



INNOVATIVE DESIGN. CLASSIC RESULTS.

**FINAL DRAINAGE REPORT
FOR
WATERSIDE AT LAKE WOODMOOR
FILING NO. 1**

April 2023

Prepared for:
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9540 Federal Drive
COLORADO SPRINGS CO 80921

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Job no. 2588.00
PCD File # SF



FINAL DRAINAGE REPORT FOR WATERSIDE AT LAKE WOODMOOR FILING NO. 1

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 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 omissions on my part in preparing this report.

Kyle R Campbell, Colorado P.E. #29794

Date

DEVELOPER'S STATEMENT:

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

Business Name: Lake Woodmoor Holdings, LLC

By: _____

Title: _____

Address: 9540 Federal Dr.

Colorado Springs, CO 80921

EL PASO COUNTY ONLY:

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.

For County Engineer / ECM Administrator
Conditions:

Date



FINAL DRAINAGE REPORT FOR WATERSIDE AT LAKE WOODMOOR FILING NO. 1

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PURPOSE

This document is the Final Drainage Report for Waterside at Lake Woodmoor Filing No. 1, previously platted as and called “Waterside Condominiums Subdivision”. The purpose of this report is to identify onsite and offsite drainage patterns, define areas tributary to the proposed water quality facility (Pond A), and to safely route developed storm water runoff via a proposed storm sewer system. The proposed Waterside at Lake Woodmoor Filing No. 1 development shall be in adherence to the El Paso County approved Drainage Basin Planning Study – Dirty Woman Creek and Crystal Creek as well as current County Drainage Criteria.

PROJECT DESCRIPTION

The Waterside at Lake Woodmoor Filing No. 1 development is a 7.53-acre residential community within the south half of Section 11, Township 11 South, Range 67 West of the 6th Principal Meridian in El Paso County, Colorado. The site is located on the east side of Woodmoor Drive just south of Deer Creek Road. Existing Lake Woodmoor sits directly to the east of the site. The development includes a total of 52 townhome residences that will be developed in a single phase. A significant portion of the site will remain as adjacent open space area to and including the existing Lake Woodmoor (See Plat and Developed Drainage Conditions).

PREVIOUS REPORTS

The latest and most applicable previously approved drainage studies are the following:

1. “Drainage Basin Planning Study Dirty Woman Creek and Crystal Creek, El Paso County, Colorado,” by Kiowa Engineering Corporation, dated September 1993.
2. “Drainage Report and Plan Waterside Condominiums Subdivision,” by Leigh Whitehead & Associates, dated August 1980.
3. “Preliminary and Final Drainage Report North Bay at Lake Woodmoor,” by Kiowa Engineering Corporation, revised February 21, 2020



SOILS AND GEOLOGY

The soils within the Waterside at Lake Woodmoor Filing No. 1 site and tributary area are Hydrologic Soil Group B, Pring course sandy loam and Tomah-Crowfoot loamy sands) as determined by the 'Soil Survey of El Paso County Area' (See Appendix for Soil Map).

DRAINAGE CRITERIA

Hydrologic calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the DCM as revised in May 2014. The proposed Stormwater Quality Facility, Sand Filter Basin (SF) design, are per the Mile High Flood District Manual and MHFD-Detention version 4.06 and UD-BMP version 3.07 spreadsheet. The Rational Method was used to estimate stormwater runoff from the developed project and tributary to the proposed full spectrum detention/water quality pond. The UDFCD UD-Inlet excel workbook was used to verify street capacities, size sump inlets, and calculate interception and flow-by rates of at-grade inlets. The UD-Sewer computer program was used to calculate the hydraulic grade line (HGL) within the storm sewer system. An overall tributary area exhibit is included to show the various types of pervious and impervious areas established to determine the overall imperviousness of the 4.92 acres tributary to the proposed storm water quality facility (Pond A, Sand Filter Basin).

FLOODPLAIN STATEMENT

A portion of the site is located within a FEMA floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Numbers 08041C 0276G, effective date, December 7, 2018. The existing floodplain area is proposed to be contained within Tract A (open space), and no proposed lots or development of any kind will be impacted by the existing floodplain.

EXISTING DRAINAGE CONDITIONS

The site is located within the Dirty Woman Creek Drainage Basin. This site was previously studied in the “Drainage Report and Plan – Waterside Condominiums Subdivision,” by Leigh Whitehead. This currently proposed residential community is to replace the previously platted but not constructed condominium community. Also consulted for this report was the “Preliminary and Final Drainage Report – North Bay at Lake Woodmoor,” by Kiowa Engineering, dated February 21, 2020.

The site is predominantly covered in native grasses, with existing trees sporadically located along the south and southeast boundary. The existing ground slopes in a south and southeasterly direction as depicted on the Existing Conditions Drainage Map in the Appendix. An existing roadside grass swale is located along the west boundary, adjacent to existing Woodmoor Drive. A more detailed summary of the existing conditions is as follows:

DESIGN POINT 1 ($Q_5 = 0.8$ cfs and $Q_{100} = 6.2$ cfs) is the existing condition runoff from Basin EX-A, 2.53 acres of the proposed site, south of Deer Creek Road. This land drains south via an existing swale directly into Lake Woodmoor at the southeast corner of the property.

DESIGN POINT 2 ($Q_5 = 0.8$ cfs and $Q_{100} = 5.9$ cfs) is the existing condition runoff from Basin EX-B, 2.62 acres of the proposed site, just west of and containing a portion of Lake Woodmoor. This land drains east as sheet flow directly into Lake Woodmoor and the FEMA floodplain limits.

DESIGN POINT 3 ($Q_5 = 0.3$ cfs and $Q_{100} = 2.5$ cfs) is the existing condition runoff from Basin EX-C, 1.13 acres of the proposed site, west of Basin EX-B. This land drains directly south as sheet flow onto the adjacent property (Lake Woodmoor Townhouses III).

DESIGN POINT 4 ($Q_5 = 1.2$ cfs and $Q_{100} = 5.5$ cfs) is the existing condition runoff from Basin EX-D, 1.74 acres of the proposed site, east of Woodmoor Drive. This land drains south via the existing roadside swale along Woodmoor Drive and onto the existing drive aisle at the southwest corner of the property.

PROPOSED DRAINAGE CONDITIONS

Developed runoff from Waterside at Lake Woodmoor Filing No. 1 will be collected in a Private storm system and piped into the Privately owned and maintained Storm Water Quality Sand Filter Facility (Pond A) that will treat the developed runoff prior to releasing into the adjacent Lake Woodmoor (Full Spectrum Detention Facility). All roadways are Private and have a pavement mat width of 24'.

The rational method was used to estimate developed runoff values. All storm sewer inlets and pipes are 'Private', with the exception being Pipe 10, Public 18" RCP passing the existing roadside ditch runoff under the proposed roadway access point (See Design Point 7). Private facilities will be owned and maintained by the Home Owner's Association. HGL grade line calculations (using UD-Sewer software) are included in the Appendix in support of the construction drawings for the proposed storm system.

At-grade and sump (low-points) inlets were designed in a way that street capacity is not an issue anywhere within the proposed Filing. Homes near sump inlets shall be constructed at least 1 foot above the 100-year water surface ponding elevation. Inlet sizing has been designed using the MHFD-Inlet Excel workbook (located in Appendix) from Mile High Flood District (UDFCD). Drainage from individual lots shall travel in rear/side-lot swales to the interior roadways. One Site-Level Low Impact Development form (IRF form) is included (See Appendix), for the basins that discharge to the proposed sand filter water quality facility (Pond A). A detailed description of the developed flows is as follows:

DESIGN POINT 1 ($Q_5 = 0.3$ cfs and $Q_{100} = 0.7$ cfs) is the developed runoff from Basin D, 0.15 acres of proposed condo units and rear yards that drains to a proposed CDOT Type C grated inlet. This basin is adjacent to existing Woodmoor Drive and just north of the existing paved drive aisle to be used as the southerly site access point. The inlet intercepts the entirety of this runoff and Pipe 1 (Private 12" PVC) conveys it to the storm manhole within Hillingdon Heights, between the inlets at Design Points 2 & 3. The overflow path for this area drain is to overtop the adjacent walk and drain south into the paved entrance.

DESIGN POINT 2 ($Q_5 = 4.8$ cfs and $Q_{100} = 9.1$ cfs) is the developed runoff from Basin A, 1.50 acres of proposed condo units, private drives Hillingdon Heights and Barnet View, and adjacent parking and landscaping that drains south along Hillingdon Heights to a proposed 15' CDOT Type R at-grade inlet. This inlet intercepts a majority of the runoff ($Q_5 = 4.8$ cfs, $Q_{100} = 8.3$ cfs) while the remaining runoff ($Q_5 = 0$ cfs, $Q_{100} = 0.8$ cfs) continues south onto the existing paved access road (Design Point 8). Pipe 2 (Private 18" RCP) conveys the intercepted runoff to the adjacent manhole, combining with Pipe 1. Pipe 3 (Private 18" RCP, $Q_5 = 5.1$ cfs and $Q_{100} = 8.9$ cfs) conveys the combined runoff from Pipes 1 & 2 into the face of the inlet at Design Point 3.

DESIGN POINT 3 ($Q_5 = 0.5$ cfs and $Q_{100} = 1.0$ cfs) is the developed runoff from Basin E, 0.13 acres of proposed Hillingdon Heights, adjacent parking and landscaping that drains south along Hillingdon Heights to a proposed 5' CDOT Type R at-grade inlet. This inlet intercepts the entirety of the runoff ($Q_5 = 0.5$ cfs, $Q_{100} = 1.0$ cfs) while the excess runoff ($Q_5 = 0$ cfs, $Q_{100} = 0$ cfs) continues south onto the existing paved access road (Design Point 8). Pipe 4 (Private 24" RCP, $Q_5 = 5.5$ cfs and $Q_{100} = 9.8$ cfs) conveys the intercepted runoff and that from Pipe 3, to the north and east toward the proposed SWQ Facility at Design Point 6. Prior to draining into the facility, the storm system combines with Pipe 6 from Design Points 4 & 5.

DESIGN POINT 4 ($Q_5 = 3.2$ cfs and $Q_{100} = 6.2$ cfs) is the developed runoff from Basin C, 0.98 acres of proposed condo units, private drives Hillingdon Heights and Barnet View, adjacent parking and landscaping that drains south to the proposed 10' CDOT Type R sump inlet at the low point along Barnet View. The inlet intercepts the entirety of this runoff and Pipe 5 (Private 18" RCP) conveys it to the inlet across the street at DP-5. The overflow path for this sump inlet is to overtop the high point in the asphalt at the SE corner of Hillingdon Heights and Barnet View and continue south along the roadway to downstream facilities.

DESIGN POINT 5 ($Q_5 = 4.3$ cfs and $Q_{100} = 8.0$ cfs) is the developed runoff from Basin B, 1.30 acres of proposed condo units, private drives Hillingdon Heights and Barnet View, and adjacent parking and landscaping that drains south along the roadways to a propose 10' CDOT Type R sump inlet at the low point along Barnet View. The inlet intercepts the entirety of this runoff and Pipe 6 (Private 24" RCP, Q_5

= 7.2 cfs and $Q_{100} = 13.6$ cfs) conveys it, and that from Pipe 5, to the south to a junction manhole with Pipe 4. Pipe 7 (Private 24" RCP, $Q_5 = 12.5$ cfs and $Q_{100} = 13.6$ cfs) conveys the combined runoff from this manhole (Pipes 4 & 6) to the east, directly into the proposed Storm Water Quality Facility (Pond A) at Design Point 6. The overflow path for this sump inlet is to overtop the high point in the asphalt at the SE corner of Hillingdon Heights and Barnet View and continue south along the roadway to downstream facilities.

BASIN F ($Q_5 = 0.9$ cfs and $Q_{100} = 1.9$ cfs) is the developed runoff 0.30 acres of proposed condo units rooftops along the eastern boundary and open space. The roof drains from these condo units are to connect underground to the proposed Private Pipe 8 (12" PVC) that runs along the back of these units. This pipe, containing the roof top drainage, drains directly into the proposed Storm Water Quality Facility (Pond A) at Design Point 6. The landscaping along the back and sides of the condo units within Basin F, will drain directly into the open space to the east and not into Pipe 8.

DESIGN POINT 6 – SAND FILTER STORM WATER QUALITY FACILITY ‘POND A’ ($Q_5 = 13.7$ cfs, $Q_{100} = 26.4$ cfs) is the overall developed runoff into the proposed Storm Water Quality Facility ‘Pond A’; Basin G and Pipes 7 & 8. Basin G is 0.56 acres of the water quality facility and surrounding slope area and back yards of adjacent condo units. This facility is a Private Sand Filter Basin (water quality only) per the El Paso County & City of Colorado Springs and Mile High Flood District (MHFD), formally Urban Drainage Flood Control District, drainage criteria. The proposed facility was sized utilizing two excel workbooks from MHFD, UD-BMP version 3.07 and MHFD-Detention version 4.06. The composite impervious value was determined using Site-Level Low Impact Development (LID) Design Effective Impervious Calculator (IRF Form) located in the Appendix of this report. Also, an exhibit of the tributary area to the pond and the assumed impervious/pervious types is included in the Appendix.

A total of 4.92 acres of Waterside at Lake Woodmoor Filing No. 1 is tributary to this facility at a calculated imperviousness of 71.3%. For a Sand Filter Basin, the minimum flat surface area required is 1,910 square feet, and a minimum required Water Quality Capture Volume (WQCV) of 3,922 cubic feet. The proposed facility has a flat bottom surface area of 1,965 square feet and at 2.0' depth, a WQCV of 5,619 cubic feet. A 4' x 4' pond outlet box with an open top (with trash grate) at 2.0' above bottom and a concrete spillway

at 3' above the pond bottom, will convey the larger storm events to the east and directly into the adjacent Lake Woodmoor. Lake Woodmoor serves as detention for the proposed development (see Lake Woodmoor Detention section). A 6" slotted underdrain system sits within the Sand Filter material (per MHFD T-6 Details) and connects to the face of the pond outlet box. An orifice plate at the entry point of the 6" underdrain into the pond box is required to drain the facility at the required 12-hour drain time. This plate should constrict the opening to a 1-7/16" diameter opening per UD-BMP v3.07 located in the Appendix of this report.

A Private 18" RCP outlet pipe (Pipe 9) will convey the detained release ($Q_5 = 3.9$ cfs, $Q_{100} = 5.2$ cfs) to the existing Lake Woodmoor located directly east of the pond. The 10' long concrete spillway is utilized to pass the incoming runoff at the 25-year storm event and higher, with a 100-year release rate into Lake Woodmoor being $Q_{100} = 13.5$ cfs and a maximum ponding depth of 3.24'. As the spillway is 3.0' above pond bottom, the flow over the spillway is only 0.24' in the 100-year event. The top of the facility (top of berm) is 5.0' above pond bottom, leaving a total freeboard over the 100-yr flow of 1.76'. A concrete impact structure per Mile High Flood District will be installed at the end of the 18" outfall pipe and edge of the existing FEMA floodplain in Lake Woodmoor. A 10' wide maintenance access road at 15% max. grade will be installed to the bottom of the facility per the DCM. Maintenance and ownership of the Private water quality facility and the pond outfall pipe is by the Homeowner's Association.

BASIN H ($Q_5 = 0.8$ cfs and $Q_{100} = 5.9$ cfs) is the developed runoff from the 2.03 acres of back yards of condo units and open space along the east boundary, including the portion of Lake Woodmoor on the proposed site. This area has no pavement, rooftops, or any other impervious surface within and therefore does not drain into the water quality facility and continues along natural drainage patterns to Lake Woodmoor. This runoff and the release from the proposed water quality facility can be compared to the Existing Conditions runoff at Design Points 1 & 2. A direct addition comparison of runoff into Lake Woodmoor is as follows:

| | | |
|------------------------------|----------------------------------|---------------------------------------|
| <u>Existing Conditions:</u> | Design Point 1 + Design Point 2: | $Q_5 = 1.6$ cfs, $Q_{100} = 12.1$ cfs |
| <u>Developed Conditions:</u> | Pond Release + Basin H: | $Q_5 = 4.7$ cfs, $Q_{100} = 19.4$ cfs |



As previously mentioned, Lake Woodmoor is accepting developed runoff and handling detention requirements within (See Lake Woodmoor Detention Section of this report). Therefore, the increase in flow rates is expected and as it is concentrated to the pond outfall location, will not cause downstream erosion or hinderance on existing facilities.

DESIGN POINT 7 ($Q_5 = 0.3$ cfs and $Q_{100} = 1.2$ cfs) is the developed runoff from Basin J, 0.36 acres of existing Woodmoor Drive roadside swale and back yards of condo units along Woodmoor Drive. The rooftops and rear/side lot swales of the adjacent condo units shall drain to Hillingdon Heights and not into this existing roadside swale. The proposed Barnet View roadway (Private) crosses the existing roadside swale at this design point. A proposed Public 18" RCP storm pipe conveys this runoff under the roadway, with excess capacity and minimal cover, to the south side and back into the existing roadside swale of Woomoor Drive.

DESIGN POINT 8 ($Q_5 = 1.6$ cfs and $Q_{100} = 5.1$ cfs) is the developed runoff at the southwest corner of the site and the existing paved entrance road off Woodmoor Drive. Specifically, this is the runoff from: Basin L, 0.64 acres of existing Woodmoor Drive roadside swale and back yards of condo units along Woodmoor Drive; Basin K, 0.07 acres of proposed Barnet View roadway accessing off Woodmoor Drive; Design Point 7 (See previous description); and the flow-by from the at-grade inlets at Design Points 2 & 3. This runoff can be compared to the Existing Conditions runoff at Design Point 4. A direct comparison of runoff at this existing entrance drive is as follows:

| | | |
|------------------------------|-----------------|--------------------------------------|
| <u>Existing Conditions:</u> | Design Point 4: | $Q_5 = 1.2$ cfs, $Q_{100} = 5.5$ cfs |
| <u>Developed Conditions:</u> | Design Point 8: | $Q_5 = 1.6$ cfs, $Q_{100} = 5.1$ cfs |

The 5-year flow is slightly higher in the developed condition due to the additional of Basin K, 0.07 acres of Barnet View that drains onto Woodmoor Drive and to this location. This slight increase in 5-yr flow will not hinder downstream facilities.

LAKE WOODMOOR DETENTION

Lake Woodmoor will provide 100-year detention storage for the developed runoff from the site. The DBPS assumed a land use of residential with 2 lots per acre for the area that encompasses the Waterside Townhomes site (see Preliminary Drainage Report). The assumed land use would have a 25 percent imperviousness resulting in a 0.5 ac-ft of only detention volume requirement. The anticipated composite imperviousness for the proposed site is 71.3 percent. This equates to a detention volume requirement of 0.885 ac-ft (from MHFD-Detention v4.06). The net increase in detention volume to Lake Woodmoor from what was assumed in the DBPS is 0.385 ac-ft. Given the approximately 46-acre surface area of Lake Woodmoor (over 6 times larger than the proposed 7.53-acre site), the increase in detention volume would cause an increase of 0.10 inches in the lake's water surface elevation. Lake Woodmoor therefore has sufficient capacity to accept the additional runoff volume, and no improvements are recommended for the reservoir. The Woodmoor Water and Sanitation District (WWSD) has provided a letter stating that they will allow the use of their facility (Lake Woodmoor) for this site's flood storage. Any future development draining to Lake Woodmoor will need to provide this same level of analysis and acceptance of developed runoff to the existing lake.

STORMWATER QUALITY (FOUR STEP PROCESS)

El Paso County requires the Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls. The Four Step Process pertains to management of smaller, frequently occurring storm events, as opposed to larger storms for which drainage and flood control infrastructure are sized. Implementation of these four steps to achieve stormwater permit requirements is required. The site adheres to this Four Step Process as follows:

1. **Employ Runoff Reduction Practices:** Proposed impervious areas (roof tops, patios) will sheet flow across landscaped yards and through open space areas to slow runoff and increase time of concentration prior to being conveyed to the proposed private streets. This will minimize directly connected impervious areas within the project site.

2. **Stabilize Drainageways:** After developed flows utilize the runoff reduction practices through the yards, these flows will travel via curb and gutter within the private streets and eventually private storm systems. These collected flows are then routed directly to the proposed stormwater quality facility on-site and ultimately released into Lake Woodmoor.
3. **Provide Water Quality Capture Volume (WQCV):** Runoff from this development will be treated through capture and slow release of the WQCV in the proposed private on-site water quality facility designed per current El Paso County drainage criteria.
4. **Consider need for Industrial and Commercial BMPs:** No industrial or commercial uses are proposed within this development. However, a site-specific storm water quality and erosion control plan and narrative will be submitted along with the grading and erosion control plan. Details such as site-specific source control construction BMP's as well as permanent BMP's were detailed in this plan and narrative to protect receiving waters. BMP's will be constructed and maintained as the development has been graded and erosion control methods employed.

DRAINAGE AND BRIDGE FEES

Waterside at Lake Woodmoor Filing No. 1 is within the Dirty Woman Creek Drainage Basin. As the site was previously platted as Waterside Condominiums in 1989, drainage and bridge fees were paid at the time of that plat recordation. The land use has not changed and therefore additional drainage and bridge fees are not required with the proposed re-plat.

CONSTRUCTION COST OPINION

The following is a construction cost opinion for the public facilities, located within the Woodmoor Drive public right-of-way, and the private facilities, intercepting the runoff from the proposed site and routing to the downstream Lake Woodmoor:

Public Drainage Facilities Non-reimbursable

| ITEM | DESCRIPTION | QUANTITY | UNIT COST | COST |
|------------------|---------------------|----------|-----------|---------------------------|
| 1. | 18" RCP Storm Drain | 77 LF | \$70/LF | \$ 5,390.00 |
| SUB-TOTAL | | | | \$ 5,390.00 |
| 10% ENGINEERING | | | | \$ 539.00 |
| 5% CONTINGENCIES | | | | \$ 269.50 |
| TOTAL | | | | <u>\$ 6,198.50</u> |

Private Drainage Facilities Non-reimbursable (FILING NO. 1)

| ITEM | DESCRIPTION | QUANTITY | UNIT COST | COST |
|------------------|-----------------------|----------|-------------|-----------------------------|
| 1. | 12" PVC Storm Drain | 742 LF | \$50/LF | \$ 37,100.00 |
| 2. | 18" RCP Storm Drain | 83 LF | \$70/LF | \$ 5,810.00 |
| 3. | 24" RCP Storm Drain | 358 LF | \$83/LF | \$ 29,714.00 |
| 4. | CDOT Type C Inlet | 1 EA | \$5,138/EA | \$ 5,138.00 |
| 5. | 5' CDOT Type R Inlet | 1 EA | \$7,981/EA | \$ 7,981.00 |
| 6. | 10' CDOT Type R Inlet | 2 EA | \$8,706/EA | \$ 17,412.00 |
| 7. | 15' CDOT Type R Inlet | 1 EA | \$11,775/EA | \$ 11,775.00 |
| 8. | Type II Storm MH | 3 EA | \$7,082/EA | \$ 21,246.00 |
| 9. | Sand Filter SWQ Pond* | 1 EA | \$80,000/EA | \$ 80,000.00 |
| SUB-TOTAL | | | | \$ 216,176.00 |
| 10% ENGINEERING | | | | \$ 21,617.60 |
| 5% CONTINGENCIES | | | | \$ 10,808.80 |
| TOTAL | | | | <u>\$ 248,602.40</u> |

*Includes cost of riprap, sand filter material, underdrain system, concrete spillway, road, and outlet box.

SUMMARY

Developed runoff from the proposed Waterside at Lake Woodmoor Filing No. 1 development is proposed to drain to one private Sand Filter (SF) Storm Water Quality Facility (owned and maintained by the Home Owner's Association) prior to discharging to the adjacent Lake Woodmoor (detention facility) and further downstream facilities. The proposed water quality pond was sized using the current and applicable drainage criteria. Therefore, the developed site runoff and proposed storm sewer facilities will not adversely affect the downstream facilities or surrounding developments.

PREPARED BY:

Matthew Larson
Project Manager

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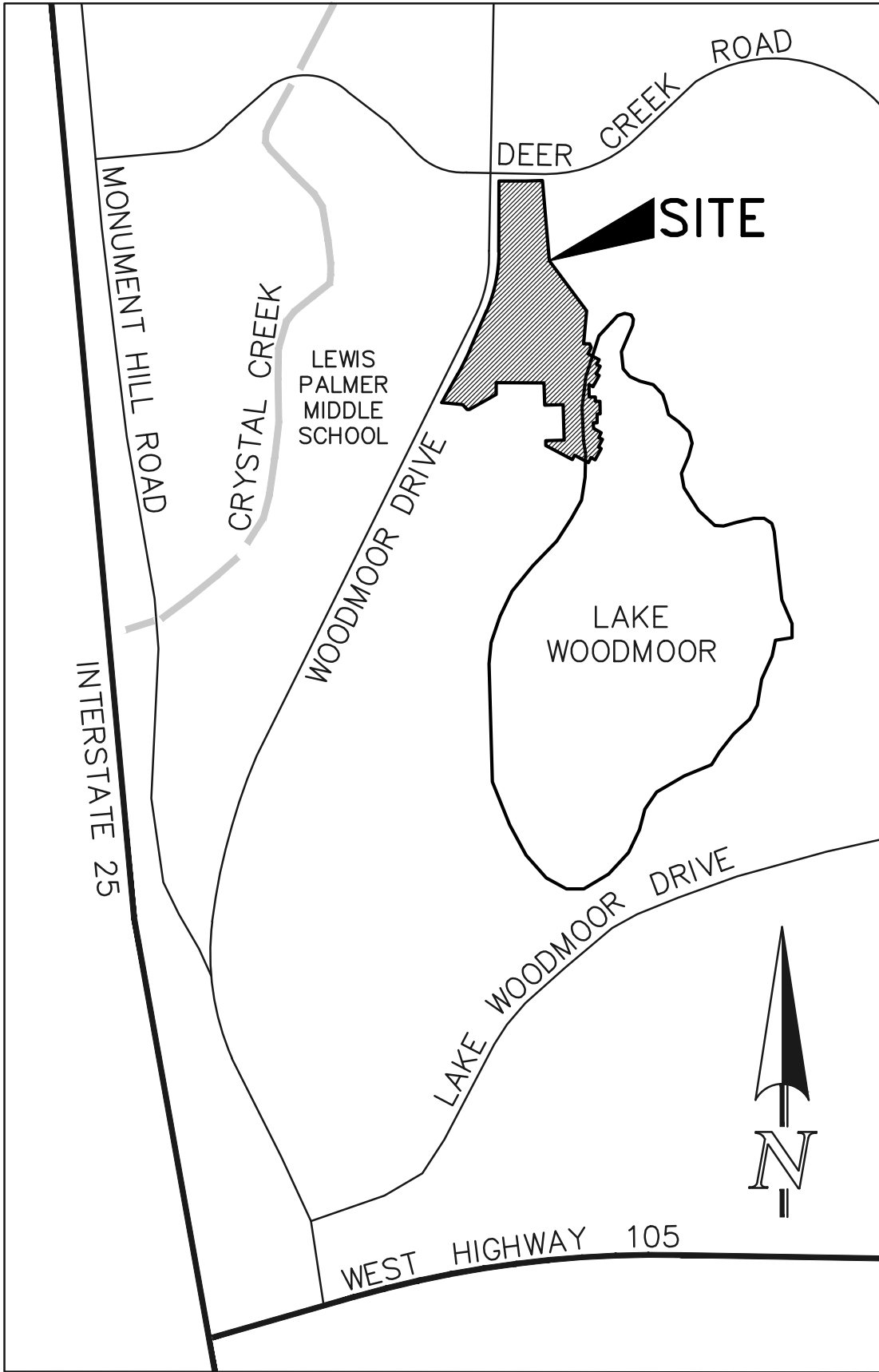
REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual Volume 1, as revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014.
2. "Urban Storm Drainage Criteria Manual Volume 1, 2 & 3," Urban Drainage and Flood Control District, dated January 2016.
3. "Drainage Basin Planning Study Dirty Woman Creek and Crystal Creek, El Paso County, Colorado," by Kiowa Engineering Corporation, dated September 1993.
4. "Drainage Report and Plan – Waterside Condominiums Subdivision," by Leigh Whitehead, dated August 20, 1980.
5. "Preliminary and Final Drainage Report North Bay at Lake Woodmoor," by Kiowa Engineering Corporation, revised February 21, 2020

APPENDIX

VICINITY MAP





VICINITY MAP
NOT TO SCALE

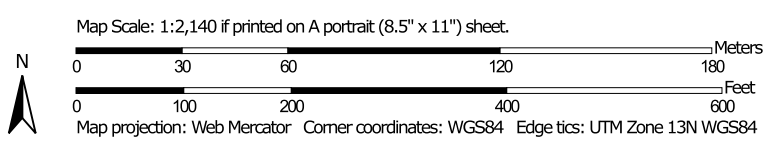
SOILS MAP (S.C.S. SURVEY)



Soil Map—El Paso County Area, Colorado
(WATERSIDE)




Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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.

Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|------------------------------------|---|--------------|----------------|
| 71 | Pring coarse sandy loam, 3 to 8 percent slopes | 5.0 | 68.1% |
| 92 | Tomah-Crowfoot loamy sands, 3 to 8 percent slopes | 1.7 | 23.7% |
| 111 | Water | 0.6 | 8.2% |
| Totals for Area of Interest | | 7.3 | 100.0% |

El Paso County Area, Colorado

71—Pring coarse sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369k

Elevation: 6,800 to 7,600 feet

Farmland classification: Not prime farmland

Map Unit Composition

Pring and similar soils: 85 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pring

Setting

Landform: Hills

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam

C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): High
(2.00 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B

Ecological site: R048AY222CO - Loamy Park

Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:

Landform: Depressions

Hydric soil rating: Yes

Other soils

Percent of map unit:

Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 19, Aug 31, 2021

El Paso County Area, Colorado

92—Tomah-Crowfoot loamy sands, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 36b9

Elevation: 7,300 to 7,600 feet

Farmland classification: Not prime farmland

Map Unit Composition

Tomah and similar soils: 50 percent

Crowfoot and similar soils: 30 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tomah

Setting

Landform: Hills, alluvial fans

Landform position (three-dimensional): Side slope, crest

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium derived from arkose and/or residuum weathered from arkose

Typical profile

A - 0 to 10 inches: loamy sand

E - 10 to 22 inches: coarse sand

Bt - 22 to 48 inches: stratified coarse sand to sandy clay loam

C - 48 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to high (0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: R049XY216CO - Sandy Divide

Hydric soil rating: No

Description of Crowfoot

Setting

Landform: Alluvial fans, hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 12 inches: loamy sand
E - 12 to 23 inches: sand
Bt - 23 to 36 inches: sandy clay loam
C - 36 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

El Paso County Area, Colorado

111—Water

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Data Source Information

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 19, Aug 31, 2021

F.E.M.A. MAP



National Flood Hazard Layer FIRMette

104°51'47"W 39°56'27"N



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

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*

NO SCREEN *Zone X*

Area of Minimal Flood Hazard *Zone X*

Effective LOMRMs *Zone D*

Area of Undetermined Flood Hazard *Zone D*

Channel, Culvert, or Storm Sewer Levee, Dike, or Floodwall

Cross Sections with 1% Annual Chance Water Surface Elevation

Coastal Transect

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

Digital Data Available

No Digital Data Available

Unmapped

OTHER AREAS OF FLOOD HAZARD

GENERAL STRUCTURES

OTHER FEATURES

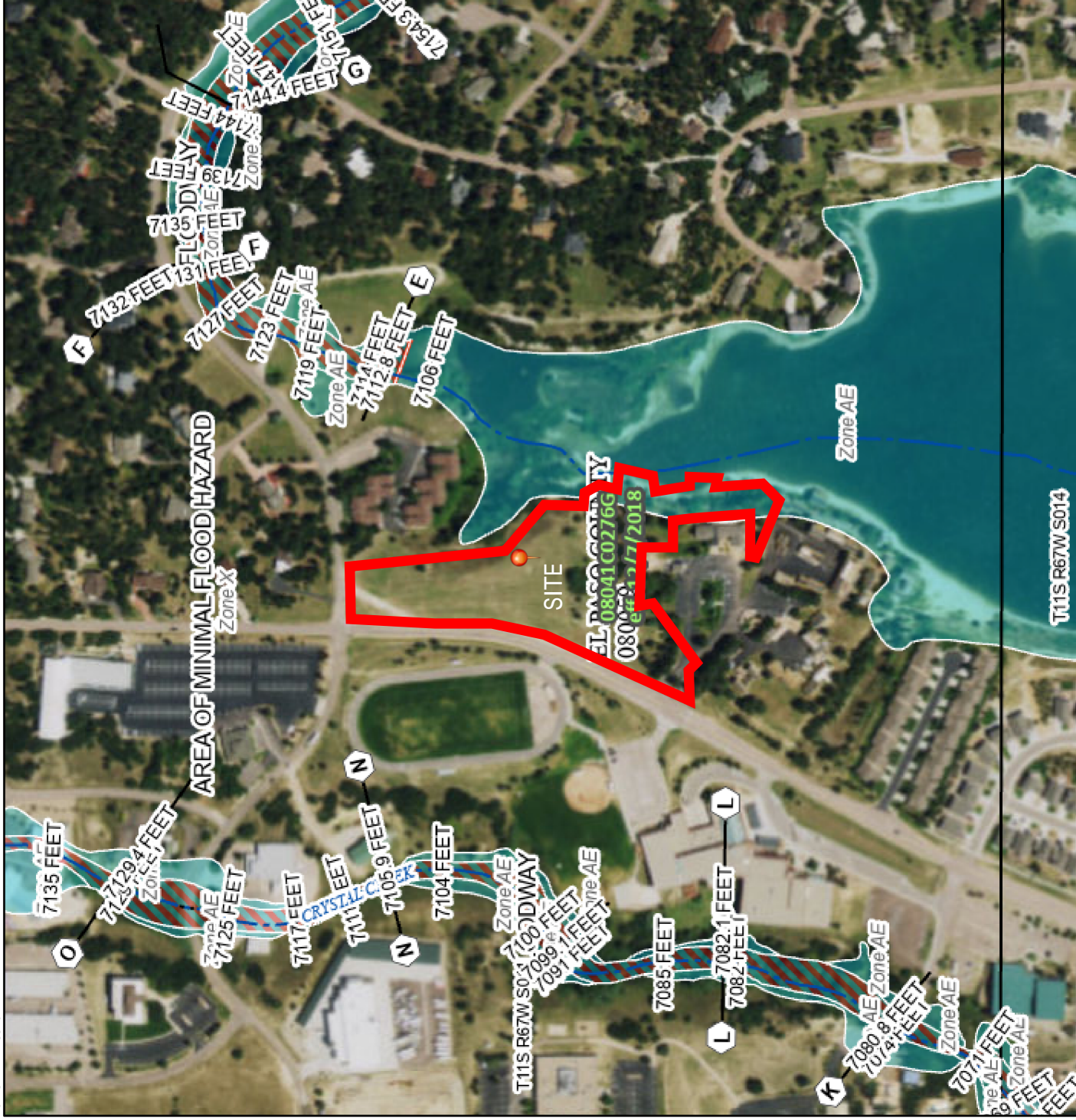
MAP PANELS

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 **6/30/2022 at 11:25 AM** 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°51'10"W 39°55'59"N

Feet 0 250 500 1,000 1,500 2,000 1:6,000

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

EXISTING CONDITIONS CALCULATIONS

JOB NAME: Waterside at Lake Woodmoor Filing No. 1
 JOB NUMBER: 2588.00
 DATE: 04/20/23
 CALCULATED BY: MAL

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY (EXISTING CONDITIONS)

| BASIN | TOTAL AREA (AC) | IMPERVIOUS AREA / STREETS | | | LOTS/LANDSCAPE/UNDEV. AREAS (NOT PAVEMENT) | | | | WEIGHTED | | WEIGHTED CA | |
|-------|-----------------|---------------------------|------|--------|--|----------|------|--------|----------|--------|-------------|---------|
| | | AREA (AC) | C(5) | C(100) | AREA (AC) | LAND USE | C(5) | C(100) | C(5) | C(100) | CA(5) | CA(100) |
| EX-A | 2.53 | 0.00 | 0.90 | 0.96 | 2.53 | OPEN | 0.08 | 0.35 | 0.08 | 0.35 | 0.20 | 0.89 |
| EX-B | 2.62 | 0.00 | 0.90 | 0.96 | 2.62 | OPEN | 0.08 | 0.35 | 0.08 | 0.35 | 0.21 | 0.92 |
| EX-C | 1.13 | 0.00 | 0.90 | 0.96 | 1.13 | OPEN | 0.08 | 0.35 | 0.08 | 0.35 | 0.09 | 0.40 |
| EX-D | 1.74 | 0.16 | 0.90 | 0.96 | 1.58 | OPEN | 0.08 | 0.35 | 0.16 | 0.41 | 0.27 | 0.71 |

JOB NAME: **Waterside at Lake Woodmoor Filing No. 1**
 JOB NUMBER: **2505.07**
 DATE: **12/6/2022**
 CALC'D BY: **MAL**

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY (EXISTING CONDITIONS)

| BASIN | WEIGHTED | | OVERLAND | | | STREET / CHANNEL FLOW | | | | Tc | INTENSITY | | TOTAL FLOWS | | |
|-------|----------|---------|----------|----------------|----------------|-----------------------|----------------|--------------|-------------------|-------------|----------------|-----------------|-------------------|---------------|-----------------|
| | CA(5) | CA(100) | C(5) | Length (ft) | Height (ft) | Tc (min) | Length (ft) | Slope (%) | Velocity (fps) | Tc (min) | TOTAL (min) | I(5) (in/hr) | I(100) (in/hr) | Q(5) (cfs) | Q(100) (cfs) |
| EX-A | 0.20 | 0.89 | 0.08 | 100 | 10 | 8.6 | 460 | 3.5% | 6.5 | 1.2 | 9.8 | 4.16 | 6.99 | 0.8 | 6.2 |
| EX-B | 0.21 | 0.92 | 0.08 | 80 | 2 | 12.2 | 200 | 21.0% | 16.0 | 0.2 | 12.4 | 3.81 | 6.39 | 0.8 | 5.9 |
| EX-C | 0.09 | 0.40 | 0.08 | 100 | 4 | 11.7 | 325 | 3.7% | 6.7 | 0.8 | 12.5 | 3.80 | 6.38 | 0.3 | 2.5 |
| EX-D | 0.27 | 0.71 | 0.08 | 30 | 2 | 5.4 | 700 | 3.1% | 6.2 | 1.9 | 7.3 | 4.60 | 7.73 | 1.2 | 5.5 |

JOB NAME: Waterside at Lake Woodmoor Filing No. 1
 JOB NUMBER: 2505.07
 DATE: 12/06/22
 CALCULATED BY: MAL

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY (EXISTING CONDITIONS)

| Design Point(s) | Contributing Basins | Equivalent CA(5) | Equivalent CA(100) | Maximum Tc | Intensity | | Flow | | FEATURE |
|-----------------|---------------------|------------------|--------------------|------------|-----------|--------|------|--------|-----------------|
| | | | | | I(5) | I(100) | Q(5) | Q(100) | |
| 1 | BASIN EX-A | 0.20 | 0.89 | 9.8 | 4.16 | 6.99 | 0.8 | 6.2 | TO LAKE |
| 2 | BASIN EX-B | 0.21 | 0.92 | 12.4 | 3.81 | 6.39 | 0.8 | 5.9 | TO LAKE |
| 3 | BASIN EX-C | 0.09 | 0.40 | 12.5 | 3.80 | 6.38 | 0.3 | 2.5 | TO SOUTH |
| 4 | BASIN EX-D | 0.27 | 0.71 | 7.3 | 4.60 | 7.73 | 1.2 | 5.5 | TO WOODMOOR DR. |

DEVELOPED CONDITIONS CALCULATIONS

JOB NAME: Waterside at Lake Woodmoor Filing No. 1
 JOB NUMBER: 2588.00
 DATE: 02/06/23
 CALCULATED BY: MAL

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY (DEVELOPED CONDITIONS)

| BASIN | TOTAL AREA (AC) | IMPERVIOUS AREA / STREETS | | | LOTS/LANDSCAPE/UNDEV. AREAS (NOT PAVEMENT) | | | | WEIGHTED | | WEIGHTED CA | |
|-------|-----------------|---------------------------|------|--------|--|----------|------|--------|----------|--------|-------------|---------|
| | | AREA (AC) | C(5) | C(100) | AREA (AC) | LAND USE | C(5) | C(100) | C(5) | C(100) | CA(5) | CA(100) |
| A | 1.50 | 1.21 | 0.90 | 0.96 | 0.29 | - | 0.08 | 0.35 | 0.74 | 0.84 | 1.11 | 1.26 |
| B | 1.30 | 1.11 | 0.90 | 0.96 | 0.19 | - | 0.08 | 0.35 | 0.78 | 0.87 | 1.01 | 1.13 |
| C | 0.98 | 0.74 | 0.90 | 0.96 | 0.24 | - | 0.08 | 0.35 | 0.70 | 0.81 | 0.69 | 0.79 |
| D | 0.15 | 0.06 | 0.90 | 0.96 | 0.09 | - | 0.08 | 0.35 | 0.41 | 0.59 | 0.06 | 0.09 |
| E | 0.13 | 0.11 | 0.90 | 0.96 | 0.02 | - | 0.08 | 0.35 | 0.77 | 0.87 | 0.10 | 0.11 |
| F | 0.30 | 0.19 | 0.90 | 0.96 | 0.11 | - | 0.08 | 0.35 | 0.60 | 0.74 | 0.18 | 0.22 |
| G | 0.56 | 0.09 | 0.90 | 0.96 | 0.47 | - | 0.08 | 0.35 | 0.21 | 0.45 | 0.12 | 0.25 |
| H | 2.03 | 0.00 | 0.90 | 0.96 | 2.03 | - | 0.08 | 0.35 | 0.08 | 0.35 | 0.16 | 0.71 |
| J | 0.36 | 0.04 | 0.90 | 0.96 | 0.32 | - | 0.08 | 0.35 | 0.17 | 0.42 | 0.06 | 0.15 |
| K | 0.07 | 0.05 | 0.90 | 0.96 | 0.02 | - | 0.08 | 0.35 | 0.67 | 0.79 | 0.05 | 0.06 |
| L | 0.64 | 0.23 | 0.90 | 0.96 | 0.41 | - | 0.08 | 0.35 | 0.37 | 0.57 | 0.24 | 0.36 |

JOB NAME: **Waterside at Lake Woodmoor Filing No. 1**
 JOB NUMBER: **2588.00**
 DATE: **2/6/2023**
 CALC'D BY: **MAL**

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY (DEVELOPED CONDITIONS)

| BASIN | WEIGHTED | | OVERLAND | | | STREET / CHANNEL FLOW | | | | Tc | INTENSITY | | TOTAL FLOWS | | |
|-------|----------|---------|----------|----------------|----------------|-----------------------|----------------|--------------|-------------------|-------------|----------------|-----------------|-------------------|---------------|-----------------|
| | CA(5) | CA(100) | C(5) | Length (ft) | Height (ft) | Tc (min) | Length (ft) | Slope (%) | Velocity (fps) | Tc (min) | TOTAL (min) | I(5) (in/hr) | I(100) (in/hr) | Q(5) (cfs) | Q(100) (cfs) |
| A | 1.11 | 1.26 | 0.08 | 30 | 1 | 6.8 | 770 | 2.9% | 6.0 | 2.2 | 8.9 | 4.30 | 7.22 | 4.8 | 9.1 |
| B | 1.01 | 1.13 | 0.08 | 30 | 1 | 6.8 | 790 | 2.0% | 4.9 | 2.7 | 9.4 | 4.22 | 7.08 | 4.3 | 8.0 |
| C | 0.69 | 0.79 | 0.08 | 25 | 0.8 | 6.3 | 290 | 3.4% | 6.5 | 0.7 | 7.0 | 4.66 | 7.82 | 3.2 | 6.2 |
| D | 0.06 | 0.09 | 0.08 | 20 | 0.4 | 6.6 | 140 | 2.0% | 4.9 | 0.5 | 7.0 | 4.66 | 7.82 | 0.3 | 0.7 |
| E | 0.10 | 0.11 | 0.08 | 10 | 0.2 | 4.6 | 125 | 2.5% | 5.5 | 0.4 | 5.0 | 5.17 | 8.67 | 0.5 | 1.0 |
| F | 0.18 | 0.22 | 0.90 | 10 | 0.2 | 0.9 | 10 | 2.0% | 4.9 | 0.0 | 5.0 | 5.17 | 8.68 | 0.9 | 1.9 |
| G | 0.12 | 0.25 | 0.08 | 30 | 4 | 4.3 | 145 | 15.0% | 13.6 | 0.2 | 5.0 | 5.17 | 8.68 | 0.6 | 2.2 |
| H | 0.16 | 0.71 | 0.08 | 40 | 4 | 5.4 | 160 | 10.0% | 11.1 | 0.2 | 5.7 | 4.98 | 8.35 | 0.8 | 5.9 |
| J | 0.06 | 0.15 | 0.08 | 20 | 0.5 | 6.1 | 330 | 3.0% | 6.1 | 0.9 | 7.0 | 4.67 | 7.83 | 0.3 | 1.2 |
| K | 0.05 | 0.06 | 0.08 | 10 | 0.2 | 4.6 | 60 | 2.0% | 4.9 | 0.2 | 5.0 | 5.17 | 8.68 | 0.2 | 0.5 |
| L | 0.24 | 0.36 | 0.08 | 10 | 2 | 2.2 | 330 | 3.6% | 6.6 | 0.8 | 5.0 | 5.17 | 8.68 | 1.2 | 3.2 |

JOB NAME: Waterside at Lake Woodmoor Filing No. 1
 JOB NUMBER: 2588.00
 DATE: 02/06/23
 CALCULATED BY: MAL

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY (DEVELOPED CONDITIONS)

| Design Point(s) | Contributing Basins | Equivalent CA(5) | Equivalent CA(100) | Maximum Tc | Intensity | | Flow | | Inlet Size |
|-----------------|--|------------------|--------------------|------------|-----------|--------|------|--------|--------------------|
| | | | | | I(5) | I(100) | Q(5) | Q(100) | |
| 1 | BASIN D | 0.06 | 0.09 | 7.0 | 4.66 | 7.82 | 0.3 | 0.7 | TYPE C INLET |
| 2 | BASIN A | 1.11 | 1.26 | 8.9 | 4.30 | 7.22 | 4.8 | 9.1 | 15' AT-GRADE |
| 3 | BASIN E | 0.10 | 0.11 | 5.0 | 5.17 | 8.67 | 0.5 | 1.0 | 5' AT-GRADE |
| 4 | BASIN C | 0.69 | 0.79 | 7.0 | 4.66 | 7.82 | 3.2 | 6.2 | 10' SUMP |
| 5 | BASIN B | 1.01 | 1.13 | 9.4 | 4.22 | 7.08 | 4.3 | 8.0 | 10' SUMP |
| 6 | PIPE 7 + PIPE 8 + BASIN G | 3.27 | 3.75 | 9.6 | 4.19 | 7.04 | 13.7 | 26.4 | POND 'A' |
| 7 | BASIN J | 0.06 | 0.15 | 7.0 | 4.67 | 7.83 | 0.3 | 1.2 | PIPE/ROAD CROSSING |
| 8 | DP-7 + BASIN K + BASIN L + FB DP-2 + FB DP-3 | 0.35 | 0.68 | 7.8 | 4.50 | 7.55 | 1.6 | 5.1 | TO WOODMOOR DR. |

JOB NAME: Waterside at Lake Woodmoor Filing No. 1
 JOB NUMBER: 2588.00
 DATE: 02/06/23
 CALCULATED BY: MAL

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM GRADE.
 REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.

FINAL DRAINAGE REPORT ~ PIPE ROUTING SUMMARY (DEVELOPED CONDITIONS)

| Pipe Run | Contributing Basins | Equivalent CA(5) | Equivalent CA(100) | Maximum Tc | Intensity | | Flow | | Pipe Size* |
|----------|-----------------------------|---------------------|-----------------------|---------------|-----------|--------|------|--------|------------|
| | | | | | I(5) | I(100) | Q(5) | Q(100) | |
| 1 | DP-1 | 0.06 | 0.09 | 7.0 | 4.66 | 7.82 | 0.3 | 0.7 | 12" |
| 2 | DP-2 (Intercepted) | 1.12 | 1.15 | 8.9 | 4.30 | 7.22 | 4.8 | 8.3 | 18" |
| 3 | PIPE 1 + PIPE 2 | 1.18 | 1.24 | 8.9 | 4.30 | 7.22 | 5.1 | 8.9 | 18" |
| 4 | PIPE 3 + DP-3 (Intercepted) | 1.27 | 1.35 | 9.0 | 4.29 | 7.20 | 5.5 | 9.8 | 24" |
| 5 | DP-4 | 0.69 | 0.79 | 7.0 | 4.66 | 7.82 | 3.2 | 6.2 | 18" |
| 6 | PIPE 5 + DP-5 | 1.70 | 1.93 | 9.4 | 4.22 | 7.08 | 7.2 | 13.6 | 24" |
| 7 | PIPE 4 + PIPE 6 | 2.97 | 3.28 | 9.6 | 4.19 | 7.04 | 12.5 | 23.1 | 24" |
| 8 | BASIN F | 0.18 | 0.22 | 5.0 | 5.17 | 8.68 | 0.9 | 1.9 | 12" |
| 9 | POND OUTFALL | 0.93 | 0.74 | 9.6 | 4.19 | 7.04 | 3.9 | 5.2 | 18" |
| 10 | DP-7 | 0.06 | 0.15 | 7.0 | 4.67 | 7.83 | 0.3 | 1.2 | 18" |

JOB NAME: Waterside at Lake Woodmoor Filing No. 1
 JOB NUMBER: 2588.00
 DATE: 02/06/23
 CALCULATED BY: MAL

At-Grade Inlet - Flow Routing (DEVELOPED CONDITIONS)

| Design Point | TOTAL | | | | | | INTERCEPTED | | | | FLOW-BY | | | |
|--------------|-------|-------|------|------|-----|------|-------------|------|------|-------|---------|------|------|-------|
| | CA5 | CA100 | I5 | I100 | Q5 | Q100 | Q5 | Q100 | CA5 | CA100 | Q5 | Q100 | CA5 | CA100 |
| 2 | 1.11 | 1.26 | 4.30 | 7.22 | 4.8 | 9.1 | 4.8 | 8.3 | 1.12 | 1.15 | 0.0 | 0.8 | 0.00 | 0.11 |
| 3 | 0.10 | 0.11 | 5.17 | 8.67 | 0.5 | 1.0 | 0.5 | 1.0 | 0.10 | 0.12 | 0.0 | 0.0 | 0.00 | 0.00 |

| | |
|----------------|--|
| JOB NAME: | <i>Waterside at Lake Woodmoor Filing No. 1</i> |
| JOB NUMBER: | <i>2588.00</i> |
| DATE: | <i>02/06/23</i> |
| CALCULATED BY: | <i>MAL</i> |

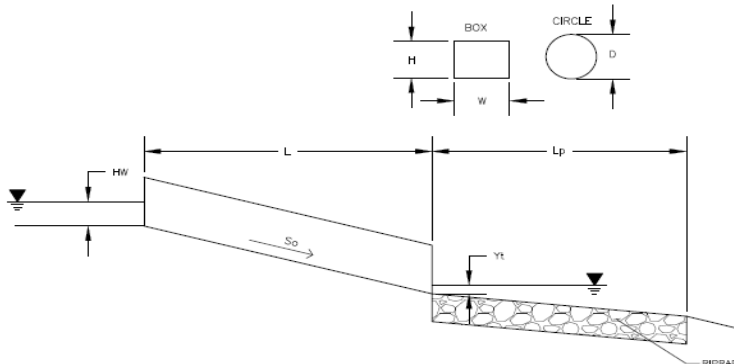
FINAL DRAINAGE REPORT ~ PIPE TRAVEL TIMES

| PIPE RUN | STREET / CHANNEL FLOW | | | | |
|----------|-----------------------|-------------|------------|--------------|--------------|
| | Pipe Diameter | Length | Slope | Velocity | Tc |
| | <i>(ft)</i> | <i>(ft)</i> | <i>(%)</i> | <i>(fps)</i> | <i>(min)</i> |
| 1 | 1.0 | 50 | 0.5% | 3.2 | 0.3 |
| 3 | 2.0 | 20 | 0.5% | 5.1 | 0.1 |
| 6 | 2.0 | 65 | 1.0% | 7.2 | 0.2 |

Determination of Culvert Headwater and Outlet Protection

Project: **WATERSIDE TOWNHOMES**

Basin ID: **PIPE 7**



Soil Type:

Choose One:

- Sandy
 Non-Sandy

Supercritical Flow! Using Da to calculate protection type.

Design Information (Input):

| | |
|--|---|
| Design Discharge | Q = <input style="border: 1px solid blue;" type="text" value="23.1"/> cfs |
| Circular Culvert: | |
| Barrel Diameter in Inches | D = <input style="border: 1px solid blue;" type="text" value="24"/> inches |
| Inlet Edge Type (Choose from pull-down list) | Grooved End Projection <input type="button" value="v"/> |
| Box Culvert: | OR |
| Barrel Height (Rise) in Feet | Height (Rise) = <input style="border: 1px solid blue;" type="text"/> |
| Barrel Width (Span) in Feet | Width (Span) = <input style="border: 1px solid blue;" type="text"/> |
| Inlet Edge Type (Choose from pull-down list) | <input type="button" value="v"/> |
| Number of Barrels | No = <input style="border: 1px solid blue;" type="text" value="1"/> |
| Inlet Elevation | Elev IN = <input style="border: 1px solid blue;" type="text" value="7115.44"/> ft |
| Outlet Elevation OR Slope | Elev OUT = <input style="border: 1px solid blue;" type="text" value="7107"/> ft |
| Culvert Length | L = <input style="border: 1px solid blue;" type="text" value="141.89"/> ft |
| Manning's Roughness | n = <input style="border: 1px solid blue;" type="text" value="0.013"/> |
| Bend Loss Coefficient | k _b = <input style="border: 1px solid blue;" type="text" value="0"/> |
| Exit Loss Coefficient | k _x = <input style="border: 1px solid blue;" type="text" value="1"/> |
| Tailwater Surface Elevation | Elev Y _t = <input style="border: 1px solid blue;" type="text"/> |
| Max Allowable Channel Velocity | V = <input style="border: 1px solid blue;" type="text" value="5"/> ft/s |

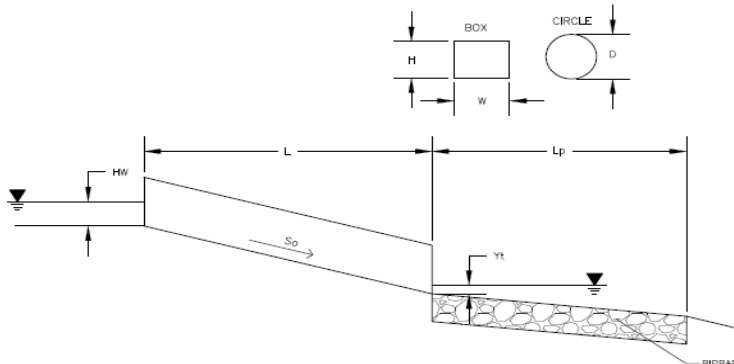
Required Protection (Output):

| | |
|---|--|
| Tailwater Surface Height | Y _t = <input style="border: 1px solid green;" type="text" value="0.80"/> ft |
| Flow Area at Max Channel Velocity | A _t = <input style="border: 1px solid green;" type="text" value="4.62"/> ft ² |
| Culvert Cross Sectional Area Available | A = <input style="border: 1px solid green;" type="text" value="3.14"/> ft ² |
| Entrance Loss Coefficient | k _e = <input style="border: 1px solid green;" type="text" value="0.20"/> |
| Friction Loss Coefficient | k _f = <input style="border: 1px solid green;" type="text" value="1.75"/> |
| Sum of All Losses Coefficients | k _s = <input style="border: 1px solid green;" type="text" value="2.95"/> ft |
| Culvert Normal Depth | Y _n = <input style="border: 1px solid green;" type="text" value="0.90"/> ft |
| Culvert Critical Depth | Y _c = <input style="border: 1px solid green;" type="text" value="1.71"/> ft |
| Tailwater Depth for Design | d = <input style="border: 1px solid green;" type="text" value="1.85"/> ft |
| Adjusted Diameter OR Adjusted Rise | D _a = <input style="border: 1px solid green;" type="text" value="1.45"/> ft |
| Expansion Factor | 1/(2*tan(θ)) = <input style="border: 1px solid green;" type="text" value="5.38"/> |
| Flow/Diameter ^{2.5} OR Flow/(Span * Rise ^{1.5}) | Q/D ^{2.5} = <input style="border: 1px solid green;" type="text" value="4.08"/> ft ^{0.5} /s |
| Froude Number | Fr = <input style="border: 1px solid green;" type="text" value="3.57"/> Supercritical! |
| Tailwater/Adjusted Diameter OR Tailwater/Adjusted Rise | Y _t /D = <input style="border: 1px solid green;" type="text" value="0.55"/> |
| Inlet Control Headwater | HW _i = <input style="border: 1px solid green;" type="text" value="3.03"/> ft |
| Outlet Control Headwater | HW _o = <input style="border: 1px solid green;" type="text" value="-4.11"/> |
| Design Headwater Elevation | HW = <input style="border: 1px solid green;" type="text" value="7,118.47"/> ft |
| Headwater/Diameter OR Headwater/Rise Ratio | HW/D = <input style="border: 1px solid green;" type="text" value="1.51"/> HW/D > 1.5! |
| Minimum Theoretical Riprap Size | d ₅₀ = <input style="border: 1px solid green;" type="text" value="7"/> in |
| Nominal Riprap Size | d ₅₀ = <input style="border: 1px solid green;" type="text" value="9"/> in |
| UDFCD Riprap Type | Type = <input style="border: 1px solid green;" type="text" value="L"/> |
| Length of Protection | L_p = <input style="border: 1px solid green;" type="text" value="20"/> ft |
| Width of Protection | T = <input style="border: 1px solid green;" type="text" value="6"/> ft |

Determination of Culvert Headwater and Outlet Protection

Project: **WATERSIDE TOWNHOMES**

Basin ID: **PIPE 8**



Soil Type:

Choose One:

- Sandy
 Non-Sandy

Supercritical Flow! Using Da to calculate protection type.

Design Information (Input):

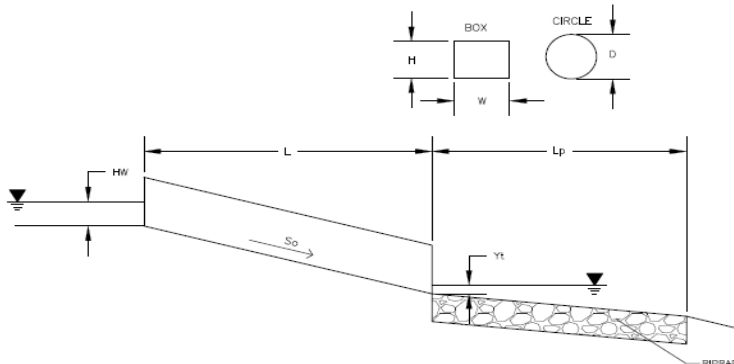
| | |
|--|---|
| Design Discharge | Q = <input style="border: 1px solid blue;" type="text" value="1.9"/> cfs |
| Circular Culvert: | |
| Barrel Diameter in Inches | D = <input style="border: 1px solid blue;" type="text" value="12"/> inches |
| Inlet Edge Type (Choose from pull-down list) | Grooved End Projection <input type="button" value="v"/> |
| Box Culvert: | OR |
| Barrel Height (Rise) in Feet | Height (Rise) = <input style="border: 1px solid blue;" type="text"/> |
| Barrel Width (Span) in Feet | Width (Span) = <input style="border: 1px solid blue;" type="text"/> |
| Inlet Edge Type (Choose from pull-down list) | <input type="button" value="v"/> |
| Number of Barrels | No = <input style="border: 1px solid blue;" type="text" value="1"/> |
| Inlet Elevation | Elev IN = <input style="border: 1px solid blue;" type="text" value="7123.52"/> ft |
| Outlet Elevation OR Slope | Elev OUT = <input style="border: 1px solid blue;" type="text" value="7107"/> ft |
| Culvert Length | L = <input style="border: 1px solid blue;" type="text" value="188.32"/> ft |
| Manning's Roughness | n = <input style="border: 1px solid blue;" type="text" value="0.013"/> |
| Bend Loss Coefficient | k _b = <input style="border: 1px solid blue;" type="text" value="0"/> |
| Exit Loss Coefficient | k _x = <input style="border: 1px solid blue;" type="text" value="1"/> |
| Tailwater Surface Elevation | Elev Y _t = <input style="border: 1px solid blue;" type="text"/> |
| Max Allowable Channel Velocity | V = <input style="border: 1px solid blue;" type="text" value="5"/> ft/s |

Required Protection (Output):

| | |
|---|--|
| Tailwater Surface Height | Y _t = <input style="border: 1px solid green;" type="text" value="0.40"/> ft |
| Flow Area at Max Channel Velocity | A _t = <input style="border: 1px solid green;" type="text" value="0.38"/> ft ² |
| Culvert Cross Sectional Area Available | A = <input style="border: 1px solid green;" type="text" value="0.79"/> ft ² |
| Entrance Loss Coefficient | k _e = <input style="border: 1px solid green;" type="text" value="0.20"/> |
| Friction Loss Coefficient | k _f = <input style="border: 1px solid green;" type="text" value="5.86"/> |
| Sum of All Losses Coefficients | k _s = <input style="border: 1px solid green;" type="text" value="7.06"/> ft |
| Culvert Normal Depth | Y _n = <input style="border: 1px solid green;" type="text" value="0.29"/> ft |
| Culvert Critical Depth | Y _c = <input style="border: 1px solid green;" type="text" value="0.59"/> ft |
| Tailwater Depth for Design | d = <input style="border: 1px solid green;" type="text" value="0.79"/> ft |
| Adjusted Diameter OR Adjusted Rise | D _a = <input style="border: 1px solid green;" type="text" value="0.64"/> ft |
| Expansion Factor | 1/(2*tan(θ)) = <input style="border: 1px solid green;" type="text" value="6.70"/> |
| Flow/Diameter ^{2.5} OR Flow/(Span * Rise ^{1.5}) | Q/D ^{2.5} = <input style="border: 1px solid green;" type="text" value="1.90"/> ft ^{0.5} /s |
| Froude Number | Fr = <input style="border: 1px solid green;" type="text" value="3.96"/> Supercritical! |
| Tailwater/Adjusted Diameter OR Tailwater/Adjusted Rise | Y _t /D = <input style="border: 1px solid green;" type="text" value="0.62"/> |
| Inlet Control Headwater | HW _i = <input style="border: 1px solid green;" type="text" value="0.81"/> ft |
| Outlet Control Headwater | HW _o = <input style="border: 1px solid green;" type="text" value="-15.08"/> |
| Design Headwater Elevation | HW = <input style="border: 1px solid green;" type="text" value="7,124.33"/> ft |
| Headwater/Diameter OR Headwater/Rise Ratio | HW/D = <input style="border: 1px solid green;" type="text" value="0.81"/> |
| Minimum Theoretical Riprap Size | d ₅₀ = <input style="border: 1px solid green;" type="text" value="2"/> in |
| Nominal Riprap Size | d ₅₀ = <input style="border: 1px solid green;" type="text" value="6"/> in |
| UDFCD Riprap Type | Type = <input style="border: 1px solid green;" type="text" value="VL"/> |
| Length of Protection | L_p = <input style="border: 1px solid green;" type="text" value="3"/> ft |
| Width of Protection | T = <input style="border: 1px solid green;" type="text" value="2"/> ft |

Determination of Culvert Headwater and Outlet Protection

Project: **WATERSIDE TOWNHOMES**
 Basin ID: **PIPE 10**



Soil Type:

Choose One:

- Sandy
 Non-Sandy

Supercritical Flow! Using D_a to calculate protection type.

Design Information (Input):

| | |
|--|---|
| Design Discharge | Q = <input style="width: 50px;" type="text" value="1.2"/> cfs |
| Circular Culvert: | |
| Barrel Diameter in Inches | D = <input style="width: 50px;" type="text" value="18"/> inches |
| Inlet Edge Type (Choose from pull-down list) | Grooved End Projection <input type="text" value="▼"/> |
| Box Culvert: | OR |
| Barrel Height (Rise) in Feet | Height (Rise) = <input style="width: 50px;" type="text"/> |
| Barrel Width (Span) in Feet | Width (Span) = <input style="width: 50px;" type="text"/> |
| Inlet Edge Type (Choose from pull-down list) | <input type="text" value="▼"/> |
| Number of Barrels | No = <input style="width: 50px;" type="text" value="1"/> |
| Inlet Elevation | Elev IN = <input style="width: 50px;" type="text" value="7139.01"/> ft |
| Outlet Elevation OR Slope | Elev OUT = <input style="width: 50px;" type="text" value="7138.24"/> ft |
| Culvert Length | L = <input style="width: 50px;" type="text" value="65"/> ft |
| Manning's Roughness | n = <input style="width: 50px;" type="text" value="0.013"/> |
| Bend Loss Coefficient | k_b = <input style="width: 50px;" type="text" value="0"/> |
| Exit Loss Coefficient | k_x = <input style="width: 50px;" type="text" value="1"/> |
| Tailwater Surface Elevation | Elev Y_t = <input style="width: 50px;" type="text"/> |
| Max Allowable Channel Velocity | V = <input style="width: 50px;" type="text" value="5"/> ft/s |

Required Protection (Output):

| | |
|---|--|
| Tailwater Surface Height | Y_t = <input style="width: 50px;" type="text" value="0.60"/> ft |
| Flow Area at Max Channel Velocity | A_t = <input style="width: 50px;" type="text" value="0.24"/> ft ² |
| Culvert Cross Sectional Area Available | A = <input style="width: 50px;" type="text" value="1.77"/> ft ² |
| Entrance Loss Coefficient | k_e = <input style="width: 50px;" type="text" value="0.20"/> |
| Friction Loss Coefficient | k_f = <input style="width: 50px;" type="text" value="1.18"/> |
| Sum of All Losses Coefficients | k_s = <input style="width: 50px;" type="text" value="2.38"/> ft |
| Culvert Normal Depth | Y_n = <input style="width: 50px;" type="text" value="0.33"/> ft |
| Culvert Critical Depth | Y_c = <input style="width: 50px;" type="text" value="0.41"/> ft |
| Tailwater Depth for Design | d = <input style="width: 50px;" type="text" value="0.95"/> ft |
| Adjusted Diameter OR Adjusted Rise | D_a = <input style="width: 50px;" type="text" value="0.91"/> ft |
| Expansion Factor | $1/(2*\tan(\Theta))$ = <input style="width: 50px;" type="text" value="6.70"/> |
| Flow/Diameter ^{2.5} OR Flow/(Span * Rise ^{1.5}) | $Q/D^{2.5}$ = <input style="width: 50px;" type="text" value="0.44"/> ft ^{0.5} /s |
| Froude Number | Fr = <input style="width: 50px;" type="text" value="1.54"/> Supercritical! |
| Tailwater/Adjusted Diameter OR Tailwater/Adjusted Rise | Y_t/D = <input style="width: 50px;" type="text" value="0.66"/> |
| Inlet Control Headwater | HW_i = <input style="width: 50px;" type="text" value="0.55"/> ft |
| Outlet Control Headwater | HW_o = <input style="width: 50px;" type="text" value="0.20"/> ft |
| Design Headwater Elevation | HW = <input style="width: 50px;" type="text" value="7,139.56"/> ft |
| Headwater/Diameter OR Headwater/Rise Ratio | HW/D = <input style="width: 50px;" type="text" value="0.37"/> |
| Minimum Theoretical Riprap Size | d_{50} = <input style="width: 50px;" type="text" value="1"/> in |
| Nominal Riprap Size | d_{50} = <input style="width: 50px;" type="text" value="6"/> in |
| UDFCD Riprap Type | Type = <input style="width: 50px;" type="text" value="VL"/> |
| Length of Protection | L_p = <input style="width: 50px;" type="text" value="5"/> ft |
| Width of Protection | T = <input style="width: 50px;" type="text" value="3"/> ft |

INLET MANAGEMENT

Worksheet Protected

| | | | |
|------------------------------------|----------------------|--------------------------|--------------------------|
| INLET NAME | DP-1 | DP-2 | DP-3 |
| Site Type (Urban or Rural) | URBAN | URBAN | URBAN |
| Inlet Application (Street or Area) | AREA | STREET | STREET |
| Hydraulic Condition | Swale | On Grade | On Grade |
| Inlet Type | CDOT Type C | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

USER-DEFINED INPUT

User-Defined Design Flows

| | | | |
|-------------------------|-----|-----|-----|
| Minor Q_{Known} (cfs) | 0.3 | 4.8 | 0.5 |
| Major Q_{Known} (cfs) | 0.7 | 9.1 | 1.0 |

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

| | | | |
|---|-------------------------|-------------------------|-------------------------|
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, Q_b (cfs) | 0.0 | 0.0 | 0.0 |
| Major Bypass Flow Received, Q_b (cfs) | 0.0 | 0.0 | 0.0 |

Watershed Characteristics

| | | | |
|---------------------------|--|--|--|
| Subcatchment Area (acres) | | | |
| Percent Impervious | | | |
| NRCS Soil Type | | | |

Watershed Profile

| | | | |
|------------------------|--|--|--|
| Overland Slope (ft/ft) | | | |
| Overland Length (ft) | | | |
| Channel Slope (ft/ft) | | | |
| Channel Length (ft) | | | |

Minor Storm Rainfall Input

| | | | |
|---|--|--|--|
| Design Storm Return Period, T_r (years) | | | |
| One-Hour Precipitation, P_1 (inches) | | | |

Major Storm Rainfall Input

| | | | |
|---|--|--|--|
| Design Storm Return Period, T_r (years) | | | |
| One-Hour Precipitation, P_1 (inches) | | | |

CALCULATED OUTPUT

| | | | |
|---|------------|------------|------------|
| Minor Total Design Peak Flow, Q (cfs) | 0.3 | 4.8 | 0.5 |
| Major Total Design Peak Flow, Q (cfs) | 0.7 | 9.1 | 1.0 |
| Minor Flow Bypassed Downstream, Q_b (cfs) | 0.0 | 0.0 | 0.0 |
| Major Flow Bypassed Downstream, Q_b (cfs) | 0.0 | 0.8 | 0.0 |

INLET MANAGEMENT

Worksheet Protected

| | | |
|------------------------------------|--------------------------|--------------------------|
| INLET NAME | DP-4 | DP-5 |
| Site Type (Urban or Rural) | URBAN | URBAN |
| Inlet Application (Street or Area) | STREET | STREET |
| Hydraulic Condition | In Sump | In Sump |
| Inlet Type | CDOT Type R Curb Opening | CDOT Type R Curb Opening |

USER-DEFINED INPUT

| | | |
|---|-------------------------|-------------------------|
| User-Defined Design Flows | | |
| Minor Q_{Known} (cfs) | 3.2 | 4.3 |
| Major Q_{Known} (cfs) | 6.2 | 8.0 |
| Bypass (Carry-Over) Flow from Upstream | | |
| Receive Bypass Flow from: | No Bypass Flow Received | No Bypass Flow Received |
| Minor Bypass Flow Received, Q_b (cfs) | 0.0 | 0.0 |
| Major Bypass Flow Received, Q_b (cfs) | 0.0 | 0.0 |
| Watershed Characteristics | | |
| Subcatchment Area (acres) | | |
| Percent Impervious | | |
| NRCS Soil Type | | |
| Watershed Profile | | |
| Overland Slope (ft/ft) | | |
| Overland Length (ft) | | |
| Channel Slope (ft/ft) | | |
| Channel Length (ft) | | |
| Minor Storm Rainfall Input | | |
| Design Storm Return Period, T_r (years) | | |
| One-Hour Precipitation, P_1 (inches) | | |
| Major Storm Rainfall Input | | |
| Design Storm Return Period, T_r (years) | | |
| One-Hour Precipitation, P_1 (inches) | | |

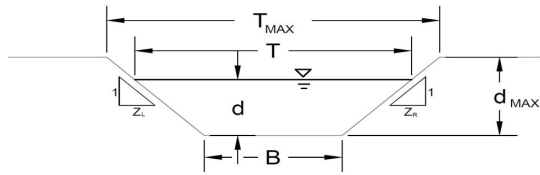
CALCULATED OUTPUT

| | | |
|---|------------|------------|
| Minor Total Design Peak Flow, Q (cfs) | 3.2 | 4.3 |
| Major Total Design Peak Flow, Q (cfs) | 6.2 | 8.0 |
| Minor Flow Bypassed Downstream, Q_b (cfs) | N/A | N/A |
| Major Flow Bypassed Downstream, Q_b (cfs) | N/A | N/A |

AREA INLET IN A SWALE

WATERSIDE TOWNHOMES

DP-1



This worksheet uses the NRCS vegetall retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)
 Manning's n (Leave cell D16 blank to manually enter an n value)
 Channel Invert Slope
 Bottom Width
 Left Side Slope
 Right Side Slope

Check one of the following soil types:

| Soil Type: | Max. Velocity (V _{MAX}) | Max Froude No. (F _{MAX}) |
|--------------|-----------------------------------|------------------------------------|
| Non-Cohesive | 5.0 fps | 0.60 |
| Cohesive | 7.0 fps | 0.80 |
| Paved | N/A | N/A |

A, B, C, D, or E =
 n = 0.020
 S₀ = 0.0010 ft/ft
 B = 2.00 ft
 Z₁ = 20.00 ft/ft
 Z₂ = 20.00 ft/ft

Choose One:
 Non-Cohesive
 Cohesive
 Paved

Maximum Allowable Top Width of Channel for Minor & Major Storm
 Maximum Allowable Water Depth in Channel for Minor & Major Storm

| | Minor Storm | Major Storm | |
|--------------------|-------------|-------------|----|
| T _{MAX} = | 20.00 | 20.00 | ft |
| d _{MAX} = | 0.87 | 1.00 | ft |

Allowable Channel Capacity Based On Channel Geometry
 MINOR STORM Allowable Capacity is based on Top Width Criterion
 MAJOR STORM Allowable Capacity is based on Top Width Criterion

| | Minor Storm | Major Storm | |
|----------------------|-------------|-------------|-----|
| Q _{allow} = | 4.6 | 4.6 | cfs |
| d _{allow} = | 0.45 | 0.45 | ft |

Water Depth in Channel Based On Design Peak Flow
 Design Peak Flow
 Water Depth

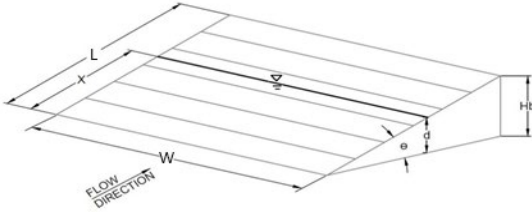
| | | | |
|------------------|------|------|-----|
| Q _o = | 0.3 | 0.7 | cfs |
| d = | 0.14 | 0.20 | ft |

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

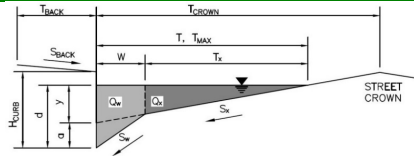
WATERSIDE TOWNHOMES

DP-1

| Inlet Design Information (Input) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|------------|------------|---------|-------|-------|------|-------|------|---------|---------------|------------|------------|---------|------------|------------|------------|---------|------------|------------|----------|--|---------|------|--|---------|------|--|
| Type of Inlet CDOT Type C | Inlet Type = CDOT Type C | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Angle of Inclined Grate (must be ≤ 30 degrees) Width of Grate Length of Grate Open Area Ratio Height of Inclined Grate Clogging Factor Grate Discharge Coefficient Orifice Coefficient Weir Coefficient | <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 150px;">θ =</td><td style="text-align: center;">0.00</td><td style="text-align: right;">degrees</td></tr> <tr><td>W =</td><td style="text-align: center;">3.00</td><td style="text-align: right;">ft</td></tr> <tr><td>L =</td><td style="text-align: center;">3.00</td><td style="text-align: right;">ft</td></tr> <tr><td>A_{RATIO} =</td><td style="text-align: center;">0.70</td><td></td></tr> <tr><td>H_B =</td><td style="text-align: center;">0.00</td><td style="text-align: right;">ft</td></tr> <tr><td>C_f =</td><td style="text-align: center;">0.50</td><td></td></tr> <tr><td>C_d =</td><td style="text-align: center;">0.96</td><td></td></tr> <tr><td>C_o =</td><td style="text-align: center;">0.64</td><td></td></tr> <tr><td>C_w =</td><td style="text-align: center;">2.05</td><td></td></tr> </table> | θ = | 0.00 | degrees | W = | 3.00 | ft | L = | 3.00 | ft | A_{RATIO} = | 0.70 | | H_B = | 0.00 | ft | C_f = | 0.50 | | C_d = | 0.96 | | C_o = | 0.64 | | C_w = | 2.05 | |
| θ = | 0.00 | degrees | | | | | | | | | | | | | | | | | | | | | | | | | | |
| W = | 3.00 | ft | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L = | 3.00 | ft | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A_{RATIO} = | 0.70 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| H_B = | 0.00 | ft | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C_f = | 0.50 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C_d = | 0.96 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C_o = | 0.64 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C_w = | 2.05 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | <table style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>MINOR</th> <th>MAJOR</th> <th></th> </tr> </thead> <tbody> <tr> <td>d =</td> <td>0.14</td> <td>0.20</td> <td></td> </tr> <tr> <td>Q_a =</td> <td>0.9</td> <td>1.7</td> <td style="text-align: right;">cfs</td> </tr> <tr> <td>Q_b =</td> <td>0.0</td> <td>0.0</td> <td style="text-align: right;">cfs</td> </tr> <tr> <td>$C\%$ =</td> <td>100</td> <td>100</td> <td style="text-align: right;">%</td> </tr> </tbody> </table> | | MINOR | MAJOR | | d = | 0.14 | 0.20 | | Q_a = | 0.9 | 1.7 | cfs | Q_b = | 0.0 | 0.0 | cfs | $C\%$ = | 100 | 100 | % | | | | | | | |
| | MINOR | MAJOR | | | | | | | | | | | | | | | | | | | | | | | | | | |
| d = | 0.14 | 0.20 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Q_a = | 0.9 | 1.7 | cfs | | | | | | | | | | | | | | | | | | | | | | | | | |
| Q_b = | 0.0 | 0.0 | cfs | | | | | | | | | | | | | | | | | | | | | | | | | |
| $C\%$ = | 100 | 100 | % | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Depth at Inlet (for depressed inlets, 1 foot is added for depression) Total Inlet Interception Capacity (assumes clogged condition) Bypassed Flow Capture Percentage = Q_a/Q_o | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)
 (Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

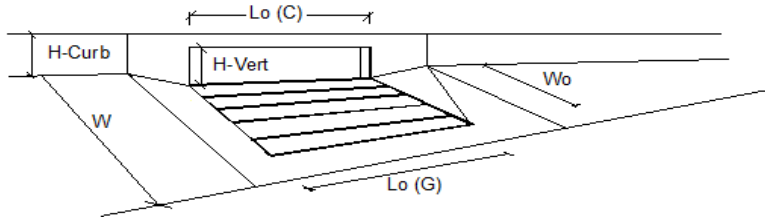
Project: **WATERSIDE TOWNHOMES**
 Inlet ID: **DP-2**



| | | | | | | | | | |
|---|--|-------------------------------------|-------------|-------------|--------|--------------------------|-------------------------------------|------|--|
| Gutter Geometry: | | | | | | | | | |
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK} = 8.0$ ft | | | | | | | | |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK} = 0.020$ ft/ft | | | | | | | | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK} = 0.020$ | | | | | | | | |
| Height of Curb at Gutter Flow Line | $H_{CURB} = 6.00$ inches | | | | | | | | |
| Distance from Curb Face to Street Crown | $T_{CROWN} = 14.0$ ft | | | | | | | | |
| Gutter Width | $W = 2.00$ ft | | | | | | | | |
| Street Transverse Slope | $S_x = 0.020$ ft/ft | | | | | | | | |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_w = 0.063$ ft/ft | | | | | | | | |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_o = 0.035$ ft/ft | | | | | | | | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET} = 0.016$ | | | | | | | | |
| Max. Allowable Spread for Minor & Major Storm | <table border="1"> <tr> <td></td> <td>Minor Storm</td> <td>Major Storm</td> <td>ft</td> </tr> <tr> <td>$T_{MAX} =$</td> <td>14.0</td> <td>14.0</td> <td></td> </tr> </table> | | Minor Storm | Major Storm | ft | $T_{MAX} =$ | 14.0 | 14.0 | |
| | Minor Storm | Major Storm | ft | | | | | | |
| $T_{MAX} =$ | 14.0 | 14.0 | | | | | | | |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | <table border="1"> <tr> <td></td> <td>Minor Storm</td> <td>Major Storm</td> <td>inches</td> </tr> <tr> <td>$d_{MAX} =$</td> <td>4.4</td> <td>7.9</td> <td></td> </tr> </table> | | Minor Storm | Major Storm | inches | $d_{MAX} =$ | 4.4 | 7.9 | |
| | Minor Storm | Major Storm | inches | | | | | | |
| $d_{MAX} =$ | 4.4 | 7.9 | | | | | | | |
| Allow Flow Depth at Street Crown (check box for yes, leave blank for no) | <table border="1"> <tr> <td></td> <td>Minor Storm</td> <td>Major Storm</td> </tr> <tr> <td></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> </table> | | Minor Storm | Major Storm | | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | Minor Storm | Major Storm | | | | | | | |
| | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | | | | | | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | | | | | | | | |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | | | | | | | | | |
| Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.80 cfs on sheet 'Inlet Management' | | | | | | | | | |
| Major storm max. allowable capacity GOOD - greater than the design peak flow of 9.10 cfs on sheet 'Inlet Management' | | | | | | | | | |
| $Q_{allow} =$ | <table border="1"> <tr> <td></td> <td>Minor Storm</td> <td>Major Storm</td> <td>cfs</td> </tr> <tr> <td></td> <td>12.1</td> <td>35.2</td> <td></td> </tr> </table> | | Minor Storm | Major Storm | cfs | | 12.1 | 35.2 | |
| | Minor Storm | Major Storm | cfs | | | | | | |
| | 12.1 | 35.2 | | | | | | | |

INLET ON A CONTINUOUS GRADE

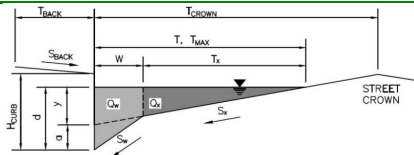
MHFD-Inlet, Version 5.02 (August 2022)



| Design Information (Input) | MINOR | MAJOR | |
|---|----------------------------|----------------------------|------------|
| Type of Inlet | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a') | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | 15.00 | 15.00 | ft |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | 0.10 | 0.10 | |
| Street Hydraulics: OK - Q < Allowable Street Capacity | | | |
| Total Inlet Interception Capacity | Q = 4.8 | Q = 8.3 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | Q_b = 0.0 | Q_b = 0.8 | cfs |
| Capture Percentage = Q _i /Q _s | C% = 100 | C% = 92 | % |

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)
 (Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

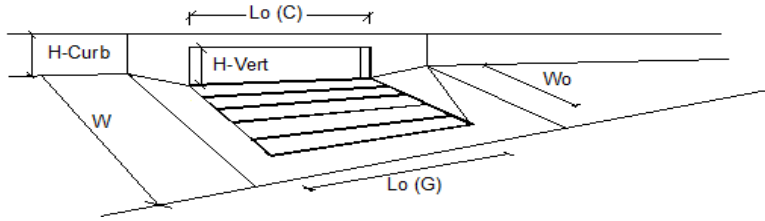
Project: **WATERSIDE TOWNHOMES**
 Inlet ID: **DP-3**



| | |
|---|---|
| Gutter Geometry: | |
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK} = 8.0$ ft |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK} = 0.200$ ft/ft |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK} = 0.020$ |
| Height of Curb at Gutter Flow Line | $H_{CURB} = 6.00$ inches |
| Distance from Curb Face to Street Crown | $T_{CROWN} = 14.0$ ft |
| Gutter Width | $W = 2.00$ ft |
| Street Transverse Slope | $S_x = 0.020$ ft/ft |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_w = 0.063$ ft/ft |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_o = 0.035$ ft/ft |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET} = 0.016$ |
| Max. Allowable Spread for Minor & Major Storm | $T_{MAX} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 14.0 & 14.0 \end{matrix}$ ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | $d_{MAX} = \begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 4.4 & 7.9 \end{matrix}$ inches |
| Allow Flow Depth at Street Crown (check box for yes, leave blank for no) | <input type="checkbox"/> <input checked="" type="checkbox"/> |
| MINOR STORM Allowable Capacity is based on Spread Criterion | |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | |
| Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.50 cfs on sheet 'Inlet Management' | |
| Major storm max. allowable capacity GOOD - greater than the design peak flow of 1.00 cfs on sheet 'Inlet Management' | |
| $Q_{allow} =$ | $\begin{matrix} \text{Minor Storm} & \text{Major Storm} \\ 12.1 & 34.0 \end{matrix}$ cfs |

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)

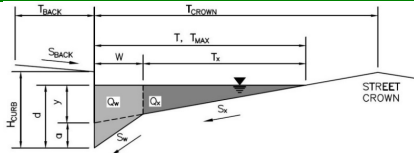


| Design Information (Input) | MINOR | MAJOR | |
|---|--------------------------|----------------------|--------|
| Type of Inlet | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a') | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | 5.00 | 5.00 | ft |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | 0.10 | 0.10 | |
| Street Hydraulics: OK - Q < Allowable Street Capacity | | | |
| Total Inlet Interception Capacity | Q = 0.5 | Q = 1.0 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | Q _b = 0.0 | Q _b = 0.0 | cfs |
| Capture Percentage = Q _i /Q _s | C% = 100 | C% = 100 | % |

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

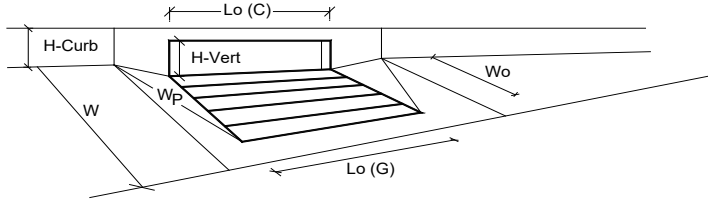
Project: WATERSIDE TOWNHOMES
Inlet ID: DP-4



| | | | | | | |
|--|---|-------------|-------------|--------|------------------|-------------|
| Gutter Geometry: | | | | | | |
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK} = 8.0$ ft | | | | | |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK} = 0.020$ ft/ft | | | | | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK} = 0.020$ | | | | | |
| Height of Curb at Gutter Flow Line | $H_{CURB} = 6.00$ inches | | | | | |
| Distance from Curb Face to Street Crown | $T_{CROWN} = 14.0$ ft | | | | | |
| Gutter Width | $W = 2.00$ ft | | | | | |
| Street Transverse Slope | $S_X = 0.020$ ft/ft | | | | | |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W = 0.063$ ft/ft | | | | | |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_0 = 0.000$ ft/ft | | | | | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET} = 0.016$ | | | | | |
| Max. Allowable Spread for Minor & Major Storm | <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td rowspan="2" style="text-align: right; padding-left: 5px;">ft</td> </tr> <tr> <td style="text-align: center;">$T_{MAX} = 14.0$</td> <td style="text-align: center;">14.0</td> </tr> </table> | Minor Storm | Major Storm | ft | $T_{MAX} = 14.0$ | 14.0 |
| Minor Storm | Major Storm | ft | | | | |
| $T_{MAX} = 14.0$ | 14.0 | | | | | |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td rowspan="2" style="text-align: right; padding-left: 5px;">inches</td> </tr> <tr> <td style="text-align: center;">$d_{MAX} = 4.4$</td> <td style="text-align: center;">7.9</td> </tr> </table> | Minor Storm | Major Storm | inches | $d_{MAX} = 4.4$ | 7.9 |
| Minor Storm | Major Storm | inches | | | | |
| $d_{MAX} = 4.4$ | 7.9 | | | | | |
| Check boxes are not applicable in SUMP conditions | <input type="checkbox"/> <input type="checkbox"/> | | | | | |
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | | | | | | |
| Q _{allow} = | <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td rowspan="2" style="text-align: right; padding-left: 5px;">cfs</td> </tr> <tr> <td style="text-align: center;">SUMP</td> <td style="text-align: center;">SUMP</td> </tr> </table> | Minor Storm | Major Storm | cfs | SUMP | SUMP |
| Minor Storm | Major Storm | cfs | | | | |
| SUMP | SUMP | | | | | |

INLET IN A SUMP OR SAG LOCATION

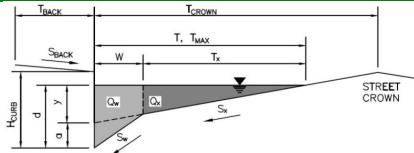
MHFD-Inlet, Version 5.02 (August 2022)



| Design Information (Input) | MINOR MAJOR | |
|--|--------------------------|-------|
| Type of Inlet | CDOT Type R Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a' from above) | 3.00 | 3.00 |
| Number of Unit Inlets (Grate or Curb Opening) | 1 | 1 |
| Water Depth at Flowline (outside of local depression) | 4.4 | 7.9 |
| Grate Information | MINOR | MAJOR |
| Length of a Unit Grate | N/A | N/A |
| Width of a Unit Grate | N/A | N/A |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | N/A | N/A |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | N/A | N/A |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | N/A | N/A |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | N/A | N/A |
| Curb Opening Information | MINOR | MAJOR |
| Length of a Unit Curb Opening | 10.00 | 10.00 |
| Height of Vertical Curb Opening in Inches | 6.00 | 6.00 |
| Height of Curb Orifice Throat in Inches | 6.00 | 6.00 |
| Angle of Throat (see USDCM Figure ST-5) | 63.40 | 63.40 |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | 2.00 | 2.00 |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | 0.10 | 0.10 |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | 3.60 | 3.60 |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | 0.67 | 0.67 |
| Low Head Performance Reduction (Calculated) | MINOR | MAJOR |
| Depth for Grate Midwidth | N/A | N/A |
| Depth for Curb Opening Weir Equation | 0.24 | 0.53 |
| Grated Inlet Performance Reduction Factor for Long Inlets | N/A | N/A |
| Curb Opening Performance Reduction Factor for Long Inlets | 0.82 | 1.00 |
| Combination Inlet Performance Reduction Factor for Long Inlets | N/A | N/A |
| Total Inlet Interception Capacity (assumes clogged condition) | 4.4 | 17.9 |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak) | 3.2 | 6.2 |

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)
 (Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

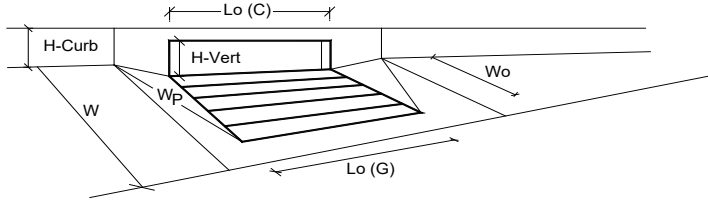
Project: WATERSIDE TOWNHOMES
Inlet ID: DP-5



| | | | | | | |
|--|---|-------------|-------------|--------|---------------------------|---------------|
| Gutter Geometry: | | | | | | |
| Maximum Allowable Width for Spread Behind Curb | $T_{BACK} = 8.0$ ft | | | | | |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | $S_{BACK} = 0.020$ ft/ft | | | | | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | $n_{BACK} = 0.020$ | | | | | |
| Height of Curb at Gutter Flow Line | $H_{CURB} = 6.00$ inches | | | | | |
| Distance from Curb Face to Street Crown | $T_{CROWN} = 14.0$ ft | | | | | |
| Gutter Width | $W = 2.00$ ft | | | | | |
| Street Transverse Slope | $S_X = 0.020$ ft/ft | | | | | |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_W = 0.063$ ft/ft | | | | | |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_0 = 0.000$ ft/ft | | | | | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{STREET} = 0.016$ | | | | | |
| Max. Allowable Spread for Minor & Major Storm | <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td rowspan="2" style="text-align: right;">ft</td> </tr> <tr> <td style="text-align: center;">$T_{MAX} = 14.0$</td> <td style="text-align: center;">14.0</td> </tr> </table> | Minor Storm | Major Storm | ft | $T_{MAX} = 14.0$ | 14.0 |
| Minor Storm | Major Storm | ft | | | | |
| $T_{MAX} = 14.0$ | 14.0 | | | | | |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td rowspan="2" style="text-align: right;">inches</td> </tr> <tr> <td style="text-align: center;">$d_{MAX} = 4.4$</td> <td style="text-align: center;">7.9</td> </tr> </table> | Minor Storm | Major Storm | inches | $d_{MAX} = 4.4$ | 7.9 |
| Minor Storm | Major Storm | inches | | | | |
| $d_{MAX} = 4.4$ | 7.9 | | | | | |
| Check boxes are not applicable in SUMP conditions | <input type="checkbox"/> <input type="checkbox"/> | | | | | |
| MINOR STORM Allowable Capacity is not applicable to Sump Condition | | | | | | |
| MAJOR STORM Allowable Capacity is not applicable to Sump Condition | | | | | | |
| | <table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Minor Storm</td> <td style="text-align: center;">Major Storm</td> <td rowspan="2" style="text-align: right;">cfs</td> </tr> <tr> <td style="text-align: center;">$Q_{allow} = \text{SUMP}$</td> <td style="text-align: center;">SUMP</td> </tr> </table> | Minor Storm | Major Storm | cfs | $Q_{allow} = \text{SUMP}$ | SUMP |
| Minor Storm | Major Storm | cfs | | | | |
| $Q_{allow} = \text{SUMP}$ | SUMP | | | | | |

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.02 (August 2022)



| Design Information (Input) | MINOR MAJOR | |
|--|--------------------------|-------|
| Type of Inlet | CDOT Type R Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a' from above) | 3.00 | 3.00 |
| Number of Unit Inlets (Grate or Curb Opening) | 1 | 1 |
| Water Depth at Flowline (outside of local depression) | 4.4 | 7.9 |
| Grate Information | MINOR | MAJOR |
| Length of a Unit Grate | N/A | N/A |
| Width of a Unit Grate | N/A | N/A |
| Open Area Ratio for a Grate (typical values 0.15-0.90) | N/A | N/A |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | N/A | N/A |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | N/A | N/A |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | N/A | N/A |
| Curb Opening Information | MINOR | MAJOR |
| Length of a Unit Curb Opening | 10.00 | 10.00 |
| Height of Vertical Curb Opening in Inches | 6.00 | 6.00 |
| Height of Curb Orifice Throat in Inches | 6.00 | 6.00 |
| Angle of Throat (see USDCM Figure ST-5) | 63.40 | 63.40 |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | 2.00 | 2.00 |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | 0.10 | 0.10 |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | 3.60 | 3.60 |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | 0.67 | 0.67 |
| Low Head Performance Reduction (Calculated) | MINOR | MAJOR |
| Depth for Grate Midwidth | N/A | N/A |
| Depth for Curb Opening Weir Equation | 0.24 | 0.53 |
| Grated Inlet Performance Reduction Factor for Long Inlets | N/A | N/A |
| Curb Opening Performance Reduction Factor for Long Inlets | 0.82 | 1.00 |
| Combination Inlet Performance Reduction Factor for Long Inlets | N/A | N/A |
| Total Inlet Interception Capacity (assumes clogged condition) | MINOR | MAJOR |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak) | 4.4 | 17.9 |
| Q _{PEAK REQUIRED} | 4.3 | 8.0 |

STORMWATER QUALITY

POND 'A'

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

| | | |
|--|----------------|------|
| User Input | | |
| Calculated cells | | |
| ***Design Storm: 1-Hour Rain Depth | WQCV Event | 0.53 |
| ***Minor Storm: 1-Hour Rain Depth | 5-Year Event | 1.75 |
| ***Major Storm: 1-Hour Rain Depth | 100-Year Event | 2.52 |
| Optional User Defined Storm | CUHP | |
| (CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm | 100-Year Event | |
| Max Intensity for Optional User Defined Storm | | 0 |

| | |
|-----------|---------------------------------------|
| Designer: | M. LARSON |
| Company: | CLASSIC CONSULTING |
| Date: | August 17, 2020 |
| Project: | WATERSIDE AT LAKE WOODMOOR FIL. NO. 1 |
| Location: | POND A |

SITE INFORMATION (USER-INPUT)

| Sub-basin Identifier | PIPE 7 | PIPE 8 | BASIN G | | | | | | | | | | | | |
|--|------------|------------|------------|--|--|--|--|--|--|--|--|--|--|--|--|
| Receiving Pervious Area Soil Type | Sandy Loam | Sandy Loam | Sandy Loam | | | | | | | | | | | | |
| Total Area (ac., Sum of DCIA, UIA, RPA, & SPA) | 4.060 | 0.300 | 0.560 | | | | | | | | | | | | |
| Directly Connected Impervious Area (DCIA, acres) | 0.000 | 0.000 | 0.000 | | | | | | | | | | | | |
| Unconnected Impervious Area (UIA, acres) | 3.230 | 0.190 | 0.090 | | | | | | | | | | | | |
| Receiving Pervious Area (RPA, acres) | 0.000 | 0.000 | 0.110 | | | | | | | | | | | | |
| Separate Pervious Area (SPA, acres) | 0.830 | 0.110 | 0.360 | | | | | | | | | | | | |
| RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP) | C | C | C | | | | | | | | | | | | |

CALCULATED RESULTS (OUTPUT)

| | | | | | | | | | | | | | | | |
|---|-------|-------|-------|--|--|--|--|--|--|--|--|--|--|--|--|
| Total Calculated Area (ac, check against input) | 4.060 | 0.300 | 0.560 | | | | | | | | | | | | |
| Directly Connected Impervious Area (DCIA, %) | 0.0% | 0.0% | 0.0% | | | | | | | | | | | | |
| Unconnected Impervious Area (UIA, %) | 79.6% | 63.3% | 16.1% | | | | | | | | | | | | |
| Receiving Pervious Area (RPA, %) | 0.0% | 0.0% | 19.6% | | | | | | | | | | | | |
| Separate Pervious Area (SPA, %) | 20.4% | 36.7% | 64.3% | | | | | | | | | | | | |
| A _v (RPA / UIA) | 0.000 | 0.000 | 1.222 | | | | | | | | | | | | |
| I _v Check | 1.000 | 1.000 | 0.450 | | | | | | | | | | | | |
| f / I for WQCV Event: | 2.0 | 2.0 | 2.0 | | | | | | | | | | | | |
| f / I for 5-Year Event: | 0.5 | 0.5 | 0.5 | | | | | | | | | | | | |
| f / I for 100-Year Event: | 0.3 | 0.3 | 0.3 | | | | | | | | | | | | |
| f / I for Optional User Defined Storm CUHP: | | | | | | | | | | | | | | | |
| IRF for WQCV Event: | 1.00 | 1.00 | 0.59 | | | | | | | | | | | | |
| IRF for 5-Year Event: | 1.00 | 1.00 | 0.89 | | | | | | | | | | | | |
| IRF for 100-Year Event: | 1.00 | 1.00 | 0.92 | | | | | | | | | | | | |
| IRF for Optional User Defined Storm CUHP: | | | | | | | | | | | | | | | |
| Total Site Imperviousness: I _{total} | 79.6% | 63.3% | 16.1% | | | | | | | | | | | | |
| Effective Imperviousness for WQCV Event: | 79.6% | 63.3% | 9.4% | | | | | | | | | | | | |
| Effective Imperviousness for 5-Year Event: | 79.6% | 63.3% | 14.2% | | | | | | | | | | | | |
| Effective Imperviousness for 100-Year Event: | 79.6% | 63.3% | 14.9% | | | | | | | | | | | | |
| Effective Imperviousness for Optional User Defined Storm CUHP: | | | | | | | | | | | | | | | |

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

| | | | | | | | | | | | | | | | |
|---|------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| WQCV Event CREDIT: Reduce Detention By: | 0.0% | 0.0% | 35.3% | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| This line only for 10-Year Event | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 100-Year Event CREDIT**: | 0.0% | 0.1% | 8.7% | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| User Defined CUHP CREDIT: Reduce Detention By: | | | | | | | | | | | | | | | |

| | |
|--|--------------|
| Total Site Imperviousness: | 71.3% |
| Total Site Effective Imperviousness for WQCV Event: | 70.6% |
| Total Site Effective Imperviousness for 5-Year Event: | 71.1% |
| Total Site Effective Imperviousness for 100-Year Event: | 71.2% |
| Total Site Effective Imperviousness for Optional User Defined Storm CUHP: | |

Notes:

- * Use Green-Ampt average infiltration rate values from Table 3-3.
- ** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.
- *** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposes

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 2

Designer: M. LARSON
Company: CLASSIC CONSULTING
Date: April 19, 2023
Project: Waterside at Lake Woodmoor Filing No. 1
Location: _____

| | |
|--|--|
| <p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)</p> <p>B) Tributary Area's Imperviousness Ratio ($i = I_a/100$)</p> <p>C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time $WQCV = 0.8 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$</p> <p>D) Contributing Watershed Area (including sand filter area)</p> <p>E) Water Quality Capture Volume (WQCV) Design Volume $V_{WQCV} = WQCV / 12 * Area$</p> <p>F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p> | <p>$I_a =$ <input style="width: 50px;" type="text" value="71.3"/> %</p> <p>$i =$ <input style="width: 50px;" type="text" value="0.713"/></p> <p>WQCV = <input style="width: 50px;" type="text" value="0.22"/> watershed inches</p> <p>Area = <input style="width: 50px;" type="text" value="214,315"/> sq ft</p> <p>$V_{WQCV} =$ <input style="width: 50px;" type="text" value=""/></p> <p>$d_6 =$ <input style="width: 50px;" type="text" value="0.42"/> in</p> <p>$V_{WQCV \text{ OTHER}} =$ <input style="width: 50px;" type="text" value="3,924"/> cu ft</p> <p>$V_{WQCV \text{ USER}} =$ <input style="width: 50px;" type="text" value=""/> cu ft</p> |
| <p>2. Basin Geometry</p> <p>A) WQCV Depth</p> <p>B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.</p> <p>C) Minimum Filter Area (Flat Surface Area)</p> <p>D) Actual Filter Area</p> <p>E) Volume Provided</p> | <p>$D_{WQCV} =$ <input style="width: 50px;" type="text" value="2.0"/> ft</p> <p>$Z =$ <input style="width: 50px;" type="text" value="4.00"/> ft / ft</p> <p>$A_{Min} =$ <input style="width: 50px;" type="text" value="1911"/> sq ft</p> <p>$A_{Actual} =$ <input style="width: 50px;" type="text" value="1966"/> sq ft</p> <p>$V_T =$ <input style="width: 50px;" type="text" value="5619"/> cu ft</p> |
| <p>3. Filter Material</p> | <p>Choose One</p> <p><input checked="" type="radio"/> 18" CDOT Class B or C Filter Material</p> <p><input type="radio"/> Other (Explain):</p> <p>_____</p> <p>_____</p> |
| <p>4. Underdrain System</p> <p>A) Are underdrains provided?</p> <p>B) Underdrain system orifice diameter for 12 hour drain time</p> <p style="margin-left: 20px;">i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice</p> <p style="margin-left: 20px;">ii) Volume to Drain in 12 Hours</p> <p style="margin-left: 20px;">iii) Orifice Diameter, 3/8" Minimum</p> | <p>Choose One</p> <p><input checked="" type="radio"/> YES</p> <p><input type="radio"/> NO</p> <p>$y =$ <input style="width: 50px;" type="text" value="2.0"/> ft</p> <p>$Vol_{12} =$ <input style="width: 50px;" type="text" value="3,924"/> cu ft</p> <p>$D_o =$ <input style="width: 50px;" type="text" value="1 7/16"/> in</p> |

Design Procedure Form: Sand Filter (SF)

Sheet 2 of 2

Designer: M. LARSON
Company: CLASSIC CONSULTING
Date: April 19, 2023
Project: Waterside at Lake Woodmoor Filing No. 1
Location: _____

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric

A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?

Choose One
 YES NO

6. Inlet / Outlet Works

A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet

Riprap pads at pipe entry points and concrete lined spillway/run-down
for major events to drain directly to downstream lake/detention.

Notes: _____

JOB NAME: Waterside at Lake Woodmoor Fil. No. 1
 JOB NUMBER: 2588.00
 DATE: 04/19/23
 CALCULATED BY: MAL

POND A - SWQ

POND SIZING WITH PONDPACK EQUATION:
 INSERT POND DESIGN SIZE INFO: (RED)

| POND ELEVATION : | |
|--------------------------|---------|
| (from lowest to highest) | |
| | 7107.00 |
| | 7107.00 |
| | 7108.00 |
| | 7108.50 |
| | 7109.00 |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| AREA (BTM to TOP): | | |
|--------------------|------|-------|
| | - | acres |
| 1,966 | 0.05 | acres |
| 2,803 | 0.06 | acres |
| 3,311 | 0.08 | acres |
| 3,819 | 0.09 | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |

PRELIMINARY SIZE:

VOLUME = $1/3\{(EL2-EL1)*(A1+A2+((A1*A2)^.5))\}$

CUMMULATIVE VOLUME:

| | | | | | | |
|------|-------|------|-------|----|-------|------|
| - | AC-FT | from | 7,107 | to | 7,107 | |
| 0.05 | AC-FT | from | 7,107 | to | 7,108 | 0.05 |
| 0.03 | AC-FT | from | 7,108 | to | 7,109 | 0.09 |
| 0.04 | AC-FT | from | 7,109 | to | 7,109 | 0.13 |
| - | AC-FT | from | 7,109 | to | - | 0.13 |
| - | AC-FT | from | - | to | - | 0.13 |
| - | AC-FT | from | - | to | - | 0.13 |
| - | AC-FT | from | - | to | - | 0.13 |
| - | AC-FT | from | - | to | - | 0.13 |
| - | AC-FT | from | - | to | - | 0.13 |
| - | AC-FT | from | - | to | - | 0.13 |

*SIZING IS FOR PRELIMINARY PURPOSES ONLY.

VOLUME = **0.129 AC-FT**

APPROXIMATE SURFACE AREA REQUIREMENT

| POND DEPTH (FT) | POND VOLUME | | | SURFACE AREA (SF) |
|-----------------|-------------|---|-------|-------------------|
| | AC-FT | = | CF | |
| 4 | 0.13 | = | 5,623 | 1,406 |
| 6 | 0.13 | = | 5,623 | 937 |
| 8 | 0.13 | = | 5,623 | 703 |
| 10 | 0.13 | = | 5,623 | 562 |

JOB NAME: Waterside at Lake Woodmoor Fil. No. 1
 JOB NUMBER: 2588.00
 DATE: 04/19/23
 CALCULATED BY: MAL

POND A - SPILLWAY

POND SIZING WITH PONDPACK EQUATION:
 INSERT POND DESIGN SIZE INFO: (RED)

| POND ELEVATION : | |
|--------------------------|---------|
| (from lowest to highest) | |
| | 7107.00 |
| | 7107.00 |
| | 7108.00 |
| | 7108.50 |
| | 7109.00 |
| | 7110.00 |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| AREA (BTM to TOP): | | |
|--------------------|------|-------|
| | - | acres |
| 1,966 | 0.05 | acres |
| 2,803 | 0.06 | acres |
| 3,311 | 0.08 | acres |
| 3,819 | 0.09 | acres |
| 4,835 | 0.11 | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |

PRELIMINARY SIZE:

VOLUME = $1/3\{(EL2-EL1)*(A1+A2+((A1*A2)^.5))\}$

CUMMULATIVE VOLUME:

| | | | | | | |
|------|-------|------|-------|----|-------|------|
| - | AC-FT | from | 7,107 | to | 7,107 | |
| 0.05 | AC-FT | from | 7,107 | to | 7,108 | 0.05 |
| 0.03 | AC-FT | from | 7,108 | to | 7,109 | 0.09 |
| 0.04 | AC-FT | from | 7,109 | to | 7,109 | 0.13 |
| 0.10 | AC-FT | from | 7,109 | to | 7,110 | 0.23 |
| - | AC-FT | from | 7,110 | to | - | 0.23 |
| - | AC-FT | from | - | to | - | 0.23 |
| - | AC-FT | from | - | to | - | 0.23 |
| - | AC-FT | from | - | to | - | 0.23 |
| - | AC-FT | from | - | to | - | 0.23 |
| - | AC-FT | from | - | to | - | 0.23 |
| - | AC-FT | from | - | to | - | 0.23 |

*SIZING IS FOR PRELIMINARY PURPOSES ONLY.

VOLUME = **0.227 AC-FT**

APPROXIMATE SURFACE AREA REQUIREMENT

| POND DEPTH (FT) | POND VOLUME | | | SURFACE AREA (SF) |
|-----------------|-------------|---|-------|-------------------|
| | AC-FT | = | CF | |
| 4 | 0.23 | = | 9,897 | 2,474 |
| 6 | 0.23 | = | 9,897 | 1,649 |
| 8 | 0.23 | = | 9,897 | 1,237 |
| 10 | 0.23 | = | 9,897 | 990 |

JOB NAME: Waterside at Lake Woodmoor Fil. No. 1
 JOB NUMBER: 2588.00
 DATE: 04/19/23
 CALCULATED BY: MAL

POND A - TOP OF BERM

POND SIZING WITH PONDPACK EQUATION:
 INSERT POND DESIGN SIZE INFO: (RED)

| POND ELEVATION : | |
|--------------------------|---------|
| (from lowest to highest) | |
| | 7107.00 |
| | 7107.00 |
| | 7108.00 |
| | 7108.50 |
| | 7109.00 |
| | 7110.00 |
| | 7112.00 |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| AREA (BTM to TOP): | | |
|--------------------|------|-------|
| | - | acres |
| 1,966 | 0.05 | acres |
| 2,803 | 0.06 | acres |
| 3,311 | 0.08 | acres |
| 3,819 | 0.09 | acres |
| 4,835 | 0.11 | acres |
| 6,508 | 0.15 | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |
| | - | acres |

PRELIMINARY SIZE:

VOLUME = $1/3\{(EL2-EL1)*(A1+A2+((A1*A2)^.5))\}$

CUMMULATIVE VOLUME:

| | | | | | | |
|------|-------|------|-------|----|-------|------|
| - | AC-FT | from | 7,107 | to | 7,107 | |
| 0.05 | AC-FT | from | 7,107 | to | 7,108 | 0.05 |
| 0.03 | AC-FT | from | 7,108 | to | 7,109 | 0.09 |
| 0.04 | AC-FT | from | 7,109 | to | 7,109 | 0.13 |
| 0.10 | AC-FT | from | 7,109 | to | 7,110 | 0.23 |
| 0.26 | AC-FT | from | 7,110 | to | 7,112 | 0.48 |
| - | AC-FT | from | 7,112 | to | - | 0.48 |
| - | AC-FT | from | - | to | - | 0.48 |
| - | AC-FT | from | - | to | - | 0.48 |
| - | AC-FT | from | - | to | - | 0.48 |
| - | AC-FT | from | - | to | - | 0.48 |

*SIZING IS FOR PRELIMINARY PURPOSES ONLY.

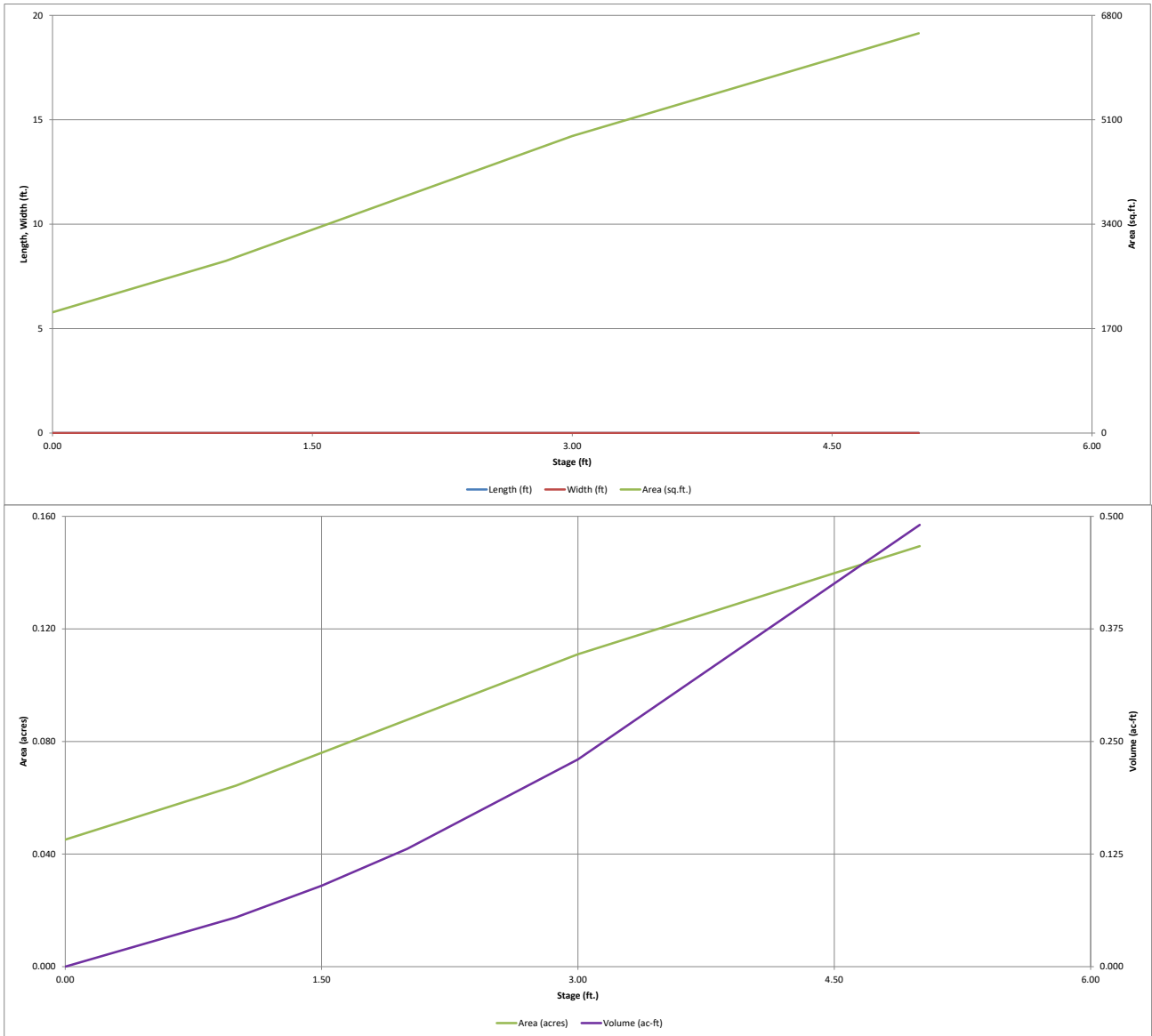
VOLUME = 0.484 AC-FT

APPROXIMATE SURFACE AREA REQUIREMENT

| POND DEPTH (FT) | POND VOLUME | | | SURFACE AREA (SF) |
|-----------------|-------------|---|--------|-------------------|
| | AC-FT | = | CF | |
| 4 | 0.48 | = | 21,086 | 5,271 |
| 6 | 0.48 | = | 21,086 | 3,514 |
| 8 | 0.48 | = | 21,086 | 2,636 |
| 10 | 0.48 | = | 21,086 | 2,109 |

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

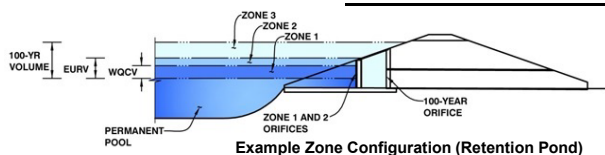
MHFD-Detention, Version 4.06 (July 2022)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: WATERSIDE TOWNHOMES
Basin ID: POND 'A'



| | Estimated Stage (ft) | Estimated Volume (ac-ft) | Outlet Type |
|--------------------------|----------------------|--------------------------|----------------------|
| Zone 1 (WQCV) | 1.54 | 0.092 | Filtration Media |
| Zone 2 (100-year) | #VALUE! | 0.512 | Weir&Pipe (Circular) |
| Zone 3 | | | |
| Total (all zones) | | 0.604 | |

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

| | | |
|-----------------------------------|------|--|
| Underdrain Orifice Invert Depth = | 2.00 | ft (distance below the filtration media surface) |
| Underdrain Orifice Diameter = | 1.00 | inches |

| | | |
|-------------------------------|------|-----------------|
| Underdrain Orifice Area = | 0.0 | ft ² |
| Underdrain Orifice Centroid = | 0.04 | 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 = | N/A | ft (relative to basin bottom at Stage = 0 ft) |
| Depth at top of Zone using Orifice Plate = | N/A | ft (relative to basin bottom at Stage = 0 ft) |
| Orifice Plate: Orifice Vertical Spacing = | N/A | inches |
| Orifice Plate: Orifice Area per Row = | N/A | sq. inches |

| | | |
|----------------------------|-----|-----------------|
| WQ Orifice Area per Row = | N/A | ft ² |
| Elliptical Half-Width = | N/A | feet |
| Elliptical Slot Centroid = | N/A | feet |
| Elliptical Slot Area = | N/A | ft ² |

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

| | Row 1 (optional) | 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) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Orifice Area (sq. inches) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

| | 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) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Orifice Area (sq. inches) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

User Input: Vertical Orifice (Circular or Rectangular)

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

| | Not Selected | Not Selected | |
|-----------------------------|--------------|--------------|-----------------|
| Vertical Orifice Area = | | | ft ² |
| Vertical Orifice Centroid = | | | feet |

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

| | Zone 2 Weir | Not Selected | |
|---------------------------------------|--------------|--------------|---|
| Overflow Weir Front Edge Height, Ho = | 2.00 | | ft (relative to basin bottom at Stage = 0 ft) |
| Overflow Weir Front Edge Length = | 4.00 | | feet |
| Overflow Weir Grate Slope = | 4.00 | | H:V |
| Horiz. Length of Weir Sides = | 4.00 | | feet |
| Overflow Grate Type = | Type C Grate | | |
| Debris Clogging % = | 50% | | % |

| | Zone 2 Weir | Not Selected | |
|--|-------------|--------------|-----------------|
| Height of Grate Upper Edge, H _u = | 3.00 | | feet |
| Overflow Weir Slope Length = | 4.12 | | feet |
| Grate Open Area / 100-yr Orifice Area = | 6.50 | | |
| Overflow Grate Open Area w/o Debris = | 11.48 | | ft ² |
| Overflow Grate Open Area w/ Debris = | 5.74 | | ft ² |

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

| | Zone 2 Circular | Not Selected | |
|----------------------------------|-----------------|--------------|--|
| Depth to Invert of Outlet Pipe = | 2.25 | | ft (distance below basin bottom at Stage = 0 ft) |
| Circular Orifice Diameter = | 18.00 | | inches |

| | Zone 2 Circular | Not Selected | |
|--|-----------------|--------------|-----------------|
| Outlet Orifice Area = | 1.77 | | ft ² |
| Outlet Orifice Centroid = | 0.75 | | feet |
| Half-Central Angle of Restrictor Plate on Pipe = | N/A | N/A | radians |

User Input: Emergency Spillway (Rectangular or Trapezoidal)

| | | |
|-------------------------------------|-------|---|
| Spillway Invert Stage = | 3.00 | ft (relative to basin bottom at Stage = 0 ft) |
| Spillway Crest Length = | 10.00 | feet |
| Spillway End Slopes = | 10.00 | H:V |
| Freeboard above Max Water Surface = | 1.00 | feet |

| | | |
|------------------------------------|------|---------|
| Spillway Design Flow Depth = | 0.50 | feet |
| Stage at Top of Freeboard = | 4.50 | feet |
| Basin Area at Top of Freeboard = | 0.14 | acres |
| Basin Volume at Top of Freeboard = | 0.42 | acre-ft |

Routed Hydrograph Results

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

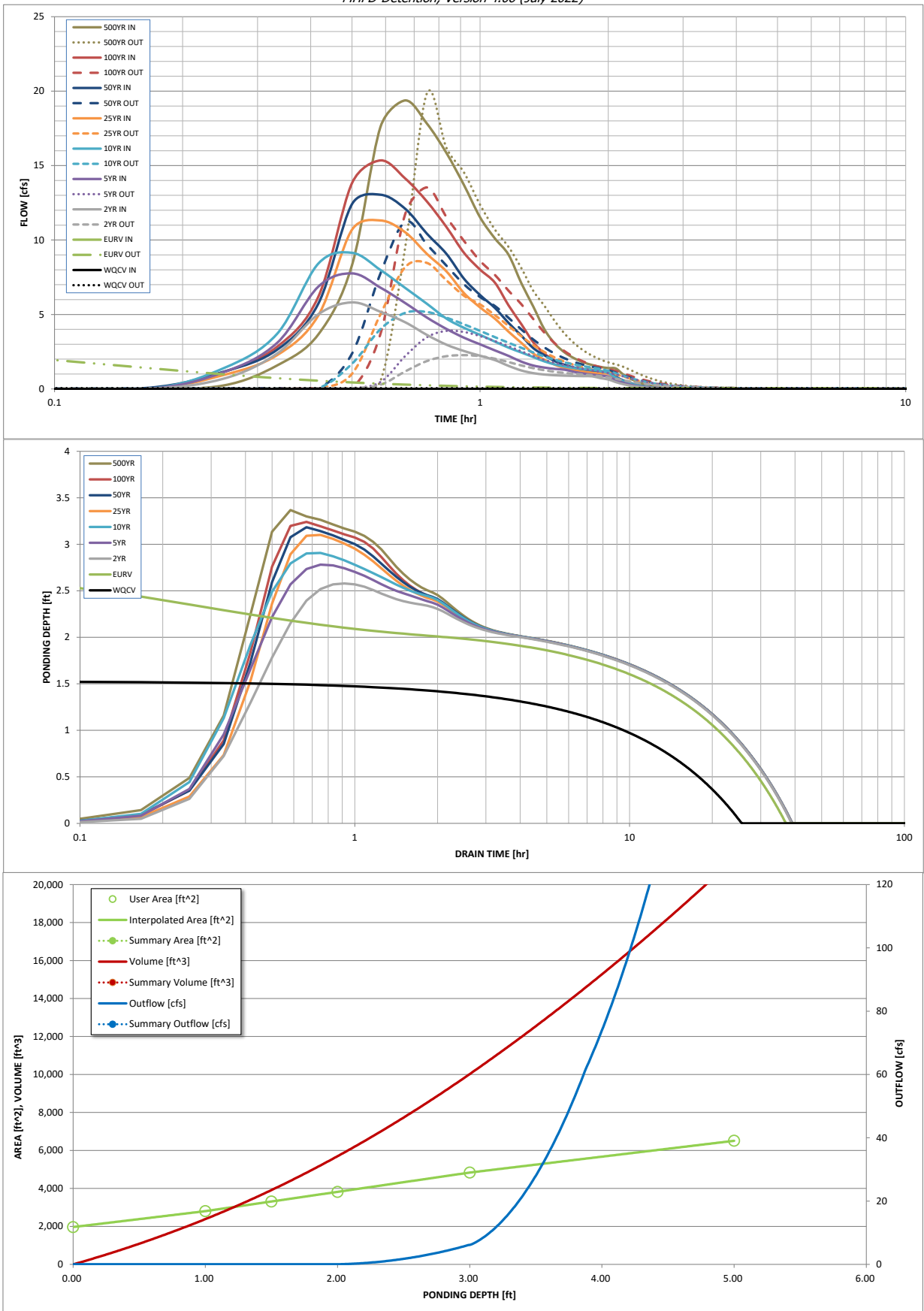
| | WQCV | EURV | 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year | 500 Year |
|---|------------------|----------|-----------------|-----------------|-----------------|----------|----------|----------|----------|
| Design Storm Return Period = | N/A | N/A | 1.19 | 1.50 | 1.75 | 2.00 | 2.25 | 2.52 | 3.10 |
| One-Hour Rainfall Depth (in) = | 0.092 | 0.386 | 0.336 | 0.452 | 0.549 | 0.663 | 0.765 | 0.885 | 1.127 |
| CUHP Runoff Volume (acre-ft) = | N/A | N/A | 0.336 | 0.452 | 0.549 | 0.663 | 0.765 | 0.885 | 1.127 |
| Inflow Hydrograph Volume (acre-ft) = | N/A | N/A | 0.5 | 1.4 | 2.1 | 3.8 | 4.8 | 6.1 | 8.4 |
| CUHP Predevelopment Peak Q (cfs) = | N/A | N/A | 0.10 | 0.29 | 0.44 | 0.77 | 0.97 | 1.24 | 1.70 |
| OPTIONAL Override Predevelopment Peak Q (cfs) = | N/A | N/A | 5.8 | 7.8 | 9.1 | 11.3 | 13.0 | 15.3 | 19.4 |
| Predevelopment Unit Peak Flow, q (cfs/acre) = | N/A | N/A | 2.3 | 3.9 | 5.2 | 8.5 | 11.2 | 13.5 | 19.9 |
| Peak Inflow Q (cfs) = | N/A | N/A | N/A | 2.7 | 2.4 | 2.2 | 2.3 | 2.2 | 2.4 |
| Ratio Peak Outflow to Predevelopment Q = | Filtration Media | Spillway | Overflow Weir 1 | Overflow Weir 1 | Overflow Weir 1 | Spillway | Spillway | Spillway | Spillway |
| Structure Controlling Flow = | N/A | 1.77 | 0.19 | 0.3 | 0.4 | 0.6 | 0.7 | 0.8 | 1.0 |
| Max Velocity through Grate 1 (fps) = | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Max Velocity through Grate 2 (fps) = | 25 | 34 | 36 | 35 | 34 | 33 | 32 | 31 | 29 |
| Time to Drain 97% of Inflow Volume (hours) = | 25 | 36 | 38 | 38 | 37 | 37 | 37 | 36 | 36 |
| Time to Drain 99% of Inflow Volume (hours) = | 1.53 | 4.27 | 2.58 | 2.78 | 2.91 | 3.10 | 3.18 | 3.24 | 3.37 |
| Maximum Ponding Depth (ft) = | 0.08 | 0.14 | 0.10 | 0.11 | 0.11 | 0.11 | 0.11 | 0.12 | 0.12 |
| Area at Maximum Ponding Depth (acres) = | 0.092 | 0.387 | 0.185 | 0.206 | 0.219 | 0.241 | 0.250 | 0.257 | 0.271 |
| Maximum Volume Stored (acre-ft) = | | | | | | | | | |

MAX. FLOW IN OUTFALL PIPE ASSUMED TO BE Q100 = 5.2 CFS AS SPILLWAY IS UTILIZED AS POND OUTFALL POINT BEYOND THIS POINT.

RATIO OF PEAK OUTFLOW TO PREDEV. Q DOES NOT APPLY AS THIS IS A SWQ FACILITY ONLY, NOT FULL SPECTRUM DETENTION

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 | 0.00 | 0.08 | 0.01 | 0.24 |
| | 0:15:00 | 0.00 | 0.00 | 0.69 | 1.13 | 1.40 | 0.94 | 1.16 | 1.14 | 1.57 | 1.57 |
| | 0:20:00 | 0.00 | 0.00 | 2.37 | 3.08 | 3.69 | 2.27 | 2.63 | 2.83 | 3.66 | 3.66 |
| | 0:25:00 | 0.00 | 0.00 | 5.01 | 6.87 | 8.41 | 4.93 | 5.72 | 6.18 | 8.30 | 8.30 |
| | 0:30:00 | 0.00 | 0.00 | 5.81 | 7.76 | 9.14 | 10.69 | 12.41 | 13.82 | 17.59 | 17.59 |
| | 0:35:00 | 0.00 | 0.00 | 5.18 | 6.80 | 7.99 | 11.31 | 13.04 | 15.35 | 19.38 | 19.38 |
| | 0:40:00 | 0.00 | 0.00 | 4.48 | 5.77 | 6.79 | 10.52 | 12.10 | 14.14 | 17.82 | 17.82 |
| | 0:45:00 | 0.00 | 0.00 | 3.63 | 4.79 | 5.72 | 9.07 | 10.43 | 12.59 | 15.85 | 15.85 |
| | 0:50:00 | 0.00 | 0.00 | 2.97 | 4.03 | 4.72 | 7.90 | 9.08 | 10.88 | 13.69 | 13.69 |
| | 0:55:00 | 0.00 | 0.00 | 2.55 | 3.44 | 4.10 | 6.43 | 7.40 | 9.14 | 11.52 | 11.52 |
| | 1:00:00 | 0.00 | 0.00 | 2.23 | 3.00 | 3.63 | 5.47 | 6.31 | 8.01 | 10.11 | 10.11 |
| | 1:05:00 | 0.00 | 0.00 | 1.94 | 2.59 | 3.18 | 4.72 | 5.44 | 7.14 | 9.01 | 9.01 |
| | 1:10:00 | 0.00 | 0.00 | 1.55 | 2.22 | 2.77 | 3.84 | 4.44 | 5.61 | 7.10 | 7.10 |
| | 1:15:00 | 0.00 | 0.00 | 1.24 | 1.83 | 2.45 | 3.10 | 3.58 | 4.35 | 5.54 | 5.54 |
| | 1:20:00 | 0.00 | 0.00 | 1.06 | 1.57 | 2.14 | 2.38 | 2.74 | 3.13 | 4.00 | 4.00 |
| | 1:25:00 | 0.00 | 0.00 | 0.97 | 1.43 | 1.85 | 1.96 | 2.26 | 2.37 | 3.03 | 3.03 |
| | 1:30:00 | 0.00 | 0.00 | 0.92 | 1.34 | 1.64 | 1.62 | 1.86 | 1.90 | 2.43 | 2.43 |
| | 1:35:00 | 0.00 | 0.00 | 0.89 | 1.29 | 1.50 | 1.40 | 1.60 | 1.60 | 2.05 | 2.05 |
| | 1:40:00 | 0.00 | 0.00 | 0.87 | 1.14 | 1.40 | 1.25 | 1.43 | 1.39 | 1.78 | 1.78 |
| | 1:45:00 | 0.00 | 0.00 | 0.86 | 1.04 | 1.33 | 1.15 | 1.31 | 1.26 | 1.61 | 1.61 |
| | 1:50:00 | 0.00 | 0.00 | 0.85 | 0.96 | 1.28 | 1.09 | 1.23 | 1.16 | 1.48 | 1.48 |
| | 1:55:00 | 0.00 | 0.00 | 0.73 | 0.90 | 1.20 | 1.04 | 1.18 | 1.10 | 1.40 | 1.40 |
| | 2:00:00 | 0.00 | 0.00 | 0.64 | 0.83 | 1.08 | 1.02 | 1.15 | 1.08 | 1.37 | 1.37 |
| | 2:05:00 | 0.00 | 0.00 | 0.46 | 0.60 | 0.77 | 0.73 | 0.82 | 0.77 | 0.98 | 0.98 |
| | 2:10:00 | 0.00 | 0.00 | 0.32 | 0.42 | 0.54 | 0.51 | 0.58 | 0.55 | 0.70 | 0.70 |
| | 2:15:00 | 0.00 | 0.00 | 0.22 | 0.29 | 0.38 | 0.36 | 0.40 | 0.39 | 0.49 | 0.49 |
| | 2:20:00 | 0.00 | 0.00 | 0.15 | 0.19 | 0.26 | 0.25 | 0.28 | 0.26 | 0.34 | 0.34 |
| | 2:25:00 | 0.00 | 0.00 | 0.10 | 0.13 | 0.17 | 0.16 | 0.18 | 0.18 | 0.22 | 0.22 |
| | 2:30:00 | 0.00 | 0.00 | 0.06 | 0.08 | 0.11 | 0.11 | 0.12 | 0.12 | 0.15 | 0.15 |
| | 2:35:00 | 0.00 | 0.00 | 0.03 | 0.05 | 0.06 | 0.07 | 0.07 | 0.07 | 0.09 | 0.09 |
| | 2:40:00 | 0.00 | 0.00 | 0.02 | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 | 0.05 |
| | 2:45:00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 |
| | 2:50:00 | 0.00 | 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 | 0.00 |
| | 3:00:00 | 0.00 | 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 | 0.00 |
| | 3:10:00 | 0.00 | 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 | 0.00 |
| | 3:20:00 | 0.00 | 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 | 0.00 |
| | 3:30:00 | 0.00 | 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 | 0.00 |
| | 3:40:00 | 0.00 | 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 | 0.00 |
| | 3:50:00 | 0.00 | 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 | 0.00 |
| | 4:00:00 | 0.00 | 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 | 0.00 |
| | 4:10:00 | 0.00 | 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 | 0.00 |
| | 4:20:00 | 0.00 | 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 | 0.00 |
| | 4:30:00 | 0.00 | 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 | 0.00 |
| | 4:40:00 | 0.00 | 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 | 0.00 |
| | 4:50:00 | 0.00 | 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 | 0.00 |
| 5:00:00 | 0.00 | 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 | 0.00 | |
| 5:10:00 | 0.00 | 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 | 0.00 | |
| 5:20:00 | 0.00 | 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 | 0.00 | |
| 5:30:00 | 0.00 | 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 | 0.00 | |
| 5:40:00 | 0.00 | 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 | 0.00 | |
| 5:50:00 | 0.00 | 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 | 0.00 | |
| 6:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

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

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

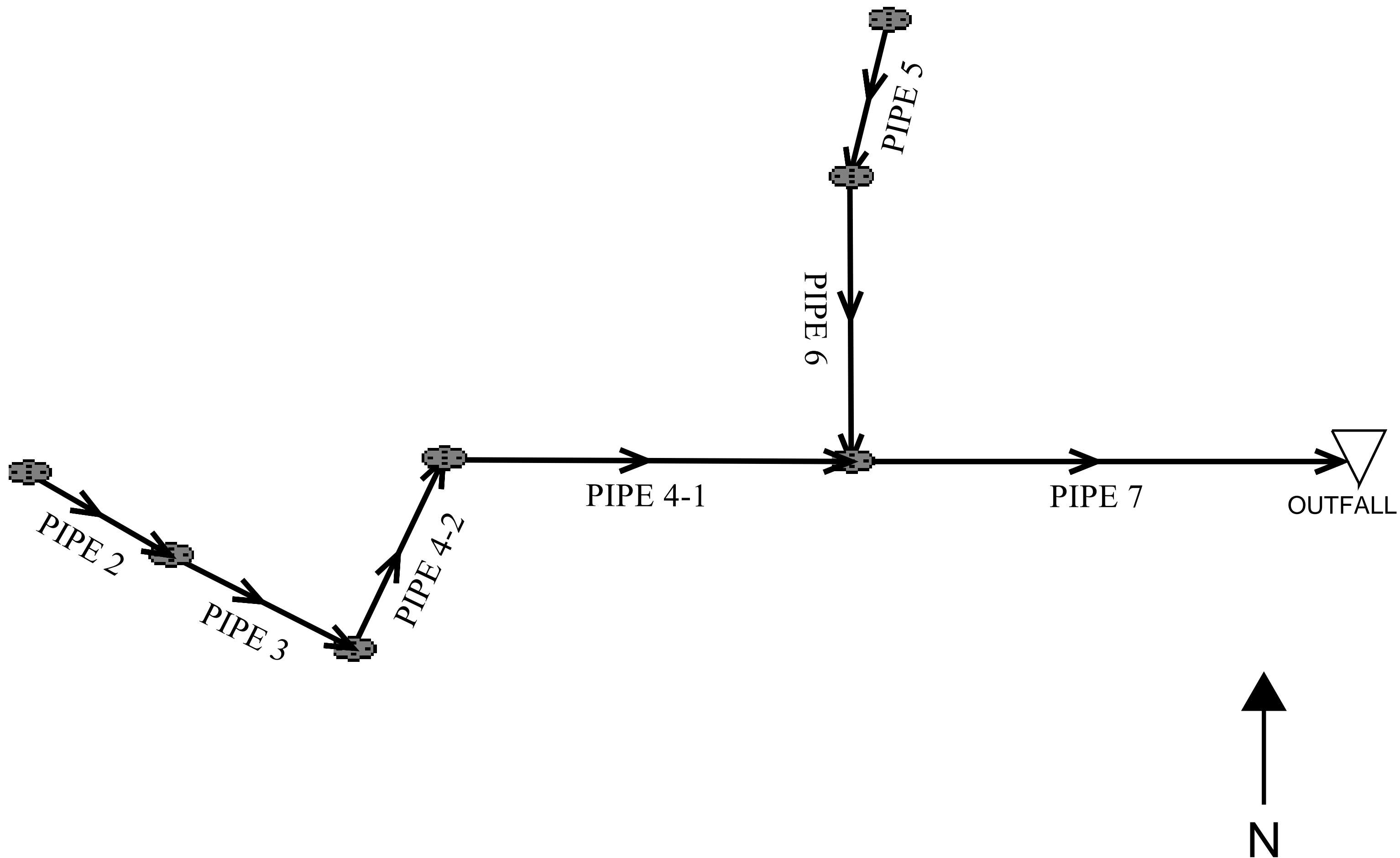
| Stage - Storage Description | Stage [ft] | Area [ft ²] | Area [acres] | Volume [ft ³] | Volume [ac-ft] | Total Outflow [cfs] |
|-----------------------------|------------|-------------------------|--------------|---------------------------|----------------|---------------------|
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For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

**HYDRAULIC GRADE LINE (HGL)
CALCULATIONS**





System Input Summary

MAIN SYSTEM - 100 - YR HGL

Rainfall Parameters

Rainfall Return Period: 100

Rainfall Calculation Method: Formula

One Hour Depth (in):

Rainfall Constant "A": 28.5

Rainfall Constant "B": 10

Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20

Maximum Rural Overland Len. (ft): 500

Maximum Urban Overland Len. (ft): 300

Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00

Maximum Depth to Rise Ratio: 0.90

Maximum Flow Velocity (fps): 18.1

Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 0.00

Manhole Input Summary:

| | | Given Flow | | Sub Basin Information | | | | | | |
|--------------|-----------------------|------------------------|--------------------------|-----------------------|--------------------|-----------------|----------------------|--------------------|--------------------|-----------------------|
| Element Name | Ground Elevation (ft) | Total Known Flow (cfs) | Local Contribution (cfs) | Drainage Area (Ac.) | Runoff Coefficient | 5yr Coefficient | Overland Length (ft) | Overland Slope (%) | Gutter Length (ft) | Gutter Velocity (fps) |
| OUTFALL 1 | 7170.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| PIPE 7 | 7128.71 | 23.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| PIPE 6 | 7132.10 | 13.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| PIPE 5 | 7132.28 | 6.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| PIPE 4-1 | 7127.73 | 9.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| PIPE 4-2 | 7126.46 | 9.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| PIPE 3 | 7126.47 | 8.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| PIPE 2 | 7126.36 | 8.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Manhole Output Summary:

| | | Local Contribution | | | | Total Design Flow | | | | |
|--------------|---------------------|--------------------|----------------|-------------------|---------------------|-------------------|-------------------|------------------|-----------------|---------|
| Element Name | Overland Time (min) | Gutter Time (min) | Basin Tc (min) | Intensity (in/hr) | Local Contrib (cfs) | Coeff. Area | Intensity (in/hr) | Manhole Tc (min) | Peak Flow (cfs) | Comment |
| OUTFALL 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| PIPE 7 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 23.10 | |
| PIPE 6 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 13.60 | |

| | | | | | | | | | | |
|----------|------|------|------|------|------|------|------|------|------|--|
| PIPE 5 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.20 | |
| PIPE 4-1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9.80 | |
| PIPE 4-2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9.80 | |
| PIPE 3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8.90 | |
| PIPE 2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8.30 | |

Sewer Input Summary:

| Element Name | Sewer Length (ft) | Elevation | | | Loss Coefficients | | | Given Dimensions | | |
|--------------|-------------------|------------------------|-----------|----------------------|-------------------|-----------|--------------|------------------|-----------------|-----------------|
| | | Downstream Invert (ft) | Slope (%) | Upstream Invert (ft) | Mannings n | Bend Loss | Lateral Loss | Cross Section | Rise (ft or in) | Span (ft or in) |
| PIPE 7 | 141.89 | 7107.00 | 5.7 | 7115.14 | 0.013 | 0.03 | 1.00 | CIRCULAR | 24.00 in | 24.00 in |
| PIPE 6 | 67.41 | 7115.44 | 9.7 | 7121.98 | 0.013 | 1.32 | 0.00 | CIRCULAR | 24.00 in | 24.00 in |
| PIPE 5 | 30.76 | 7122.48 | 1.0 | 7122.79 | 0.013 | 0.08 | 0.76 | CIRCULAR | 18.00 in | 18.00 in |
| PIPE 4-1 | 115.43 | 7115.44 | 0.5 | 7116.01 | 0.013 | 0.05 | 1.00 | CIRCULAR | 24.00 in | 24.00 in |
| PIPE 4-2 | 33.37 | 7116.31 | 0.5 | 7116.48 | 0.013 | 0.77 | 0.30 | CIRCULAR | 24.00 in | 24.00 in |
| PIPE 3 | 17.17 | 7116.98 | 1.0 | 7117.15 | 0.013 | 1.32 | 0.25 | CIRCULAR | 18.00 in | 18.00 in |
| PIPE 2 | 7.17 | 7121.42 | 1.0 | 7121.49 | 0.013 | 0.05 | 1.00 | CIRCULAR | 18.00 in | 18.00 in |

Sewer Flow Summary:

| | | | | |
|--|---------------------------|----------------------|--------------------|--|
| | Full Flow Capacity | Critical Flow | Normal Flow | |
|--|---------------------------|----------------------|--------------------|--|

| Element Name | Flow (cfs) | Velocity (fps) | Depth (in) | Velocity (fps) | Depth (in) | Velocity (fps) | Froude Number | Flow Condition | Flow (cfs) | Surcharged Length (ft) | Comment |
|--------------|------------|----------------|------------|----------------|------------|----------------|---------------|----------------|------------|------------------------|---------|
| PIPE 7 | 54.33 | 17.29 | 20.51 | 8.08 | 10.93 | 16.59 | 3.50 | Supercritical | 23.10 | 0.00 | |
| PIPE 6 | 70.65 | 22.49 | 15.93 | 6.14 | 7.14 | 17.37 | 4.68 | Supercritical | 13.60 | 0.00 | |
| PIPE 5 | 10.57 | 5.98 | 11.55 | 5.18 | 9.91 | 6.22 | 1.34 | Supercritical | 6.20 | 0.00 | |
| PIPE 4-1 | 15.94 | 5.07 | 13.43 | 5.42 | 13.61 | 5.33 | 0.98 | Pressurized | 9.80 | 115.43 | |
| PIPE 4-2 | 16.19 | 5.15 | 13.43 | 5.42 | 13.47 | 5.40 | 0.99 | Pressurized | 9.80 | 33.37 | |
| PIPE 3 | 10.48 | 5.93 | 13.85 | 6.10 | 12.74 | 6.65 | 1.18 | Pressurized | 8.90 | 17.17 | |
| PIPE 2 | 10.43 | 5.90 | 13.39 | 5.89 | 12.13 | 6.55 | 1.22 | Supercritical | 8.30 | 0.00 | |

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

| Element Name | Peak Flow (cfs) | Cross Section | Existing | | Calculated | | Used | | | Comment |
|--------------|-----------------|---------------|----------|----------|------------|----------|----------|----------|-------------------------|---------|
| | | | Rise | Span | Rise | Span | Rise | Span | Area (ft ²) | |
| PIPE 7 | 23.10 | CIRCULAR | 24.00 in | 24.00 in | 18.00 in | 18.00 in | 24.00 in | 24.00 in | 3.14 | |
| PIPE 6 | 13.60 | CIRCULAR | 24.00 in | 24.00 in | 18.00 in | 18.00 in | 24.00 in | 24.00 in | 3.14 | |
| PIPE 5 | 6.20 | CIRCULAR | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 1.77 | |
| PIPE 4-1 | 9.80 | CIRCULAR | 24.00 in | 24.00 in | 21.00 in | 21.00 in | 24.00 in | 24.00 in | 3.14 | |

| | | | | | | | | | | |
|----------|------|----------|----------|----------|----------|----------|----------|----------|------|--|
| PIPE 4-2 | 9.80 | CIRCULAR | 24.00 in | 24.00 in | 21.00 in | 21.00 in | 24.00 in | 24.00 in | 3.14 | |
| PIPE 3 | 8.90 | CIRCULAR | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 1.77 | |
| PIPE 2 | 8.30 | CIRCULAR | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 1.77 | |

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics were calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 0.00

| Element Name | Invert Elev. | | Downstream Manhole Losses | | HGL | | EGL | | |
|--------------|-----------------|---------------|---------------------------|-------------------|-----------------|---------------|-----------------|--------------------|---------------|
| | Downstream (ft) | Upstream (ft) | Bend Loss (ft) | Lateral Loss (ft) | Downstream (ft) | Upstream (ft) | Downstream (ft) | Friction Loss (ft) | Upstream (ft) |
| PIPE 7 | 7107.00 | 7115.14 | 0.00 | 0.00 | 7107.91 | 7116.85 | 7112.19 | 5.68 | 7117.86 |
| PIPE 6 | 7115.44 | 7121.98 | 0.38 | 0.00 | 7117.23 | 7123.31 | 7120.72 | 3.17 | 7123.89 |
| PIPE 5 | 7122.48 | 7122.79 | 0.02 | 0.15 | 7123.85 | 7123.85 | 7124.05 | 0.13 | 7124.18 |
| PIPE 4-1 | 7115.44 | 7116.01 | 0.01 | 0.69 | 7118.41 | 7118.62 | 7118.56 | 0.22 | 7118.77 |
| PIPE 4-2 | 7116.31 | 7116.48 | 0.12 | 0.11 | 7118.85 | 7118.91 | 7119.00 | 0.06 | 7119.06 |
| PIPE 3 | 7116.98 | 7117.15 | 0.52 | 0.05 | 7119.48 | 7119.60 | 7119.87 | 0.12 | 7120.00 |
| PIPE 2 | 7121.42 | 7121.49 | 0.02 | 0.05 | 7122.43 | 7122.61 | 7123.10 | 0.05 | 7123.14 |

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_{fi} ^ 2/(2*g)
- Lateral loss = V_{fo} ^ 2/(2*g)- Junction Loss K * V_{fi} ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft

The minimum trench width is 2.00 ft

| Element Name | Length (ft) | Wall (in) | Bedding (in) | Bottom Width (ft) | Downstream | | | Upstream | | | Volume (cu. yd) | Comment |
|--------------|-------------|-----------|--------------|-------------------|----------------|-------------------|------------|----------------|-------------------|------------|-----------------|---------|
| | | | | | Top Width (ft) | Trench Depth (ft) | Cover (ft) | Top Width (ft) | Trench Depth (ft) | Cover (ft) | | |
| PIPE 7 | 141.89 | 3.00 | 4.00 | 5.50 | 125.00 | 63.58 | 60.75 | 26.14 | 14.15 | 11.32 | 10783.99 | |
| PIPE 6 | 67.41 | 3.00 | 4.00 | 5.50 | 25.54 | 13.85 | 11.02 | 19.24 | 10.70 | 7.87 | 352.85 | |
| PIPE 5 | 30.76 | 2.50 | 4.00 | 4.92 | 18.74 | 10.16 | 7.91 | 18.48 | 10.03 | 7.78 | 109.97 | |
| PIPE 4-1 | 115.43 | 3.00 | 4.00 | 5.50 | 25.54 | 13.85 | 11.02 | 22.44 | 12.30 | 9.47 | 675.48 | |
| PIPE 4-2 | 33.37 | 3.00 | 4.00 | 5.50 | 21.84 | 12.00 | 9.17 | 18.96 | 10.56 | 7.73 | 145.94 | |
| PIPE 3 | 17.17 | 2.50 | 4.00 | 4.92 | 18.46 | 10.02 | 7.77 | 18.14 | 9.86 | 7.61 | 59.56 | |
| PIPE 2 | 7.17 | 2.50 | 4.00 | 4.92 | 9.60 | 5.59 | 3.34 | 9.24 | 5.41 | 3.16 | 8.53 | |

Total earth volume for sewer trenches = 12136 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.

- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: $(\text{equivalent diameter in inches}/12)+1$ inches
- The sewer bedding thickness is equal to:
 - Four inches for pipes less than 33 inches.
 - Six inches for pipes less than 60 inches.
 - Eight inches for all larger sizes.

System Input Summary

MAIN SYSTEM

5-YR HGL

Rainfall Parameters

Rainfall Return Period: 5

Rainfall Calculation Method: Formula

One Hour Depth (in):

Rainfall Constant "A": 28.5

Rainfall Constant "B": 10

Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20

Maximum Rural Overland Len. (ft): 500

Maximum Urban Overland Len. (ft): 300

Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00

Maximum Depth to Rise Ratio: 0.90

Maximum Flow Velocity (fps): 18.1

Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 0.00

| | | | | | | | | | | |
|----------|------|------|------|------|------|------|------|------|------|--|
| PIPE 5 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.20 | |
| PIPE 4-1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.50 | |
| PIPE 4-2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.50 | |
| PIPE 3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.10 | |
| PIPE 2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.80 | |

Sewer Input Summary:

| Element Name | Sewer Length (ft) | Elevation | | | Loss Coefficients | | | Given Dimensions | | |
|--------------|-------------------|------------------------|-----------|----------------------|-------------------|-----------|--------------|------------------|-----------------|-----------------|
| | | Downstream Invert (ft) | Slope (%) | Upstream Invert (ft) | Mannings n | Bend Loss | Lateral Loss | Cross Section | Rise (ft or in) | Span (ft or in) |
| PIPE 7 | 141.89 | 7107.00 | 5.7 | 7115.14 | 0.013 | 0.03 | 1.00 | CIRCULAR | 24.00 in | 24.00 in |
| PIPE 6 | 67.41 | 7115.44 | 9.7 | 7121.98 | 0.013 | 1.32 | 0.00 | CIRCULAR | 24.00 in | 24.00 in |
| PIPE 5 | 30.76 | 7122.48 | 1.0 | 7122.79 | 0.013 | 0.08 | 0.76 | CIRCULAR | 18.00 in | 18.00 in |
| PIPE 4-1 | 115.43 | 7115.44 | 0.5 | 7116.01 | 0.013 | 0.05 | 1.00 | CIRCULAR | 24.00 in | 24.00 in |
| PIPE 4-2 | 33.37 | 7116.31 | 0.5 | 7116.48 | 0.013 | 0.77 | 0.30 | CIRCULAR | 24.00 in | 24.00 in |
| PIPE 3 | 17.17 | 7116.98 | 1.0 | 7117.15 | 0.013 | 1.32 | 0.25 | CIRCULAR | 18.00 in | 18.00 in |
| PIPE 2 | 7.17 | 7121.42 | 1.0 | 7121.49 | 0.013 | 0.05 | 1.00 | CIRCULAR | 18.00 in | 18.00 in |

Sewer Flow Summary:

| | | | | |
|--|---------------------------|----------------------|--------------------|--|
| | Full Flow Capacity | Critical Flow | Normal Flow | |
|--|---------------------------|----------------------|--------------------|--|

| Element Name | Flow (cfs) | Velocity (fps) | Depth (in) | Velocity (fps) | Depth (in) | Velocity (fps) | Froude Number | Flow Condition | Flow (cfs) | Surcharged Length (ft) | Comment |
|--------------|------------|----------------|------------|----------------|------------|----------------|---------------|----------------|------------|------------------------|---------|
| PIPE 7 | 54.33 | 17.29 | 15.25 | 5.94 | 7.83 | 14.05 | 3.59 | Supercritical | 12.50 | 0.00 | |
| PIPE 6 | 70.65 | 22.49 | 11.43 | 4.88 | 5.17 | 14.46 | 4.63 | Supercritical | 7.20 | 0.00 | |
| PIPE 5 | 10.57 | 5.98 | 8.17 | 4.10 | 6.79 | 5.24 | 1.43 | Supercritical | 3.20 | 0.00 | |
| PIPE 4-1 | 15.94 | 5.07 | 9.93 | 4.48 | 9.73 | 4.61 | 1.04 | Supercritical | 5.50 | 0.00 | |
| PIPE 4-2 | 16.19 | 5.15 | 9.93 | 4.48 | 9.64 | 4.66 | 1.06 | Supercritical | 5.50 | 0.00 | |
| PIPE 3 | 10.48 | 5.93 | 10.43 | 4.80 | 8.86 | 5.89 | 1.37 | Supercritical | 5.10 | 0.00 | |
| PIPE 2 | 10.43 | 5.90 | 10.10 | 4.70 | 8.58 | 5.78 | 1.37 | Supercritical | 4.80 | 0.00 | |

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

| Element Name | Peak Flow (cfs) | Cross Section | Existing | | Calculated | | Used | | | Comment |
|--------------|-----------------|---------------|----------|----------|------------|----------|----------|----------|-------------------------|---------|
| | | | Rise | Span | Rise | Span | Rise | Span | Area (ft ²) | |
| PIPE 7 | 12.50 | CIRCULAR | 24.00 in | 24.00 in | 18.00 in | 18.00 in | 24.00 in | 24.00 in | 3.14 | |
| PIPE 6 | 7.20 | CIRCULAR | 24.00 in | 24.00 in | 18.00 in | 18.00 in | 24.00 in | 24.00 in | 3.14 | |
| PIPE 5 | 3.20 | CIRCULAR | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 1.77 | |
| PIPE 4-1 | 5.50 | CIRCULAR | 24.00 in | 24.00 in | 18.00 in | 18.00 in | 24.00 in | 24.00 in | 3.14 | |

| | | | | | | | | | | |
|----------|------|----------|----------|----------|----------|----------|----------|----------|------|--|
| PIPE 4-2 | 5.50 | CIRCULAR | 24.00 in | 24.00 in | 18.00 in | 18.00 in | 24.00 in | 24.00 in | 3.14 | |
| PIPE 3 | 5.10 | CIRCULAR | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 1.77 | |
| PIPE 2 | 4.80 | CIRCULAR | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 18.00 in | 1.77 | |

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics were calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 0.00

| Element Name | Invert Elev. | | Downstream Manhole Losses | | HGL | | EGL | | |
|--------------|-----------------|---------------|---------------------------|-------------------|-----------------|---------------|-----------------|--------------------|---------------|
| | Downstream (ft) | Upstream (ft) | Bend Loss (ft) | Lateral Loss (ft) | Downstream (ft) | Upstream (ft) | Downstream (ft) | Friction Loss (ft) | Upstream (ft) |
| PIPE 7 | 7107.00 | 7115.14 | 0.00 | 0.00 | 7107.65 | 7116.41 | 7110.72 | 6.24 | 7116.96 |
| PIPE 6 | 7115.44 | 7121.98 | 0.11 | 0.00 | 7116.52 | 7122.93 | 7119.12 | 4.18 | 7123.30 |
| PIPE 5 | 7122.48 | 7122.79 | 0.00 | 0.04 | 7123.05 | 7123.47 | 7123.47 | 0.26 | 7123.73 |
| PIPE 4-1 | 7115.44 | 7116.01 | 0.00 | 0.20 | 7117.10 | 7117.10 | 7117.16 | 0.09 | 7117.25 |
| PIPE 4-2 | 7116.31 | 7116.48 | 0.04 | 0.03 | 7117.17 | 7117.31 | 7117.45 | 0.17 | 7117.62 |
| PIPE 3 | 7116.98 | 7117.15 | 0.17 | 0.02 | 7117.72 | 7118.02 | 7118.26 | 0.12 | 7118.38 |
| PIPE 2 | 7121.42 | 7121.49 | 0.01 | 0.01 | 7122.13 | 7122.33 | 7122.65 | 0.02 | 7122.68 |

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_{fi} ^ 2/(2*g)
- Lateral loss = V_{fo} ^ 2/(2*g)- Junction Loss K * V_{fi} ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft

The minimum trench width is 2.00 ft

| Element Name | Length (ft) | Wall (in) | Bedding (in) | Bottom Width (ft) | Downstream | | | Upstream | | | Volume (cu. yd) | Comment |
|--------------|-------------|-----------|--------------|-------------------|----------------|-------------------|------------|----------------|-------------------|------------|-----------------|---------|
| | | | | | Top Width (ft) | Trench Depth (ft) | Cover (ft) | Top Width (ft) | Trench Depth (ft) | Cover (ft) | | |
| PIPE 7 | 141.89 | 3.00 | 4.00 | 5.50 | 125.00 | 63.58 | 60.75 | 26.14 | 14.15 | 11.32 | 10783.99 | |
| PIPE 6 | 67.41 | 3.00 | 4.00 | 5.50 | 25.54 | 13.85 | 11.02 | 19.24 | 10.70 | 7.87 | 352.85 | |
| PIPE 5 | 30.76 | 2.50 | 4.00 | 4.92 | 18.74 | 10.16 | 7.91 | 18.48 | 10.03 | 7.78 | 109.97 | |
| PIPE 4-1 | 115.43 | 3.00 | 4.00 | 5.50 | 25.54 | 13.85 | 11.02 | 22.44 | 12.30 | 9.47 | 675.48 | |
| PIPE 4-2 | 33.37 | 3.00 | 4.00 | 5.50 | 21.84 | 12.00 | 9.17 | 18.96 | 10.56 | 7.73 | 145.94 | |
| PIPE 3 | 17.17 | 2.50 | 4.00 | 4.92 | 18.46 | 10.02 | 7.77 | 18.14 | 9.86 | 7.61 | 59.56 | |
| PIPE 2 | 7.17 | 2.50 | 4.00 | 4.92 | 9.60 | 5.59 | 3.34 | 9.24 | 5.41 | 3.16 | 8.53 | |

Total earth volume for sewer trenches = 12136 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.

- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: $(\text{equivalent diameter in inches}/12)+1$ inches
- The sewer bedding thickness is equal to:
 - Four inches for pipes less than 33 inches.
 - Six inches for pipes less than 60 inches.
 - Eight inches for all larger sizes.

DRAINAGE MAPS



CONDO MAP FOR THE COVE AT WOODMOOR
CONDO BOOK I, PAGE 79

LAKE WOODMOOR

**PROPOSED SWQ
FACILITY (POND 'A')
SAND FILTER BASIN**

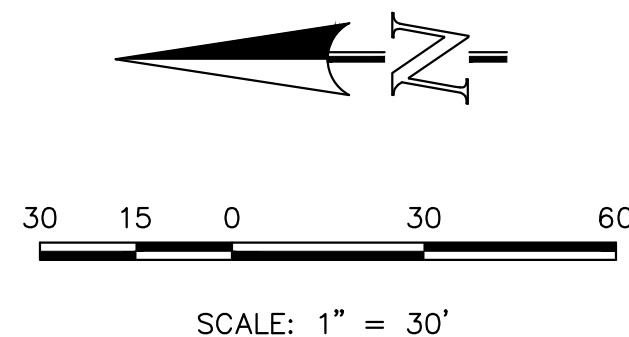
LAKE WOODMOOR TOWNHOUSES III
PLAT BK M-2, PG 27

WOODMOOR DRIVE
DEER CREEK ROAD
80' PUBLIC ROW
PLAT BOOK H-2, PAGE 59

WOODMOOR DRIVE
WOODMOOR DRIVE
80' PUBLIC ROW
PLAT BOOK M-2, PAGE 28

- SPA - SEPARATE PERVIOUS AREA (1.30 AC.)
- UIA - UNCONNECTED IMPERVIOUS AREA (3.51 AC.)
- RPA - RECEIVING PERVIOUS AREA (0.11 AC.)

SAND FILTER WATER QUALITY INFORMATION
4.92 TOTAL ACRES
71.3% IMPERVIOUS
MIN. SAND FILTER BASIN AREA = 1,910 S.F.
MIN. WQCV = 3,922 C.F.
PROVIDED SAND FILTER BASIN AREA = 1,965 S.F.
PROVIDED WQCV = 5,619 C.F.



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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.

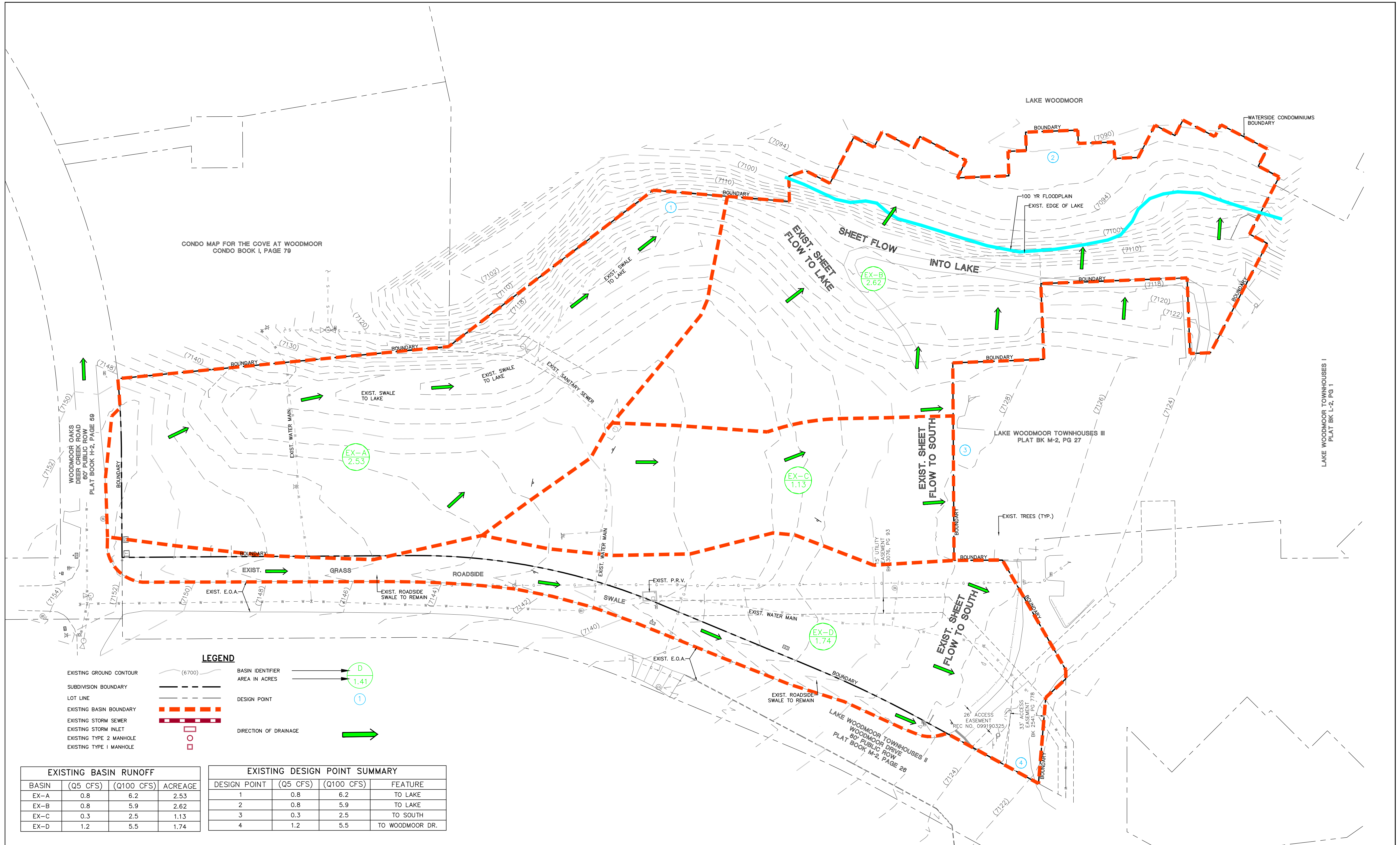
| NO. | REVISION | DATE |
|-----|----------|------|
| | | |
| | | |
| | | |

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

| | | | |
|-----------------------------------|--------------|--------------|---------------|
| WATERSIDE AT LAKE WOODMOOR | | | |
| FILING NO. 1 | | | |
| FINAL DRAINAGE REPORT | | | |
| TRIBUTARY AREA EXHIBIT | | | |
| DESIGNED BY | MAL | SCALE | DATE 02/06/23 |
| DRAWN BY | MAL | (H) 1" = 30' | SHEET 1 OF 1 |
| CHECKED BY | (V) 1" = N/A | JOB NO. | 2588.00 |

CLASSIC CONSULTING



CONDO MAP FOR THE COVE AT WOODMOOR
CONDO BOOK I, PAGE 79

LAKE WOODMOOR

WATERSIDE CONDOMINIUMS BOUNDARY

LAKE WOODMOOR TOWNHOUSES I
PLAT BK L-2, PG 1

LAKE WOODMOOR TOWNHOUSES III
PLAT BK M-2, PG 27

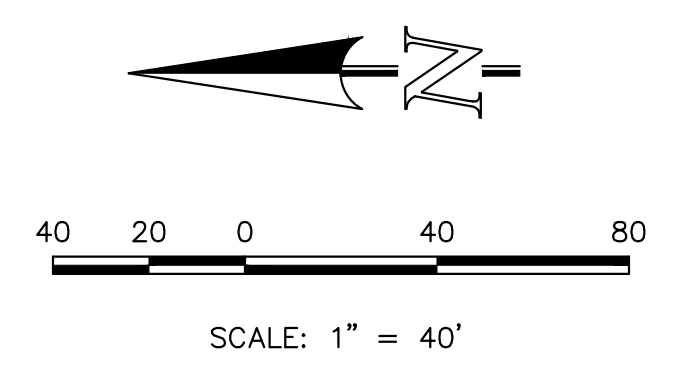
LAKE WOODMOOR TOWNHOUSES II
WOODMOOR DRIVE
80' PUBLIC ROW
PLAT BOOK M-2, PAGE 28

LEGEND

- EXISTING GROUND CONTOUR (6700)
- SUBDIVISION BOUNDARY
- LOT LINE
- EXISTING BASIN BOUNDARY
- EXISTING STORM SEWER
- EXISTING STORM INLET
- EXISTING TYPE 2 MANHOLE
- EXISTING TYPE 1 MANHOLE
- BASIN IDENTIFIER
- AREA IN ACRES
- DESIGN POINT
- DIRECTION OF DRAINAGE

| EXISTING BASIN RUNOFF | | | |
|-----------------------|----------|------------|---------|
| BASIN | (Q5 CFS) | (Q100 CFS) | ACREAGE |
| EX-A | 0.8 | 6.2 | 2.53 |
| EX-B | 0.8 | 5.9 | 2.62 |
| EX-C | 0.3 | 2.5 | 1.13 |
| EX-D | 1.2 | 5.5 | 1.74 |

| EXISTING DESIGN POINT SUMMARY | | | |
|-------------------------------|----------|------------|-----------------|
| DESIGN POINT | (Q5 CFS) | (Q100 CFS) | FEATURE |
| 1 | 0.8 | 6.2 | TO LAKE |
| 2 | 0.8 | 5.9 | TO LAKE |
| 3 | 0.3 | 2.5 | TO SOUTH |
| 4 | 1.2 | 5.5 | TO WOODMOOR DR. |



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| 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

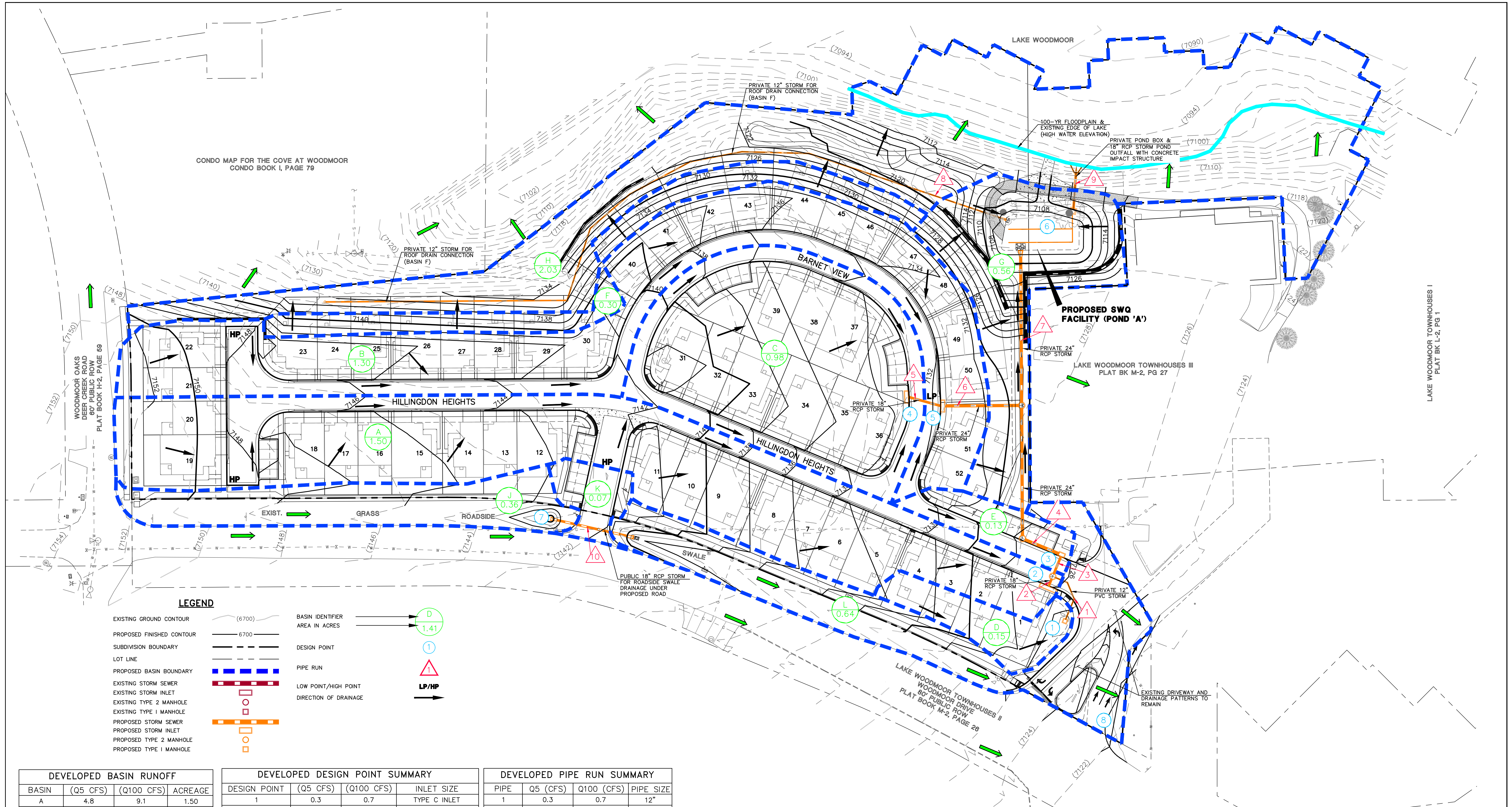
619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903
(719)785-0790
(719)785-0799(fax)

| WATERSIDE AT LAKE WOODMOOR FILING NO. 1 FINAL DRAINAGE REPORT EXISTING CONDITIONS MAP | | | |
|--|--------------|--------------|---------------|
| DESIGNED BY | MAL | SCALE | DATE 02/06/23 |
| DRAWN BY | MAL | (H) 1" = 40' | SHEET 1 OF 1 |
| CHECKED BY | (V) 1" = N/A | JOB NO. | 2588.00 |

CLASSIC CONSULTING

N:\258800\DRAWINGS\DEVELOPMENT\258800-EXIST.dwg, 4/17/2023, 3:59:17 PM, 1:1

CONDO MAP FOR THE COVE AT WOODMOOR
CONDO BOOK I, PAGE 79



LEGEND

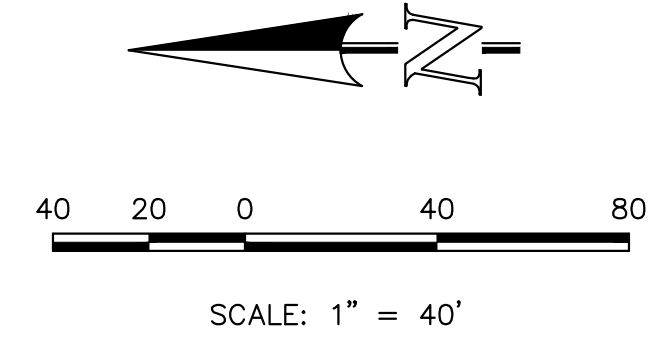
- EXISTING GROUND CONTOUR (6700)
- PROPOSED FINISHED CONTOUR (6700)
- SUBDIVISION BOUNDARY
- LOT LINE
- PROPOSED BASIN BOUNDARY
- EXISTING STORM SEWER
- EXISTING STORM INLET
- EXISTING TYPE 2 MANHOLE
- EXISTING TYPE 1 MANHOLE
- PROPOSED STORM SEWER
- PROPOSED STORM INLET
- PROPOSED TYPE 2 MANHOLE
- PROPOSED TYPE 1 MANHOLE
- BASIN IDENTIFIER
- AREA IN ACRES
- DESIGN POINT
- PIPE RUN
- LOW POINT/HIGH POINT
- DIRECTION OF DRAINAGE

| DEVELOPED BASIN RUNOFF | | | |
|------------------------|----------|------------|---------|
| BASIN | (Q5 CFS) | (Q100 CFS) | ACREAGE |
| A | 4.8 | 9.1 | 1.50 |
| B | 4.3 | 8.0 | 1.30 |
| C | 3.2 | 6.2 | 0.98 |
| D | 0.3 | 0.7 | 0.15 |
| E | 0.5 | 1.0 | 0.13 |
| F | 0.9 | 1.9 | 0.30 |
| G | 0.6 | 2.2 | 0.56 |
| H | 0.8 | 5.9 | 2.03 |
| J | 0.3 | 1.2 | 0.36 |
| K | 0.2 | 0.5 | 0.07 |
| L | 1.2 | 3.2 | 0.64 |

| DEVELOPED DESIGN POINT SUMMARY | | | |
|--------------------------------|----------|------------|--------------------|
| DESIGN POINT | (Q5 CFS) | (Q100 CFS) | INLET SIZE |
| 1 | 0.3 | 0.7 | TYPE C INLET |
| 2 | 4.8 | 9.1 | 15" AT-GRADE |
| 3 | 0.5 | 1.0 | 5" AT-GRADE |
| 4 | 3.2 | 6.2 | 10" SUMP |
| 5 | 4.3 | 8.0 | 10" SUMP |
| 6 | 13.7 | 26.4 | POND 'A' |
| 7 | 0.3 | 1.2 | PIPE/ROAD CROSSING |
| 8 | 1.6 | 5.1 | TO WOODMOOR DR. |

| DEVELOPED PIPE RUN SUMMARY | | | |
|----------------------------|----------|------------|-----------|
| PIPE | Q5 (CFS) | Q100 (CFS) | PIPE SIZE |
| 1 | 0.3 | 0.7 | 12" |
| 2 | 4.8 | 8.3 | 18" |
| 3 | 5.1 | 8.9 | 18" |
| 4 | 5.5 | 9.8 | 24" |
| 5 | 3.2 | 6.2 | 18" |
| 6 | 7.2 | 13.6 | 24" |
| 7 | 12.5 | 23.1 | 24" |
| 8 | 0.9 | 1.9 | 12" |
| 9 | 3.9 | 5.2 | 18" |
| 10 | 0.3 | 1.2 | 18" |

STORM SYSTEM NOTES:
 ALL INLETS ARE CDOT TYPE R CURB INLETS.
 ALL STORM SEWER IS 'PRIVATE', EXCEPT PIPE 10 WITHIN WOODMOOR DRIVE R.O.W.
 'PUBLIC' STORM SEWER FACILITIES WILL BE OWNED AND MAINTAINED BY EL PASO COUNTY.
 'PRIVATE' STORM SEWER FACILITIES WILL BE OWNED AND MAINTAINED BY THE HOMES OWNERS ASSOCIATION OR OWNER.



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| 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

WATERSIDE AT LAKE WOODMOOR
 FILING NO. 1
 FINAL DRAINAGE REPORT
 DEVELOPED CONDITIONS MAP
 DESIGNED BY MAL SCALE DATE 02/06/23
 DRAWN BY MAL (H) 1"= 40' SHEET 1 OF 1
 CHECKED BY (V) 1"= N/A JOB NO. 2588.00

N:\258800\DRAWINGS\DEVELOPMENT\258800-FDR-DE-Valley_6/7/2023_4-21-38_Plan_Miscorny_11