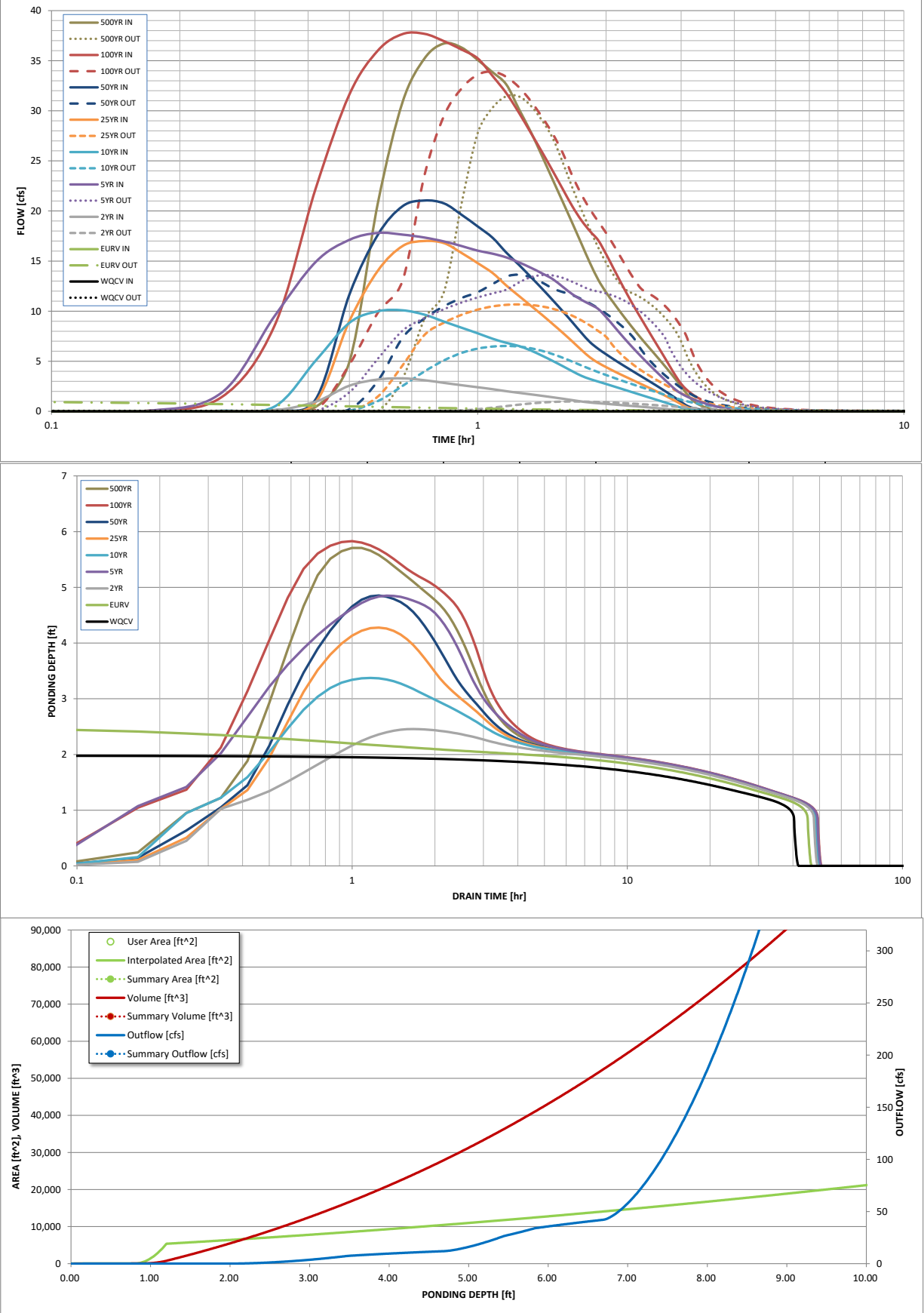
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.123	0.206	0.293	0.647	1.000	1.630	2.059	2.677	3.804
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.293	2.509	1.000	1.630	2.059	4.656	3.804
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.0	5.7	8.7	15.6	19.6	25.0	35.0
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.09	0.60	0.40	0.71	0.89	1.79	1.60
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	3.3	17.8	10.1	17.0	21.0	37.7	36.7
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	1.0	13.6	6.5	10.7	13.6	33.9	31.4
Peak Inflow Q (cfs) =	N/A	N/A	N/A	1.0	0.8	0.7	0.7	0.9	0.9
Peak Outflow Q (cfs) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	N/A	N/A	0.2	3.0	2.7
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	43	44	21	35	29	25	6	11
Time to Drain 99% of Inflow Volume (hours) =	40	45	47	38	44	41	40	30	33
Maximum Ponding Depth (ft) =	1.99	2.52	2.46	4.85	3.37	4.28	4.85	5.83	5.71
Area at Maximum Ponding Depth (acres) =	0.15	0.16	0.16	0.25	0.19	0.22	0.25	0.29	0.28
Maximum Volume Stored (acre-ft) =	0.124	0.206	0.195	0.680	0.357	0.544	0.680	0.938	0.904

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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: ...[SWMM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	0:10:00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.05	0.01
	0:15:00	0.00	0.00	0.03	1.83	0.06	0.04	0.05	1.39	0.07
	0:20:00	0.00	0.00	0.11	9.48	0.47	0.11	0.13	8.51	0.45
	0:25:00	0.00	0.00	0.97	14.91	5.06	0.92	1.21	22.24	4.95
	0:30:00	0.00	0.00	2.57	17.12	8.84	9.02	11.66	31.63	20.83
	0:35:00	0.00	0.00	3.18	17.81	9.99	14.05	17.64	36.02	30.90
	0:40:00	0.00	0.00	3.29	17.64	10.09	16.51	20.48	37.66	35.22
	0:45:00	0.00	0.00	3.11	17.35	9.65	17.00	21.04	37.68	36.71
	0:50:00	0.00	0.00	2.84	16.96	8.96	16.79	20.76	36.95	36.31
	0:55:00	0.00	0.00	2.61	16.50	8.35	15.81	19.62	36.11	35.07
	1:00:00	0.00	0.00	2.41	16.04	7.79	14.79	18.46	35.23	33.85
	1:05:00	0.00	0.00	2.22	15.74	7.25	13.82	17.33	33.48	32.63
	1:10:00	0.00	0.00	2.01	15.37	6.84	12.57	15.85	31.77	30.15
	1:15:00	0.00	0.00	1.85	14.87	6.52	11.51	14.62	29.79	27.86
	1:20:00	0.00	0.00	1.70	14.33	6.07	10.54	13.40	27.78	25.45
	1:25:00	0.00	0.00	1.55	13.77	5.55	9.62	12.24	25.86	23.11
	1:30:00	0.00	0.00	1.41	13.20	5.03	8.72	11.10	23.99	20.91
	1:35:00	0.00	0.00	1.26	12.43	4.51	7.84	9.99	22.18	18.81
	1:40:00	0.00	0.00	1.12	11.70	4.01	6.98	8.91	20.48	16.77
	1:45:00	0.00	0.00	0.99	11.14	3.55	6.14	7.85	19.08	14.83
	1:50:00	0.00	0.00	0.88	10.69	3.23	5.39	6.92	17.99	13.15
	1:55:00	0.00	0.00	0.81	10.23	2.98	4.85	6.25	17.09	11.89
	2:00:00	0.00	0.00	0.75	9.42	2.74	4.42	5.71	15.71	10.84
	2:05:00	0.00	0.00	0.69	8.54	2.50	4.03	5.21	14.26	9.85
	2:10:00	0.00	0.00	0.63	7.69	2.27	3.68	4.74	12.87	8.95
	2:15:00	0.00	0.00	0.57	6.90	2.05	3.35	4.31	11.57	8.10
	2:20:00	0.00	0.00	0.52	6.17	1.84	3.03	3.90	10.38	7.31
	2:25:00	0.00	0.00	0.46	5.49	1.64	2.73	3.51	9.28	6.57
	2:30:00	0.00	0.00	0.41	4.85	1.44	2.44	3.13	8.23	5.87
	2:35:00	0.00	0.00	0.35	4.25	1.25	2.15	2.76	7.22	5.19
	2:40:00	0.00	0.00	0.30	3.68	1.07	1.86	2.39	6.26	4.51
	2:45:00	0.00	0.00	0.25	3.14	0.89	1.58	2.03	5.32	3.84
	2:50:00	0.00	0.00	0.20	2.62	0.72	1.29	1.67	4.39	3.17
	2:55:00	0.00	0.00	0.15	2.14	0.54	1.01	1.31	3.51	2.50
	3:00:00	0.00	0.00	0.10	1.79	0.37	0.73	0.95	2.76	1.84
	3:05:00	0.00	0.00	0.06	1.52	0.25	0.45	0.61	2.21	1.24
	3:10:00	0.00	0.00	0.04	1.29	0.19	0.28	0.40	1.80	0.85
	3:15:00	0.00	0.00	0.03	1.10	0.15	0.18	0.27	1.47	0.60
	3:20:00	0.00	0.00	0.02	0.94	0.12	0.12	0.19	1.22	0.42
	3:25:00	0.00	0.00	0.02	0.79	0.10	0.08	0.13	1.00	0.28
	3:30:00	0.00	0.00	0.01	0.66	0.07	0.05	0.09	0.81	0.19
	3:35:00	0.00	0.00	0.01	0.54	0.06	0.04	0.06	0.66	0.12
	3:40:00	0.00	0.00	0.01	0.44	0.04	0.02	0.04	0.54	0.07
	3:45:00	0.00	0.00	0.01	0.35	0.03	0.02	0.03	0.44	0.05
	3:50:00	0.00	0.00	0.01	0.27	0.02	0.01	0.02	0.35	0.04
	3:55:00	0.00	0.00	0.00	0.21	0.02	0.01	0.02	0.27	0.03
	4:00:00	0.00	0.00	0.00	0.15	0.01	0.01	0.01	0.21	0.02
	4:05:00	0.00	0.00	0.00	0.11	0.01	0.00	0.01	0.15	0.02
	4:10:00	0.00	0.00	0.00	0.07	0.01	0.00	0.01	0.10	0.01
	4:15:00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.06	0.01
	4:20:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.01
	4:25:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

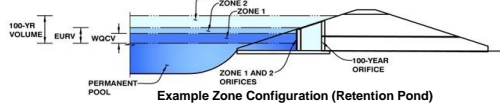
[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Flying Horse North Master Drainage Plan**

Basin ID: **Pond 11**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	79.73	acres
Watershed Length =	2,715	ft
Watershed Length to Centroid =	1,530	ft
Watershed Slope =	0.037	ft/ft
Watershed Imperviousness =	28.50%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

Water Quality Capture Volume (WQCV) =	0.975	acre-feet
Excess Urban Runoff Volume (EURV) =	2.322	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.370	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	3.903	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	5.321	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	7.486	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	9.112	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	11.293	acre-feet
500-yr Runoff Volume (P1 = 3.39 in.) =	17.208	acre-feet
Approximate 2-yr Detention Volume =	1.653	acre-feet
Approximate 5-yr Detention Volume =	2.375	acre-feet
Approximate 10-yr Detention Volume =	3.504	acre-feet
Approximate 25-yr Detention Volume =	4.095	acre-feet
Approximate 50-yr Detention Volume =	4.317	acre-feet
Approximate 100-yr Detention Volume =	5.132	acre-feet

Optional User Overrides

		acre-feet
		acre-feet
	1.19	inches
	1.50	inches
	1.75	inches
	2.00	inches
	2.25	inches
	2.52	inches
	3.39	inches

Define Zones and Basin Geometry

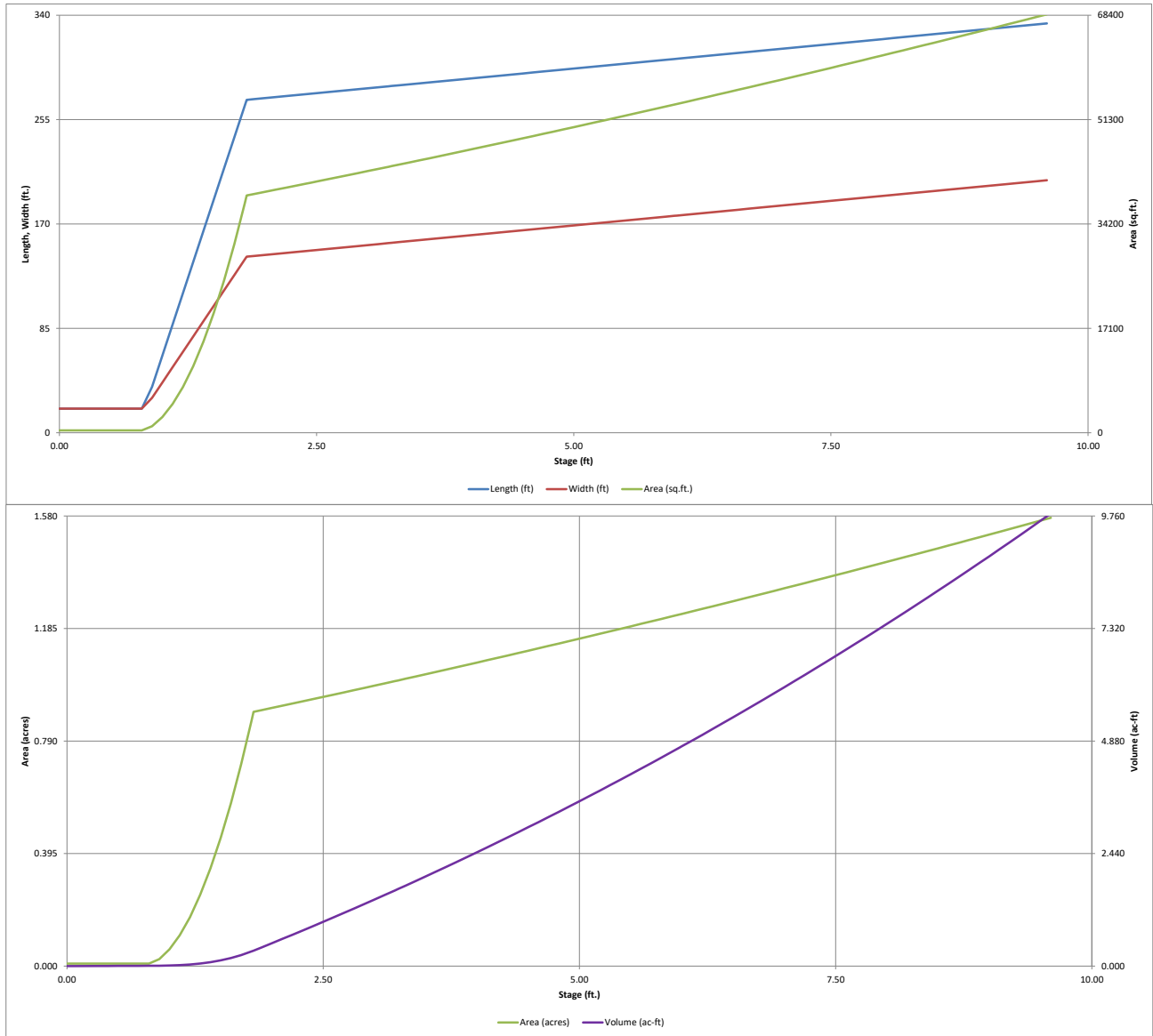
Zone 1 Volume (WQCV) =	0.975	acre-feet
Zone 2 Volume (5-year - Zone 1) =	1.400	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.757	acre-feet
Total Detention Basin Volume =	5.132	acre-feet
Initial Surge Volume (ISV) =	127	ft ³
Initial Surge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.004	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{LW}) =	2	

Initial Surge Area (A _{ISV}) =	386	ft ²
Surcharge Volume Length (L _{ISV}) =	19.6	ft
Surcharge Volume Width (W _{ISV}) =	19.6	ft
Depth of Basin Floor (H _{FLOOR}) =	0.99	ft
Length of Basin Floor (L _{FLOOR}) =	271.1	ft
Width of Basin Floor (W _{FLOOR}) =	143.4	ft
Area of Basin Floor (A _{FLOOR}) =	38,876	ft ²
Volume of Basin Floor (V _{FLOOR}) =	14,235	ft ³
Depth of Main Basin (H _{MAIN}) =	4.18	ft
Length of Main Basin (L _{MAIN}) =	304.5	ft
Width of Main Basin (W _{MAIN}) =	176.8	ft
Area of Main Basin (A _{MAIN}) =	53,855	ft ²
Volume of Main Basin (V _{MAIN}) =	192,959	ft ³
Calculated Total Basin Volume (V _{total}) =	4.764	acre-feet

Depth Increment =	0.10	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		19.6	19.6	386		0.009		
ISV	0.33		19.6	19.6	386		0.009	127	0.003
	0.40		19.6	19.6	386		0.009	154	0.004
	0.50		19.6	19.6	386		0.009	193	0.004
	0.60		19.6	19.6	386		0.009	232	0.005
	0.70		19.6	19.6	386		0.009	270	0.006
	0.80		19.6	19.6	386		0.009	309	0.007
	0.90		37.4	28.4	1,063		0.024	369	0.008
	1.00		62.8	40.9	2,569		0.059	546	0.013
	1.10		88.2	53.4	4,711		0.108	904	0.021
	1.20		113.6	65.9	7,488		0.172	1,509	0.035
	1.30		139.0	78.4	10,899		0.250	2,423	0.056
	1.40		164.4	90.9	14,946		0.343	3,710	0.085
	1.50		189.8	103.4	19,628		0.451	5,433	0.125
	1.60		215.2	115.9	24,944		0.573	7,657	0.176
	1.70		240.6	128.4	30,896		0.709	10,443	0.240
	1.80		266.0	140.9	37,482		0.860	13,857	0.318
Floor	1.82		271.1	143.4	38,876		0.892	14,621	0.336
	1.90		271.7	144.0	39,142		0.899	17,741	0.407
	2.00		272.5	144.8	39,475		0.906	21,672	0.498
	2.10		273.3	145.6	39,809		0.914	25,636	0.589
	2.20		274.1	146.4	40,145		0.922	29,634	0.680
	2.30		274.9	147.2	40,482		0.929	33,665	0.773
	2.40		275.7	148.0	40,821		0.937	37,730	0.866
Zone 1 (WQCV)	2.45		276.1	148.4	40,990		0.941	39,776	0.913
	2.50		276.5	148.8	41,160		0.945	41,830	0.960
	2.60		277.3	149.6	41,501		0.953	45,963	1.055
	2.70		278.1	150.4	41,844		0.961	50,130	1.151
	2.80		278.9	151.2	42,187		0.968	54,331	1.247
	2.90		279.7	152.0	42,532		0.976	58,567	1.345
	3.00		280.5	152.8	42,878		0.984	62,838	1.443
	3.10		281.3	153.6	43,225		0.992	67,143	1.541
	3.20		282.1	154.4	43,574		1.000	71,483	1.641
Zone 2 (5-year)	3.23		282.4	154.7	43,679		1.003	72,792	1.671
	3.30		282.9	155.2	43,924		1.008	75,858	1.741
	3.40		283.7	156.0	44,275		1.016	80,268	1.843
	3.50		284.5	156.8	44,627		1.025	84,713	1.945
	3.60		285.3	157.6	44,981		1.033	89,193	2.048
	3.70		286.1	158.4	45,336		1.041	93,709	2.151
	3.80		286.9	159.2	45,693		1.049	98,260	2.256
	3.90		287.7	160.0	46,050		1.057	102,848	2.361
	4.00		288.5	160.8	46,409		1.065	107,471	2.467
	4.10		289.3	161.6	46,769		1.074	112,129	2.574
	4.20		290.1	162.4	47,131		1.082	116,824	2.682
	4.30		290.9	163.2	47,493		1.090	121,556	2.791
	4.40		291.7	164.0	47,857		1.099	126,323	2.900
	4.50		292.5	164.8	48,223		1.107	131,127	3.010
	4.60		293.3	165.6	48,589		1.115	135,968	3.121
	4.70		294.1	166.4	48,957		1.124	140,845	3.233
	4.80		294.9	167.2	49,326		1.132	145,759	3.346
	4.90		295.7	168.0	49,696		1.141	150,710	3.460
	5.00		296.5	168.8	50,068		1.149	155,698	3.574
	5.10		297.3	169.6	50,441		1.158	160,724	3.690
	5.20		298.1	170.4	50,815		1.167	165,787	3.806
	5.30		298.9	171.2	51,191		1.175	170,887	3.923
	5.40		299.7	172.0	51,568		1.184	176,025	4.041
	5.50		300.5	172.8	51,946		1.193	181,201	4.160
	5.60		301.3	173.6	52,325		1.201	186,414	4.279
	5.70		302.1	174.4	52,706		1.210	191,666	4.400
	5.80		302.9	175.2	53,087		1.219	196,955	4.521
Zone 3 (100-year)	5.90		303.7	176.0	53,471		1.228	202,283	4.644
	5.98		304.4	176.7	53,778		1.235	206,573	4.742
	6.00		304.5	176.8	53,855		1.236	207,649	4.767
	6.10		305.3	177.6	54,241		1.245	213,054	4.891
	6.20		306.1	178.4	54,628		1.254	218,498	5.016
	6.30		306.9	179.2	55,016		1.263	223,980	5.142
	6.40		307.7	180.0	55,406		1.272	229,501	5.269
	6.50		308.5	180.8	55,797		1.281	235,061	5.396
	6.60		309.3	181.6	56,189		1.290	240,660	5.525
	6.70		310.1	182.4	56,582		1.299	246,299	5.654
	6.80		310.9	183.2	56,977		1.308	251,977	5.785
	6.90		311.7	184.0	57,373		1.317	257,694	5.916
	7.00		312.5	184.8	57,770		1.326	263,451	6.048
	7.10		313.3	185.6	58,169		1.335	269,248	6.181
	7.20		314.1	186.4	58,569		1.345	275,085	6.315
	7.30		314.9	187.2	58,970		1.354	280,962	6.450
	7.40		315.7	188.0	59,372		1.363	286,879	6.586
	7.50		316.5	188.8	59,776		1.372	292,837	6.723
	7.60		317.3	189.6	60,181		1.382	298,834	6.860
	7.70		318.1	190.4	60,587		1.391	304,873	6.999
	7.80		318.9	191.2	60,994		1.400	310,952	7.138
	7.90		319.7	192.0	61,403		1.410	317,072	7.279
	8.00		320.5	192.8	61,813		1.419	323,232	7.420
	8.10		321.3	193.6	62,225		1.428	329,434	7.563
	8.20		322.1	194.4	62,637		1.438	335,677	7.706
	8.30		322.9	195.2	63,051		1.447	341,962	7.850
	8.40		323.7	196.0	63,466		1.457	348,288	7.996
	8.50		324.5	196.8	63,883		1.467	354,655	8.142
	8.60		325.3	197.6	64,301		1.476	361,064	8.289
	8.70		326.1	198.4	64,720		1.486	367,515	8.437
	8.80		326.9	199.2	65,140		1.495	374,008	8.586
	8.90		327.7	200.0	65,561		1.505	380,543	8.736
	9.00		328.5	200.8	65,984		1.515	387,121	8.887
	9.10		329.3	201.6	66,409		1.525	393,740	9.039
	9.20		330.1	202.4	66,834		1.534	400,402	9.192
	9.30		330.9	203.2	67,261		1.544	407,107	9.346
	9.40		331.7	204.0	67,689		1.554	413,855	9.501
	9.50		332.5	204.8	68,118		1.564	420,645	9.657
	9.60		333.3	205.6	68,548		1.574	427,478	9.814

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

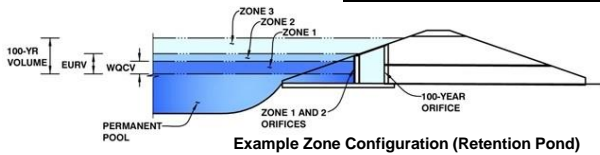


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 11



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.52	0.975	Orifice Plate
Zone 2 (5-year)	3.92	1.400	Weir&Pipe (Circular)
Zone 3 (100-year)	6.30	2.757	Weir&Pipe (Restrict)
Total (all zones)		5.132	

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 ft²
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 = 3.92 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = N/A inches
Orifice Plate: Orifice Area per Row = N/A inches

Calculated Parameters for Plate
WQ Orifice Area per Row = N/A ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.00	2.00	3.00				
Orifice Area (sq. inches)	3.57	3.57	3.57	10.00				

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected
Invert of Vertical Orifice =	N/A	N/A
Depth at top of Zone using Vertical Orifice =	N/A	N/A
Vertical Orifice Diameter =	N/A	N/A

ft (relative to basin bottom at Stage = 0 ft)
ft (relative to basin bottom at Stage = 0 ft)
inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = N/A ft²
Vertical Orifice Centroid = N/A feet

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

	Zone 2 Weir	Zone 3 Weir
Overflow Weir Front Edge Height, H _o =	2.52	3.92
Overflow Weir Front Edge Length =	10.00	10.00
Overflow Weir Grate Slope =	0.00	4.00
Horiz. Length of Weir Sides =	10.00	18.00
Overflow Grate Type =	Type C Grate	Type C Grate
Debris Clogging % =	50%	50%

ft (relative to basin bottom at Stage = 0 ft)
feet
H:V
feet
%
%

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = 2.52 feet
Overflow Weir Slope Length = 10.00 feet
Grate Open Area / 100-yr Orifice Area = 9.85
Overflow Grate Open Area w/o Debris = 69.60 ft²
Overflow Grate Open Area w/ Debris = 34.80 ft²

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

	Zone 2 Circular	Zone 3 Restrictor
Depth to Invert of Outlet Pipe =	2.50	2.80
Circular Orifice Diameter or Pipe Diameter =	36.00	60.00
Restrictor Plate Height Above Pipe Invert =		50.00

ft (distance below basin bottom at Stage = 0 ft)
inches
inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = 7.07 ft²
Outlet Orifice Centroid = 1.50 feet
Half-Central Angle of Restrictor Plate on Pipe = N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 15.30 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 96.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.97 feet
Stage at Top of Freeboard = 17.27 feet
Basin Area at Top of Freeboard = 2.42 acres
Basin Volume at Top of Freeboard = 25.02 acre-ft

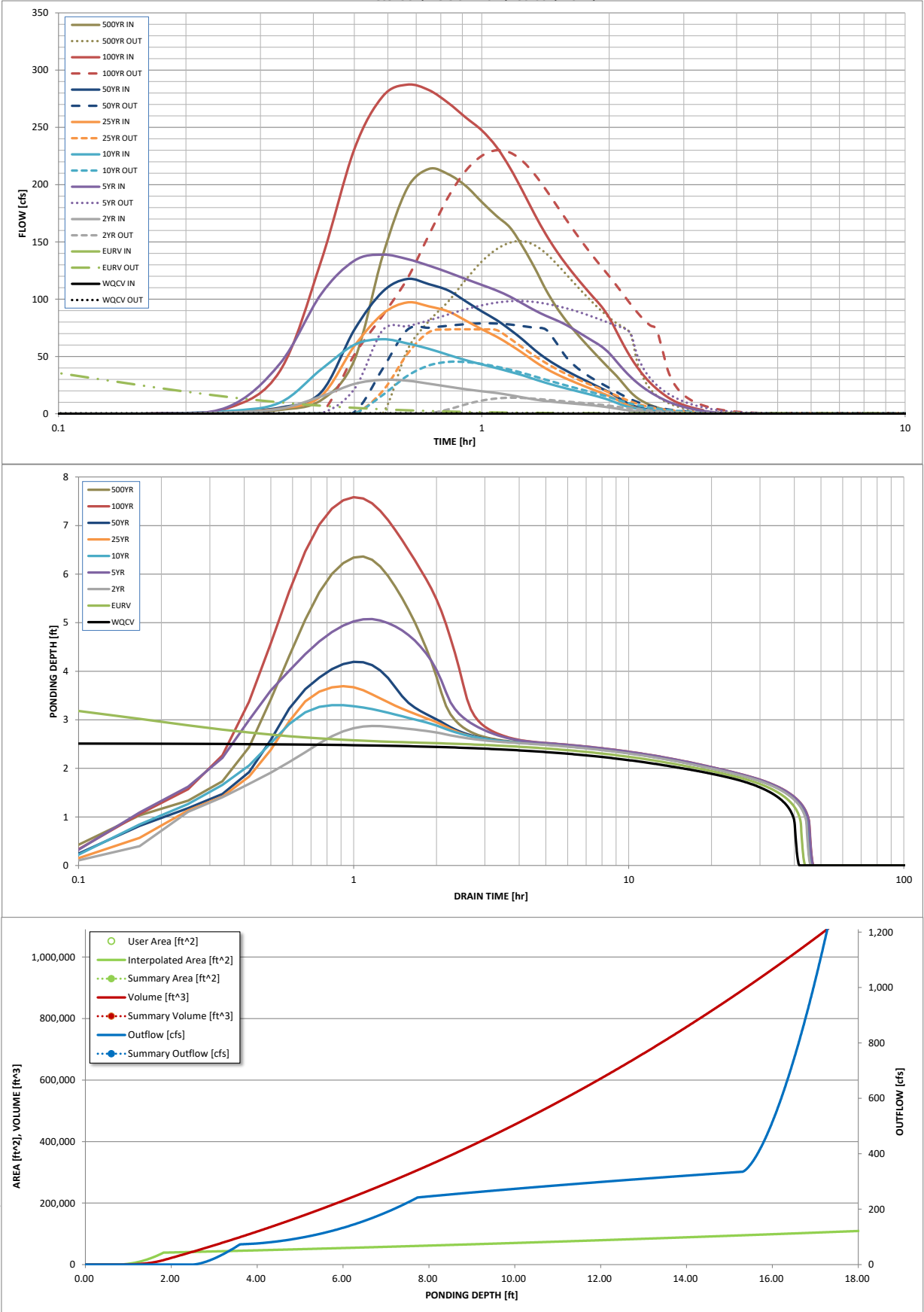
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.39
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.39
CUHP Runoff Volume (acre-ft) =	0.975	2.322	2.370	3.903	5.321	7.486	9.112	11.293	17.208
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.370	15.619	5.321	7.486	9.112	28.758	17.208
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	9.0	25.0	37.8	67.7	85.0	108.0	168.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		103.5				221.3	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	1.30	0.47	0.85	1.07	2.78	2.11
Peak Inflow Q (cfs) =	N/A	N/A	29.6	138.9	65.1	97.2	117.7	287.3	213.7
Peak Outflow Q (cfs) =	0.4	73.2	14.0	98.4	45.3	73.7	78.9	230.0	150.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	1.2	1.1	0.9	1.0	0.9
Structure Controlling Flow =	Overflow Weir 1	Outlet Plate 1	Overflow Weir 1	Overflow Weir 2	Overflow Weir 1	Outlet Plate 1	Overflow Weir 2	Overflow Weir 2	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	1.07	0.19	1.2	0.6	1.0	1.1	1.4	1.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	0.1	N/A	N/A	0.0	1.0	0.4
Time to Drain 97% of Inflow Volume (hours) =	38	38	40	22	36	32	30	9	20
Time to Drain 99% of Inflow Volume (hours) =	40	41	43	36	41	40	39	30	35
Maximum Ponding Depth (ft) =	2.52	3.87	2.87	5.07	3.30	3.69	4.19	7.58	6.36
Area at Maximum Ponding Depth (acres) =	0.95	1.05	0.97	1.16	1.01	1.04	1.08	1.38	1.27
Maximum Volume Stored (acre-ft) =	0.979	2.329	1.315	3.655	1.741	2.141	2.671	6.833	5.218

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)



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: ...[SWM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.15	0.00	0.00	0.13	0.23	0.59
	0:15:00	0.00	0.00	1.10	5.66	2.29	1.55	1.99	4.66	3.32
	0:20:00	0.00	0.00	4.30	43.71	9.70	4.49	5.33	37.21	11.68
	0:25:00	0.00	0.00	15.06	104.14	38.56	15.22	18.54	132.57	46.97
	0:30:00	0.00	0.00	26.05	133.65	60.20	59.13	73.34	231.06	138.01
	0:35:00	0.00	0.00	29.62	138.88	65.06	87.24	106.62	277.06	196.91
	0:40:00	0.00	0.00	28.86	135.05	61.42	97.17	117.65	287.31	213.74
	0:45:00	0.00	0.00	26.23	129.30	56.65	93.75	113.10	282.54	209.10
	0:50:00	0.00	0.00	23.66	123.37	51.42	89.28	107.62	271.32	198.85
	0:55:00	0.00	0.00	21.40	117.59	46.77	81.30	98.15	258.59	184.87
	1:00:00	0.00	0.00	19.63	112.46	43.09	73.75	89.36	247.38	172.67
	1:05:00	0.00	0.00	18.13	107.62	39.83	67.32	81.86	232.96	162.45
	1:10:00	0.00	0.00	16.24	102.21	36.61	60.20	73.37	214.44	145.69
	1:15:00	0.00	0.00	14.28	96.08	33.50	52.93	64.66	194.13	127.38
	1:20:00	0.00	0.00	12.44	90.31	30.08	45.60	55.68	174.02	108.38
	1:25:00	0.00	0.00	11.10	85.56	27.02	39.51	48.32	156.65	93.15
	1:30:00	0.00	0.00	10.17	81.68	24.41	34.69	42.46	142.30	81.07
	1:35:00	0.00	0.00	9.39	77.51	22.10	30.68	37.56	130.26	71.10
	1:40:00	0.00	0.00	8.68	72.64	20.00	27.16	33.23	119.80	62.24
	1:45:00	0.00	0.00	7.98	67.83	18.03	23.98	29.32	110.45	54.17
	1:50:00	0.00	0.00	7.29	63.29	16.14	21.03	25.66	101.85	46.61
	1:55:00	0.00	0.00	6.43	58.80	14.16	18.18	22.15	93.77	39.51
	2:00:00	0.00	0.00	5.54	52.93	11.97	15.45	18.79	83.86	32.89
	2:05:00	0.00	0.00	4.50	45.41	9.47	12.30	14.90	71.47	25.53
	2:10:00	0.00	0.00	3.48	38.21	7.13	9.14	11.03	59.49	18.66
	2:15:00	0.00	0.00	2.60	32.02	5.56	6.40	7.83	49.02	13.63
	2:20:00	0.00	0.00	2.00	26.82	4.51	4.72	5.84	40.28	10.21
	2:25:00	0.00	0.00	1.61	22.47	3.68	3.56	4.44	33.01	7.66
	2:30:00	0.00	0.00	1.31	18.85	2.99	2.72	3.41	27.03	5.71
	2:35:00	0.00	0.00	1.07	15.76	2.41	2.08	2.62	22.10	4.21
	2:40:00	0.00	0.00	0.86	13.07	1.92	1.61	2.01	17.94	3.04
	2:45:00	0.00	0.00	0.69	10.76	1.50	1.22	1.53	14.43	2.18
	2:50:00	0.00	0.00	0.56	8.85	1.17	0.93	1.16	11.58	1.64
	2:55:00	0.00	0.00	0.45	7.28	0.90	0.73	0.91	9.35	1.28
	3:00:00	0.00	0.00	0.37	5.98	0.70	0.57	0.71	7.60	1.02
	3:05:00	0.00	0.00	0.29	4.89	0.54	0.45	0.55	6.19	0.80
	3:10:00	0.00	0.00	0.23	3.95	0.41	0.34	0.42	5.01	0.61
	3:15:00	0.00	0.00	0.17	3.16	0.30	0.25	0.31	4.01	0.44
	3:20:00	0.00	0.00	0.12	2.49	0.21	0.18	0.22	3.17	0.30
	3:25:00	0.00	0.00	0.08	1.93	0.13	0.12	0.14	2.46	0.19
	3:30:00	0.00	0.00	0.05	1.47	0.07	0.07	0.08	1.88	0.10
	3:35:00	0.00	0.00	0.03	1.11	0.03	0.03	0.04	1.41	0.04
	3:40:00	0.00	0.00	0.01	0.82	0.01	0.01	0.01	1.04	0.01
	3:45:00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.76	0.00
	3:50:00	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.54	0.00
	3:55:00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.39	0.00
	4:00:00	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.28	0.00
	4:05:00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.20	0.00
	4:10:00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.15	0.00
	4:15:00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.12	0.00
	4:20:00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.08	0.00
	4:25:00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.06	0.00
	4:30:00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.04	0.00
	4:35:00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.03	0.00
	4:40:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00
	4:45:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00
	4:50:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	4:55:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	5:00:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	5:05:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	5:10:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	5:15:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

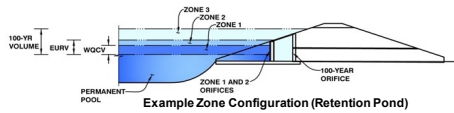
[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 13



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	23.03	acres
Watershed Length =	1,258	ft
Watershed Length to Centroid =	783	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	65.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

Water Quality Capture Volume (WQCV) =	0.488	acre-feet
Excess Urban Runoff Volume (EURV) =	1.634	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.042	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	1.456	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	1.884	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	2.406	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	3.276	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	3.989	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	5.262	acre-feet
Approximate 2-yr Detention Volume =	1.267	acre-feet
Approximate 5-yr Detention Volume =	1.699	acre-feet
Approximate 10-yr Detention Volume =	2.166	acre-feet
Approximate 25-yr Detention Volume =	2.333	acre-feet
Approximate 50-yr Detention Volume =	2.430	acre-feet
Approximate 100-yr Detention Volume =	2.627	acre-feet

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.488	acre-feet
Zone 2 Volume (5-year - Zone 1) =	1.211	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.927	acre-feet
Total Detention Basin Volume =	2.627	acre-feet
Initial Surcharge Volume (ISV) =	64	ft ³
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{tr}) =	0.50	ft
Slope of Trickle Channel (S _{tr}) =	0.004	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{L/W}) =	2	

Initial Surcharge Area (A _{ISV}) =	193	ft ²
Surcharge Volume Length (L _{ISV}) =	13.9	ft
Surcharge Volume Width (W _{ISV}) =	13.9	ft
Depth of Basin Floor (H _{floor}) =	0.68	ft
Length of Basin Floor (L _{floor}) =	186.6	ft
Width of Basin Floor (W _{floor}) =	98.9	ft
Area of Basin Floor (A _{floor}) =	18,456	ft ²
Volume of Basin Floor (V _{floor}) =	4,655	ft ³
Depth of Main Basin (H _{main}) =	4.49	ft
Length of Main Basin (L _{main}) =	222.5	ft
Width of Main Basin (W _{main}) =	134.8	ft
Area of Main Basin (A _{main}) =	30,002	ft ²
Volume of Main Basin (V _{main}) =	107,744	ft ³
Calculated Total Basin Volume (V _{total}) =	2,584	acre-feet

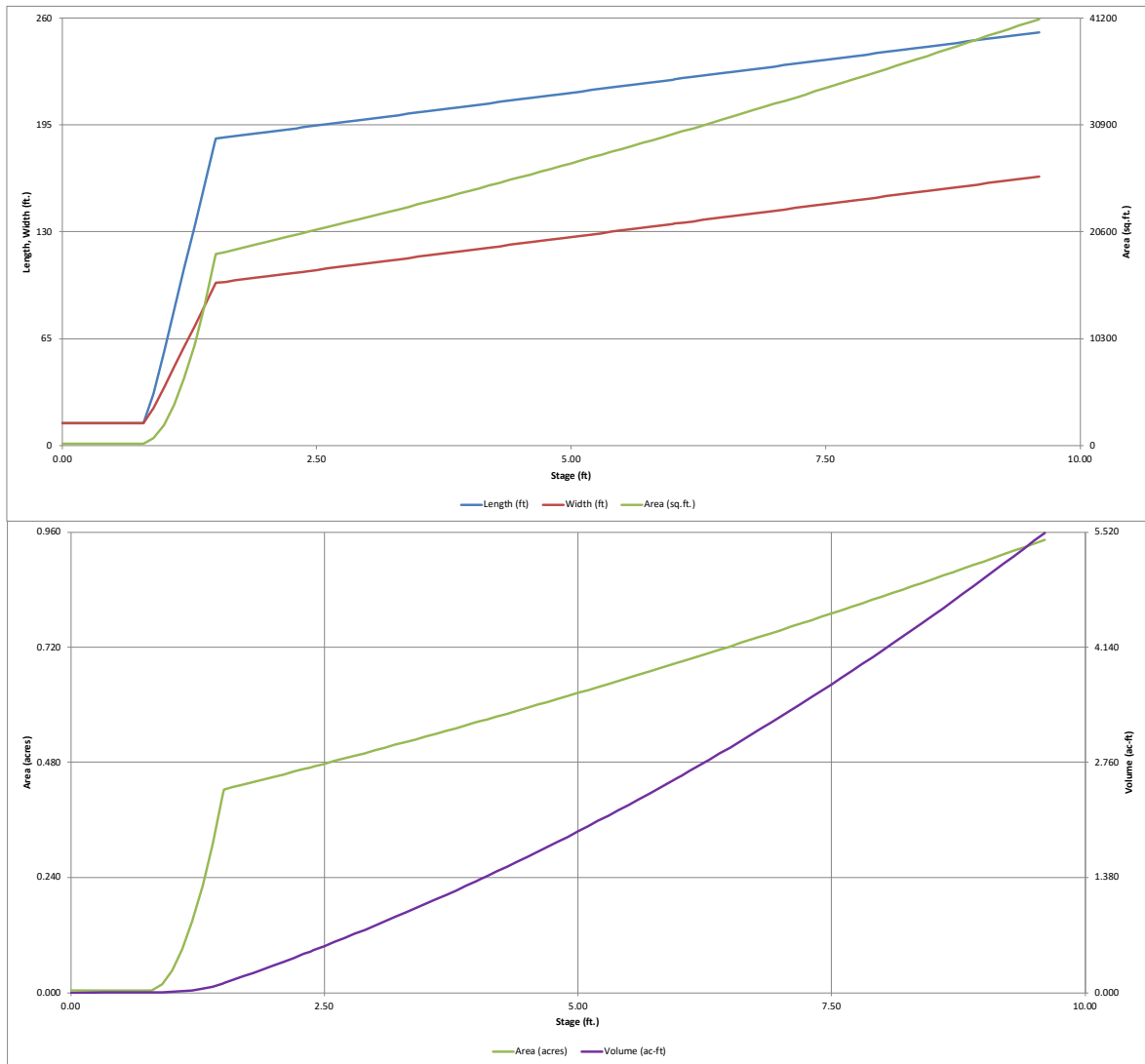
Optional User Overrides

	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

Depth Increment =	0.10	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		13.9	13.9	193		0.004		
ISV	0.33		13.9	13.9	193		0.004	64	0.001
	0.40		13.9	13.9	193		0.004	77	0.002
	0.50		13.9	13.9	193		0.004	97	0.002
	0.60		13.9	13.9	193		0.004	116	0.003
	0.70		13.9	13.9	193		0.004	135	0.003
	0.80		13.9	13.9	193		0.004	155	0.004
	0.90		31.7	22.6	717		0.016	190	0.004
	1.00		57.1	35.1	2,006		0.046	321	0.007
	1.10		82.5	47.6	3,930		0.090	613	0.014
	1.20		107.9	60.1	6,489		0.149	1,128	0.026
1.30		133.3	72.6	9,682		0.222	1,932	0.044	
1.40		158.7	85.1	13,511		0.310	3,086	0.071	
1.50		184.1	97.6	17,975		0.413	4,655	0.107	
Floor	1.51		186.6	98.9	18,456		0.424	4,837	0.111
	1.60		187.3	99.6	18,662		0.428	6,507	0.149
	1.70		188.1	100.4	18,892		0.434	8,385	0.192
	1.80		188.9	101.2	19,124		0.439	10,286	0.236
	1.90		189.7	102.0	19,357		0.444	12,210	0.280
	2.00		190.5	102.8	19,591		0.450	14,157	0.325
	2.10		191.3	103.6	19,826		0.455	16,128	0.370
	2.20		192.1	104.4	20,063		0.461	18,123	0.416
	2.30		192.9	105.2	20,300		0.466	20,141	0.462
	2.36		193.4	105.7	20,444		0.469	21,363	0.490
2.40		193.7	106.0	20,540		0.472	22,183	0.509	
2.50		194.5	106.8	20,780		0.477	24,249	0.557	
2.60		195.3	107.6	21,022		0.483	26,339	0.605	
2.70		196.1	108.4	21,265		0.488	28,453	0.653	
2.80		196.9	109.2	21,509		0.494	30,592	0.702	
2.90		197.7	110.0	21,755		0.499	32,755	0.752	
3.00		198.5	110.8	22,001		0.505	34,943	0.802	
3.10		199.3	111.6	22,250		0.511	37,155	0.853	
3.20		200.1	112.4	22,499		0.517	39,393	0.904	
3.30		200.9	113.2	22,750		0.522	41,655	0.956	
3.40		201.7	114.0	23,002		0.528	43,943	1.009	
3.50		202.5	114.8	23,255		0.534	46,255	1.062	
3.60		203.3	115.6	23,509		0.540	48,594	1.116	
3.70		204.1	116.4	23,765		0.546	50,957	1.170	
3.80		204.9	117.2	24,022		0.551	53,347	1.225	
3.90		205.7	118.0	24,281		0.557	55,762	1.280	
4.00		206.5	118.8	24,540		0.563	58,203	1.336	
Zone 2 (5-year)	4.05		206.9	119.2	24,671		0.566	59,433	1.364
	4.10		207.3	119.6	24,801		0.569	60,670	1.393
	4.20		208.1	120.4	25,063		0.575	63,163	1.450
	4.30		208.9	121.2	25,327		0.581	65,683	1.508
	4.40		209.7	122.0	25,592		0.588	68,228	1.566
	4.50		210.5	122.8	25,858		0.594	70,801	1.625
	4.60		211.3	123.6	26,125		0.600	73,400	1.685
	4.70		212.1	124.4	26,394		0.606	76,026	1.745
	4.80		212.9	125.2	26,663		0.612	78,679	1.806
	4.90		213.7	126.0	26,935		0.618	81,359	1.868
5.00		214.5	126.8	27,207		0.625	84,066	1.930	
5.10		215.3	127.6	27,481		0.631	86,800	1.993	
5.20		216.1	128.4	27,756		0.637	89,562	2.056	
5.30		216.9	129.2	28,032		0.644	92,351	2.120	
5.40		217.7	130.0	28,310		0.650	95,168	2.185	
5.50		218.5	130.8	28,589		0.656	98,013	2.250	
5.60		219.3	131.6	28,869		0.663	100,886	2.316	
5.70		220.1	132.4	29,150		0.669	103,787	2.383	
5.80		220.9	133.2	29,433		0.676	106,716	2.450	
5.90		221.7	134.0	29,717		0.682	109,674	2.518	
Zone 3 (100-year)	6.00		222.5	134.8	30,002		0.689	112,660	2.586
	6.02		222.7	135.0	30,059		0.690	113,260	2.600
	6.10		223.3	135.6	30,288		0.695	115,674	2.656
	6.20		224.1	136.4	30,576		0.702	118,117	2.725
	6.30		224.9	137.2	30,865		0.709	121,789	2.796
	6.40		225.7	138.0	31,156		0.715	124,890	2.867
	6.50		226.5	138.8	31,447		0.722	128,021	2.939
	6.60		227.3	139.6	31,740		0.729	131,180	3.011
	6.70		228.1	140.4	32,034		0.735	134,369	3.085
	6.80		228.9	141.2	32,330		0.742	137,587	3.159
6.90		229.7	142.0	32,627		0.749	140,835	3.233	
7.00		230.5	142.8	32,925		0.756	144,112	3.308	
7.10		231.3	143.6	33,224		0.763	147,420	3.384	
7.20		232.1	144.4	33,525		0.770	150,757	3.461	
7.30		232.9	145.2	33,827		0.777	154,125	3.538	
7.40		233.7	146.0	34,130		0.784	157,523	3.616	
7.50		234.5	146.8	34,434		0.791	160,951	3.695	
7.60		235.3	147.6	34,740		0.798	164,409	3.774	
7.70		236.1	148.4	35,047		0.805	167,899	3.854	
7.80		236.9	149.2	35,355		0.812	171,419	3.935	
7.90		237.7	150.0	35,665		0.819	174,970	4.017	
8.00		238.5	150.8	35,976		0.826	178,552	4.099	
8.10		239.3	151.6	36,288		0.833	182,165	4.182	
8.20		240.1	152.4	36,601		0.840	185,809	4.266	
8.30		240.9	153.2	36,916		0.847	189,485	4.350	
8.40		241.7	154.0	37,232		0.855	193,193	4.435	
8.50		242.5	154.8	37,549		0.862	196,932	4.521	
8.60		243.3	155.6	37,868		0.869	200,702	4.607	
8.70		244.1	156.4	38,187		0.877	204,505	4.695	
8.80		244.9	157.2	38,508		0.884	208,340	4.783	
8.90		245.7	158.0	38,831		0.891	212,207	4.872	
9.00		246.5	158.8	39,154		0.899	216,106	4.961	
9.10		247.3	159.6	39,479		0.906	220,038	5.051	
9.20		248.1	160.4	39,806		0.914	224,002	5.142	
9.30		248.9	161.2	40,133		0.921	227,999	5.234	
9.40		249.7	162.0	40,462		0.929	232,029	5.327	
9.50		250.5	162.8	40,792		0.936	236,091	5.420	
9.60		251.3	163.6	41,123		0.944	240,187	5.514	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

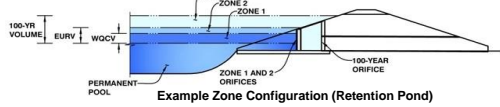


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Flying Horse North**

Basin ID: **Pond 14**



Watershed Information

Selected BMP Type =	EDB
Watershed Area =	97.53 acres
Watershed Length =	4,027 ft
Watershed Length to Centroid =	2,183 ft
Watershed Slope =	0.059 ft/ft
Watershed Imperviousness =	10.00% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	100.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

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

Water Quality Capture Volume (WQCV) =	0.545 acre-feet
Excess Urban Runoff Volume (EURV) =	0.917 acre-feet
2-yr Runoff Volume (P1 = 0.92 in.) =	0.450 acre-feet
5-yr Runoff Volume (P1 = 1.2 in.) =	1.153 acre-feet
10-yr Runoff Volume (P1 = 1.45 in.) =	2.407 acre-feet
25-yr Runoff Volume (P1 = 1.69 in.) =	4.971 acre-feet
50-yr Runoff Volume (P1 = 2.15 in.) =	8.392 acre-feet
100-yr Runoff Volume (P1 = 2.49 in.) =	11.684 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	16.938 acre-feet
Approximate 2-yr Detention Volume =	0.452 acre-feet
Approximate 5-yr Detention Volume =	0.734 acre-feet
Approximate 10-yr Detention Volume =	1.579 acre-feet
Approximate 25-yr Detention Volume =	2.249 acre-feet
Approximate 50-yr Detention Volume =	2.660 acre-feet
Approximate 100-yr Detention Volume =	3.555 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
0.92	inches
1.20	inches
1.45	inches
	inches
2.15	inches
2.49	inches
	inches

Define Zones and Basin Geometry

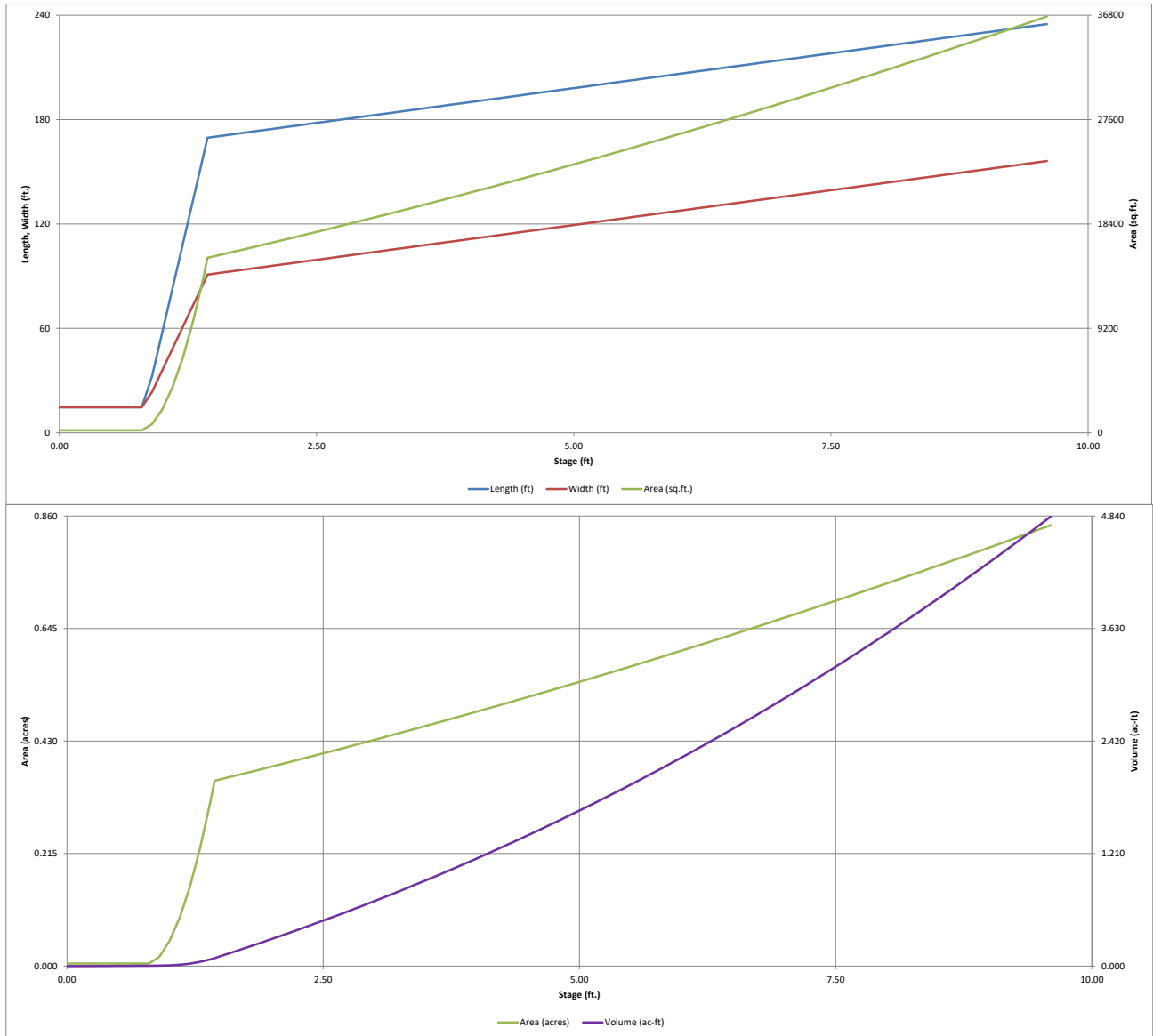
Zone 1 Volume (WQCV) =	0.545 acre-feet
Zone 2 Volume (5-year - Zone 1) =	0.190 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.821 acre-feet
Total Detention Basin Volume =	3.555 acre-feet
Initial Surge Volume (ISV) =	71 ft ³
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H _{total}) =	8.00 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.004 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 H:V
Basin Length-to-Width Ratio (R _{LW}) =	2

Initial Surge Area (A _{ISV}) =	216 ft ²
Surcharge Volume Length (L _{ISV}) =	14.7 ft
Surcharge Volume Width (W _{ISV}) =	14.7 ft
Depth of Basin Floor (H _{FLOOR}) =	0.61 ft
Length of Basin Floor (L _{FLOOR}) =	169.6 ft
Width of Basin Floor (W _{FLOOR}) =	90.9 ft
Area of Basin Floor (A _{FLOOR}) =	15,425 ft ²
Volume of Basin Floor (V _{FLOOR}) =	3,551 ft ³
Depth of Main Basin (H _{MAIN}) =	6.56 ft
Length of Main Basin (L _{MAIN}) =	222.1 ft
Width of Main Basin (W _{MAIN}) =	143.4 ft
Area of Main Basin (A _{MAIN}) =	31,853 ft ²
Volume of Main Basin (V _{MAIN}) =	151,852 ft ³
Calculated Total Basin Volume (V _{total}) =	3.572 acre-feet

Depth Increment =	0.10	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		14.7	14.7	216		0.005		
ISV	0.33		14.7	14.7	216		0.005	71	0.002
	0.40		14.7	14.7	216		0.005	86	0.002
	0.50		14.7	14.7	216		0.005	108	0.002
	0.60		14.7	14.7	216		0.005	129	0.003
	0.70		14.7	14.7	216		0.005	151	0.003
	0.80		14.7	14.7	216		0.005	173	0.004
	0.90		32.5	23.4	761		0.017	211	0.005
	1.00		57.9	35.9	2,079		0.048	348	0.008
	1.10		83.3	48.4	4,033		0.093	648	0.015
	1.20		108.7	60.9	6,622		0.152	1,176	0.027
	1.30		134.1	73.4	9,845		0.226	1,994	0.046
Floor	1.40		159.5	85.9	13,704		0.315	3,166	0.073
	1.44		169.6	90.9	15,425		0.354	3,748	0.086
	1.50		170.1	91.4	15,550		0.357	4,678	0.107
	1.60		170.9	92.2	15,760		0.362	6,243	0.143
	1.70		171.7	93.0	15,971		0.367	7,830	0.180
	1.80		172.5	93.8	16,184		0.372	9,437	0.217
	1.90		173.3	94.6	16,397		0.376	11,066	0.254
	2.00		174.1	95.4	16,612		0.381	12,717	0.292
	2.10		174.9	96.2	16,829		0.386	14,389	0.330
	2.20		175.7	97.0	17,046		0.391	16,083	0.369
	2.30		176.5	97.8	17,265		0.396	17,798	0.409
	2.40		177.3	98.6	17,485		0.401	19,536	0.448
	2.50		178.1	99.4	17,707		0.406	21,295	0.489
	2.60		178.9	100.2	17,929		0.412	23,077	0.530
Zone 1 (WQCV)	2.64		179.2	100.5	18,019		0.414	23,796	0.546
	2.70		179.7	101.0	18,153		0.417	24,881	0.571
	2.80		180.5	101.8	18,378		0.422	26,708	0.613
	2.90		181.3	102.6	18,605		0.427	28,557	0.656
	3.00		182.1	103.4	18,833		0.432	30,429	0.699
Zone 2 (5-year)	3.09		182.8	104.1	19,039		0.437	32,133	0.738
	3.10		182.9	104.2	19,062		0.438	32,323	0.742
	3.20		183.7	105.0	19,292		0.443	34,241	0.786
	3.30		184.5	105.8	19,524		0.448	36,182	0.831
	3.40		185.3	106.6	19,757		0.454	38,146	0.876
	3.50		186.1	107.4	19,991		0.459	40,133	0.921
	3.60		186.9	108.2	20,226		0.464	42,144	0.967
	3.70		187.7	109.0	20,463		0.470	44,179	1.014
	3.80		188.5	109.8	20,701		0.475	46,237	1.061
	3.90		189.3	110.6	20,940		0.481	48,319	1.109
	4.00		190.1	111.4	21,181		0.486	50,425	1.158
	4.10		190.9	112.2	21,423		0.492	52,555	1.206
	4.20		191.7	113.0	21,666		0.497	54,709	1.256
	4.30		192.5	113.8	21,910		0.503	56,888	1.306
	4.40		193.3	114.6	22,156		0.509	59,091	1.357
	4.50		194.1	115.4	22,403		0.514	61,319	1.408
	4.60		194.9	116.2	22,651		0.520	63,572	1.459
	4.70		195.7	117.0	22,901		0.526	65,850	1.512
	4.80		196.5	117.8	23,151		0.531	68,152	1.565
	4.90		197.3	118.6	23,404		0.537	70,480	1.618
	5.00		198.1	119.4	23,657		0.543	72,833	1.672
	5.10		198.9	120.2	23,912		0.549	75,211	1.727
	5.20		199.7	121.0	24,168		0.555	77,615	1.782
	5.30		200.5	121.8	24,425		0.561	80,045	1.838
	5.40		201.3	122.6	24,683		0.567	82,500	1.894
	5.50		202.1	123.4	24,943		0.573	84,982	1.951
	5.60		202.9	124.2	25,204		0.579	87,489	2.008
	5.70		203.7	125.0	25,466		0.585	90,023	2.067
	5.80		204.5	125.8	25,730		0.591	92,582	2.125
	5.90		205.3	126.6	25,995		0.597	95,169	2.185
	6.00		206.1	127.4	26,261		0.603	97,781	2.245
	6.10		206.9	128.2	26,529		0.609	100,421	2.305
	6.20		207.7	129.0	26,797		0.615	103,087	2.367
	6.30		208.5	129.8	27,067		0.621	105,780	2.428
	6.40		209.3	130.6	27,339		0.628	108,501	2.491
	6.50		210.1	131.4	27,611		0.634	111,248	2.554
	6.60		210.9	132.2	27,885		0.640	114,023	2.618
	6.70		211.7	133.0	28,160		0.646	116,825	2.682
	6.80		212.5	133.8	28,437		0.653	119,655	2.747
	6.90		213.3	134.6	28,714		0.659	122,513	2.813
	7.00		214.1	135.4	28,993		0.666	125,398	2.879
	7.10		214.9	136.2	29,274		0.672	128,311	2.946
	7.20		215.7	137.0	29,555		0.678	131,253	3.013
	7.30		216.5	137.8	29,838		0.685	134,222	3.081
	7.40		217.3	138.6	30,122		0.692	137,220	3.150
	7.50		218.1	139.4	30,407		0.698	140,247	3.220
	7.60		218.9	140.2	30,694		0.705	143,302	3.290
	7.70		219.7	141.0	30,982		0.711	146,386	3.361
	7.80		220.5	141.8	31,271		0.718	149,498	3.432
	7.90		221.3	142.6	31,562		0.725	152,640	3.504
Zone 3 (100-year)	7.98		221.9	143.3	31,795		0.730	155,174	3.562
	8.00		222.1	143.4	31,853		0.731	155,811	3.577
	8.10		222.9	144.2	32,147		0.738	159,011	3.650
	8.20		223.7	145.0	32,441		0.745	162,240	3.725
	8.30		224.5	145.8	32,736		0.752	165,499	3.799
	8.40		225.3	146.6	33,033		0.758	168,787	3.875
	8.50		226.1	147.4	33,332		0.765	172,106	3.951
	8.60		226.9	148.2	33,631		0.772	175,454	4.028
	8.70		227.7	149.0	33,932		0.779	178,832	4.105
	8.80		228.5	149.8	34,234		0.786	182,240	4.184
	8.90		229.3	150.6	34,537		0.793	185,679	4.263
	9.00		230.1	151.4	34,842		0.800	189,147	4.342
	9.10		230.9	152.2	35,147		0.807	192,647	4.423
	9.20		231.7	153.0	35,455		0.814	196,177	4.504
	9.30		232.5	153.8	35,763		0.821	199,738	4.585
	9.40		233.3	154.6	36,073		0.828	203,330	4.668
	9.50		234.1	155.4	36,384		0.835	206,952	4.751
	9.60		234.9	156.2	36,696		0.842	210,606	4.835

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

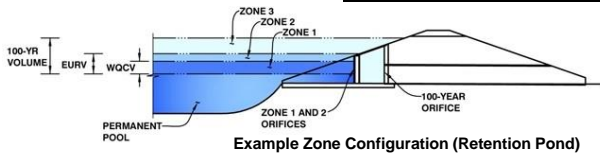


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North

Basin ID: Pond 14



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.64	0.545	Orifice Plate
Zone 2 (5-year)	3.09	0.190	Weir&Pipe (Circular)
Zone 3 (100-year)	7.98	2.821	Weir&Pipe (Restrict)
Total (all zones)		3.555	

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 ft²
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 = 2.36 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 9.40 inches
Orifice Plate: Orifice Area per Row = 1.77 sq. inches (diameter = 1-1/2 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = 1.229E-02 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	0.79	1.57					
Orifice Area (sq. inches)	1.77	1.77	1.77					

	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)

Invert of Vertical Orifice = Not Selected Not Selected ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = Not Selected Not Selected ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = Not Selected Not Selected inches

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = Not Selected Not Selected ft²
Vertical Orifice Centroid = Not Selected Not Selected feet

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

Overflow Weir Front Edge Height, H_o = Zone 2 Weir Zone 3 Weir ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 2.64 3.09 feet
Overflow Weir Grate Slope = 8.00 8.00 H:V
Horiz. Length of Weir Sides = 0.00 4.00 feet
Overflow Grate Type = 8.00 16.00
Debris Clogging % = Type C Grate Type C Grate %
50% 50%

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = Zone 2 Weir Zone 3 Weir feet
Overflow Weir Slope Length = 2.64 7.09 feet
Grate Open Area / 100-yr Orifice Area = 8.00 16.49
Overflow Grate Open Area w/o Debris = 9.07 12.49 ft²
Overflow Grate Open Area w/ Debris = 44.54 91.83 ft²
22.27 45.91

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

Depth to Invert of Outlet Pipe = Zone 2 Circular Zone 3 Restrictor ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter or Pipe Diameter = 2.64 3.09 inches
Restrictor Plate Height Above Pipe Invert = 30.00 42.00 inches
30.00

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = Zone 2 Circular Zone 3 Restrictor ft²
Outlet Orifice Centroid = 4.91 7.35 feet
Half-Central Angle of Restrictor Plate on Pipe = 1.25 1.39 radians
N/A 2.01

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 8.00 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 30.00 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.93 feet
Stage at Top of Freeboard = 9.93 feet
Basin Area at Top of Freeboard = 0.87 acres
Basin Volume at Top of Freeboard = 5.12 acre-ft

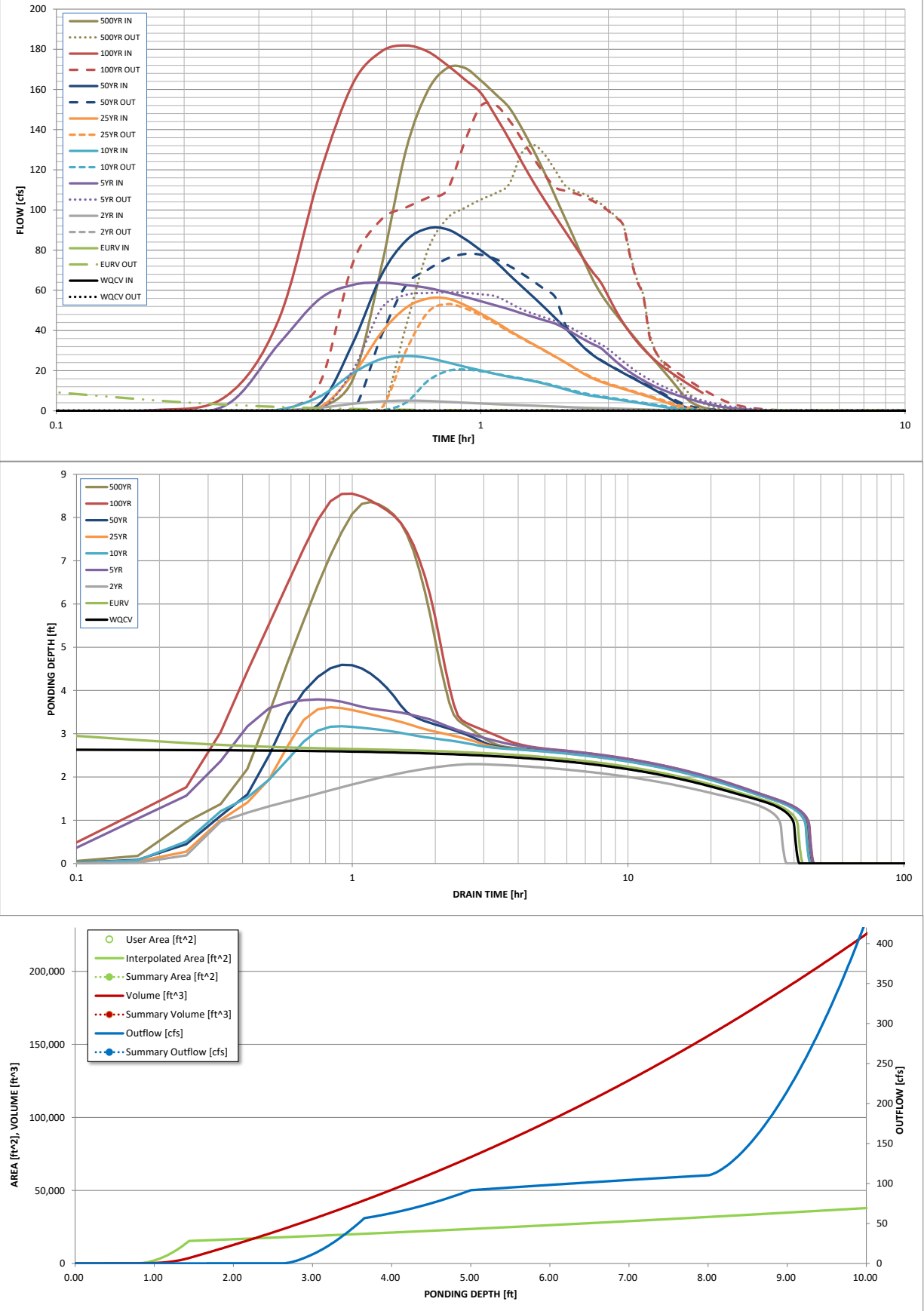
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.92	1.20	1.45	1.69	2.15	2.49	3.14
One-Hour Rainfall Depth (in) =	0.545	0.917	0.450	1.153	2.407	4.971	8.392	11.684	16.938
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.450	8.367	2.407	4.971	8.392	20.351	16.938
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.0	7.0	20.9	50.3	84.7	115.8	164.5
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.61	0.21	0.52	0.87	1.77	1.69
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	5.1	63.8	27.3	55.9	90.8	181.9	170.7
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.2	59.0	20.6	53.1	78.1	152.3	132.3
Peak Inflow Q (cfs) =	N/A	N/A	1.0	1.0	1.0	1.1	0.9	0.9	0.8
Peak Outflow Q (cfs) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ratio Peak Outflow to Predevelopment Q =	Overflow Weir 1	Overflow Weir 2	Plate	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Spillway	Spillway
Structure Controlling Flow =	N/A	0.92	N/A	1.2	0.4	1.1	1.3	1.7	1.6
Max Velocity through Grate 1 (fps) =	N/A	0.02	N/A	0.1	0.0	0.0	0.2	0.4	0.4
Max Velocity through Grate 2 (fps) =	39	39	35	22	36	29	21	4	6
Time to Drain 97% of Inflow Volume (hours) =	40	41	36	36	42	39	35	26	28
Time to Drain 99% of Inflow Volume (hours) =	2.64	3.50	2.30	3.79	3.17	3.62	4.59	8.55	8.36
Maximum Ponding Depth (ft) =	0.41	0.46	0.40	0.47	0.44	0.46	0.52	0.77	0.75
Area at Maximum Ponding Depth (acres) =	0.546	0.921	0.405	1.057	0.773	0.972	1.454	3.989	3.837
Maximum Volume Stored (acre-ft) =									

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



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: ...[SWMM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
	0:10:00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.29	0.03
	0:15:00	0.00	0.00	0.04	2.68	0.12	0.08	0.14	7.02	0.23
	0:20:00	0.00	0.00	0.24	32.98	0.57	0.30	0.44	44.87	1.48
	0:25:00	0.00	0.00	1.54	55.61	7.07	1.79	3.51	117.19	15.75
	0:30:00	0.00	0.00	3.53	62.71	18.79	18.19	33.86	163.00	71.73
	0:35:00	0.00	0.00	4.73	63.81	25.86	38.97	67.52	178.88	129.78
	0:40:00	0.00	0.00	5.08	62.67	27.30	51.32	84.73	181.87	159.22
	0:45:00	0.00	0.00	4.92	61.19	26.36	55.87	90.83	178.86	170.61
	0:50:00	0.00	0.00	4.49	58.99	24.17	55.91	90.37	172.14	170.73
	0:55:00	0.00	0.00	4.06	56.77	21.97	52.72	85.64	164.98	164.50
	1:00:00	0.00	0.00	3.69	54.57	20.15	48.45	79.93	158.30	157.70
	1:05:00	0.00	0.00	3.34	52.53	18.39	44.34	74.33	146.80	150.98
	1:10:00	0.00	0.00	3.05	50.58	16.96	40.05	67.83	135.25	140.66
	1:15:00	0.00	0.00	2.81	48.53	15.88	36.34	61.94	123.84	129.49
	1:20:00	0.00	0.00	2.58	46.69	14.77	33.08	56.51	113.61	118.13
	1:25:00	0.00	0.00	2.37	44.99	13.47	29.99	51.25	104.70	106.53
	1:30:00	0.00	0.00	2.15	43.36	12.09	26.98	46.11	96.67	95.52
	1:35:00	0.00	0.00	1.94	40.87	10.71	24.08	41.15	89.22	85.10
	1:40:00	0.00	0.00	1.72	38.18	9.35	21.22	36.26	82.14	75.03
	1:45:00	0.00	0.00	1.55	35.58	8.22	18.43	31.56	75.42	65.77
	1:50:00	0.00	0.00	1.43	33.33	7.45	16.21	27.95	69.27	58.57
	1:55:00	0.00	0.00	1.34	31.33	6.84	14.55	25.21	64.11	52.89
	2:00:00	0.00	0.00	1.24	27.96	6.29	13.23	22.93	56.89	48.02
	2:05:00	0.00	0.00	1.14	24.60	5.73	12.03	20.83	49.77	43.47
	2:10:00	0.00	0.00	1.03	21.71	5.18	10.93	18.86	43.80	39.17
	2:15:00	0.00	0.00	0.92	19.22	4.63	9.88	16.99	38.80	35.13
	2:20:00	0.00	0.00	0.82	17.06	4.10	8.85	15.19	34.54	31.34
	2:25:00	0.00	0.00	0.72	15.15	3.58	7.85	13.48	30.86	27.81
	2:30:00	0.00	0.00	0.62	13.49	3.08	6.87	11.80	27.71	24.41
	2:35:00	0.00	0.00	0.53	12.02	2.60	5.90	10.15	24.97	21.07
	2:40:00	0.00	0.00	0.43	10.74	2.12	4.94	8.51	22.58	17.76
	2:45:00	0.00	0.00	0.34	9.62	1.66	3.99	6.88	20.48	14.46
	2:50:00	0.00	0.00	0.25	8.60	1.19	3.03	5.27	18.53	11.19
	2:55:00	0.00	0.00	0.17	7.68	0.76	2.09	3.67	16.71	8.01
	3:00:00	0.00	0.00	0.11	6.83	0.48	1.24	2.26	14.99	5.37
	3:05:00	0.00	0.00	0.09	6.05	0.36	0.74	1.48	13.35	3.73
	3:10:00	0.00	0.00	0.07	5.34	0.28	0.45	0.99	11.80	2.62
	3:15:00	0.00	0.00	0.06	4.69	0.23	0.29	0.67	10.34	1.81
	3:20:00	0.00	0.00	0.05	4.09	0.18	0.19	0.45	8.96	1.22
	3:25:00	0.00	0.00	0.04	3.54	0.14	0.13	0.31	7.68	0.79
	3:30:00	0.00	0.00	0.04	3.03	0.10	0.09	0.21	6.45	0.48
	3:35:00	0.00	0.00	0.03	2.54	0.08	0.06	0.14	5.28	0.30
	3:40:00	0.00	0.00	0.02	2.14	0.05	0.05	0.11	4.22	0.22
	3:45:00	0.00	0.00	0.02	1.84	0.04	0.03	0.08	3.39	0.16
	3:50:00	0.00	0.00	0.02	1.59	0.03	0.03	0.06	2.78	0.13
	3:55:00	0.00	0.00	0.01	1.37	0.02	0.02	0.04	2.30	0.10
	4:00:00	0.00	0.00	0.01	1.17	0.02	0.01	0.03	1.90	0.08
	4:05:00	0.00	0.00	0.01	0.99	0.01	0.01	0.02	1.56	0.05
	4:10:00	0.00	0.00	0.00	0.83	0.01	0.01	0.02	1.28	0.03
	4:15:00	0.00	0.00	0.00	0.69	0.00	0.00	0.01	1.04	0.02
	4:20:00	0.00	0.00	0.00	0.56	0.00	0.00	0.00	0.85	0.01
	4:25:00	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.69	0.00
	4:30:00	0.00	0.00	0.00	0.36	0.00	0.00	0.00	0.56	0.00
	4:35:00	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.44	0.00
	4:40:00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.34	0.00
	4:45:00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.25	0.00
	4:50:00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.17	0.00
	4:55:00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.11	0.00
	5:00:00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.06	0.00
	5:05:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

0 5:50:00 0

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

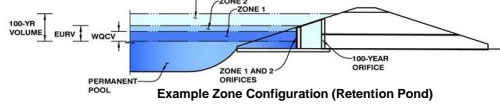
[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Flying Horse North Master Drainage Plan**

Basin ID: **Pond 15**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	40.87 acres
Watershed Length =	1,765 ft
Watershed Length to Centroid =	1,089 ft
Watershed Slope =	0.036 ft/ft
Watershed Imperviousness =	37.20% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	100.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

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

Water Quality Capture Volume (WQCV) =	0.587 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.587 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.565 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.388 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	3.133 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.211 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	5.054 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	6.152 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.39 in.) =	9.210 acre-feet	3.39	inches
Approximate 2-yr Detention Volume =	1.161 acre-feet		
Approximate 5-yr Detention Volume =	1.632 acre-feet		
Approximate 10-yr Detention Volume =	2.277 acre-feet		
Approximate 25-yr Detention Volume =	2.567 acre-feet		
Approximate 50-yr Detention Volume =	2.696 acre-feet		
Approximate 100-yr Detention Volume =	3.115 acre-feet		

Define Zones and Basin Geometry

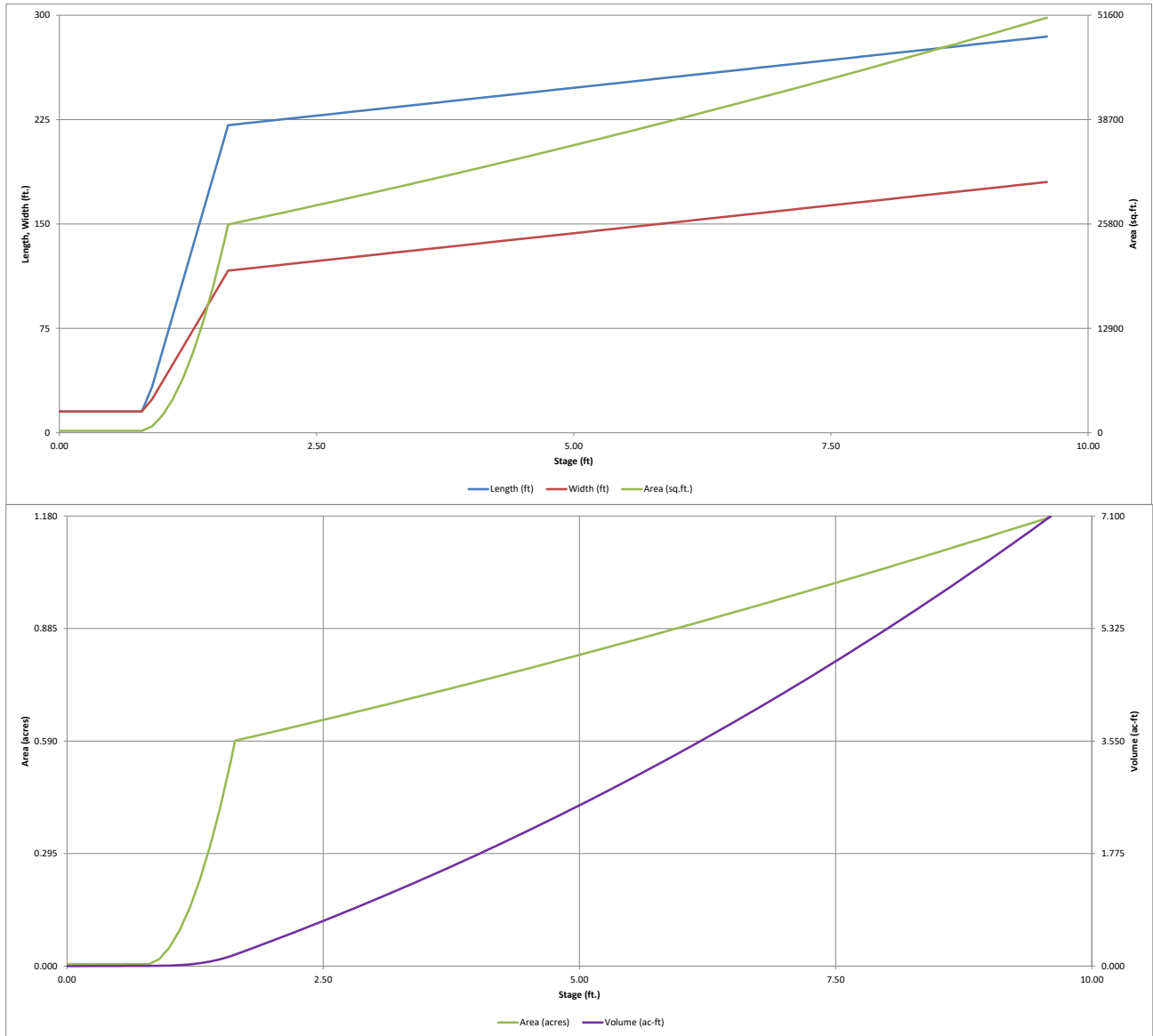
Zone 1 Volume (WQCV) =	0.587 acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.000 acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	1.821 acre-feet
Total Detention Basin Volume =	3.408 acre-feet
Initial Surge Volume (ISV) =	77 ft ³
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H _{total}) =	6.00 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.004 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 H:V
Basin Length-to-Width Ratio (L _W) =	2

Initial Surge Area (A _{ISV}) =	232 ft ²
Surcharge Volume Length (L _{ISV}) =	15.2 ft
Surcharge Volume Width (W _{ISV}) =	15.2 ft
Depth of Basin Floor (H _{FLOOR}) =	0.81 ft
Length of Basin Floor (L _{FLOOR}) =	221.0 ft
Width of Basin Floor (W _{FLOOR}) =	116.5 ft
Area of Basin Floor (A _{FLOOR}) =	25,744 ft ²
Volume of Basin Floor (V _{FLOOR}) =	7,674 ft ³
Depth of Main Basin (H _{MAIN}) =	4.36 ft
Length of Main Basin (L _{MAIN}) =	255.9 ft
Width of Main Basin (W _{MAIN}) =	151.4 ft
Area of Main Basin (A _{MAIN}) =	38,732 ft ²
Volume of Main Basin (V _{MAIN}) =	139,596 ft ³
Calculated Total Basin Volume (V _{total}) =	3.385 acre-feet

Depth Increment =	0.10	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		15.2	15.2	232		0.005		
ISV	0.33		15.2	15.2	232		0.005	77	0.002
	0.40		15.2	15.2	232		0.005	93	0.002
	0.50		15.2	15.2	232		0.005	116	0.003
	0.60		15.2	15.2	232		0.005	139	0.003
	0.70		15.2	15.2	232		0.005	163	0.004
	0.80		15.2	15.2	232		0.005	186	0.004
	0.90		33.0	24.0	792		0.018	227	0.005
	1.00		58.4	36.5	2,132		0.049	368	0.008
	1.10		83.8	49.0	4,107		0.094	675	0.015
	1.20		109.2	61.5	6,717		0.154	1,210	0.028
1.30		134.6	74.0	9,962		0.229	2,039	0.047	
1.40		160.0	86.5	13,841		0.318	3,224	0.074	
1.50		185.4	99.0	18,356		0.421	4,829	0.111	
Floor	1.60		210.8	111.5	23,506		0.540	6,916	0.159
	1.64		221.0	116.5	25,744		0.591	7,901	0.181
	1.70		221.5	117.0	25,906		0.595	9,451	0.217
	1.80		222.3	117.8	26,177		0.601	12,055	0.277
	1.90		223.1	118.6	26,450		0.607	14,686	0.337
	2.00		223.9	119.4	26,724		0.613	17,345	0.398
	2.10		224.7	120.2	26,999		0.620	20,031	0.460
	2.20		225.5	121.0	27,276		0.626	22,745	0.522
	2.30		226.3	121.8	27,554		0.633	25,486	0.585
	2.31		226.3	121.9	27,581		0.633	25,762	0.591
2.40		227.1	122.6	27,833		0.639	28,255	0.649	
2.50		227.9	123.4	28,113		0.645	31,053	0.713	
2.60		228.7	124.2	28,395		0.652	33,878	0.778	
2.70		229.5	125.0	28,678		0.658	36,732	0.843	
2.80		230.3	125.8	28,962		0.665	39,614	0.909	
2.90		231.1	126.6	29,247		0.671	42,524	0.976	
3.00		231.9	127.4	29,534		0.678	45,463	1.044	
3.10		232.7	128.2	29,822		0.685	48,431	1.112	
3.20		233.5	129.0	30,111		0.691	51,428	1.181	
3.30		234.3	129.8	30,402		0.698	54,453	1.250	
3.40		235.1	130.6	30,694		0.705	57,508	1.320	
3.50		235.9	131.4	30,987		0.711	60,592	1.391	
3.60		236.7	132.2	31,281		0.718	63,705	1.462	
3.70		237.5	133.0	31,577		0.725	66,848	1.535	
Zone 2 (EURV)	3.78		238.1	133.6	31,815		0.730	69,384	1.593
	3.80		238.3	133.8	31,874		0.732	70,021	1.607
	3.90		239.1	134.6	32,172		0.739	73,223	1.681
	4.00		239.9	135.4	32,472		0.745	76,455	1.755
4.10		240.7	136.2	32,773		0.752	79,718	1.830	
4.20		241.5	137.0	33,075		0.759	83,010	1.906	
4.30		242.3	137.8	33,378		0.766	86,333	1.982	
4.40		243.1	138.6	33,683		0.773	89,686	2.059	
4.50		243.9	139.4	33,989		0.780	93,069	2.137	
4.60		244.7	140.2	34,296		0.787	96,483	2.215	
4.70		245.5	141.0	34,605		0.794	99,928	2.294	
4.80		246.3	141.8	34,914		0.802	103,404	2.374	
4.90		247.1	142.6	35,225		0.809	106,911	2.454	
5.00		247.9	143.4	35,538		0.816	110,449	2.536	
5.10		248.7	144.2	35,851		0.823	114,019	2.618	
5.20		249.5	145.0	36,166		0.830	117,620	2.700	
5.30		250.3	145.8	36,483		0.838	121,252	2.784	
5.40		251.1	146.6	36,800		0.845	124,916	2.868	
5.50		251.9	147.4	37,119		0.852	128,612	2.953	
5.60		252.7	148.2	37,439		0.859	132,340	3.038	
5.70		253.5	149.0	37,760		0.867	136,100	3.124	
5.80		254.3	149.8	38,083		0.874	139,892	3.211	
5.90		255.1	150.6	38,407		0.882	143,717	3.299	
Z3 (100+1/2WQCV)	6.00		255.9	151.4	38,732		0.889	147,574	3.388
	6.03		256.1	151.6	38,830		0.891	148,737	3.415
	6.10		256.7	152.2	39,058		0.897	151,463	3.477
	6.20		257.5	153.0	39,386		0.904	155,385	3.567
	6.30		258.3	153.8	39,715		0.912	159,340	3.658
	6.40		259.1	154.6	40,045		0.919	163,328	3.750
	6.50		259.9	155.4	40,377		0.927	167,349	3.842
	6.60		260.7	156.2	40,710		0.935	171,404	3.935
	6.70		261.5	157.0	41,044		0.942	175,491	4.029
	6.80		262.3	157.8	41,379		0.950	179,612	4.123
6.90		263.1	158.6	41,716		0.958	183,767	4.219	
7.00		263.9	159.4	42,054		0.965	187,956	4.315	
7.10		264.7	160.2	42,393		0.973	192,178	4.412	
7.20		265.5	161.0	42,733		0.981	196,434	4.510	
7.30		266.3	161.8	43,075		0.989	200,725	4.608	
7.40		267.1	162.6	43,418		0.997	205,049	4.707	
7.50		267.9	163.4	43,763		1.005	209,408	4.807	
7.60		268.7	164.2	44,108		1.013	213,802	4.908	
7.70		269.5	165.0	44,455		1.021	218,230	5.010	
7.80		270.3	165.8	44,803		1.029	222,693	5.112	
7.90		271.1	166.6	45,153		1.037	227,191	5.216	
8.00		271.9	167.4	45,504		1.045	231,724	5.320	
8.10		272.7	168.2	45,856		1.053	236,291	5.425	
8.20		273.5	169.0	46,209		1.061	240,895	5.530	
8.30		274.3	169.8	46,564		1.069	245,533	5.637	
8.40		275.1	170.6	46,919		1.077	250,207	5.744	
8.50		275.9	171.4	47,277		1.085	254,917	5.852	
8.60		276.7	172.2	47,635		1.094	259,663	5.961	
8.70		277.5	173.0	47,995		1.102	264,444	6.071	
8.80		278.3	173.8	48,356		1.110	269,262	6.181	
8.90		279.1	174.6	48,718		1.118	274,115	6.293	
9.00		279.9	175.4	49,081		1.127	279,005	6.405	
9.10		280.7	176.2	49,446		1.135	283,932	6.518	
9.20		281.5	177.0	49,812		1.144	288,895	6.632	
9.30		282.3	177.8	50,180		1.152	293,894	6.747	
9.40		283.1	178.6	50,549		1.160	298,931	6.863	
9.50		283.9	179.4	50,918		1.169	304,004	6.979	
9.60		284.7	180.2	51,290		1.177	309,114	7.096	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

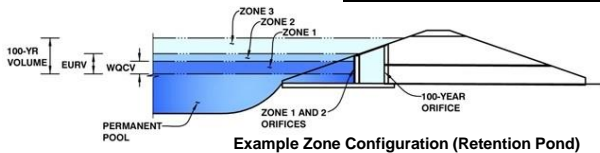


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 15



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.31	0.587	Orifice Plate
Zone 2 (EURV)	3.78	1.000	Weir&Pipe (Circular)
Zone 3 (100+1/2WQCV)	6.03	1.821	Weir&Pipe (Restrict)
Total (all zones)		3.408	

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 ft²
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 = 2.36 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = 9.40 inches
Orifice Plate: Orifice Area per Row = 1.99 sq. inches (diameter = 1-9/16 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = 1.382E-02 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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	0.79	1.57					
Orifice Area (sq. inches)	1.99	1.99	1.99					

	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
Vertical Orifice Area = Not Selected ft²
Vertical Orifice Centroid = Not Selected feet

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

	Zone 2 Weir	Zone 3 Weir	
Overflow Weir Front Edge Height, H _o =	2.39	2.49	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.00	5.00	feet
Overflow Weir Grate Slope =	0.00	4.00	H:V
Horiz. Length of Weir Sides =	5.00	10.00	feet
Overflow Grate Type =	Type C Grate	Type C Grate	
Debris Clogging % =	50%	50%	%

Calculated Parameters for Overflow Weir
Height of Grate Upper Edge, H_u = 2.39 feet
Overflow Weir Slope Length = 5.00 feet
Grate Open Area / 100-yr Orifice Area = 22.15
Overflow Grate Open Area w/o Debris = 17.40 ft²
Overflow Grate Open Area w/ Debris = 8.70 ft²

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

	Zone 2 Circular	Zone 3 Restrictor	
Depth to Invert of Outlet Pipe =	2.50	2.70	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter or Pipe Diameter =	12.00	36.00	inches
Restrictor Plate Height Above Pipe Invert =		25.00	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = 0.79 ft²
Outlet Orifice Centroid = 0.50 feet
Half-Central Angle of Restrictor Plate on Pipe = N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	31.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.93 feet
Stage at Top of Freeboard = 8.93 feet
Basin Area at Top of Freeboard = 1.12 acres
Basin Volume at Top of Freeboard = 6.33 acre-ft

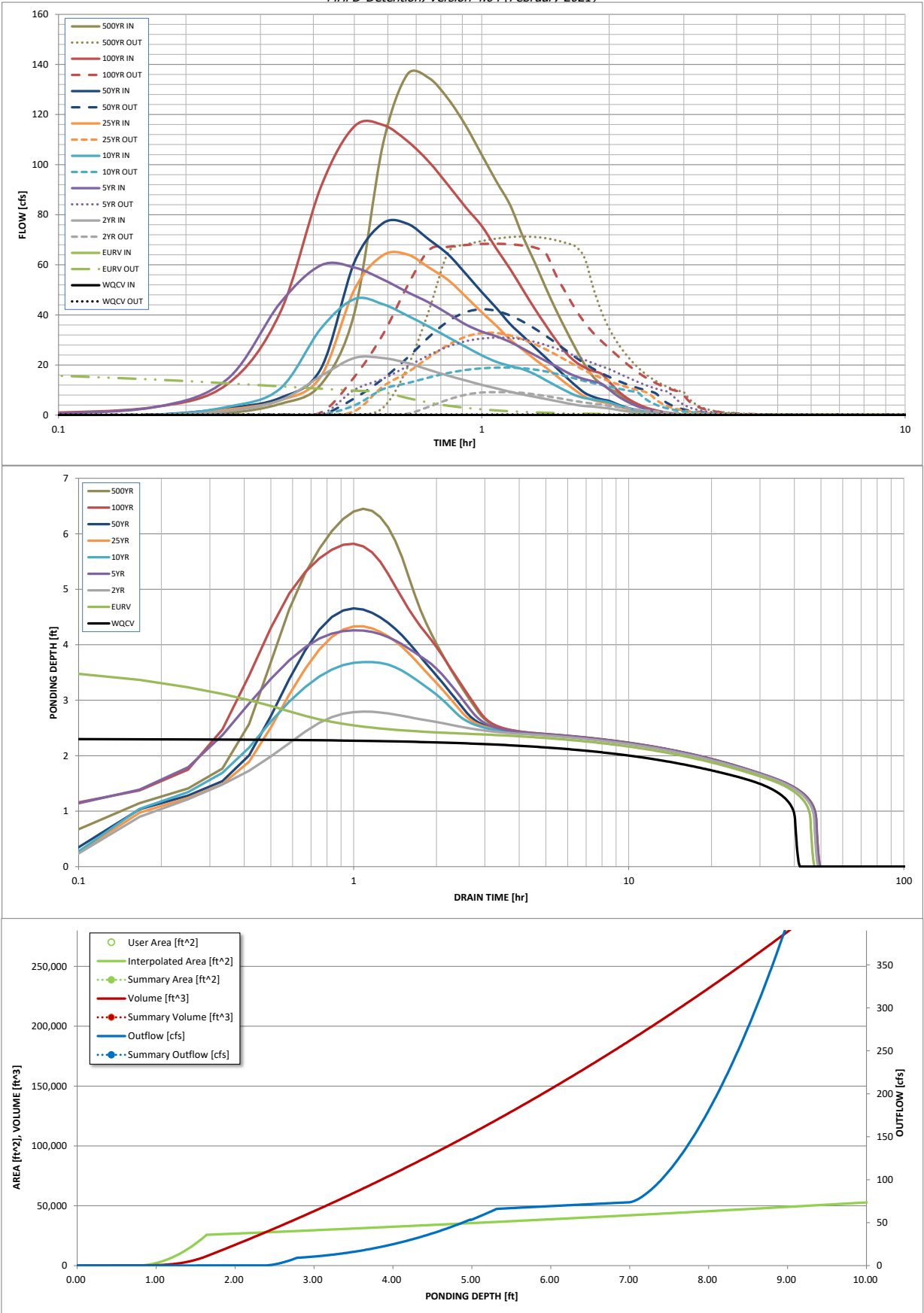
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.39
One-Hour Rainfall Depth (in) =	0.587	1.587	1.565	2.388	3.133	4.211	5.054	6.152	9.210
CUHP Runoff Volume (acre-ft) =	N/A	N/A	1.565	4.857	3.133	4.211	5.054	8.775	9.210
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.8	13.3	20.2	35.6	44.6	57.0	88.8
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.12	0.77	0.49	0.87	1.09	1.66	2.17
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	22.8	59.8	46.3	64.1	76.5	115.9	136.0
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	9.1	30.9	18.9	32.8	42.3	68.4	71.3
Peak Inflow Q (cfs) =	N/A	N/A	N/A	1.0	0.9	0.9	0.9	1.0	0.8
Peak Outflow Q (cfs) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Structure Controlling Flow =	Plate	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Overflow Weir 2	Outlet Plate 2	Outlet Plate 2
Max Velocity through Grate 1 (fps) =	N/A	0.50	0.46	0.5	0.5	0.5	0.5	0.6	0.6
Max Velocity through Grate 2 (fps) =	N/A	0.32	0.02	0.6	0.3	0.6	0.9	1.6	1.7
Time to Drain 97% of Inflow Volume (hours) =	39	41	43	34	39	36	34	26	25
Time to Drain 99% of Inflow Volume (hours) =	40	45	46	43	45	44	43	40	39
Maximum Ponding Depth (ft) =	2.31	3.78	2.80	4.26	3.69	4.33	4.65	5.82	6.45
Area at Maximum Ponding Depth (acres) =	0.63	0.73	0.66	0.76	0.72	0.77	0.79	0.88	0.92
Maximum Volume Stored (acre-ft) =	0.591	1.593	0.903	1.944	1.520	2.005	2.254	3.229	3.786

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)



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: ...[SWM]Outflow hydrographs\Pond6 OutflowHydrograph.xlsx

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.55	0.00
	0:10:00	0.00	0.00	0.00	3.05	0.00	0.00	0.18	3.10	0.83
	0:15:00	0.00	0.00	1.60	14.26	3.27	2.20	2.77	12.25	4.45
	0:20:00	0.00	0.00	5.84	44.61	10.48	5.83	6.83	40.67	12.21
	0:25:00	0.00	0.00	15.59	59.80	34.54	15.42	18.52	91.07	40.72
	0:30:00	0.00	0.00	22.81	58.93	46.32	50.11	61.06	115.27	107.68
	0:35:00	0.00	0.00	22.79	54.19	44.31	63.75	76.55	115.87	135.98
	0:40:00	0.00	0.00	20.82	49.14	39.76	64.15	76.41	109.44	134.56
	0:45:00	0.00	0.00	18.07	44.94	35.32	58.91	70.09	101.12	126.16
	0:50:00	0.00	0.00	15.72	40.41	31.03	53.88	64.09	91.75	115.49
	0:55:00	0.00	0.00	13.81	36.16	27.25	47.29	56.41	82.92	103.88
	1:00:00	0.00	0.00	12.08	33.34	23.85	41.04	49.09	75.47	93.21
	1:05:00	0.00	0.00	10.66	31.42	21.25	35.60	42.69	66.36	83.86
	1:10:00	0.00	0.00	9.30	29.19	19.60	30.17	36.36	58.34	71.33
	1:15:00	0.00	0.00	8.22	26.56	18.32	26.11	31.60	50.09	61.02
	1:20:00	0.00	0.00	7.29	24.00	16.33	22.35	27.02	42.51	50.81
	1:25:00	0.00	0.00	6.44	21.60	13.93	19.00	22.91	35.82	41.70
	1:30:00	0.00	0.00	5.60	19.48	11.66	15.68	18.87	29.78	33.76
	1:35:00	0.00	0.00	4.80	17.20	9.61	12.60	15.14	24.73	26.53
	1:40:00	0.00	0.00	4.10	15.51	7.86	9.79	11.74	21.24	20.15
	1:45:00	0.00	0.00	3.61	14.34	6.81	7.38	8.89	19.03	15.30
	1:50:00	0.00	0.00	3.38	13.48	6.22	6.03	7.31	17.57	12.38
	1:55:00	0.00	0.00	2.99	12.56	5.69	5.19	6.31	16.52	10.47
	2:00:00	0.00	0.00	2.67	10.20	5.09	4.65	5.66	13.33	9.11
	2:05:00	0.00	0.00	2.15	7.89	4.08	3.63	4.42	10.15	6.95
	2:10:00	0.00	0.00	1.68	6.09	3.16	2.77	3.36	7.70	5.08
	2:15:00	0.00	0.00	1.32	4.66	2.43	2.10	2.54	5.86	3.70
	2:20:00	0.00	0.00	1.02	3.53	1.85	1.58	1.91	4.46	2.71
	2:25:00	0.00	0.00	0.79	2.62	1.39	1.20	1.44	3.35	2.04
	2:30:00	0.00	0.00	0.61	1.92	1.03	0.89	1.07	2.50	1.52
	2:35:00	0.00	0.00	0.46	1.41	0.77	0.66	0.80	1.89	1.14
	2:40:00	0.00	0.00	0.35	1.00	0.58	0.50	0.60	1.38	0.87
	2:45:00	0.00	0.00	0.25	0.68	0.43	0.37	0.45	0.96	0.64
	2:50:00	0.00	0.00	0.18	0.43	0.30	0.27	0.32	0.61	0.45
	2:55:00	0.00	0.00	0.11	0.24	0.19	0.18	0.21	0.35	0.30
	3:00:00	0.00	0.00	0.07	0.10	0.11	0.11	0.13	0.15	0.17
	3:05:00	0.00	0.00	0.03	0.03	0.05	0.05	0.06	0.04	0.08
	3:10:00	0.00	0.00	0.01	0.00	0.02	0.02	0.02	0.00	0.02
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

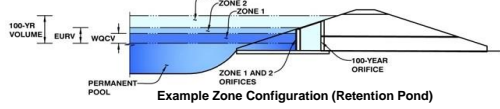
[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: **Flying Horse North MDDP**

Basin ID: **Pond 16**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	28.99	acres
Watershed Length =	1,505	ft
Watershed Length to Centroid =	954	ft
Watershed Slope =	0.035	ft/ft
Watershed Imperviousness =	34.66%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Denver - Capitol Building	

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

Water Quality Capture Volume (WQCV) =	0.399	acre-feet
Excess Urban Runoff Volume (EURV) =	1.043	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.034	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	1.610	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	2.133	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	2.899	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	3.492	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	4.270	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	5.793	acre-feet
Approximate 2-yr Detention Volume =	0.758	acre-feet
Approximate 5-yr Detention Volume =	1.071	acre-feet
Approximate 10-yr Detention Volume =	1.515	acre-feet
Approximate 25-yr Detention Volume =	1.723	acre-feet
Approximate 50-yr Detention Volume =	1.812	acre-feet
Approximate 100-yr Detention Volume =	2.110	acre-feet

Optional User Overrides

		acre-feet
		acre-feet
	1.19	inches
	1.50	inches
	1.75	inches
	2.00	inches
	2.25	inches
	2.52	inches
		inches

Define Zones and Basin Geometry

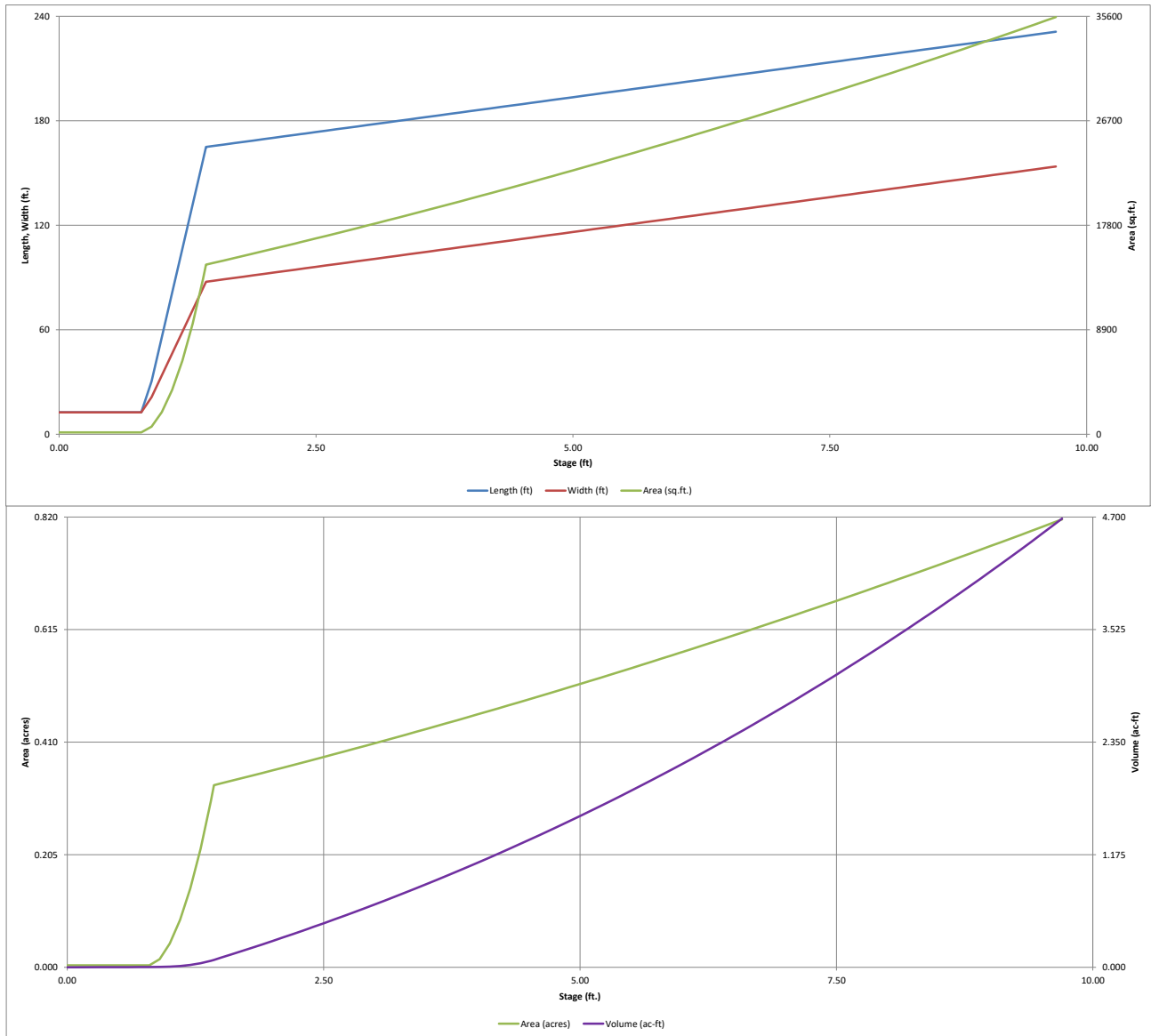
Zone 1 Volume (WQCV) =	0.399	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.644	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.067	acre-feet
Total Detention Basin Volume =	2.110	acre-feet
Initial Surge Volume (ISV) =	52	ft ³
Initial Surge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.004	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{LW}) =	2	

Initial Surge Area (A _{ISV}) =	158	ft ²
Surcharge Volume Length (L _{ISV}) =	12.6	ft
Surcharge Volume Width (W _{ISV}) =	12.6	ft
Depth of Basin Floor (H _{FLOOR}) =	0.60	ft
Length of Basin Floor (L _{FLOOR}) =	165.0	ft
Width of Basin Floor (W _{FLOOR}) =	87.6	ft
Area of Basin Floor (A _{FLOOR}) =	14,448	ft ²
Volume of Basin Floor (V _{FLOOR}) =	3,223	ft ³
Depth of Main Basin (H _{MAIN}) =	4.57	ft
Length of Main Basin (L _{MAIN}) =	201.5	ft
Width of Main Basin (W _{MAIN}) =	124.1	ft
Area of Main Basin (A _{MAIN}) =	25,017	ft ²
Volume of Main Basin (V _{MAIN}) =	89,079	ft ³
Calculated Total Basin Volume (V _{total}) =	2.122	acre-feet

Depth Increment =	0.10	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		12.6	12.6	158		0.004		
ISV	0.33		12.6	12.6	158		0.004	52	0.001
	0.40		12.6	12.6	158		0.004	63	0.001
	0.50		12.6	12.6	158		0.004	79	0.002
	0.60		12.6	12.6	158		0.004	95	0.002
	0.70		12.6	12.6	158		0.004	111	0.003
	0.80		12.6	12.6	158		0.004	126	0.003
	0.90		30.4	21.3	647		0.015	158	0.004
	1.00		55.8	33.8	1,886		0.043	279	0.006
	1.10		81.2	46.3	3,759		0.086	556	0.013
	1.20		106.6	58.8	6,268		0.144	1,052	0.024
	1.30		132.0	71.3	9,412		0.216	1,831	0.042
Floor	1.40		157.4	83.8	13,190		0.303	2,956	0.068
	1.43		165.0	87.6	14,448		0.332	3,370	0.077
	1.50		165.5	88.1	14,589		0.335	4,386	0.101
	1.60		166.3	88.9	14,793		0.340	5,855	0.134
	1.70		167.1	89.7	14,998		0.344	7,345	0.169
	1.80		167.9	90.5	15,204		0.349	8,855	0.203
	1.90		168.7	91.3	15,411		0.354	10,386	0.238
	2.00		169.5	92.1	15,620		0.359	11,937	0.274
	2.10		170.3	92.9	15,830		0.363	13,510	0.310
	2.20		171.1	93.7	16,041		0.368	15,103	0.347
	2.30		171.9	94.5	16,254		0.373	16,718	0.384
Zone 1 (WQCV)	2.35		172.3	94.9	16,361		0.376	17,533	0.403
	2.40		172.7	95.3	16,468		0.378	18,354	0.421
	2.50		173.5	96.1	16,683		0.383	20,012	0.459
	2.60		174.3	96.9	16,899		0.388	21,691	0.498
	2.70		175.1	97.7	17,117		0.393	23,391	0.537
	2.80		175.9	98.5	17,336		0.398	25,114	0.577
	2.90		176.7	99.3	17,556		0.403	26,859	0.617
	3.00		177.5	100.1	17,777		0.408	28,625	0.657
	3.10		178.3	100.9	18,000		0.413	30,414	0.698
	3.20		179.1	101.7	18,224		0.418	32,225	0.740
	3.30		179.9	102.5	18,450		0.424	34,059	0.782
	3.40		180.7	103.3	18,676		0.429	35,915	0.825
	3.50		181.5	104.1	18,904		0.434	37,794	0.868
	3.60		182.3	104.9	19,133		0.439	39,696	0.911
	3.70		183.1	105.7	19,364		0.445	41,621	0.955
	3.80		183.9	106.5	19,595		0.450	43,569	1.000
Zone 2 (EURV)	3.90		184.7	107.3	19,828		0.455	45,540	1.045
	4.00		185.5	108.1	20,063		0.461	47,535	1.091
	4.10		186.3	108.9	20,298		0.466	49,553	1.138
	4.20		187.1	109.7	20,535		0.471	51,594	1.184
	4.30		187.9	110.5	20,773		0.477	53,660	1.232
	4.40		188.7	111.3	21,013		0.482	55,749	1.280
	4.50		189.5	112.1	21,253		0.488	57,862	1.328
	4.60		190.3	112.9	21,495		0.493	60,000	1.377
	4.70		191.1	113.7	21,739		0.499	62,161	1.427
	4.80		191.9	114.5	21,983		0.505	64,347	1.477
	4.90		192.7	115.3	22,229		0.510	66,558	1.528
	5.00		193.5	116.1	22,476		0.516	68,793	1.579
	5.10		194.3	116.9	22,724		0.522	71,053	1.631
	5.20		195.1	117.7	22,974		0.527	73,338	1.684
	5.30		195.9	118.5	23,225		0.533	75,648	1.737
	5.40		196.7	119.3	23,477		0.539	77,983	1.790
	5.50		197.5	120.1	23,731		0.545	80,344	1.844
	5.60		198.3	120.9	23,986		0.551	82,729	1.899
	5.70		199.1	121.7	24,242		0.557	85,141	1.955
	5.80		199.9	122.5	24,499		0.562	87,578	2.011
Zone 3 (100-year)	5.90		200.7	123.3	24,758		0.568	90,041	2.067
	5.98		201.4	124.0	24,965		0.573	92,030	2.113
	6.00		201.5	124.1	25,017		0.574	92,529	2.124
	6.10		202.3	124.9	25,279		0.580	95,044	2.182
	6.20		203.1	125.7	25,541		0.586	97,585	2.240
	6.30		203.9	126.5	25,805		0.592	100,152	2.299
	6.40		204.7	127.3	26,070		0.598	102,746	2.359
	6.50		205.5	128.1	26,336		0.605	105,366	2.419
	6.60		206.3	128.9	26,604		0.611	108,013	2.480
	6.70		207.1	129.7	26,873		0.617	110,687	2.541
	6.80		207.9	130.5	27,143		0.623	113,388	2.603
	6.90		208.7	131.3	27,414		0.629	116,116	2.666
	7.00		209.5	132.1	27,687		0.636	118,871	2.729
	7.10		210.3	132.9	27,961		0.642	121,653	2.793
	7.20		211.1	133.7	28,236		0.648	124,463	2.857
	7.30		211.9	134.5	28,513		0.655	127,300	2.922
	7.40		212.7	135.3	28,790		0.661	130,166	2.988
	7.50		213.5	136.1	29,069		0.667	133,059	3.055
	7.60		214.3	136.9	29,350		0.674	135,979	3.122
	7.70		215.1	137.7	29,631		0.680	138,929	3.189
	7.80		215.9	138.5	29,914		0.687	141,906	3.258
	7.90		216.7	139.3	30,199		0.693	144,911	3.327
	8.00		217.5	140.1	30,484		0.700	147,946	3.396
	8.10		218.3	140.9	30,771		0.706	151,008	3.467
	8.20		219.1	141.7	31,059		0.713	154,100	3.538
	8.30		219.9	142.5	31,348		0.720	157,220	3.609
	8.40		220.7	143.3	31,639		0.726	160,369	3.682
	8.50		221.5	144.1	31,931		0.733	163,548	3.755
	8.60		222.3	144.9	32,224		0.740	166,756	3.828
	8.70		223.1	145.7	32,518		0.747	169,993	3.902
	8.80		223.9	146.5	32,814		0.753	173,259	3.977
	8.90		224.7	147.3	33,111		0.760	176,556	4.053
	9.00		225.5	148.1	33,409		0.767	179,882	4.130
	9.10		226.3	148.9	33,709		0.774	183,238	4.207
	9.20		227.1	149.7	34,010		0.781	186,624	4.284
	9.30		227.9	150.5	34,312		0.788	190,040	4.363
	9.40		228.7	151.3	34,615		0.795	193,486	4.442
	9.50		229.5	152.1	34,920		0.802	196,963	4.522
	9.60		230.3	152.9	35,226		0.809	200,470	4.602
	9.70		231.1	153.7	35,533		0.816	204,008	4.683

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

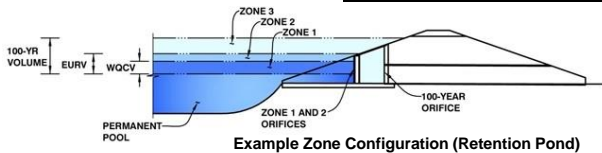


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.05 (January 2022)

Project: Flying Horse North MDDP

Basin ID: Pond 16



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.35	0.399	Orifice Plate
Zone 2 (EURV)	3.90	0.644	Circular Orifice
Zone 3 (100-year)	5.98	1.067	Weir&Pipe (Restrict)
Total (all zones)		2.110	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = 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)

Centroid of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 1-5/16 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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	0.80	1.60					
Orifice Area (sq. inches)	1.40	1.40	1.40					

	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)

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

Calculated Parameters for Vertical Orifice
Zone 2 Circular
Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Type =
Debris Clogging % = %

Calculated Parameters for Overflow Weir
Zone 3 Weir
Height of Grate Upper Edge, H_u = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Zone 3 Restrictor
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

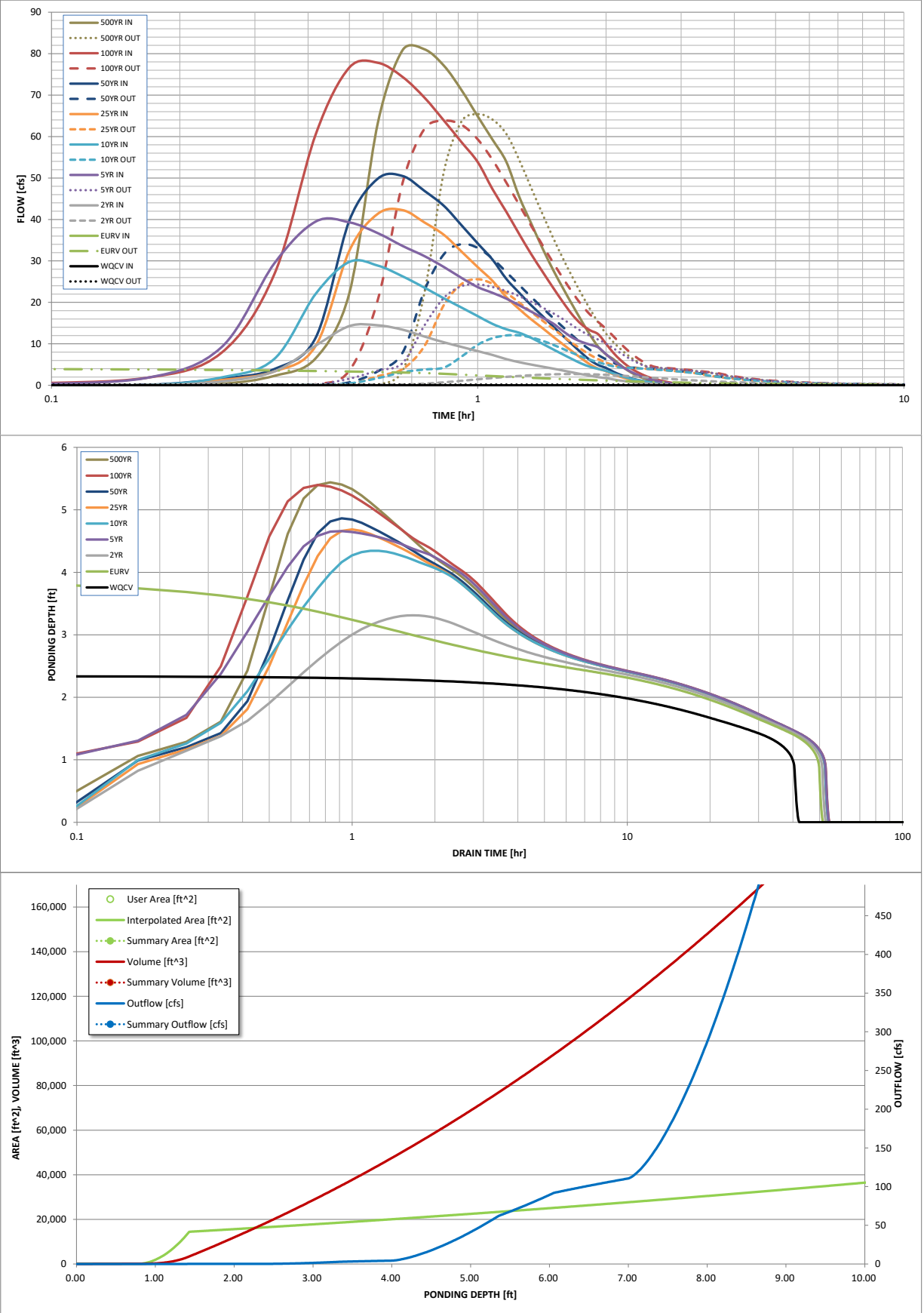
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.399	1.043	1.034	1.610	2.133	2.899	3.492	4.270	5.793
CUHP Runoff Volume (acre-ft) =	N/A	N/A	1.034	3.422	2.133	2.899	3.492	6.198	5.793
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.3	9.3	14.0	24.7	31.0	39.7	55.2
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.11	0.84	0.48	0.85	1.07	2.46	1.91
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	14.5	39.5	29.8	42.2	50.5	77.8	81.0
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	2.7	24.3	12.0	25.6	34.1	63.8	65.4
Peak Inflow Q (cfs) =	N/A	N/A	N/A	1.0	0.9	1.0	1.1	0.9	1.2
Peak Outflow Q (cfs) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.9	0.3	1.0	1.4	2.8	2.8
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	46	47	39	43	40	38	29	31
Time to Drain 99% of Inflow Volume (hours) =	40	49	50	48	49	48	47	44	44
Maximum Ponding Depth (ft) =	2.35	3.90	3.31	4.66	4.34	4.69	4.86	5.40	5.44
Area at Maximum Ponding Depth (acres) =	0.38	0.46	0.42	0.50	0.48	0.50	0.51	0.54	0.54
Maximum Volume Stored (acre-ft) =	0.403	1.045	0.786	1.402	1.251	1.417	1.508	1.785	1.806

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.32	0.00
	0:10:00	0.00	0.00	0.00	1.77	0.00	0.00	0.11	1.79	0.34
	0:15:00	0.00	0.00	0.92	9.10	1.88	1.27	1.60	7.77	2.28
	0:20:00	0.00	0.00	3.34	29.42	6.38	3.35	3.92	26.81	6.51
	0:25:00	0.00	0.00	9.57	39.49	22.05	9.51	11.47	60.50	22.27
	0:30:00	0.00	0.00	14.29	39.30	29.77	32.48	39.77	76.66	63.40
	0:35:00	0.00	0.00	14.47	36.68	28.86	41.39	49.87	77.79	80.87
	0:40:00	0.00	0.00	13.41	33.60	26.27	42.25	50.47	74.36	81.05
	0:45:00	0.00	0.00	11.76	31.16	23.55	39.28	46.89	69.39	77.08
	0:50:00	0.00	0.00	10.37	28.52	20.96	36.28	43.27	63.84	71.17
	0:55:00	0.00	0.00	9.25	25.89	18.74	32.24	38.58	58.62	64.89
	1:00:00	0.00	0.00	8.24	23.69	16.69	28.51	34.22	53.85	59.25
	1:05:00	0.00	0.00	7.31	22.30	14.81	25.19	30.31	47.30	53.94
	1:10:00	0.00	0.00	6.32	20.91	13.52	21.30	25.69	41.88	45.60
	1:15:00	0.00	0.00	5.58	19.32	12.68	18.43	22.36	36.55	39.18
	1:20:00	0.00	0.00	5.01	17.80	11.48	15.95	19.36	31.73	33.21
	1:25:00	0.00	0.00	4.51	16.35	10.05	13.86	16.79	27.53	28.00
	1:30:00	0.00	0.00	4.04	14.97	8.71	11.81	14.28	23.67	23.53
	1:35:00	0.00	0.00	3.57	13.11	7.47	9.92	11.98	20.13	19.43
	1:40:00	0.00	0.00	3.12	11.52	6.31	8.17	9.85	17.04	15.66
	1:45:00	0.00	0.00	2.69	10.50	5.26	6.52	7.85	14.74	12.20
	1:50:00	0.00	0.00	2.33	9.82	4.48	5.06	6.09	13.29	9.32
	1:55:00	0.00	0.00	1.97	9.15	3.95	4.02	4.89	12.33	7.44
	2:00:00	0.00	0.00	1.73	7.52	3.49	3.41	4.18	10.02	6.27
	2:05:00	0.00	0.00	1.40	5.94	2.83	2.64	3.26	7.78	4.79
	2:10:00	0.00	0.00	1.13	4.69	2.25	2.01	2.49	6.03	3.57
	2:15:00	0.00	0.00	0.90	3.67	1.78	1.55	1.91	4.63	2.64
	2:20:00	0.00	0.00	0.71	2.86	1.39	1.18	1.46	3.57	1.92
	2:25:00	0.00	0.00	0.56	2.19	1.07	0.90	1.11	2.74	1.41
	2:30:00	0.00	0.00	0.44	1.65	0.82	0.69	0.84	2.09	1.05
	2:35:00	0.00	0.00	0.34	1.24	0.61	0.52	0.63	1.60	0.79
	2:40:00	0.00	0.00	0.27	0.92	0.46	0.39	0.48	1.23	0.61
	2:45:00	0.00	0.00	0.21	0.67	0.35	0.30	0.37	0.91	0.47
	2:50:00	0.00	0.00	0.16	0.46	0.27	0.23	0.28	0.65	0.36
	2:55:00	0.00	0.00	0.11	0.30	0.19	0.17	0.20	0.42	0.26
	3:00:00	0.00	0.00	0.08	0.17	0.13	0.12	0.14	0.25	0.18
	3:05:00	0.00	0.00	0.05	0.08	0.08	0.07	0.09	0.12	0.11
	3:10:00	0.00	0.00	0.02	0.03	0.04	0.04	0.05	0.04	0.06
	3:15:00	0.00	0.00	0.01	0.00	0.02	0.02	0.02	0.00	0.02
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

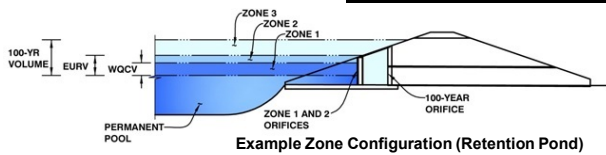
[illegible]

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North Drainage Plan

Basin ID: Pond 17



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.20	0.203	Orifice Plate
Zone 2 (EURV)	3.19	0.193	Circular Orifice
Zone 3 (100-year)	5.98	0.739	Weir&Pipe (Restrict)
Total (all zones)		1.134	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = 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 = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 1-1/16 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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	0.73	1.47					
Orifice Area (sq. inches)	0.86	0.86	0.86					

	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)

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

Calculated Parameters for Vertical Orif
Zone 2 Circular Not Selected
Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Gate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Gate Type =
Debris Clogging % = %

Calculated Parameters for Overflow W
Zone 3 Weir Not Selected
Height of Gate Upper Edge, H_u = ft
Overflow Weir Slope Length = feet
Gate Open Area / 100-yr Orifice Area = ft²
Overflow Gate Open Area w/o Debris = ft²
Overflow Gate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl
Zone 3 Restrictor Not Selected
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = degrees

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

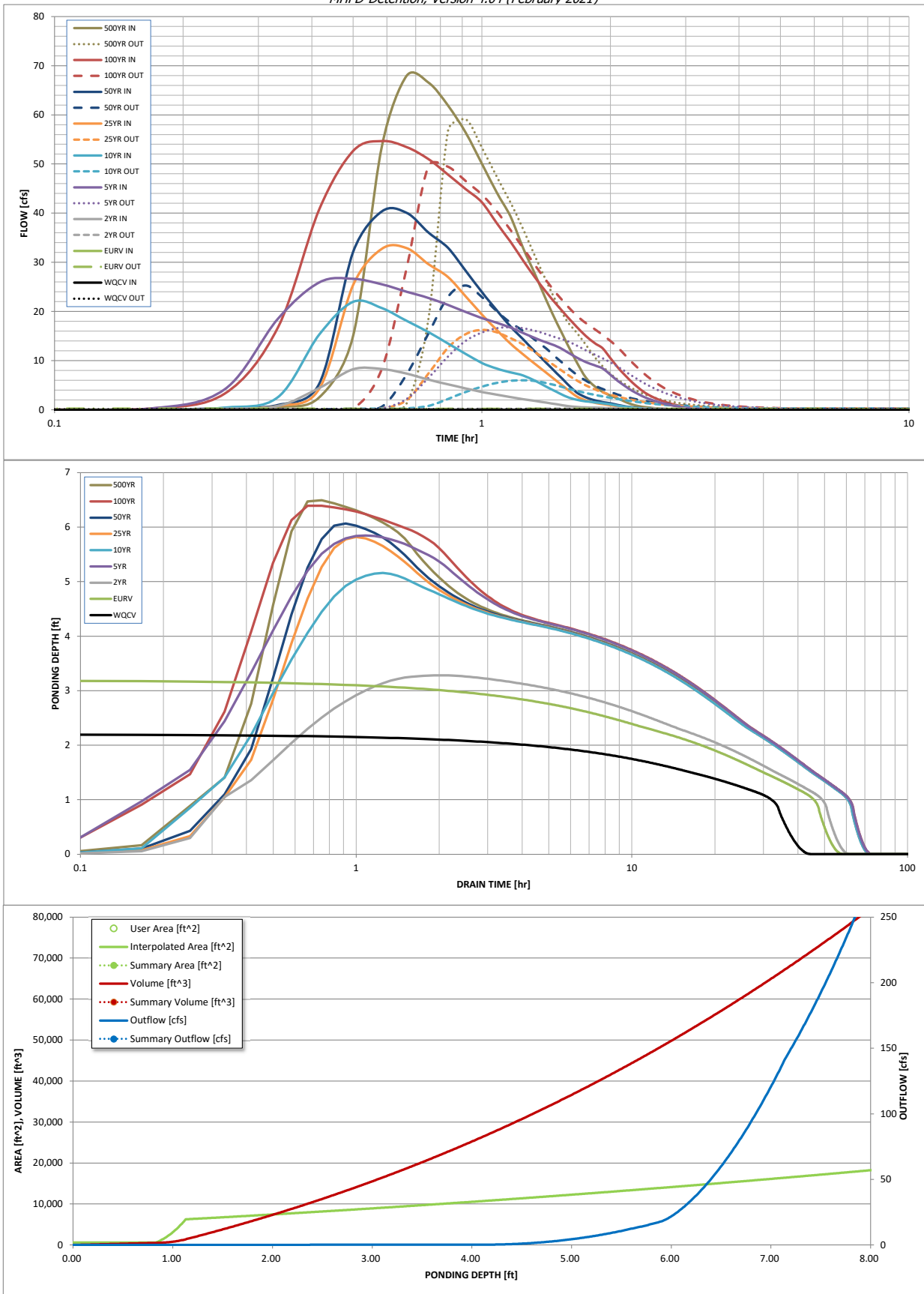
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.203	0.396	0.447	0.851	1.240	1.888	2.346	2.988
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.447	2.651	1.240	1.888	2.346	4.897
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	4.1	11.0	16.6	28.4	35.5	44.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		17.0				50.0
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.17	0.72	0.71	1.21	1.51	2.13
Peak Inflow Q (cfs) =	N/A	N/A	8.3	26.6	22.0	32.9	40.4	54.7
Peak Outflow Q (cfs) =	0.1	0.2	0.2	16.8	6.0	16.3	25.3	49.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.4	0.6	0.7	1.0
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	1.0	0.3	0.9	1.2	1.7
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	37	48	51	47	56	52	49	37
Time to Drain 99% of Inflow Volume (hours) =	40	52	55	59	63	61	60	54
Maximum Ponding Depth (ft) =	2.20	3.20	3.28	5.85	5.16	5.82	6.07	6.39
Area at Maximum Ponding Depth (acres) =	0.18	0.21	0.21	0.32	0.29	0.32	0.33	0.34
Maximum Volume Stored (acre-ft) =	0.203	0.398	0.415	1.092	0.883	1.083	1.163	1.273

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.04 (February 2021)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

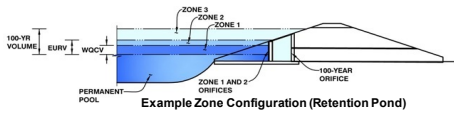
	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.05	0.00
	0:10:00	0.00	0.00	0.00	0.26	0.00	0.00	0.02	0.27	0.08
	0:15:00	0.00	0.00	0.22	4.18	0.45	0.30	0.37	3.29	0.52
	0:20:00	0.00	0.00	0.79	18.56	2.61	0.77	0.98	16.80	2.53
	0:25:00	0.00	0.00	4.46	25.92	15.35	4.29	5.35	40.82	15.05
	0:30:00	0.00	0.00	8.26	26.63	21.95	25.39	32.12	52.64	53.58
	0:35:00	0.00	0.00	8.30	25.54	20.68	32.77	40.35	54.68	67.92
	0:40:00	0.00	0.00	7.36	24.02	18.10	32.91	40.08	53.45	66.58
	0:45:00	0.00	0.00	6.15	22.77	15.80	29.61	36.06	50.98	61.89
	0:50:00	0.00	0.00	5.18	21.33	13.47	27.01	32.92	47.85	56.39
	0:55:00	0.00	0.00	4.37	19.93	11.38	23.07	28.30	44.90	50.07
	1:00:00	0.00	0.00	3.63	18.66	9.55	19.40	23.96	42.22	44.24
	1:05:00	0.00	0.00	3.09	17.72	8.40	16.26	20.24	37.98	39.36
	1:10:00	0.00	0.00	2.60	16.73	7.64	13.48	16.97	34.23	32.88
	1:15:00	0.00	0.00	2.18	15.62	6.97	11.29	14.34	30.38	27.54
	1:20:00	0.00	0.00	1.81	14.58	5.89	9.31	11.82	26.90	22.25
	1:25:00	0.00	0.00	1.45	13.70	4.70	7.53	9.55	23.90	17.62
	1:30:00	0.00	0.00	1.11	12.91	3.60	5.82	7.39	21.31	13.49
	1:35:00	0.00	0.00	0.80	11.76	2.62	4.19	5.34	19.01	9.72
	1:40:00	0.00	0.00	0.58	10.63	2.04	2.73	3.53	16.90	6.62
	1:45:00	0.00	0.00	0.49	9.74	1.74	1.93	2.57	15.06	4.83
	1:50:00	0.00	0.00	0.44	9.07	1.53	1.45	1.97	13.62	3.68
	1:55:00	0.00	0.00	0.38	8.43	1.35	1.16	1.59	12.53	2.88
	2:00:00	0.00	0.00	0.33	7.13	1.12	0.95	1.33	10.52	2.30
	2:05:00	0.00	0.00	0.25	5.87	0.86	0.71	0.99	8.61	1.62
	2:10:00	0.00	0.00	0.19	4.80	0.64	0.51	0.71	6.98	1.08
	2:15:00	0.00	0.00	0.14	3.88	0.47	0.36	0.51	5.58	0.73
	2:20:00	0.00	0.00	0.11	3.11	0.34	0.27	0.37	4.39	0.53
	2:25:00	0.00	0.00	0.08	2.50	0.24	0.20	0.27	3.43	0.39
	2:30:00	0.00	0.00	0.06	2.01	0.17	0.14	0.20	2.70	0.29
	2:35:00	0.00	0.00	0.05	1.61	0.13	0.10	0.14	2.14	0.21
	2:40:00	0.00	0.00	0.03	1.29	0.09	0.08	0.11	1.70	0.16
	2:45:00	0.00	0.00	0.02	1.02	0.06	0.06	0.08	1.34	0.11
	2:50:00	0.00	0.00	0.01	0.79	0.04	0.04	0.05	1.03	0.08
	2:55:00	0.00	0.00	0.01	0.61	0.02	0.02	0.03	0.79	0.05
	3:00:00	0.00	0.00	0.00	0.46	0.01	0.01	0.02	0.59	0.02
	3:05:00	0.00	0.00	0.00	0.34	0.00	0.00	0.01	0.44	0.01
	3:10:00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.32	0.00
	3:15:00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.23	0.00
	3:20:00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.17	0.00
	3:25:00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.12	0.00
	3:30:00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.09	0.00
	3:35:00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.06	0.00
	3:40:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.00
	3:45:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North Drainage Plan

Basin ID: Pond 17



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	23.50	acres
Watershed Length =	1,050	ft
Watershed Length to Centroid =	540	ft
Watershed Slope =	0.060	ft/ft
Watershed Imperviousness =	17.16%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

Water Quality Capture Volume (WQCV) =	0.203	acre-feet
Excess Urban Runoff Volume (EURV) =	0.396	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.447	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.851	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	1.240	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	1.888	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	2.346	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	2.988	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	4.182	acre-feet
Approximate 2-yr Detention Volume =	0.267	acre-feet
Approximate 5-yr Detention Volume =	0.401	acre-feet
Approximate 10-yr Detention Volume =	0.679	acre-feet
Approximate 25-yr Detention Volume =	0.863	acre-feet
Approximate 50-yr Detention Volume =	0.911	acre-feet
Approximate 100-yr Detention Volume =	1.134	acre-feet

Optional User Overrides

		acre-feet
		acre-feet
	1.19	inches
	1.50	inches
	1.75	inches
	2.00	inches
	2.25	inches
	2.52	inches
		inches

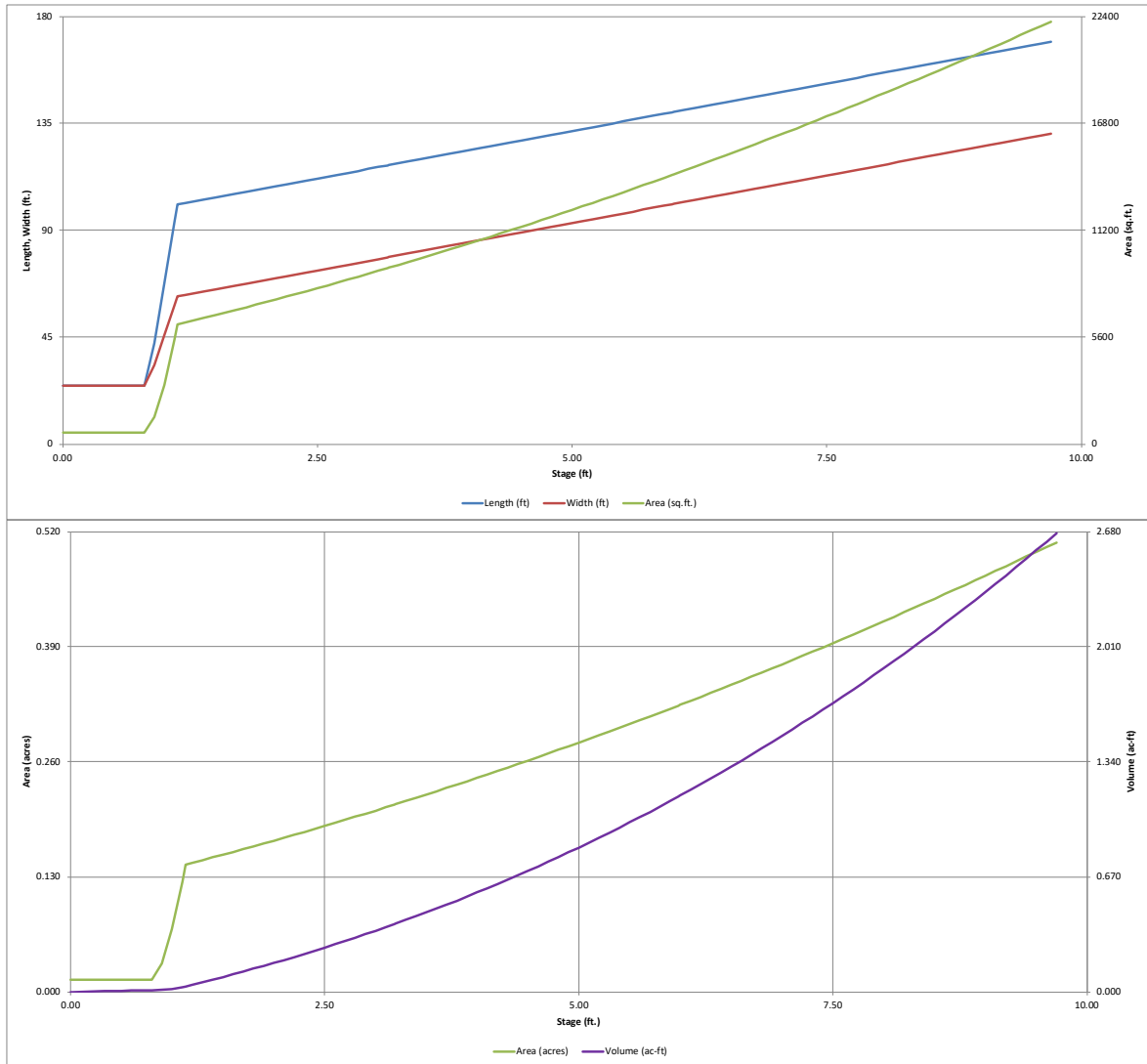
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.203	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.193	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.739	acre-feet
Total Detention Basin Volume =	1.134	acre-feet
Initial Surge Volume (ISV) =	200	ft ³
Initial Surge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H _{total}) =	6.00	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.004	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (R _{L/W}) =	2	
Initial Surge Area (A _{ISV}) =	606	ft ²
Surge Volume Length (L _{ISV}) =	24.6	ft
Surge Volume Width (W _{ISV}) =	24.6	ft
Depth of Basin Floor (H _{floor}) =	0.30	ft
Length of Basin Floor (L _{floor}) =	100.8	ft
Width of Basin Floor (W _{floor}) =	62.1	ft
Area of Basin Floor (A _{floor}) =	6,263	ft ²
Volume of Basin Floor (V _{floor}) =	882	ft ³
Depth of Main Basin (H _{main}) =	4.87	ft
Length of Main Basin (L _{main}) =	139.8	ft
Width of Main Basin (W _{main}) =	101.1	ft
Area of Main Basin (A _{main}) =	14,129	ft ²
Volume of Main Basin (V _{main}) =	48,372	ft ³
Calculated Total Basin Volume (V _{total}) =	1.142	acre-feet

Depth Increment =	0.10	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		24.6	24.6	606		0.014		
ISV	0.33		24.6	24.6	606		0.014	200	0.005
	0.40		24.6	24.6	606		0.014	242	0.006
	0.50		24.6	24.6	606		0.014	303	0.007
	0.60		24.6	24.6	606		0.014	364	0.008
	0.70		24.6	24.6	606		0.014	424	0.010
	0.80		24.6	24.6	606		0.014	485	0.011
	0.90		42.4	33.4	1,415		0.032	572	0.013
	1.00		67.8	45.9	3,110		0.071	793	0.018
Floor	1.10		93.2	58.4	5,440		0.125	1,215	0.028
	1.13		100.8	62.1	6,263		0.144	1,390	0.032
	1.20		101.4	62.7	6,354		0.146	1,832	0.042
	1.30		102.2	63.5	6,486		0.149	2,474	0.057
	1.40		103.0	64.3	6,619		0.152	3,129	0.072
	1.50		103.8	65.1	6,754		0.155	3,798	0.087
	1.60		104.6	65.9	6,889		0.158	4,480	0.103
	1.70		105.4	66.7	7,026		0.161	5,176	0.119
	1.80		106.2	67.5	7,165		0.164	5,885	0.135
	1.90		107.0	68.3	7,304		0.168	6,609	0.152
	2.00		107.8	69.1	7,445		0.171	7,346	0.169
Zone 1 (WQCV)	2.10		108.6	69.9	7,587		0.174	8,098	0.186
	2.20		109.4	70.7	7,731		0.177	8,864	0.203
	2.30		110.2	71.5	7,875		0.181	9,644	0.221
	2.40		111.0	72.3	8,021		0.184	10,439	0.240
	2.50		111.8	73.1	8,169		0.188	11,248	0.258
	2.60		112.6	73.9	8,317		0.191	12,073	0.277
	2.70		113.4	74.7	8,467		0.194	12,912	0.296
	2.80		114.2	75.5	8,618		0.198	13,766	0.316
	2.90		115.0	76.3	8,770		0.201	14,636	0.336
	3.00		115.8	77.1	8,924		0.205	15,520	0.356
	3.10		116.6	77.9	9,079		0.208	16,420	0.377
Zone 2 (EURV)	3.19		117.3	78.6	9,219		0.212	17,244	0.396
	3.20		117.4	78.7	9,235		0.212	17,336	0.398
	3.30		118.2	79.5	9,393		0.216	18,267	0.419
	3.40		119.0	80.3	9,551		0.219	19,215	0.441
	3.50		119.8	81.1	9,711		0.223	20,178	0.463
	3.60		120.6	81.9	9,873		0.227	21,157	0.486
	3.70		121.4	82.7	10,035		0.230	22,152	0.509
	3.80		122.2	83.5	10,199		0.234	23,164	0.532
	3.90		123.0	84.3	10,364		0.238	24,192	0.555
	4.00		123.8	85.1	10,531		0.242	25,237	0.579
	4.10		124.6	85.9	10,699		0.246	26,298	0.604
	4.20		125.4	86.7	10,868		0.249	27,377	0.628
	4.30		126.2	87.5	11,038		0.253	28,472	0.654
	4.40		127.0	88.3	11,209		0.257	29,584	0.679
	4.50		127.8	89.1	11,382		0.261	30,714	0.705
	4.60		128.6	89.9	11,556		0.265	31,861	0.731
	4.70		129.4	90.7	11,732		0.269	33,025	0.758
	4.80		130.2	91.5	11,908		0.273	34,207	0.785
	4.90		131.0	92.3	12,086		0.277	35,407	0.813
	5.00		131.8	93.1	12,266		0.282	36,625	0.841
	5.10		132.6	93.9	12,446		0.286	37,860	0.869
	5.20		133.4	94.7	12,628		0.290	39,114	0.898
	5.30		134.2	95.5	12,811		0.294	40,386	0.927
	5.40		135.0	96.3	12,995		0.298	41,676	0.957
	5.50		135.8	97.1	13,181		0.303	42,985	0.987
	5.60		136.6	97.9	13,368		0.307	44,312	1.017
	5.70		137.4	98.7	13,556		0.311	45,659	1.048
	5.80		138.2	99.5	13,746		0.316	47,024	1.080
	5.90		139.0	100.3	13,937		0.320	48,408	1.111
Zone 3 (100-year)	5.98		139.6	100.9	14,090		0.323	49,529	1.137
	6.00		139.8	101.1	14,129		0.324	49,811	1.144
	6.10		140.6	101.9	14,322		0.329	51,234	1.176
	6.20		141.4	102.7	14,516		0.333	52,675	1.209
	6.30		142.2	103.5	14,712		0.338	54,137	1.243
	6.40		143.0	104.3	14,910		0.342	55,618	1.277
	6.50		143.8	105.1	15,108		0.347	57,119	1.311
	6.60		144.6	105.9	15,308		0.351	58,640	1.346
	6.70		145.4	106.7	15,509		0.356	60,180	1.382
	6.80		146.2	107.5	15,711		0.361	61,741	1.417
	6.90		147.0	108.3	15,915		0.365	63,323	1.454
	7.00		147.8	109.1	16,119		0.370	64,924	1.490
	7.10		148.6	109.9	16,326		0.375	66,547	1.528
	7.20		149.4	110.7	16,533		0.380	68,190	1.565
	7.30		150.2	111.5	16,742		0.384	69,853	1.604
	7.40		151.0	112.3	16,952		0.389	71,538	1.642
	7.50		151.8	113.1	17,163		0.394	73,244	1.681
	7.60		152.6	113.9	17,375		0.399	74,970	1.721
	7.70		153.4	114.7	17,589		0.404	76,719	1.761
	7.80		154.2	115.5	17,804		0.409	78,488	1.802
	7.90		155.0	116.3	18,021		0.414	80,280	1.843
	8.00		155.8	117.1	18,238		0.419	82,093	1.885
	8.10		156.6	117.9	18,457		0.424	83,927	1.927
	8.20		157.4	118.7	18,677		0.429	85,784	1.969
	8.30		158.2	119.5	18,899		0.434	87,663	2.012
	8.40		159.0	120.3	19,122		0.439	89,564	2.056
	8.50		159.8	121.1	19,346		0.444	91,487	2.100
	8.60		160.6	121.9	19,571		0.449	93,433	2.145
	8.70		161.4	122.7	19,798		0.454	95,401	2.190
	8.80		162.2	123.5	20,026		0.460	97,393	2.236
	8.90		163.0	124.3	20,255		0.465	99,407	2.282
	9.00		163.8	125.1	20,485		0.470	101,444	2.329
	9.10		164.6	125.9	20,717		0.476	103,504	2.376
	9.20		165.4	126.7	20,950		0.481	105,587	2.424
	9.30		166.2	127.5	21,184		0.486	107,694	2.472
	9.40		167.0	128.3	21,420		0.492	109,824	2.521
	9.50		167.8	129.1	21,657		0.497	111,978	2.571
	9.60		168.6	129.9	21,895		0.503	114,155	2.621
	9.70		169.4	130.7	22,134		0.508	116,357	2.671

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



Appendix E

Worksheet for Culvert 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	3.00	ft
Discharge	58.65	ft ³ /s

Results

Normal Depth	2.18	ft
Flow Area	5.51	ft ²
Wetted Perimeter	6.13	ft
Hydraulic Radius	0.90	ft
Top Width	2.67	ft
Critical Depth	2.48	ft
Percent Full	72.8	%
Critical Slope	0.00763	ft/ft
Velocity	10.65	ft/s
Velocity Head	1.76	ft
Specific Energy	3.94	ft
Froude Number	1.31	
Maximum Discharge	71.74	ft ³ /s
Discharge Full	66.69	ft ³ /s
Slope Full	0.00773	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	72.76	%
Downstream Velocity	Infinity	ft/s

Worksheet for Culvert 1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.18	ft
Critical Depth	2.48	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00763	ft/ft

Cross Section for Culvert 1

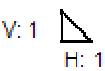
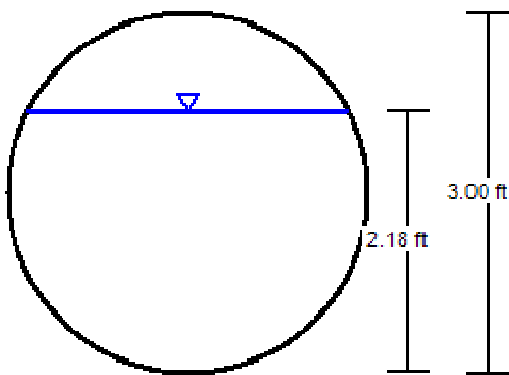
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013
Channel Slope	0.01000 ft/ft
Normal Depth	2.18 ft
Diameter	3.00 ft
Discharge	58.65 ft³/s

Cross Section Image



Worksheet for Culvert 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Diameter	3.50	ft
Discharge	116.26	ft ³ /s

Results

Normal Depth	2.41	ft
Flow Area	7.05	ft ²
Wetted Perimeter	6.84	ft
Hydraulic Radius	1.03	ft
Top Width	3.25	ft
Critical Depth	3.22	ft
Percent Full	68.7	%
Critical Slope	0.01159	ft/ft
Velocity	16.49	ft/s
Velocity Head	4.23	ft
Specific Energy	6.63	ft
Froude Number	1.97	
Maximum Discharge	153.05	ft ³ /s
Discharge Full	142.28	ft ³ /s
Slope Full	0.01335	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	68.73	%
Downstream Velocity	Infinity	ft/s

Worksheet for Culvert 2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.41	ft
Critical Depth	3.22	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.01159	ft/ft

Cross Section for Culvert 2

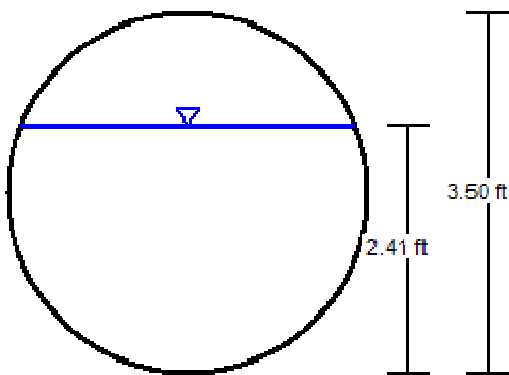
Project Description

Friction Method Manning Formula
Solve For Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Normal Depth	2.41	ft
Diameter	3.50	ft
Discharge	116.26	ft³/s

Cross Section Image



V: 1
H: 1

Appendix F

- LEGEND**
- MAJOR ROADWAYS
 - BLACK SQUIRREL BASIN BOUNDARY
 - MAJOR BASIN BOUNDARY
 - MINOR SUB-BASIN BOUNDARY
 - CITY LIMITS
 - NORTHGATE BOUNDARY
 - FOREST AREA
 - MAJOR BASIN ACREAGE
 - MINOR SUB-BASIN DESIGNATION
 - 100-ACRE LIMIT & STABILIZED CHANNEL
 - DESIGN POINT
 - DETENTION POND
 - PARTIALLY LINED CHANNEL
 - FULLY LINED CHANNEL

BLACK SQUIRREL CREEK DRAINAGE BASIN
DEVELOPED MAJOR DRAINAGE FACILITIES

DESIGN POINT - REACH	FACILITY	DESIGN FLOW (cfs) (1)
1A	RURAL MAJOR DRAINAGEWAY	850
1B	RURAL MAJOR DRAINAGEWAY	850
2	RURAL MAJOR DRAINAGEWAY	850
3	RURAL MAJOR DRAINAGEWAY	850
4	RURAL MAJOR DRAINAGEWAY	850
5	RURAL MAJOR DRAINAGEWAY	850
6	RURAL MAJOR DRAINAGEWAY	850
7	RURAL MAJOR DRAINAGEWAY	850
8	RURAL MAJOR DRAINAGEWAY	850
9	RURAL MAJOR DRAINAGEWAY	850
10	RURAL MAJOR DRAINAGEWAY	850
11	RURAL MAJOR DRAINAGEWAY	850
12	RURAL MAJOR DRAINAGEWAY	850
13	RURAL MAJOR DRAINAGEWAY	850
14	RURAL MAJOR DRAINAGEWAY	850
15	RURAL MAJOR DRAINAGEWAY	850
16	RURAL MAJOR DRAINAGEWAY	850
17	RURAL MAJOR DRAINAGEWAY	850
18	RURAL MAJOR DRAINAGEWAY	850
19	RURAL MAJOR DRAINAGEWAY	850
20	RURAL MAJOR DRAINAGEWAY	850
21	RURAL MAJOR DRAINAGEWAY	850
22	RURAL MAJOR DRAINAGEWAY	850
23	RURAL MAJOR DRAINAGEWAY	850
24	RURAL MAJOR DRAINAGEWAY	850
25	RURAL MAJOR DRAINAGEWAY	850
26	RURAL MAJOR DRAINAGEWAY	850
27	RURAL MAJOR DRAINAGEWAY	850
28	RURAL MAJOR DRAINAGEWAY	850
29	RURAL MAJOR DRAINAGEWAY	850
30	RURAL MAJOR DRAINAGEWAY	850
31	RURAL MAJOR DRAINAGEWAY	850
32	RURAL MAJOR DRAINAGEWAY	850
33	RURAL MAJOR DRAINAGEWAY	850
34	RURAL MAJOR DRAINAGEWAY	850
35	RURAL MAJOR DRAINAGEWAY	850
36	RURAL MAJOR DRAINAGEWAY	850
37	RURAL MAJOR DRAINAGEWAY	850
38	RURAL MAJOR DRAINAGEWAY	850
39	RURAL MAJOR DRAINAGEWAY	850
40	RURAL MAJOR DRAINAGEWAY	850
41	RURAL MAJOR DRAINAGEWAY	850
42	RURAL MAJOR DRAINAGEWAY	850
43	RURAL MAJOR DRAINAGEWAY	850
44	RURAL MAJOR DRAINAGEWAY	850
45	RURAL MAJOR DRAINAGEWAY	850
46	RURAL MAJOR DRAINAGEWAY	850
47	RURAL MAJOR DRAINAGEWAY	850
48	RURAL MAJOR DRAINAGEWAY	850
49	RURAL MAJOR DRAINAGEWAY	850
50	RURAL MAJOR DRAINAGEWAY	850
51	RURAL MAJOR DRAINAGEWAY	850
52	RURAL MAJOR DRAINAGEWAY	850
53	RURAL MAJOR DRAINAGEWAY	850
54	RURAL MAJOR DRAINAGEWAY	850
55	RURAL MAJOR DRAINAGEWAY	850
56	RURAL MAJOR DRAINAGEWAY	850
57	RURAL MAJOR DRAINAGEWAY	850
58	RURAL MAJOR DRAINAGEWAY	850
59	RURAL MAJOR DRAINAGEWAY	850
60	RURAL MAJOR DRAINAGEWAY	850
61	RURAL MAJOR DRAINAGEWAY	850
62	RURAL MAJOR DRAINAGEWAY	850
63	RURAL MAJOR DRAINAGEWAY	850
64	RURAL MAJOR DRAINAGEWAY	850
65	RURAL MAJOR DRAINAGEWAY	850
66	RURAL MAJOR DRAINAGEWAY	850
67	RURAL MAJOR DRAINAGEWAY	850
68	RURAL MAJOR DRAINAGEWAY	850
69	RURAL MAJOR DRAINAGEWAY	850
70	RURAL MAJOR DRAINAGEWAY	850
71	RURAL MAJOR DRAINAGEWAY	850
72	RURAL MAJOR DRAINAGEWAY	850
73	RURAL MAJOR DRAINAGEWAY	850
74	RURAL MAJOR DRAINAGEWAY	850
75	RURAL MAJOR DRAINAGEWAY	850
76	RURAL MAJOR DRAINAGEWAY	850
77	RURAL MAJOR DRAINAGEWAY	850
78	RURAL MAJOR DRAINAGEWAY	850
79	RURAL MAJOR DRAINAGEWAY	850
80	RURAL MAJOR DRAINAGEWAY	850
81	RURAL MAJOR DRAINAGEWAY	850
82	RURAL MAJOR DRAINAGEWAY	850
83	RURAL MAJOR DRAINAGEWAY	850
84	RURAL MAJOR DRAINAGEWAY	850
85	RURAL MAJOR DRAINAGEWAY	850
86	RURAL MAJOR DRAINAGEWAY	850
87	RURAL MAJOR DRAINAGEWAY	850
88	RURAL MAJOR DRAINAGEWAY	850
89	RURAL MAJOR DRAINAGEWAY	850
90	RURAL MAJOR DRAINAGEWAY	850
91	RURAL MAJOR DRAINAGEWAY	850
92	RURAL MAJOR DRAINAGEWAY	850
93	RURAL MAJOR DRAINAGEWAY	850
94	RURAL MAJOR DRAINAGEWAY	850
95	RURAL MAJOR DRAINAGEWAY	850
96	RURAL MAJOR DRAINAGEWAY	850
97	RURAL MAJOR DRAINAGEWAY	850
98	RURAL MAJOR DRAINAGEWAY	850
99	RURAL MAJOR DRAINAGEWAY	850
100	RURAL MAJOR DRAINAGEWAY	850

GLENEAGLE

MONUMENT BRANCH
DRAINAGE BASIN

ASSUMED URBAN / RURAL LIMITS
SEE FIG. 1 FOR LAND USE DETAIL

MIDDLE TRIB.
DRAINAGE BASIN

ELKHORN
DRAINAGE BASIN

BLACK SQUIRREL CREEK DRAINAGE BASIN DEVELOPED CONDITIONS MAJOR FACILITIES

FIGURE 4
URS
CONSULTANTS
MAKING TECHNOLOGY WORK™
COLORADO SPRINGS, COLORADO



INNOVATIVE DESIGN. **CLASSIC RESULTS.**

**PRELIMINARY DRAINAGE REPORT
FOR
FLYING HORSE NORTH PRELIMINARY PLAN
AND
FINAL DRAINAGE REPORT
FOR
FLYING HORSE NORTH FILING NO. 1**

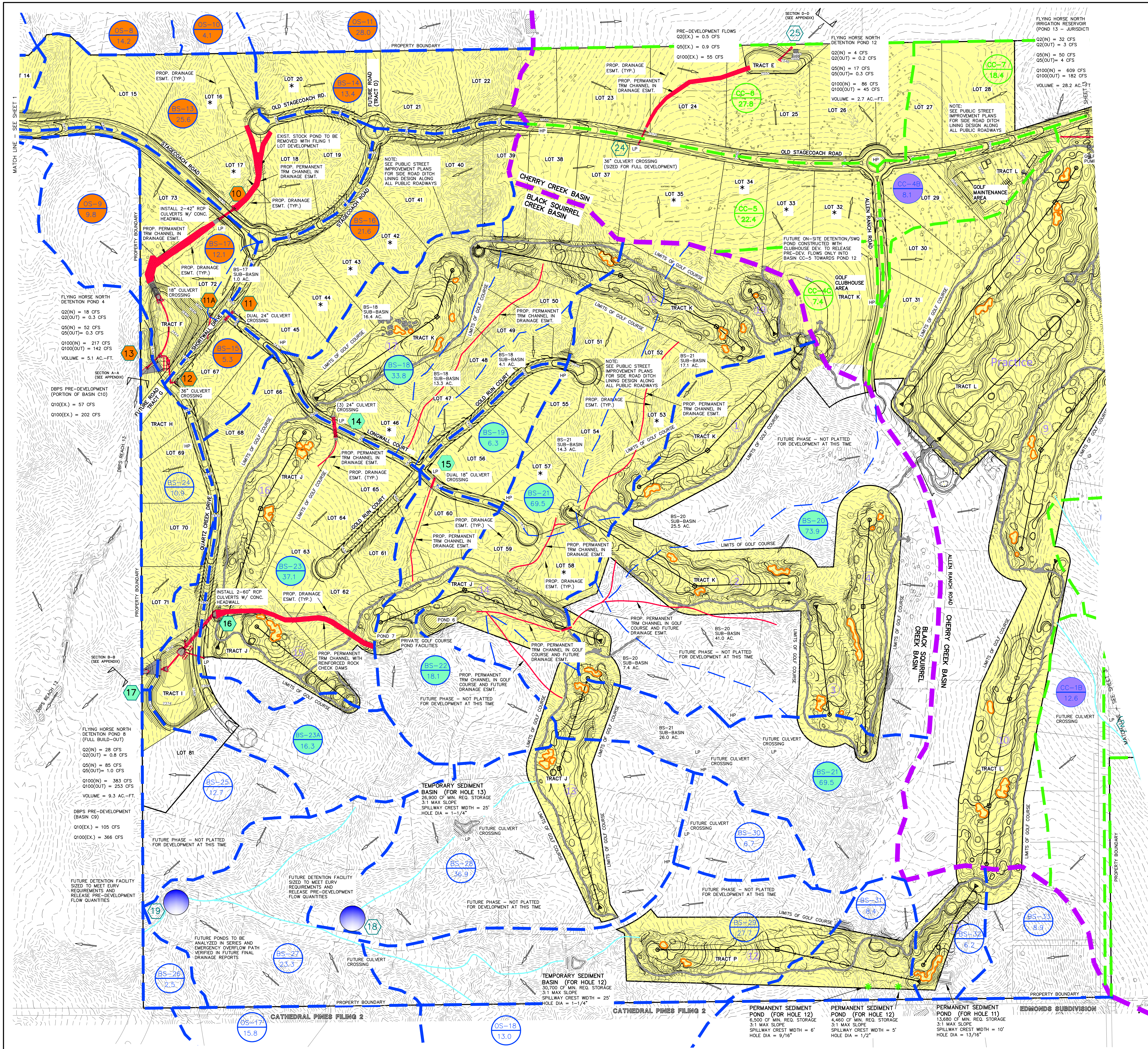
NOVEMBER 2017
Revised June 2018

Prepared for:
PRI #2 LLC
6385 CORPORATE DRIVE SUITE 200
COLORADO SPRINGS CO 80919
(719) 592-9333

Prepared by:
**CLASSIC CONSULTING ENGINEERS &
SURVEYORS**
619 N. CASCADE AVE SUITE 200
COLORADO SPRINGS CO 80903
(719) 785-0790

Job no. 1096.11
PCD File No. SP-17-012 and SF-18-001





BASIN SUMMARY - DEVELOPED CONDITIONS							
BASIN (label)	AREA (acres)	COMPOSITE CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)	Q (cfs)
OS-8	14.20	65.0	0.27	2.1	6.2	24.7	
OS-9	9.80	60.0	0.37	0.1	1.0	9.1	
OS-10	4.10	65.0	0.17	0.7	2.1	8.2	
OS-11	28.00	65.0	0.35	2.4	8.2	38.7	
OS-12	68.10	62.7	0.37	2.2	11.9	75.8	
OS-13	38.90	63.0	0.33	1.4	7.4	45.0	
OS-14	28.40	62.0	0.31	0.7	4.6	31.0	
OS-15	70.80	63.9	0.38	3.3	14.8	84.2	
OS-16	4.50	65.0	0.24	0.4	1.5	7.2	
OS-17	15.80	65.0	0.19	1.6	5.9	27.7	
OS-18	13.00	65.0	0.20	1.3	4.7	22.6	
BS-13	25.60	65.0	0.23	3.7	10.2	40.7	
BS-14	13.40	65.0	0.23	2.6	6.8	26.5	
BS-15	5.30	65.0	0.16	1.6	3.7	12.2	
BS-16	21.50	65.0	0.34	4.6	11.8	44.1	
BS-17	12.10	65.0	0.21	3.1	7.7	26.7	
BS-18	33.80	63.6	0.41	3.5	12.4	56.0	
BS-19	6.30	65.0	0.18	2.1	4.6	15.0	
BS-20	73.90	63.4	0.31	7.4	24.6	112.4	
BS-21	69.50	64.3	0.35	7.8	23.9	103.0	
BS-22	18.10	64.4	0.22	3.7	9.6	36.5	
BS-23	37.10	63.3	0.33	4.5	13.6	58.2	
BS-24	16.30	64.4	0.29	5.5	12.0	36.3	
BS-25	10.90	63.0	0.17	0.6	3.3	17.6	
EX-24 (Pre-Dev)	13.20	60.0	0.17	0.2	2.2	17.8	
BS-25	12.70	63.0	0.23	0.4	2.7	17.3	
BS-26	2.90	60.0	0.18	0.0	0.4	3.4	
BS-27	23.30	65.0	0.22	2.1	8.0	38.8	
BS-28	36.90	64.4	0.32	2.2	9.3	49.4	
BS-29	27.70	64.0	0.33	1.4	6.5	35.9	
BS-30	6.70	65.0	0.20	0.7	2.4	11.7	
BS-31	8.40	63.5	0.23	0.3	1.9	11.8	
BS-32	6.20	62.6	0.20	0.3	1.6	9.4	
BS-33	8.90	64.7	0.19	0.8	3.2	15.3	
CC-1A	9.80	65.0	0.23	0.8	3.3	16.0	
CC-1B	12.60	64.8	0.25	1.0	4.0	19.4	
CC-2A	11.00	65.0	0.22	1.0	3.8	18.3	
CC-2B	20.80	65.0	0.22	1.9	7.1	34.6	
CC-2C	6.40	65.0	0.18	0.7	2.5	11.5	
CC-3	52.50	63.1	0.43	1.8	8.8	54.5	
CC-4A	108.70	62.6	0.44	15.4	39.0	156.0	
CC-4B	8.10	76.1	0.26	4.0	7.3	20.6	
CC-4C (Pre-Dev)	7.40	61.0	0.13	0.2	1.8	11.2	
CC-5	22.40	65.0	0.26	1.8	7.1	34.3	
CC-6	27.80	65.0	0.25	2.3	9.1	43.2	
CC-7	18.40	65.0	0.29	1.4	5.4	27.0	

DESIGN POINTS SURFACE ROUTING SUMMARY - DEVELOPED CONDITIONS

Design Point (label)	Contributing Basins	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
DP-10 DEV	OS-8, OS-10, OS-11, BS-13, BS-14	10.7	32.0	143
DP-11 DEV	BS-16	4.6	11.8	36
DP-12 DEV	DP-11, 1.0 AC. Portion of BS-17 and BS-15	4.2	11.8	46
TOTAL INFLOW TO POND 4 (UD Detention hydrograph)	DP-10, DP-12, BS-17, OS-9	10	16	217
DP-13 DEV	Release from FHN Pond 4	0.3	0.3	142
DP-14 DEV	BS-18	3.5	12.4	56
DP-15 DEV	BS-19	2.1	4.6	15
DP-16 DEV	DP-14, DP-15, BS-20, BS-21, BS-22, BS-23	25.0	78.0	362
TOTAL INFLOW TO FHN POND 8 (Full Build-out) (UD Detention hydrograph)	DP-10, DP-12, BS-17, OS-9	24	37	390
DP-17 DEV (Full Build-out)	Release from FHN Pond 8	0.8	1.0	253
TOTAL INFLOW TO FHN POND 8 (Filing 1 Only) (UD Detention hydrograph)	DP-10, DP-12, BS-17, OS-9	9	14	301
DP-17 DEV (Filing 1 Only)	Release from FHN Pond 8	0.4	0.5	219
DP-18 DEV	BS-28, BS-29, BS-30, OS-18	5.0	21.6	115
DP-19 DEV	BS-27, OS-17, Release from DP-18	3.8	16.8	126
DP-20 DEV	CC-1A, OS-12	3.2	14.3	88
DP-21 DEV	CC-2A, OS-13	2.1	10.5	62
DP-22 DEV	CC-2B, Release from DP-21	3.7	16.6	92
DP-23 DEV	CC-3, OS-14	2.5	13.0	84
DP-24 DEV	CC-4C (Pre-Dev), CC-5	1.9	8.4	45
TOTAL INFLOW TO POND 12 (UD Detention hydrograph)	CC-4C, CC-5, CC-6	6	9	85
DP-25 DEV	Release from FHN Pond 12	0.2	0.3	45

LEGEND

DESCRIPTION SYMBOL

EXISTING GROUND CONTOUR 6910

PROPOSED FINISHED CONTOUR 6910

BASIN BOUNDARY EAST CHERRY CREEK

MAJOR BASIN BOUNDARY

BASIN BOUNDARY BLACK SQUIRREL

DESIGN POINT

LOTS WITH NON-STANDARD CULVERT SIZE

BASIN IDENTIFIER

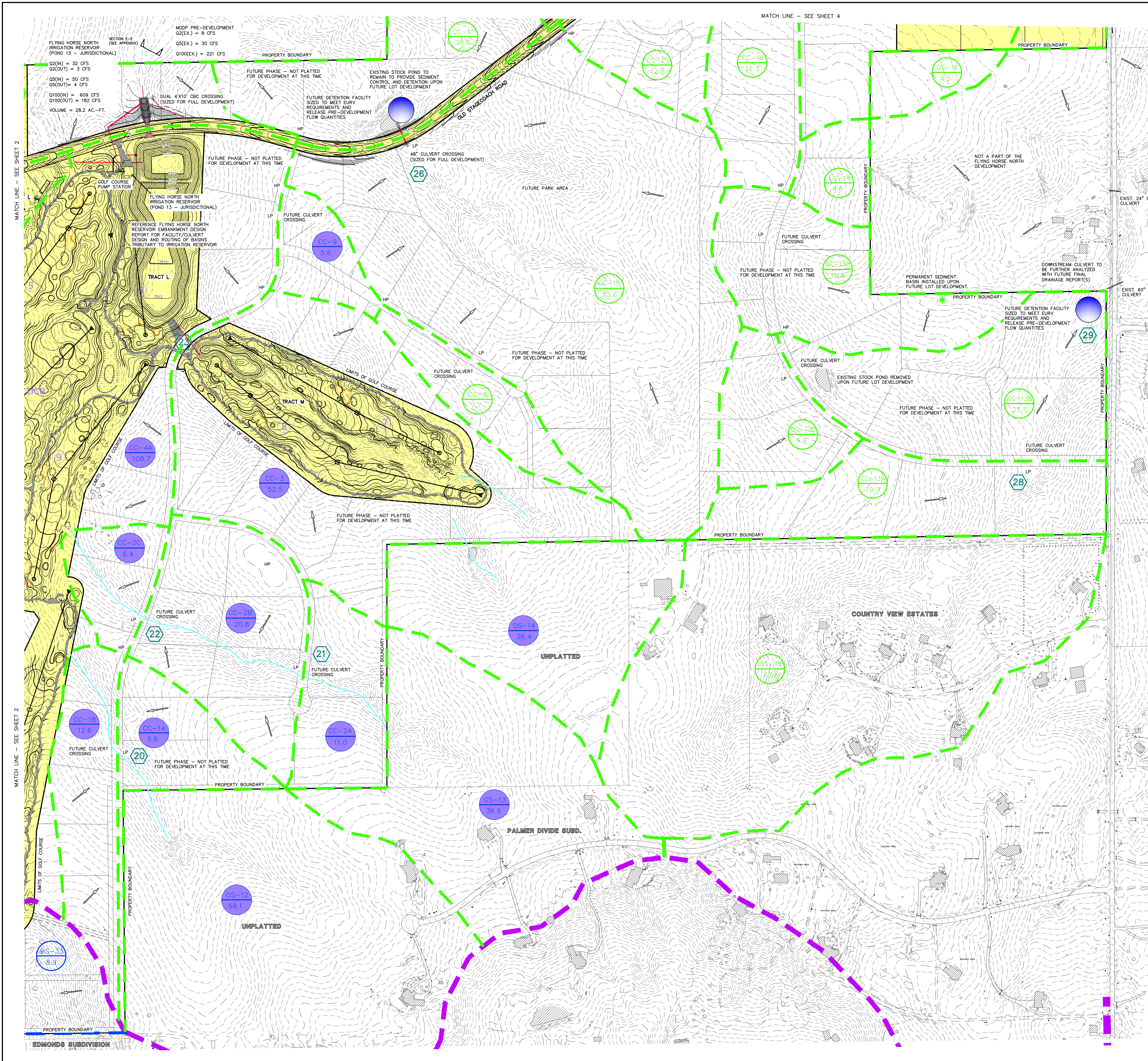
AREA IN ACRES

EXISTING DIRECTION OF FLOW

PROPOSED DIRECTION OF FLOW

STORM SEWER

FILING NO. 1 PLAT AREA



BASIN SUMMARY - DEVELOPED CONDITIONS							
BASIN (label)	AREA (acres)	COMPOSITE CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)	Q 100 Yr. (cfs)
OS-8	14.20	65.0	0.27	2.1	6.2	24.7	
OS-9	9.80	60.0	0.37	0.1	1.0	9.1	
OS-10	4.10	65.0	0.17	0.7	2.1	8.2	
OS-11	28.00	65.0	0.35	2.4	8.2	38.7	
OS-12	68.10	62.7	0.37	2.2	11.9	75.8	
OS-13	36.90	63.0	0.33	1.4	7.4	45.0	
OS-14	26.40	62.0	0.31	0.7	4.6	31.0	
OS-15	70.80	63.9	0.38	3.3	14.8	84.2	
OS-16	4.50	65.0	0.24	0.4	1.5	7.2	
OS-17	15.80	65.0	0.19	1.6	5.9	27.7	
OS-18	13.00	65.0	0.20	1.3	4.7	22.6	
CC-1A	9.80	65.0	0.23	0.8	3.3	16.0	
CC-1B	12.60	64.8	0.25	1.0	4.0	19.4	
CC-2A	11.00	65.0	0.22	1.0	3.8	18.3	
CC-2B	20.80	65.0	0.22	1.9	7.1	34.6	
CC-3C	6.40	65.0	0.18	0.7	2.5	11.5	
CC-3	52.50	63.1	0.43	1.8	8.8	54.5	
CC-4A	108.70	62.6	0.44	15.4	39.0	156.0	
CC-4B	8.10	76.1	0.26	4.0	7.3	20.6	
CC-4C (Pre-Dev)	7.40	61.0	0.13	0.2	1.8	11.2	
CC-5	22.40	65.0	0.26	1.8	7.1	34.3	
CC-6	27.80	65.0	0.25	2.3	9.1	43.2	
CC-7	18.40	65.0	0.29	1.4	5.4	27.0	
CC-8	7.70	65.0	0.25	0.4	1.5	7.2	
CC-9	5.60	65.0	0.19	0.6	2.1	9.8	
CC-10	85.60	62.6	0.39	2.6	14.1	91.9	
CC-11	18.60	63.1	0.21	0.9	5.0	28.1	
CC-12	12.20	65.0	0.26	1.0	3.9	18.7	
CC-13A	19.30	65.0	0.31	1.4	5.4	27.3	
CC-13B	25.50	65.0	0.31	1.8	7.2	36.1	
CC-13C	9.90	65.0	0.22	0.9	3.4	16.5	
CC-13D	18.80	65.0	0.25	1.5	6.2	29.2	
CC-14	4.60	65.0	0.21	0.4	1.6	7.5	
CC-15	12.80	65.0	0.24	1.1	4.3	20.4	
CC-16	16.30	65.0	0.30	1.2	4.6	23.6	
CC-17	23.00	65.0	0.35	1.7	6.5	32.8	
CC-18	6.20	66.5	0.30	0.7	2.2	9.7	
CC-19	3.70	65.0	0.25	0.3	1.2	5.8	
CC-20	39.30	65.0	0.25	3.2	12.9	61.0	
CC-21	6.20	61.0	0.20	0.1	1.2	8.5	
CC-22	13.80	65.0	0.25	1.1	4.5	21.4	
CC-23	5.70	64.7	0.33	0.4	1.5	7.7	
CC-24	39.60	65.0	0.25	3.3	13.0	61.5	
CC-25	3.50	65.0	0.23	0.3	1.2	5.7	
CC-26	10.70	65.0	0.26	1.4	5.3	26.6	
CC-27	18.90	64.4	0.31	1.2	4.9	25.8	
CC-28	154.80	64.4	0.63	6.5	24.7	136.3	

DESIGN POINTS SURFACE ROUTING SUMMARY - DEVELOPED CONDITIONS

Design Point (label)	Contributing Basins	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
DP-20 DEV	CC-1A, OS-12	3.2	14.3	88
DP-21 DEV	CC-2A, OS-13	2.1	10.5	62
DP-22 DEV	CC-2B, Release from DP-21	3.7	16.6	92
DP-23 DEV	CC-3, OS-14	2.5	13.0	84
DP-24 DEV	CC-4C (Pre-Dev), CC-5	1.9	8.4	45
TOTAL INFLOW TO POND 12 (UD Detention hydrograph)	CC-4C, CC-5, CC-6	6	9	85
DP-25 DEV	Release from FHN Pond 12	0.2	0.3	45
DP-26 DEV	CC-8, CC-10	3.0	15.9	102
DP-27 DEV	CC-15, CC-20	4.3	17.2	81
DP-28 DEV	CC-13A, OS-15	4.6	19.8	110
DP-29 DEV	CC-13B, CC-13C, Release from DP-28	5.8	26.6	155
DP-30 DEV	CC-18	0.7	2.2	10
DP-31 DEV	CC-19, Release from DP-30	0.9	3.2	15
DP-32 DEV	CC-17, OS-16	2.0	7.8	40
DP-33 DEV	CC-23, CC-24	3.6	14.4	69
DP-34 DEV	CC-26, CC-27, CC-28 and Release from CC-16 & DP-32	6.0	23.5	168

LEGEND

DESCRIPTION

SYMBOL

EXISTING GROUND CONTOUR

6910

PROPOSED FINISHED CONTOUR

6910

BASIN BOUNDARY EAST CHERRY CREEK

MAJOR BASIN BOUNDARY

DESIGN POINT

3

BASIN IDENTIFIER

BB

AREA IN ACRES

10.0

EXISTING DIRECTION OF FLOW

PROPOSED DIRECTION OF FLOW

STORM SEWER

FILING NO. 1 PLAT AREA

SCALE: 1" = 200'

200 100 0 200 400

CLASSIC CONSULTING ENGINEERS & SURVEYORS

619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903

FLYING HORSE NORTH PRELIMINARY/FINAL DRAINAGE REPORT

FILING NO. 1 AND PRELIMINARY PLAN DRAINAGE MAP

DESIGNED BY

MAW

SCALE

(H) 1" = 200'

DATE

10-25-17

DRAWN BY

MAW

CHECKED BY

(V) N/A

SHEET

3 OF 4

JOB NO.

1096.11



INNOVATIVE DESIGN. **CLASSIC RESULTS.**

**FLYING HORSE NORTH
IRRIGATION RESERVOIR EMBANKMENT
DESIGN REPORT**

**DAMID: 080459
Construction File No.: C-2085**

AUGUST 2018

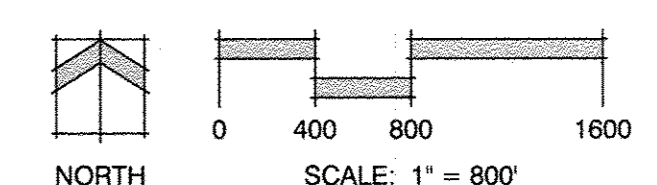
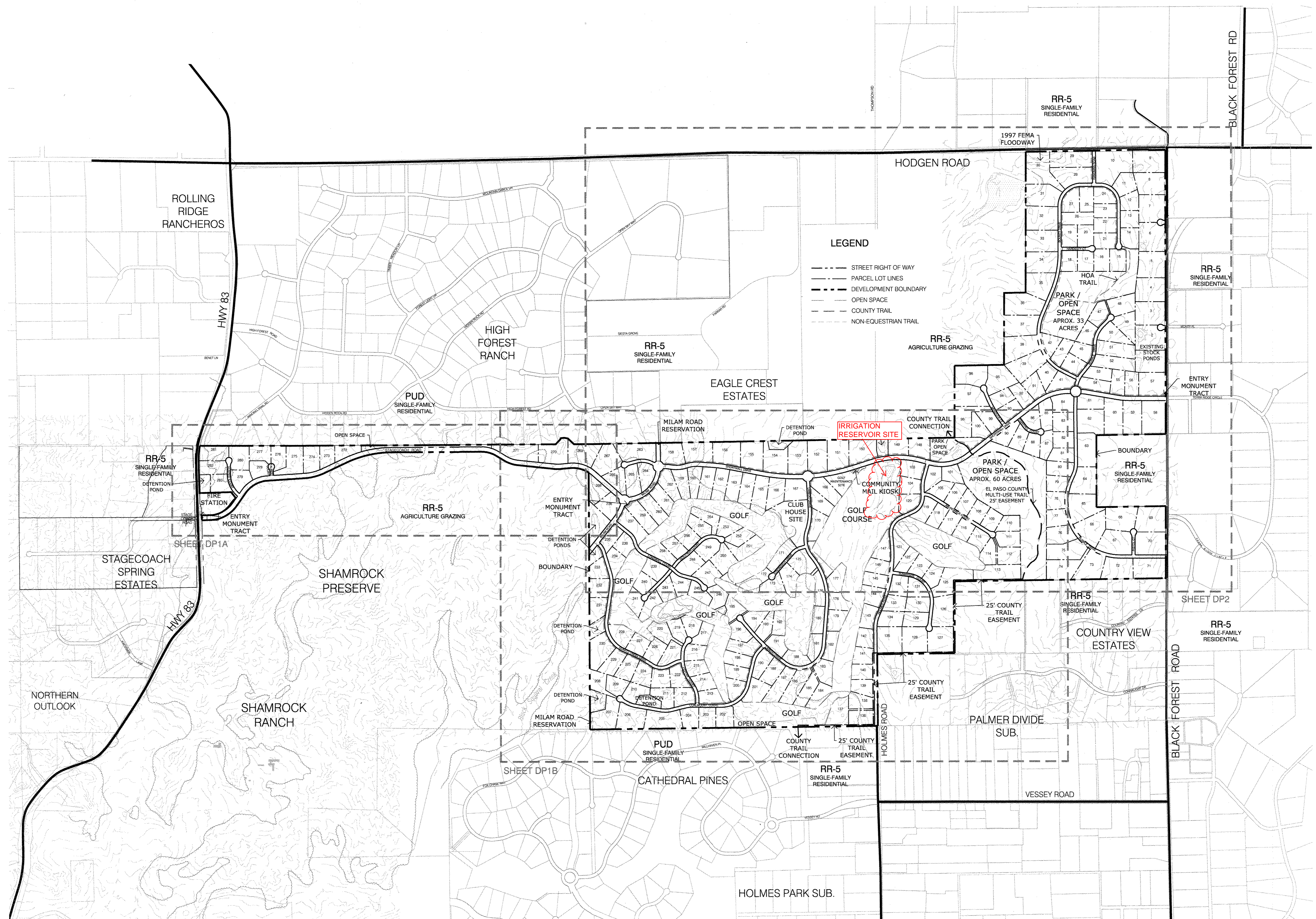
Prepared for:
PRI #2 LLC
6385 CORPORATE DRIVE SUITE 200
COLORADO SPRINGS CO 80919
(719) 592-9333

Prepared by:
**CLASSIC CONSULTING ENGINEERS &
SURVEYORS**
619 N. CASCADE AVE SUITE 200
COLORADO SPRINGS CO 80903
(719) 785-0790

Job no. 1096.11
PCD File No. SF-18-001



P:\Class2\Shamrock Ranch\Drawings\Planning\Develop\DP-Layout\Flynn_Horse_North_DP.dwg [Full.dwg] 3/8/2017 4:06:11 PM kmarshall



Land Planning
Landscape
Architecture
Urban Design

NES

N.E.S. Inc.
619 N. Cascade Avenue, Suite 200
Colorado Springs, CO 80903

Tel. 719.471.0073
Fax 719.471.0267

www.nescolorado.com

© 2012. All Rights Reserved.

**FLYING HORSE
NORTH**

**PLANNED UNIT
DEVELOPMENT**

DATE:	04-18-2016
PROJECT MGR:	J. MAYNARD
PREPARED BY:	K. MARSHALL

DATE:	BY:	DESCRIPTION:
07-25-16	KMM	Per review comments
09-07-16	KMM	Per 2nd review comments
11-28-16	KMM	Milam Revisions

**DEVELOPMENT PLAN
OVERALL SITE**

DP
2 OF 6

FIGURE 1.2

3/22/2017 217032585

The travel time for overland flow is the estimate in time required for flow to travel from the uppermost part of a drainage basin to a defined channel or inlet of a local storm sewer system. Overland flow can be significant in small basins because a significant portion of time of concentration is due to overland flow. The velocity of overland flow can vary greatly with the surface cover and tillage characteristics. If the slope and land use of the overland flow reach are known, the travel time can be read from figure 5-2 or calculated using the following equation:

TABLE 5-1 RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

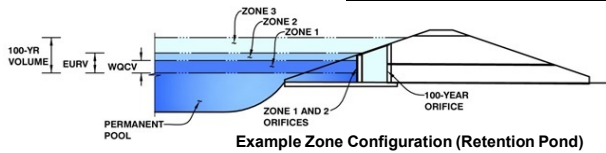
LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY			
		10		100	
		A&B*	C&D*	A&B*	C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
⅛ Acre or less	65	0.60	0.70	0.70	0.80
¼ Acre	40	0.50	0.60	0.60	0.70
⅓ Acre	30	0.40	0.50	0.55	0.60
½ Acre	25	0.35	0.45	0.45	0.55
1 Acre	20	0.30	0.40	0.40	0.50
Industrial					
Light Areas	80	0.70	0.70	0.80	0.80
Heavy Areas	90	0.80	0.80	0.90	0.90
Parks and Cemeteries	7	0.30	0.35	0.55	0.60
Playgrounds	13	0.30	0.35	0.60	0.65
Railroad Yard Areas	40	0.50	0.55	0.60	0.65
Undeveloped Areas					
Historic Flow Analysis-Greenbelts, Agricultural	2	0.15	0.25	0.20	0.30
Pasture/Meadow	0	0.25	0.30	0.35	0.45
Forest	0	0.10	0.15	0.15	0.20
Exposed Rock	100	0.90	0.90	0.95	0.95
Offsite Flow Analysis (when land use not defined)	45	0.55	0.60	0.65	0.70
Streets					
Paved	100	0.90	0.90	0.95	0.95
Gravel	80	0.80	0.80	0.85	0.85
Drive and Walks	100	0.90	0.90	0.95	0.95
Roofs	90	0.90	0.90	0.95	0.95
Lawns	0	0.25	0.30	0.35	0.45
*Hydrologic Soil Group					

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)

Project: Flying Horse North Master Drainage Plan

Basin ID: Pond 13



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.36	0.488	Orifice Plate
Zone 2 (5-year)	4.63	1.211	Circular Orifice
Zone 3 (100-year)	6.06	0.927	Weir&Pipe (Restrict)
Total (all zones)		2.627	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = 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 = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (diameter = 1-7/16 inches)

Calculated Parameters for Plate
WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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	0.79	1.57					
Orifice Area (sq. inches)	1.68	1.68	1.68					

	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)

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

Calculated Parameters for Vertical Orif
Zone 2 Circular Not Selected
Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Gate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Gate Type =
Debris Clogging % = %

Calculated Parameters for Overflow W
Zone 3 Weir Not Selected
Height of Gate Upper Edge, H_u = ft
Overflow Weir Slope Length = feet
Gate Open Area / 100-yr Orifice Area =
Overflow Gate Open Area w/o Debris =
Overflow Gate Open Area w/ Debris =

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl
Zone 3 Restrictor Not Selected
Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe =

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

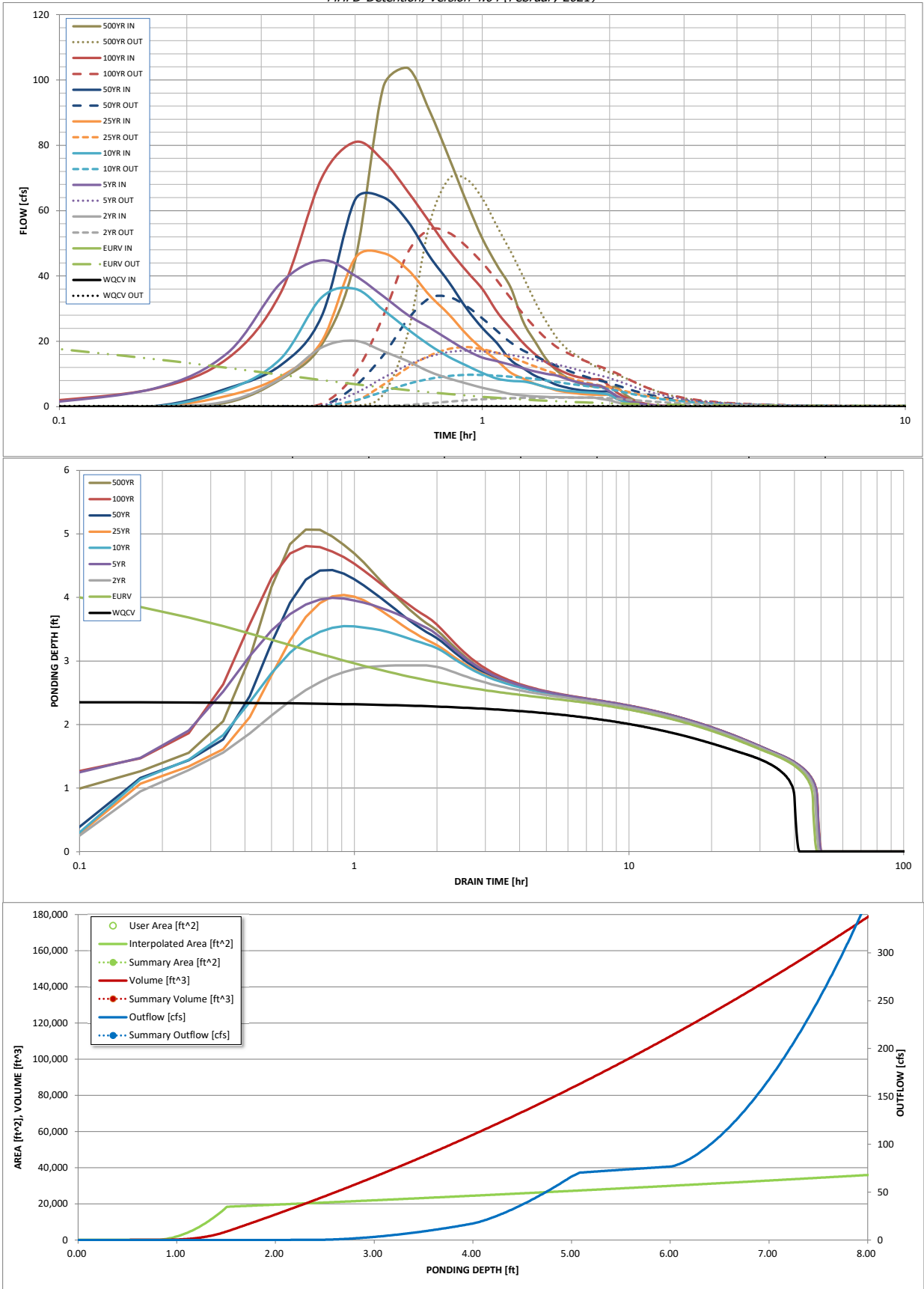
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.488	1.634	1.042	1.456	1.884	2.406	3.276	3.989
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.042	2.782	1.884	2.406	3.276	4.881
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	2.3	6.7	15.4	26.0	34.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		20.0				55.0
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.87	0.29	0.67	1.13	2.39
Peak Inflow Q (cfs) =	N/A	N/A	20.1	44.8	36.0	47.0	64.0	81.0
Peak Outflow Q (cfs) =	0.2	29.5	2.8	17.2	9.8	18.2	33.6	54.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	1.4	1.2	1.3	1.0
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Gate 1 (fps) =	N/A	0.87	N/A	N/A	N/A	0.0	0.7	1.7
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	41	44	39	42	40	37	33
Time to Drain 99% of Inflow Volume (hours) =	40	45	47	45	46	46	45	43
Maximum Ponding Depth (ft) =	2.36	4.52	2.93	3.99	3.55	4.04	4.43	4.81
Area at Maximum Ponding Depth (acres) =	0.47	0.59	0.50	0.56	0.54	0.57	0.59	0.61
Maximum Volume Stored (acre-ft) =	0.490	1.637	0.767	1.331	1.083	1.353	1.584	1.806

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-DETENTION, Version 4.04 (February 2021)



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: ..\SWM\Outflow hydrographs\Pond6_OutflowHydrograph.xlsx

Inflow Hydrographs

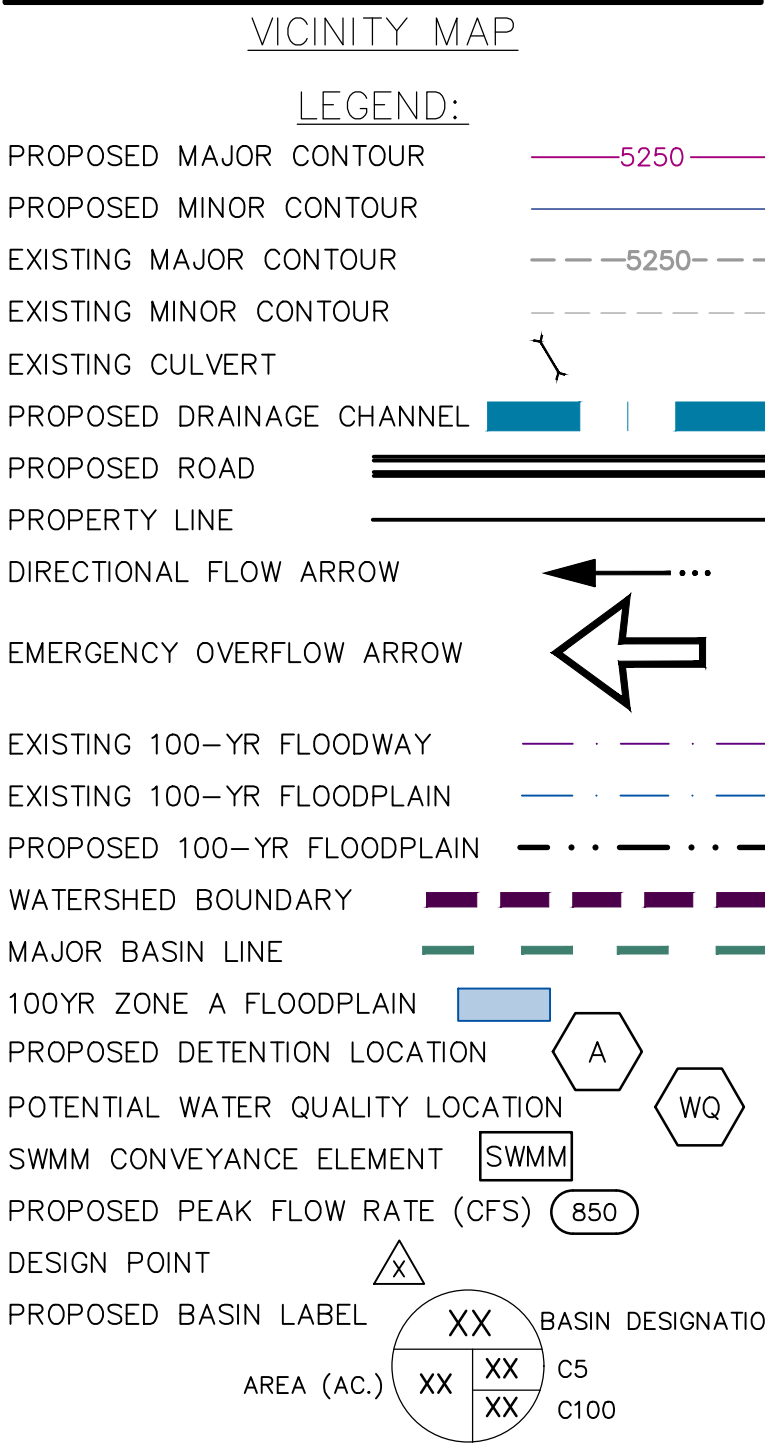
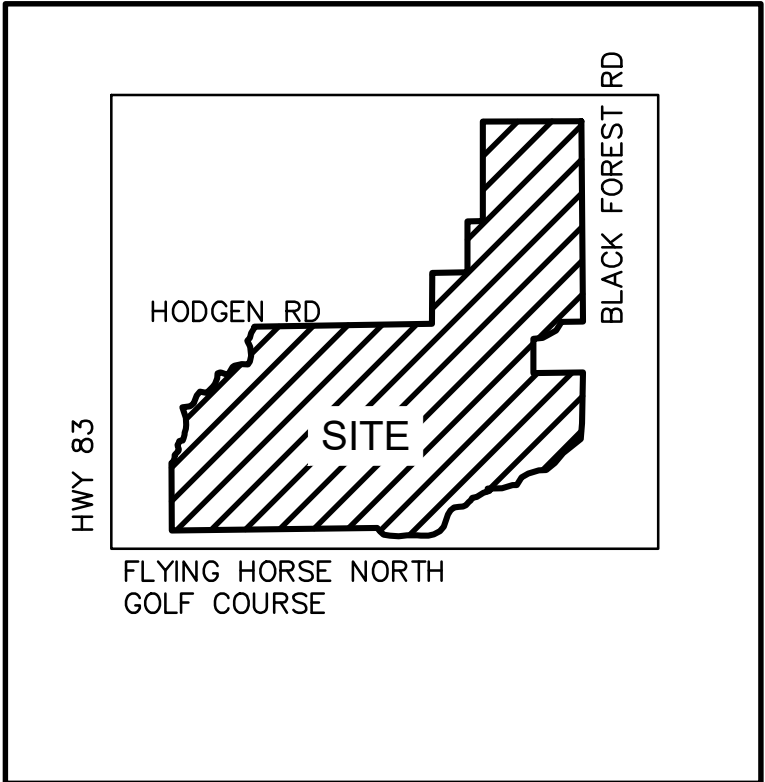
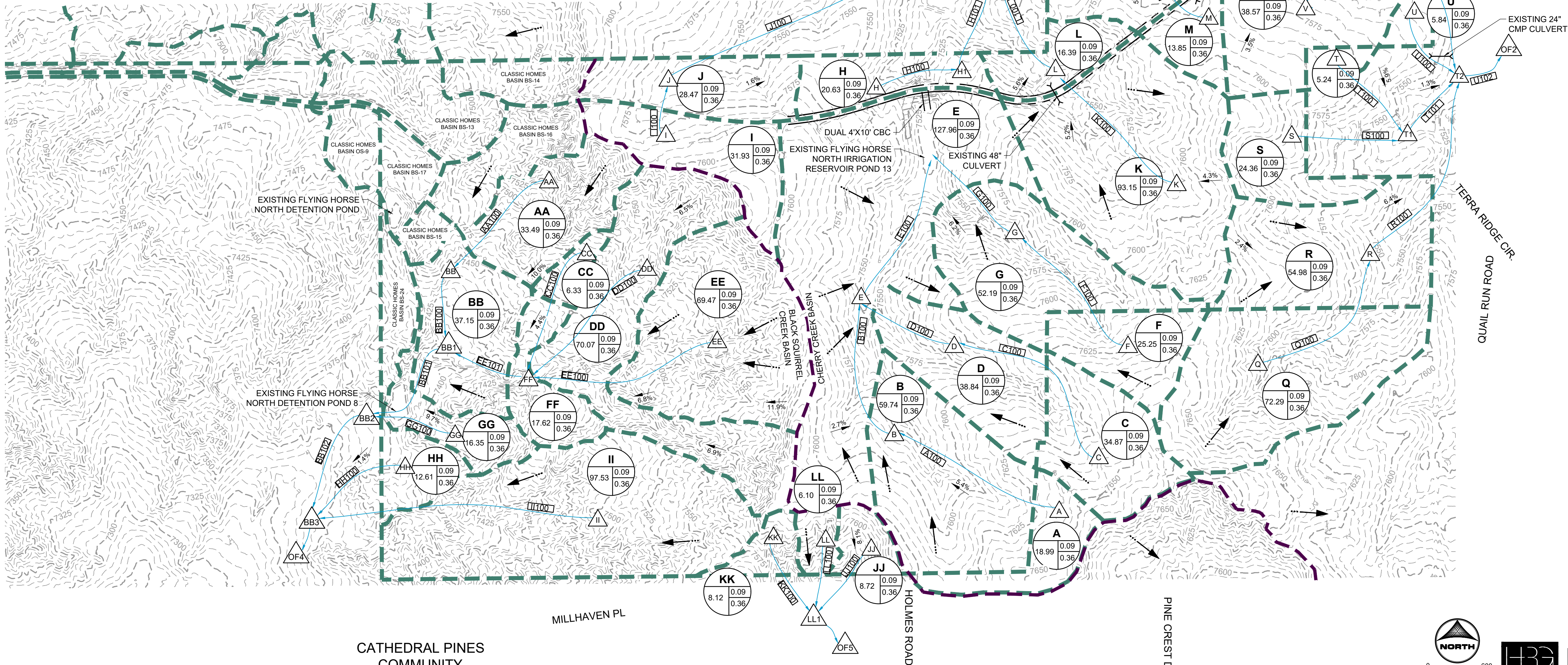
The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.41	0.00	0.00	0.00	1.01	0.00
	0:10:00	0.00	0.00	0.00	5.50	0.00	0.00	0.16	5.44	1.32
	0:15:00	0.00	0.00	1.65	16.52	5.18	3.36	5.62	14.77	8.33
	0:20:00	0.00	0.00	8.60	37.83	14.67	9.22	12.68	34.79	18.87
	0:25:00	0.00	0.00	18.09	44.78	33.40	19.95	27.64	69.96	44.82
	0:30:00	0.00	0.00	20.15	40.12	36.04	45.48	63.36	81.03	97.91
	0:35:00	0.00	0.00	16.94	33.76	29.63	47.00	64.04	75.29	103.64
	0:40:00	0.00	0.00	13.89	28.06	23.69	41.94	56.72	65.86	90.52
	0:45:00	0.00	0.00	10.69	24.15	18.86	34.08	46.05	56.52	76.40
	0:50:00	0.00	0.00	8.62	20.52	15.26	28.31	38.19	48.17	62.76
	0:55:00	0.00	0.00	7.12	17.27	12.58	22.18	30.11	41.54	51.52
	1:00:00	0.00	0.00	5.79	15.04	10.31	17.65	24.11	36.06	43.26
	1:05:00	0.00	0.00	4.82	13.92	8.58	14.12	19.40	29.01	36.45
	1:10:00	0.00	0.00	3.89	12.85	7.88	10.43	14.27	23.97	25.86
	1:15:00	0.00	0.00	3.42	11.72	7.67	8.59	11.74	19.45	19.89
	1:20:00	0.00	0.00	3.15	10.79	6.93	6.94	9.44	16.03	14.49
	1:25:00	0.00	0.00	3.00	10.06	5.95	5.95	8.05	13.55	11.02
	1:30:00	0.00	0.00	2.90	9.51	5.30	5.01	6.68	11.61	8.96
	1:35:00	0.00	0.00	2.84	8.46	4.86	4.43	5.82	10.19	7.57
	1:40:00	0.00	0.00	2.79	7.61	4.57	4.06	5.27	9.21	6.69
	1:45:00	0.00	0.00	2.77	7.03	4.38	3.81	4.90	8.72	6.17
	1:50:00	0.00	0.00	2.77	6.64	4.25	3.69	4.72	8.40	5.99
	1:55:00	0.00	0.00	2.30	6.20	4.02	3.61	4.60	8.20	5.90
	2:00:00	0.00	0.00	1.98	4.66	3.60	3.58	4.55	6.18	5.90
	2:05:00	0.00	0.00	1.30	3.24	2.36	2.35	2.99	4.29	3.89
	2:10:00	0.00	0.00	0.82	2.25	1.52	1.52	1.93	3.00	2.50
	2:15:00	0.00	0.00	0.52	1.57	0.95	0.96	1.21	2.06	1.58
	2:20:00	0.00	0.00	0.30	1.09	0.56	0.57	0.73	1.43	0.94
	2:25:00	0.00	0.00	0.16	0.74	0.32	0.34	0.43	0.96	0.56
	2:30:00	0.00	0.00	0.07	0.48	0.15	0.17	0.21	0.62	0.28
	2:35:00	0.00	0.00	0.02	0.32	0.05	0.06	0.07	0.41	0.09
	2:40:00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.31	0.00
	2:45:00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.24	0.00
	2:50:00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.18	0.00
	2:55:00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.12	0.00
	3:00:00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.08	0.00
	3:05:00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.06	0.00
	3:10:00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.03	0.00
	3:15:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00
	3:20:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	3:25:00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

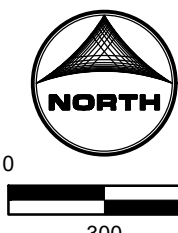
Appendix G

Basin	Design Point	5 Year Pre Development	100 Year Pre Development
A	A	20.84	43.83
B	B	103.48	221.28
C	C	33.36	71.27
D	D	31.56	67.84
E	E	223.69	483.10
F	F	24.27	51.63
G	G	79.17	166.51
H	H	18.59	39.78
I	I	34.58	72.63
J	J	56.31	120.46
K	K	92.05	195.43
L	L	107.58	228.73
M	M	11.48	24.61
N	N	68.16	143.11
O	O	22.69	48.54
P	P	38.52	82.17
Q	Q	64.68	137.80
R	R	108.65	232.13
S	S	25.99	54.65
T	T	4.04	8.68
	T1	137.90	294.73
	T2	145.46	311.00
U	U	4.15	8.95
V	V	29.63	63.92
W	W	3.45	7.33
X	X	167.76	361.56

Basin	Design Point	5 Year Pre Development	100 Year Pre Development
	IRR_Pond	298.49	644.35
	SP1	207.17	515.49
	SP2	281.79	653.32
	SP3	320.31	725.59
AA	AA	38.76	80.22
BB	BB	40.62	84.15
	BB1	242.15	503.29
	BB2	257.03	534.86
	BB3	346.26	733.92
CC	CC	6.53	13.57
DD	DD	58.42	123.69
EE	EE	81.16	167.45
FF	FF	162.77	340.42
GG	GG	14.93	31.99
HH	HH	13.01	27.42
II	II	81.77	175.60
JJ	JJ	9.74	20.50
KK	KK	7.51	15.99
LL	LL	6.88	14.48
	LL1	24.12	50.88
	OF1	320.31	725.59
	OF2	145.46	311.00
	OF3	167.76	361.56
	OF4	346.26	733.92
	OF5	24.12	50.88



NOTES:



Job No.: 211030.01
Prepared By: CLB
Date: 02/21/2022

EXISTING EX1

FLYING HORSE NORTH SKETCH PLAN

A PORTION OF SECTIONS 34, 35 AND 36 TOWNSHIP 11 SOUTH, RANGE 66 WEST, AND A PORTION OF SECTIONS 30 AND 31, TOWNSHIP 11 SOUTH, RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO

NOTES

GENERAL NOTES

- A TOTAL OF 1,471 DWELLING UNITS ARE PROPOSED WITHIN THE FLYING HORSE NORTH SKETCH PLAN ON APPROXIMATELY 912.5 ACRES. THE SUBMITTAL ALSO, INCLUDES A LUXURY RESORT HOTEL AND GOLF CASITAS (UNITS) WITH 225 KEYS (ROOMS).
- CLUSTERING OF UNITS WITHIN RESIDENTIAL DISTRICTS IS PERMITTED, BUT NOT REQUIRED, SO LONG AS THE OVERALL DENSITY LIMIT IS NOT EXCEEDED. THE USE OF CLUSTERING IS ENCOURAGED TO PROMOTE COMMON OPEN SPACE, PROTECT NATURAL FEATURES, AND PROVIDE CREATIVE AND FLEXIBLE DESIGN ALTERNATIVES.
- A DENSITY TRANSFER MAY BE PERMITTED ON FLYING HORSE NORTH FOR ALL RESIDENTIAL DISTRICTS. THIS TRANSFER WOULD BE PROPOSED AT THE TIME OF REZONING AND/OR PRELIMINARY PLAN (WHERE APPROPRIATE) AND WOULD NEED TO BE REVIEWED BY STAFF TO ENSURE THAT THE OVERALL DEVELOPMENT CONCEPT IS ADHERED TO. A DENSITY TRANSFER NOT TO EXCEED TWENTY PERCENT (20%) OF THE MAXIMUM UNITS FOR EACH PARCEL IS PERMITTED. THE TRANSFERRED DENSITY SHALL MEET ALL MINIMUM REQUIREMENTS OF THE RECEIVING AREA SUCH AS LOT SIZE, SETBACKS, ETC. IN NO CASE SHALL THE OVERALL DENSITY CAP EXCEED THE TOTAL UNITS APPROVED FOR THE PROJECT.
- SPECIFIC DEVELOPMENT STANDARDS SUCH AS SETBACKS, LOT COVERAGE, BUILDING HEIGHTS AND LAND USES SHALL BE ADDRESSED WITH A SUBSEQUENT ZONING OF THE PROPERTY AT A LATER DATE. THESE STANDARDS WILL EITHER FOLLOW SPECIFIC PROPOSED PUD DEVELOPMENT PLANS OR PER COUNTY ZONING STANDARDS IF FOLLOWING "CONVENTIONAL ZONING" OF THE COUNTY.
- ALL COMMON LANDSCAPE, OPEN SPACE, PARKS, TRACTS AND DRAINAGE FACILITIES WITHIN THIS DEVELOPMENT SHALL BE OWNED AND MAINTAINED BY THE HOA (TO BE NAMED) OR FLYING HORSE NORTH METROPOLITAN DISTRICT WITH THE EXCEPTION OF THE COUNTY TRAIL AS DEPICTED ON THE SKETCH PLAN.
- ALL DETENTION PONDS AND CROSS LOT DRAINAGE DITCHES WILL BE LOCATED WITHIN DRAINAGE EASEMENTS PROVIDING ACCESS FOR MAINTENANCE TO THE FLYING HORSE NORTH METROPOLITAN DISTRICT OR HOA (TO BE NAMED).
- THERE SHALL BE NO DIRECT RESIDENTIAL LOT ACCESS TO BLACK FOREST ROAD EXCEPT FOR THE EXISTING STAGECOACH ROAD ACCESS AND POTENTIAL COMMERCIAL ACCESS.
- PARK IMPROVEMENTS PROVIDED BY THE DEVELOPER MAY BE APPLIED TO PARK LAND DEDICATION AND/OR FEES WITH REVIEW AND APPROVAL BY EL PASO COUNTY PARKS. ANY PARK IMPROVEMENTS WILL BE COORDINATED AT A LATER DATE WITH EL PASO COUNTY PARKS VIA PARK LAND AGREEMENTS.
- ALL ELECTRIC SERVICE SHALL BE PROVIDED BY MOUNTAIN VIEW ELECTRIC ASSOCIATION AND GAS TO BE PROVIDED BY BLACK HILLS ENERGY. NATURAL GAS EASEMENTS WILL BE PROVIDED AS REQUIRED.
- SITE LIGHTING, IF REQUIRED, WILL MEET THE REQUIREMENTS SET FORTH IN SECTION 6.2.3 OF EL PASO COUNTY LAND DEVELOPMENT CODE.
- THE DEVELOPER SHALL COMPLY WITH FEDERAL AND STATE LAWS, REGULATIONS, ORDINANCES, REVIEW AND PERMIT REQUIREMENTS, AN OTHER AGENCY REQUIREMENTS, IF ANY, OF APPLICABLE AGENCIES INCLUDING, BUT NOT LIMITED TO, THE COLORADO PARKS AND WILDLIFE, COLORADO DEPARTMENT OF TRANSPORTATION, U.S. ARMY CORPS OF ENGINEERS, AND THE U.S. FISH AND WILDLIFE SERVICE REGARDING THE ENDANGERED SPECIES ACT, PARTICULARLY AS IT RELATES TO ANY LISTED SPECIES.
- THE FOLLOWING DISTRICTS WILL SERVE THE PROPERTY
LEWIS-PALMER DISTRICT 38 AND ACADEMY DISTRICT 20
FIRE EMERGENCY - BLACK FOREST FIRE PROTECTION DISTRICT
EMERGENCY SERVICES - BLACK FOREST FIRE PROTECTION DISTRICT
TELECOM/FIBER - FORCE BROADBAND & COMCAST
PIKES PEAK LIBRARY DISTRICT
ELECTRICAL SERVICES - MVEA
- THE MAILBOX KIOSK WILL BE DETERMINED WITH EACH FINAL PLAT AND IN COORDINATION WITH THE U.S. POSTAL SERVICE.
- THE FIRE STATION LOCATED IN FILING 1 CAN BE RELOCATED ANYWHERE IN THE SKETCH PLAN AREA IF NEEDED. IF FIRE DEPARTMENT DETERMINES RELOCATION IS NOT NEEDED, THE LAND NEED NOT BE DEDICATED TO THEM.
- APPLICABLE PARK, SCHOOL, TRANSPORTATION, DRAINAGE, BRIDGE, AND TRAFFIC FEES SHALL BE PAID TO THE EL PASO COUNTY PLANNING AND COMMUNITY DEVELOPMENT DEPARTMENT AT THE TIME OF RECORDING ANY FINAL PLAT.
- ACCESS LOCATIONS AND ROADWAY CLASSIFICATIONS ARE CONCEPTUAL ONLY AND WILL BE DETERMINED AT THE TIME PRELIMINARY PLAN REVIEW. FINAL LOCATIONS AND CLASSIFICATIONS OF ROADWAYS WILL BE SUBJECT MORE DETAILED LAND DESIGN AND SUBDIVISION REVIEW.

FLOODPLAIN NOTES:

- PORTIONS OF THIS PROPERTY ARE LOCATED WITHIN A DESIGNATED FEMA FLOODPLAIN AS DETERMINED BY THE FEMA NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE MAP NUMBERS '08041C0305G' AND '08041C0315G' WITH AN EFFECTIVE DATE OF DECEMBER 7, 2018.
- THE EXISTING FLOODPLAIN BOUNDARIES ARE INTENDED TO REMAIN AND DEVELOPMENT WILL OCCUR OUTSIDE THE FLOODPLAIN LIMITS.
- NO STRUCTURES OR SOLID FENCES ARE PERMITTED WITHIN THE DESIGNATED FLOODPLAIN AREA.

PUBLIC STREETS

- PER THE INTERGOVERNMENTAL AGREEMENT, THE CITY OF COLORADO SPRINGS WILL REQUIRE THE STREETS TO BE DESIGNED AND CONSTRUCTED TO THE CITY STANDARDS.
- SIDEWALKS OR WALKWAYS WILL BE PROVIDED ALONG ALL STREETS AND INTERIOR TO DEVELOPMENT PARCELS, PARKS AND TRAIL SYSTEMS.
- PUBLIC STREETS WITHIN THIS DEVELOPMENT SHALL PROVIDE FOR LEVELS OF VEHICULAR CIRCULATION REQUIRED BY THE TRAFFIC STUDY AND SHALL BE PAVED.
- UNTIL APPROVED BY THE COUNTY ENGINEER ALL ACCESS POINTS SHOWN ON THIS PLAN ARE CONCEPTUAL AND NON-BINDING UPON THE COUNTY APPROVAL OF THIS SKETCH PLAN AMENDMENT SHALL NOT BE INTERPRETED TO INCLUDE APPROVAL OF ANY ACCESS TO ANY PUBLIC ROADS. THE COUNTY ENGINEER SHALL APPROVE ALL ACCESSES IN ACCORDANCE WITH THE REQUIREMENTS AND PROCEDURES OF THE ENGINEERING CRITERIA MANUAL AT THE TIME OF PUD DEVELOPMENT PLAN AND/OR SUBDIVISION SUBMITTAL AND REVIEW.

PRIVATE STREETS

- ANY FUTURE PRIVATE STREETS, IF PROPOSED, WILL BE PRIVATELY OWNED AND MAINTAINED BY THE FLYING HORSE NORTH METROPOLITAN DISTRICT NO. 1 OR HOA (HOMEOWNERS ASSOCIATION-TO BE NAMED).

PHASING PLAN:

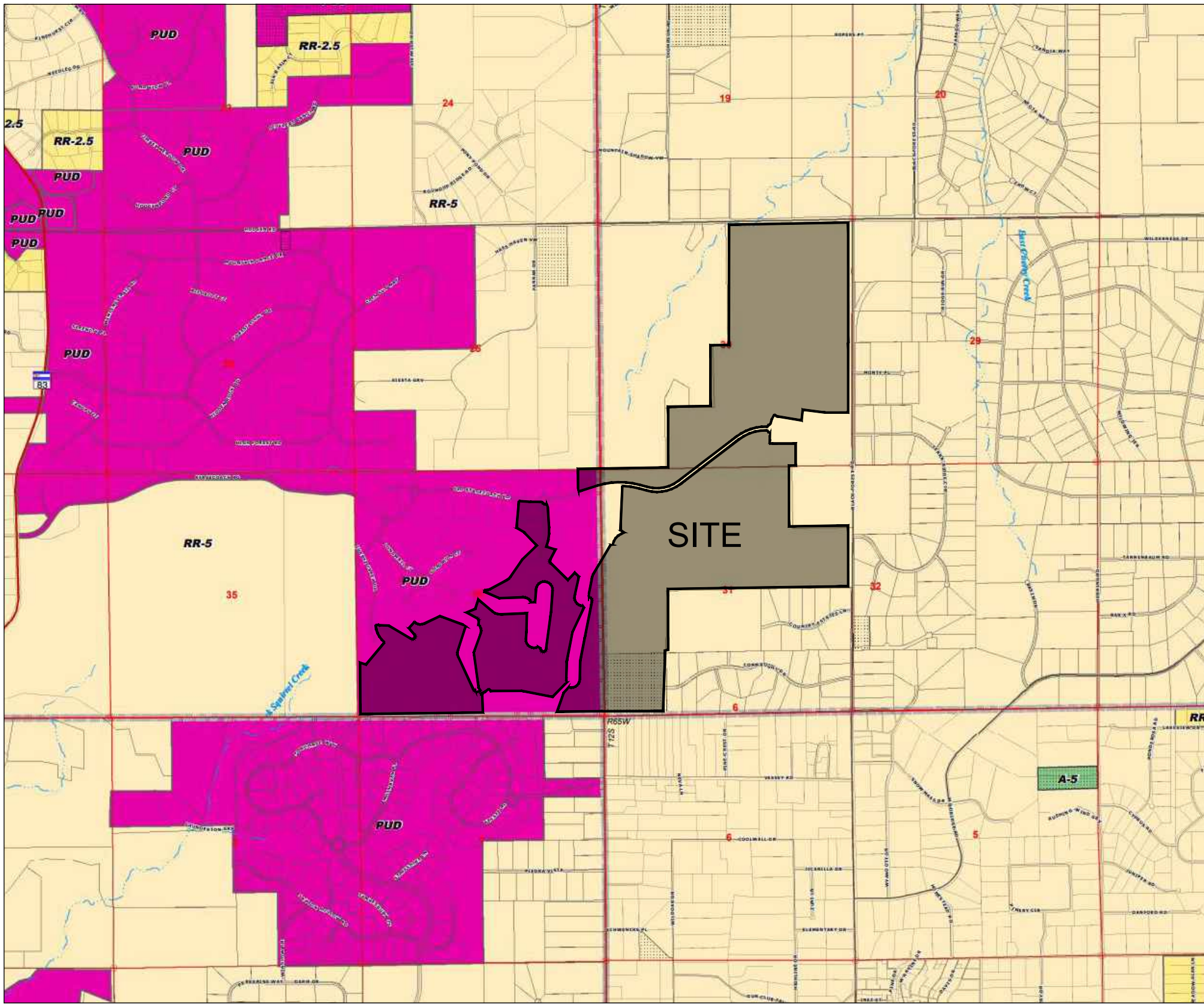
- THE FLYING HORSE NORTH PROJECT WILL BE DEVELOPED IN MULTIPLE PHASES AND PLATTED IN MULTIPLE FILINGS, WHICH HAVE YET TO BE DETERMINED. THE SEQUENCE OF CONSTRUCTION AND DEVELOPMENT IS NOT DEPENDENT UPON UTILITIES OR INFRASTRUCTURE.

GEOLOGIC HAZARDS DISCLOSURE STATEMENT:

- AREAS OF PROPOSED SUBDIVISION HAVE BEEN FOUND TO BE IMPACTED BY GEOLOGICAL CONDITIONS, INCLUDING SEASONAL AND POTENTIALLY SEASONAL SHALLOW GROUND WATER, ARTIFICIAL FILL, LOOSE AND EXPANSIVE SOILS AND SLOPE STABILITY. THESE CONDITIONS CAN BE MITIGATED BY AVOIDANCE, RE-GRADING, PROPER ENGINEERING DESIGN, AND CONSTRUCTION TECHNIQUES. A MAP OF THE HAZARD AREAS AND PROPOSED MITIGATION MEASURES CAN BE FOUND IN THE GEOLOGICAL HAZARD STUDY AND WASTEWATER STUDY PREPARED BY ENTECH ENGINEERING INC., DATED JANUARY 15, 2019. FURTHER STUDIES OF THESE CONDITIONS SHALL BE PROVIDED WITH EITHER PRELIMINARY OR FINAL PLANS.

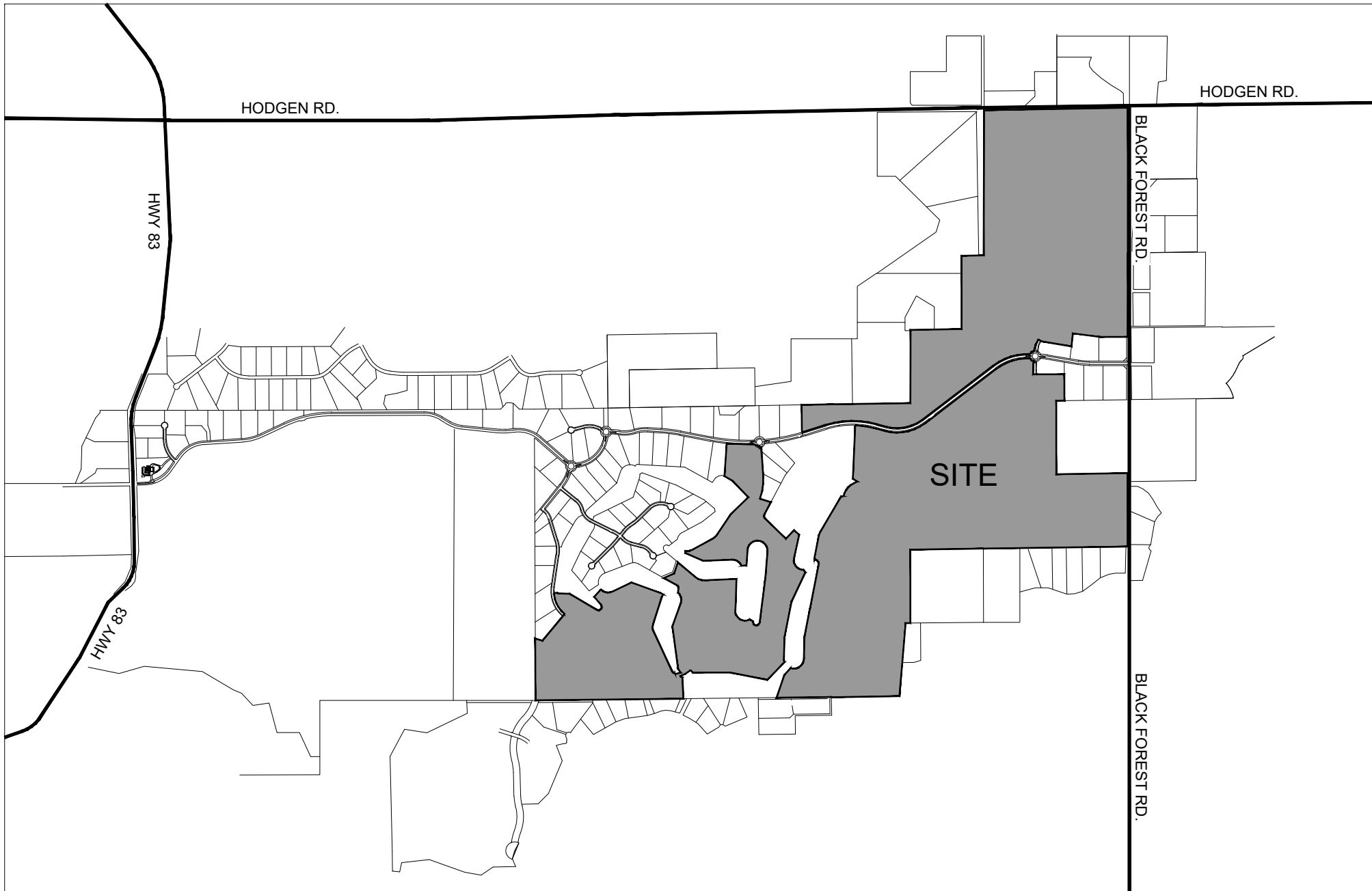
ZONING MAP

SCALE = N.T.S



VICINITY MAP

SCALE = N.T.S



SHEET INDEX

SHEET 1 OF 4: COVER SHEET
SHEET 2 OF 4: SKETCH PLAN
SHEET 3 OF 4: ADJACENT PROPERTY MAP
SHEET 4 OF 4: ADJACENT PROPERTY OWNERS

OWNER/DEVELOPER:
FLYING HORSE DEVELOPMENT LLC
2138 FLYING HORSE CLUB DRIVE
COLORADO SPRINGS, CO 80921

PLANNER/LANDSCAPE ARCHITECT:
HRGREEN DEVELOPMENT, LLC
1975 RESEARCH PARKWAY SUITE 230
COLORADO SPRINGS, CO 80920
720.602.4941

CIVIL ENGINEER:
HRGREEN DEVELOPMENT, LLC
1975 RESEARCH PARKWAY SUITE 230
COLORADO SPRINGS, CO 80920
720.602.4965

ECOLOGIST:
BRISTLECONE ECOLOGY
2023 W. SCOTT PLACE
DENVER, CO 80211
971.237.3906

TRANSPORTATION CONSULTANTS:
SM ROCHA, LLC
DENVER, CO 80211
303.458.9798

SITE DATA

EXISTING LAND USE: VACANT
EXISTING ZONING: PUD & RR-5

SITE ACREAGE: 912.6 AC
MAXIMUM NUMBER OF UNITS: 1,121
MAXIMUM GROSS DENSITY: 1.23 DU/AC

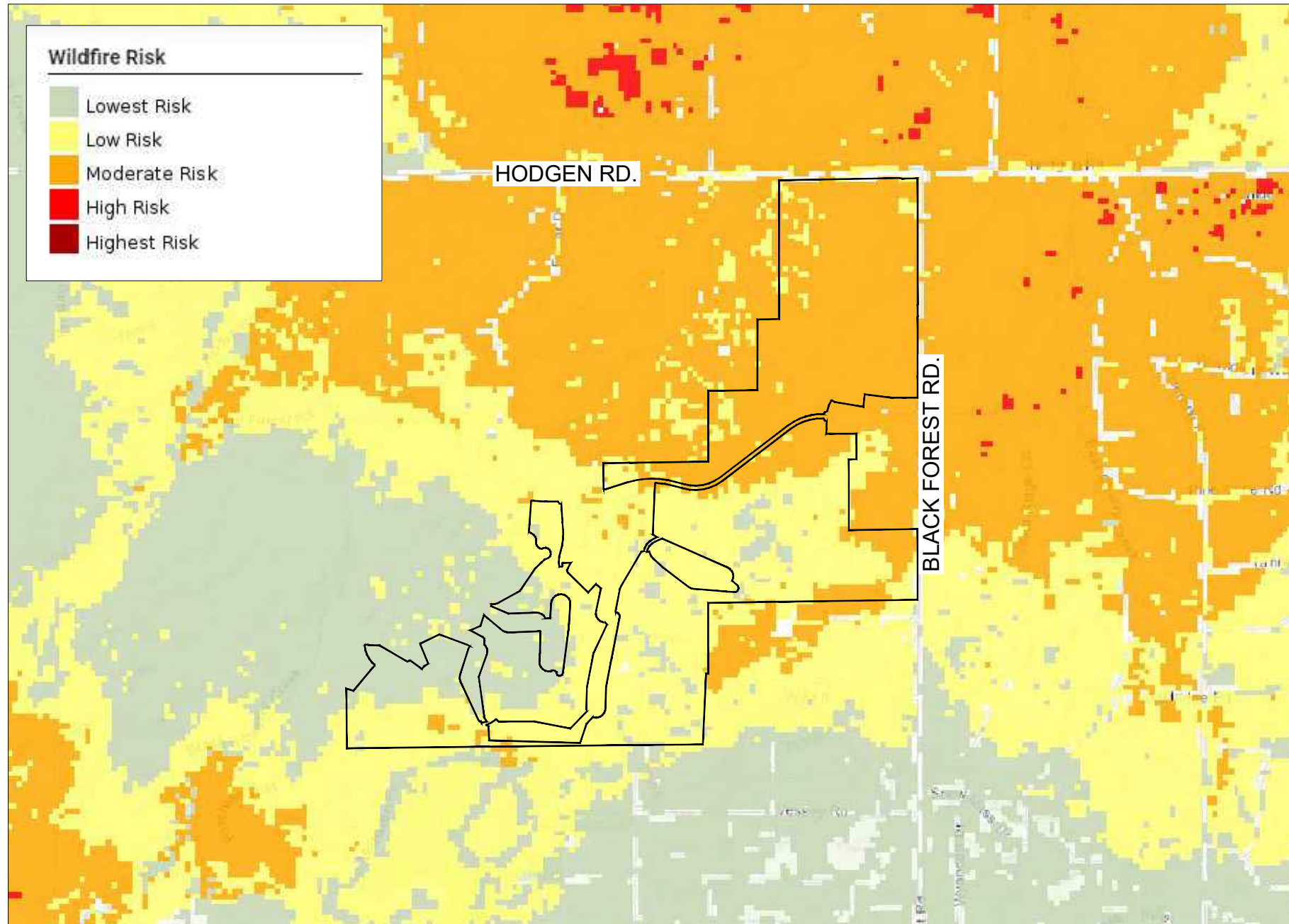
TOTAL AREAS (SEE LAND USE CHART ON SHEET 2)

RESIDENTIAL: 853.8 AC
ESTATE LOTS (5 ACRES) 118.3 AC
ESTATE LOTS (2.5 ACRES) 152.7 AC
LOW DENSITY 332.9 AC
MEDIUM DENSITY 46.0 AC
ESTIMATED OPEN SPACE 203.9 AC

HOTEL/GOLF CASITAS 26.6 AC
BRANDED FLATS 5.6 AC
GOLF CLUB, RESTAURANT/BAR, 11.0 AC
GOLF AMENITIES (HOTEL)
ESTATE CLUBHOUSE (HOTEL) 2.4 AC
COMMERCIAL 9.1 AC
FITNESS CENTER 4.1 AC

WILDFIRE RISK MAP

SCALE = N.T.S



COUNTY FILE NUMBER: SKP223

DRAWN BY: JAG JOB DATE: 3/1/2022
APPROVED: PLS JOB NUMBER: 211030
CAD DATE: 7/20/2022
CAD FILE: J:\2021\211030\CAD\Drawings\Sketch-Plan\COVER-SHEET

BAR IS ONE INCH ON OFFICIAL DRAWINGS.
0" 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION



FLYING HORSE NORTH
DEVELOPMENT, LLC.
EL PASO COUNTY, COLORADO

FLYING HORSE NORTH SKETCH PLAN
COVER SHEET

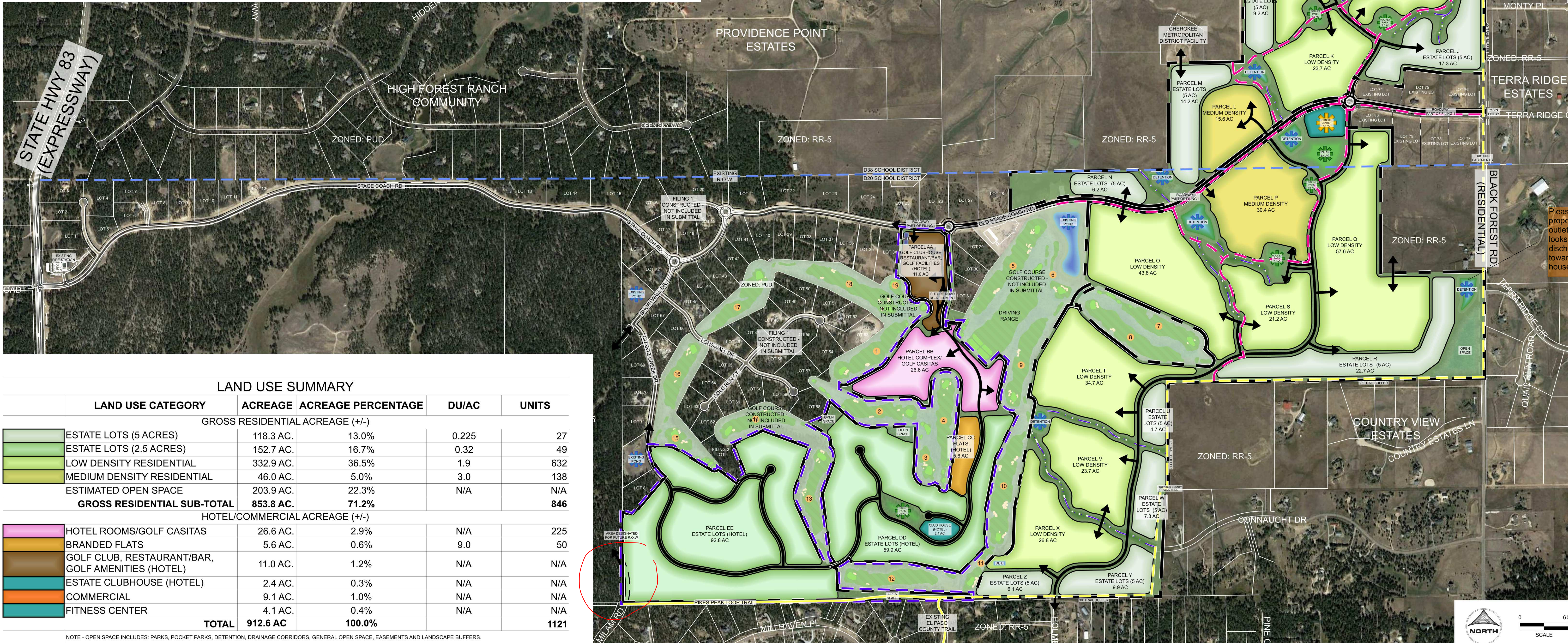
SHEET
SP.1

1

FLYING HORSE NORTH SKETCH PLAN

LEGEND

	ESTATE LOTS (5 AC)		HOTEL PARCELS
	ESTATE LOTS (2.5 AC)		SCHOOL DISTRICT LINE
	LOW DENSITY		FHN TRAIL
	MEDIUM DENSITY		PUBLIC COUNTY TRAIL
	BRANDED FLATS (HOTEL)		DRAINAGE WAY
	COMMERCIAL		PARK/POCKET PARK
	GOLF CLUB, FITNESS CENTER, RESTAURANT/BAR (HOTEL)		FITNESS CENTER
	HOTEL COMPLEX		POTENTIAL FIRE STATION
	CLUBHOUSE		PROPOSED DETENTION
	ROADWAY		
	DETENTION		
	SITE BOUNDARY		



Please elaborate on proposed Pond 9 outlet. Currently looks to be discharging directly towards existing house.

LAND USE SUMMARY

LAND USE CATEGORY	ACREAGE	ACREAGE PERCENTAGE	DU/AC	UNITS
GROSS RESIDENTIAL ACREAGE (+/-)				
ESTATE LOTS (5 ACRES)	118.3 AC.	13.0%	0.225	27
ESTATE LOTS (2.5 ACRES)	152.7 AC.	16.7%	0.32	49
LOW DENSITY RESIDENTIAL	332.9 AC.	36.5%	1.9	632
MEDIUM DENSITY RESIDENTIAL	46.0 AC.	5.0%	3.0	138
ESTIMATED OPEN SPACE	203.9 AC.	22.3%	N/A	N/A
GROSS RESIDENTIAL SUB-TOTAL	853.8 AC.	71.2%		846
HOTEL/COMMERCIAL ACREAGE (+/-)				
HOTEL ROOMS/GOLF CASITAS	26.6 AC.	2.9%	N/A	225
BRANDED FLATS	5.6 AC.	0.6%	9.0	50
GOLF CLUB, RESTAURANT/BAR, GOLF AMENITIES (HOTEL)	11.0 AC.	1.2%	N/A	N/A
ESTATE CLUBHOUSE (HOTEL)	2.4 AC.	0.3%	N/A	N/A
COMMERCIAL	9.1 AC.	1.0%	N/A	N/A
FITNESS CENTER	4.1 AC.	0.4%	N/A	N/A
TOTAL	912.6 AC	100.0%		1121

NOTE - OPEN SPACE INCLUDES: PARKS, POCKET PARKS, DETENTION, DRAINAGE CORRIDORS, GENERAL OPEN SPACE, EASEMENTS AND LANDSCAPE BUFFERS.

DRAWN BY: JAG
APPROVED: PLS
CAD DATE: 07/01/2022
CAD FILE: J:\2021\1211030\CAD\Drawings\Sketch-Plan\BUBBLE-PLAN

BAR IS ONE INCH ON
OFFICIAL DRAWINGS.
0" 1"
IF NOT ONE INCH,
ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen.com
HRGreen

FLYING HORSE NORTH
DEVELOPMENT, LLC.
EL PASO COUNTY, COLORADO

FLYING HORSE NORTH SKETCH PLAN
SKETCH PLAN DRAWING

SHEET
SP.2

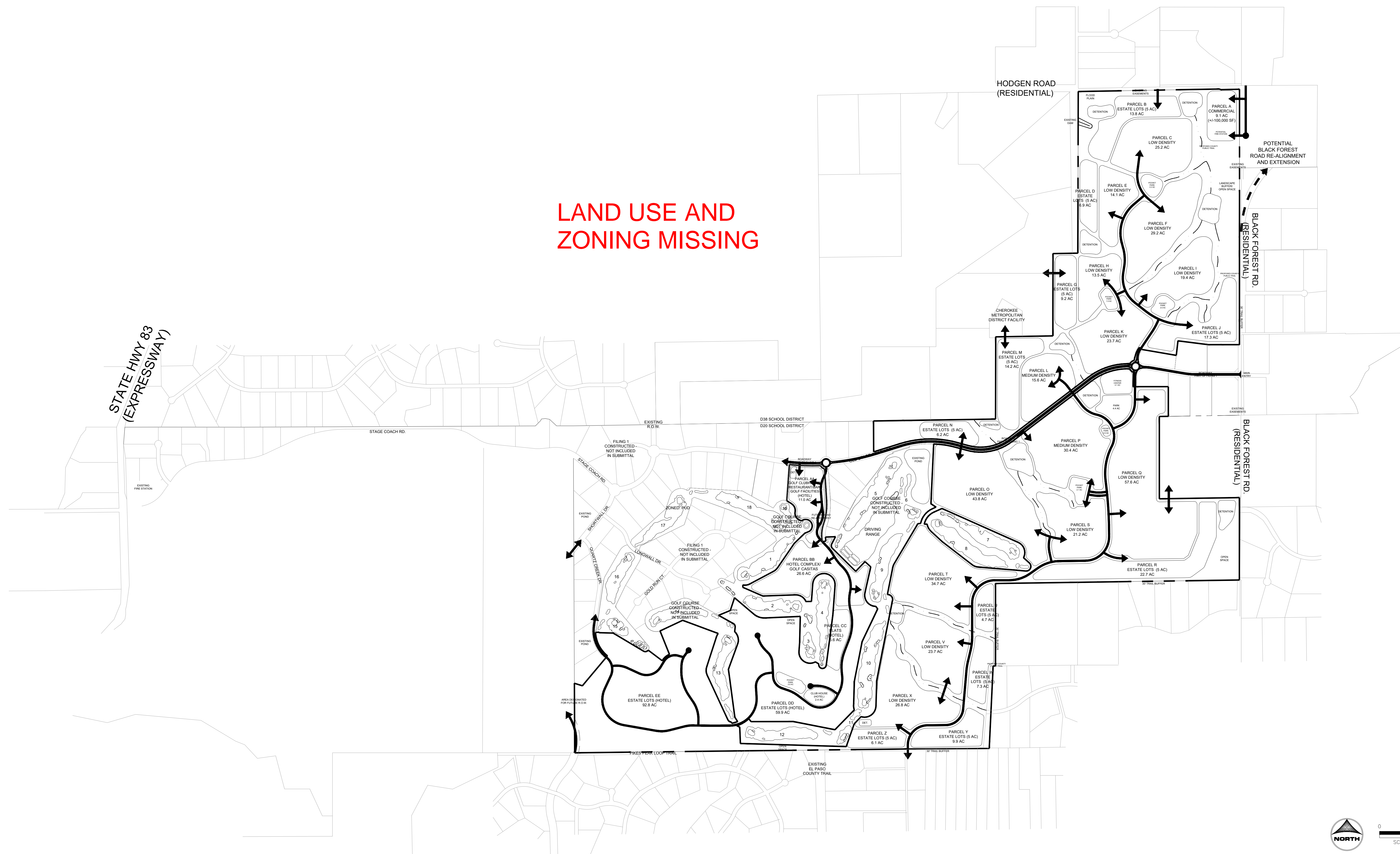
2

COUNTY FILE NUMBER: SKP223

FLYING HORSE NORTH SKETCH PLAN

LAND USE AND ZONING MISSING

STATE HWY 83
(EXPRESSWAY)



COUNTY FILE NUMBER: SKP223

DRAWN BY: JAG JOB DATE: 3/1/2022 BAR IS ONE INCH ON OFFICIAL DRAWINGS
APPROVED: PLS JOB NUMBER: 211030 0 1"
CAD DATE: 2/21/2022 IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY
CAD FILE: J121021211030\CAD\DWG\CS\Sketch-Plan\ADJACENT-PROPERTY

NO.	DATE	BY	REVISION DESCRIPTION



HRGreen.com

HRGreen

FLYING HORSE NORTH
DEVELOPMENT, LLC.
EL PASO COUNTY, COLORADO

FLYING HORSE NORTH SKETCH PLAN
ADJACENT PROPERTY DATA MAP

SHEET
SP.3

3

FLYING HORSE NORTH SKETCH PLAN

ADJACENT PROPERTY OWNERS

SHAMROCK SS LLC ZONING - RR-5 15555 HWY 83 COLORADO SPRINGS, CO	WAUGH JOSHUA T ZONED - RR-5 14445 HOLMES ROAD COLORADO SPRINGS, CO	MACEDO JUAN H LOMEIL ZONED - RR-5 6710 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	MCCGRATH DONALD T ZONED - PUD 6750 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	DEIM CONNIE ZONED - RR-5 SUNDANCE RANCH LANE COLORADO SPRINGS, CO	STEPHENSON TRAVIS ZONED - PUD 4901 HIGH FOREST ROAD COLORADO SPRINGS, CO	WELLER ERICH G ZONED - PUD 5310 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	KIM MICHAEL SANG-HAK ZONED - PUD 5075 OLD STAGECOACH ROAD COLORADO SPRINGS, CO
BRI J FAMILY TRUST ZONED - PUD 4820 FOXCHASE WAY COLORADO SPRINGS, CO	HOFFPAUIR DAN W JR ZONED - RR-5 14495 HOMES ROAD COLORADO SPRINGS, CO	SOMBRIC WAYNE S ZONED - RR-5 6740 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	MIKUSKA ERIC ZONED - RR-5 15645 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	BR&C INC ZONED - RR-5 30-11-65 COLORADO SPRINGS, CO	JOHNSON LIVING TRUST ZONED - PUD 4841 HIGH FOREST ROAD COLORADO SPRINGS, CO	LAM TU T ZONED - PUD 5390 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	TEUSCHER KURT ZONED - PUD 5035 OLD STAGECOACH ROAD COLORADO SPRINGS, CO
PIASECKI NANCY L REVOC TRUST ZONED - PUD 4940 FOXCHASE WAY COLORADO SPRINGS, CO	SELF BOB J ZONED - RR-5 5910 VESSEY ROAD COLORADO SPRINGS, CO	HOPSON SEAN ZONED - RR-5 6770 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	GARD DIANA M ZONED - RR-5 6835 MONTY PLACE COLORADO SPRINGS, CO	BR&C INC ZONED - RR-5 30-11-65 COLORADO SPRINGS, CO	RAMIREZ MELODY B ZONED - PUD 4781 HIGH FOREST ROAD COLORADO SPRINGS, CO	LUERS BEACH LLC ZONED - PUD 5470 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	DOWNS BRADLEY JAMES ZONED - PUD 55305 OLD STAGECOACH ROAD COLORADO SPRINGS, CO
BRINGARD FAMILY LICING TRUST ZONED - PUD 14465 MILLHAVEN PLACE COLORADO SPRINGS, CO	JONES INGRID L ZONED - RR-5 5940 VESSEY ROAD COLORADO SPRINGS, CO	MCKINLEY DAVID R ZONED - RR-5 14920 QUAIL RUN ROAD COLORADO SPRINGS, CO	FRANKOVIS JESSE J ZONED - RR-5 6840 MONTY PLACE COLORADO SPRINGS, CO	CHEROKEE METROPOLITAN DISTRICT ZONED - RR-5 30-11-65 COLORADO SPRINGS, CO	FOWLER NORMAN W ZONED - PUD 4670 STAGECOACH ROAD COLORADO SPRINGS, CO	GREENWOOD TAYLOR J ZONED - PUD 5550 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	KAVERMAN JOSEPH A ZONED - PUD 5215 OLD STAGECOACH ROAD COLORADO SPRINGS, CO
ALLAN NEAL A ZONED - PUD 14425 MILLHAVEN PLACE COLORADO SPRINGS, CO	RUPP JERRREY D ZONED - RR-5 5970 VESSEY ROAD COLORADO SPRINGS, CO	WINNINGHAM AARON JASON ZONED - RR-5 14940 QUAIL RUN ROAD COLORADO SPRINGS, CO	OLIVAS SOCORRO J ZONED - RR-5 6905 ALPACA HEIGHTS COLORADO SPRINGS, CO	SUNDANCE RANCH OF BLACK FOREST ZONED - RR-5 HODGEN ROAD COLORADO SPRINGS, CO	TYRLSON TYRONE L ZONED - PUD 4760 STAGECOACH ROAD COLORADO SPRINGS, CO	LONG RUSSEL I ZONED - PUD 5630 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	PIEPER RANDALL L ZONED - PUD 5125 OLD STAGECOACH ROAD COLORADO SPRINGS, CO
ALEX & AUTUMM SIMPSON ZONED - PUD 14385 MILLHAVEN PLACE COLORADO SPRINGS, CO	LITTLETON STANLEY ZONED - RR-5 6010 VESSEY ROAD COLORADO SPRINGS, CO	LYNDE ROBERT A ZONED - RR-5 15015 TERRA RIDGE CIRCLE COLORADO SPRINGS, CO	HILL DOUGLAS E ZONED - RR-5 6910 ALPACA HEIGHTS COLORADO SPRINGS, CO	SUNDANCE RANCH OF BLACK FOREST ZONED - RR-5 HODGEN ROAD COLORADO SPRINGS, CO	JONES CHRISTOPHER P ZONED - PUD 4850 STAGECOACH ROAD COLORADO SPRINGS, CO	PECK MICHAEL S ZONED - PUD 5555 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	SHECTER TRUST ZONED - PUD 15291 LONGWALL DRIVE COLORADO SPRINGS, CO
MAITHILI VENKATACHALLAM ZONED - PUD 14345 MILLHAVEN PLACE COLORADO SPRINGS, CO	SWANSON BRECK C ZONED - RR-5 6030 VESSEY ROAD COLORADO SPRINGS, CO	SPLIT PINE RANCH LIVING TRUST ZONED - RR-5 15385 BLACK FOREST ROAD COLORADO SPRINGS, CO	WHITNEY CHRISTOPHER D ZONED - RR-5 16485 BLACK FOREST ROAD COLORADO SPRINGS, CO	SHELL JAMES R II ZONED - RR-5 15550 FARRAR ROAD COLORADO SPRINGS, CO	WALTERS MICHAEL A ZONED - PUD 4910 STAGECOACH ROAD COLORADO SPRINGS, CO	RENNER LLC ZONED - PUD 15331 ALLEN RANCH ROAD COLORADO SPRINGS, CO	CHRISTOPHER MICHAEL MARSHALL ZONED - PUD 15051 LONGWALL DRIVE COLORADO SPRINGS, CO
DULANEY KIMBERLY L ZONED - PUD 14325 MILLHAVEN PLACE COLORADO SPRINGS, CO	HOOKS GROUP LP ZONED - RR-5 6005 CONNAUGHT DRIVE COLORADO SPRINGS, CO	APODACA LESLIE E ZONED - RR-5 15380 BLACK FOREST ROAD COLORADO SPRINGS, CO	BERENS MARK E ZONED - RR-5 6850 HODGEN ROAD COLORADO SPRINGS, CO	SHELL JAMES R II ZONED - RR-5 15550 FARRAR ROAD COLORADO SPRINGS, CO	YOUNG MICHAEL J ZONED - PUD 4915 STAGECOACH ROAD COLORADO SPRINGS, CO	BOOGAARD RYAN ZONED - PUD 15271 ALLEN RANCH ROAD COLORADO SPRINGS, CO	
SMITH PAUL R ZONED - PUD 14265 MILLHAVEN PLACE COLORADO SPRINGS, CO	MCILRATH WILLIAM F TRUSTEE ZONED - RR-5 6010 CONNAUGHT DRIVE COLORADO SPRINGS, CO	DERKSEN PROPERTIES LLC ZONED - PUD 6755 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	MOLES JUSTIN ZONED - RR-5 16550 BLACK FOREST ROAD COLORADO SPRINGS, CO	BREWER GEORGE F II ZONED - PUD 15501 OPEN SKY WAY COLORADO SPRINGS, CO	DAY GREGORY ZONED -PUD 4955 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	ALEXANDER SCOTT E ZONED - PUD 5395 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	
ANDERSON MATTHEW P ZONED - PUD 5025 VESSEY ROAD COLORADO SPRINGS, CO	WAY MARGARET E ZONED - RR-5 14820 BLACK FOREST ROAD COLORADO SPRINGS, CO	NGUYEN LINH T ZONED - PUD 6715 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	MUNSON BRANDON J ZONED - RR-5 16710 BLACK FOREST ROAD COLORADO SPRINGS, CO	MONTGOMERY MONTIE C ZONED - PUD 15547 OPEN SKY WAY COLORADO SPRINGS, CO	RZONCA THADDEUS ZONED - PUD 4995 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	CLAWSON MATTHEW R ZONED - PUD 5355 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	
ESPENLAUB ECTON ZONED - PUD 4985 VESSEY ROAD COLORADO SPRINGS, CO	ABELL LIVING TRUST ZONED - RR-5 6620 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	MONACO57 LIVING TRUST ZONED - PUD 6675 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	MILLER ROBERT S ZONED - RR-5 6520 HODGEN ROAD COLORADO SPRINGS, CO	RANGER CANDACE S LIVING TRUST ZONED - PUD 15593 OPEN SKY WAY COLORADO SPRINGS, CO	SIDWELL DUSTIN JEFFREY ZONED - PUD 4990 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	PLAISTOWE NORMAN H ZONED - PUD 5315 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	
DILLINGHAM MICHAEL V ZONED - RR-5 14498 HOLMES ROAD COLORADO SPRINGS, CO	HERRON PATRICK J ZONED - RR-5 6650 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	ST HENRYS LLC ZONED - PUD 6595 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	JOHN R SHANTZ & BELINDA S ZONED - RR-5 16547 RIDGEBACK ROAD COLORADO SPRINGS, CO	JANNELLE EVA ALLEN REVOCABLE TRUST ZONED - PUD 15639 OPEN SKY WAY COLORADO SPRINGS, CO	SPARKS DUSTIN R ZONED - PUD 5070 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	RAMPART ENTERPRISES INC ZONED - PUD 5235 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	
THOMAS JOHN K ZONED - RR-5 14490 HOLMES ROAD COLORADO SPRINGS, CO	ABELL LIVING TRUST ZONED - RR-5 6620 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	SMITH AARON ZONED - PUD 6590 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	NAVARETTE JEANINE A ZONED - RR-5 6280 HODGEN ROAD COLORADO SPRINGS, CO	STUDHOLME FAMILY TRUST ZONED - PUD 15685 OPEN SKY WAY COLORADO SPRINGS, CO	SPILLERS STEVEN HOWARD ZONED - PUD 5150 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	KELLY J PHELAN TRUST ZONED - PUD 5155 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	
ERNST CHARLES H ZONED - RR-5 14410 HOMES ROAD COLORADO SPRINGS, CO	COPPOCK AARON O ZONED - RR-5 6680 COUNTRY ESTATES LANE COLORADO SPRINGS, CO	HARRIS GEORGE D ZONED - PUD 6670 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	ANDREWS SCOTT W ZONED - RR-5 HODGEN ROAD COLORADO SPRINGS, CO	MAHER FAMILY REVOC LIVING TRUST ZONED - PUD 4961 HIGH FOREST ROAD COLORADO SPRINGS, CO	PECK JAMES D ZONED - PUD 5230 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	WINGO JAMES D ZONED - PUD 5115 OLD STAGECOACH ROAD COLORADO SPRINGS, CO	

COUNTY FILE NUMBER: SKP223

DRAWN BY: JAG

JOB DATE: 3/1/2022

APPROVED: PLS

JOB NUMBER: 211030

CAD DATE: 7/20/2022

CAD FILE: J:\2021\211030\CAD\Drawgs\C\Sketch-Plan\ADJACENT-PROPERTY

BAR IS ONE INCH ON OFFICIAL DRAWINGS.

0 1"

IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION



FLYING HORSE NORTH
DEVELOPMENT, LLC.
EL PASO COUNTY, COLORADO

FLYING HORSE NORTH SKETCH PLAN
ADJACENT PROPERTY DATA OWNERS

SHEET
SP.4

FLYING HORSE NORTH SKETCH PLAN

ADJACENT PROPERTY OWNERS

BECKER JACOB J
ZONED - PUD
5142 GOLD RUN COURT
COLORADO SPRINGS, CO

KEV PARTNERS LTD
ZONED - PUD
5172 GOLD RUN COURT
COLORADO SPRINGS, CO

HENDRICKS JAMES
ZONED - PUD
5202 GOLD RUN COURT
COLORADO SPRINGS, CO

C&C LIVING TRUST
ZONED - PUD
5232 GOLD RUN COURT
COLORADO SPRINGS, CO

ALBRIGHT MARK PHILLIP
ZONED - PUD
5262 GOLD RUN COURT
COLORADO SPRINGS, CO

VILIESIS TRUST
ZONED - PUD
5292 GOLD RUN COURT
COLORADO SPRINGS, CO

SHOPTAUGH GLENN MARK
ZONED - PUD
5261 GOLD RUN COURT
COLORADO SPRINGS, CO

VILLAGREE LLC
ZONED - PUD
5231 GOLD RUN COURT
COLORADO SPRINGS, CO

S&J TRUST
ZONED - PUD
5201 GOLD RUN COURT
COLORADO SPRINGS, CO

CHAVEZ XAVIER D
ZONED - PUD
5141 GOLD RUN COURT
COLORADO SPRINGS, CO

DALY FAMILY TRUST
ZONED - PUD
14911 LONGWALL DRIVE
COLORADO SPRINGS, CO

STIMPLE FAMILY LLLP
ZONED - PUD
14842 LONGWALL DRIVE
COLORADO SPRINGS, CO

CREPS DARREL E III
ZONED - PUD
14912 LONGWALL DRIVE
COLORADO SPRINGS, CO

CAIN JASON
ZONED - PUD
14982 LONGWALL DRIVE
COLORADO SPRINGS, CO

DICKEY MICHAEL R
ZONED - PUD
5021 GOLD RUN CT
COLORADO SPRINGS, CO

LIDDIARD JEREMY
ZONED - PUD
5013 GOLD RUN CT
COLORADO SPRINGS, CO

MILLER SCOTT G
ZONED - PUD
5012 GOLD RUN CT
COLORADO SPRINGS, CO

BRENNAN THOMAS LIVING TRUST
ZONED - PUD
5022 GOLD RUN CT
COLORADO SPRINGS, CO

WINTER CHARLES C
ZONED - PUD
5082 GOLD RUN CT
COLORADO SPRINGS, CO

THEOBARD CHARLES N
ZONED - PUD
4945 STAGECOACH ROAD
COLORADO SPRINGS, CO

HOWARTH WILLIAM
ZONED - PUD
15290 SHORTWALL DRIVE
COLORADO SPRINGS, CO

GERBER JOSEPH DAVID
ZONED - PUD
15262 SHORTWALL DRIVE
COLORADO SPRINGS, CO

COFFEY LAVANSON C III
ZONED - PUD
15192 SHORTWALL DRIVE
COLORADO SPRINGS, CO

ST AUBYN JARED
ZONED - PUD
15233 QUARTZ CREEK DRIVE
COLORADO SPRINGS, CO

MOMBER SIMON R
ZONED - PUD
15232 QUARTZ CREEK DRIVE
COLORADO SPRINGS, CO

SHABE ERIC M
ZONED - PUD
15182 QUARTZ CREEK DRIVE
COLORADO SPRINGS, CO

ZACHAR MICHAEL R
ZONED - PUD
15132 QUARTZ CREEK DRIVE
COLORADO SPRINGS, CO

HARVEY SETH A
ZONED - PUD
15032 QUARTZ CREEK DRIVE
COLORADO SPRINGS, CO

PITTS JOHN
ZONED - PUD
4661 HIGH FOREST ROAD
COLORADO SPRINGS, CO
LAVEZZO NICHOLAS J
ZONED - PUD
1601 HIGH FOREST ROAD
COLORADO SPRINGS, CO

HIGH FOREST RANCH HOMEOWNERS
ZONED - PUD
4541 HIGH FOREST ROAD
COLORADO SPRINGS, CO

SALGADO PAUL R
ZONED - PUD
4415 HIDDEN ROCK ROAD
COLORADO SPRINGS, CO

JOHNSON GREGG
ZONED - PUD
4365 HIDDEN ROCK ROAD
COLORADO SPRINGS, CO

ROMANS LIVING TRUST
ZONED - PUD
4315 HIDDEN ROCK ROAD
COLORADO SPRINGS, CO

RYAN CHRISTOPHER J
ZONED - PUD
4265 HIDDEN ROCK ROAD
COLORADO SPRINGS, CO

MARY CLAUDE F TRUSTEE
ZONED - PUD
4215 HIDDEN ROCK ROAD
COLORADO SPRINGS, CO

STREVELL MICHAEL W
ZONED - PUD
4165 HIDDEN ROCK ROAD
COLORADO SPRINGS, CO

GOULD TODD E
ZONED - PUD
4115 HIDDEN ROCK ROAD
COLORADO SPRINGS, CO

DESAUTELS BRUCE T
ZONED - PUD
4661 HIDDEN ROCK ROAD
COLORADO SPRINGS, CO

HOUSE JAMIE GLEN
ZONED - PUD
15575 WINDING TRAIL ROAD
COLORADO SPRINGS, CO

MATALIUS ANDREW J III
ZONED - PUD
15525 WINDING TRAIL ROAD
COLORADO SPRINGS, CO

WATSON RANDY
ZONED - PUD
15520 WINDING TRAIL ROAD
COLORADO SPRINGS, CO

MARSHALL KARLYE
ZONED - PUD
15480 BILLINGS COURT
COLORADO SPRINGS, CO

VANCE ERZA G
ZONED - PUD
15450 BILLINGS COURT
COLORADO SPRINGS, CO

PRI #2 LLC
ZONED - PUD
HIGHWAY 83
COLORADO SPRINGS, CO

MCKENZIE J THOMAS
ZONED - PUD
15420 BILLINGS COURT
COLORADO SPRINGS, CO

JONE LUCAS
ZONED - PUD
15419 BILLINGS COURT
COLORADO SPRINGS, CO

ROGER WILLIAM T
ZONED - PUD
15479 BILLINGS COURT
COLORADO SPRINGS, CO

DOMBROWSKI MICHAEL J
ZONED - PUD
3680 STAGECOACH ROAD
COLORADO SPRINGS, CO

ROBIN SCOTT BROWN LIVING TRUST
ZONED - PUD
3590 STAGECOACH ROAD
COLORADO SPRINGS, CO

JACKOWIAK RYAN
ZONED - PUD
3770 STAGECOACH ROAD
COLORADO SPRINGS, CO

BALSICK LUKE A
ZONED - PUD
3860 STAGECOACH ROAD
COLORADO SPRINGS, CO

HIMES ELMER S
ZONED - PUD
3950 STAGECOACH ROAD
COLORADO SPRINGS, CO

OTERO THEODAORE M III
ZONED - PUD
4040 STAGECOACH ROAD
COLORADO SPRINGS, CO

HARRIS GUY MCALLISTER
ZONED - PUD
4130 STAGECOACH ROAD
COLORADO SPRINGS, CO

SCOTT W ANDREWS
PO BOX 158
USAF ACADEMY, CO 80840

JACOB BAHR
1360 ALMAGRE PEAK DR.
COLORADO SPRINGS, CO 80921

CHRISTOPHER A BOWMAN
6425 CONNAUGHT DRIVE
COLORADO SPRINGS, CO 80908

DAVID K BURST
6655 COUNTRY ESTATES LN
COLORADO SPRINGS, CO 80908

GREGORY B CHAFFEE
15650 TERRA RIDGE CIRCLE
COLORADO SPRINGS, CO 80908

AARON O COPPOCK
6680 COUNTRY ESTATES LANE
COLORADO SPRINGS, CO 80908

TAMMY L DALE
6490 CONNAUGHT DRIVE
COLORADO SPRINGS, CO 80908

DAWSON FAMILY TRUST
6070 CONNAUGHT DRIVE
COLORADO SPRINGS, CO 80908

REBECCA L DENNIS
14915 QUAIL RUN ROAD
COLORADO SPRINGS, CO 80908

DERKSEN PROPERTIES LLC
5491 PADDINGTON CREEK
COLORADO SPRINGS, CO 80924

DIANE F FERL
15010 TERRA RIDGE CIRCLE
COLORADO SPRINGS, CO 80908

KIMBERLEY A HOLLINGSWORTH
6625 COUNTRY ESTATES LANE
COLORADO SPRINGS, CO 80908

JOHN R AND BELINDA SHANTZ
2651 19TH AVE
KINGSBURG, CA 93631

DANIEL W LULCHUK
6790 CONNAUGHT DRIVE
COLORADO SPRINGS, CO 80908

ROBERT MELANSON
14725 BLACK FOREST ROAD
COLORADO SPRINGS, CO 80908

ERIC MIKUSKA
15645 TERRA RIDGE CIRCLE
COLORADO SPRINGS, CO 80908

ANTHONY A PALAZZARI
6250 CONNAUGHT DRIVE
COLORADO SPRINGS, CO 80908

PETER G RODAS
6305 CONNAUGHT DRIVE
COLORADO SPRINGS, CO 80908

ERIC J ROWE
6670 CONNAUGHT DRIVE
COLORADO SPRINGS, CO 80908

RYE LLC
16755 HAPPY LANDING
MONUMENT, CO 80132

SAVAGE DEVELOPMENT INC
1125 DIAMOND RIM DRIVE
COLORADO SPRINGS, CO 80921

MARK A SLUTZ
6730 CONNAUGHT DRIVE
COLORADO SPRINGS, CO 80908

JEFFREY B SMITH
13925 HIGHWAY 83
COLORADO SPRINGS, CO 80921

BART W TIMM
14695 BLACK FOREST ROAD
COLORADO SPRINGS, CO 80908

WILLIAM E TRUMP
6370 CONNAUGHT DRIVE
COLORADO SPRINGS, CO 80908

COUNTY FILE NUMBER: SKP223

DRAWN BY: JAG JOB DATE: 3/1/2022
APPROVED: PLS JOB NUMBER: 211030
CAD DATE: 7/20/2022
CAD FILE: J:\2021\211030\CAD\Draws\C\Sketch-Plan\ADJACENT-PROPERTY

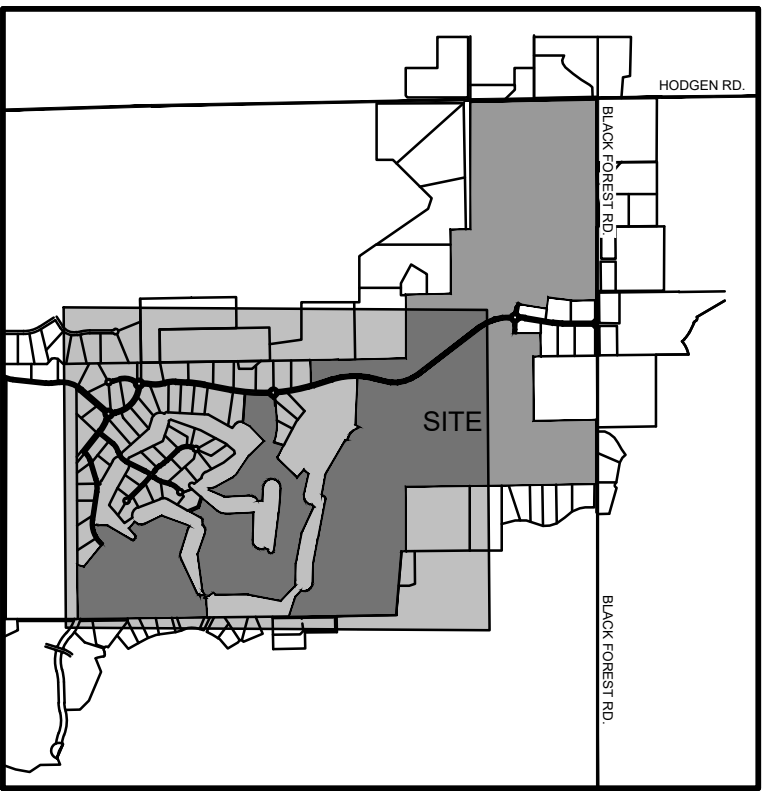
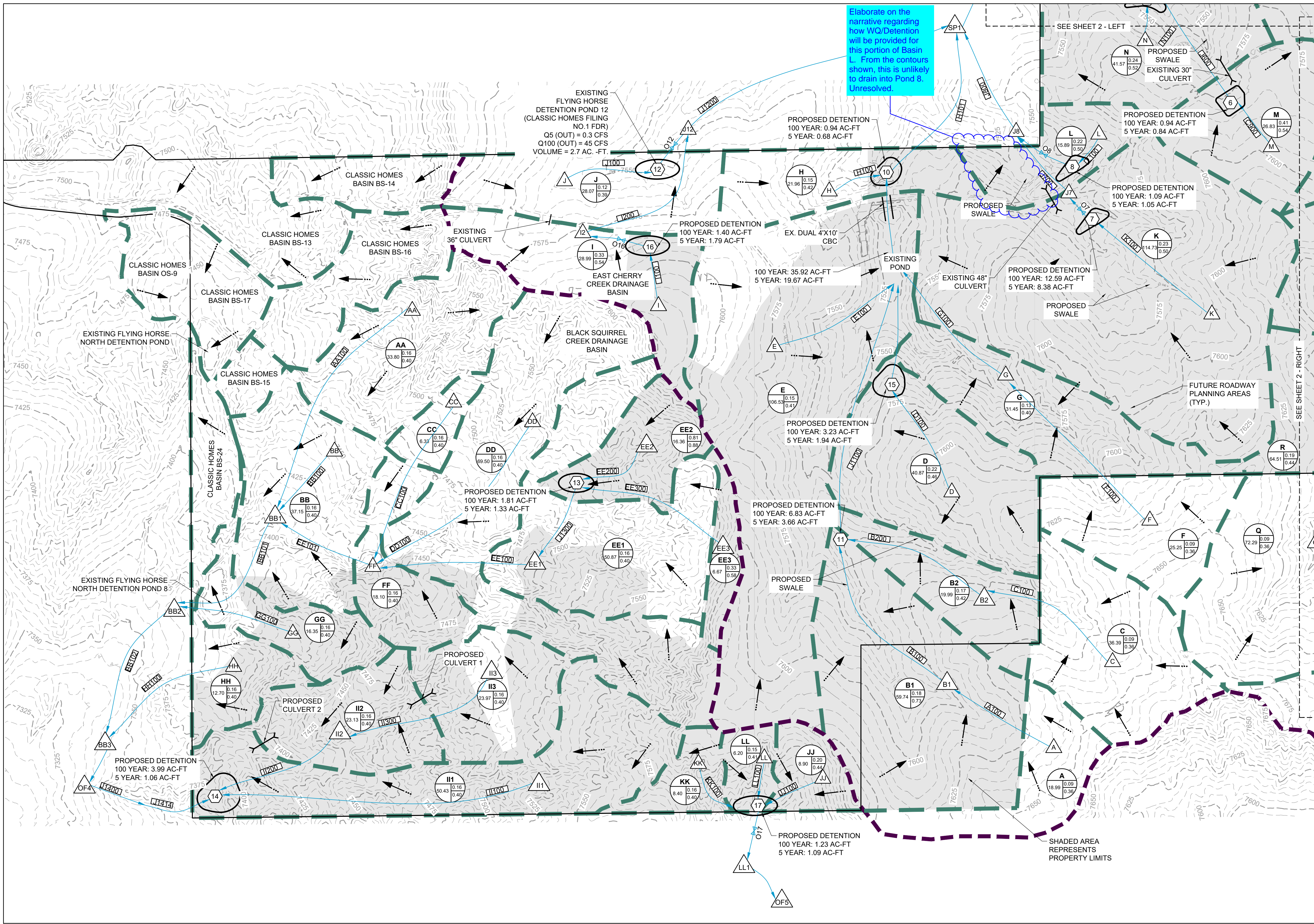
BAR IS ONE INCH ON OFFICIAL DRAWINGS.
0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen.com
HRGreen

FLYING HORSE NORTH
DEVELOPMENT, LLC.
EL PASO COUNTY, COLORADO

FLYING HORSE NORTH SKETCH PLAN
ADJACENT PROPERTY DATA OWNERS



VICINITY MAP

- LEGEND:**
- PROPOSED MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR
 - PROPOSED STORM DRAIN PIPE
 - EXISTING STORM DRAIN PIPE
 - PROPOSED DRAINAGE CHANNEL
 - PROPOSED ROAD
 - PROPERTY LINE
 - DIRECTIONAL FLOW ARROW
 - EMERGENCY OVERFLOW ARROW
 - EXISTING 100-YR FLOODWAY
 - EXISTING 100-YR FLOODPLAIN
 - PROPOSED 100-YR FLOODPLAIN
 - WATERSHED BOUNDARY
 - MAJOR BASIN LINE
 - 100YR ZONE A FLOODPLAIN
 - PROPOSED DETENTION LOCATION
 - POTENTIAL WATER QUALITY LOCATION
 - SWMM CONVEYANCE ELEMENT
 - PROPOSED PEAK FLOW RATE (CFS)
 - DESIGN POINT
 - PROPOSED BASIN LABEL
 - BASIN DESIGNATION
 - AREA (AC.)
 - C5
 - C100

NOTES:

SEE SHEET 2 FOR DESIGN FLOWS

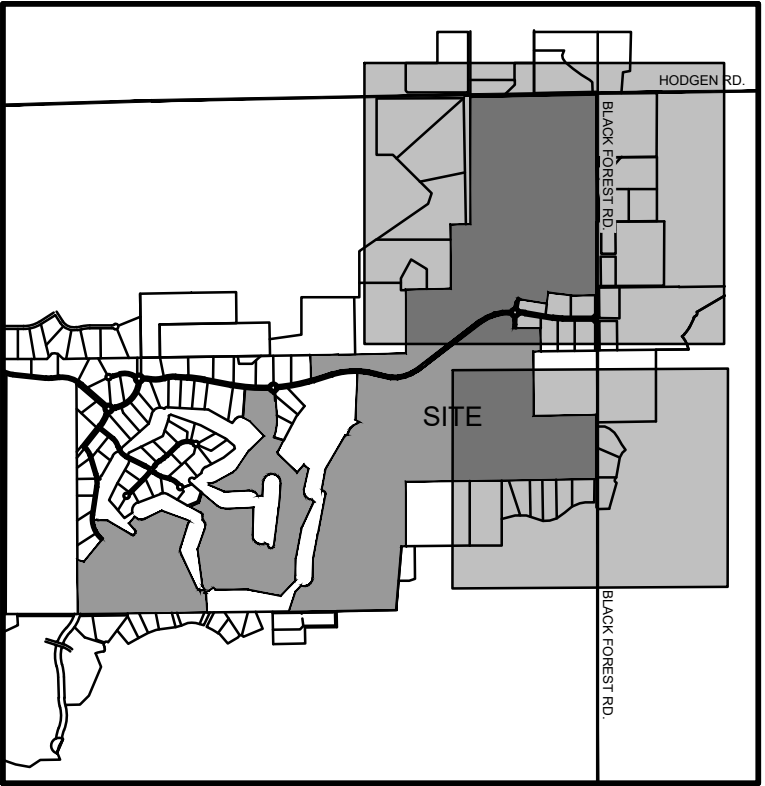
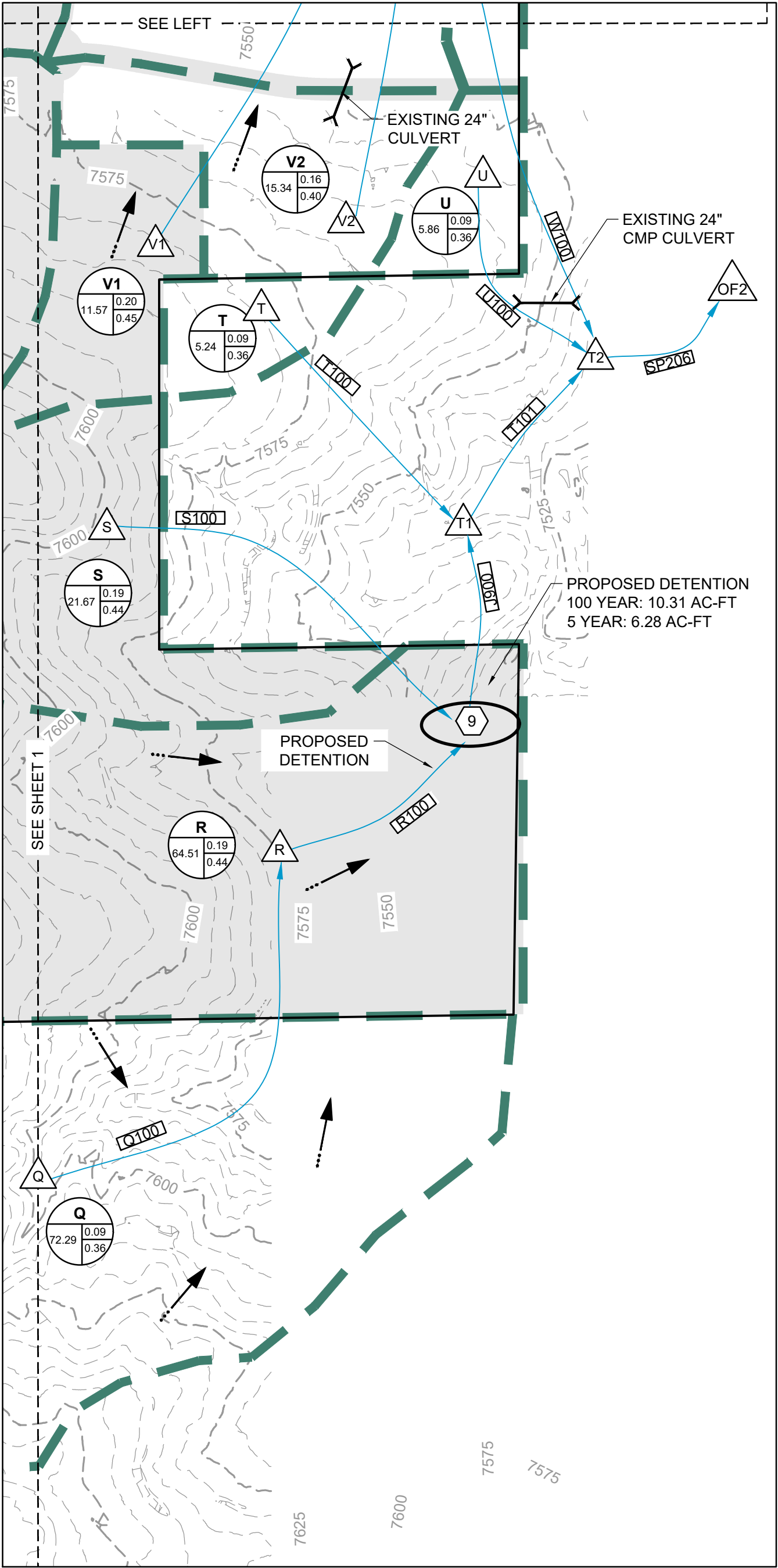
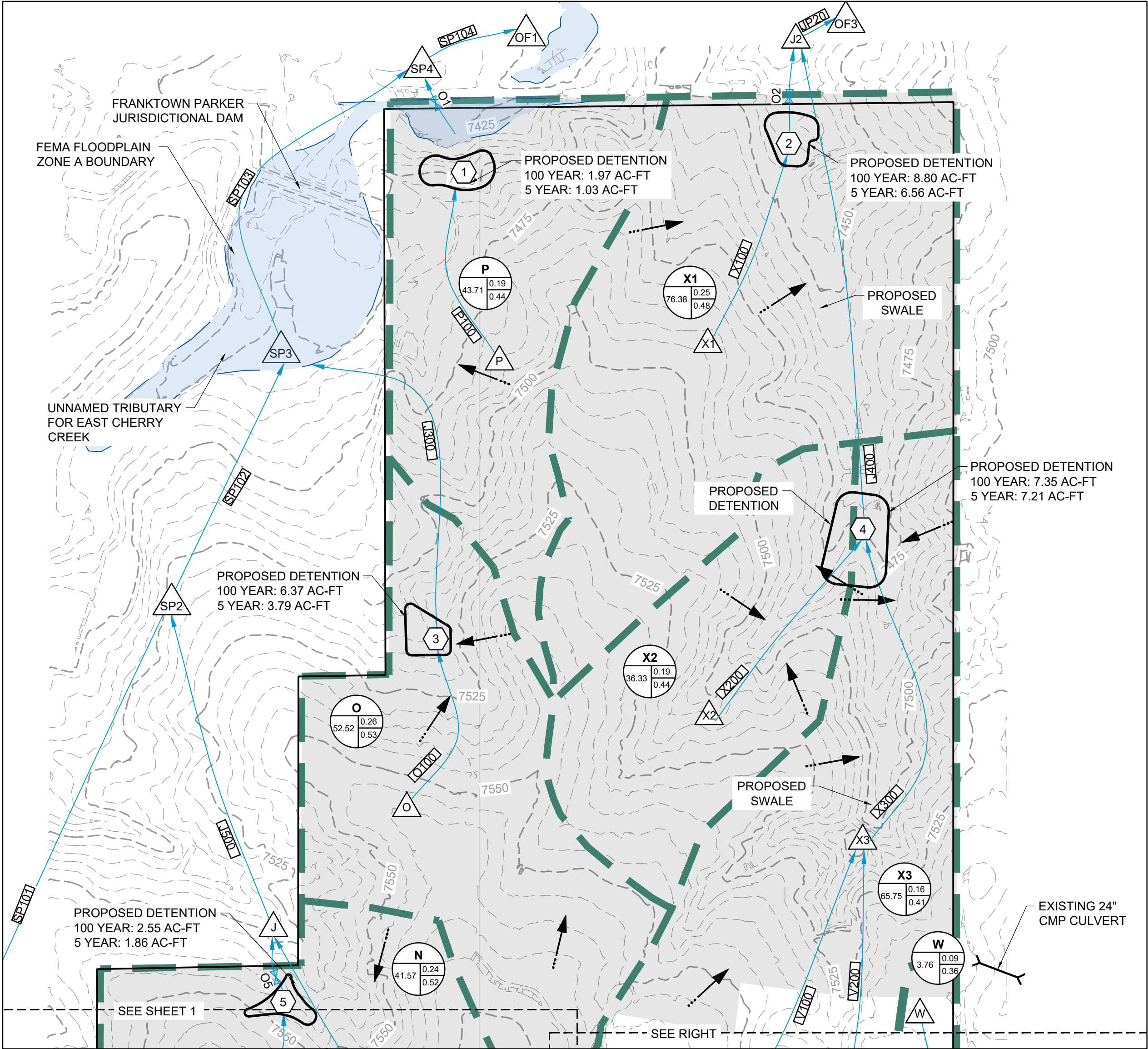


Job No.: 211030.01
Prepared By: TBI
Date: 7/28/2022

PROPOSED DRAINAGE BASINS

FIG.1

BASIN	DESIGN POINT	5 YEAR POST DEVELOPMENT	100 YEAR POST DEVELOPMENT
A	A	20.84	43.83
AA	AA	39.23	81.18
B1	B1	66.93	133.69
B2	B2	17.99	37.14
BB	BB	40.62	84.15
	BB1	214.28	483.72
	BB2	229.61	515.49
	BB3	307.27	646.46
C	C	35.31	75.28
CC	CC	6.53	13.57
D	D	61.12	117.38
DD	DD	57.78	122.41
E	E	74.68	157.91
EE1	EE1	53.25	156.68
EE2	EE2	35.71	63.62
EE3	EE3	10.38	19.33
F	F	24.27	51.63
FF	FF	20.78	330.28
G	G	27.18	108.76
GG	GG	15.49	32.48
H	H	17.86	37.80
HH	HH	13.56	28.16
I	I	40.37	78.06
II1	II1	34.94	74.39
II2	II2	28.04	116.26
II3	II3	28.32	58.65
	IRR_J	114.18	274.80
	IRR_POND	243.77	550.27
J	J	24.45	51.19
JJ	JJ	11.49	22.80
K	K	200.94	382.30
KK	KK	8.14	16.95
L	L	15.97	32.40
LL	LL	7.36	15.07
LL1	LL1	0	49.55
M	M	46.54	89.08
N	N	73.48	141.24
O	O	63.86	127.40
	OF1	240.43	705.93
	OF2	104.34	242.18
	OF3	95.68	271.49
	OF4	307.27	646.46
	OF5	16.85	49.55
P	P	40	82.83
Q	Q	64.68	137.80
R	R	56.59	253.86
S	S	30.83	58.96
	SP1	189.85	511.89
	SP2	223.43	618.35
	SP3	212.45	641.31
	SP4	240.49	706.05
T	T	4.04	8.68
	T1	98.27	228.33
	T2	104.34	242.18
U	U	4.81	10.51
V1	V1	13.99	27.67
V2	V2	16.15	33.25
W	W	3.45	7.46
X1	X1	80.91	163.27
X2	X2	41.46	82.46
X3	X3	47.59	100.73



VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION
- POTENTIAL WATER QUALITY LOCATION
- SWMM CONVEYANCE ELEMENT
- PROPOSED PEAK FLOW RATE (CFS)
- DESIGN POINT
- PROPOSED BASIN LABEL

AREA (AC.)

BASIN DESIGNATION

C5

C100

NOTES:



Job No.: 211030.01
Prepared By: TBI
Date: 7/28/2022

PROPOSED DRAINAGE BASINS

FIG.1

SKP-22-003 MDDP_PCD Review_V2.pdf Markup Summary

Callout (2)

Subbasin 7 is located at the east end of the residential parcel. The basin drains the residential parcel and the adjacent Pond 8. The basin is 3.5 acres, with a composite value of 2.00 cfs and a 50 year of 10.0 cfs and 10.0 cfs.

Subbasin 11 is located east of Subbasin 12 and is composed of existing 2.5 acre residential parcel and the adjacent Pond 9. The basin is 3.5 acres, with a composite value of 2.00 cfs and a 50 year of 10.0 cfs and 10.0 cfs.

Subbasin 12 is located at the east end of the site. The basin is 3.5 acres, with a composite value of 2.00 cfs and a 50 year of 10.0 cfs and 10.0 cfs.

Subbasin 13 is located at the east end of the site. The basin is 3.5 acres, with a composite value of 2.00 cfs and a 50 year of 10.0 cfs and 10.0 cfs.

Subbasin 14 is located at the east end of the site. The basin is 3.5 acres, with a composite value of 2.00 cfs and a 50 year of 10.0 cfs and 10.0 cfs.

Subject: Callout
Page Label: 11
Author: dsdlaforce
Date: 9/8/2022 9:41:49 AM
Status:
Color: ■
Layer:
Space:

Add Sub-basin W

is 54.98 acres, with a composite impervious value of 108.65 cfs and 232.13 cfs respectively.

Subbasin Q is located at the east end of the site. The basin is 3.5 acres, with a composite value of 2.00 cfs and a 50 year of 10.0 cfs and 10.0 cfs.

Subbasin R is located at the east end of the site. The basin is 3.5 acres, with a composite value of 2.00 cfs and a 50 year of 10.0 cfs and 10.0 cfs.

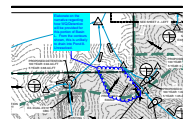
Subbasin S is located at the east end of the site. The basin is 3.5 acres, with a composite value of 2.00 cfs and a 50 year of 10.0 cfs and 10.0 cfs.

Subbasin T is located at the east end of the site. The basin is 3.5 acres, with a composite value of 2.00 cfs and a 50 year of 10.0 cfs and 10.0 cfs.

Subject: Callout
Page Label: 11
Author: dsdlaforce
Date: 9/8/2022 9:42:41 AM
Status:
Color: ■
Layer:
Space:

Update. No basin V2 in the map

Cloud+ (1)



Subject: Cloud+
Page Label: [1] Exhibit
Author: dsdlaforce
Date: 9/8/2022 10:29:46 AM
Status:
Color: ■
Layer:
Space:

Elaborate on the narrative regarding how WQ/Detention will be provided for this portion of Basin L. From the contours shown, this is unlikely to drain into Pond 8. Unresolved.

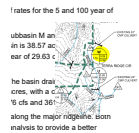
Engineer (1)



Subject: Engineer
Page Label: 210
Author: dotprete
Date: 9/5/2022 9:32:21 AM
Status:
Color: ■
Layer:
Space:

Please elaborate on proposed Pond 9 outlet. Currently looks to be discharging directly towards existing house


Group (1)



Subject: Group
Page Label: 11
Author: dsdlaforce
Date: 9/8/2022 9:41:45 AM
Status:
Color: ■
Layer:
Space:

Highlight (2)

[illegible]

Subject: Highlight
Page Label: 14
Author: dsdlaforce
Date: 9/8/2022 10:30:01 AM
Status:
Color: 
Layer:
Space:

The basin drains towards the northwest into proposed Detention Pond 7.

the 5 and 10
asin V2 and i
and follows


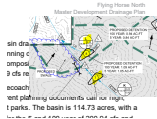


Subject: Highlight
Page Label: 11
Author: dsdlaforce
Date: 9/8/2022 9:42:22 AM
Status:
Color: 
Layer:
Space:

Image (2)

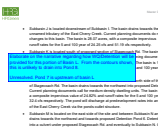



Subject: Image
Page Label: 14
Author: dsdlaforce
Date: 9/8/2022 10:30:48 AM
Status:
Color: 
Layer:
Space:



Subject: Image
Page Label: 24
Author: dsdlaforce
Date: 9/8/2022 10:46:37 AM
Status:
Color: 
Layer:
Space:

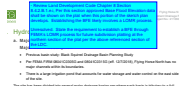
Text Box (3)




Subject: Text Box
Page Label: 14
Author: dsdlaforce
Date: 9/8/2022 10:30:25 AM
Status:
Color: 
Layer:
Space:

Elaborate on the narrative regarding how WQ/Detention will be provided for this portion of Basin L. From the contours shown, this is unlikely to drain into Pond 8.

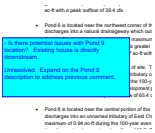
Unresolved. Pond 7 is upstream of basin L




Subject: Text Box
Page Label: 9
Author: dsdlaforce
Date: 9/8/2022 10:44:06 AM
Status:
Color: 
Layer:
Space:

- Review Land Development Code Chapter 8 Section 8.4.2.B.1.e.i, Per this section approved Base Flood Elevation data shall be shown on the plat when this portion of the sketch plan develops. Establishing the BFE likely involves a LOMR process.

Unresolved. State the requirement to establish a BFE through FEMA's LOMR process for future subdivision platting at the northern section of the plat per the above referenced section of the LDC.



Subject: Text Box
Page Label: 24
Author: dsdlaforce
Date: 9/8/2022 10:54:31 AM
Status:
Color: 
Layer:
Space:

- Is there potential issues with Pond 9 location?
Existing house is directly downstream.

Unresolved. Expand on the Pond 9 description to address previous comment.