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**Preliminary Drainage Report  
Meadow Lake Industrial Phase 1  
El Paso County, Colorado**

April 2024

HR Green Project No: 2202774

**Prepared For:**

Meadowlake Developments, LLC

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PCD File No. SP236



## Engineer's Statement

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

\_\_\_\_\_

Colleen Monahan, P.E., LEED AP

Date

State of Colorado No. 56067

For and on behalf of HR Green Development, LLC

## Owner/Developer's Statement

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

By: \_\_\_\_\_

Authorized Signature

\_\_\_\_\_ Date

Address: Meadowlake Developments, LLC

PO Box 1385

Colorado Springs, CO 80901

## EI Paso County Statement

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

\_\_\_\_\_

Joshua Palmer, P.E.

Date

County Engineer/ECM Administrator

Conditions:

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## I. General Purpose, Location and Description

### a. Purpose

The purpose of the Preliminary Drainage Report (PDR) for Meadow Lake Industrial Phase 1 is to describe the onsite and offsite drainage patterns, size drainage infrastructure to safely capture and convey developed runoff to water quality and detention facilities, and to safely route detained stormwater to adequate outfalls.

### b. General Location

Meadow Lake Industrial is 254 acres of undeveloped land. Meadow Lake Industrial Phase 1, referred to as 'the site' herein, is a 51.3-acre portion of the overall 254 acres that is zoned for Industrial and will be developed as an industrial subdivision. The remaining area will be undeveloped.

The site lies within a part of the east half of Section 9, Township 13 South, Range 64 West of the 6<sup>th</sup> P.M., El Paso County, Colorado. The site is bound to the north and west by undeveloped unplatted land, to the east by Curtis Road, and to the south by Falcon Highway. There are A vicinity map is presented in Appendix A.

### c. Description of Property

The property is currently undeveloped and unplatted. Meadow Lake Industrial Phase 1 will plat 27 industrial lots and two drainage tracts on approximately 51.3 acres. The site is generally bisected by a ridge that directs stormwater east towards Curtis Road and west towards an unnamed tributary. The unnamed tributary runs north-south through the site, however; all development will occur east of the tributary.

The site is part of two major drainage basins: Haegler Ranch Basin and Solberg Ranch Basin. The basins are depicted on the drainage maps in Appendix E.

There are no existing utilities and no known irrigation facilities on the site. Onsite vegetation consists primarily of native grasses and weeds. The topography is gently sloping with 2-4% grades. Per a NRCS web soil survey, the site's soil is comprised of Type A soils: Blakeland loamy sand, Truckton loamy sand and Columbine gravelly sandy loam, Type B soil Stapleton sandy loam, and Type D soil Fluvaquentic Haplaquolls. A NRCS soil survey is presented in Appendix A.

### d. Floodplain Statement

Based on FEMA FIRM 08041C0558G & 08041C0566G, revised December 7, 2018, there are no floodplains (Zone A or Zone X) within the Phase 1 boundary. Zone A areas determined to be within the 1.0% annual chance flood but do not have base flood elevations established. Zone X are areas determined to be outside the 0.2% annual chance flood. The FIRM is presented in Appendix A.

## II. Drainage Design Criteria

### a. Drainage Criteria

Hydrologic data and calculations were performed using the El Paso County Drainage Criteria Manual Volume 1 & 2 (EPCDCM), with current revisions.

Onsite drainage improvements are designed for the 5-year storm (minor event) and 100-year storm (major event) using rainfall values from CCSDCM Table 6-2. Runoff was calculated per CCSDCM Section 6.3.0 - Rational Method. Full spectrum pond design was completed using the latest version of Mile High Flood District's (MHFD) UD-Detention per CCSDCM Section 13.3.2.1. The detention pond allowable release rate will be limited to less than historic rates.

Return Period (yr)	5	100
1-hr Rainfall Depth (in)	1.50	2.52

Inlets were sized per the methods described in EPCDCM Section III Chapter 7 – Street Drainage and Storm Water Inlets. Storm sewer was sized per the methods described in EPCDCM Section III Chapter 8 – Storm Drains and Appurtenances.

### III. Drainage Basins and Subbasins

#### a. Major Basin Descriptions

The site is part of two major drainage basins: Haegler Ranch Basin and Solberg Ranch Basin. The basins are depicted on the drainage maps in Appendix E. Of the 51.3 acres of Meadow Lake Industrial Phase 1, approximately 8.75 acres of the north part of the site drains to an existing roadside swale in Curtis Road that then travels northerly as part of Haegler Ranch Basin, ultimately draining to Chico Creek. The remainder of the south side of site, 42.55 acres, lies within Solberg Ranch Drainage Basin and drains to the unnamed tributary on the site to a culvert on the north side of Falcon Highway to under Falcon Highway and ultimately to Chico Creek.

The Haegler Ranch drainage basin was studied in the “Haegler Ranch Basin Drainage Basin Planning Study” in May 2009. The Solberg Ranch Basin does not have an associated Drainage Basin Planning Study.

#### b. Previous Drainage Studies

A portion of the site was previously studied as part of the Haegler Ranch Basin Drainage Basin Planning Study (DBPS), dated May 2009, by URS. Haegler Ranch is an unnamed tributary, eventually tributary to Black Squirrel Creek. The overall Haegler Ranch Basin flows to the southeast from north of Eastonville Road to McDaniels Road with a total of 16.6 sq mi in El Paso County, Colorado. Much of the existing basin consists of 2- and 5- acre residential lots surrounded by open space range land with gently rolling topography used for agriculture and later parcels with homes. Some higher density residential is planned in the northern part of the basin. The study did not identify any drainage concerns or recommendations for the site.

A portion of the site lies within Solberg Ranch Basin. Solberg Ranch does not have a Drainage Basin Planning Study (DBPS) on file with El Paso County.

#### c. Existing Subbasin Description

Basin EX1 is 8.75 acres of undeveloped area and paved roadway. Stormwater ( $Q_5 = 3.4$  cfs  $Q_{100} = 18.3$  cfs) flows east offsite in a roadside ditch adjacent to Curtis Road to DP2.

Basin EX2 is 30.77 acres of undeveloped area and paved roadway. Stormwater ( $Q_5 = 9.5$  cfs  $Q_{100} = 57.8$  cfs) flows south in a roadside ditch adjacent to Curtis Road to DP4.

Basin EX3 is 13.39 acres of undeveloped area and paved roadway. Stormwater ( $Q_5 = 4.5$  cfs  $Q_{100} = 25.4$  cfs) flows south in a roadside ditch adjacent to Curtis Road to DP6.

Basin EX4 is 7.03 acres of undeveloped area. Stormwater ( $Q_5 = 2.1$  cfs  $Q_{100} = 14.3$  cfs) flows west towards OS4 at DP8.

Basin OS1 is 2.83 acres of undeveloped area. Stormwater ( $Q_5 = 1.0$  cfs  $Q_{100} = 6.7$  cfs) flows east towards EX1 at DP1.

Basin OS2.1 is 5.34 acres of undeveloped area. Stormwater ( $Q_5 = 1.8$  cfs  $Q_{100} = 11.9$  cfs) flows north towards EX2 at DP3.

Basin OS2.2 is 0.37 acres of undeveloped area. Stormwater ( $Q_5 = 0.1$  cfs  $Q_{100} = 0.9$  cfs) flows north towards EX3 at DP5.

Basin OS3 is 3.96 acres of undeveloped area and paved roadway. Stormwater ( $Q_5 = 2.1$  cfs  $Q_{100} = 9.2$  cfs) flows south in a roadside ditch adjacent to Curtis Road to DP7.

Basin OS4 is 40.63 acres of undeveloped area and paved roadway. Stormwater ( $Q_5 = 10.7$  cfs  $Q_{100} = 64.7$  cfs) flows south towards an existing public box culvert and offsite at DP9.

#### **d. Proposed Subbasin Description**

Basin A is 5.78 acres of roadway and undeveloped area. Stormwater ( $Q_5 = 8.4$  cfs  $Q_{100} = 19.9$  cfs) is captured at DP1 in a public 10' Type R sump inlet. In the event of inlet failure at DP1, an overflow path is provided in Greenfield Avenue to Pond A. Basin A will be detained in Pond A.

Basin B is 1.10 acres of roadway and lot area. Stormwater ( $Q_5 = 3.6$  cfs  $Q_{100} = 6.6$  cfs) is captured at DP2 in a public 5' Type R sump inlet. In the event of inlet failure at DP2, an overflow path is provided in Greenfield Avenue to Pond A. Basin B will be detained in Pond A.

Basin C is 3.01 acres of industrial lots and roadway. Stormwater ( $Q_5 = 7.0$  cfs  $Q_{100} = 13.9$  cfs) is captured at DP3 in a private 20' Type R on-grade inlet in Wild Iris Way. Basin C will be detained in Pond A. In the event of inlet failure at DP3, an overflow path is provided in Wild Iris Way to Pond A.

Basin D is 3.05 acres of industrial lots and roadway. Stormwater ( $Q_5 = 7.3$  cfs  $Q_{100} = 14.6$  cfs) is captured at DP4 in a private 20' Type R on-grade inlet in Wild Iris Way. Basin D will be detained in Pond A. In the event of inlet failure at DP3, an overflow path is provided in Wild Iris Way to Pond A.

Basin E is 3.68 acres of industrial lots and roadway. Stormwater ( $Q_5 = 8.8$  cfs  $Q_{100} = 17.5$  cfs) is captured at DP5 in a private 15' Type R sump inlet in Wild Iris Way. Basin E will be detained in Pond A. In the event of inlet failure at DP3, an overflow path is provided in Wild Iris Way to Pond A by overtopping the curb and gutter at the knuckle.

Basin F is 1.10 acres of industrial lots and roadway. Stormwater ( $Q_5 = 2.8$  cfs  $Q_{100} = 5.2$  cfs) is captured at DP6 in a private 15' Type R sump inlet in Wild Iris Way. Basin F will be detained in Pond A. In the event of inlet failure at DP3, an overflow path is provided in Wild Iris Way to Pond A by overtopping the curb and gutter at the knuckle.

Basin G is 6.75 acres of industrial lots and undeveloped area. Stormwater ( $Q_5 = 2.0$  cfs  $Q_{100} = 13.5$  cfs) will remain undisturbed in this phase of development. Basin G will drain north offsite as part of the Haegler major drainage basin.

Basin H is 3.71 acres of industrial lots and undeveloped area. Stormwater ( $Q_5 = 7.7$  cfs  $Q_{100} = 15.8$  cfs) is captured at DP8 and conveyed in a swale to Pond A. Basin H will be detained in Pond A.

Basin I is 1.12 acres of industrial lots and undeveloped area. Stormwater ( $Q_5 = 2.1$  cfs  $Q_{100} = 4.6$  cfs) is captured at DP9 and conveyed in a swale to Pond A. Basin G will be detained in Pond A.

Basin J is 3.14 acres and contains Pond A. Stormwater ( $Q_5 = 3.0$  cfs  $Q_{100} = 9.6$  cfs) sheet flows directly to Pond A. Basin J will be detained in Pond A.

Basin K is 0.24 acres of roadway. Stormwater ( $Q_5 = 1.0$  cfs  $Q_{100} = 1.9$  cfs) is captured at DP11 in a public 10' Type R sump inlet in Sagebrush Street. In the event of inlet failure at DP11, an overflow path is provided to Curtis Street. Basin K will be detained in Pond B.

Basin L is 0.24 acres of roadway. Stormwater ( $Q_5 = 1.0$  cfs  $Q_{100} = 1.9$  cfs) is captured at DP12 in a public 10' Type R sump inlet in Sagebrush Street. In the event of inlet failure at DP12, an overflow path is provided to Curtis Street. Basin K will be detained in Pond B.

Basin M and DP14 have been omitted as they are an old basin and design point that have been removed. In order to keep all calculations consistent within this report, the proceeding basin designations and design points have not changed and remain sequential.

Basin N is 6.07 acres of industrial lots and roadway. Stormwater ( $Q_5 = 14.5$  cfs  $Q_{100} = 28.9$  cfs) is captured at DP15 in a public 15' Type R on-grade inlet in Mariposa Lily Court. Basin N will be detained in Pond B. In the event of inlet failure at DP15, an overflow path is provided in within the adjacent public roadway and access road that drain due south directly to Pond B.

Basin O is 3.04 acres of industrial lots and roadway. Stormwater ( $Q_5 = 7.2$  cfs  $Q_{100} = 14.2$  cfs) is captured at DP16 in a private 10' Type R on-grade inlet in Wildflower Court. Basin O will be detained in Pond B. In the event of inlet failure at DP16, an overflow path is provided in within the adjacent public roadway and access road that drain due south directly to Pond B.

Basin P is 3.20 acres of industrial lots and roadway. Stormwater ( $Q_5 = 7.8$  cfs  $Q_{100} = 15.5$  cfs) is captured at DP17 in a private 10' Type R on-grade inlet in Wildflower Court. Basin P will be detained in Pond B. In the event of inlet failure at DP17, an overflow path is provided within the adjacent public roadway and access road that drain due south directly to Pond B.

Basin Q is 1.01 acres of roadway. Stormwater ( $Q_5 = 4.0$  cfs  $Q_{100} = 7.6$  cfs) is captured at DP18 in a public 5' Type R sump inlet in Greenfield Avenue. In the event of inlet failure at DP18, flows will overtop the sump and flow to Pond B along the maintenance access road. Basin Q will be detained in Pond B. In the event of inlet failure at DP18, an overflow path is provided within the public roadway and access road that drain due south directly to Pond B.

Basin R is 1.42 acres of roadway. Stormwater ( $Q_5 = 2.5$  cfs  $Q_{100} = 7.9$  cfs) is captured at DP19 in a public 10' Type R sump inlet in Greenfield Avenue. In the event of inlet failure at DP19, flows will overtop the sump and flow to Pond B along the maintenance access road. Basin R will be detained in Pond B. In the event of inlet failure at DP19, an overflow path is provided within the public roadway and access road that drain due south directly to Pond B.

Basin S is 0.85 acres of grass swale. Stormwater ( $Q_5 = 0.3$  cfs  $Q_{100} = 1.9$  cfs) is captured at DP21 and conveyed in a swale to Pond B. Basin S will be detained in Pond B.

Basin T is 1.40 acres and contains Pond B. Stormwater ( $Q_5 = 0.5$  cfs  $Q_{100} = 3.2$  cfs) sheet flows directly to Pond B. Basin T will be detained in Pond B.

Basin OS1 2.83 acres of undeveloped land. Stormwater ( $Q_5 = 1.0$  cfs  $Q_{100} = 6.7$  cfs) flows east into subbasin G at DP E1.

Basin ROW1 is 1.95 acres of right of way. Stormwater ( $Q_5 = 1.4$  cfs  $Q_{100} = 5.0$  cfs) flows north in a roadside ditch adjacent to Curtis Road to DP E2.

Basin ROW2 is 2.99 acres of right of way. Stormwater ( $Q_5 = 1.9$  cfs  $Q_{100} = 7.1$  cfs) flows south in a roadside ditch adjacent to Curtis Road to DP E7.

Basin ROW3 is 6.44 acres of right of way. Stormwater ( $Q_5 = 2.4$  cfs  $Q_{100} = 11.8$  cfs) flows south in a roadside ditch adjacent to Curtis Road to DP E9.

Basin OS4 is 40.11 acres of undeveloped land. Stormwater ( $Q_5 = 10.5$  cfs  $Q_{100} = 63.9$  cfs) flows south in the unnamed tributary to E9.

A total flow summary of existing vs. proposed design points is below. Flows to all existing design points drainage offsite will not be increased.

DESIGN POINT	EX $Q_5$ (cfs)	PR $Q_5$ (cfs)	EX $Q_{100}$ (cfs)	PR $Q_{100}$ (cfs)
E1	1.0	1.0	6.7	6.7
E2	4.2	2.8	23.9	23.8
E4	10.9	2.6	67.6	21.4
E7	13.2	8.1	77.4	32.4
E8	2.1	0.5	14.3	14.3
E9	22.6	18.6	135.2	109.2

## IV. Drainage Facility Design

### a. General Concept

For all Meadow Lake Phase 1 lots draining to Solberg Ranch Drainage Basin, storm water will be collected and conveyed by a series of inlets, swales and storm sewer to two full spectrum water quality and detention ponds. The full spectrum water quality and detention ponds will discharge at less than historic rates.

For all Meadow Lake Phase 1 lots draining to Haegler Ranch Drainage Basin, onsite water quality and detention shall be the responsibility of the future property owner and shall be designed at the time of site development plan application.

### b. Water Quality & Detention

**Lots 1 & 15 (Basin G)** - Haegler Ranch Drainage Basin - Lots 1 and 15 (Basin G on proposed conditions map) will provide their own detention and water quality treatment at time of Site Development Plan that will discharge to the Haegler Ranch Drainage Basin as it has gone historically.



### **Pond A - Solberg Ranch Drainage Basin**

Water quality and detention for Basins A – F, and H - J is provided in a full spectrum water quality and detention pond: Pond A. Pond A is located in Tract A. A total of 24.94 acres at 65% imperviousness will be detained in the pond. The WQCV is 0.528 ac-ft, the EURV is 1.954 ac-ft, and the 100-year volume is 2.961 ac-ft. The WQCV, EURV and 100-year storms are released in 40, 69 and 72 hours, respectively. A forebay is located at the outfall into the pond and a 40" trickle channel conveys flow towards the outlet structure. A 15' wide ramp at a slope no greater than 12% slope is provided to the bottom of the pond to facilitate future maintenance. A 45' emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0' of freeboard towards Curtis Road. The spillway will be lined with Type L riprap. The outfall for the pond drains into the existing roadside swale adjacent to Curtis Street. The total flow to this outfall point (DP E4) will remain at or less than existing flowrates for the minor and major storms. Pond design calculations are presented in Appendix D.

### **Pond B - Solberg Ranch Drainage Basin**

Water quality and detention for Basins K - T is provided in a full spectrum water quality and detention pond: Pond B. Pond B is located in Tract B. A total of 17.47 acres at 73% imperviousness will be detained in the pond. The WQCV is 0.421 ac-ft, the EURV is 1.458 ac-ft, and the 100-year volume is 2.230 ac-ft. The WQCV, EURV and 100-year storms are released in 40, 69 and 71 hours, respectively. A forebay is located at the outfall into the pond and a 40" trickle channel conveys flow towards the outlet structure. A 15' wide ramp at a slope no greater than 12% slope is provided to the bottom of the pond to facilitate future maintenance. A 50' emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0' of freeboard towards Curtis Road. The spillway will be lined with Type L riprap. The outfall for Pond B will be into a level spreader at DP8. The level spreader has been designed to drain runoff discharging from Pond B the same as existing conditions. Runoff draining from Pond B will be restricted so that there is no increase in the total runoff discharging to design point E8. Pond design calculations are presented in Appendix D.

### **c. Inspection and Maintenance**

The private detention ponds are to be owned and maintained by a metropolitan district, to be established with the project. Maintenance access for the full spectrum detention facilities will be provided through private drainage easements and tracts. A maintenance agreement with the County is required and will be provided with Final Drainage Report for this project.

### **d. Four Step Method to Minimize Adverse Impacts of Urbanization**

Step 1 – Reducing Runoff Volumes: Low impact development (LID) practices are utilized to reduce runoff at the source. In general, stormwater discharges are routed across pervious areas prior to capture in storm sewer. This practice promotes infiltration and reduces peak runoff rates.

Step 2 – Treat and slowly release the WQCV: This step utilizes full spectrum water quality and detention to capture the WQCV and slowly release runoff from the site. Two onsite full spectrum detention ponds provide water quality treatment for the majority of the site. The WQCV is released over a period of 40 hours.

Lots 1 and 15 (Basin G on proposed conditions map) will provide their own detention and water quality treatment at time of Site Development Plan that will discharge to the Haegler Ranch Drainage Basin as it has gone historically.

Step 3 – Stabilize stream channels: This step establishes practices to stabilize drainageways and provide scour protection at stormwater outfalls. Erosion protection is provided at all concentrated stormwater discharge points in the form of riprap pads.

Step 4 – Consider the need for source controls: This project has no need for specialized source controls.

**e. Drainage and Bridge Fees**

Solberg Ranch - 2024 Drainage Basin / Bridge Fees						
Drainage Fee/Impervious Acre	Bridge Fee/Impervious Acre	Site Acreage	Site Impervious	Impervious Acres	Drainage Fee	Bridge Fee
\$24,832.00	\$0	44.55	77%	34.30	\$851,737.60	\$0

Haegler Ranch - 2024 Drainage Basin / Bridge Fees						
Drainage Fee/Impervious Acre	Bridge Fee/Impervious Acre	Site Acreage	Site Impervious	Impervious Acres	Drainage Fee	Bridge Fee
\$13,971.00	\$2,062.00	6.75	77%	5.20	\$72,649.20	\$10,722.40

**f. Opinion of Probable Cost**

An engineer’s opinion of probable cost is presented will be provided with the Final Drainage Report submittal.

**g. Hydraulic Grade Line Analysis**

A hydraulic grade line analysis of the proposed storm will be provided with the Final Drainage Report submittal.

**V. Summary**

Meadow Lake Industrial Phase 1 lies within the Solberg Ranch Drainage Basin and the Haegler Ranch Basin Drainage Basin. Water quality and detention for the site is provided in full spectrum water quality and detention ponds for all lots draining to the Solberg Ranch Drainage Basin in Ponds A and B. For Lots 1 and 15 draining to the Haegler Ranch Drainage Basin, they will provide their own detention and water quality treatment at time of Site Development Plan that will discharge to the Haegler Ranch Drainage Basin as it has gone historically. The water quality and detention ponds will be owned and maintained by a metropolitan district, to be established with the project. All drainage facilities were sized per the El Paso County Drainage Criteria Manuals. Offsite basins will not be affected by this project. The existing unnamed channel west of the proposed development will not be affected or its condition modified. The runoff release of the site is less than existing rates to the ultimate outfall point into the channel and with appropriate controls as described herein.

## VI. Drawings

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

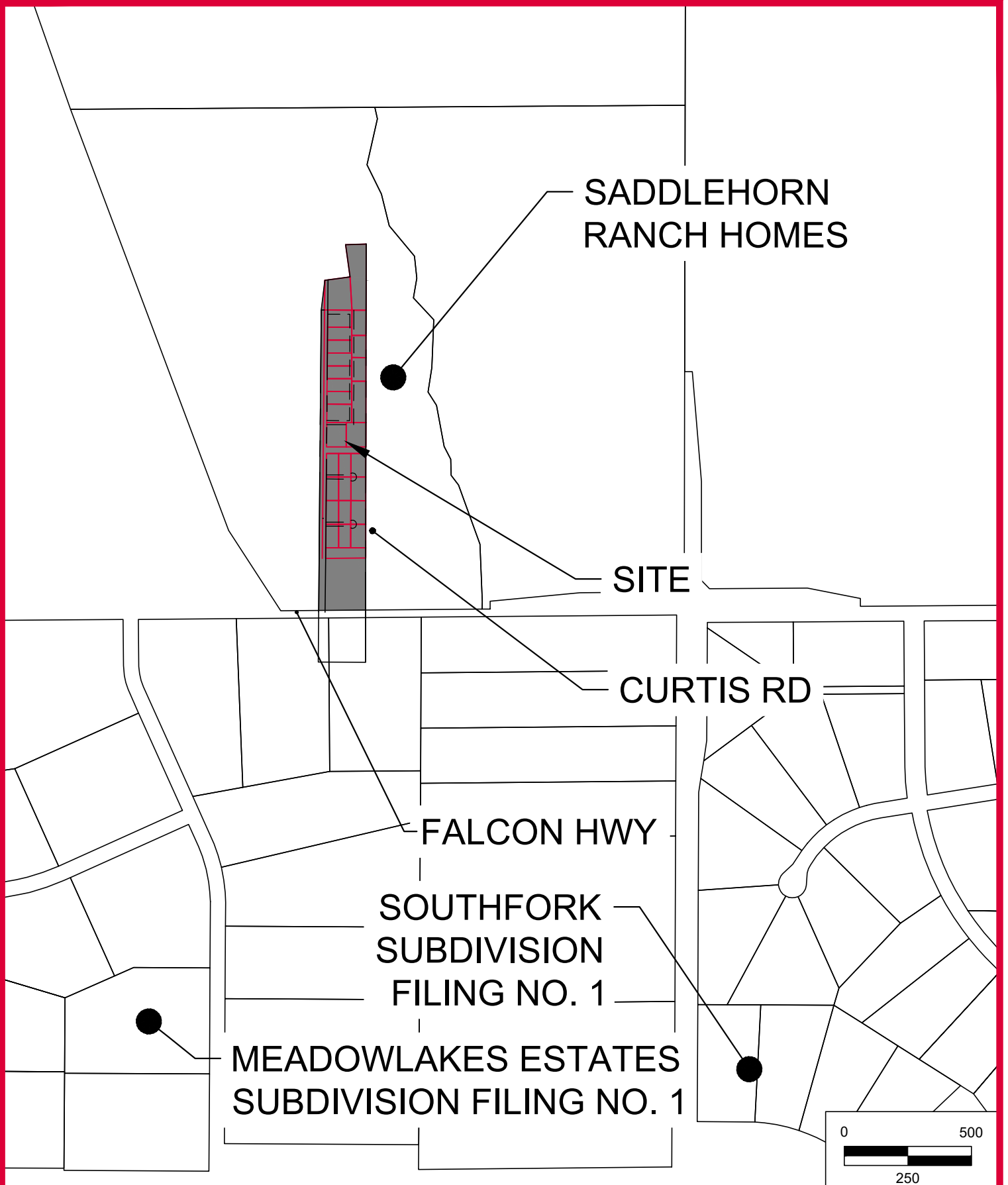
## VII. References

1. Haegler Ranch Basin Drainage Basin Planning Study (DBPS), dated May 2009, by URS
2. City of Colorado Springs – Drainage Criteria Manual, May 2014, Revised January 2021.
3. Drainage Criteria Manual of El Paso, Colorado, October 2018.
4. Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018.



## **APPENDIX A – VICINITY MAP, SOIL MAP, FEMA MAP**





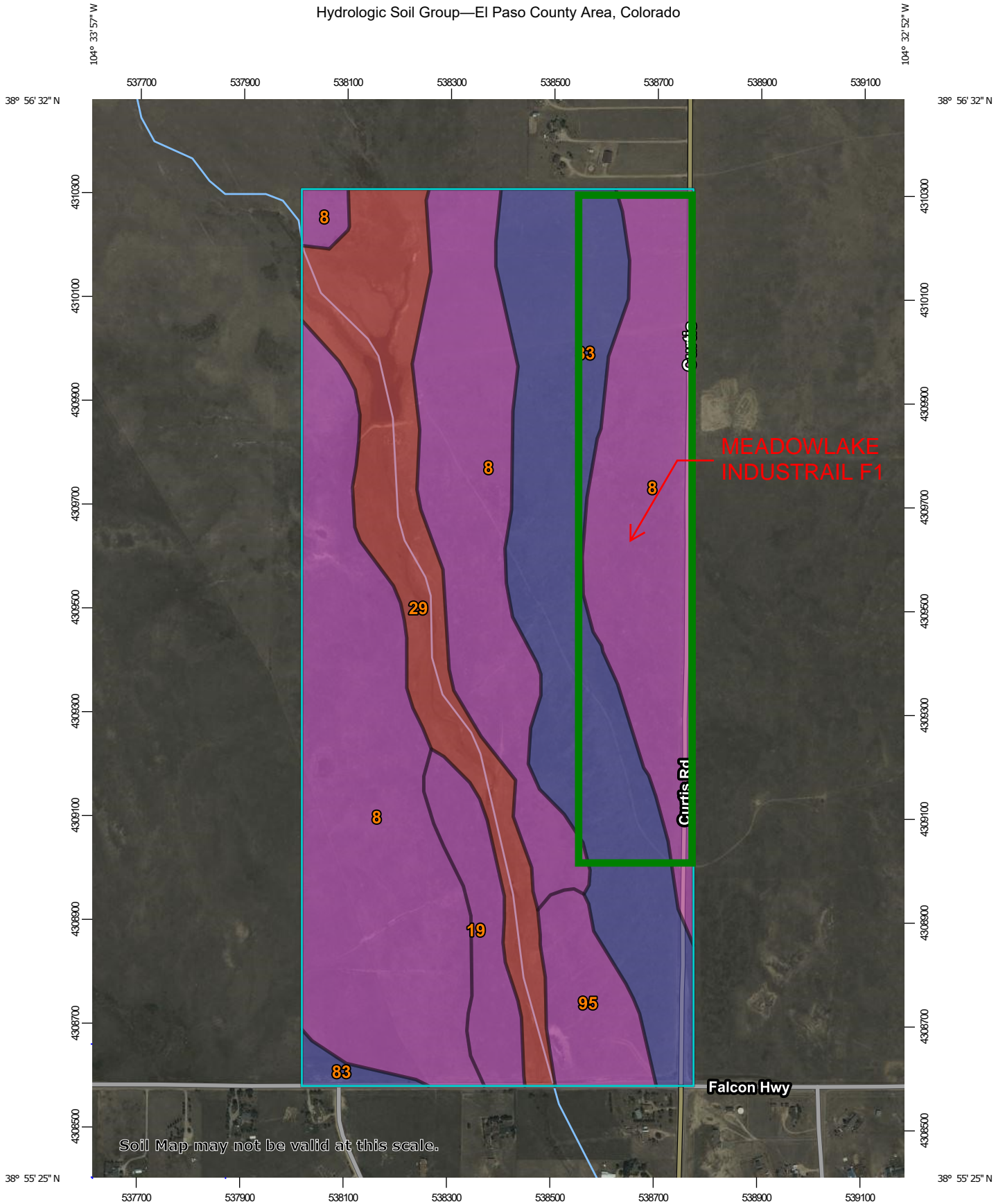
HRGreen.com



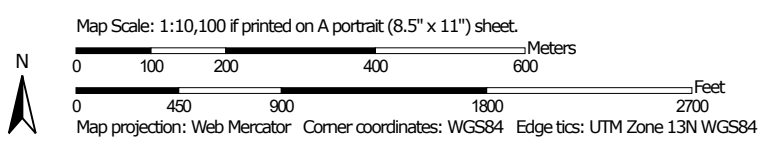
SHEET  
VICINITY MAP

SCALE: 1"=500'  
DATE: 06/08/2023

































Hydrologic Soil Group—El Paso County Area, Colorado



Soil Map may not be valid at this scale.



### MAP LEGEND

- Area of Interest (AOI)**
  -  Area of Interest (AOI)
- Soils**
  - Soil Rating Polygons**
    -  A
    -  A/D
    -  B
    -  B/D
    -  C
    -  C/D
    -  D
    -  Not rated or not available
  - Soil Rating Lines**
    -  A
    -  A/D
    -  B
    -  B/D
    -  C
    -  C/D
    -  D
    -  Not rated or not available
  - Soil Rating Points**
    -  A
    -  A/D
    -  B
    -  B/D
-  C
-  C/D
-  D
-  Not rated or not available
- Water Features**
  -  Streams and Canals
- Transportation**
  -  Rails
  -  Interstate Highways
  -  US Routes
  -  Major Roads
  -  Local Roads
- Background**
  -  Aerial Photography

### MAP INFORMATION

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

**Warning:** Soil Map may not be valid at this scale.  
 Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado  
 Survey Area Data: Version 20, Sep 2, 2022

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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

## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	174.3	53.7%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	13.3	4.1%
29	Fluvaquentic Haplaquolls, nearly level	D	47.2	14.5%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	75.9	23.4%
95	Truckton loamy sand, 1 to 9 percent slopes	A	14.0	4.3%
<b>Totals for Area of Interest</b>			<b>324.7</b>	<b>100.0%</b>



## 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

**NOTES TO USERS**

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

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

**Coastal Base Flood Elevations** shown on this map apply only to landward of 0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

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

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

NGS Information Services  
NOAA, NGS12  
National Geodetic Survey  
SSM/C-3, #5002  
1315 East-West Highway  
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at <http://www.ngs.noaa.gov/>.

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

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

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

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

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

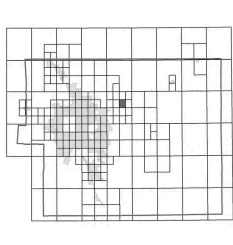
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/fip/>.

**El Paso County Vertical Datum Offset Table**

Flooding Source	Vertical Datum Offset (ft)

REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION.

**Panel Location Map**

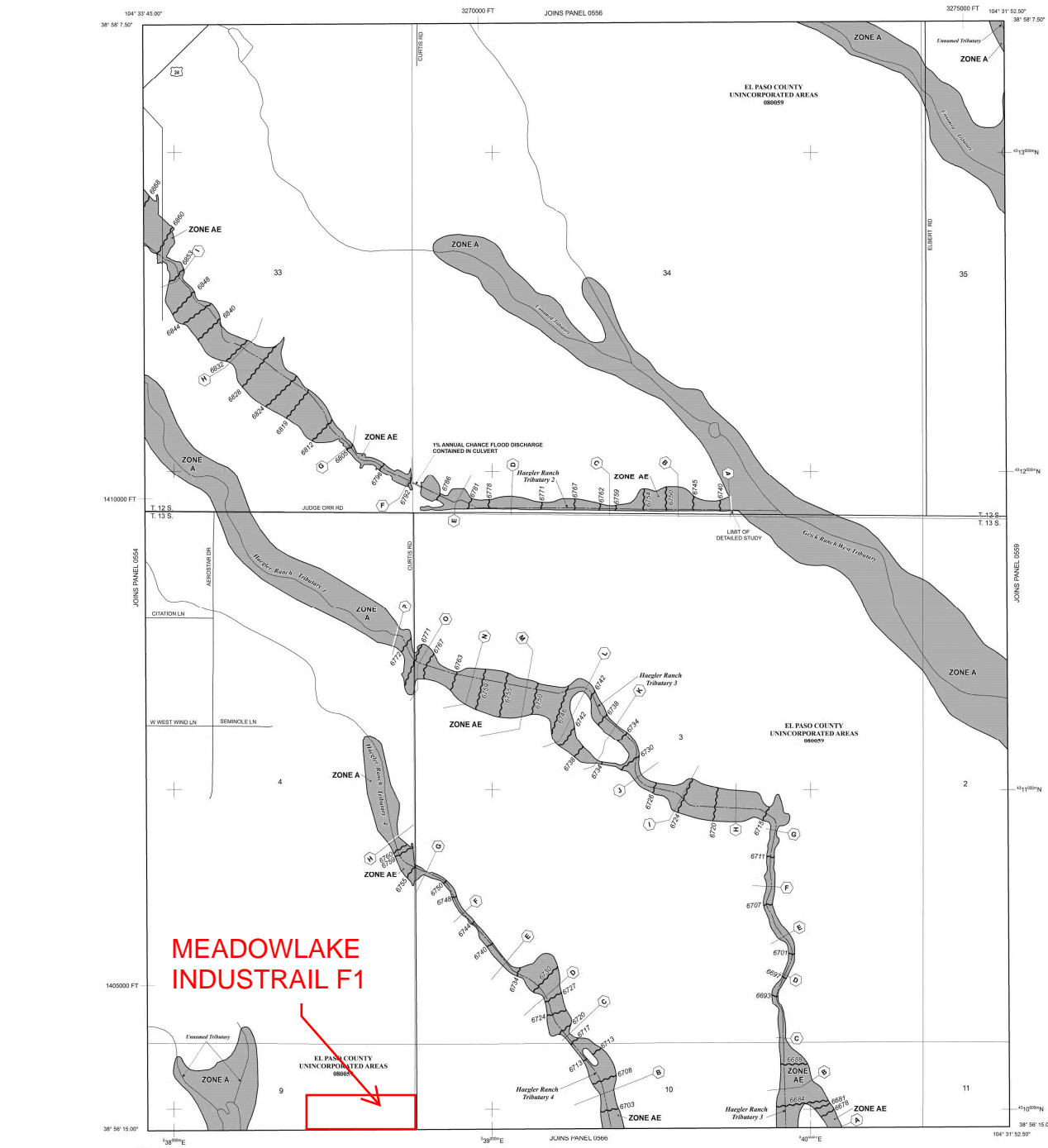


**MEADOWLAKE INDUSTRIAL F1**

**EL PASO COUNTY UNINCORPORATED AREAS**

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

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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 64 WEST, AND TOWNSHIP 13 SOUTH, RANGE 64 WEST.

**LEGEND**

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

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

**ZONE A** No Base Flood Elevations determined.  
**ZONE AE** Base Flood Elevations determined.  
**ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevation determined.  
**ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of shallow fan flooding, velocities also determined.  
**ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was unacceptably deficient. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.  
**ZONE AR9** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.  
**ZONE AV** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.  
**ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachments or used to the 1% annual chance flood limit to prevent serious substantial increases in flood heights.

**OTHER FLOOD AREAS**

**ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or no open water.  
**ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.  
**ZONE D** Areas in which flood hazards are underestimated, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

**OTHERWISE PROTECTED AREAS (OPAs)**

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

**MAP REPOSITORIES**  
 Refer to Map Repositories list on Map Index

**EFFECTIVE DATE OF COUNTRYWIDE FLOOD INSURANCE RATE MAP**  
 MARCH 11, 1997

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

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

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

**MAP SCALE 1" = 500'**

250 500 1000 FEET  
 150 300 450 METERS

**NFIP PANEL 0558G**

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

**PANEL 558 OF 1300**  
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:  
 COMMUNITY NUMBER PANEL SUFFIX  
 EL PASO COUNTY 0558 0558 G

**MAP NUMBER 08401C0558G**

**MAP REVISED DECEMBER 7, 2018**

Federal Emergency Management Agency

Notice to User: The Map Number shown on this label should be used when making map requests. The Community Number shown above should be used on insurance applications for the subject community.

**NOTES TO USERS**

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

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

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NGS Information Services  
NOAA, NNGS12  
National Geodetic Survey  
SSM/C-3, #5022  
1315 East-West Highway  
Silver Spring, MD 20910-3282

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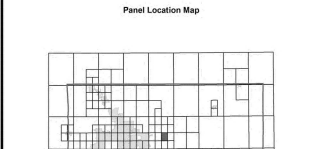
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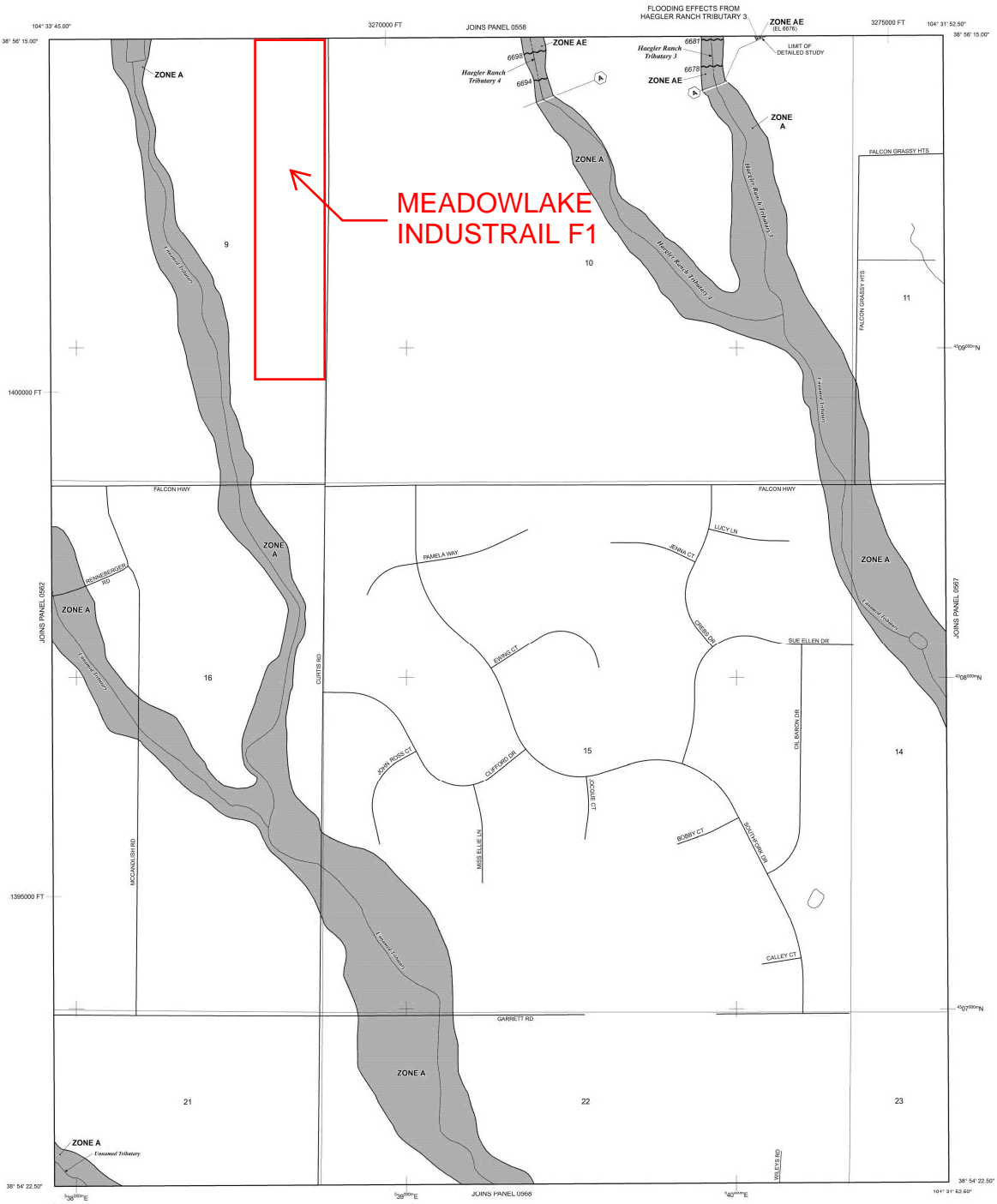
**El Paso County Vertical Datum Offset Table**

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



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**MEADOWLAKE INDUSTRIAL F1**

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 64 WEST.

**LEGEND**

- SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**
- ZONE A** The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zone A, AE, AH, AO, AR, AV, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE AE** No Base Flood Elevations determined.
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- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of shallow fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently destroyed. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE AV** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE**
- OTHER FLOOD AREAS**
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or all zone areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- OTHER AREAS**
- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain. Areas in which flood hazards are underestimated, but possible.
- ZONE D** COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
- OTHERWISE PROTECTED AREAS (OPAs)**
- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities
- Base Flood Elevation line and value, elevation in feet\*
- Base Flood Elevation value where uniform within zone; elevation in feet\*
- \* Referenced to the North American Vertical Datum of 1988 (NAVD 88)
- Cross section line
- Transsect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 1000-meter Universal Transverse Mercator grid ticks, zone 13
- 5000-foot grid ticks: Colorado State Plane coordinate system, central zone 10 (PROJCOE10).
- Lambert Conformal Conic Projection
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- 1:1.5 River Mile
- MAP REPOSITORIES Refer to Map Repositories list on Map Index
- EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP MARCH 17, 1997
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL DECEMBER 7, 2018 To update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.
- For community map revision history prior to countywide mapping, refer to the Community Map History Tables located in the Flood Insurance Study report for this jurisdiction.
- To determine if flood insurance is available in this community, contact your insurance agent or the National Flood Insurance Program at 1-800-638-6620.

**NATIONAL FLOOD INSURANCE PROGRAM**

**PANEL 0566G**

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

PANEL 566 OF 1300  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS	NUMBER	PANEL	SUFFIX
COMMUNITY	0566	0566	G
EL PASO COUNTY			

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

**MAP NUMBER**  
08041C0566G

**MAP REVISED**  
DECEMBER 7, 2018

Federal Emergency Management Agency



**APPENDIX B – HYDROLOGIC CALCULATIONS**





**MEADOWLAKE INDUSTRIAL**

**EXISTING CONDITIONS**

**EL PASO COUNTY, CO**

**Calc'd by:**

**SPC**

**Checked by:**

**CM**

**Date:**

**4/9/2024**

**SUMMARY RUNOFF TABLE**

BASIN	AREA (ac)	% IMPERVIOUS	Q <sub>5</sub> (cfs)	Q <sub>100</sub> (cfs)
EX1	8.75	5	3.4	18.3
EX2	30.77	3	9.5	57.8
EX3	13.39	5	4.5	25.4
EX4	7.03	2	2.1	14.3
OS1	2.83	2	1.0	6.7
OS2.1	5.34	2	1.8	11.9
OS2.2	0.37	2	0.1	0.9
OS3	3.96	11	2.1	9.2
OS4	40.63	3	10.7	64.7

**DESIGN POINT SUMMARY TABLE**

DESIGN POINT	CONTRIBUTING BASINS	ΣQ <sub>5</sub> (cfs)	ΣQ <sub>100</sub> (cfs)
1	OS1	1.0	6.7
2	EX1, DP1	4.2	23.9
3	OS2.1	1.8	11.9
4	EX2, DP3	10.9	67.6
5	OS2.2	0.1	0.9
6	EX3, DP5	13.2	79.9
7	OS3, DP6	13.2	77.4
8	EX4	2.1	14.3
9	OS4, DP7, DP8	22.6	135.2



**MEADOWLAKE INDUSTRIAL**

**EXISTING CONDITIONS**

**EL PASO COUNTY, CO**


**Calc'd by: SPC**

**Checked by: CM**

**Date: 4/9/2024**

**SOIL TYPE: HSG A&B**

<b>COMPOSITE 'C' FACTORS</b>																			
<b>BASIN</b>	<b>LAND USE TYPE</b>															<b>TOTAL</b>	<b>COMPOSITE IMPERVIOUSNESS &amp; C FACTOR</b>		
	<b>Historic Flow Analysis-- Greenbelts, Agriculture</b>			<b>Paved</b>			<b>Land Use Undefined</b>			<b>Land Use Undefined</b>			<b>Land Use Undefined</b>						
	<b>%I</b>	<b>C<sub>5</sub></b>	<b>C<sub>100</sub></b>	<b>%I</b>	<b>C<sub>5</sub></b>	<b>C<sub>100</sub></b>	<b>%I</b>	<b>C<sub>5</sub></b>	<b>C<sub>100</sub></b>	<b>%I</b>	<b>C<sub>5</sub></b>	<b>C<sub>100</sub></b>	<b>%I</b>	<b>C<sub>5</sub></b>	<b>C<sub>100</sub></b>				
	<b>2</b>	<b>0.09</b>	<b>0.36</b>	<b>100</b>	<b>0.90</b>	<b>0.96</b>	<b>0</b>	<b>0.00</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>	<b>0.00</b>	<b>0</b>	<b>0.00</b>	<b>0.00</b>				
	<b>ACRES</b>			<b>ACRES</b>			<b>ACRES</b>			<b>ACRES</b>			<b>ACRES</b>						
EX1	8.46			0.29												8.75	5	0.12	0.38
EX2	30.35			0.42												30.77	3	0.10	0.37
EX3	13.04			0.35												13.39	5	0.11	0.38
EX4	7.03															7.03	2	0.09	0.36
OS1	2.83															2.83	2	0.09	0.36
OS2.1	5.34															5.34	2	0.09	0.36
OS2.2	0.37															0.37	2	0.09	0.36
OS3	3.61			0.35												3.96	11	0.16	0.41
OS4	40.03			0.60												40.63	3	0.10	0.37

	<b>MEADOWLAKE INDUSTRIAL</b>	<b>Calc'd by:</b>	<b>SPC</b>
	<b>EXISTING CONDITIONS</b>	<b>Checked by:</b>	<b>CM</b>
	<b>EL PASO COUNTY, CO</b>	<b>Date:</b>	<b>4/9/2024</b>

<b>TIME OF CONCENTRATION</b>													
<b>BASIN DATA</b>			<b>OVERLAND TIME (T<sub>f</sub>)</b>			<b>TRAVEL TIME (T<sub>t</sub>)</b>					<b>TOTAL</b>	<b>tc=(L/180)+10</b>	<b>Design tc</b>
DESIGNATION	C <sub>s</sub>	AREA (ac)	LENGTH (ft)	SLOPE %	t <sub>f</sub> (min)	C <sub>v</sub>	LENGTH (ft)	SLOPE %	V (ft/s)	t <sub>t</sub> (min)	t <sub>c</sub> (min)	tc max	tc design (min)
EX1	0.12	8.75	100	2.3	13.7	10	1270	3.0	1.7	12.2	25.9	17.6	17.6
EX2	0.10	30.77	100	2.2	14.1	10	1820	2.1	1.4	20.9	35.0	20.7	20.7
EX3	0.11	13.39	100	2.1	14.2	10	1889	1.9	1.4	22.8	37.0	21.1	21.1
EX4	0.09	7.03	100	2.4	13.8	10	1086	4.1	2.0	8.9	22.8	16.6	16.6
OS1	0.09	2.83	100	5.0	10.8	10	210	5.0	2.2	1.6	12.4	11.7	11.7
OS2.1	0.09	5.34	100	2.0	14.7	10	527	1.7	1.3	6.7	21.4	13.5	13.5
OS2.2	0.09	0.37	97	3.7	11.8	10	0	0.0	0.0	0.0	11.8	10.5	10.5
OS3	0.16	3.96	100	2.0	13.7	10	1160	2.0	1.4	13.7	27.3	17.0	17.0
OS4	0.10	40.63	100	5.5	10.4	10	3177	3.5	1.9	28.3	38.7	28.2	28.2

Table 6-7. Conveyance Coefficient, C<sub>v</sub>

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

\*For buried riprap, select C<sub>v</sub> value based on type of vegetative cover.

$$t_i = \frac{0.395(1.1 - C_s)\sqrt{L}}{S^{0.33}} \quad V = C_v S_w^{0.5}$$



**MEADOWLAKE INDUSTRIAL**  
**EXISTING CONDITIONS**  
**DESIGN STORM: 5-YEAR**

Calc'd by:

SPC

Checked by:

CM

Date:

4/9/2024

DESIGN POINT	BASIN ID	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		AREA (ac)	C <sub>s</sub>	t <sub>c</sub> (min)	C <sub>s</sub> *A (ac)	I (in./hr.)	Q (cfs)	t <sub>c</sub> (min)	C <sub>s</sub> *A (ac)	I (in./hr.)	Q (cfs)	Q <sub>street</sub> (cfs)	C <sub>s</sub> *A (ac)	SLOPE %	Q <sub>PIPE</sub> (cfs)	C <sub>s</sub> *A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (FT)	VEL. (FPS)	
1	OS1	2.83	0.09	11.7	0.25	3.89	1.0	11.7	0.25	3.89	1.0	1.0	0.25	3.0				940	3.5	4.52	BASIN OS1 DRAINS INTO EX1 VIA SHEET FLOW AT DP1
2	EX1	8.75	0.12	17.6	1.02	3.28	3.4	17.6	1.28	3.28	4.2										BASIN EX1 DRAINS NORTH OFFSITE VIA CHANNLEIZED FLOW AT DP2
3	OS2.1	5.34	0.09	13.5	0.48	3.68	1.8	13.5	0.48	3.68	1.8	1.8	0.48	3.0				832	3.5	4.00	BASIN OS2.1 DRAINS INTO EX2 VIA SHEET FLOW AT DP3
4	EX2	30.77	0.10	20.7	3.11	3.04	9.5	20.7	3.59	3.04	10.9	10.9	3.59	1.7				1150	2.6	7.35	BASIN EX2 DRAINS INTO EX3 VIA CHANNELIZED FLOW AT DP4
5	OS2.2	0.37	0.09	10.5	0.03	4.05	0.1	10.5	0.03	4.05	0.1	0.1	0.03	1.9				1285	2.8	7.77	BASIN OS3 DRAINS INTO OS4 VIA CHANNELIZED FLOW AT DP5
6	EX3	13.39	0.11	21.1	1.49	3.01	4.5	28.0	5.11	2.58	13.2	13.2	5.11	2.1				1015	2.9	5.84	BASIN EX3 DRAINS INTO OS3 VIA CHANNELIZED FLOW AT DP6
7	OS3	3.96	0.16	17.0	0.64	3.33	2.1	33.9	5.75	2.30	13.2	13.2	5.75	3.7				853	3.8	3.70	BASIN OS3 DRAINS INTO OS4 VIA CHANNELIZED FLOW AT DP7
8	EX4	7.03	0.09	16.6	0.63	3.37	2.1	16.6	0.63	3.37	2.1	2.1	0.63	1.4				1571	2.4	11.06	BASIN EX4 DRAINS INTO OS4 VIA SHEET FLOW AT DP8
9	OS4	40.63	0.10	28.2	4.14	2.57	10.7	37.5	10.53	2.14	22.6										DP9 TOTAL FLOW OFFSITE AT EXISTING BOX CULVERTS





**MEADOWLAKE INDUSTRIAL**  
**EXISTING CONDITIONS**  
**DESIGN STORM: 100-YEAR**

<b>Calc'd by:</b>	<b>SPC</b>
<b>Checked by:</b>	<b>CM</b>
<b>Date:</b>	<b>4/9/2024</b>

DESIGN POINT	BASIN ID	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		AREA (ac)	C <sub>100</sub>	t <sub>c</sub> (min)	C <sub>100</sub> *A (ac)	f (in./hr.)	Q (cfs)	t <sub>c</sub> (min)	C <sub>100</sub> *A (ac)	f (in./hr.)	Q (cfs)	Q <sub>street</sub> (cfs)	C <sub>100</sub> *A (ac)	SLOPE %	Q <sub>PIPE</sub> (cfs)	C <sub>100</sub> *A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)		
1	OS1	2.83	0.36	11.7	1.02	6.53	6.7	11.7	1.02	6.53	6.7	6.7	1.02	3.0					940	3.5	4.52	BASIN OS1 DRAINS INTO EX1 VIA SHEET FLOW AT DP1	
2	EX1	8.75	0.38	17.6	3.32	5.51	18.3	17.6	4.34	5.51	23.9											BASIN EX1 DRAINS NORTH OFFSITE VIA CHANNELIZED FLOW AT DP2	
3	OS2.1	5.34	0.36	13.5	1.92	6.18	11.9	13.5	1.92	6.18	11.9	11.9	1.92	3.0					832	3.5	4.00	BASIN OS2.1 DRAINS INTO EX2 VIA SHEET FLOW AT DP3	
4	EX2	30.77	0.37	20.7	11.33	5.10	57.8	20.7	13.25	5.10	67.6	67.6	13.25	1.7					1150	2.6	7.35	BASIN EX2 DRAINS INTO EX3 VIA CHANNELIZED FLOW AT DP4	
5	OS2.2	0.37	0.36	10.5	0.13	6.80	0.9	10.5	0.13	6.80	0.9	0.9	0.13	1.9					1285	2.8	7.77	BASIN OS3 DRAINS INTO OS4 VIA CHANNELIZED FLOW AT DP5	
6	EX3	13.39	0.38	21.1	5.03	5.06	25.4	28.0	18.42	4.34	79.9	79.9	18.42	2.1					1015	2.9	5.84	BASIN EX3 DRAINS INTO OS3 VIA CHANNELIZED FLOW AT DP6	
7	OS3	3.96	0.41	17.0	1.64	5.60	9.2	33.9	20.05	3.86	77.4	77.4	20.05	3.7					853	3.8	3.70	BASIN OS3 DRAINS INTO OS4 VIA CHANNELIZED FLOW AT DP7	
8	EX4	7.03	0.36	16.6	2.53	5.66	14.3	16.6	2.53	5.66	14.3	14.3	2.53	1.4					1571	2.4	11.06	BASIN EX4 DRAINS INTO OS4 VIA SHEET FLOW AT DP8	
9	OS4	40.63	0.37	28.2	14.99	4.32	64.7	37.5	37.57	3.60	135.2											DP9 TOTAL FLOW OFFSITE AT EXISTING BOX CULVERTS	



**MEADOWLAKE INDUSTRIAL**  
**PROPOSED CONDITIONS**  
**EL PASO COUNTY, CO**

**Calc'd by:**

**DH/AB**

**Checked by:**

**NQJ**

**Date:**


**4/9/2024**

**SUMMARY RUNOFF TABLE**

BASIN	AREA (ac)	% IMPERVIOUS	Q <sub>5</sub> (cfs)	Q <sub>100</sub> (cfs)
A	5.78	45	8.4	19.9
B	1.10	96	3.6	6.6
C	3.01	80	7.0	13.9
D	3.05	80	7.3	14.6
E	3.68	80	8.8	17.5
F	1.10	90	2.8	5.2
G	6.75	2	2.0	13.5
H	3.71	74	7.7	15.8
I	1.12	67	2.1	4.6
J	3.14	25	3.0	9.6
K	0.24	90	1.0	1.9
L	0.24	90	1.0	1.9
N	6.07	80	14.5	28.9
O	3.04	80	7.2	14.2
P	3.20	80	7.8	15.5
Q	1.01	96	4.0	7.6
R	1.42	96	2.5	7.9
S	0.85	2	0.3	1.9
T	1.40	3	0.5	3.2
OS1	2.83	2	1.0	6.7
ROW1	1.95	17	1.4	5.0
ROW2	2.99	16	1.9	7.1
ROW3	6.44	7	2.4	11.8
OS4	40.11	3	10.5	63.9

**DESIGN POINT SUMMARY TABLE**

DESIGN POINT	CONTRIBUTING BASINS	ΣQ <sub>5</sub> (cfs)	ΣQ <sub>100</sub> (cfs)
E1	OS1	1.0	6.7
7	G, DP E1	31.8	65.5
E2	ROW 1, DP 7	4.2	23.8
1	A	8.4	19.9
2	E	3.6	6.6
2.1	DP 1, DP 2	11.4	25.3
3	C	7.0	13.9
4	D	7.3	14.6
4.1	DP 3, DP 4	13.7	27.2
5	E	8.8	17.5
5.1	DP 2.1, DP5	18.0	38.3
5.2	DP 4.1, DP 5.1	29.3	60.8
6	F, DP 5.2	31.8	65.5
6.1	DP 6	31.8	65.5
8	H	7.7	15.8
9	I, DP 8	9.2	19.0
10	DP 6.1, DP 9	42.4	90.3
13	ROW2	1.9	7.1
E4	DP 13, POND A RELEASE	2.6	21.4
11	K	42.4	90.3
12	L, DP 11	42.4	90.3
12.1	DP 12	42.4	90.3
15	N	14.5	28.9
16	O	7.2	14.2
17	P	7.8	15.5
17.1	DP 16, DP 17	14.7	29.2
18	Q	4.0	7.6
19	R	2.5	7.9
19.1	DP 18, DP 19	17.5	37.7
20.1	DP 17.1, DP 19.1	23.8	50.2
21	S	1.7	4.4
22	T, DP 20.1, DP 21	13.7	55.7
E7	ROW 2, DP E4	8.1	32.4
E8	POND B RELEASE	0.5	14.3
E9	OS4, DP E7, DP E8	18.6	109.2

	<b>MEADOWLAKE INDUSTRIAL</b>					<b>Calc'd by:</b>					<b>DH/AB</b>
	<b>PROPOSED CONDITIONS</b>					<b>Checked by:</b>					<b>NQJ</b>
	<b>EL PASO COUNTY, CO</b>					<b>Date:</b>					<b>4/9/2024</b>

**COMPOSITE 'C' FACTORS**

BASIN	UNDEVELOPED	INDUSTRIAL	PAVED	TOTAL	SOIL TYPE	UNDEVELOPED			INDUSTRIAL			PAVED			COMPOSITE IMPERVIOUSNESS & C		
	ACRES					%I	C <sub>5</sub>	C <sub>100</sub>	%I	C <sub>5</sub>	C <sub>100</sub>	%I	C <sub>5</sub>	C <sub>100</sub>	%I	C <sub>5</sub>	C <sub>100</sub>
	A	3.27	0.00	2.51		5.78	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	45
B	0.00	0.23	0.87	1.10	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	96	0.84	0.91
C	0.00	3.01	0.00	3.01	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	80	0.59	0.70
D	0.00	3.05	0.00	3.05	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	80	0.59	0.70
E	0.00	3.68	0.00	3.68	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	80	0.59	0.70
F	0.00	0.57	0.53	1.10	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.74	0.83
G	6.75	0.00	0.00	6.75	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	2	0.09	0.36
H	0.30	3.41	0.00	3.71	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	74	0.55	0.67
I	0.19	0.93	0.00	1.12	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	67	0.51	0.64
J	2.20	0.94	0.00	3.14	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	25	0.24	0.46
K	0.02	0.00	0.22	0.24	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.82	0.90
L	0.02	0.00	0.22	0.24	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	90	0.82	0.90
N	0.00	6.07	0.00	6.07	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	80	0.59	0.70
O	0.00	3.04	0.00	3.04	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	80	0.59	0.70
P	0.00	3.20	0.00	3.20	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	80	0.59	0.70
Q	0.20	0.20	0.81	1.01	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	96	0.86	0.98
R	0.28	0.28	1.14	1.42	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	96	0.86	0.98
S	0.85	0.00	0.00	0.85	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	2	0.09	0.36
T	1.38	0.00	0.02	1.40	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	3	0.10	0.37
OS1	2.83	0.00	0.00	2.83	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	2	0.09	0.36
ROW1	1.66	0.00	0.29	1.95	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	17	0.21	0.45
ROW2	2.57	0.00	0.42	2.99	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	16	0.20	0.44
ROW3	6.09	0.00	0.35	6.44	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	7	0.13	0.39
OS4	39.51	0.00	0.60	40.11	A/B	2	0.09	0.36	80	0.59	0.70	100	0.90	0.96	3	0.10	0.37
Pond A				25.69											65		
Pond B				17.47											73		



**MEADOWLAKE INDUSTRIAL**

**Calc'd by:**

**DH/AB**

**PROPOSED CONDITIONS**

**Checked by:**

**NQJ**

**EL PASO COUNTY, CO**

**Date:**

**4/9/2024**

**TIME OF CONCENTRATION**

BASIN DATA			OVERLAND TIME (T <sub>i</sub> )			TRAVEL TIME (T <sub>t</sub> )					TOTAL	tc=(L/180)+10	Design tc
DESIGNATION	C <sub>s</sub>	AREA (ac)	LENGTH (ft)	SLOPE %	t <sub>i</sub> (min)	C <sub>v</sub>	LENGTH (ft)	SLOPE %	V (ft/s)	t <sub>t</sub> (min)	t <sub>c</sub> (min)	tc max	tc design (min)
A	0.44	5.78	100	1.9	9.7	20	1360	2.2	3.0	7.6	17.4	18.1	17.4
B	0.84	1.10	100	1.9	3.9	20	1330	2.2	3.0	7.5	11.4	17.9	11.4
C	0.59	3.01	100	2.0	7.4	20	665	1.9	2.8	4.0	11.4	14.3	11.4
D	0.59	3.05	100	2.0	7.4	20	425	1.5	2.4	2.9	10.3	12.9	10.3
E	0.59	3.68	100	2.0	7.4	20	470	1.6	2.5	3.1	10.5	13.2	10.5
F	0.74	1.10	100	1.9	5.3	20	1680	1.7	2.6	10.7	16.1	19.9	16.1
G	0.09	6.75	100	4.0	11.7	10	1200	0.4	0.7	30.2	41.8	17.2	17.2
H	0.55	3.71	100	2.0	8.0	15	665	2.4	2.3	4.7	12.7	14.3	12.7
I	0.51	1.12	100	2.0	8.7	15	360	1.1	1.6	3.8	12.5	12.6	12.5
J	0.24	3.14	100	2.0	12.5	20	140	0.9	1.9	1.2	13.7	11.3	11.3
K	0.82	0.24	15	2.0	1.6	20	390	1.5	2.4	2.7	5.0	12.3	5.0
L	0.82	0.24	15	2.0	1.6	20	390	1.5	2.4	2.7	5.0	12.3	5.0
N	0.59	6.07	100	2.0	7.4	20	460	1.5	2.4	3.1	10.6	13.1	10.6
O	0.59	3.04	100	2.0	7.4	20	525	1.5	2.4	3.6	11.0	13.5	11.0
P	0.59	3.20	40	2.0	4.7	20	1100	3.0	3.5	5.3	10.0	16.3	10.0
Q	0.86	1.01	100	2.0	3.6	20	550	1.5	2.4	3.7	7.3	13.6	7.3
R	0.86	1.42	17	25.0	0.6	10	1160	1.5	1.2	15.8	16.4	16.5	16.4
S	0.09	0.85	100	2.0	14.7	20	505	2.5	3.2	2.7	17.4	13.4	13.4
T	0.10	1.40	100	2.0	14.5	20	540	2.5	3.2	2.8	17.4	13.6	13.6
OS1	0.09	2.83	100	5.0	10.8	10	210	5.0	2.2	1.6	12.4	11.7	11.7
ROW1	0.21	1.95	81	6.4	7.9	15	1012	0.5	1.1	15.9	23.8	16.1	16.1
ROW2	0.20	2.99	81	6.4	8.0	15	1494	1.9	2.1	12.0	20.0	18.8	18.8
ROW3	0.13	6.44	81	3.4	10.6	15	2515	1.2	1.6	25.5	36.1	24.4	24.4
OS4	0.10	40.11	300	5.5	18.0	15	2977	3.5	2.8	17.7	35.6	28.2	28.2

**FORMULAS:**

$$t_i = \frac{0.395(1.1 - C_s)\sqrt{L}}{S^{0.33}} \quad V = C_v S_w^{0.5}$$

**Table 6-7. Conveyance Coefficient, C<sub>v</sub>**

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

\*For buried riprap, select C<sub>v</sub> value based on type of vegetative cover.



**MEADOWLAKE INDUSTRIAL  
PROPOSED CONDITIONS  
DESIGN STORM: 5-YEAR**

Calc'd by:  
Checked by:  
Date:

**DH/AB  
NQJ  
4/9/2024**

STREET	DESIGN POINT	BASIN ID	DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS	
			AREA (ac)	C <sub>5</sub>	t <sub>c</sub> (min)	C <sub>5</sub> *A (ac)	f (in./hr.)	Q (cfs)	t <sub>c</sub> (min)	C <sub>5</sub> *A (ac)	f (in./hr.)	Q (cfs)	Q <sub>street</sub> (cfs)	C <sub>5</sub> *A (ac)	SLOPE %	Q <sub>PIPE</sub> (cfs)	C <sub>5</sub> *A (ac)	SLOPE %	PIPE SIZE (FT)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min)		
	E1	OS1	2.83	0.09	11.7	0.25	3.89	1.0	11.7	0.25	3.89	0.99	1.0	0.25	4.8					228	4.4	0.87	DP E1 DRAINS VIA SHEETFLOW INTO BASIN G TO DP 7	
	7	G	6.75	0.09	17.2	0.61	3.31	2.0	17.2	0.86	3.31	2.86	2.9	0.86	4.0				81	4.0	0.34	DP7 DRAINS VIA SHEETFLOW INTO BASIN ROW1 TO DP E2		
	E2	ROW1	1.95	0.21	16.1	0.41	3.42	1.4	17.6	1.27	3.28	4.18	4.2	1.27	4.0				81	4.0	0.34	DP E2 DRAINS NORTH OFFSITE		
	1	A	5.78	0.44	17.4	2.55	3.30	8.4	17.4	2.55	3.30	8.42				8.4	2.55	1.2	1.5	40	6.5	0.10	DP1 CAPTURED W/ 10' TYPE R SUMP INELT, PIPE TO DP2.1	
	2	B	1.1	0.84	11.4	0.92	3.93	3.6	11.4	0.92	3.93	3.61				3.6	0.92	0.5	1.5	89	4.2	0.35	DP2 CAPTURED W/ 5' TYPE R SUMP INLET, PIPE TO DP2.1	
	2.1								17.5	3.47	3.29	11.43				11.4	3.47	0.5	1.5	305	4.2	1.21	DP2.1 FLOW, PIPE TO DP5.1	
	3	C	3.01	0.59	11.4	1.78	3.93	7.0	11.4	1.78	3.93	6.97				7.0	1.78	2.0	1.5	427	8.4	0.85	DP3 CAPTURED W/ 20' TYPE R INLET, PIPE TO DP4.1	
	4	D	3.05	0.59	10.3	1.80	4.08	7.3	10.3	1.80	4.08	7.35				7.3	1.80	1.0	1.5	6	5.9	0.02	DP4 CAPTURED W/ 20' TYPE R INLET, PIPE TO DP4.1	
	4.1								12.3	3.58	3.82	13.66				13.7	3.58	2.0	1.5	500	8.4	0.99	DP4.1 FLOW, PIPE TO DP5.1	
	5	E	3.68	0.59	10.5	2.17	4.05	8.8	10.5	2.17	4.05	8.80				8.8	2.17	3.0	1.5	6	10.3	0.01	DP5 CAPTURED W/ 15' TYPE R SUMP INLET, PIPE TO DP5.1	
	5.1								18.7	5.64	3.19	18.00				18.0	5.64	0.4	2.0	50	4.6	0.18	DP5.1 FLOW, PIPE TO DP5.2	
	5.2								18.9	9.22	3.18	29.28				29.3	9.22	0.8	2.0	36	6.2	0.10	DP5.2 FLOW, PIPE TO DP6.1	
	6	F	1.1	0.74	16.1	0.81	3.42	2.8	19.0	10.03	3.17	31.78				2.8	0.81	1.0	2.0	12	7.2	0.03	DP6 CAPTURED IN 15' TYPE R SUMP INLET , PIPE TO DP6.1	
	6.1								19.0	10.03	3.17	31.78												DP6.1, PIPE TO POND A
	8	H	3.71	0.55	12.7	2.04	3.76	7.7	12.7	2.04	3.76	7.68	7.7	2.04	1.7					360	2.6	2.30	SWALE TO BASIN I	
	9	I	1.12	0.51	12.5	0.57	3.80	2.1	15.1	2.60	3.52	9.16												SWALE TO DET POND A
	10	J	3.14	0.24	11.3	0.75	3.94	3.0	19.0	13.39	3.17	42.42												DP10 FLOW, TOTAL FLOW ENTERING POND A
	13	ROW2	2.99	0.20	18.8	0.61	3.19	1.9	18.8	0.61	3.19	1.94				1.9	0.61	0.5	1.5	75	4.2	0.30	DP13 FLOW, TOTAL FLOW TO CULVERT AT DP 13	
	E4								19.0	0.61	3.16	2.63												DP E4 FLOW, TOTAL FLOW TO ROADSIDE SWALE INCLUDING POND A RELEASE



**MEADOWLAKE INDUSTRIAL  
PROPOSED CONDITIONS  
DESIGN STORM: 5-YEAR**

**Calc'd by:**  
**Checked by:**  
**Date:**

**DH/AB**  
**NQJ**  
**4/9/2024**

STREET	DESIGN POINT	BASIN ID	DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
			AREA (ac)	C <sub>5</sub>	t <sub>c</sub> (min)	C <sub>5</sub> *A (ac)	f (in./hr.)	Q (cfs)	t <sub>c</sub> (min)	C <sub>5</sub> *A (ac)	f (in./hr.)	Q (cfs)	Q <sub>street</sub> (cfs)	C <sub>5</sub> *A (ac)	SLOPE %	Q <sub>PIPE</sub> (cfs)	C <sub>5</sub> *A (ac)	SLOPE %	PIPE SIZE (FT)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min)	
	11	K	0.24	0.82	5.0	0.20	5.17	1.0	5.0	0.20	5.17	1.02				1.0	0.20	2.0	1.5	25	8.4	0.05	DP11 CAPTURED W/ 5' TYPE R SUMP INLET, PIPE TO DP12.1
	12	L	0.24	0.82	5.0	0.20	5.17	1.0	5.0	0.39	5.15	2.03				1.0	0.20	2.0	1.5	25	8.4	0.05	DP12 CAPTURED W/ 5' TYPE R SUMP INELT, PIPE TO DP12.1
	12.1								5.0	0.39	5.15	2.03	2.0	0.39	1.0					1150	2.0	9.58	DP12.1 SWALE FLOW TO DP21
	15	N	6.07	0.59	10.6	3.58	4.05	14.5	10.6	3.58	4.05	14.50				16.9	4.17	3.6	1.5	32	11.3	0.05	DP15 CAPTURED IN 15' TYPE R INLET, PIPE TO DP19.1
	16	O	3.04	0.59	11.0	1.79	3.99	7.2	11.0	1.79	3.99	7.15				8.6	2.16	1.0	1.5	10	5.9	0.03	DP16 CAPTURED IN 10' TYPE R INLET, PIPE TO DP17.1
	17	P	3.2	0.59	10.0	1.89	4.13	7.8	10.0	1.89	4.13	7.80				14.6	3.53	2.0	1.5	27	8.4	0.05	DP17 CAPTURED IN 10' TYPE R INLET, PIPE TO DP17.1
	17.1								11.0	3.68	3.98	14.67				14.7	3.68	3.6	2.0	42	13.7	0.05	DP17.1 FLOW, PIPE TO DP21
	18	Q	1.01	0.86	7.3	0.86	4.60	4.0	7.3	0.86	4.60	3.98				7.5	1.63	0.5	1.5	50	4.2	0.20	DP18 CAPTURED IN 5' TYPE R INLET, PIPE TO DP19.1
	19	R	0.85	0.86	16.4	0.73	3.39	2.5	16.4	0.73	3.39	2.46				2.5	0.73	1.0	1.5	6	5.9	0.02	DP19 CAPTURED IN 10' TYPE R SUMP INLET, PIPE TO DP19.1
	19.1								16.4	5.17	3.38	17.51				17.5	5.17	0.5	2.0	42	5.1	0.14	DP19.1 FLOW, PIPE TO DP20.1
	20.1								16.6	7.06	3.37	23.81				23.8	7.06	0.5	2.5	370	5.9	1.04	DP20.1 PIPE FLOW TO POND B
	21	S	0.85	0.09	13.4	0.08	3.69	0.3	14.6	0.47	3.56	1.67				1.7	0.47	0.5	2.5	370	5.9	1.04	DP21 SWALE FLOW TO POND B
	22	T	1.4	0.10	13.6	0.14	3.67	0.5	13.6	3.72	3.67	13.68	13.7	3.72	3.7					60	3.8	0.26	TOTAL FLOW ENTERING POND B
	E7	ROW3	6.44	0.13	24.4	0.86	2.79	2.4	24.4	2.66	2.79	8.11	8.1	2.66	4.2					865	4.1	3.52	DP E7 SWALE FLOW TO DP E9
	E8											0.50											DP E8 SWALE FLOW TO DP E9 (POND B RELEASE)
	E9	OS4	40.11	0.10	28.2	4.10	2.57	10.5	28.2	6.75	2.57	18.58											DP E9 TOTAL FLOW OFFSITE



**MEADOWLAKE INDUSTRIAL**  
**PROPOSED CONDITIONS**  
**DESIGN STORM: 100-YEAR**

Calc'd by:  
 Checked by:  
 Date:

DH/AB  
 NJQ  
 4/9/2024

STREET	DESIGN POINT	BASIN ID	DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS	
			AREA (ac)	C <sub>100</sub>	t <sub>c</sub> (min)	C <sub>100</sub> *A (ac)	I (in./hr.)	Q (cfs)	t <sub>c</sub> (min)	C <sub>100</sub> *A (ac)	I (in./hr.)	Q (cfs)	Q <sub>street</sub> (cfs)	C <sub>100</sub> *A (ac)	SLOPE %	Q <sub>PIPE</sub> (cfs)	C <sub>100</sub> *A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)		
	E1	OS1	2.83	0.36	11.7	1.02	6.53	6.7	11.7	1.02	6.53	6.7	6.7	1.02	4.8					228	4.4	0.87	DP E1 DRAINS VIA SHEETFLOW INTO BASIN G TO DP 7	
	7	G	6.75	0.36	17.2	2.43	5.56	13.5	17.2	3.45	5.56	19.2	19.2	3.45	4.0					81	4.0	0.34	DP7 DRAINS VIA SHEETFLOW INTO BASIN ROW1 TO DP E2	
	E2	ROW1	1.95	0.45	16.1	0.88	5.74	5.0	17.6	4.32	5.51	23.8	23.8	4.32	4.0					81	4.0	0.34	<b>DP E2 DRAINS NORTH OFFSITE</b>	
	1	A	5.78	0.62	17.4	3.59	5.54	19.9	17.4	3.59	5.54	19.9				19.9	3.59	1.2	1.5	40	6.5	0.10	DP1 CAPTURED W/ 10' TYPE R SUMP INELT, PIPE TO DP2.1	
	2	B	1.1	0.91	11.4	1.00	6.60	6.6	11.4	1.00	6.60	6.6				6.6	1.00	0.5	1.5	89	4.2	0.35	DP2 CAPTURED W/ 5' TYPE R SUMP INLET, PIPE TO DP2.1	
	2.1								17.5	4.58	5.52	25.3				25.3	4.58	0.5	1.5	305	4.2	1.21	DP2.1 FLOW, PIPE TO DP5.1	
	3	C	3.01	0.70	11.4	2.11	6.59	13.9	11.4	2.11	6.59	13.9				13.9	2.11	2.0	1.5	427	8.4	0.85	DP3 CAPTURED W/ 20' TYPE R INLET, PIPE TO DP4.1	
	4	D	3.05	0.70	10.3	2.14	6.85	14.6	10.3	2.14	6.85	14.6				14.6	2.14	1.0	1.5	6	5.9	0.02	DP4 CAPTURED W/ 20' TYPE R INLET, PIPE TO DP4.1	
	4.1								12.3	4.24	6.41	27.2				27.2	4.24	2.0	1.5	500	8.4	0.99	DP4.1 FLOW, PIPE TO DP5.1	
	5	E	3.68	0.70	10.5	2.58	6.81	17.5	10.5	2.58	6.81	17.5				17.5	2.58	3.0	1.5	6	10.3	0.01	DP5 CAPTURED W/ 15' TYPE R SUMP INLET, PIPE TO DP5.1	
	5.1								18.7	7.16	5.36	38.3				38.3	7.16	0.4	2.0	50	4.6	0.18	DP5.1 FLOW, PIPE TO DP5.2	
	5.2								18.9	11.40	5.33	60.8				60.8	11.40	0.8	2.0	36	6.2	0.10	DP5.2 FLOW, PIPE TO DP6.1	
	6	F	1.1	0.83	16.1	0.91	5.74	5.2	19.0	12.31	5.32	65.5				5.2	0.91	1.0	2.0	12	7.2	0.03	DP6 CAPTURED IN 15' TYPE R SUMP INLET, PIPE TO DP6.1	
	6.1								19.0	12.31	5.32	65.5												DP6.1, PIPE TO POND A
	8	H	3.71	0.67	12.7	2.50	6.32	15.8	12.7	2.50	6.32	15.8	15.8	2.50	1.7					360	2.6	2.30	SWALE TO BASIN I	
	9	I	1.12	0.64	12.5	0.72	6.38	4.6	15.1	3.21	5.90	19.0												SWALE TO DET POND A
	10	J	3.14	0.46	11.3	1.45	6.62	9.6	19.0	16.97	5.32	90.3												<b>DP10 FLOW, TOTAL FLOW ENTERING POND A</b>
	13	ROW2	2.99	0.44	18.8	1.33	5.35	7.1	18.8	1.33	5.35	7.1				7.1	1.33	0.5	1.5	75	4.2	0.30	DP13 FLOW, TOTAL FLOW TO CULVERT AT DP 13	
	E4								19.0	1.33	5.31	21.4												DP E4 FLOW, TOTAL FLOW TO ROADSIDE SWALE INCLUDING POND A RELEASE



**MEADOWLAKE INDUSTRIAL**  
**PROPOSED CONDITIONS**  
**DESIGN STORM: 100-YEAR**

**Calc'd by:**  
**Checked by:**  
**Date:**

**DH/AB**  
**NQJ**  
**4/9/2024**

			DIRECT RUNOFF									TOTAL RUNOFF			STREET			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C <sub>100</sub>	t <sub>c</sub> (min)	C <sub>100</sub> *A (ac)	I (in./hr.)	Q (cfs)	t <sub>c</sub> (min)	C <sub>100</sub> *A (ac)	I (in./hr.)	Q (cfs)	Q <sub>street</sub> (cfs)	C <sub>100</sub> *A (ac)	SLOPE %	Q <sub>PIPE</sub> (cfs)	C <sub>100</sub> *A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)			
	11	K	0.24	0.90	5.0	0.22	8.68	1.9	5.0	0.22	8.68	1.9				1.9	0.22	2.0	1.5	25	8.4	0.05	DP11 CAPTURED W/ 5' TYPE R SUMP INLET, PIPE TO DP12.1		
	12	L	0.24	0.90	5.0	0.22	8.68	1.9	5.0	0.43	8.65	3.7				1.9	0.22	2.0	1.5	25	8.4	0.05	DP12 CAPTURED W/ 5' TYPE R SUMP INLET, PIPE TO DP12.1		
	12.1								5.0	0.43	8.65	3.7	3.7	0.43	1.0					1150	2.0	9.58	DP12.1 SWALE FLOW TO DP21		
	15	N	6.07	0.70	10.6	4.25	6.80	28.9	10.6	4.25	6.80	28.9				16.9	2.49	3.6	1.5	32	11.3	0.05	DP15 CAPTURED IN 15' TYPE R INLET, PIPE TO DP19.1		
	16	O	3.04	0.70	11.0	2.13	6.69	14.2	11.0	2.13	6.69	14.2				8.6	1.28	1.0	1.5	10	5.9	0.03	DP16 CAPTURED IN 10' TYPE R INLET, PIPE TO DP17.1		
	17	P	3.2	0.70	10.0	2.24	6.94	15.5	10.0	2.24	6.94	15.5				14.6	2.10	2.0	1.5	27	8.4	0.05	DP17 CAPTURED IN 10' TYPE R INLET, PIPE TO DP17.1		
	17.1								11.0	4.37	6.69	29.2				29.2	4.37	3.6	2.0	42	13.7	0.05	DP17.1 FLOW, PIPE TO DP21		
	18	Q	1.01	0.98	7.3	0.99	7.73	7.6	7.3	0.99	7.73	7.6				7.5	0.97	0.5	1.5	50	4.2	0.20	DP18 CAPTURED IN 5' TYPE R INLET, PIPE TO DP19.1		
	19	R	1.42	0.98	16.4	1.39	5.68	7.9	16.4	1.39	5.68	7.9				7.9	1.39	1.0	1.5	6	5.9	0.02	DP19 CAPTURED IN 10' TYPE R SUMP INLET, PIPE TO DP19.1		
	19.1								16.4	6.63	5.68	37.7				37.7	6.63	0.5	2.0	42	5.1	0.14	DP19.1 FLOW, PIPE TO DP20.1		
	20.1								16.6	8.87	5.66	50.2				50.2	8.87	0.5	2.5	370	5.9	1.04	DP20.1 PIPE FLOW TO POND B		
	21	S	0.85	0.36	13.4	0.31	6.20	1.9	14.6	0.74	5.97	4.4				4.4	0.74	0.5	2.5	370	5.9	1.04	DP21 SWALE FLOW TO POND B		
	22	T	1.4	0.37	13.6	0.52	6.17	3.2	17.6	10.12	5.51	55.7	55.7	10.12	3.7					60	3.8	0.26	TOTAL FLOW ENTERING POND B		
	E7	ROW3	6.44	0.39	24.4	2.53	4.68	11.8	24.4	3.86	4.68	32.4	32.4	3.86	4.2					865	4.1	3.52	DP E7 SWALE FLOW TO DP E9		
	E8											14.3											DP E8 SWALE FLOW TO DP E9 (POND B RELEASE)		
	E9	OS4	40.11	0.37	28.2	14.80	4.32	63.9	28.2	18.66	4.32	109.2											DP E9 TOTAL FLOW OFFSITE		



## **APPENDIX C – HYDRAULIC CALCULATIONS**

*Hydraulic calculations will be provided with the Final Drainage Report.*



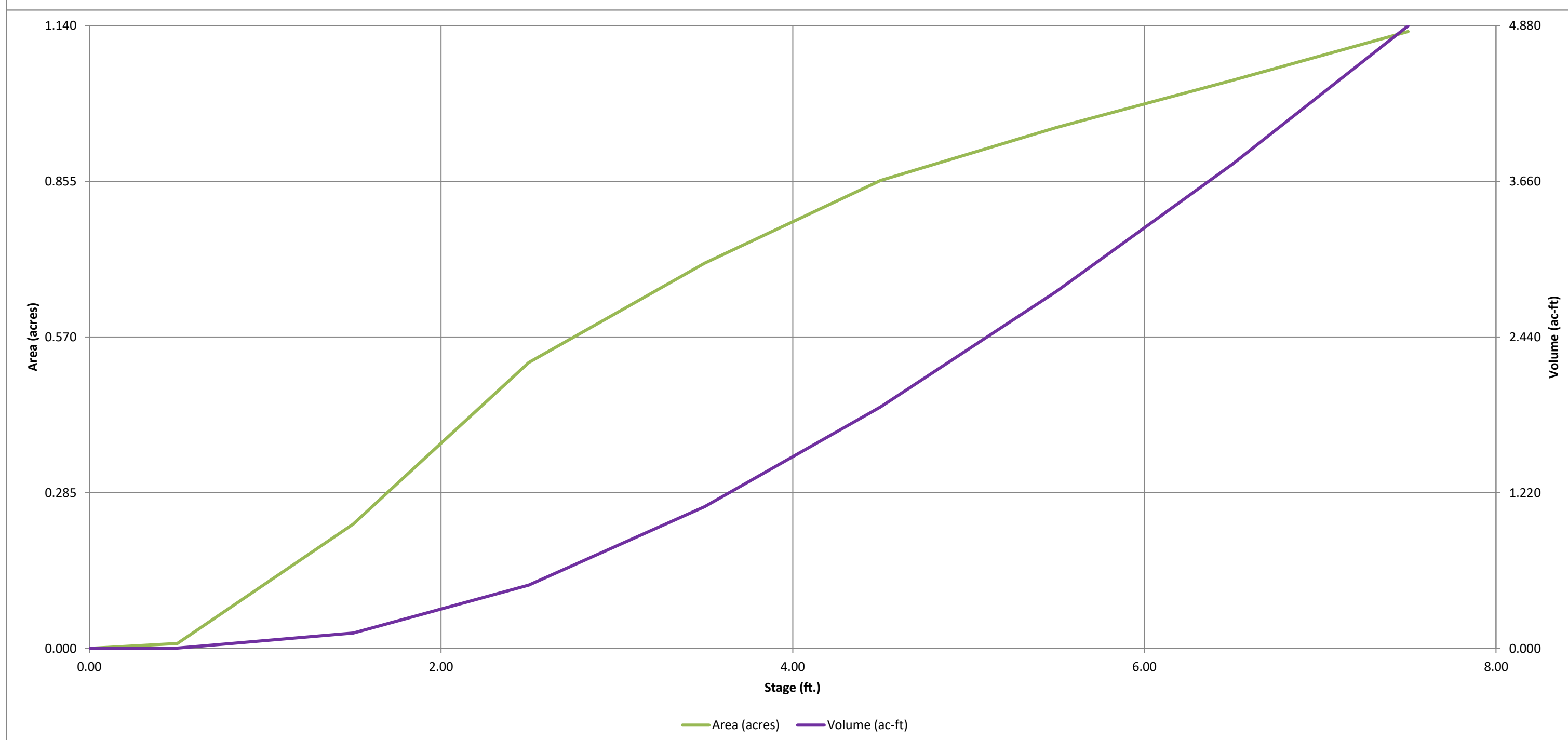
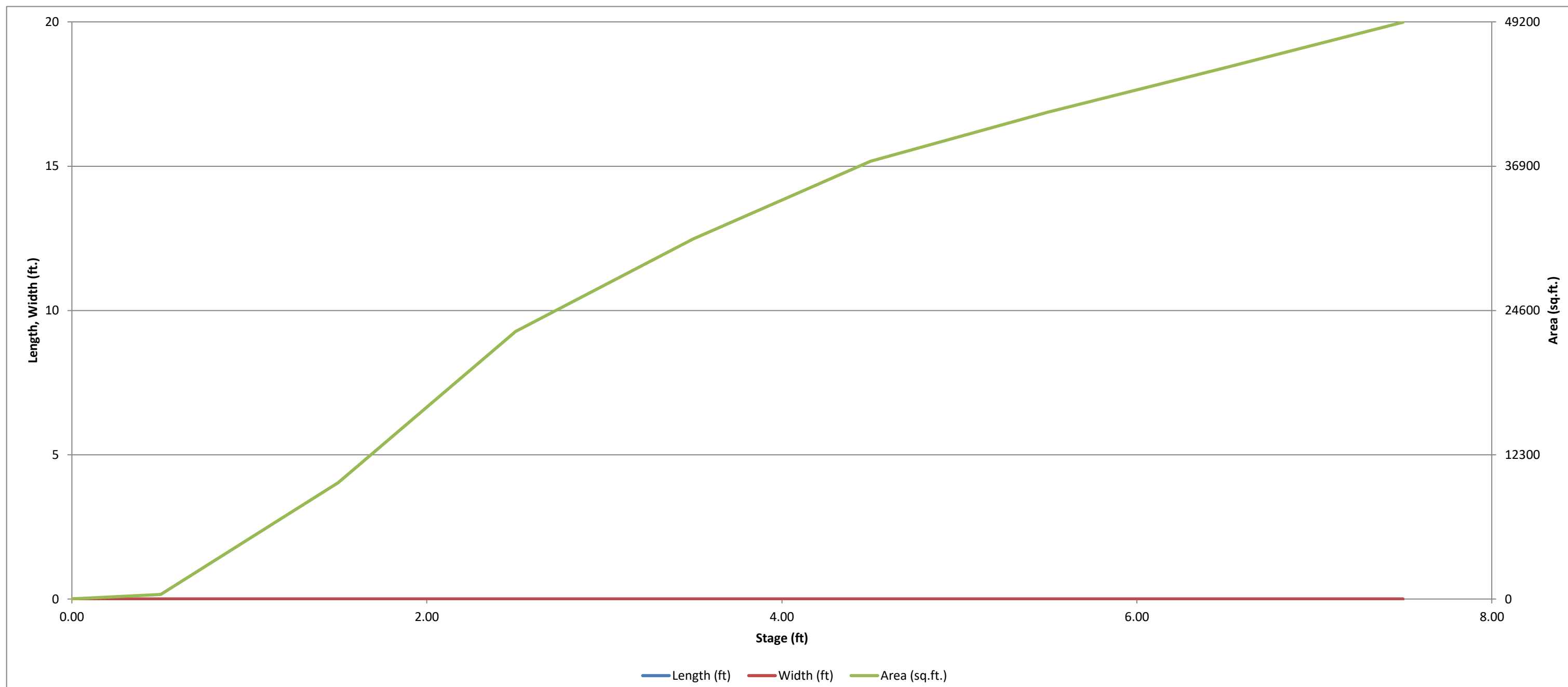
## **APPENDIX D – WATER QUALITY & DETENTION**





# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

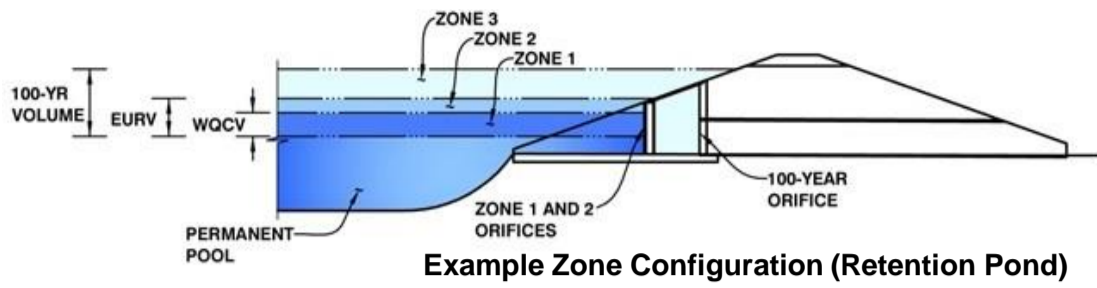


# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

**Project: Meadowlake Industrial F1**

**Basin ID: Pond A**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.56	0.528	Orifice Plate
Zone 2 (EURV)	4.58	1.425	Circular Orifice
Zone 3 (100-year)	5.68	1.007	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>2.961</b>	

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

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

**Calculated Parameters for Underdrain**

Underdrain Orifice Area =	N/A	ft <sup>2</sup>
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)**

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.56	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	1.90	sq. inches (diameter = 1-9/16 inches)

**Calculated Parameters for Plate**

WQ Orifice Area per Row =	1.319E-02	ft <sup>2</sup>
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft <sup>2</sup>

**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	0.83	1.66					
Orifice Area (sq. inches)	1.90	1.90	1.90					

	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)**

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.57	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	4.64	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	3.33	N/A	inches

**Calculated Parameters for Vertical Orifice**

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.06	N/A	ft <sup>2</sup>
Vertical Orifice Centroid =	0.14	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 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.67	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.67	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	2.92	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

**Calculated Parameters for Overflow Weir**

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H <sub>g</sub> =	4.67	N/A	feet
Overflow Weir Slope Length =	2.92	N/A	feet
Grate Open Area / 100-yr Orifice Area =	8.80	N/A	
Overflow Grate Open Area w/o Debris =	11.52	N/A	ft <sup>2</sup>
Overflow Grate Open Area w/ Debris =	5.76	N/A	ft <sup>2</sup>

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.10	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	12.50		inches

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

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.31	N/A	ft <sup>2</sup>
Outlet Orifice Centroid =	0.58	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.97	N/A	radians

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

Spillway Invert Stage =	6.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	45.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

**Calculated Parameters for Spillway**

Spillway Design Flow Depth =	0.50	feet
Stage at Top of Freeboard =	7.50	feet
Basin Area at Top of Freeboard =	1.13	acres
Basin Volume at Top of Freeboard =	4.88	acre-ft

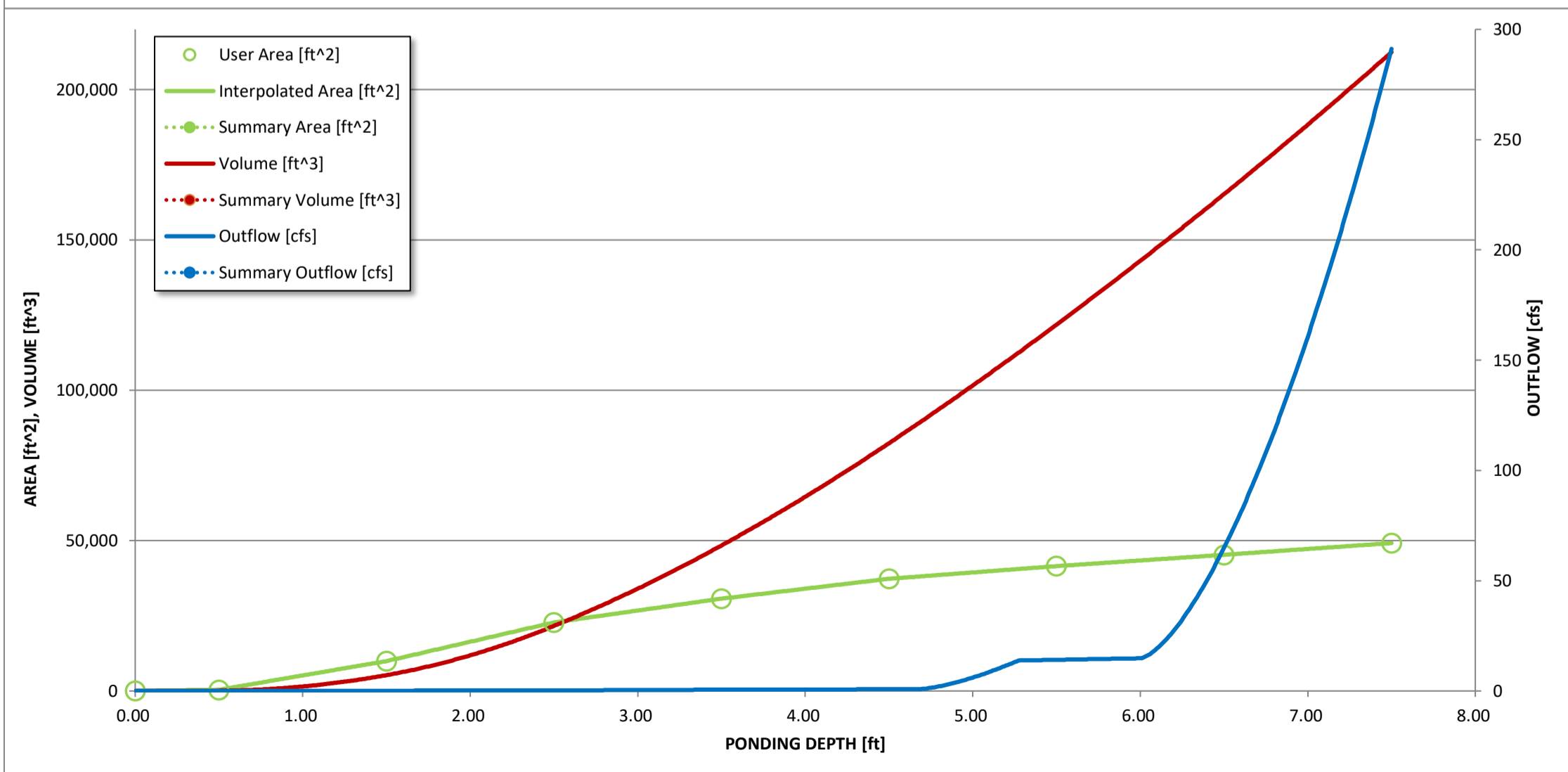
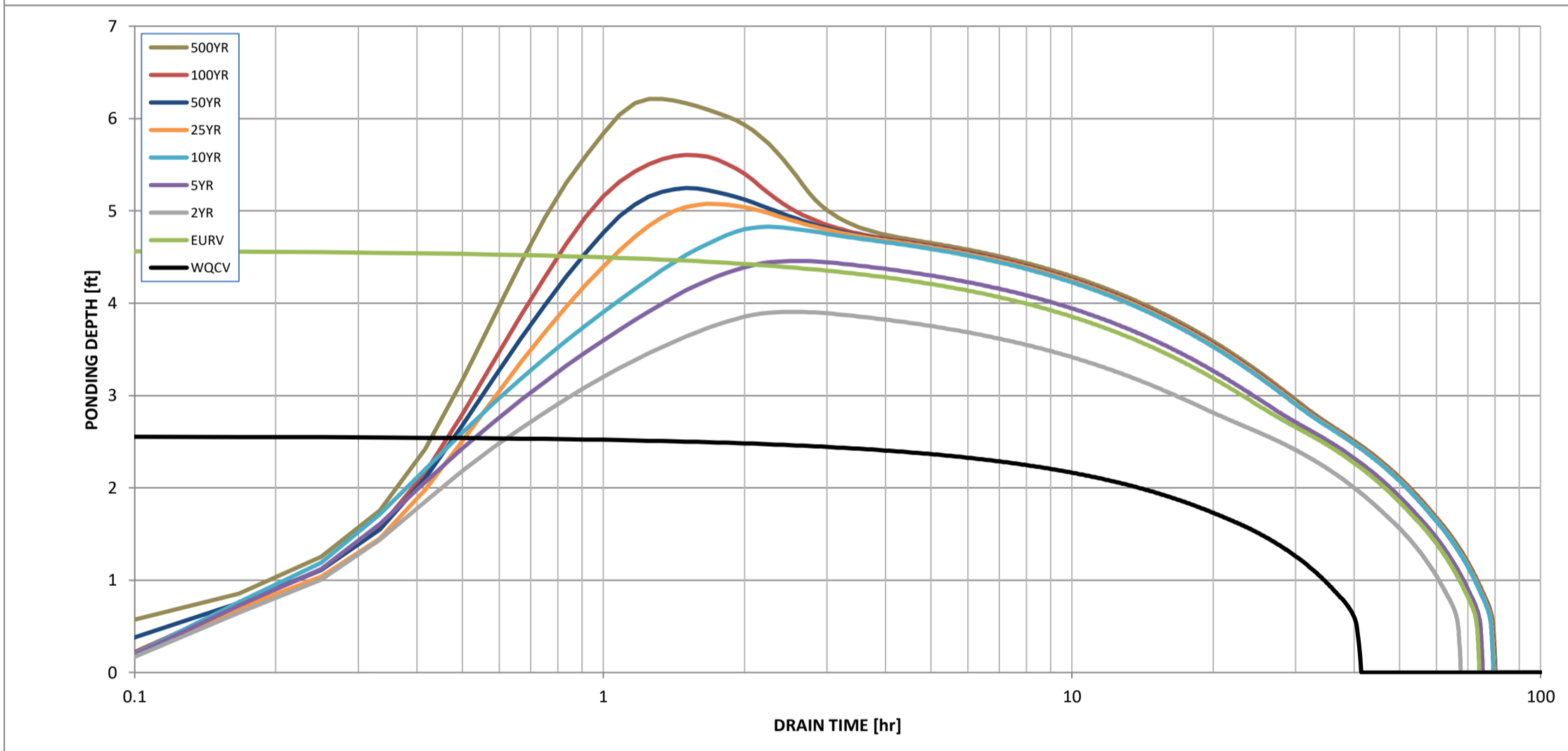
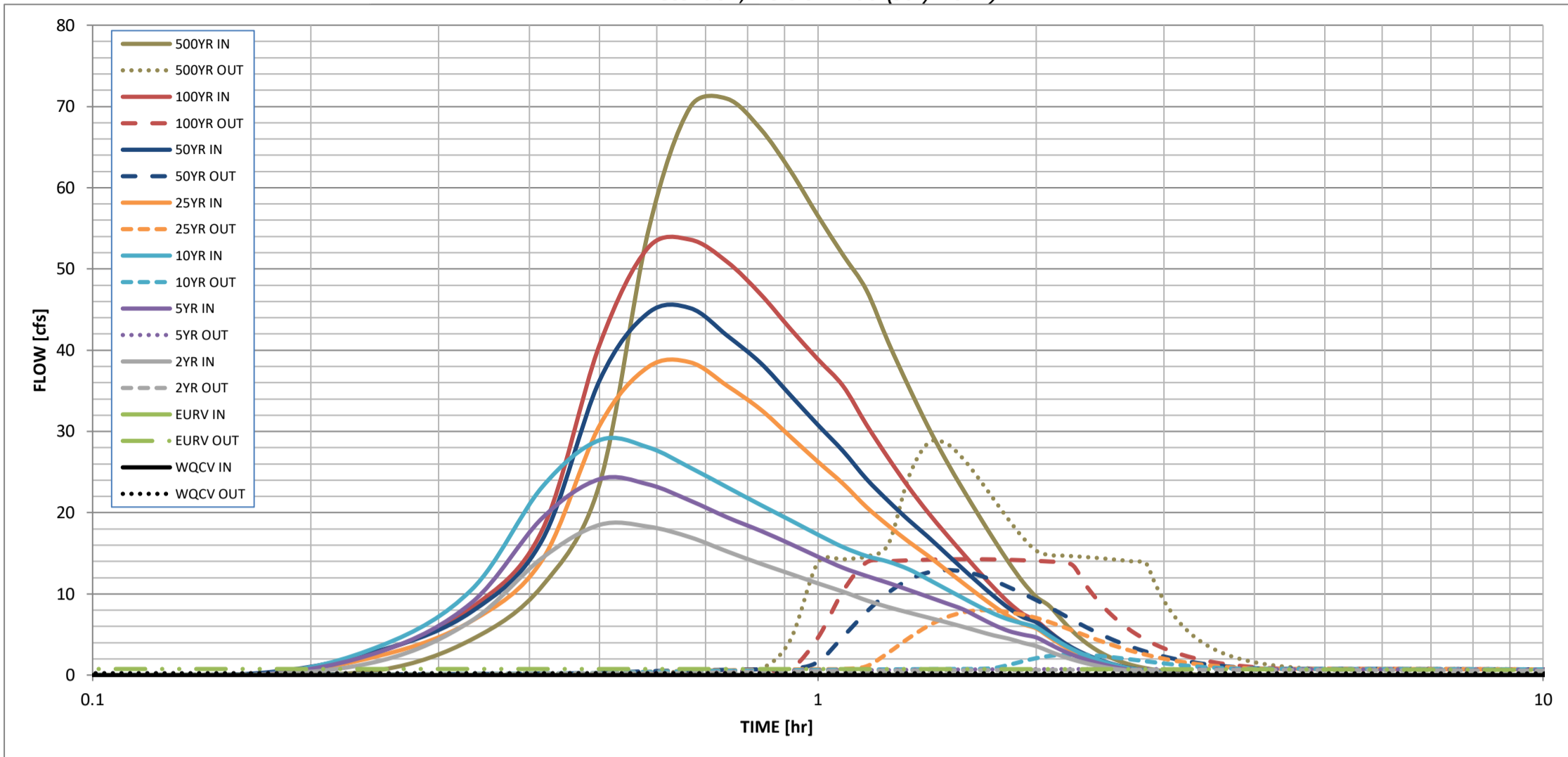
**Routed Hydrograph Results**

*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) =	0.528	1.954	1.519	1.984	2.391	2.971	3.467	4.091	5.411
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.519	1.984	2.391	2.971	3.467	4.091	5.411
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	0.3	1.5	6.4	9.5	14.3	23.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.06	0.26	0.38	0.57	0.95
Peak Inflow Q (cfs) =	N/A	N/A	18.5	24.1	28.9	38.5	45.2	53.6	70.9
Peak Outflow Q (cfs) =	0.2	0.8	0.7	0.7	2.5	8.0	12.9	14.3	28.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.5	1.7	1.2	1.4	1.0	1.2
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	0.6	1.0	1.2	1.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	64	59	65	68	66	65	63	60
Time to Drain 99% of Inflow Volume (hours) =	<b>40</b>	69	64	71	74	73	73	72	71
Maximum Ponding Depth (ft) =	2.56	4.58	3.91	4.46	4.83	5.08	5.24	5.61	6.21
Area at Maximum Ponding Depth (acres) =	0.53	0.86	0.77	0.85	0.89	0.91	0.93	0.96	1.01
Maximum Volume Stored (acre-ft) =	0.528	1.960	1.405	1.849	2.170	2.395	2.552	2.892	3.494

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



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

# DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

## Inflow Hydrographs

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

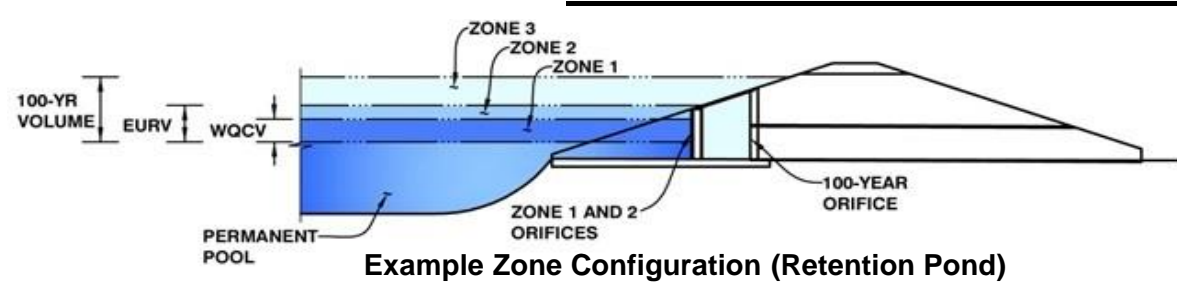
Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.02	0.66
	0:15:00	0.00	0.00	1.80	2.94	3.64	2.45	3.09	2.99	4.41
	0:20:00	0.00	0.00	6.72	8.95	10.55	6.68	7.83	8.33	10.96
	0:25:00	0.00	0.00	14.42	19.32	23.15	14.16	16.61	17.82	23.50
	0:30:00	0.00	0.00	18.50	24.13	28.92	30.71	36.26	40.65	54.55
	0:35:00	0.00	0.00	18.29	23.49	28.05	37.92	44.58	52.61	69.91
	0:40:00	0.00	0.00	16.97	21.48	25.55	38.51	45.18	53.61	70.94
	0:45:00	0.00	0.00	15.22	19.42	23.13	35.61	41.79	50.86	67.26
	0:50:00	0.00	0.00	13.73	17.78	20.97	32.73	38.45	46.92	62.08
	0:55:00	0.00	0.00	12.47	16.15	19.07	29.35	34.46	42.62	56.55
	1:00:00	0.00	0.00	11.30	14.59	17.30	26.28	30.81	38.89	51.72
	1:05:00	0.00	0.00	10.28	13.22	15.76	23.57	27.58	35.59	47.41
	1:10:00	0.00	0.00	9.21	12.21	14.67	20.70	24.16	30.84	41.02
	1:15:00	0.00	0.00	8.38	11.36	13.97	18.43	21.46	26.76	35.56
	1:20:00	0.00	0.00	7.71	10.50	13.05	16.45	19.11	23.17	30.72
	1:25:00	0.00	0.00	7.11	9.67	11.83	14.74	17.08	20.10	26.56
	1:30:00	0.00	0.00	6.54	8.88	10.64	13.02	15.04	17.45	22.95
	1:35:00	0.00	0.00	5.97	8.13	9.52	11.39	13.12	15.03	19.68
	1:40:00	0.00	0.00	5.40	7.12	8.47	9.87	11.33	12.78	16.65
	1:45:00	0.00	0.00	4.89	6.18	7.55	8.47	9.69	10.73	13.89
	1:50:00	0.00	0.00	4.49	5.44	6.85	7.25	8.25	8.94	11.50
	1:55:00	0.00	0.00	3.99	5.00	6.37	6.30	7.15	7.55	9.65
	2:00:00	0.00	0.00	3.58	4.65	5.88	5.76	6.52	6.72	8.56
	2:05:00	0.00	0.00	2.95	3.86	4.89	4.71	5.32	5.41	6.87
	2:10:00	0.00	0.00	2.37	3.09	3.93	3.74	4.21	4.21	5.33
	2:15:00	0.00	0.00	1.90	2.47	3.14	2.95	3.32	3.26	4.11
	2:20:00	0.00	0.00	1.51	1.96	2.50	2.33	2.62	2.52	3.16
	2:25:00	0.00	0.00	1.20	1.56	1.97	1.83	2.06	1.94	2.42
	2:30:00	0.00	0.00	0.94	1.22	1.53	1.42	1.60	1.49	1.85
	2:35:00	0.00	0.00	0.74	0.94	1.18	1.10	1.23	1.15	1.43
	2:40:00	0.00	0.00	0.57	0.72	0.90	0.84	0.94	0.88	1.10
	2:45:00	0.00	0.00	0.44	0.55	0.70	0.65	0.73	0.69	0.86
	2:50:00	0.00	0.00	0.33	0.41	0.53	0.50	0.56	0.53	0.66
	2:55:00	0.00	0.00	0.24	0.30	0.39	0.37	0.41	0.40	0.49
	3:00:00	0.00	0.00	0.16	0.21	0.27	0.26	0.29	0.28	0.34
	3:05:00	0.00	0.00	0.10	0.13	0.17	0.17	0.19	0.18	0.22
	3:10:00	0.00	0.00	0.05	0.08	0.10	0.10	0.11	0.11	0.13
	3:15:00	0.00	0.00	0.02	0.04	0.04	0.05	0.05	0.05	0.06
	3:20:00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02
	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 STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Meadowlake Industrial F1

Basin ID: Pond B



Example Zone Configuration (Retention Pond)

Watershed Information

Table with watershed parameters: Selected BMP Type (EDB), Watershed Area (17.47 acres), Watershed Length (1,280 ft), Watershed Length to Centroid (640 ft), Watershed Slope (0.020 ft/ft), Watershed Imperviousness (73.00%), Percentage Hydrologic Soil Group A (23.0%), Percentage Hydrologic Soil Group B (77.0%), Percentage Hydrologic Soil Groups C/D (0.0%), 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.

Table of runoff and detention volumes: Water Quality Capture Volume (WQCV) = 0.421 acre-feet, Excess Urban Runoff Volume (EURV) = 1.458 acre-feet, 2-yr Runoff Volume (P1 = 1.19 in.) = 1.212 acre-feet, 5-yr Runoff Volume (P1 = 1.5 in.) = 1.626 acre-feet, 10-yr Runoff Volume (P1 = 1.75 in.) = 1.966 acre-feet, 25-yr Runoff Volume (P1 = 2 in.) = 2.381 acre-feet, 50-yr Runoff Volume (P1 = 2.25 in.) = 2.748 acre-feet, 100-yr Runoff Volume (P1 = 2.52 in.) = 3.187 acre-feet, 500-yr Runoff Volume (P1 = 3.14 in.) = 4.110 acre-feet, Approximate 2-yr Detention Volume = 1.095 acre-feet, Approximate 5-yr Detention Volume = 1.448 acre-feet, Approximate 10-yr Detention Volume = 1.800 acre-feet, Approximate 25-yr Detention Volume = 1.979 acre-feet, Approximate 50-yr Detention Volume = 2.083 acre-feet, Approximate 100-yr Detention Volume = 2.230 acre-feet.

Optional User Overrides

Table for optional user overrides with columns for parameter name, unit, and value (e.g., 1.19 inches, 1.50 inches).

Define Zones and Basin Geometry

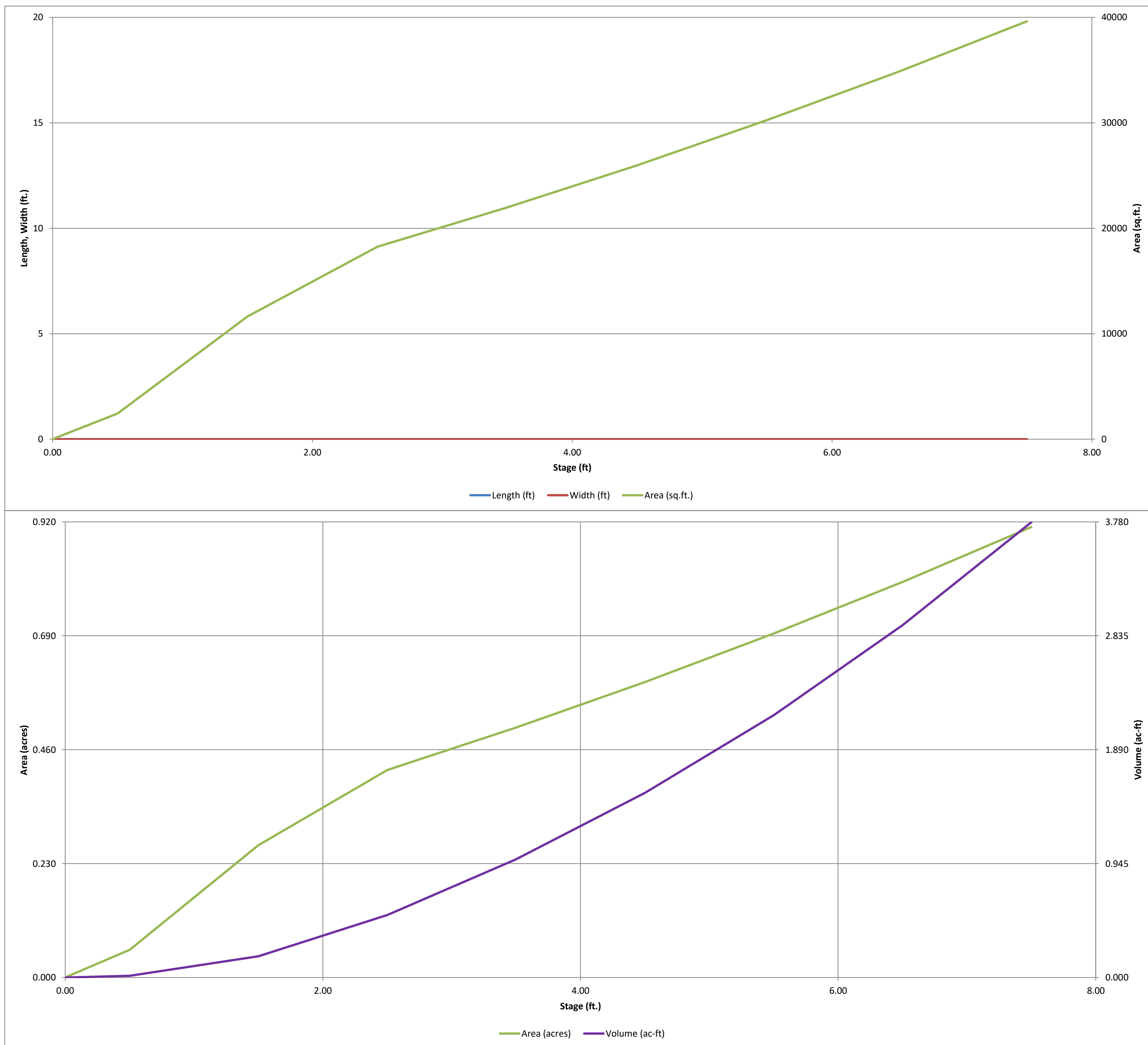
Table of basin geometry parameters: Zone 1 Volume (WQCV) = 0.421 acre-feet, Zone 2 Volume (EURV - Zone 1) = 1.037 acre-feet, Zone 3 Volume (100-year - Zones 1 & 2) = 0.772 acre-feet, Total Detention Basin Volume = 2.230 acre-feet, Initial Surcharge Volume (ISV) = user ft^3, Initial Surcharge Depth (ISD) = user ft, Total Available Detention Depth (Htotal) = user ft, Depth of Trickle Channel (HTC) = user ft, Slope of Trickle Channel (STC) = user ft/ft, Slopes of Main Basin Sides (Smain) = user H:V, Basin Length-to-Width Ratio (RL/W) = user, Initial Surcharge Area (AISV) = user ft^2, Surcharge Volume Length (LISV) = user ft, Surcharge Volume Width (WISV) = user ft, Depth of Basin Floor (HFLOOR) = user ft, Length of Basin Floor (LFLOOR) = user ft, Width of Basin Floor (WFLOOR) = user ft, Area of Basin Floor (AFLOOR) = user ft^2, Volume of Basin Floor (VFLOOR) = user ft^3, Depth of Main Basin (HMAIN) = user ft, Length of Main Basin (LMAIN) = user ft, Width of Main Basin (WMAIN) = user ft, Area of Main Basin (AMAIN) = user ft^2, Volume of Main Basin (VMAIN) = user ft^3, Calculated Total Basin Volume (Vtotal) = user acre-feet.

Main stage-storage table with columns: 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). Rows include 'Top of Micropool' and stages 6733, 6735, 6740 with associated area and volume data.



# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

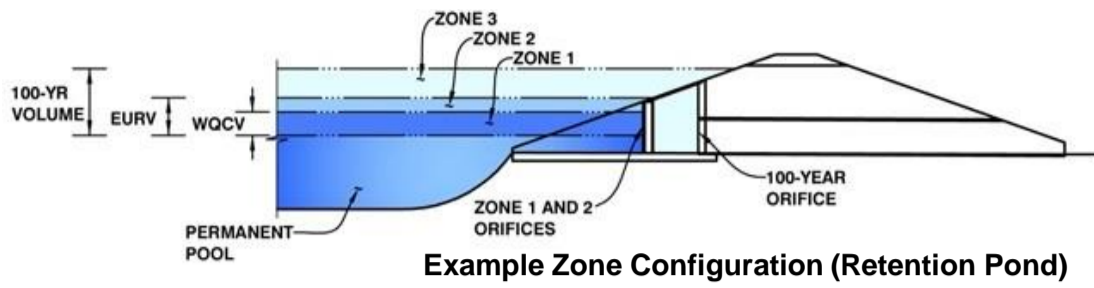


# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

**Project: Meadowlake Industrial F1**

**Basin ID: Pond B**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.26	0.421	Orifice Plate
Zone 2 (EURV)	4.38	1.037	Circular Orifice
Zone 3 (100-year)	5.58	0.772	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>2.230</b>	

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

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

**Calculated Parameters for Underdrain**

Underdrain Orifice Area =	N/A	ft <sup>2</sup>
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)**

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.26	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	1.89	sq. inches (diameter = 1-9/16 inches)

**Calculated Parameters for Plate**

WQ Orifice Area per Row =	1.313E-02	ft <sup>2</sup>
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft <sup>2</sup>

**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	0.75	1.50					
Orifice Area (sq. inches)	1.89	1.89	1.89					

	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)**

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.27	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	4.44	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	2.00	N/A	inches

**Calculated Parameters for Vertical Orifice**

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.02	N/A	ft <sup>2</sup>
Vertical Orifice Centroid =	0.08	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 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H <sub>o</sub> =	4.50	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.67	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	2.92	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

**Calculated Parameters for Overflow Weir**

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H <sub>g</sub> =	4.50	N/A	feet
Overflow Weir Slope Length =	2.92	N/A	feet
Grate Open Area / 100-yr Orifice Area =	8.80	N/A	
Overflow Grate Open Area w/o Debris =	11.52	N/A	ft <sup>2</sup>
Overflow Grate Open Area w/ Debris =	5.76	N/A	ft <sup>2</sup>

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.20	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	12.50		inches

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

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.31	N/A	ft <sup>2</sup>
Outlet Orifice Centroid =	0.58	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.97	N/A	radians

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

Spillway Invert Stage =	6.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	50.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

**Calculated Parameters for Spillway**

Spillway Design Flow Depth =	0.50	feet
Stage at Top of Freeboard =	7.50	feet
Basin Area at Top of Freeboard =	0.91	acres
Basin Volume at Top of Freeboard =	3.78	acre-ft

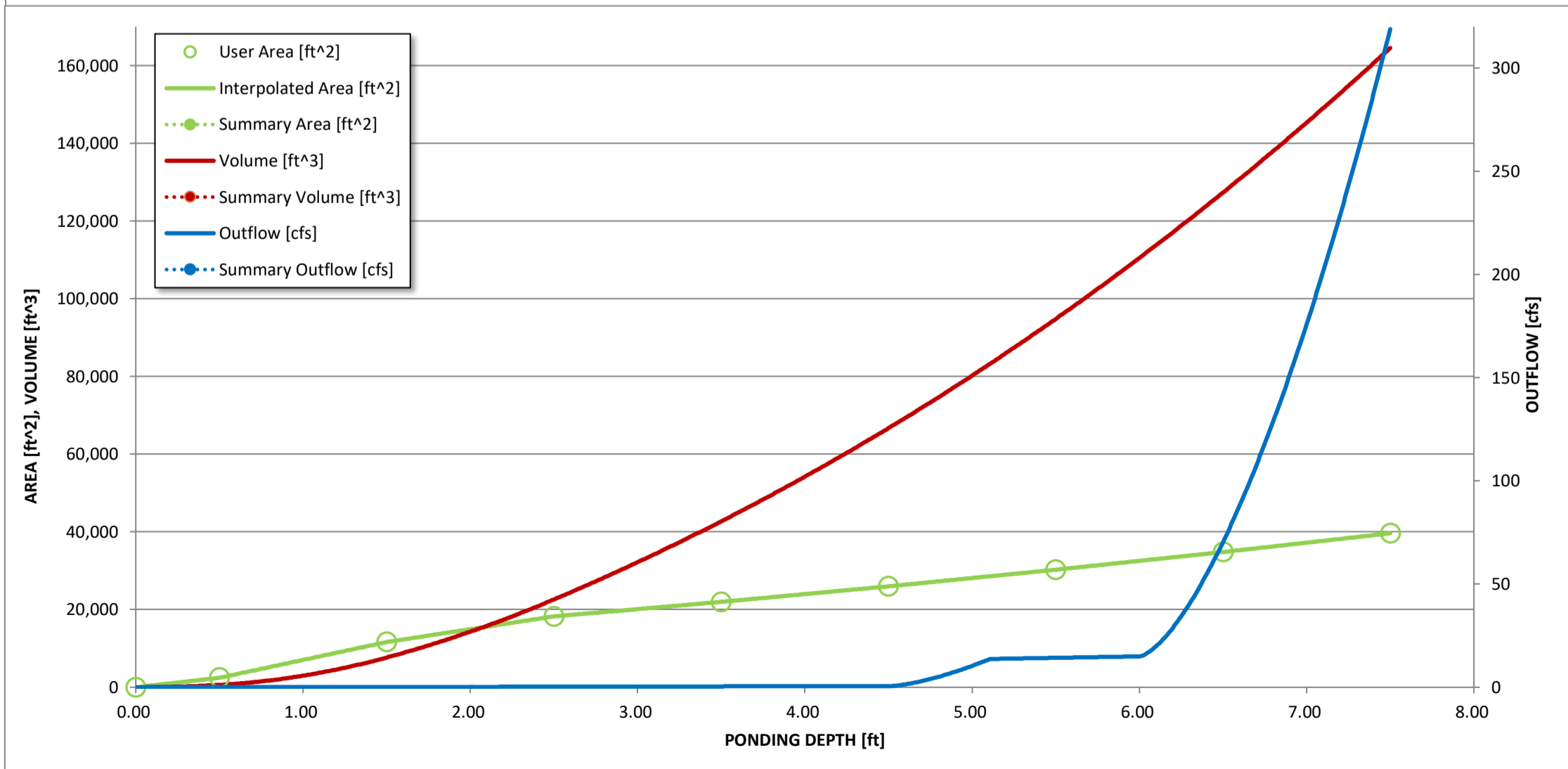
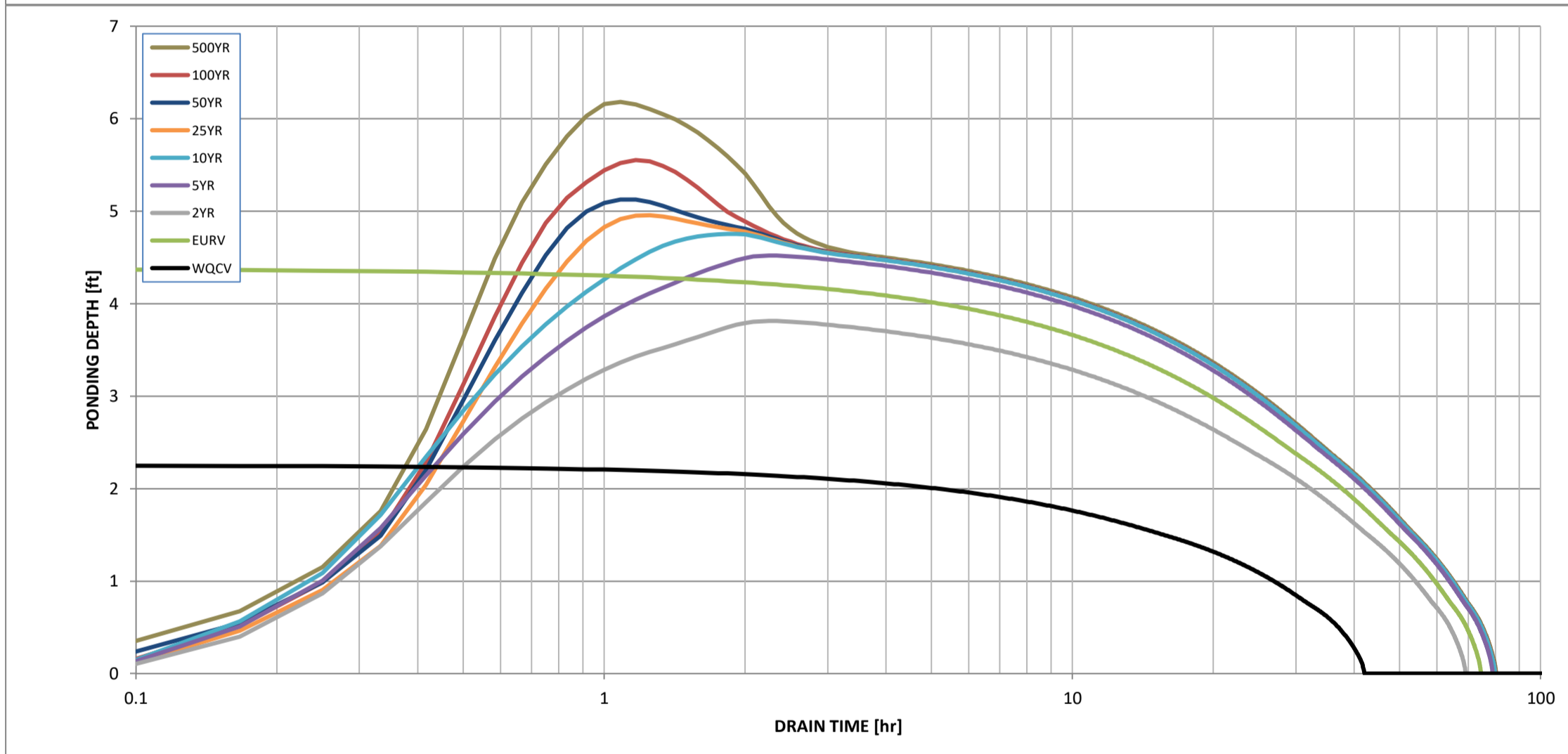
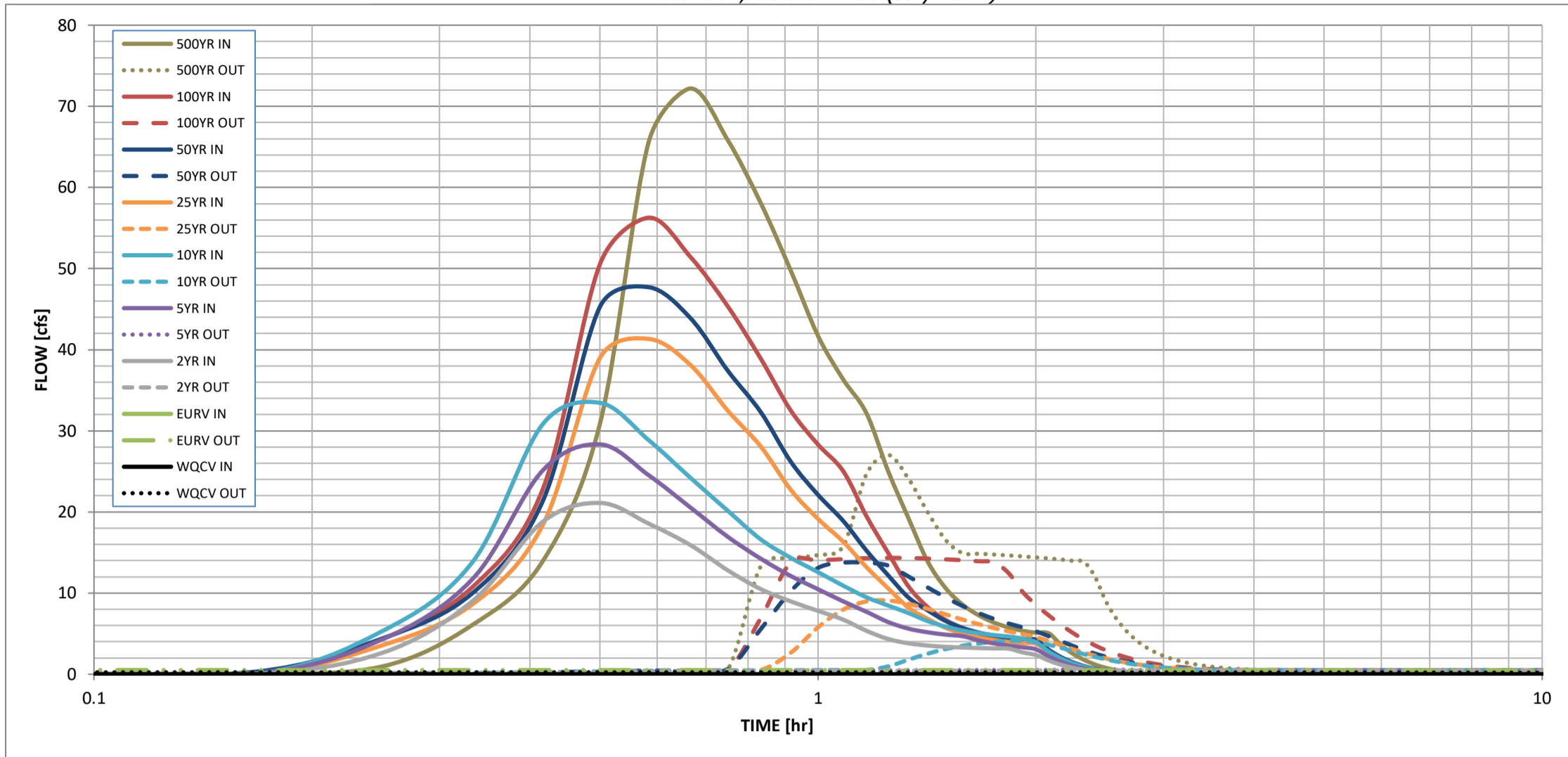
**Routed Hydrograph Results**

*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) =	0.421	1.458	1.212	1.626	1.966	2.381	2.748	3.187	4.110
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.212	1.626	1.966	2.381	2.748	3.187	4.110
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	3.6	6.2	12.0	15.6	20.5	29.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.02	0.21	0.35	0.69	0.89	1.17	1.67
Peak Inflow Q (cfs) =	N/A	N/A	21.1	28.3	33.4	41.3	47.7	56.3	72.2
Peak Outflow Q (cfs) =	0.2	0.5	0.5	0.6	4.1	9.1	13.7	14.3	27.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.7	0.8	0.9	0.7	0.9
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.3	0.7	1.1	1.2	1.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	37	63	59	67	66	64	63	62	59
Time to Drain 99% of Inflow Volume (hours) =	<b>40</b>	69	65	73	73	72	72	71	69
Maximum Ponding Depth (ft) =	2.26	4.38	3.81	4.52	4.76	4.96	5.13	5.55	6.18
Area at Maximum Ponding Depth (acres) =	0.38	0.59	0.53	0.60	0.62	0.64	0.66	0.70	0.77
Maximum Volume Stored (acre-ft) =	0.422	1.460	1.141	1.537	1.683	1.809	1.919	2.211	2.673

# DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.06 (July 2022)*



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

# DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

## Inflow Hydrographs

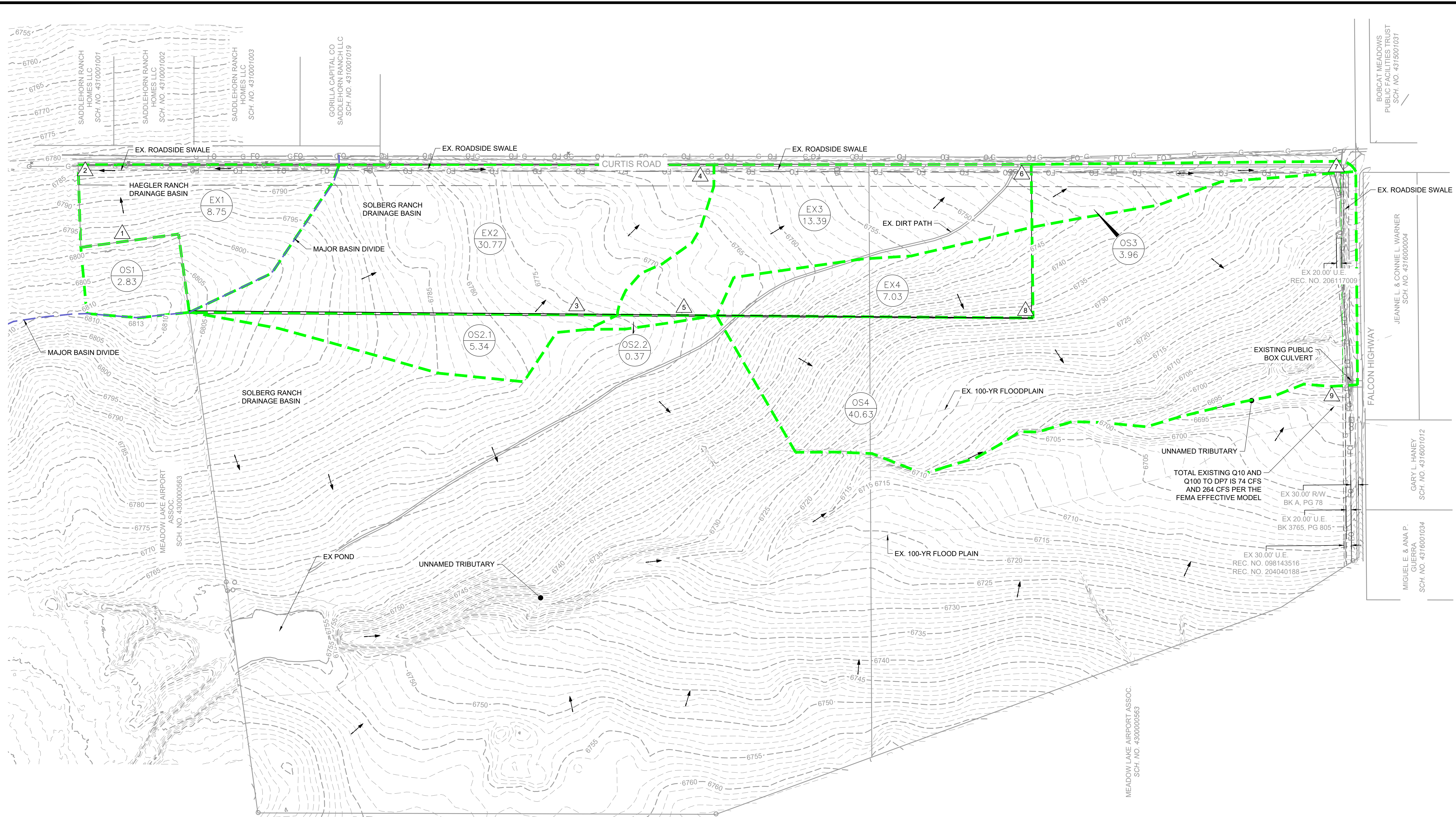
The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.03	0.95
	0:15:00	0.00	0.00	2.63	4.28	5.30	3.55	4.39	4.32	6.08
	0:20:00	0.00	0.00	9.02	11.74	13.83	8.63	10.00	10.76	13.93
	0:25:00	0.00	0.00	18.79	25.11	30.82	18.37	21.33	22.79	30.93
	0:30:00	0.00	0.00	21.11	28.33	33.45	39.00	45.32	50.58	65.54
	0:35:00	0.00	0.00	18.57	24.54	28.87	41.34	47.71	56.28	72.21
	0:40:00	0.00	0.00	15.91	20.54	24.20	38.11	43.89	51.43	65.89
	0:45:00	0.00	0.00	12.82	16.96	20.17	32.52	37.45	45.39	58.10
	0:50:00	0.00	0.00	10.50	14.25	16.63	28.09	32.33	38.92	49.80
	0:55:00	0.00	0.00	8.98	12.12	14.36	22.75	26.23	32.53	41.71
	1:00:00	0.00	0.00	7.81	10.48	12.58	19.15	22.12	28.32	36.34
	1:05:00	0.00	0.00	6.73	8.98	10.92	16.34	18.90	25.04	32.17
	1:10:00	0.00	0.00	5.35	7.69	9.48	13.20	15.24	19.48	25.03
	1:15:00	0.00	0.00	4.34	6.43	8.46	10.58	12.19	14.96	19.24
	1:20:00	0.00	0.00	3.81	5.61	7.54	8.21	9.45	10.83	13.93
	1:25:00	0.00	0.00	3.53	5.17	6.55	6.84	7.88	8.28	10.63
	1:30:00	0.00	0.00	3.37	4.88	5.87	5.72	6.56	6.70	8.58
	1:35:00	0.00	0.00	3.29	4.68	5.39	4.99	5.71	5.70	7.27
	1:40:00	0.00	0.00	3.22	4.17	5.05	4.51	5.13	5.01	6.36
	1:45:00	0.00	0.00	3.18	3.79	4.82	4.20	4.76	4.55	5.76
	1:50:00	0.00	0.00	3.14	3.51	4.65	3.98	4.50	4.23	5.35
	1:55:00	0.00	0.00	2.69	3.31	4.39	3.84	4.33	4.06	5.12
	2:00:00	0.00	0.00	2.36	3.07	3.95	3.76	4.24	4.00	5.04
	2:05:00	0.00	0.00	1.68	2.18	2.79	2.67	3.01	2.85	3.59
	2:10:00	0.00	0.00	1.16	1.52	1.94	1.86	2.10	2.00	2.52
	2:15:00	0.00	0.00	0.80	1.03	1.34	1.29	1.45	1.39	1.75
	2:20:00	0.00	0.00	0.53	0.68	0.90	0.87	0.97	0.93	1.17
	2:25:00	0.00	0.00	0.34	0.44	0.58	0.57	0.64	0.61	0.77
	2:30:00	0.00	0.00	0.21	0.28	0.37	0.37	0.42	0.40	0.50
	2:35:00	0.00	0.00	0.11	0.16	0.21	0.22	0.24	0.23	0.29
	2:40:00	0.00	0.00	0.05	0.08	0.09	0.10	0.12	0.11	0.14
	2:45:00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.03	0.04
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	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 E – DRAINAGE MAPS**





**LEGEND:**

- EXISTING MAJOR CONTOUR  -5250-
- EXISTING MINOR CONTOUR
- FLOW DIRECTION  ←
- DRAINAGE BASIN
- DESIGN POINT 11 BASIN DESIGNATION
- EXISTING BASIN LABEL 1.25 AREA (AC.)

SUMMARY RUNOFF TABLE				
BASIN	AREA (ac)	% IMPERVIOUS	Q5 (cfs)	Q100 (cfs)
EX1	8.75	5	3.4	18.3
EX2	30.77	3	9.5	57.8
EX3	13.39	5	4.5	25.4
EX4	7.03	2	2.1	14.3
OS1	2.83	2	1.0	6.7
OS2.1	5.34	2	1.8	11.9
OS2.2	0.37	2	0.1	0.9
OS3	3.96	11	2.1	9.2
OS4	40.63	3	10.7	64.7

DESIGN POINT SUMMARY TABLE			
DESIGN POINT	CONTRIBUTING BASINS	SQ5 (cfs)	SQ100 (cfs)
1	OS1	1.0	6.7
2	EX1, DP1	4.2	23.9
3	OS2.1	1.8	11.9
4	EX2, DP3	10.9	67.6
5	OS2.2	0.1	0.9
6	EX3, DP5	13.2	79.9
7	OS3, DP6	13.2	77.4
8	EX4	2.1	14.3
9	OS4, DP7, DP8	22.6	135.2

Job No.: 2202774  
 Prepared By: AB  
 Date: 4/9/2024

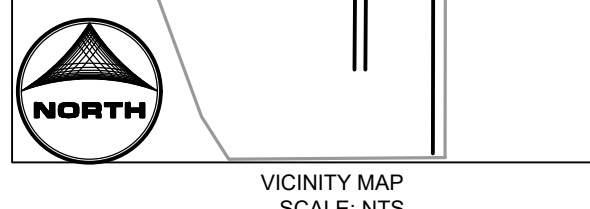
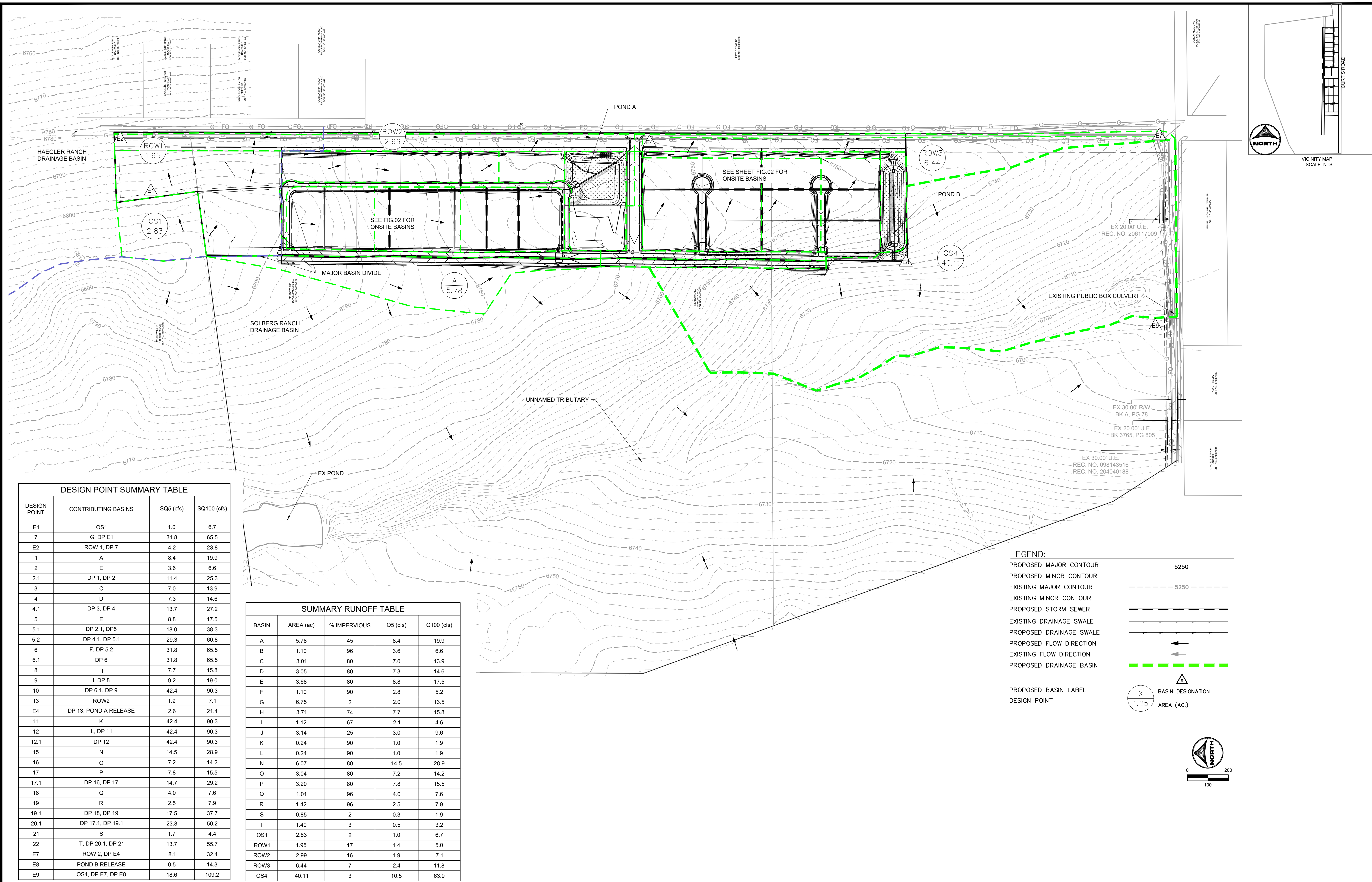
MEADOWLAKE INDUSTRIAL  
 EXISTING DRAINAGE MAP

BOBCAT MEADOWS  
 PUBLIC FACILITIES TRUST  
 SCH. NO. 4316001031

JEANNEL & CONNIE L. WARNER  
 SCH. NO. 4316000004

GARY L. HANEY  
 SCH. NO. 4316001012

MIGUELE & ANA P. GUERRA  
 SCH. NO. 4316001034

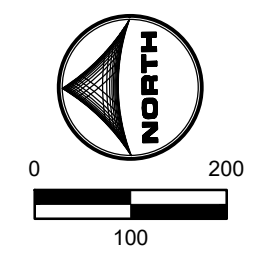


DESIGN POINT	CONTRIBUTING BASINS	SQ5 (cfs)	SQ100 (cfs)
E1	OS1	1.0	6.7
7	G, DP E1	31.8	65.5
E2	ROW 1, DP 7	4.2	23.8
1	A	8.4	19.9
2	E	3.6	6.6
2.1	DP 1, DP 2	11.4	25.3
3	C	7.0	13.9
4	D	7.3	14.6
4.1	DP 3, DP 4	13.7	27.2
5	E	8.8	17.5
5.1	DP 2.1, DP5	18.0	38.3
5.2	DP 4.1, DP 5.1	29.3	60.8
6	F, DP 5.2	31.8	65.5
6.1	DP 6	31.8	65.5
8	H	7.7	15.8
9	I, DP 8	9.2	19.0
10	DP 6.1, DP 9	42.4	90.3
13	ROW2	1.9	7.1
E4	DP 13, POND A RELEASE	2.6	21.4
11	K	42.4	90.3
12	L, DP 11	42.4	90.3
12.1	DP 12	42.4	90.3
15	N	14.5	28.9
16	O	7.2	14.2
17	P	7.8	15.5
17.1	DP 16, DP 17	14.7	29.2
18	Q	4.0	7.6
19	R	2.5	7.9
19.1	DP 18, DP 19	17.5	37.7
20.1	DP 17.1, DP 19.1	23.8	50.2
21	S	1.7	4.4
22	T, DP 20.1, DP 21	13.7	55.7
E7	ROW 2, DP E4	8.1	32.4
E8	POND B RELEASE	0.5	14.3
E9	OS4, DP E7, DP E8	18.6	109.2

BASIN	AREA (ac)	% IMPERVIOUS	Q5 (cfs)	Q100 (cfs)
A	5.78	45	8.4	19.9
B	1.10	96	3.6	6.6
C	3.01	80	7.0	13.9
D	3.05	80	7.3	14.6
E	3.68	80	8.8	17.5
F	1.10	90	2.8	5.2
G	6.75	2	2.0	13.5
H	3.71	74	7.7	15.8
I	1.12	67	2.1	4.6
J	3.14	25	3.0	9.6
K	0.24	90	1.0	1.9
L	0.24	90	1.0	1.9
N	6.07	80	14.5	28.9
O	3.04	80	7.2	14.2
P	3.20	80	7.8	15.5
Q	1.01	96	4.0	7.6
R	1.42	96	2.5	7.9
S	0.85	2	0.3	1.9
T	1.40	3	0.5	3.2
OS1	2.83	2	1.0	6.7
ROW1	1.95	17	1.4	5.0
ROW2	2.99	16	1.9	7.1
ROW3	6.44	7	2.4	11.8
OS4	40.11	3	10.5	63.9

**LEGEND:**

- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- EXISTING DRAINAGE SWALE
- PROPOSED DRAINAGE SWALE
- PROPOSED FLOW DIRECTION
- EXISTING FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- PROPOSED BASIN LABEL
- DESIGN POINT



DRAWN BY: AB/DH    JOB DATE: 4/16/2024    BAR IS ONE INCH ON OFFICIAL DRAWINGS.  
 APPROVED: CM    JOB NUMBER: 2202774    0" = 1"  
 CAD DATE: 4/19/2024    IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.  
 CAD FILE: J:\2022\2202774\CAD\DWG\CIDrainage\Pr\_Drainage\_Map

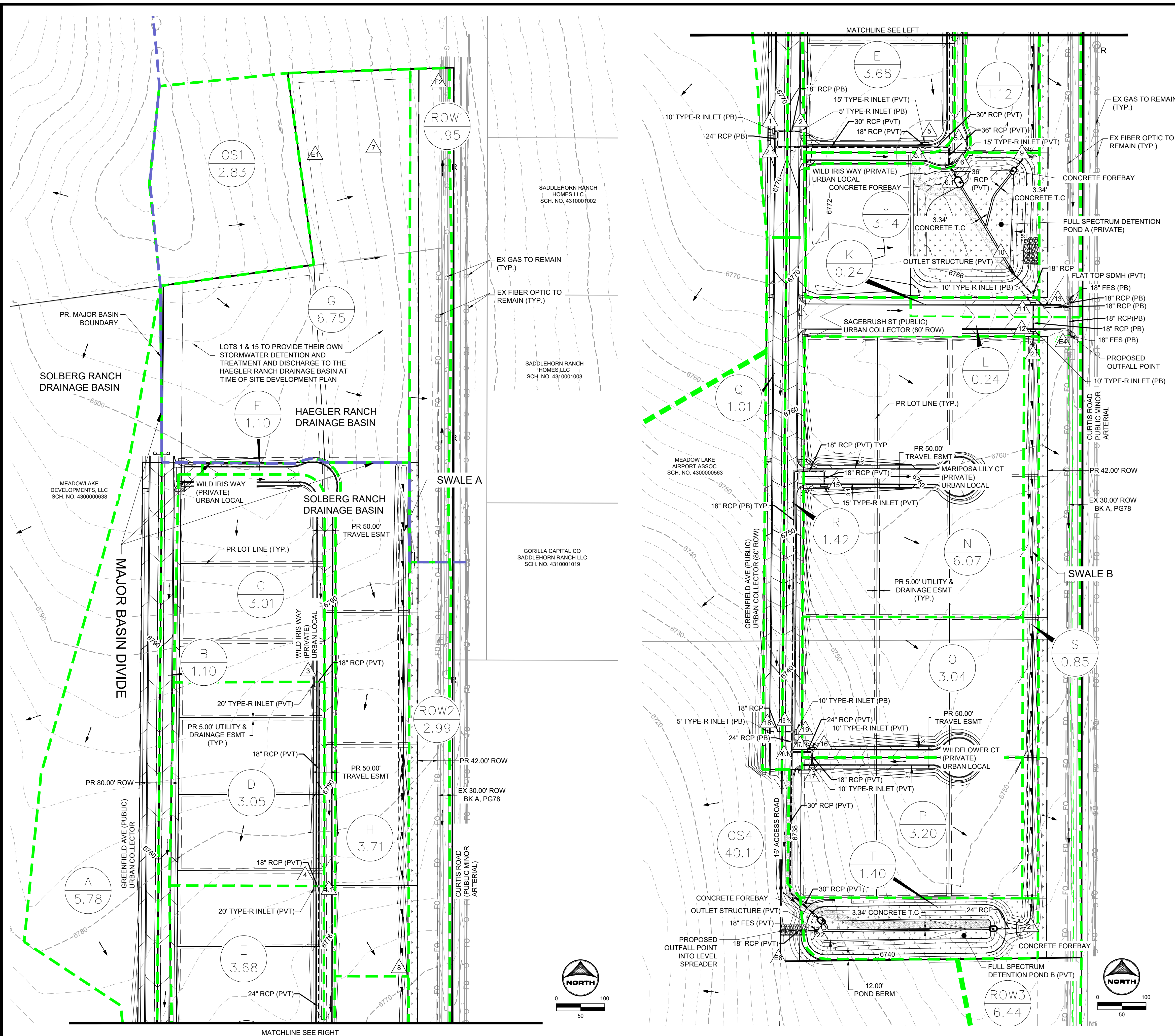
NO.	DATE	BY	REVISION DESCRIPTION

**HRGreen**  
 HR GREEN - COLORADO SPRINGS  
 1975 RESEARCH PARKWAY SUITE 230  
 COLORADO SPRINGS, CO 80920  
 PHONE: 719.384.2440  
 FAX: 713.965.0044

**MEADOW LAKE INDUSTRIAL PHASE 1**  
**MEADOWLAKE DEVELOPMENTS, LLC**  
 EL PASO COUNTY, CO

DRAINAGE MAPS  
 PROPOSED DRAINAGE MAP

SHEET  
**DR**  
**2**

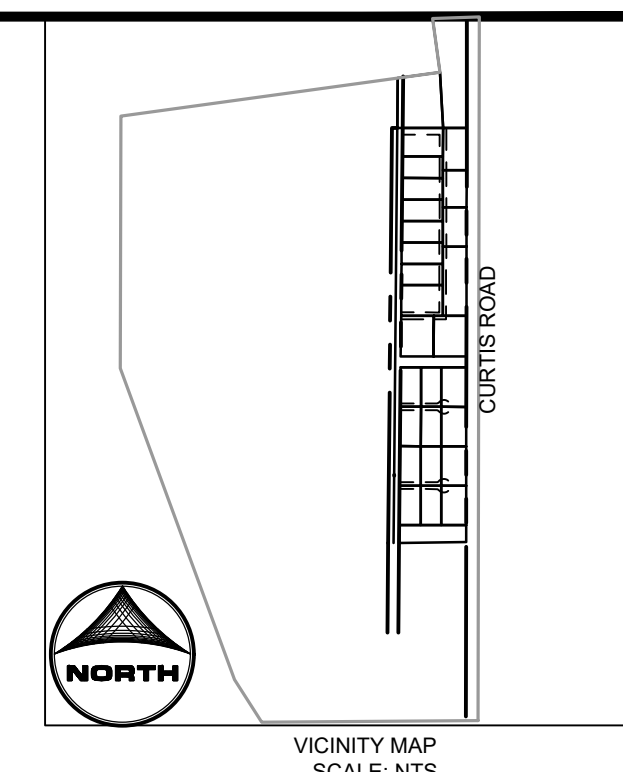
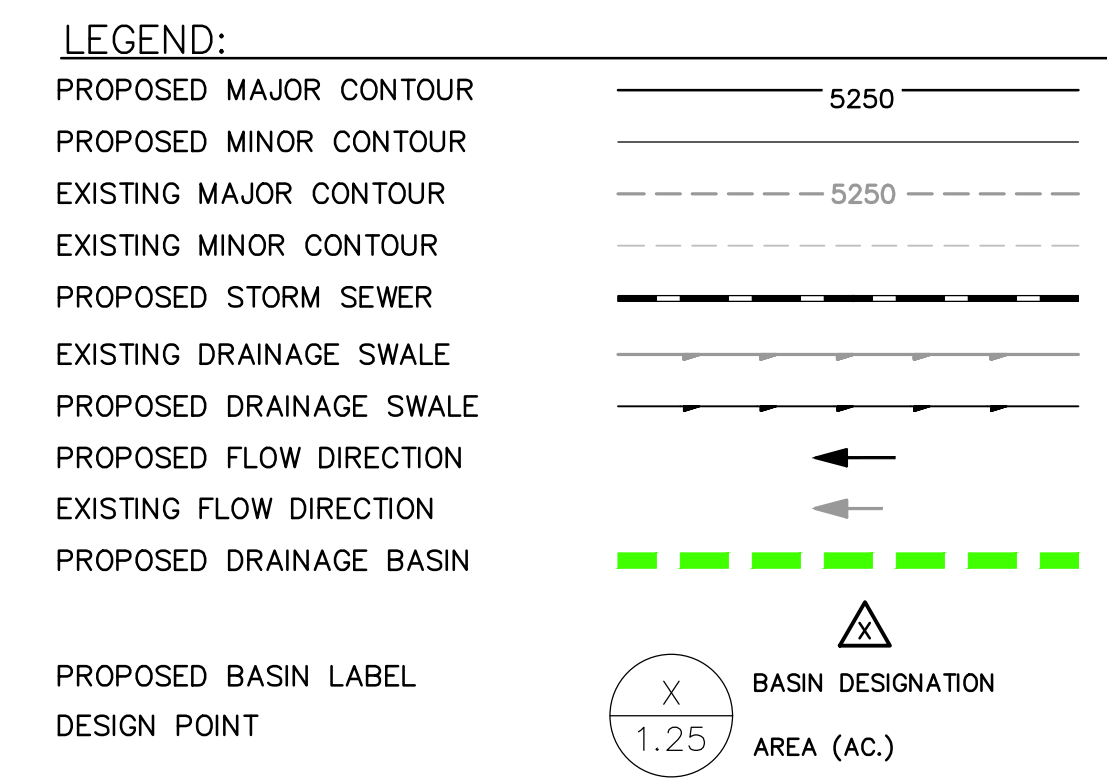


### DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	QS (cfs)	Q100 (cfs)
E1	OS1	1.0	6.7
7	G, DP E1	31.8	65.5
E2	ROW 1, DP 7	4.2	23.8
1	A	8.4	19.9
2	E	3.6	6.6
2.1	DP 1, DP 2	11.4	25.3
3	C	7.0	13.9
4	D	7.3	14.6
4.1	DP 3, DP 4	13.7	27.2
5	E	8.8	17.5
5.1	DP 2.1, DP 5	18.0	38.3
5.2	DP 4.1, DP 5.1	29.3	60.8
6	F, DP 5.2	31.8	65.5
6.1	DP 6	31.8	65.5
8	H	7.7	15.8
9	I, DP 8	9.2	19.0
10	DP 6.1, DP 9	42.4	90.3
13	ROW2	1.9	7.1
E4	DP 13, POND A RELEASE	2.6	21.4
11	K	42.4	90.3
12	L, DP 11	42.4	90.3
12.1	DP 12	42.4	90.3
15	N	14.5	28.9
16	O	7.2	14.2
17	P	7.8	15.5
17.1	DP 16, DP 17	14.7	29.2
18	Q	4.0	7.6
19	R	2.5	7.9
19.1	DP 18, DP 19	17.5	37.7
20.1	DP 17.1, DP 19.1	23.8	50.2
21	S	1.7	4.4
22	T, DP 20.1, DP 21	13.7	55.7
E7	ROW 2, DP E4	8.1	32.4
E8	POND B RELEASE	0.5	14.3
E9	OS4, DP E7, DP E8	18.6	109.2

### SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMPERVIOUS	Q5 (cfs)	Q100 (cfs)
A	5.78	45	8.4	19.9
B	1.10	96	3.6	6.6
C	3.01	80	7.0	13.9
D	3.05	80	7.3	14.6
E	3.68	80	8.8	17.5
F	1.10	90	2.8	5.2
G	6.75	2	2.0	13.5
H	3.71	74	7.7	15.8
I	1.12	67	2.1	4.6
J	3.14	25	3.0	9.6
K	0.24	90	1.0	1.9
L	0.24	90	1.0	1.9
N	6.07	80	14.5	28.9
O	3.04	80	7.2	14.2
P	3.20	80	7.8	15.5
Q	1.01	96	4.0	7.6
R	1.42	96	2.5	7.9
S	0.85	2	0.3	1.9
T	1.40	3	0.5	3.2
OS1	2.83	2	1.0	6.7
ROW1	1.95	17	1.4	5.0
ROW2	2.99	16	1.9	7.1
ROW3	6.44	7	2.4	11.8
OS4	40.11	3	10.5	63.9



DRAWN BY: AB/DH    JOB DATE: 4/16/2024  
 APPROVED: CM    JOB NUMBER: 2202774  
 CAD DATE: 4/19/2024  
 CAD FILE: J:\2022\2202774\CAD\DWG\CIDrainage\Pr\_Drainage\_Map

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

NO.	DATE	BY	REVISION DESCRIPTION

**HRGreen**  
 HR GREEN - COLORADO SPRINGS  
 1975 RESEARCH PARKWAY SUITE 230  
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**MEADOW LAKE INDUSTRIAL PHASE 1**  
 MEADOWLAKE DEVELOPMENTS, LLC  
 EL PASO COUNTY, CO

DRAINAGE MAPS  
 PROPOSED DRAINAGE MAP

SHEET  
**DR**  
**3**