PRELIMINARY DRAINAGE REPORT

for

WINDERMERE FILING NO. 2

Colorado Springs, CO

August 2024

Prepared for:

Colo Windermere #2, LLC
4164 Austin Bluffs Parkway, #361
Colorado Springs, CO 80918
Contact: James Todd Stephens

Prepared by:

Drexel, Barrell & Co.
101 Sahwatch St, Suite 100
Colorado Springs, CO 80903
Contact: Tim McConnell, P.E.
(719) 260-0887

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APPENDICES

PRELIMINARY DRAINAGE REPORT

for

WINDERMERE FILING NO. 2

Colorado Springs, Colorado

1.0 CERTIFICATION STATEMENTS

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 El Paso County for drainage reports, and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omission on my part in preparing this report.

_____

Tim D. McConnell, P.E. Date
Colorado P.E. License No. 33797
For and on Behalf of Drexel, Barrell & Co.

DEVELOPER'S STATEMENT

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

Business Name: Colo Windermere #2, LLC

By: _____

James Todd Stephens Date
Title: Owner
Address: 4164 Austin Bluffs Parkway, #361
Colorado Springs, CO 80918

EL PASO COUNTY

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

_____

County Engineer/ECM Administrator Date

CONDITIONS

PRELIMINARY DRAINAGE REPORT

for

WINDERMERE FILING NO. 2

Colorado Springs, Colorado

2.0 PURPOSE

This report is prepared by Drexel, Barrel & Co in support of the Windermere Filing No. 2 subdivision. This preliminary drainage report is presented in order to determine the adequacy of the existing drainage facilities based upon the anticipated development. This report is associated with a preliminary plan amendment, which triggered the need for this drainage analysis. This development is in the concept stage and as such no site work, grading or drainage and utility installation is to occur at this time. The drainage report will be required to be updated upon final layout, grading and drainage design.

3.0 GENERAL SITE DESCRIPTION

Location

The site is located at the northwest corner of N. Carefree Cir. and Marksheffel Rd. - the E 1/2 of Section 29, Township 13 S, Range 65 W of the 6th P.M., El Paso County, Colorado.

The site is bound on the west by Antelope Ridge Dr., on the north by the Windermere Filing No. 1 subdivision (Pronghorn Meadows Circle), on the east by Marksheffel Rd., and on the south by N. Carefree Cir.

Site Conditions

The site is approximately 9.26 acres in size and is proposed as a multi-family home subdivision. The proposed site development includes approximately 200 multi-family units. The site has recently been overlot graded, seeded and mulched as part of the Windermere Filing No. 1 development to the north. The site is located within the Sand Creek Drainage Basin. Historically, this site drains to the southeast towards the intersection of N. Carefree Circle and Marksheffel Road.

This site was studied as part of the approved Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1, by Classic Consulting (October 2014) and the more recently approved Final Drainage Report for Windermere Filing No. 1, by Drexel, Barrell & Co. (April 2022).

Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the site is underlain by Truckton sandy loam, a type 'A' hydrologic soil. See appendix for map.

Climate

This area of El Paso County can be described as the foothills, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry, and summers

relatively warm and dry. Precipitation ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are common during the summer months.

Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel #08041C0543 G (December 7, 2018) the project site is within a designated Zone X area described as "area of minimal hazard". A firmette map is included in the appendix.

4.0 HISTORIC HYDROLOGY

The existing condition described in the previously approved *Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1, by Classic Consulting (October 2014)* of the project area is presented here for reference, specifically for the offsite basins that have not changed from the time of the Classic Consulting report.

A copy of the existing conditions map from the Classic Consulting report is provided in the appendix and presented as the historic condition. Reference Section 5.0 below for the existing condition analysis.

5.0 EXISTING HYDROLOGY

As described above, the Windermere Filing No. 2 site was overlot graded as part of the Windermere Filing No. 1 development and studied as part of the previously approved *Final Drainage Report for Windermere Filing No. 1, by Drexel, Barrell & Co. (April 2022)*. A full-spectrum detention facility was designed as part of Filing No.1 and in order to minimize future grading within the detention facility area, the volume was based on assumed final build-out watershed imperviousness of 68%.

The following basin descriptions are pulled directly from the previously approved Windermere Filing No. 1 Final Drainage Report.

South area – tributary to existing N. Carefree/Marksheffel storm system

Basin C3 covers an area of 0.63-acres of pond embankment and is located along the southeasterly project boundary along N. Marksheffel Road. This basin generates flows of Q_5=0.5 cfs and Q_{100}=2.5 cfs that travel offsite to the east and ultimately south along N. Marksheffel Road towards the existing storm inlet at DP-S. As this basin is to remain undeveloped, the discharge of flows offsite is acceptable under MS4 criteria.

Existing Design Point 4 covers runoff from Basin D-16 of the Pronghorn Meadows Subdivision to the west of this project development. An existing 8' sump curb inlet intercepts the runoff (Q_5=4.9 cfs and Q_{100}=10.7 cfs) and directs it via existing 24" RCP across Antelope Ridge Drive, where it currently discharges into a roadside swale along N. Carefree Circle. Design and extension of this storm system to the east and connection to the existing storm sewer system at DP-S will be completed at the time of development of Tract B, and will be analyzed at final time by a final drainage report for Tract B.

Basin C4 is accurately shown in the previously approved drainage report for Tract B - along N. Carefree

Review C2: It appears that excerpt was not provided in the appendix.

Review C3: Unresolved. Acknowledge that an excerpt was provided; however, it is not relevant to the project. Please provide a delineation of the subject project on excerpt map, text discussion, and calculations of the basin that match the historical conditions of the proposed project.

Review C4: Unresolved. Excerpts from the SF2126 - Windermere final flat filing 1 is not existing condition. They are proposed condition.

Review C3: Existing condition cannot be fully reviewed without existing drainage map. Additional comments may be added once the existing drainage map is provided.

Review C4: Unresolved. Please provide the existing condition - the no-build scenario. A comparison of the discharge leaving the site between the no-build condition and the proposed condition is required. Further comments may be generated once the existing condition is provided.

Circle and generates flows of Q_5=2.1 cfs and Q_{100}=6.9 cfs that travel to the south and ultimately combine with flows from Design Point 4 in a roadside swale traveling east along N. Carefree Circle towards DP-S.

A portion of basin C4 (0.72-acres) is conservatively assumed to cover future development of Tract B that will drain offsite and will not be treated for Water Quality. As per El Paso County ECM App I.7.1.C.1, this area is less than 20% of site area or 1-acre, and is due to grading restrictions (an exclusion listed in ECM App I.7.1.B), the discharge of these flows offsite to the southern drainageway is permitted under County MS4 criteria. This assumption of grading and future use will be required to be reviewed at the time of replat for future development of Tract B. To meet this criteria, this area will be required to remain impervious, or be redirected to drain to the detention pond.

DP-S is located at the existing area inlet in Basin C3. The flows leave this inlet via an existing 24" storm pipe that connects to the existing storm system in N. Carefree Cir., which then carries the flows to the south. This design point reflects the flows from Basins C3 & C4, detained flows released by the south detention facility, offsite Basin EXR, and offsite Basin D-16. The combined flows at DP-S are Q_5=10.0 cfs and Q_{100}=33.7 cfs, which is less than the existing condition at Ex. DP-6 of Q_5=18.4 cfs and Q_{100}=42.6cfs.

Existing Design Point 19 represents the flows generated by offsite Basin NC2 (Q_5=5.1 cfs and Q_{100}=9.8 cfs), these flows are picked up by the existing 15' triple at-grade inlet just west of the intersection with N. Marksheffel Road. The flows then leave this inlet via an existing 18" storm pipe to the east, ultimately converging with the flows from DP-S at an existing manhole at existing design point J1.

Flows of Q_5=15.1 cfs and Q_{100}=43.5 cfs leave DP-J1 via an existing 24" storm pipe and are carried to the existing 10' sump inlet at Existing DP-20 in offsite Basin NC1. The flows leave this existing inlet via an existing 30" storm pipe ultimately traveling to the south via the Marksheffel Road storm system. Developed runoff rates at DP-20 (Q_5=17.0 cfs and Q_{100}=46.9 cfs) are less than those in the existing condition (Q_5=24.2 cfs and Q_{100}=53.3 cfs, thereby reducing impact to the existing storm sewer system.

6.0 PROPOSED HYDROLOGY

This preliminary drainage report is presented in order to determine the adequacy of the existing drainage facilities based upon the anticipated development. This report is associated with a preliminary plan amendment, which triggered the need for this drainage analysis. This development is in the concept stage and as such no site work, grading or drainage and utility installation is to occur at this time. The drainage report will be required to be updated upon final layout, grading and drainage design.

The Rational Method was used to determine runoff quantities for the 5- and 100-year storm recurrence intervals, and Mile High Flood District design software (MHFD-Detention v.4.03) for pond analysis. See below for a summary runoff table and description of each design point.

The basins and design points described below are based on a preliminary concept site design. Grading and subsequent areas tributary to the detention facility are subject to change and any areas not tributary to the detention facility will be assessed for water quality treatment in adherence to County drainage criteria at the final drainage report stage.

Rational Method Runoff Summary

BASIN	AREA (AC)	Q5 (cfs)	Q100 (cfs)
A1	6.79	12.6	27.9
B1	3.33	7.2	16.0
B2	0.49	1.0	2.3
B4	0.16	0.4	0.8
P1	1.00	0.5	2.7
D16	2.73	4.9	10.7
A2	0.92	0.7	3.4
NC2	1.61	6.3	12.1
EXR	0.53	2.4	4.4
C3	0.63	0.5	2.5
Pond Release	1.00	0.3	10.6
NC1	0.43	1.9	3.4

The proposed runoff of A1 is higher than that of B3 in the excerpts (SF2126). Please clarify whether the south pond will still have sufficient capacity to accommodate this increase. This comment arises because the excerpts were not included in Review C3.

Design Point 1 represents the flows generated by basin A1 (Q_5=12.6 cfs and Q_{100}=27.9 cfs). These flows sheet flow across the site, from northwest to southeast, before being discharged into the existing detention facility. No early grading is proposed with this concept design, and it is acknowledged that prior to any grading an adequate method will need to be provided for flows to discharge into the existing detention facility.

Design Point 2 covers flow from offsite basins B1 and B2. Flows of Q_5=8.1 cfs and Q_{100}=17.7 cfs travel via the existing private 24" RCP storm sewer to the east and discharge into the north end of the existing detention facility.

Design Point 3 represents all flows reaching the existing detention facility (Basins B4, P1, DP1, and DP2) for a total flow of Q_5=19.8 cfs and Q_{100}=45.8 cfs. The existing detention facility and modifications for this developed condition are described further below.

Design Point 4 is identical to DP-4-EX in the historic and existing condition, and represents flows (Q_5= 4.9cfs and Q_{100}=10.7cfs) from offsite basin D16 which discharges on to the Windermere property. In the developed condition, it is proposed that the roadside ditch be continued to capture flows that are not able to be captured by the detention facility due to grading restraints. This swale would allow flows to continue to the east to be captured by the existing Type D area inlet at the intersection of N. Carefree Cir. and Marksheffel Road. As the grading for the site is refined, the area tributary to the detention facility will be maximized to the extent possible given the site grading constraints. Appropriate erosion control measures will be provided at the terminus of the swale to aid in erosion and scour mitigation.

Design Point 19 is equivalent to DP-19-EX from the historic and existing condition, and consists of runoff from off-site basin NC-2 with a flow of Q_5= 8.3cfs and Q_{100}=12.1cfs) An existing 15" Type R at-grade curb inlet just west of the intersection of N. Carefree Circle

The existing condition discussion is missing. Please revise it to reflect the proposed condition in SF2126. Additionally, the runoff at DP19 for this project is higher than what was calculated in SF2126. Please clarify whether the existing storm pipe, existing inlets have sufficient capacity to handle the increased runoff. Pipe, and inlet capacity calculations will be required in the FDR. This comment arises because the excerpts were not included in Review C3.

and Marksheffel Road intercepts a portion of this runoff (Q_5=4.8 cfs and Q_{100}=8.1 cfs) and discharges to the east via public 18" RCP storm sewer.

Design Point S is located at the same existing area inlet as DP-6-EX. In the developed condition flows reaching this point, from basins EXR, A2, C3, DP4, in addition to the proposed pond release rate will equal Q_5=7.8 cfs and Q_{100}=29.2 cfs. Flows exit this area inlet by public 24" RCP to the south.

Design Point J1 is located at the existing manhole on the north side of N. Carefree Circle and represents the combining of flows from DP-19 and DP-S. Flows of Q_5=12.4 cfs and Q_{100}=38.0 cfs continue to the south via the existing public 30" RCP towards DP-20.

Design Point 20 (equivalent to DP-EX-20) as in the existing condition consists of surface runoff from basin NC-1, flowby from the at-grade inlet at DP-19 and pipe flow from DP-J1. An existing public 10' Type R sump inlet intercepts all the surface runoff and combines it with the upstream flows from DP-J1 and DP-19 existing at-grade inlet capture. Total developed runoff at this location is Q_5=13.7 cfs and Q_{100}=40.4 cfs. This runoff continues within the existing Marksheffel Road storm system to the south. Should the inlet be clogged, the resulting runoff will continue east via the neighboring curb and gutter.

7.0 EXISTING DETENTION/WATER QUALITY FACILITY

As part of the overlot design for Windermere Filing No. 1, the detention pond located in the southeast corner of the property was designed as a full-spectrum detention facility to capture flows from the Windermere Filing No. 2 basins.

In order to minimize future grading within the detention facility area, the volume was based on an assumed final build-out watershed imperviousness of 68.0%, which considered Windermere Filing No. 2 (Windermere Filing No. 1 – Tract B) as potentially higher density than single-family residential. As part of the Windermere Filing 1 overlot grading, the pond was excavated to full volume and the outlet structure and associated piping installed. An interim orifice plate (assuming full developed condition within the street right-of-way, but no further development) was installed to allow for appropriate WQCV drain time. Once the design is finalized at the final drainage report stage, the orifice plate will need to be switched out to allow for discharge of the developed flows. It is anticipated based on this preliminary design that the restrictor plate will need to be raised to 7.80" above the invert of the 18" outfall pipe. No other portion of the detention facility will need to be modified.

Based on the analysis in this preliminary report, the developed condition encompasses a total of 12.79 acres that is tributary to this existing facility, with a composite imperviousness of 54.9% for the final fully developed condition. Required volumes are listed below.

		Required Volume		
	Imperviousness	**WQCV**	**EURV**	**100-YR**
FINAL	54.9%	0.24	0.83	1.29

The actual pond volume at the proposed spillway stage is 1.15 acre-feet. A concrete forebay with an energy dissipater has been installed where the flows enter the pond. The volume of the forebay was designed for 3% of the WQCV volume for the pond, as is still within that limit for this concept design condition. The flows exit the forebay through a notch, discharging into the concrete trickle channel at the bottom of the pond. The trickle channel conveys the flows to the micropool. The outlet structure then releases the flows at a reduced flow rate with the use of a plate with orifice holes, into a proposed 18" pipe with restrictor plate, discharging into an existing storm inlet at the corner of N. Carefree Circle and Marksheffel Rd, after which the flows continue to the south via the existing storm sewer system.

In accordance with El Paso County criteria, the modified Type C outlet structure with a permanent micropool will release the WQCV over a 40-hour period. Switching out of the orifice plate will ensure that the WQCV release rate remains within criteria for the final developed condition. The outlet structure will remain in place and in this preliminary stage will result in release rates of Q_5=0.3 cfs and Q_{100}=10.6 cfs. For comparison, the existing basin EX-A released flow rates of Q_5=11.3 cfs and Q_{100}=28.2 cfs.

A 27-ft wide riprap emergency spillway is located on the south side of the pond. In the event that water overtops the spillway, flow will discharge into existing area inlet at the intersection of N. Carefree Cir and Marksheffel Rd, where it is then picked up by the existing storm system.

All detention facility calculations, including excerpts for forebay volumes, micropool surface areas, outlet structures, discharge pipes and spillway design are provided in the appendix.

The pond has a 15' wide maintenance access that provides access to the pond bottom, forebay and outlet structure per ECM 3.3.3.K. A private maintenance agreement and O&M manual has been established for this pond as required by the County. Necessary modifications to this maintenance access will be provided with the final drainage report.

8.0 FOUR-STEP PROCESS

This project conforms to the City of Colorado Springs/El Paso County Four Step Process. The process focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

1. ***Employ Runoff Reduction Practices:*** Proposed impervious areas on this site (roofs, asphalt/sidewalk) will sheet flow across landscaped ground as much as possible to slow runoff and increase time of concentration prior to being conveyed to the proposed public streets and storm sewer system. This will minimize directly connected impervious areas within the project site.

2. ***Implement BMP's that provide a Water Quality Capture Volume with slow release:*** Runoff from this project will be treated through capture and slow release of the WQCV in apermanent Extended Detention Basin designed per current City of El Paso County drainage criteria.

3. ***Stabilize Drainage Ways:*** Flows from the detention facility are released directly into the existing storm sewer system and no stabilization will be necessary.

4. ***Implement Site Specific and Other Source Control BMP's:*** The site is proposed as a residential development, and as such standard household source control will be utilized in order to minimize potential pollutants entering the storm system. Example source control measures consist of: garages for storage of household chemicals, trash receptacles for individual households and in common areas for pet waste. The need for Industrial and Commercial BMP's was considered, however per ECM I.7.2.A the need for industrial and commercial BMPs are not applicable for this project.

9.0 GEOTECHNICAL HAZARDS

In accordance with geotechnical recommendations, the project design is intended to direct runoff away from structures, and into the receiving storm sewer system and water quality/detention basins. This will be accomplished by a variety of means, i.e. curb and gutter and storm sewer. Per "Soils and Geology Study, Windermere Subdivision" by RMG, October 26, 2020 (Revised January 18, 2021), and updated with an addendum for Tract B (March 30, 2022)

10.0 FACILITY MAINTENANCE

Ownership and maintenance of all public facilities, generally located within the public right-of-way will be by El Paso County. Ownership and maintenance of all tracts and private facilities will be by the Sands Metropolitan District #4.

11.0 CONSTRUCTION COST ESTIMATE

Construction cost estimate will be provided with the Final Drainage Report.

12.0 DRAINAGE/BRIDGE FEES

Tract B was considered as an open space tract for the drainage fee calculation for Windermere Filing No. 1. Development of this tract will require payment of drainage and bridge fees associated with the proposed impervious acreage. This will be determined with the Final Drainage Report for this development as site imperviousness is confirmed.

13.0 CONCLUSIONS

The Windermere Filing No. 2 project has been designed in accordance with El Paso County criteria. The detention facility has been designed to limit the release of storm runoff to historic conditions. This development will not negatively impact or increase flows in the downstream facilities.

14.0 REFERENCES

The sources of information used in the development of this study are listed below:

1. City of Colorado Springs "Drainage Criteria Manual", 2016.

2. Urban Storm Drainage Criteria Manuals, Urban Drainage and Flood Control District. June 2001, Revised October 2019.

3. Soil Survey for Colorado Springs and El Paso County, Colorado, U.S. Department of Agriculture, Soil Conservation Service, June 1980.

4. "Flood Insurance Studies for Colorado Springs and El Paso County, Colorado", prepared by the Federal Emergency Management Agency (FEMA), 2018.

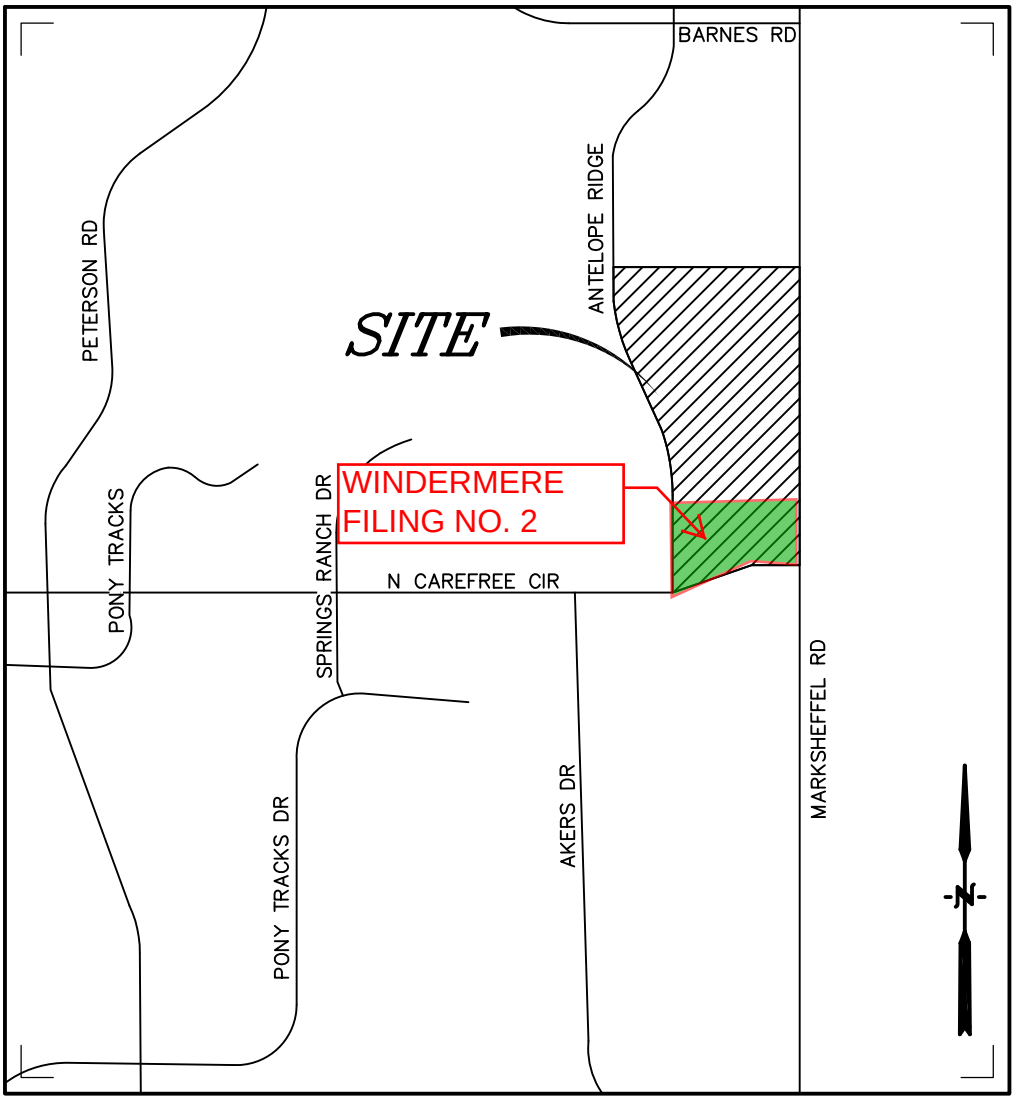
5. "Soils and Geology Study, Windermere Subdivision", prepared by RMG, October 26, 2020, Revised January 18, 2021.

6. "Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1," prepared by Classic Consulting Engineers & Surveyors, October 2014.

7. "Final Drainage Report Marksheffel Road from Constitution Ave. to Dublin Rd.," by CH2M Hill, dated May 2008 and Marksheffel Road Construction Drawings by Wilson & Company.

8. "Final Drainage Report for Windermere Filing No. 1" prepared by Drexel, Barrell & Co., March 8, 2022.

APPENDIX



Vicinity Map

Not to scale

WINDERMERE
COLORADO SPRINGS, CO
VICINITY MAP

Drexel, Barrell & Co.
Engineers • Surveyors

DATE:

JOB NO: 21187-00CSCV

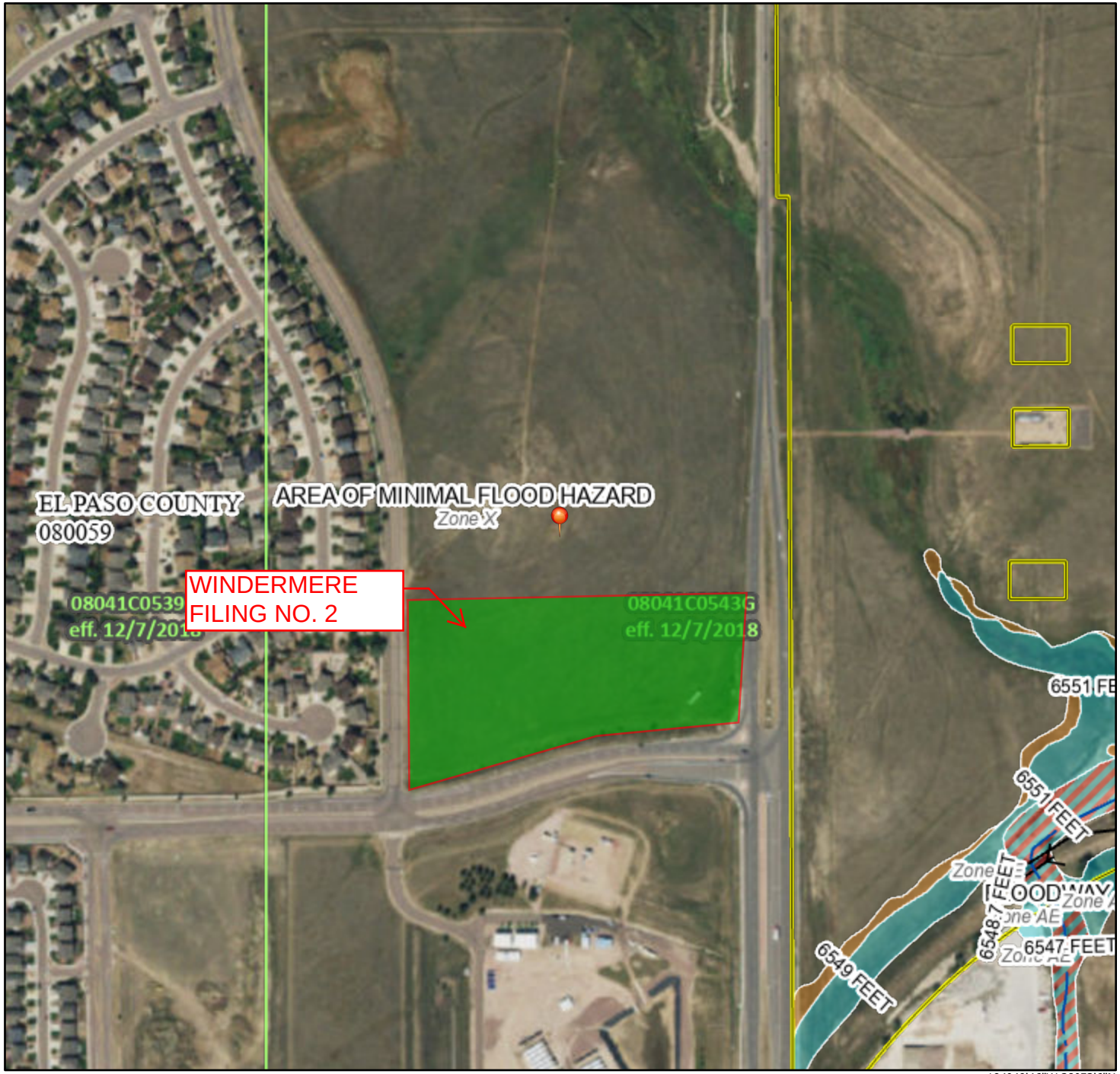
DWG. NO. VMAP

SHEET 1 OF 1

National Flood Hazard Layer FIRMette

FEMA

104°41'24"W 38°53'34"N



104°40'46"W 38°53'6"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/8/2021 at 3:46 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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


104° 41' 21" W
104° 40' 54" W
38° 53' 38" N
38° 53' 10" N
527000
527100
527200
527300
527400
527500
527600
4305000
4304900
4304800
4304700
4304600
4304500
4304400
4304300
N Marksheffel Rd
97
WINDERMERE
FILING NO. 2
Carefree
Soil Map may not be valid at this scale.
Map Scale: 1:4,170 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 50 100 200 300
Feet
0 200 400 800 1200
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 15, Oct 10, 2017

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

Date(s) aerial images were photographed: Apr 15, 2011—Jun 17, 2014

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
97	Truckton sandy loam, 3 to 9 percent slopes	A	56.4	100.0%
Totals for Area of Interest			**56.4**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

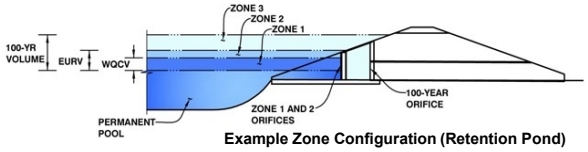
APPROVED DRAINAGE REPORT EXCERPTS

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Windermere Filing No. 1

Basin ID: South Pond - Interim Condition



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.52	0.118	Orifice Plate
Zone 2 (EURV)	3.53	0.124	Orifice Plate
Zone 3 (100-year)	4.82	0.253	Weir&Pipe (Restrict)
Total (all zones)		0.496	

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

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =		ft (distance below the filtration media surface)	Underdrain Orifice Area =		ft^2
Underdrain Orifice Diameter =		inches	Underdrain Orifice Centroid =		feet

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

			Calculated Parameters for Plate		
Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	3.53	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	25.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.18	2.35					
Orifice Area (sq. inches)	0.67	0.67	0.67					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

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		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.40	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.40	N/A	feet
Overflow Weir Front Edge Length =	3.92	N/A	feet	Overflow Weir Slope Length =	3.92	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	16.92	N/A	
Horiz. Length of Weir Sides =	3.92	N/A	feet	Overflow Grate Open Area w/o Debris =	10.76	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	5.38	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

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

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.64	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.34	N/A	feet
Restrictor Plate Height Above Pipe Invert =	7.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.35	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.94	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.55	feet
Spillway Crest Length =	27.00	feet	Stage at Top of Freeboard =	8.49	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.58	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.80	acre-ft

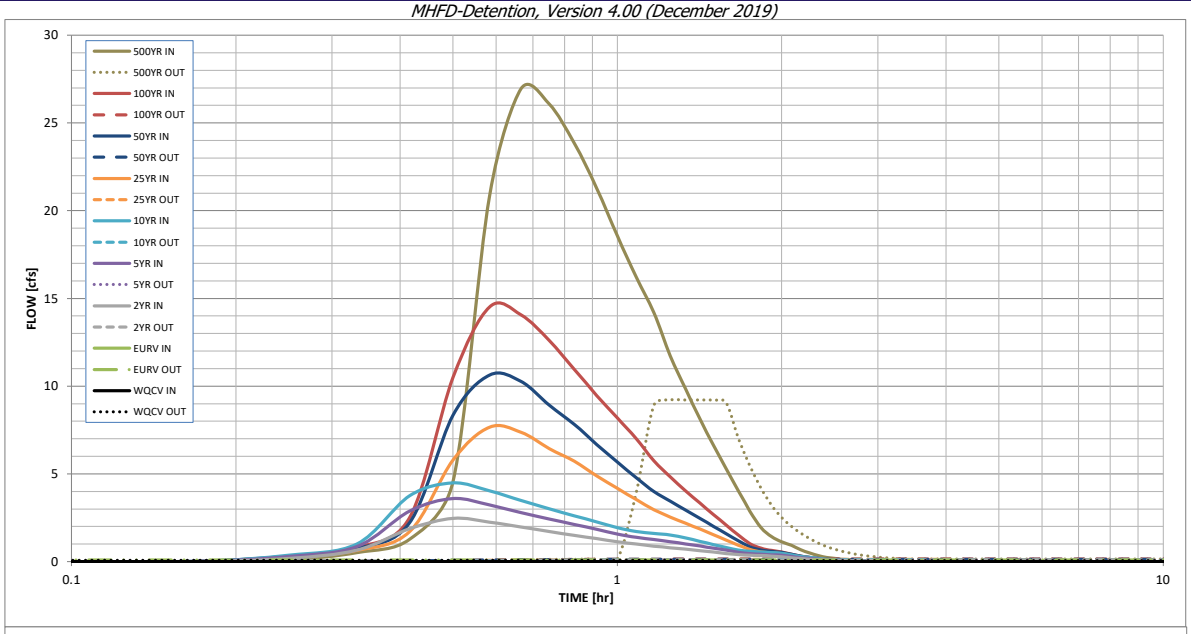
Routed Hydrograph Results

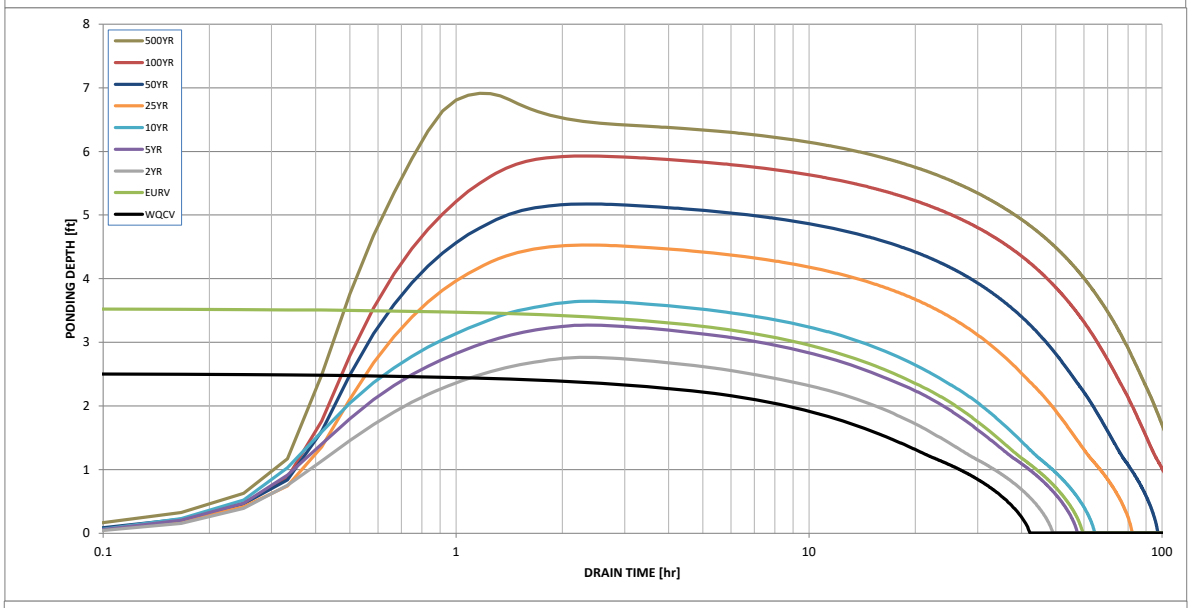
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

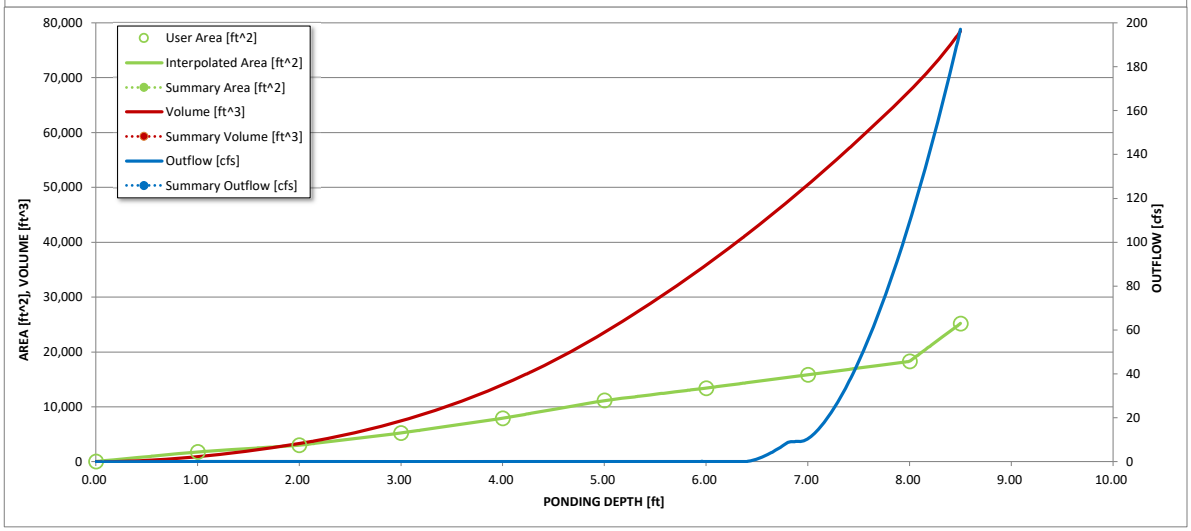
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.118	0.243	0.156	0.221	0.279	0.448	0.608	0.825	1.590
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.156	0.221	0.279	0.448	0.608	0.825	1.590
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.3	2.9	5.6	9.1	20.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.27	0.52	0.84	1.89
Peak Inflow Q (cfs) =	N/A	N/A	2.5	3.6	4.5	7.7	10.6	14.5	27.0
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	9.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.3	0.0	0.0	0.0	0.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.8
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	53	44	51	57	71	83	99	103
Time to Drain 99% of Inflow Volume (hours) =	**40**	57	47	55	61	77	91	108	116
Maximum Ponding Depth (ft) =	2.51	3.53	2.76	3.27	3.64	4.53	5.17	5.93	6.91
Area at Maximum Ponding Depth (acres) =	0.10	0.15	0.11	0.14	0.16	0.22	0.27	0.30	0.36
Maximum Volume Stored (acre-ft) =	0.118	0.243	0.144	0.204	0.260	0.427	0.585	0.799	1.127

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.10
	0:15:00	0.00	0.00	0.18	0.30	0.37	0.25	0.31	0.30	0.52
	0:20:00	0.00	0.00	0.66	0.86	1.01	0.64	0.75	0.80	1.28
	0:25:00	0.00	0.00	1.87	2.88	3.75	1.72	2.23	2.52	4.55
	0:30:00	0.00	0.00	2.47	3.59	4.48	5.79	8.34	10.48	20.89
	0:35:00	0.00	0.00	2.25	3.22	4.03	7.67	10.63	14.52	26.95
	0:40:00	0.00	0.00	1.98	2.79	3.48	7.36	10.26	14.06	26.08
	0:45:00	0.00	0.00	1.71	2.42	3.01	6.45	8.92	12.61	23.86
	0:50:00	0.00	0.00	1.50	2.13	2.62	5.72	7.82	10.97	21.29
	0:55:00	0.00	0.00	1.31	1.84	2.26	4.89	6.68	9.47	18.56
	1:00:00	0.00	0.00	1.13	1.57	1.94	4.17	5.67	8.18	16.22
	1:05:00	0.00	0.00	1.00	1.38	1.72	3.54	4.78	7.01	14.18
	1:10:00	0.00	0.00	0.89	1.26	1.61	2.96	3.99	5.75	11.72
	1:15:00	0.00	0.00	0.79	1.14	1.52	2.54	3.44	4.83	9.85
	1:20:00	0.00	0.00	0.71	1.01	1.35	2.18	2.93	4.04	8.14
	1:25:00	0.00	0.00	0.62	0.89	1.16	1.86	2.47	3.34	6.64
	1:30:00	0.00	0.00	0.54	0.77	0.97	1.53	2.02	2.69	5.30
	1:35:00	0.00	0.00	0.46	0.65	0.81	1.23	1.59	2.08	4.03
	1:40:00	0.00	0.00	0.40	0.53	0.66	0.94	1.18	1.51	2.87
	1:45:00	0.00	0.00	0.36	0.45	0.59	0.69	0.84	1.03	1.94
	1:50:00	0.00	0.00	0.35	0.42	0.55	0.56	0.66	0.76	1.43
	1:55:00	0.00	0.00	0.31	0.39	0.52	0.49	0.58	0.63	1.13
	2:00:00	0.00	0.00	0.28	0.36	0.48	0.46	0.53	0.55	0.93
	2:05:00	0.00	0.00	0.22	0.29	0.38	0.36	0.41	0.42	0.68
	2:10:00	0.00	0.00	0.18	0.23	0.30	0.28	0.32	0.31	0.49
	2:15:00	0.00	0.00	0.14	0.18	0.23	0.21	0.24	0.23	0.34
	2:20:00	0.00	0.00	0.11	0.14	0.18	0.16	0.18	0.17	0.24
	2:25:00	0.00	0.00	0.08	0.11	0.14	0.13	0.14	0.13	0.18
	2:30:00	0.00	0.00	0.06	0.08	0.10	0.09	0.11	0.10	0.14
	2:35:00	0.00	0.00	0.05	0.06	0.08	0.07	0.08	0.07	0.10
	2:40:00	0.00	0.00	0.04	0.05	0.06	0.05	0.06	0.06	0.08
	2:45:00	0.00	0.00	0.03	0.03	0.04	0.04	0.04	0.04	0.06
	2:50:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	2:55:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:05:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

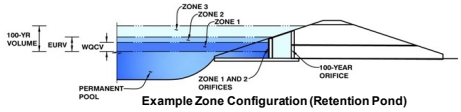
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **Windermere South - FINAL**

Basin ID:

WINDERMERE FILING NO. 1 FDR EXCERPT
SOUTH POND FINAL DESIGN



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	10.89	acres
Watershed Length =	700	ft
Watershed Length to Centroid =	400	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	68.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.242	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.931	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.641	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.838	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.996	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.198	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.395	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.633	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.49 in.) =	2.459	acre-feet	3.49	inches
Approximate 2-yr Detention Volume =	0.607	acre-feet		
Approximate 5-yr Detention Volume =	0.792	acre-feet		
Approximate 10-yr Detention Volume =	0.953	acre-feet		
Approximate 25-yr Detention Volume =	1.143	acre-feet		
Approximate 50-yr Detention Volume =	1.257	acre-feet		
Approximate 100-yr Detention Volume =	1.373	acre-feet		

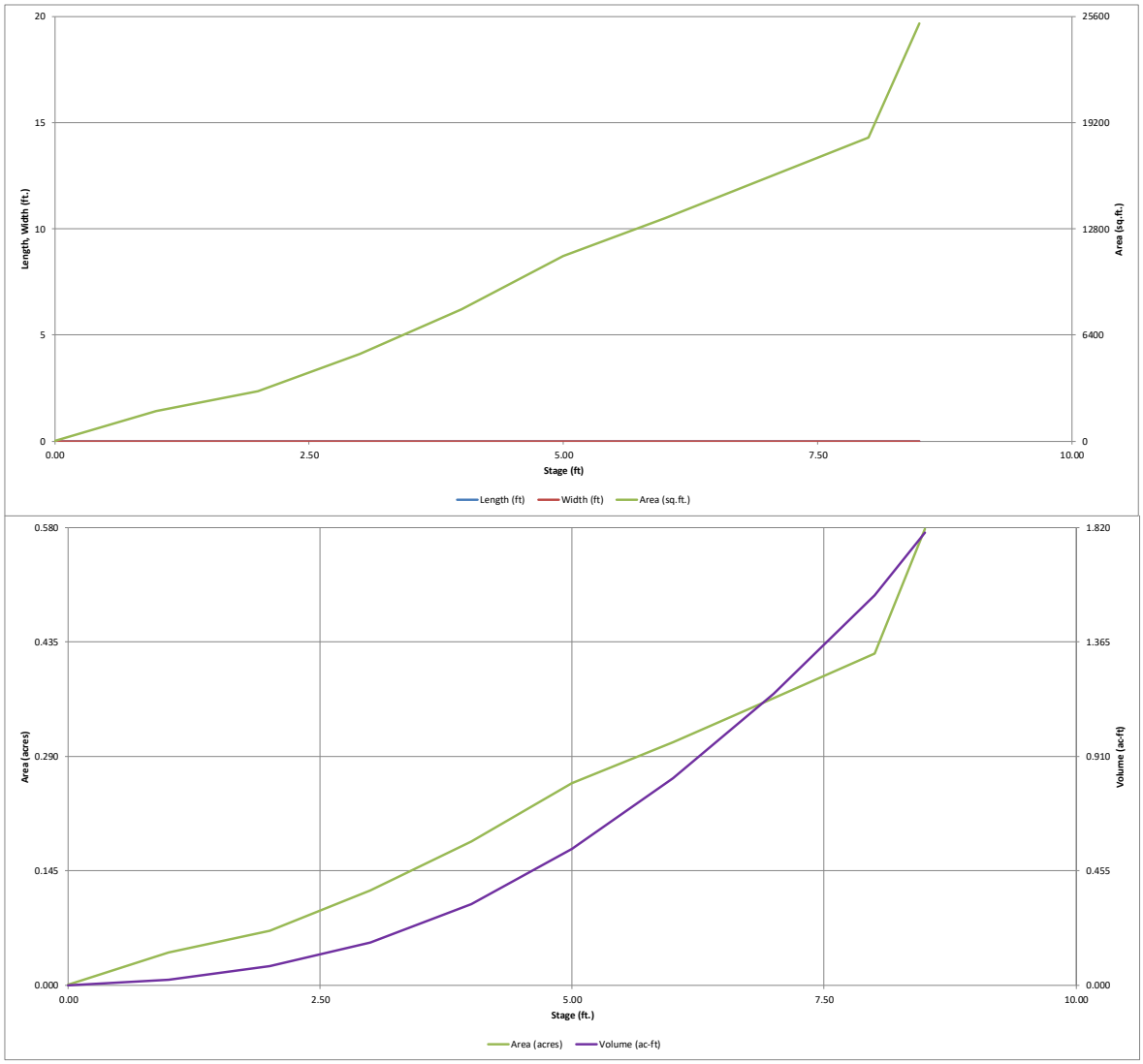
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.242	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.689	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.442	acre-feet
Total Detention Basin Volume =	1.373	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	40	0.001		
6574	--	1.00	--	--	--	1,801	0.041	920	0.021
6575	--	2.00	--	--	--	3,008	0.069	3,325	0.076
6576	--	3.00	--	--	--	5,232	0.120	7,445	0.171
6577	--	4.00	--	--	--	7,923	0.182	14,022	0.322
6578	--	5.00	--	--	--	11,161	0.256	23,564	0.541
6579	--	6.00	--	--	--	13,425	0.308	35,857	0.823
6580	--	7.00	--	--	--	15,853	0.364	50,496	1.159
6581	--	8.00	--	--	--	18,293	0.420	67,569	1.551
6581.5	--	8.50	--	--	--	25,208	0.579	78,445	1.801

WINDERMERE FILING NO. 1 FDR EXCERPT
SOUTH POND FINAL DESIGN

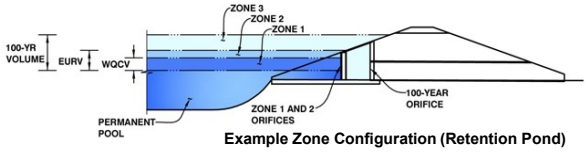


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: **Windermere South - FINAL**

Basin ID:



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.52	0.242	Orifice Plate
Zone 2 (EURV)	6.34	0.689	Orifice Plate
Zone 3 (100-year)	7.57	0.442	Weir&Pipe (Restrict)
Total (all zones)		1.373	

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

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

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	6.34	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	25.40	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.11	4.23					
Orifice Area (sq. inches)	1.24	1.24	1.24					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.40	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.40	N/A	feet
Overflow Weir Front Edge Length =	3.92	N/A	feet	Overflow Weir Slope Length =	3.92	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	16.92	N/A	
Horiz. Length of Weir Sides =	3.92	N/A	feet	Overflow Grate Open Area w/o Debris =	10.76	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	5.38	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.64	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.34	N/A	feet
Restrictor Plate Height Above Pipe Invert =	7.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.35	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.94	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.55	feet
Spillway Crest Length =	27.00	feet	Stage at Top of Freeboard =	8.49	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.58	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.80	acre-ft

Calculated Parameters for Spillway

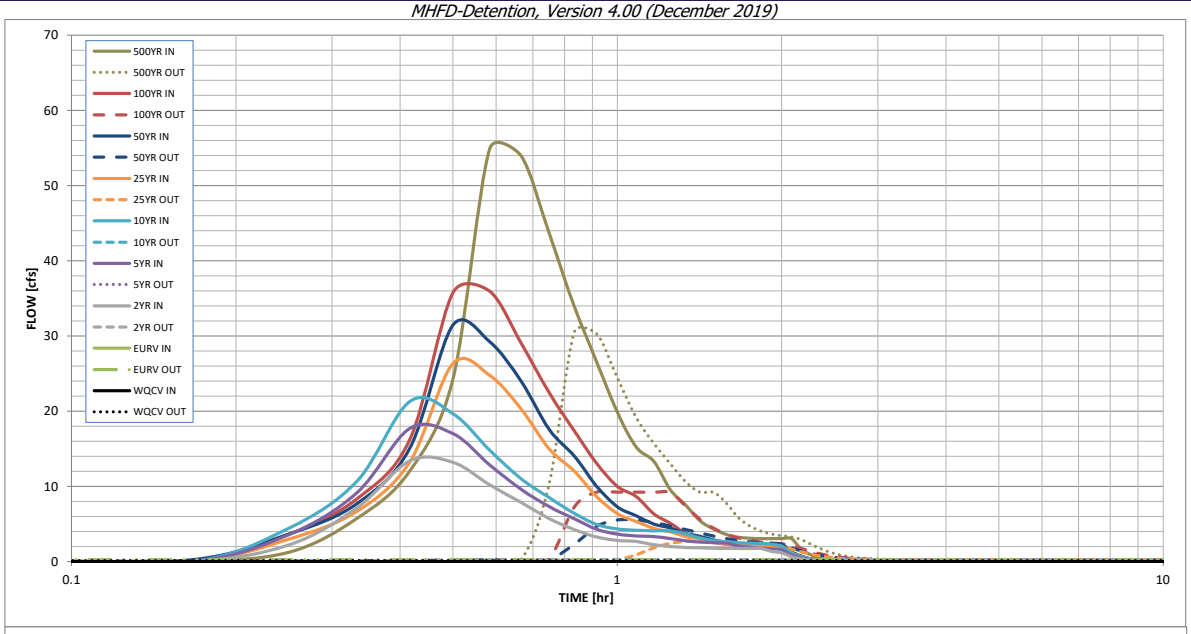
Routed Hydrograph Results

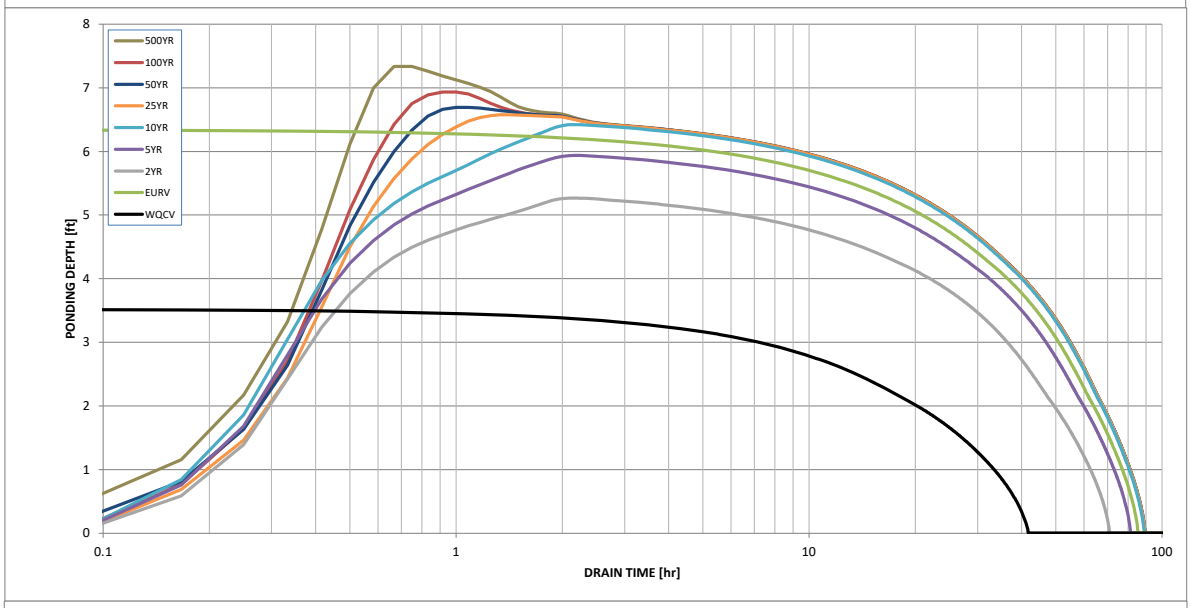
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

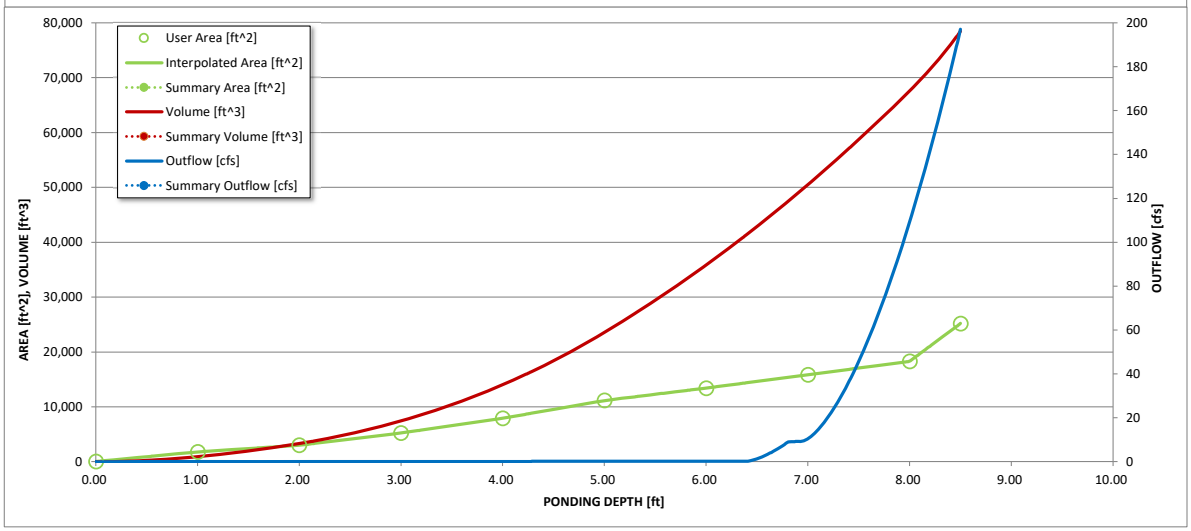
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.242	0.931	0.641	0.838	0.996	1.198	1.395	1.633	2.459
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.641	0.838	0.996	1.198	1.395	1.633	2.459
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.3	2.9	5.6	9.1	20.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.27	0.52	0.84	1.89
Peak Inflow Q (cfs) =	N/A	N/A	13.4	17.7	21.3	26.3	31.4	35.9	54.9
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	0.3	2.7	5.5	9.2	30.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	1.1	0.9	1.0	1.0	1.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	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	0.0	0.2	0.5	0.8	0.9
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	75	63	72	78	77	76	74	69
Time to Drain 99% of Inflow Volume (hours) =	**40**	81	68	77	84	84	83	83	80
Maximum Ponding Depth (ft) =	3.53	6.34	5.26	5.94	6.42	6.57	6.69	6.93	7.33
Area at Maximum Ponding Depth (acres) =	0.15	0.33	0.27	0.30	0.33	0.34	0.35	0.36	0.38
Maximum Volume Stored (acre-ft) =	0.243	0.931	0.609	0.802	0.954	1.008	1.046	1.134	1.282

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







DETENTION BASIN OUTLET ST

WINDERMERE FILING NO. 1 FDR EXCERPT
SOUTH POND FINAL 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	0.25	0.02	1.24
	0:15:00	0.00	0.00	2.20	3.58	4.43	2.98	3.64	3.62	5.72
	0:20:00	0.00	0.00	7.15	9.15	10.68	6.68	7.69	8.35	12.02
	0:25:00	0.00	0.00	13.38	17.69	21.29	13.23	15.05	16.20	24.26
	0:30:00	0.00	0.00	13.20	16.99	19.67	26.35	31.45	35.75	54.89
	0:35:00	0.00	0.00	10.18	12.85	14.80	24.76	29.25	35.94	53.97
	0:40:00	0.00	0.00	7.86	9.61	11.02	20.31	24.00	29.05	43.65
	0:45:00	0.00	0.00	5.71	7.29	8.49	14.97	17.57	22.45	33.95
	0:50:00	0.00	0.00	4.27	5.70	6.40	12.02	14.05	17.39	26.56
	0:55:00	0.00	0.00	3.25	4.28	4.93	8.64	9.99	13.05	19.85
	1:00:00	0.00	0.00	2.81	3.64	4.33	6.38	7.27	9.99	15.21
	1:05:00	0.00	0.00	2.65	3.41	4.15	5.32	6.06	8.64	13.31
	1:10:00	0.00	0.00	2.23	3.33	4.09	4.41	4.99	6.33	9.55
	1:15:00	0.00	0.00	2.01	3.06	4.06	3.95	4.46	5.08	7.52
	1:20:00	0.00	0.00	1.88	2.76	3.68	3.31	3.73	3.74	5.42
	1:25:00	0.00	0.00	1.80	2.60	3.14	3.00	3.37	3.03	4.32
	1:30:00	0.00	0.00	1.76	2.50	2.81	2.55	2.87	2.57	3.60
	1:35:00	0.00	0.00	1.73	2.44	2.62	2.30	2.58	2.32	3.22
	1:40:00	0.00	0.00	1.73	2.08	2.51	2.16	2.42	2.24	3.10
	1:45:00	0.00	0.00	1.73	1.88	2.44	2.08	2.34	2.19	3.03
	1:50:00	0.00	0.00	1.73	1.76	2.41	2.05	2.30	2.19	3.03
	1:55:00	0.00	0.00	1.36	1.70	2.30	2.03	2.28	2.19	3.03
	2:00:00	0.00	0.00	1.15	1.57	2.02	2.03	2.28	2.19	3.03
	2:05:00	0.00	0.00	0.65	0.89	1.16	1.16	1.30	1.25	1.73
	2:10:00	0.00	0.00	0.36	0.50	0.65	0.66	0.74	0.71	0.98
	2:15:00	0.00	0.00	0.18	0.27	0.34	0.35	0.39	0.37	0.51
	2:20:00	0.00	0.00	0.08	0.13	0.16	0.18	0.20	0.19	0.26
	2:25:00	0.00	0.00	0.03	0.05	0.05	0.06	0.07	0.07	0.09
	2:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	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
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	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
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	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

North Pond (North Forebay)

FOREBAY VOLUME

Req'd V=3% x WQCV

Ex DP 24	Impervious	Area	
	0.34	79.05	
WQCV=			1.0826 ac-ft
V=			0.0325 ac-ft
Actual V			0.0409 ac-ft

FOREBAY RELEASE NOTCH WIDTH

5-YR NOTCH

$Q=CLH^{3/2}$

Q_{100}=	111.3	cfs
2% of Q=	2.23	cfs
C=	2.6	
H (height of forebay wall)=	1	ft
L=	10	in
	3	in min.

FOREBAY RELEASE NOTCH WIDTH

100-YR NOTCH

$Q=CLH^{3/2}$

Q_{100}=	199.7	cfs
2% of Q=	3.99	cfs
C=	2.6	
H (height of forebay wall)=	1	ft
L=	18	in
	3	in min.

North Pond (South Forebay)

FOREBAY VOLUME

Req'd V=3% x WQCV

DPM1	Impervious	Area	
	0.65	40.15	
WQCV=			0.8503 ac-ft
V=			0.0255 ac-ft
Actual V			0.0310 ac-ft

FOREBAY RELEASE NOTCH WIDTH

5-YR NOTCH

$Q=CLH^{3/2}$

Q_{100}=	54.8	cfs
2% of Q=	1.10	cfs
C=	2.6	
H (height of forebay wall)=	1	ft
L=	5	in
	3	in min.

FOREBAY RELEASE NOTCH WIDTH

100-YR NOTCH

$Q=CLH^{3/2}$

Q_{100}=	119.4	cfs
2% of Q=	2.39	cfs
C=	2.6	
H (height of forebay wall)=	1	ft
L=	11	in
	3	in min.

South Pond (Forebay)

FOREBAY VOLUME

Req'd V=3% x WQCV

From Detention spreadsheet

WQCV=	0.052	ac-ft
V=	0.0016	ac-ft
Actual V	0.0040	ac-ft

FOREBAY RELEASE NOTCH WIDTH

$Q=CLH^{3/2}$

Q_{100}=	17.9	cfs
2% of Q=	0.36	cfs
C=	2.6	
H (height of forebay wall)=	1	ft
L=	2	in
	3	in min.

WINDERMERE FILING NO. 1 FDR EXCERPT
SOUTH POND FINAL DESIGN

Figure 13-12c. Emergency Spillway Protection

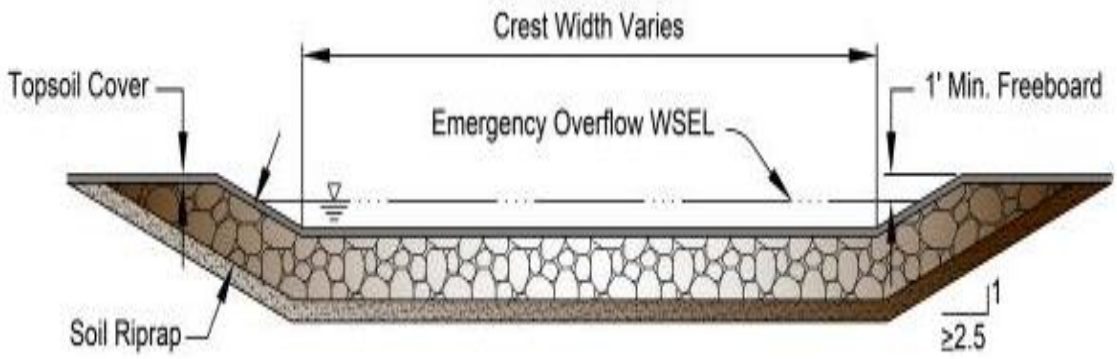
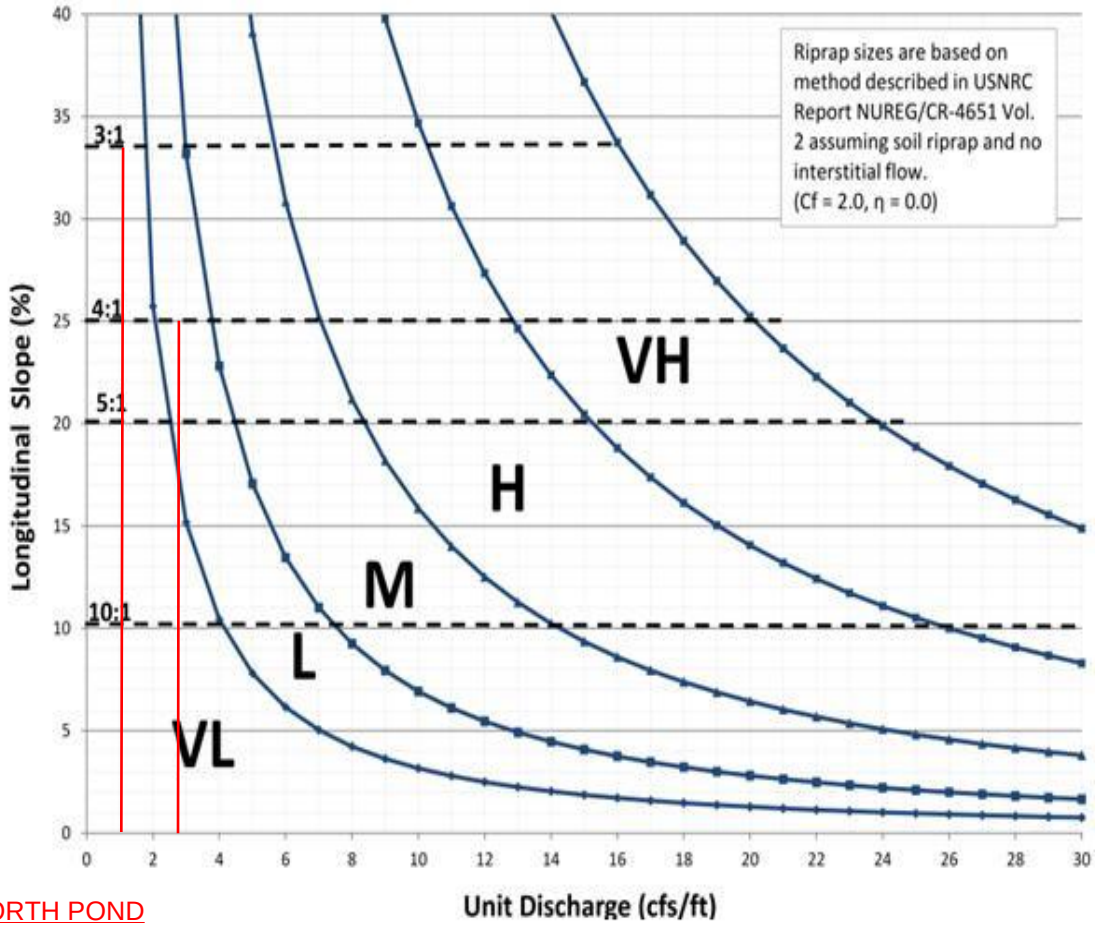


Figure 13-12d. Riprap Types for Emergency Spillway Protection



NORTH POND
UNIT DISCHARGE= 194.1/70=2.7cfs
SOUTH POND
UNIT DISCHARGE= 35.9/27= 1.3cfs

HYDROLOGIC ANALYSIS

Review C3: Existing drainage map showing all the existing basins and DP is required. This calculation cannot be reviewed until the map is provided.

Review C4: Unresolved. Please provide hydrologic analysis of existing condition.

PROJECT INFORMATION

Drexel, Barrell & Co.

PROJECT:	Windermere 2
PROJECT NO:	21187-03
DESIGN BY:	KGV
REV. BY:	TDM
AGENCY:	El Paso County
REPORT TYPE:	Preliminary
DATE:	6/5/2024
Soil Type: A	

	C2*	C5*	C10*	C100*	% IMPERV
Landscape/Lawn		0.15		0.50	0
Residential (<1/8 acre)		0.45		0.59	65
Asphalt/Sidewalk		0.90		0.96	100

PROPOSED

SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV
		ACRE	C2	C5	C10	C100	
A1	Landscape/Lawn	0.06		0.15		0.50	0
	Residential (<1/8 acre)	6.69		0.45		0.59	65
	Asphalt/Sidewalk	0.04		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL A1		6.79					
A2	Landscape/Lawn	0.88		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.03		0.90		0.96	100
	WEIGHTED AVERAGE			0.18		0.52	4%
TOTAL A2		0.92					
POND							
P1	Landscape/Lawn	1.00		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.15		0.50	0%
TOTAL P1		1.00					
OFFSITE							
B1	Landscape/Lawn	0.00		0.15		0.50	0
	Residential (<1/8 acre)	3.33		0.45		0.59	65
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL B1		3.33					
B2	Landscape/Lawn	0.00		0.15		0.50	0
	Residential (<1/8 acre)	0.49		0.45		0.59	65
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL B2		0.49					
B4	Landscape/Lawn	0.00		0.15		0.50	0
	Residential (<1/8 acre)	0.16		0.45		0.59	65
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL B4		0.16					

Tributary to Pond		12.70					55.0%
D16	Landscape/Lawn	0.00		0.15		0.50	0
	Residential (<1/8 acre)	2.73		0.45		0.59	65
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL D16		2.73					
NC2	Landscape/Lawn	0.27		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	1.34		0.90		0.96	100
	WEIGHTED AVERAGE			0.77		0.88	83%
TOTAL NC2		1.61					
EXR	Landscape/Lawn	0.00		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.53		0.90		0.96	100
	WEIGHTED AVERAGE			0.90		0.96	100%
TOTAL EXR		0.53					
C3	Landscape/Lawn	0.63		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.15		0.50	0%
TOTAL C3		0.63					
NC1	Landscape/Lawn	0.03		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.40		0.90		0.96	100
	WEIGHTED AVERAGE			0.85		0.93	93%
TOTAL NC1		0.43					

PROJECT INFORMATION

PROJECT: Windermere 2
PROJECT NO: 21187-03
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Preliminary
DATE: 6/5/2024

Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

PROPOSED TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t_i)				TRAVEL TIME (t_t)					PIPE TRAVEL TIME (t_p)				TIME OF CONC. t_c		FINAL t_c
BASIN	DESIGN PT:	C_5	C_{100}	AREA	LENGTH	HT	SLOPE	t_i	LENGTH	HT	SLOPE	VEL.	t_t	LENGTH	SLOPE	VEL.	t_t	COMP.	MINIMUM	
				Ac	Ft	FT	%	Min	Ft	FT	%	FPS	Min	Ft	%	FPS	Min	t_c	t_c	**Min**
A1	1	0.45	0.59	6.79	100	2	3.0	8.4	855	21	3.7	10.1	1.4					9.8	5	**9.8**
B1		0.45	0.59	3.33	35	1	3.5	4.7	885	30	3.4	10.8	1.4					6.1	5	**6.1**
B2		0.45	0.59	0.49	50	2	4.0	5.4	725	20	2.8	9.8	1.2					6.6	5	**6.6**
B1+B2	2	0.45	0.59	3.82	From Basin B1			6.1						212	0.5	5.1	0.7	6.8	5	**6.8**
B4		0.45	0.59	0.16	50	17	33.3	2.7	185	3	1.5	4.0	0.8					3.4	5	**5.0**
P1		0.15	0.50	1.00	100	1	1.0	17.8	205	10	4.8	12.8	0.3					18.0	5	**18.0**
DP1+DP2+B4+P1	3	0.42	0.58	11.78	From Design Point 1			9.8	250	2.5	1.0	4.0	1.0					10.9	5	**10.9**
D16	4	0.45	0.59	2.73	200	10	5.0	10.1	350	12	3.5	6.5	0.9					11.0	5	**11.0**
A2		0.18	0.52	0.92	50	10	5.9	6.7	992	25	3.3	8.5	1.9					8.7	5	**8.7**
NC2	19	0.77	0.88	1.61	50	2	4.0	2.7	1340	35	2.6	9.4	2.4					5.1	5	**5.1**
EXR		0.90	0.96	0.53	20	2	10.0	0.8	320	6	2.0	4.9	1.1					1.9	5	**5.0**
C3		0.15	0.50	0.63	60	12	20.0	5.1	455	15	3.3	5.6	1.4					6.4	5	**6.4**
EXR+C3+DP6+A2	S	0.41	0.61	4.81	From Design Point 6			11.0						850	3.0	11.8	1.2	12.2	5	**12.2**
DP19+DPS	J1	0.50	0.67	6.42	From Design Point S			12.2						100	1.0	5.9	0.3	12.4	5	**12.4**
NC1		0.85	0.93	0.43	45	1	2.2	2.4	185	4	2.2	8.7	0.4					2.8	5	**5.0**
DPJ1+NC1	20	0.52	0.69	6.85	From Design Point J1			12.4						50	1.0	8.4	0.1	12.5	5	**12.5**

PROJECT INFORMATION

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

PROPOSED **RUNOFF** **5 YR STORM** **P1=** **1.50**

BASIN (S)	DESIGN POINT	AREA (AC)	DIRECT RUNOFF RUNOFF COEFF	DIRECT RUNOFF t_c (MIN)	C * A	I (IN/HR)	Q (CFS)
A1	1	6.79	0.45	9.8	3.06	4.13	**12.6**
B1		3.33	0.45	6.1	1.50	4.84	**7.2**
B2		0.49	0.45	6.6	0.22	4.72	**1.0**
B1+B2	2	3.82	0.45	6.8	1.72	4.68	**8.1**
B4		0.16	0.45	5.0	0.07	5.10	**0.4**
P1		1.00	0.15	18.0	0.15	3.17	**0.5**
DP1+DP2+B4+P1	3	11.78	0.42	10.9	5.00	3.97	**19.8**
D16	4	2.73	0.45	11.0	1.23	3.96	**4.9**
A2		0.92	0.18	8.7	0.16	4.32	**0.7**
NC2	19	1.61	0.77	5.1	1.25	5.08	**6.3**
EXR		0.53	0.90	5.0	0.48	5.10	**2.4**
C3		0.63	0.15	6.4	0.09	4.76	**0.5**
Pond Release	P						**0.3**
EXR+C3+DP5+POND RELEASE	S	4.81	0.41	12.2	1.96	3.80	**7.8**
DP19+DPS	J1	6.42	0.50	12.4	3.21	3.76	**12.4**
NC1		0.43	0.85	5.0	0.36	5.10	**1.9**
DPJ1+NC1	20	6.85	0.52	12.5	3.57	3.75	**13.7**

PROJECT INFORMATION

PROJECT: Windermere 2
PROJECT NO: 21187-03
DESIGN BY: KGV
REV. BY: TDM
AGENCY: El Paso County
REPORT TYPE: Preliminary
DATE: 6/5/2024

Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

PROPOSED **RUNOFF** **100 YR STORM** **P1=** **2.52**

			DIRECT RUNOFF				
BASIN (S)	**DESIGN POINT**	**AREA (AC)**	**RUNOFF COEFF**	**t_c (MIN)**	**C * A**	**I (IN/HR)**	**Q (CFS)**
A1	1	6.79	0.59	9.8	4.02	6.93	**27.9**
B1		3.33	0.59	6.1	1.96	8.12	**16.0**
B2		0.49	0.59	6.6	0.29	7.92	**2.3**
B1+B2	2	3.82	0.59	6.8	2.25	7.87	**17.7**
B4		0.16	0.59	5.0	0.09	8.58	**0.8**
P1		1.00	0.50	18.0	0.50	5.33	**2.7**
DP1+DP2+B4+P1	3	11.78	0.58	10.9	6.87	6.67	**45.8**
D16	4	2.73	0.59	11.0	1.61	6.65	**10.7**
A2		0.92	0.52	8.7	0.48	7.26	**3.4**
NC2	19	1.61	0.88	5.1	1.42	8.54	**12.1**
EXR		0.53	0.96	5.0	0.51	8.58	**4.4**
C3		0.63	0.50	6.4	0.32	8.00	**2.5**
Pond Release	P						**10.6**
EXR+C3+DP5+POND RELEASE	S	4.81	0.61	12.2	2.91	6.38	**29.2**
DP19+DPS	J1	6.42	0.67	12.4	4.33	6.32	**38.0**
NC1		0.43	0.93	5.0	0.40	8.58	**3.4**
DPJ1+NC1	20	6.85	0.69	12.5	4.73	6.29	**40.4**

HYDRAULIC ANALYSIS

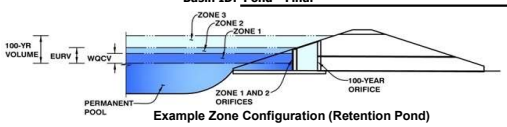
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: Windermere Filing No. 1

Basin ID: Pond - Final

WINDERMERE FILING NO. 2 SOUTH POND
FINAL DESIGN DEVELOPED CONDITION



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	12.79	acres
Watershed Length =	1,000	ft
Watershed Length to Centroid =	350	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	54.90%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.235	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.831	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.593	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.785	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.938	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.163	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.384	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.660	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.49 in.) =	2.617	acre-feet	3.49	inches
Approximate 2-yr Detention Volume =	0.537	acre-feet		
Approximate 5-yr Detention Volume =	0.705	acre-feet		
Approximate 10-yr Detention Volume =	0.856	acre-feet		
Approximate 25-yr Detention Volume =	1.041	acre-feet		
Approximate 50-yr Detention Volume =	1.157	acre-feet		
Approximate 100-yr Detention Volume =	1.289	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.235	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.596	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.458	acre-feet
Total Detention Basin Volume =	1.289	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

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

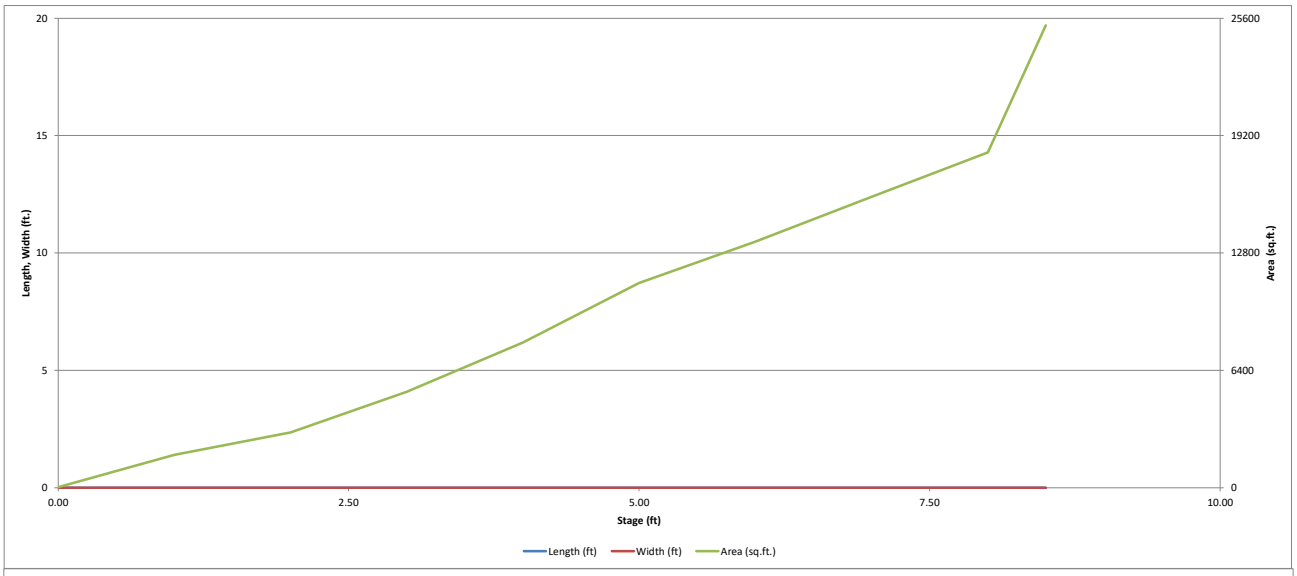
Depth Increment = ft

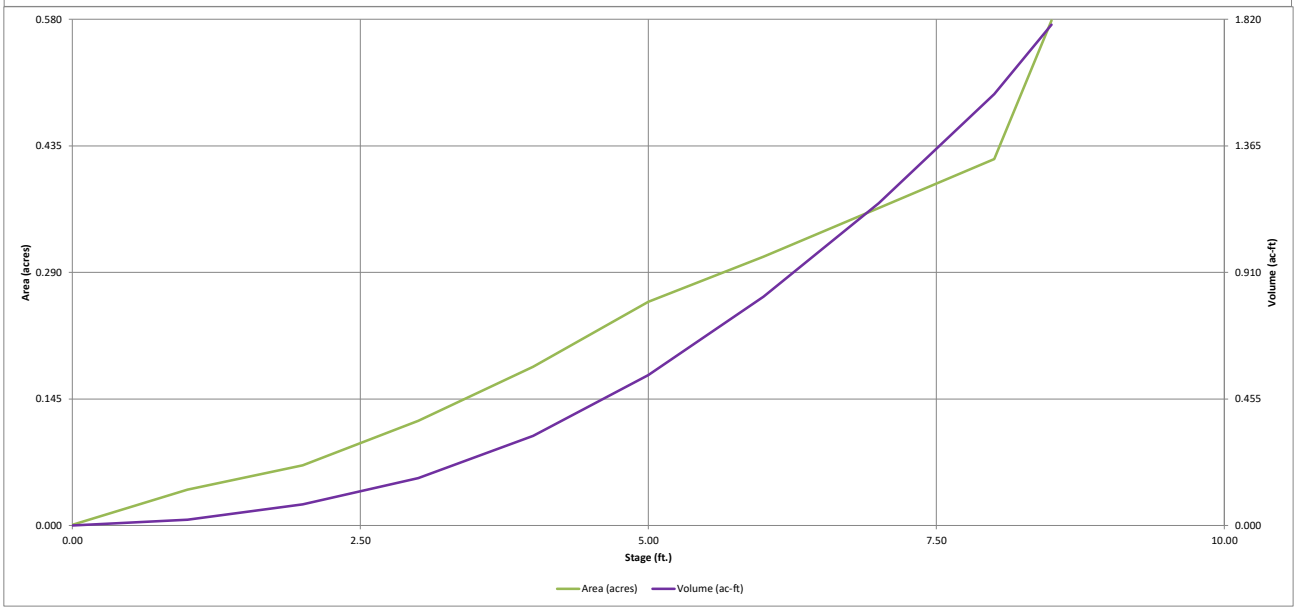
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	40	0.001		
6574	--	1.00	--	--	--	1,801	0.041	920	0.021
6575	--	2.00	--	--	--	3,008	0.069	3,325	0.076
6576	--	3.00	--	--	--	5,232	0.120	7,445	0.171
6577	--	4.00	--	--	--	7,923	0.182	14,022	0.322
6578	--	5.00	--	--	--	11,161	0.256	23,564	0.541
6579	--	6.00	--	--	--	13,425	0.308	35,857	0.823
6580	--	7.00	--	--	--	15,853	0.364	50,496	1.159
6581	--	8.00	--	--	--	18,293	0.420	67,569	1.551
6581.5	--	8.50	--	--	--	25,208	0.579	78,445	1.801

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

WINDERMERE FILING NO. 2 SOUTH POND
FINAL DESIGN DEVELOPED CONDITION





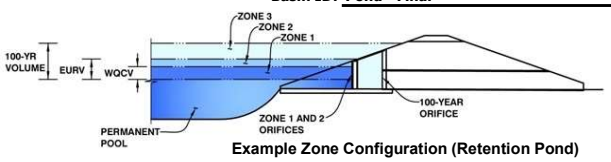
WINDERMERE FILING NO. 2 SOUTH POND
FINAL DESIGN DEVELOPED CONDITION

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: **Windermere Filing No. 1**

Basin ID: **Pond - Final**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.48	0.235	Orifice Plate
Zone 2 (EURV)	6.03	0.596	Orifice Plate
Zone 3 (100-year)	7.35	0.458	Weir&Pipe (Restrict)
Total (all zones)		1.289	

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

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =		ft (distance below the filtration media surface)	Underdrain Orifice Area =		ft^2
Underdrain Orifice Diameter =		inches	Underdrain Orifice Centroid =		feet

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

			Calculated Parameters for Plate		
Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	6.03	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	24.10	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.01	4.02					
Orifice Area (sq. inches)	1.10	1.70	2.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

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		Calculated Parameters for Overflow Weir	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.40	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.40	N/A	feet
Overflow Weir Front Edge Length =	3.92	N/A	feet	Overflow Weir Slope Length =	3.92	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	14.68	N/A	
Horiz. Length of Weir Sides =	3.92	N/A	feet	Overflow Grate Open Area w/o Debris =	10.78	N/A	ft^2
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	5.39	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

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

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.73	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.38	N/A	feet
Restrictor Plate Height Above Pipe Invert =	7.80		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.44	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.94	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.55	feet
Spillway Crest Length =	27.00	feet	Stage at Top of Freeboard =	8.49	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.58	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.80	acre-ft

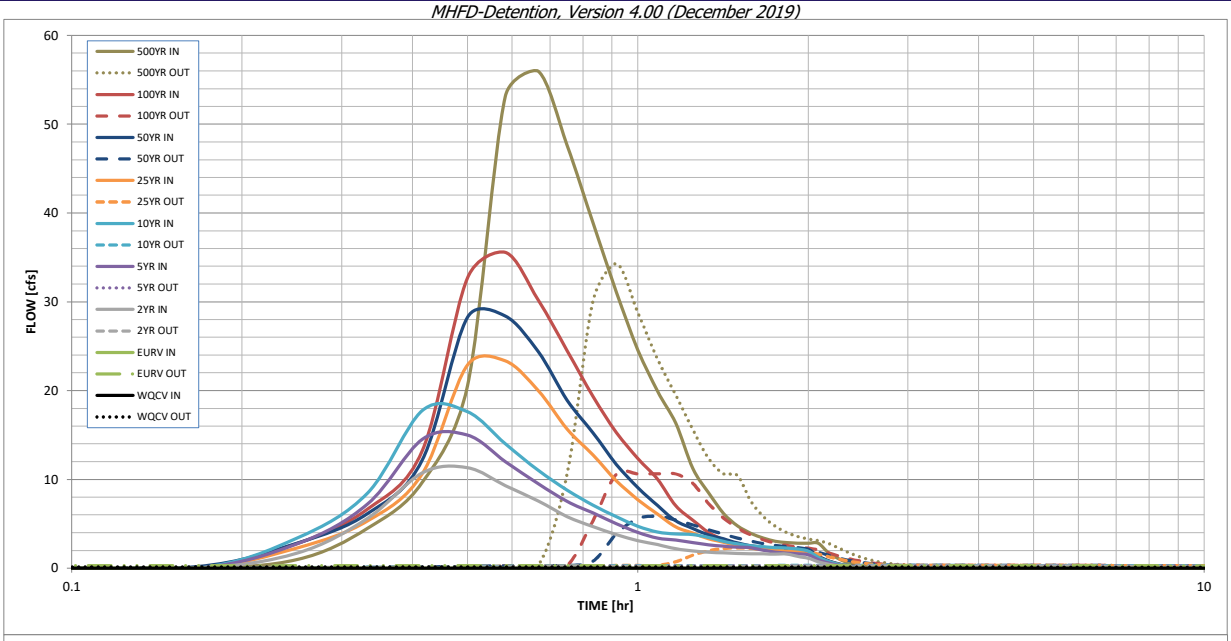
Routed Hydrograph Results — *The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).*

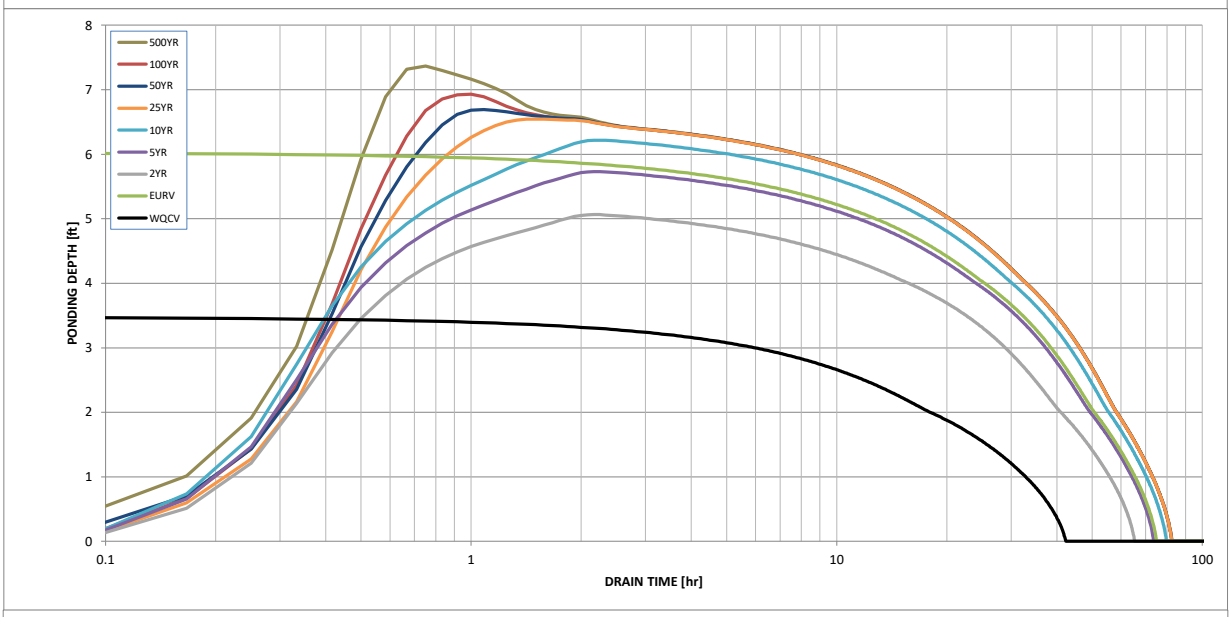
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.235	0.831	0.593	0.785	0.938	1.163	1.384	1.660	2.617
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.593	0.785	0.938	1.163	1.384	1.660	2.617
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.3	0.4	3.3	6.4	10.4	23.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.26	0.50	0.81	1.83
Peak Inflow Q (cfs) =	N/A	N/A	11.3	15.0	17.8	23.3	28.4	35.6	56.0
Peak Outflow Q (cfs) =	0.1	0.3	0.3	0.3	0.3	2.3	5.8	10.6	34.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	0.8	0.7	0.9	1.0	1.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.5	1.0	1.0
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	57	64	68	69	67	65	58
Time to Drain 99% of Inflow Volume (hours) =	**40**	70	62	69	75	77	76	75	72
Maximum Ponding Depth (ft) =	3.48	6.03	5.06	5.73	6.22	6.54	6.69	6.93	7.37
Area at Maximum Ponding Depth (acres) =	0.15	0.31	0.26	0.29	0.32	0.34	0.35	0.36	0.38
Maximum Volume Stored (acre-ft) =	0.236	0.832	0.556	0.742	0.889	0.998	1.049	1.134	1.294

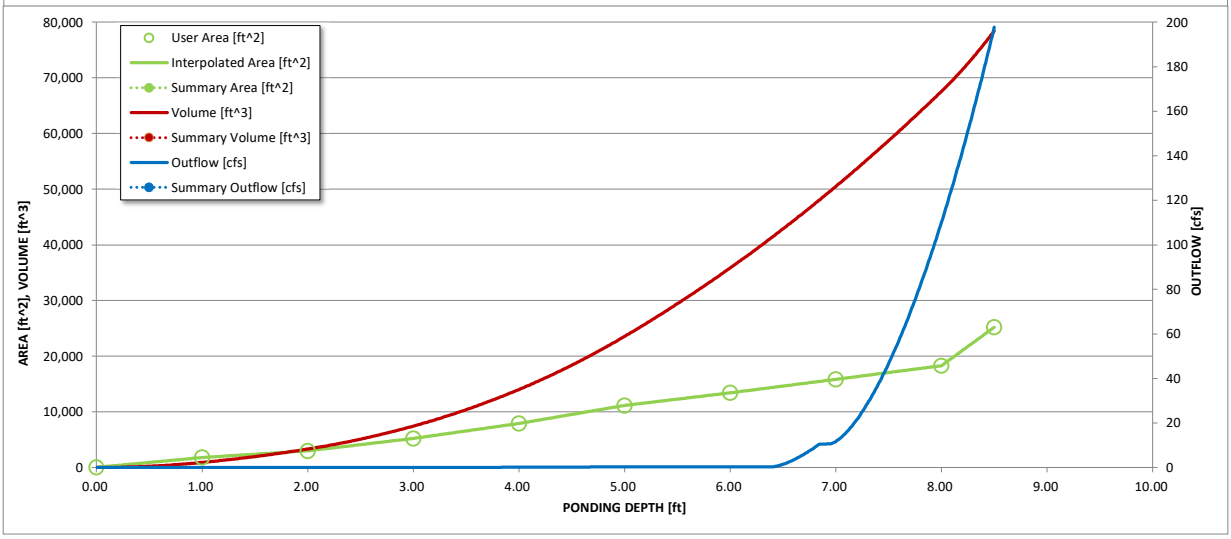
WINDERMERE FILING NO. 2 SOUTH POND
FINAL DESIGN DEVELOPED CONDITION

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.02	0.95
	0:15:00	0.00	0.00	1.68	2.73	3.39	2.28	2.81	2.79	4.49
	0:20:00	0.00	0.00	5.61	7.23	8.47	5.32	6.15	6.66	9.68
	0:25:00	0.00	0.00	10.75	14.52	17.75	10.67	12.20	13.26	20.56
	0:30:00	0.00	0.00	11.32	14.97	17.61	22.87	28.23	32.69	53.10
	0:35:00	0.00	0.00	9.30	12.01	14.00	23.34	28.40	35.57	55.97
	0:40:00	0.00	0.00	7.55	9.51	11.03	20.01	24.38	30.21	47.63
	0:45:00	0.00	0.00	5.82	7.52	8.79	15.67	18.93	24.52	38.91
	0:50:00	0.00	0.00	4.67	6.22	7.11	12.74	15.26	19.35	31.09
	0:55:00	0.00	0.00	3.80	5.00	5.79	9.84	11.69	15.27	24.59
	1:00:00	0.00	0.00	3.09	4.02	4.72	7.73	9.07	12.35	19.94
	1:05:00	0.00	0.00	2.65	3.40	4.07	6.08	7.06	10.03	16.32
	1:10:00	0.00	0.00	2.19	3.15	3.85	4.64	5.31	7.03	11.24
	1:15:00	0.00	0.00	1.94	2.90	3.78	3.95	4.48	5.42	8.50
	1:20:00	0.00	0.00	1.80	2.64	3.47	3.31	3.74	4.04	6.17
	1:25:00	0.00	0.00	1.71	2.47	3.02	2.93	3.30	3.20	4.77
	1:30:00	0.00	0.00	1.66	2.36	2.72	2.51	2.83	2.71	3.93
	1:35:00	0.00	0.00	1.63	2.30	2.53	2.25	2.54	2.38	3.37
	1:40:00	0.00	0.00	1.60	2.01	2.40	2.09	2.35	2.17	3.03
	1:45:00	0.00	0.00	1.59	1.81	2.32	1.99	2.23	2.07	2.87
	1:50:00	0.00	0.00	1.59	1.69	2.26	1.93	2.17	2.04	2.82
	1:55:00	0.00	0.00	1.31	1.61	2.15	1.90	2.13	2.02	2.80
	2:00:00	0.00	0.00	1.13	1.50	1.92	1.88	2.11	2.02	2.80
	2:05:00	0.00	0.00	0.72	0.96	1.24	1.21	1.36	1.30	1.79
	2:10:00	0.00	0.00	0.45	0.60	0.78	0.77	0.86	0.82	1.13
	2:15:00	0.00	0.00	0.27	0.37	0.48	0.47	0.53	0.50	0.69
	2:20:00	0.00	0.00	0.15	0.22	0.28	0.28	0.31	0.30	0.41
	2:25:00	0.00	0.00	0.08	0.12	0.15	0.16	0.18	0.17	0.23
	2:30:00	0.00	0.00	0.03	0.06	0.06	0.07	0.08	0.07	0.10
	2:35:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	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

DRAINAGE MAPS

BASIN RUNOFF SUMMARY		
BASIN	Q5 (CFS)	Q100 (CFS)
EX-A	11.3	28.2
EX-B	5.7	14.2
EX-C	17.7	44.1
EX-D	5.8	14.5
EX-E	1.0	2.6
EX-F	4.0	10.0
EX-R	1.7	3.4
D-13	13.8	28.5
D-14	7.2	15.1
D-15	4.6	8.6
D-16	7.2	14.6
NC-1	1.9	3.6
NC-2	6.7	12.5
WS	47.3	66.4
CT	90.8	184.7

PIPE RUN SUMMARY			
PIPE	Q5 (CFS)	Q100 (CFS)	PIPE SIZE
6A	4.8	8.1	EX. 18"
6B	18.4	42.6	EX. 24"
6C	21.6	47.9	EX. 24"
7	24.2	53.3	EX. 30"
8	24.7	50.9	EX. 36"

DESIGN POINT SUMMARY			
DESIGN POINT	Q5 (CFS)	Q100 (CFS)	FACILITY
4	7.2	14.6	EX. 8' SUMP INLET
6	18.4	42.6	EX. TYPE D GRATED INLET
7	20.0	41.6	EX. 25' SUMP INLET
8	5.6	11.2	EX. 10' SUMP INLET
19	6.7	12.5	EX. 15' AT-GRADE INLET
20	3.7	8.0	EX. 10' SUMP INLET
24	111.3	199.7	OFF-SITE RUNOFF TO POND
25	117.5	215.1	TOTAL EXISTING TO POND
26	138.3	266.9	EX. TO MARKSHEFFEL RD.

MDDP DP-1X
Q5 = 185 CFS
Q100 = 600 CFS
(SEE REPORT TEXT)

MDDP DP-1C
Q5 = 250 CFS
Q100 = 852 CFS

Please provide a discussion of the existing condition. Hydrologic calculations for the existing condition are required, along with excerpts of the relevant calculations.

CLASSIC - WINDERMERE FILING NO. 1 FDR EXCERPT
HISTORIC CONDITION & OFFSITE BASINS EXTENTS

LEGEND
EXISTING GROUND CONTOUR (5810)
EXISTING STORM SEWER
BASIN IDENTIFIER / AREA IN ACRES
DESIGN POINT
PIPE RUN

CALE: 1" = 100'

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS 8:11 UTILITY NOTIFICATION OF COLORADO IT'S THE LAW
THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

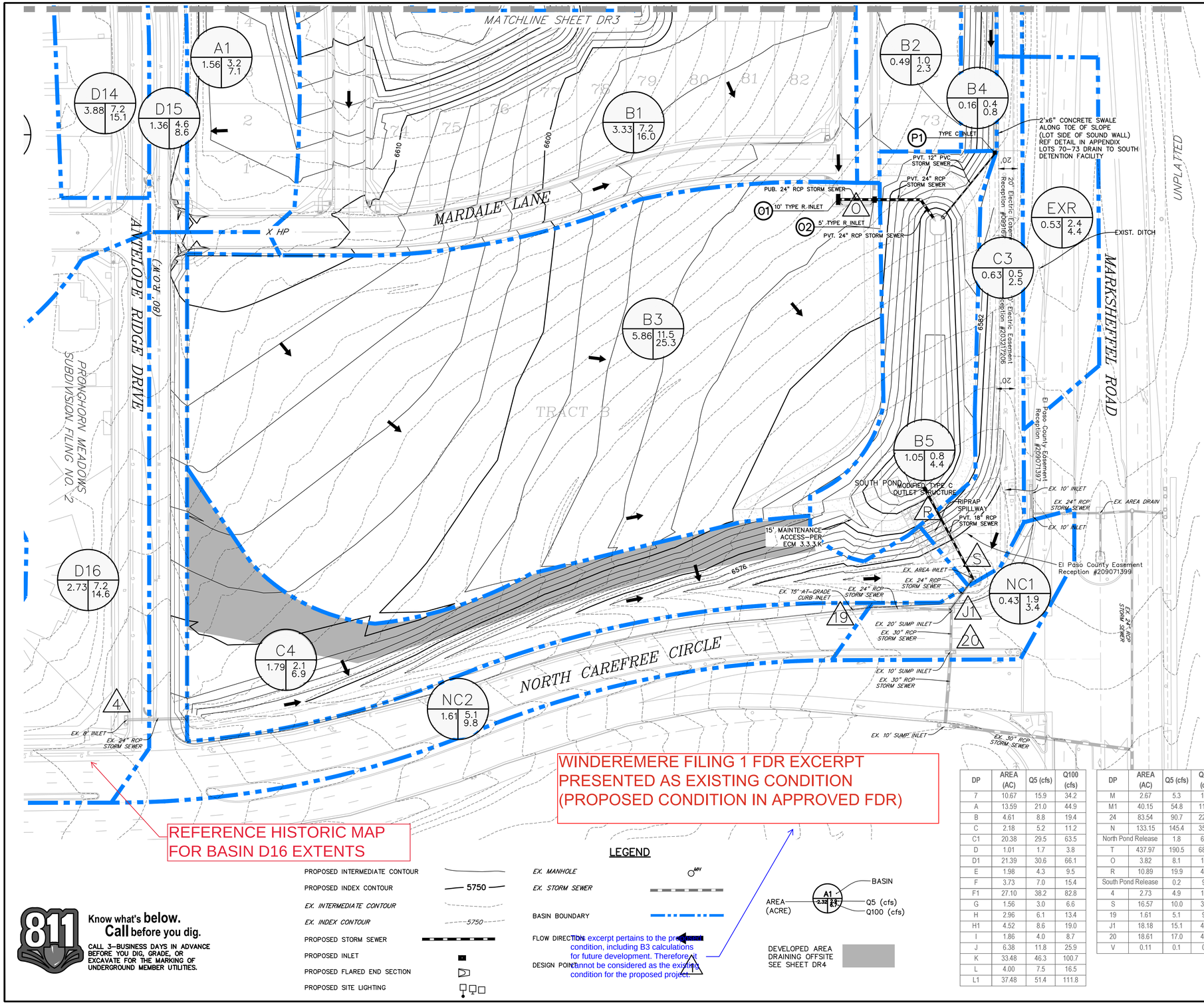
NO. REVISION DATE

REVIEW:
PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC
KYLE R. CAMPBELL, COLORADO P.E. #29794 DATE

CLASSIC SM CONSULTING ENGINEERS & SURVEYORS
6385 Corporate Drive, Suite 101 (719)785-0790
Colorado Springs, Colorado 80919 (719)785-0799(Fax)

WINDERMERE
EXISTING CONDITIONS DRAINAGE MAP
PRELIMINARY DRAINAGE REPORT WINDERMERE
FINAL DRAINAGE REPORT WINDERMERE FIL. NO. 1

DESIGNED BY	MAL	SCALE	DATE 09/01//14
DRAWN BY	MAL	(H) 1"= 100'	SHEET 1 OF 1
CHECKED BY		(V) 1"= N/A	JOB NO. 2241.000



DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
7	10.67	15.9	34.2
A	13.59	21.0	44.9
B	4.61	8.8	19.4
C	2.18	5.2	11.2
C1	20.38	29.5	63.5
D	1.01	1.7	3.8
D1	21.39	30.6	66.1
E	1.98	4.3	9.5
F	3.73	7.0	15.4
F1	27.10	38.2	82.8
G	1.56	3.0	6.6
H	2.96	6.1	13.4
H1	4.52	8.6	19.0
I	1.86	4.0	8.7
J	6.38	11.8	25.9
K	33.48	46.3	100.7
L	4.00	7.5	16.5
L1	37.48	51.4	111.8

DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
M	2.67	5.3	11.8
M1	40.15	54.8	119.4
24	83.54	90.7	229.0
N	133.15	145.4	357.5
North Pond Release		1.8	66.0
T	437.97	190.5	682.4
O	3.82	8.1	17.9
R	10.89	19.9	46.2
South Pond Release		0.2	9.2
4	2.73	4.9	10.7
S	16.57	10.0	33.7
19	1.61	5.1	9.8
J1	18.18	15.1	43.5
20	18.61	17.0	46.9
V	0.11	0.1	0.5

NOTE:
SEE "PRELIMINARY DRAINAGE REPORT FOR WINDERMERE," BY CLASSIC CONSULTING ENGINEERS & SURVEYORS, OCTOBER 2014 FOR EXISTING DRAINAGE MAP AND CALCULATIONS INCLUDING BASINS D16, NC1, NC2 AND THEIR DESIGN POINTS

PREPARED BY:
DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
BOULDER • COLORADO SPRINGS • GREELEY

CLIENT:
THE LANDHUIS COMPANY
212 N. WAHSATCH AVE., #301
COLORADO SPRINGS, CO 80903
(719) 635-3200
CONTACT: JEFF MARK

DRAINAGE MAP FOR
WINDERMERE
FILING NO. 1
N. MARKSHEFFEL ROAD
EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	7-9-21
RESUBMITTAL	1-5-22

DESIGNED BY:	SBN
DRAWN BY:	SBN
CHECKED BY:	TDM
FILE NAME:	

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 50'
VERTICAL: N/A

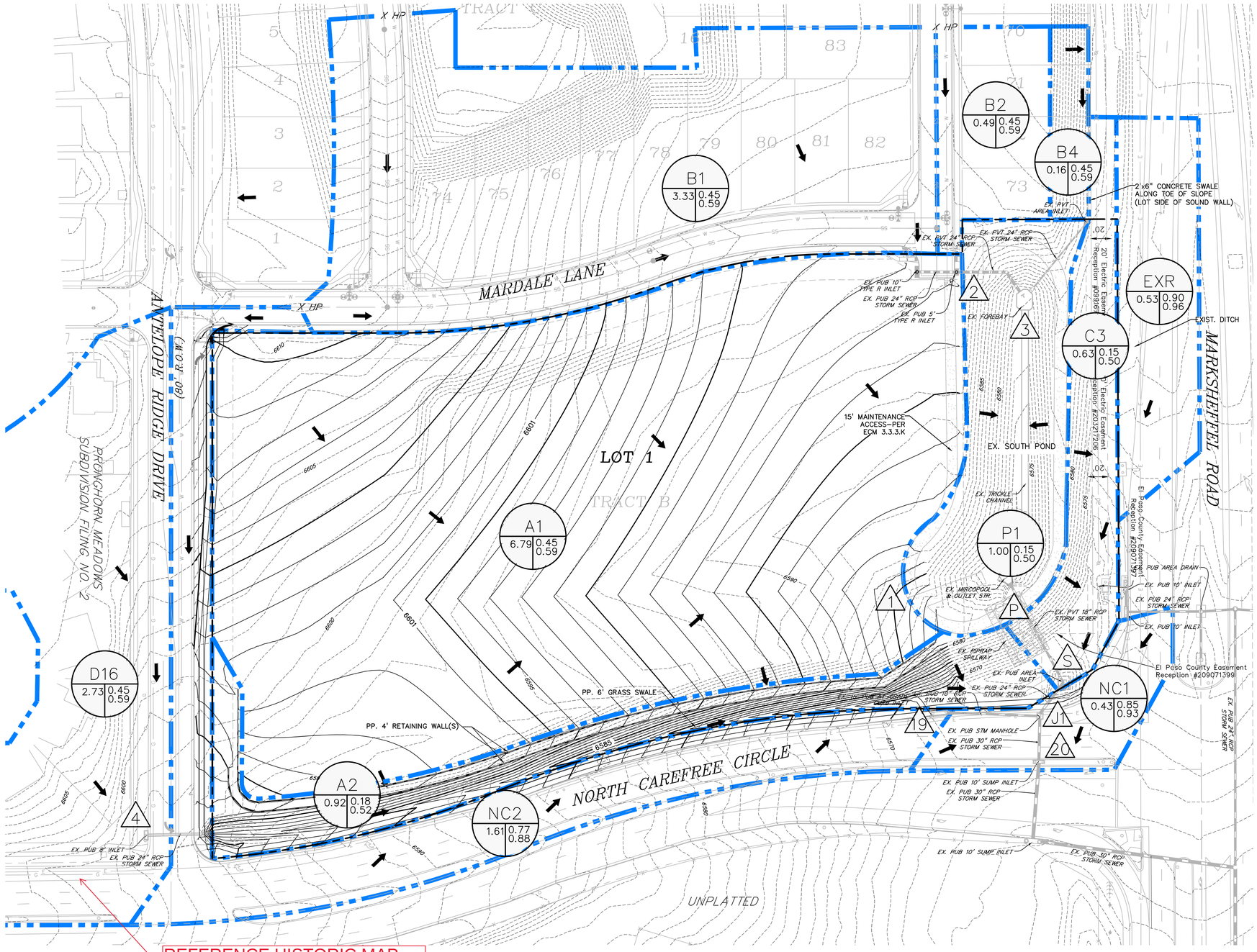
PROPOSED DRAINAGE MAP

PROJECT NO. 21187-01CSCV

DRAWING NO.

DR4

SHEET: 4 OF 5



LEGEND

- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR — 5750
- EX. INTERMEDIATE CONTOUR
- EX. INDEX CONTOUR — 5750
- PROPOSED STORM SEWER
- PROPOSED INLET
- PROPOSED FLARED END SECTION
- EX. MANHOLE
- EX. STORM SEWER
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT (1)
- AREA (ACRE) — A1 (2.50 | 2.8 | 6.7) — BASIN, Q5 (cfs), Q100 (cfs)

BASIN	AREA (AC)	Q5 (cfs)	Q100 (cfs)
A1	6.79	12.6	27.9
B1	3.33	7.2	16.0
B2	0.49	1.0	2.3
B4	0.16	0.4	0.8
P1	1.00	0.5	2.7
D16	2.73	4.9	10.7
A2	0.92	0.7	3.4
NC2	1.61	6.3	12.1
EXR	0.53	2.4	4.4
C3	0.63	0.5	2.5
Pond Release	1.00	0.3	10.6
NC1	0.43	1.9	3.4

DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
1	6.79	12.6	27.9
2	3.82	8.1	17.7
3	11.78	19.8	45.8
19	1.61	6.3	12.1
4	2.73	4.9	10.7
P	1.00	0.3	10.6
S	4.81	7.8	29.2
J1	6.42	12.4	38.0
20	6.85	13.7	40.4

COUNTY FILE NO.: SP223

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
101 SAHWATCH ST. STE 100
COLORADO SPGS, COLORADO 80903
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
COLORADO SPRINGS • LAFAYETTE

CLIENT:

COLO WINDERMERE #2, LLC
4164 AUSTIN BLUFFS PWY, #361
COLORADO SPRINGS, CO 80918
(719) 200-9594
CONTACT: JAMES TODD STEPHENS

DRAINAGE PLANS FOR
WINDERMERE FILING 2
N. MARKSHEFFEL ROAD
EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	4/1/22
REVISED	8/2/24

DESIGNED BY:	KGV
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 50'
VERTICAL: N/A

PROPOSED DRAINAGE MAP

PROJECT NO. 21187-03CSCV

DRAWING NO.

DR

SHEET: 1 OF 1