FINAL DRAINAGE REPORT for

Veteran's Victory Filing No.1 Lot 1

Villages at Waterview North Colorado Springs, CO

Prepared for:

Veterans Villa Operating, LLC
17332 Edna St.
Omaha, NE 68136
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Prepared by:

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Kimley-Horn Project #: 096955000
SWENT Project #: STM-REV23-0334
SWENT Master Project #: STM-MP22-0263

August 14, 2023

Kimley»Horn

CERTIFICATION

ENGINEERS STATEMENT

This report and plan for the drainage design of Veteran's Victory at Waterview North was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

SIGNATURE (Affix Seal): ____

Colorado P.E. No. 59054 Date

DEVELOPER'S STATEMENT

Veteran's Villa Operating, LLC. hereby certifies that the drainage facilities for Veteran's Victory Lot 1 at Waterview North shall be constructed according to the design presented in this report. I understand that the City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Colorado Springs pursuant to section 7.7.906 of the City Code; and cannot, on behalf of Veteran's Victory at Waterview North guarantee that final drainage design review will absolve Veterans Villa Operating, LLC and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

Veterans Villa Operating, LLC
Name of Developer

____
Authorized Signature Date

____
Printed Name

Manager
Title

17332 Edna St. Omaha, NE 68136
Address:

CITY OF COLORADO SPRINGS STATEMENT

Filed in accordance with Section 7.7.906 of the Code of the City of Colorado Springs, 2001, as amended.

For City Engineer Date

Conditions:

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INTRODUCTION

PURPOSE AND SCOPE OF STUDY

The purpose of this report is to outline the required storm sewer and drainage improvements necessary to support the Veteran's Victory at Waterview North project (the "Property"), City of Colorado Springs, Colorado (the "City"). This Final Drainage Report identifies onsite and offsite drainage patterns, storm sewer and inlet locations, and areas tributary to the Site and proposes to safely route developed storm water to adequate outfalls. This report is designed in conformance with the *Villages at Waterview North Master Development Drainage Plan* by Kimley-Horn approved January 9, 2023 (the "MDDP") and the *Amendment to the Master Drainage Development Plan for Waterview, Waterview North* prepared by Dakota Springs Engineering approved February 2021 (the "MDDP Amendment"), and the *Villages at Waterview North Addition No. 1 Final Drainage Report* by Kimley-Horn approved XXXX 2023 (the "Metro Roads FDR"). The Site is 10.0 acres in size and is located within the Jimmy Camp Creek Drainage Basin, which is mostly undeveloped.

LOCATION

The Property is situated in a portion of Section 9, Township 15 South, Range 65 West of the 6th P.M., City of Colorado Springs, County of El Paso, State of Colorado (the "Site"). The Property is not currently platted. The Property is bounded by vacant land to the north owned by the City of Colorado Springs, vacant land to the east owned by WVN 96, LLC, vacant land to the west owned by CPR Entitlements, LLC, and vacant land to the south owned by Schulz Partnership, LLP.

GENERAL PROJECT DESCRIPTION

The Property, Veteran's Victory Filing No. 1 - Lot 1 and Tract A ("Lot 1"), is 10.0 acres and is located approximately 1200' to the northeast of the intersection of Powers Boulevard and Bradley Road. The proposed improvements involve the construction of four multi-family buildings, one amenity building with a pool deck, and associated parking, drive aisles, and landscape improvements (the "Project"). The Project also involves the construction of associated private utilities and stormwater infrastructure. The developed runoff from the Project will outfall to an offsite private regional detention pond southeast of the Site (proposed by the Metro Roads FDR). The Site is ultimately tributary to the Jimmy Camp Creek Drainage Basin

PROJECT CHARACTERISTICS

The Site is 10.0 acres with approximately 13.5 acres of disturbance, including 10.0 acres of onsite disturbance and 3.5 acres of offsite disturbance. The offsite disturbance is proposed in order to temporarily route offsite flows around our Site until those offsite areas are developed in the future. The development involves the construction of four multi-family buildings, one amenity building, landscaping, drive aisles, wet and dry utilities, and stormwater infrastructure (the "Project"). The proposed stormwater infrastructure includes the construction of private stormwater mains, private stormwater inlets, concrete inverted crowns with 5-feet gutter pans, curb and gutter, and swales. The Site will discharge offsite into the public stormwater infrastructure within the public roadway south of the Site and ultimately outfall into an offsite private regional detention pond to the southeast of the Site, per the Metro Roads FDR.

The proposed buildings, parking lot, paved drives, and other impervious surfaces comprise 58.5 percent (260,829 square feet) of the overall Project Site. Landscape areas internal and on the perimeter of the Site consist of parking islands and landscape zones within the landscape setback areas. The proposed landscaping areas make up 41.5 percent (173,626 square feet) of the Project Site. The weighted imperviousness of the entire drainage area totals to 58.5.0%

The Site is currently undeveloped and consists of vacant land and existing vegetation. Generally, in the existing conditions the Site slopes approximately 1% to 33% from west to east. However, this report assumes the overlot grading for the Site is complete per Initial Grading Plans for the Master Development by Dakota Springs Engineering dated XXX. The project site is not located in a streamside and thus not bound by streamside overlay guidelines and compliance. There are no major irrigation facilities within the Site and there is no known history of flooding. The Site does not currently provide onsite water quality or detention for the Site. It is assumed the offsite private regional detention pond southeast of the Site (proposed by the Metro Roads FDR) will be complete prior to the start of the Project. NRCS soil data is available for this Site and has been noted that soils onsite are generally USCS Type A and B. The NRCS Soils map is provided in the **Appendix**.

VARIANCES FROM CRITERIA

There are no proposed variances from the City of Colorado Springs Drainage Criteria, Volumes 1 and 2, dated May 2014, revised January 2021 and December 2020, respectively, (the "criteria") for the proposed development.

EXISTING DRAINAGE CONDITIONS

MAJOR DRAINAGE BASIN DESCRIPTION

The Project is within the Jimmy Camp Creek Drainage Basin and is a part of the MDDP and the Metro Roads FDR. Relevant excerpts from both reports are included in the **Appendix**.

Villages at Waterview North – MDDP

- The Project Site lies within *Villages at Waterview North Master Development Drainage Plan* study (the "MDDP") by Kimley-Horn, approved January 2023.
- The proposed development complies with the MDDP. No changes are proposed the Master Drainage Study.

Villages at Waterview North – Metro Roads FDR

- The Project Site lies within *Villages at Waterview North Addition No. 1 Final Drainage Report* (the "Metro Roads FDR") by Kimley-Horn, approved XXXX 2023.
- The proposed development complies with the Metro Roads FDR. No changes are proposed to the Metro Roads FDR Study.

Veteran's Victory Filing No. 1 Lot 2 FDR

- The project area described in the *Veteran's Victory Filing No. 1 – Lot 2 Final Drainage Report* (Lot 2 FDR) by Kimley-Horn, dated XXXX 2023 is tributary to the Site associated with this report.
- Storm infrastructure for the Site is proposed to accommodate Lot 2's developed flows based on findings from the current Lot 2 FDR .

EXISTING DRAINAGE BASIN

The existing Site has been divided into five onsite sub-basins, EX1 through EX4, and and OS1. There are also two offsite sub-basins OF1 and OF2. A description of each sub-basin is listed below. Calculations of the existing sub-basins on the Project Site have been completed using current stormwater criteria. An Existing Conditions Drainage Map and associated calculations are provided in the **Appendix** of this report. The weighted imperviousness of the entire drainage area under existing conditions is 2.0%.

Sub-Basin EX1

Sub-basin EX1 is 1.59 acres and consists of the northwest corner of the Site. This basin is mostly undeveloped overlot graded land. The runoff developed within this sub-basin generally sheet flows from southwest to northeast at slopes of approximately 1% to 4% toward a low point in the basin at DP EX1. The developed direct runoff flows are 0.49 cfs and 3.63 cfs for the 5-year and 100-year events, respectively.

Sub-Basin EX2

Sub-basin EX2 is 2.69 acres and consists of the northeast corner of the Site. This basin is mostly undeveloped overlot graded land. The runoff developed within this sub-basin generally sheet flows from west to east at slopes of approximately 1% to 6% offsite along the eastern property line at DP EX2. The developed direct runoff flows are 0.79 cfs and 5.80 cfs for the 5-year and 100-year events, respectively.

Sub-Basin EX3

Sub-basin EX3 is 2.31 acres and consists of the southwest corner of the Site. This basin is mostly undeveloped overlot graded land. The runoff developed within this sub-basin generally sheet flows from north to south at slopes of approximately 1% to 2% toward a low point in the basin at DP EX3. The developed direct runoff flows are 0.68 cfs and 4.97 cfs for the 5-year and 100-year events, respectively.

Sub-Basin EX4

Sub-basin EX4 is 3.30 acres and consists of the southeast corner of the Site. This basin is mostly undeveloped overlot graded land. The runoff developed within this sub-basin generally sheet flows from southwest to northwest at slopes of approximately 3% offsite along the eastern property line at DP EX4. The developed direct runoff flows are 0.98 cfs and 7.23 cfs for the 5-year and 100-year events, respectively.

Offsite Sub-Basin OS1

Sub-basin OS1 is 0.17 acres and consists of the northern edge of the Site. This basin is mostly undeveloped overlot graded land. The runoff developed within this sub-basin generally sheet flows from southwest to northwest at slopes of approximately 6% to 33% offsite along the northern property line into an existing swale at DP OS1. The developed direct runoff flows are 0.06 cfs and 0.45 cfs for the 5-year and 100-year events, respectively.

Offsite Sub-Basin OF1

Sub-basin OF1 is 1.93 acres and consists of the adjacent property southwest of the Site. This basin is mostly undeveloped overlot graded land. The runoff developed within this sub-basin generally sheet flows from west to east at slopes of approximately 6% into the Site at DP OF1. The developed direct runoff flows are 0.60 cfs and 4.39 cfs for the 5-year and 100-year events, respectively.

Offsite Sub-Basin OF2

Sub-basin OF2 is 3.03 acres and consists of the adjacent property northwest of the Site. This basin is mostly undeveloped overlot graded land. The runoff developed within this sub-basin generally sheet flows from west to east at slopes of approximately 5% to 8% into the Site at DP OF2. The developed direct runoff flows are 0.90 cfs and 6.58 cfs for the 5-year and 100-year events, respectively.

MAJOR DRAINAGE BASIN DESCRIPTION

The Site is located in the Jimmy Camp Creek watershed and generally slopes from west to east at approximately 1% to 33%. The existing runoff from the Site is captured by existing storm sewer within S. Powers Boulevard and Bradley Road. The runoff then continues east and eventually outfalls to Jimmy Camp Creek.

PROPOSED DRAINAGE CONDITIONS

The developed runoff for the majority of the Site will overland flow into the roadways towards the 5-feet concrete inverted crowns to be collected by proposed private on-grade type D and type C storm sewer inlets within the crown. The apartment buildings and the backsides of the buildings will not follow this pattern. The roof drainage from the apartment buildings is to daylight into the adjacent landscaping behind the buildings and will be captured via type C or D inlets in sump within the landscaping. The southeast apartment building roof drainage will daylight into the adjacent landscaping behind the building but will not be captured by a type C inlet like the others. Instead, this runoff will continue into the eastern private drive and will be captured by proposed private on-grade type R inlets towards the entrance of the Site. Lastly, the areas adjacent to the garages (which are located underneath each apartment building) will flow towards the garage entrances. The drives entering the garages will be superelevated away from the garage entrance and proposed private type R inlets in sump will capture these flows near the garage entrances.

All proposed storm sewer onsite is to be private and will connect to the public storm sewer within the public roadway south of the Site. The public storm sewer will discharge into the proposed private regional full spectrum detention pond southeast of the Site ("Pond 1") as referenced in the Metro Roads FDR.

The proposed Project can be divided into thirty-one (31) sub-basins, A1 to A21, R1 to R5, A-OS1 to A-OS2, A-UD1, and O1 to O2. Sub-basins A1 to A21 and R1 to R5 connect to the proposed private storm sewer onsite and therefore ultimately outfall to Pond 1. Sub-basin A-UD1 discharges offsite to the north and is not captured and treated by a detention facility. However, A-UD1 makes up less than one percent (1%) of the site and its flows are considered negligible. Sub-basins A-OS1 and A-OS2 flow offsite into the public roadway south of the Site. The developed flows will be captured within the public storm infrastructure within the roadway and will ultimately outfall to Pond 1.

Sub-basin O1 consists of the lot northwest of the Site. This lot is not a part of the Project area but has flows entering into the Site. A temporary offsite swale has been proposed to allow these flows to bypass the Site until the lot is developed in the future. Sub-basin O2 consists of the lot southwest of the Site, Veteran's Victory Filing No. 1, Lot 2. At this time, it is not known when Lot 2 will be developed but this lot is owned by the same owner of the Project described in this report. Even if Lot 2 is not developed at the same time as the Project Site, Lot 2 is to be disturbed to help balance the earthwork for the Project. Lot 2 will be left in an excavated cut condition and a temporary offsite swale and temporary sediment basin are proposed until this lot is developed in the future. Per the Lot 2 FDR, Lot 2 will still be tributary to the Site in developed conditions. The proposed private storm sewer on the west side of the Site is sized to accommodate the developed flows from Lot 2 based on calculations provided on the Lot 2 FDR.

Calculations of the proposed sub-basins have been completed using current stormwater criteria. The proposed Conditions Drainage Map and associated calculations are provided in the **Appendix** of this report. A summary of these calculations is shown in *Table 1* below.

Table 1:

SUMMARY - PROPOSED RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)	Weighted Imperviousness
A1	A1	0.34	1.35	2.56	1.35	2.56	83.5%
A2	A2	0.49	1.84	3.54	1.84	3.54	78.4%
A3	A3	0.39	1.44	2.78	1.60	3.08	77.8%
A4	A4	0.54	1.53	3.16	1.70	3.45	64.3%
A5	A5	0.32	1.14	2.23	1.28	2.50	74.8%
A6	A6	0.11	0.23	0.52	0.23	0.52	48.9%
A7	A7	0.40	1.21	2.40	1.35	2.66	71.8%
A8	A8	0.25	1.02	1.90	1.02	1.90	87.3%
A9	A9	0.18	0.55	1.14	0.55	1.14	63.5%
A10	A10	0.22	0.73	1.46	0.73	1.46	70.3%
A11	A11	0.31	1.07	2.13	1.07	2.13	71.6%
A12	A12	0.32	0.70	1.55	0.70	1.55	53.4%
A13	A13	0.22	0.72	1.45	0.86	1.71	68.9%
A14	A14	0.07	0.33	0.59	0.33	0.59	100.0%
A15	A15	0.67	0.90	2.50	0.90	2.50	30.2%
A16	A16	0.28	0.93	1.87	0.93	1.87	68.0%
A17	A17	0.15	0.54	1.07	0.68	1.33	73.5%
A18	A18	0.90	0.59	2.46	2.62	6.24	12.5%
A19	A19	0.56	0.60	2.16	2.63	5.94	17.2%
R1	R1	0.54	2.03	3.78	2.03	3.78	90.0%
R2	R2	0.54	2.03	3.78	2.03	3.78	90.0%
R3	R3	0.54	2.03	3.78	2.03	3.78	90.0%
R4	R4	0.15	0.57	1.07	0.57	1.07	90.0%
OS-1	OS-1	0.10	0.04	0.27	0.04	0.27	2.0%
OS-2	OS-2	0.07	0.11	0.31	0.11	0.31	31.4%
OS-3	OS-3	0.17	0.06	0.41	0.06	0.41	2.0%
UD-1	UD-1	0.08	0.03	0.24	0.03	0.24	2.0%
Total		8.92	24.32	51.11	-	-	53.0%

COMPLIANCE WITH MASTER REPORTS

Per the MDDP and the Metro Roads FDR, the weighted impervious values shown for Basins 3 and 4 were 95% and 70%, respectively. As the Site makes up approximately half of Basins 3 and half of Basin 4, the average imperviousness for the site area was found to be approximately 83%. The proposed weighted impervious value for the Site is 58.5%. Therefore, the proposed Project complies the MDDP and the Metro Roads FDR. Reference **Appendix** for applicable MDDP and Metro Roads FDR sections.

MAJOR DRAINAGEWAYS

The developed runoff from the Project will convey flows via private storm infrastructure connected to public storm sewer infrastructure before outfalling into Pond 1 located southeast of the site, and ultimately discharging into Jimmy Camp Creek. Per the Metro Roads FDR, the developed flows will be released at or below historic rates and will not negatively impact infrastructure downstream.

HYDRAULIC ANALYSIS METHODOLOGY

Hydraulic calculations were computed the various methods defined below. Results of the hydraulic calculations are provided in the **Appendix**.

Storm Sewer Pipe Hydraulics

StormCAD will be utilized to analyze pipe flows and conveyance capacity based upon direct runoff and time of concentration calculations for respective design point tributary areas. StormCAD uses the Standard Step method to compute the hydraulic profile. Storm sewer design and modeling consists of design intervals as outlined by the following design storm events:

- Minor Storm: 5-year Storm Event
- Major Storm: 100-year Storm Event

These calculations will be included in a future submittal of this report.

Gutter Capacity and Inlet Hydraulics

Applicable design methods will be utilized to size proposed storm sewer inlets, which includes the use of UD-Inlet, v5.01 MHFD spreadsheets and nomographs. The gutter capacity and inlet hydraulic analysis will consist of design intervals as outlined by the following design storm events:

- Minor Storm: 5-year Storm Event
- Major Storm: 100-year Storm Event

For the inlets proposed within the landscaping, the swale capacity section included in the spreadsheet was ignored. Instead, the swale capacity was modeled using Bentely Flowmaster as discussed in the Swale section below.

Per the Lot 2 FDR, developed runoff for Lot 2 will enter the Project Site to the west. The inlets along the west side of the Site (within Basin A20 and west of A5 and A6) have been sized to accommodate the flows from Lot 2 based on calculations provided in the Lot 2 FDR. Lot 2 is responsible for verifying the storm infrastructure proposed with this report meets its needs. If any changes are needed, they will be the responsibility of Lot 2 at the time of its development. Excerpts from this report are included in the **Appendix**.

Emergency Overflow Path

Emergency overflow routing for the private regional pond will occur along its southern edge into Bradley Road and continue east per the Metro Roads FDR.

Due to the design of the buildings and the nature of the drive under parking level, the proposed site grading design provides low points adjacent to each of the parking garage entrances. The elevations of garage entries are lower than the adjacent grade and lower than the existing elevation at the adjacent property line. Based upon this condition, there is no overland emergency overflow path to the public right of way. Therefore, added measures have been included in the design to help capture the greater than 100-year event and assist with mitigating clogging near the garage opening. These measures include:

- The proposed Type R inlets near the garage entrances are in a sump condition and are placed three inches below the finished grade of the garage entrances.
- The Type R inlets have been oversized and are capturing approximately five percent (5%) of the required 100-year storm event.
- The proposed grading of the driveways at the entrances slope away from the building for XX LF at a minimum of X.X%.
- Internally, the garages are equipped with floor drains which are connected to the sanitary sewer system via a sand oil interceptor (by others).

In a completely clogged condition of the storm sewer system, the lower level of the building has potential to flood due to the lack of emergency overflow path. By the signature of this Final Drainage Report, the Owner of the property herby understands the risks associated with this design and Kimley-Horn assumes no liability for the drainage design associated with the potential flooding of the buildings.

Swale Capacity and Cross Sections Hydraulics

Hydraulic calculations for swale and cross section analysis were compute using Bentley Flowmaster. The swales were designed to convey the 100-year storm event for the tributary basin. The proposed swales onsite are defined as Swale A through Swale F. All swales are proposed as v-shaped vegetated swales.

In addition to modeling the swale capacities, Flowmaster was used to model the ponding depths at specific cross sections. In sub-basin A20, the ponding depth over the proposed private inlets were modeled as the sub-basin accommodates additional offsite flows from Lot 2 and is located adjacent to a proposed building. The ponding depths were verified as sufficiently lower than the building elevation assuming 100% clogged conditions for the inlets. A cross section showing the ponding depth over the inlet for the 100-year storm event is provided within the **Appendix**. If Lot 2 proposes additional flows to this area than shown in this report, it is the responsibility of Lot 2 to verify the ponding depths over the inlets and propose additional inlets if necessary. An inverted crown within the center of the proposed private roadways onsite is proposed and the roadways are designed with the capacity to hold the 100-year storm event within the roadway. A cross section showing the normal depth within the roadway for the 100-year storm event is provided within the **Appendix**. The 100-year storm even will be contained within the roadway.

FOUR-STEP PROCESS

The four-step process per the Urban Drainage and Flood Control District Manual (the "Manual") provides guidance and requirements for the selection of siting of structural Construction Control Measures (CCMs) for new development and significant redevelopment.

Step 1: Employ Runoff Reduction Practices

Currently the Site is vacant undeveloped land. Development of the Site will increase current runoff conditions due to increased imperviousness values. However, stormwater runoff reduction techniques will be used to promote stormwater infiltration and reduce the amount of runoff. As documented in the runoff reduction calculations and exhibit found in the **Appendix**, the Site was divided into Unconnected Impervious Areas (UIA) and Receiving Pervious Area (RPA) per the City of Colorado Springs Green Infrastructure Manual. The runoff will be reduced by 12% through the implementation of RPAs.

Step 2: Implement Control Measures That Provide a Water Quality Capture Volume with Slow Release
The water quality capture volume (WQCV) for the Site will be captured and detained within Pond 1. Slow release with at least a 40-hour drain for the WQCV time will be provided through an orifice plate internal to the Pond 1 outlet structure. 99% of the Project Site disturbed area (9.9 acres) will ultimately be routed to Pond 1 for water quality treatment. The Pond 1 WQCV and outlet structure design information can be referenced in the Metro Roads FDR excerpts in the **Appendix**.

Step 3: Stabilize Drainageways
There are no open channels on or adjacent to this site, therefore no stabilization will be necessary. All new and re-development projects are required to construct or participate in the funding of channel stabilization measures. The downstream outlet has sufficient stabilization. Development site is 6500 ft from Jimmy Camp Creek.

Step 4: Implement Site Specific and Other Source Control Measures
The Site does not require "Covering of Storage/Handling Areas" or "Spill Containment and Control" (specialized CCMs) in the final constructed condition. There is no proposed material storage or other Site operations that would introduce contaminants to the City's MS4 that would require Site specific control or source control CCM for the proposed project.

All flows leaving the Site will be released at or below historic rates and will cause no impact to downstream facilities and additional offsite improvements are not required by this Project.

Detention and Water Quality

The Metro Roads FDR states that full spectrum detention and water quality for the proposed Site is provided within the private regional pond located southeast of the Site, Pone 1. The outlet structure was designed to release the WQCV in at least a 40-hour time period and the EURV in 68-72 hours per the Manual.

Temporary Sediment Basin

A temporary sediment basin is proposed offsite, within Veteran's Victory Lot 2 (sub-basin O2). Lot 2 is included within the Site disturbed area in order to help balance the earthwork of the Project. At this time, it is unknown when Lot 2 will be developed. This report assumes Lot 2 will be constructed at a later date than the Project and Lot 2 will be left in an excavated cut condition with a temporary offsite swale and temporary sediment basin until then. If Lot 2 is developed at the same time as the Project, the temporary sediment basin will not be necessary

The temporary sediment basin has a drainage basin area of 3.91 of disturbed acres with a required volume of 14,076 cubic feet. The proposed basin has 16,154 cubic feet of volume. The basin meets the requirements set forth in the Manual. An eight-foot-wide Type L 9" riprap pad is proposed as outfall protection at the base of the temporary swale to the toe of the sediment basin. A 14-foot emergency spillway for the basin is proposed with Type L 9" riprap from the spillway invert to the outfall (SW inlet within sub-basin A20). The applicable details from the Manual and the basin calculations are included in the **Appendix**.

Kimley»Horn

EROSION CONTROL PLAN

A Grading and Erosion Control Plan will be submitted to the Stormwater Enterprise for review and approval prior to construction.

FLOODPLAIN STATEMENT

Floodplain identification was determined using FIRM panels by FEMA and information provided in the Criteria. The Flood Insurance Rate Maps (FIRM) 08041C0768G effective date December 7, 2018, by FEMA, indicates that the Site is located in Zone X (outside of the 500-year flood plain). This panel is included in the **Appendix**.

FEES DEVELOPMENT

DRAINAGE AND BRIDGE FEES

The Project Site is located in the Jimmy Camp Creek Basin. The fees associated with Jimmy Camp Creek were paid with the Metro Roads FDR during final plat recordation for the entire 116.5-acre Master Development. No fees are required for this Project. However, the total 2023 drainage, bridge, and pond fee amount associated with the Project is summarized below for reference.

Fee Type	Fee/Acre	Acre	Total
Drainage	$10,030	10.06	$100,901.80
Bridge	--	--	--
Pond Land	--	--	--
Pond Facility	$3,269	10.06	$32,886.14
Surcharge	--		--
Total			**$133,787.94**

CONSTRUCTION COST OPINION

An opinion of probable construction cost for the construction of the private drainage facilities for the Project has been included in the **Appendix**.

MAINTENANCE AND OPERATIONS

The private storm sewer infrastructure proposed onsite will be owned and maintained by Lot owner. Pond 1 will be owned and maintained by the Metro District for the Master Development (currently in the process of being established).

GROUNDWATER CONSIDERATIONS

Groundwater was not encountered in the test borings which were drilled to depths of 20-feet throughout the Site.

SUMMARY

COMPLIANCE WITH STANDARDS

The drainage design presented within this report for Veteran's Victory Filing No. 1 Lot 1 conforms to the City of Colorado Springs Storm Drainage Criteria, the Urban Drainage and Flood Control District Manual, the Metro Roads FDR, and the MDDP. Additionally, the Site runoff and storm drain facilities will not adversely affect the water quality or peak flows downstream in Jimmy Camp Creek and surrounding developments.

REFERENCES

1. City of Colorado Springs Drainage Criteria Manual Vol. 1, May 2014 (Revised January 2021).

2. City of Colorado Springs Drainage Criteria Manual Vol. 2, May 2014 (Revised December 2020).

3. Mile High Flood District Urban Storm Drainage Criteria Manual (MHFDDCM), Vol. 1, prepared by Wright-McLaughlin Engineers, updated June 2016.

4. Mile High Flood District Urban Storm Drainage Criteria Manual (MHFDDCM), Vol. 3, prepared by Wright-McLaughlin Engineers, updated November 2010.

5. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0768G, Effective Date December 7, 2018, prepared by the Federal Emergency Management Agency (FEMA).

6. Master Developer Drainage Plan for Villages at Waterview North, prepared by Kimley-Horn and Associates, January 19, 2023.

7. Amendment to Master Drainage Development Plan for Waterview, Waterview North, prepared by Dakota Springs Engineering, February 2021.

8. The Villages at Waterview North Addition No. 1, Metro Roads Final Drainage Report, prepared by Kimley-Horn and Associates, July 2023

9. Veteran's Victory Filing No. 1 Lot 2 Final Drainage report, prepared by Kimley-Horn and Associates, July 2023

APPENDIX

APPENDIX A – VICINITY MAP

GRAPHIC SCALE IN FEET
0 500 1000 2000

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VICINITY MAP
VETERAN'S VICTORY FILING NO. 1 - LOT 1

Kimley»Horn

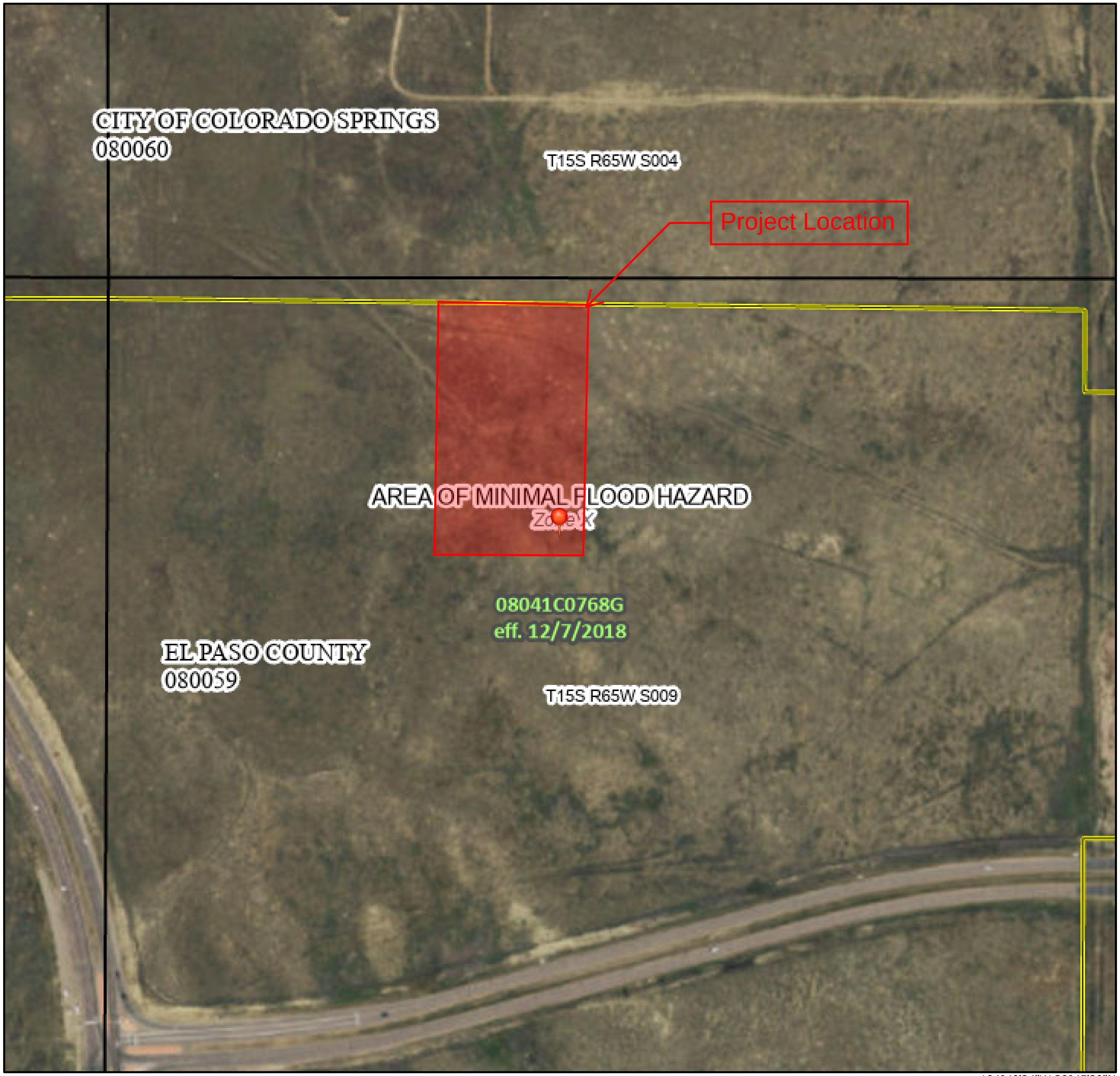
2 N NEVADA AVE., SUITE 900, COLORADO SPRINGS, 80903
PHONE: 719-453-0180

APPENDIX B – FEMA MAP AND SOILS REPORT

National Flood Hazard Layer FIRMette

FEMA

104°41'2"W 38°46'7"N



104°40'24"W 38°45'39"N

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

1:6,000

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

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/3/2022 at 9:17 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.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for

El Paso County Area, Colorado

August 1, 2022

Preface

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

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

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

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

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

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

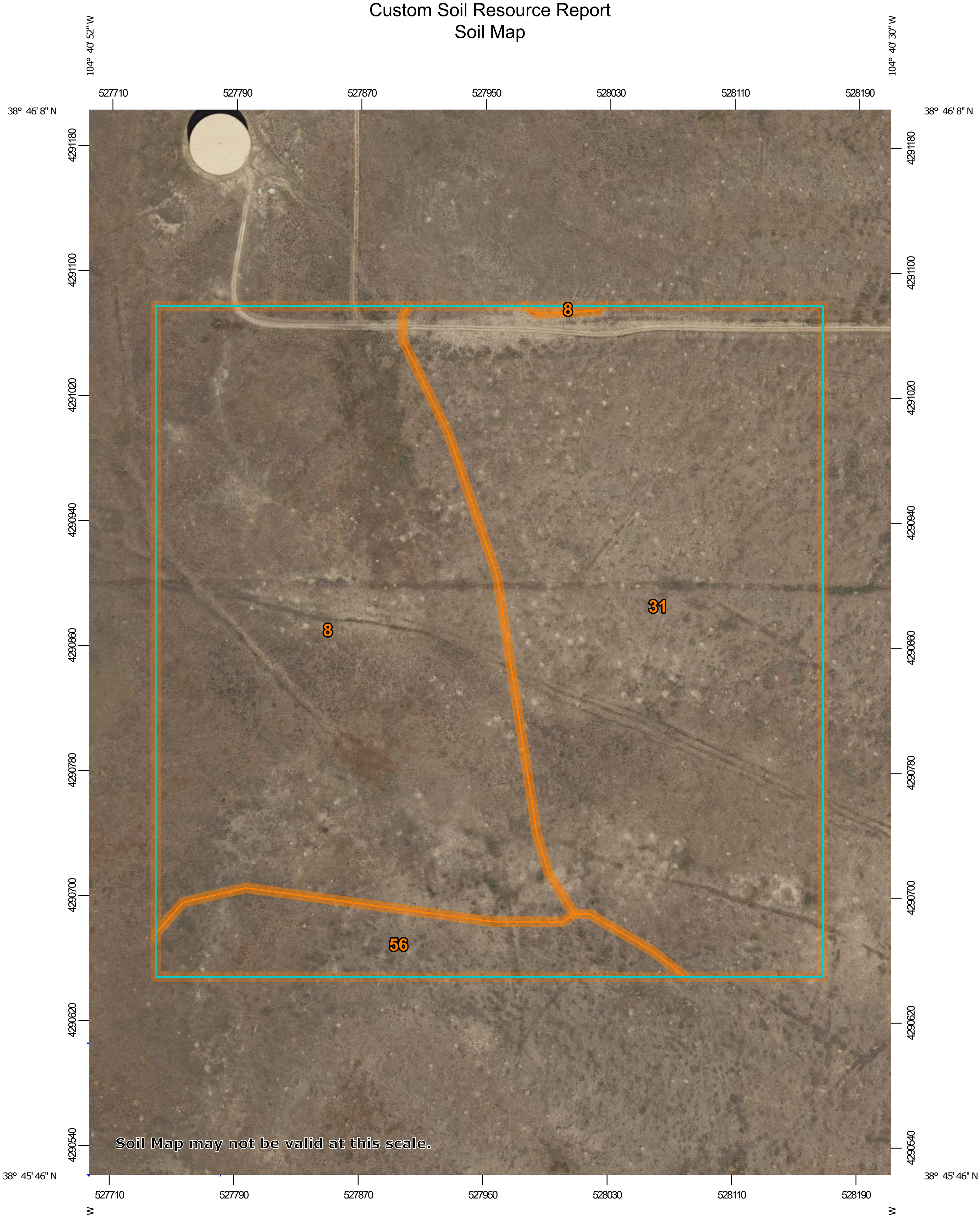
The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

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

Soil Map



Map Scale: 1:3,320 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 45, 90, 180, 270

Feet: 0, 150, 300, 600, 900

N

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	20.6	45.0%
31	Fort Collins loam, 3 to 8 percent slopes	21.7	47.6%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	3.4	7.4%
Totals for Area of Interest		**45.7**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

El Paso County Area, Colorado

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

31—Fort Collins loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 3684
Elevation: 5,200 to 6,500 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 48 to 52 degrees F
Farmland classification: Not prime farmland

Map Unit Composition

Fort collins and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fort Collins

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 9 inches: loam
Bt - 9 to 16 inches: clay loam
Bk - 16 to 21 inches: clay loam
Ck - 21 to 60 inches: loam

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 (0.57 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY002CO - Loamy Plains
Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

56—Nelson-Tassel fine sandy loams, 3 to 18 percent slopes

Map Unit Setting

National map unit symbol: 3690
Elevation: 5,600 to 6,400 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Nelson and similar soils: 55 percent
Tassel and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nelson

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous residuum weathered from interbedded sedimentary rock

Typical profile

A - 0 to 5 inches: fine sandy loam
Ck - 5 to 23 inches: fine sandy loam
Cr - 23 to 27 inches: weathered bedrock

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Description of Tassel

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous slope alluvium over residuum weathered from sandstone

Typical profile

A - 0 to 4 inches: fine sandy loam
C - 4 to 10 inches: fine sandy loam
Cr - 10 to 14 inches: weathered bedrock

Properties and qualities

Slope: 3 to 18 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)

Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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

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

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

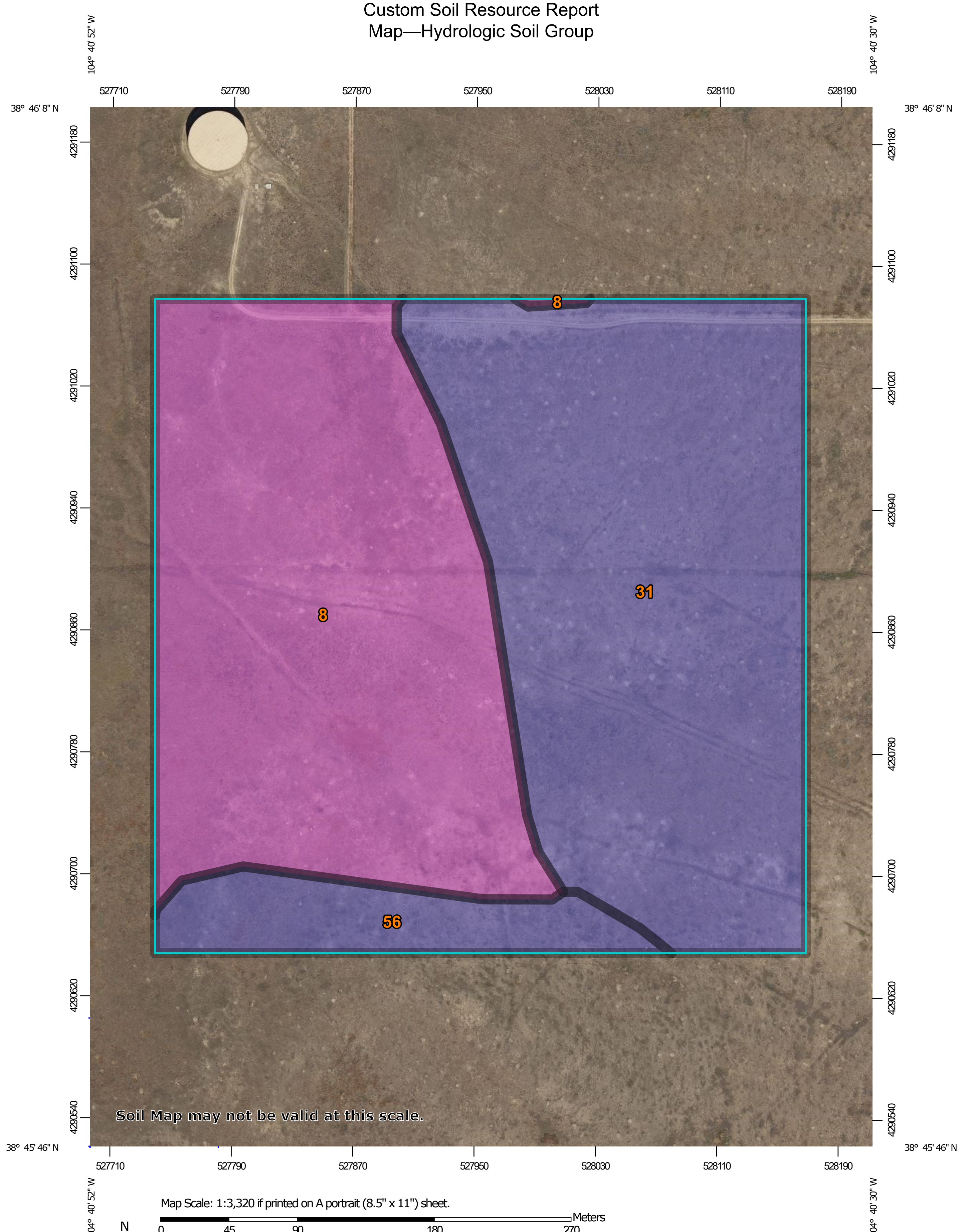
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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

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

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

Map—Hydrologic Soil Group



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Meters: 0, 45, 90, 180, 270

Feet: 0, 150, 300, 600, 900

N

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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Survey Area Data: Version 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	20.6	45.0%
31	Fort Collins loam, 3 to 8 percent slopes	B	21.7	47.6%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	B	3.4	7.4%
Totals for Area of Interest			**45.7**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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APPENDIX C – HYDROLOGIC CALCULATIONS

IDF Equations:

$I_{100} = -2.52\ln(D) + 12.735$
$I_{50} = -2.25\ln(D) + 11.375$
I_{25} $-2.00\ln(D) + 10.111$
I_{10} $-1.75\ln(D) + 8.847$
I_{5} $-1.50\ln(D) + 7.583$
I_{2} $-1.19\ln(D) + 6.035$

Where:
I = Rainfall Intensity (in/hr)
D= Duration (minutes)

	2-yr	5-yr	10-yr	100-yr
P_1 =	1.19	1.5	1.75	2.52

*The Design Point Rainfall Values and Time Intensity Frequency Tabulation are found in Table 6-2 and Figure 6-5 respectively, of the Colorado Springs Drainage Criteria Manual, Volume 1

ROOF						
NRCS Soil	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A/B	0.71	0.73	0.75	0.78	0.80	0.81
C/D						

LANDSCAPE						
NRCS Soil	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A/B	0.02	0.08	0.15	0.25	0.30	0.35
C/D						

PAVEMENT						
NRCS Soil	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A/B	0.89	0.90	0.92	0.94	0.95	0.96
C/D						

I (%)	
ROOF	90.00%
LANDSCAPE	2.00%
PAVEMENT	100.00%

Weighted Imperviousness Calculations (Existing)

SUB-BASIN	AREA (SF)	AREA (Acres)	ROOF AREA	ROOF IMPERVIOUSNESS	ROOF C2	ROOF C5	ROOF C10	ROOF C100	LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE C2	LANDSCAPE C5	LANDSCAPE C10	LANDSCAPE C100	PAVEMENT AREA	PAVEMENT IMPERVIOUSNESS	PAVEMENT C2	PAVEMENT C5	PAVEMENT C10	PAVEMENT C100	WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS C2	C5	C10	C100
EXISTING BASINS ON PROPOSED																									
EX-1	69,335	1.59	0	90%	0.71	0.73	0.75	0.81	69,335	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
EX-2	117,166	2.69	0	90%	0.71	0.73	0.75	0.81	117,166	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
EX-3	100,453	2.31	0	90%	0.71	0.73	0.75	0.81	100,453	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
EX-4	143,889	3.30	0	90%	0.71	0.73	0.75	0.81	143,889	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
OS1	7,524	0.17	0	90%	0.71	0.73	0.75	0.81	7,524	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
OF1	84,107	1.93	0	90%	0.71	0.73	0.75	0.81	84,107	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
OF2	131,794	3.03	0	90%	0.71	0.73	0.75	0.81	131,794	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
TOTAL	654,268	15.02	0	90%	0.71	0.73	0.75	0.81	654,268	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35

Veteran's Victory Lot 1 - Drainage Report
Existing Runoff Calculations
Time of Concentration

Watercourse Coefficient

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

	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
EX-1	EX-1	69,335	1.59	0.08	100	1.0%	18.7	220	4.4%	7.00	1.5	2.5	21.2	320	11.8	11.8
EX-2	EX-2	117,166	2.69	0.08	100	1.2%	17.6	550	5.5%	8.00	1.9	4.9	22.5	650	13.6	13.6
EX-3	EX-3	100,453	2.31	0.08	100	0.8%	20.1	556	2.0%	9.00	1.3	7.3	27.4	656	13.6	13.6
EX-4	EX-4	143,889	3.30	0.08	100	2.6%	13.6	450	2.8%	10.00	1.7	4.5	18.1	550	13.1	13.1
OS1	OS1	7,524	0.17	0.08	45	33.0%	3.9	450	6.0%	7.00	1.7	4.4	8.3	495	12.8	8.3
OF1	OF1	84,107	1.93	0.08	100	6.0%	10.3	245	6.0%	7.00	1.7	2.4	12.7	345	11.9	11.9
OF2	OF2	131,794	3.03	0.08	100	5.0%	10.9	488	8.4%	7.00	2.0	4.0	14.9	588	13.3	13.3

Veteran's Victory Lot 1 - Drainage Report
Existing Runoff Calculations **Design Storm** ***5 Year***
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
EX-1	EX-1	1.59	0.08	11.8	0.13	3.88	0.49					
EX-2	EX-2	2.69	0.08	13.6	0.22	3.67	0.79					
EX-3	EX-3	2.31	0.08	13.6	0.18	3.67	0.68					
EX-4	EX-4	3.30	0.08	13.1	0.26	3.72	0.98					
OS1	OS1	0.17	0.08	8.3	0.01	4.42	0.06					
OF1	OF1	1.93	0.08	11.9	0.15	3.87	0.60					
OF2	OF2	3.03	0.08	13.3	0.24	3.70	0.90					

Veteran's Victory Lot 1 - Drainage Report

Existing Runoff Calculations **Design Storm** ***100 Year***

(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
EX-1	EX-1	1.59	0.35	11.8	0.56	6.52	3.63					
EX-2	EX-2	2.69	0.35	13.6	0.94	6.16	5.80					
EX-3	EX-3	2.31	0.35	13.6	0.81	6.16	4.97					
EX-4	EX-4	3.30	0.35	13.1	1.16	6.25	7.23					
OS1	OS1	0.17	0.35	8.3	0.06	7.41	0.45					
OF1	OF1	1.93	0.35	11.9	0.68	6.49	4.39					
OF2	OF2	3.03	0.35	13.3	1.06	6.21	6.58					

SUMMARY - EXISTING RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
EX-1	EX-1	1.59	0.49	3.63	0.49	3.63
EX-2	EX-2	2.69	0.79	5.80	0.79	5.80
EX-3	EX-3	2.31	0.68	4.97	0.68	4.97
EX-4	EX-4	3.30	0.98	7.23	0.98	7.23
OS1	OS1	0.17	0.06	0.45	0.06	0.45
OF1	OF1	1.93	0.60	4.39	0.60	4.39
OF2	OF2	3.03	0.90	6.58	0.90	6.58

Weighted Imperviousness Calculations (Proposed)

SUB-	AREA	AREA	ROOF	ROOF	ROOF				LANDSCAPE	LANDSCAPE	LANDSCAPE				PAVEMENT	PAVEMENT	PAVEMENT				WEIGHTED	WEIGHTED COEFFICIENTS			
BASIN	(SF)	(Acres)	AREA	IMPERVIOUSNESS	C2	C5	C10	C100	AREA	IMPERVIOUSNESS	C2	C5	C10	C100	AREA	IMPERVIOUSNESS	C2	C5	C10	C100	IMPERVIOUSNESS	C2	C5	C10	C100
EXISTING BASINS ON PROPOSED SITE																									
A1	14,982	0.34	0	90%	0.71	0.73	0.75	0.81	2,527	2%	0.02	0.08	0.15	0.35	12,455	100%	0.89	0.90	0.92	0.96	83.5%	0.74	0.76	0.79	0.86
A2	21,533	0.49	0	90%	0.71	0.73	0.75	0.81	4,755	2%	0.02	0.08	0.15	0.35	16,778	100%	0.89	0.90	0.92	0.96	78.4%	0.70	0.72	0.75	0.83
A3	17,000	0.39	0	90%	0.71	0.73	0.75	0.81	3,851	2%	0.02	0.08	0.15	0.35	13,149	100%	0.89	0.90	0.92	0.96	77.8%	0.69	0.71	0.75	0.82
A4	23,711	0.54	0	90%	0.71	0.73	0.75	0.81	8,629	2%	0.02	0.08	0.15	0.35	15,082	100%	0.89	0.90	0.92	0.96	64.3%	0.57	0.60	0.64	0.74
A5	13,943	0.32	0	90%	0.71	0.73	0.75	0.81	3,590	2%	0.02	0.08	0.15	0.35	10,353	100%	0.89	0.90	0.92	0.96	74.8%	0.67	0.69	0.72	0.80
A6	4,672	0.11	0	90%	0.71	0.73	0.75	0.81	2,434	2%	0.02	0.08	0.15	0.35	2,238	100%	0.89	0.90	0.92	0.96	48.9%	0.44	0.47	0.52	0.64
A7	17,603	0.40	0	90%	0.71	0.73	0.75	0.81	5,062	2%	0.02	0.08	0.15	0.35	12,541	100%	0.89	0.90	0.92	0.96	71.8%	0.64	0.66	0.70	0.78
A8	10,833	0.25	0	90%	0.71	0.73	0.75	0.81	1,405	2%	0.02	0.08	0.15	0.35	9,428	100%	0.89	0.90	0.92	0.96	87.3%	0.78	0.79	0.82	0.88
A9	7,826	0.18	0	90%	0.71	0.73	0.75	0.81	2,917	2%	0.02	0.08	0.15	0.35	4,909	100%	0.89	0.90	0.92	0.96	63.5%	0.57	0.59	0.63	0.73
A10	9,440	0.22	0	90%	0.71	0.73	0.75	0.81	2,864	2%	0.02	0.08	0.15	0.35	6,576	100%	0.89	0.90	0.92	0.96	70.3%	0.63	0.65	0.69	0.77
A11	13,696	0.31	0	90%	0.71	0.73	0.75	0.81	3,973	2%	0.02	0.08	0.15	0.35	9,723	100%	0.89	0.90	0.92	0.96	71.6%	0.64	0.66	0.70	0.78
A12	13,858	0.32	0	90%	0.71	0.73	0.75	0.81	6,592	2%	0.02	0.08	0.15	0.35	7,266	100%	0.89	0.90	0.92	0.96	53.4%	0.48	0.51	0.55	0.67
A13	9,481	0.22	0	90%	0.71	0.73	0.75	0.81	3,010	2%	0.02	0.08	0.15	0.35	6,471	100%	0.89	0.90	0.92	0.96	68.9%	0.61	0.64	0.68	0.77
A14	3,065	0.07	0	90%	0.71	0.73	0.75	0.81	0	2%	0.02	0.08	0.15	0.35	3,065	100%	0.89	0.90	0.92	0.96	100.0%	0.89	0.90	0.92	0.96
A15	29,237	0.67	0	90%	0.71	0.73	0.75	0.81	20,827	2%	0.02	0.08	0.15	0.35	8,410	100%	0.89	0.90	0.92	0.96	30.2%	0.27	0.32	0.37	0.53
A16	12,345	0.28	0	90%	0.71	0.73	0.75	0.81	4,032	2%	0.02	0.08	0.15	0.35	8,313	100%	0.89	0.90	0.92	0.96	68.0%	0.61	0.63	0.67	0.76
A17	6,731	0.15	0	90%	0.71	0.73	0.75	0.81	1,820	2%	0.02	0.08	0.15	0.35	4,911	100%	0.89	0.90	0.92	0.96	73.5%	0.65	0.68	0.71	0.80
A18	38,991	0.90	0	90%	0.71	0.73	0.75	0.81	34,824	2%	0.02	0.08	0.15	0.35	4,167	100%	0.89	0.90	0.92	0.96	12.5%	0.11	0.17	0.23	0.42
A19	24,407	0.56	0	90%	0.71	0.73	0.75	0.81	20,623	2%	0.02	0.08	0.15	0.35	3,784	100%	0.89	0.90	0.92	0.96	17.2%	0.15	0.21	0.27	0.44
A20	22,586	0.52	0	90%	0.71	0.73	0.75	0.81	22,586	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
R1	23,420	0.54	23,420	90%	0.71	0.73	0.75	0.81	0	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	90.0%	0.71	0.73	0.75	0.81
R2	23,420	0.54	23,420	90%	0.71	0.73	0.75	0.81	0	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	90.0%	0.71	0.73	0.75	0.81
R3	23,420	0.54	23,420	90%	0.71	0.73	0.75	0.81	0	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	90.0%	0.71	0.73	0.75	0.81
R4	6,607	0.15	6,607	90%	0.71	0.73	0.75	0.81	0	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	90.0%	0.71	0.73	0.75	0.81
R5	23,420	0.54	23,420	90%	0.71	0.73	0.75	0.81	0	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	90.0%	0.71	0.73	0.75	0.81
A-OS1	4,323	0.10	0	90%	0.71	0.73	0.75	0.81	4,323	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
A-OS2	3,079	0.07	0	90%	0.71	0.73	0.75	0.81	2,156	2%	0.02	0.08	0.15	0.35	923	100%	0.89	0.90	0.92	0.96	31.4%	0.28	0.33	0.38	0.53
A21	7,332	0.17	0	90%	0.71	0.73	0.75	0.81	7,332	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
A-UD1	3,494	0.08	0	90%	0.71	0.73	0.75	0.81	3,494	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35
TOTAL	**434,455**	**9.97**	**100,287**	**90%**	**0.71**	**0.73**	**0.75**	**0.81**	**173,626**	**2%**	**0.02**	**0.08**	**0.15**	**0.35**	**160,542**	**100%**	**0.89**	**0.90**	**0.92**	**0.96**	**58.5%**	**0.50**	**0.53**	**0.57**	**0.68**
O1	84,665	1.94	0	90%	0.71	0.73	0.75	0.81	84,665	2%	0.02	0.08	0.15	0.35	0	100%	0.89	0.90	0.92	0.96	2.0%	0.02	0.08	0.15	0.35

Veteran's Victory Lot 1 - Drainage Report
Proposed Runoff Calculations
Time of Concentration

Watercourse Coefficient

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

	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
A1	A1	14,982	0.34	0.76	20	6.0%	1.5	251	1.5%	20.00	2.4	1.7	5.0	271	11.5	5.0
A2	A2	21,533	0.49	0.72	32	6.6%	2.1	247	2.9%	20.00	3.4	1.2	5.0	279	11.6	5.0
A3	A3	17,000	0.39	0.71	20	6.0%	1.7	190	0.5%	20.00	1.4	2.2	5.0	210	11.2	5.0
A4	A4	23,711	0.54	0.60	64	5.0%	4.3	220	0.5%	20.00	1.4	2.6	6.9	284	11.6	6.9
A5	A5	13,943	0.32	0.69	20	2.0%	2.7	118	0.5%	20.00	1.4	1.4	5.0	138	10.8	5.0
A6	A6	4,672	0.11	0.47	63	2.0%	7.2	58	0.5%	20.00	1.4	0.7	7.9	121	10.7	7.9
A7	A7	17,603	0.40	0.66	66	1.5%	5.7	179	0.5%	20.00	1.4	2.1	7.8	245	11.4	7.8
A8	A8	10,833	0.25	0.79	41	1.3%	3.3	110	0.5%	20.00	1.4	1.3	5.0	151	10.8	5.0
A9	A9	7,826	0.18	0.59	22	24.0%	1.5	200	5.4%	20.00	4.6	0.7	5.0	222	11.2	5.0
A10	A10	9,440	0.22	0.65	32	3.4%	3.1	130	5.4%	20.00	4.6	0.5	5.0	162	10.9	5.0
A11	A11	13,696	0.31	0.66	49	4.9%	3.3	146	0.5%	20.00	1.4	1.7	5.0	195	11.1	5.0
A12	A12	13,858	0.32	0.51	87	2.2%	7.7	85	0.5%	20.00	1.4	1.0	8.7	172	11.0	8.7
A13	A13	9,481	0.22	0.64	49	11.2%	2.6	82	0.5%	20.00	1.4	1.0	5.0	131	10.7	5.0
A14	A14	3,065	0.07	0.90	45	1.0%	2.5	0	1.0%	20.00	2.0	0.0	5.0	45	10.3	5.0
A15	A15	29,237	0.67	0.32	56	3.0%	7.5	378	2.9%	20.00	3.4	1.9	9.4	434	12.4	9.4
A16	A16	12,345	0.28	0.63	24	13.0%	1.8	570	2.9%	20.00	3.4	2.8	5.0	594	13.3	5.0
A17	A17	6,731	0.15	0.68	54	11.2%	2.5	15	0.5%	20.00	1.4	0.2	5.0	69	10.4	5.0
A18	A18	38,991	0.90	0.17	100	4.5%	10.3	130	4.9%	7.00	1.5	1.4	11.7	230	11.3	11.3
A19	A19	24,407	0.56	0.21	100	10.0%	7.6	143	8.0%	7.00	2.0	1.2	8.8	243	11.4	5.0
A20	A20	22,586	0.52	0.08	40	10.0%	5.5	360	1.0%	7.00	0.7	8.6	14.1	400	12.2	12.2
R1	R1	23,420	0.54	0.73	-	-	-	-	-	-	-	-	-	-	-	5.0
R2	R2	23,420	0.54	0.73	-	-	-	-	-	-	-	-	-	-	-	5.0
R3	R3	23,420	0.54	0.73	-	-	-	-	-	-	-	-	-	-	-	5.0
R4	R4	6,607	0.15	0.73	-	-	-	-	-	-	-	-	-	-	-	5.0
R5	R5	23,420	0.54	0.73	-	-	-	-	-	-	-	-	-	-	-	5.0
A-OS1	A-OS1	4,323	0.10	0.08	70	10.0%	7.3	-	-	-	0.0	0.0	7.3	70	10.4	7.3
A-OS2	A-OS2	3,079	0.07	0.33	79	9.5%	6.0	27	1.8%	20.00	2.7	0.2	6.2	106	10.6	6.2
A21	A21	7,332	0.17	0.08	100	8.4%	9.2	185	8.4%	20.00	5.8	0.5	9.7	285	11.6	9.7
A-UD1	A-UD1	3,494	0.08	0.08	39	33.0%	3.6	-	-	-	0.0	0.0	5.0	39	10.2	5.0
O1	O1	84,665	1.94	0.08	100	6.0%	10.3	334	1.0%	7.00	0.7	8.0	18.3	434	12.4	12.4

Veteran's Victory Lot 1 - Drainage Report
Proposed Runoff Calculations **Design Storm** ***5 Year***
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN	DRAIN	AREA	RUNOFF	T(c)	C x A	I	Q	T(c)	C x A	I	Q	
POINT	BASIN	ac.	COEFF	min		in/hr	cfs	min		in/hr	cfs	
A1	A1	0.34	0.76	5.0	0.26	5.17	1.35					
A2	A2	0.49	0.72	5.0	0.36	5.17	1.84					
A3	A3	0.39	0.71	5.0	0.28	5.17	1.44				1.60	50% of A14 flows into this basin
A4	A4	0.54	0.60	6.9	0.33	4.69	1.53				1.70	50% of A14 flows into this basin
A5	A5	0.32	0.69	5.0	0.22	5.17	1.14				1.28	25% of R4 flows into this basin
A6	A6	0.11	0.47	7.9	0.05	4.49	0.23					
A7	A7	0.40	0.66	7.8	0.27	4.50	1.21				1.35	25% of R4 flows into this basin
A8	A8	0.25	0.79	5.0	0.20	5.17	1.02					
A9	A9	0.18	0.59	5.0	0.11	5.17	0.55					
A10	A10	0.22	0.65	5.0	0.14	5.17	0.73					
A11	A11	0.31	0.66	5.0	0.21	5.16	1.07					
A12	A12	0.32	0.51	8.7	0.16	4.34	0.70					
A13	A13	0.22	0.64	5.0	0.14	5.17	0.72				0.86	25% of R4 flows into this basin
A14	A14	0.07	0.90	5.0	0.06	5.17	0.33					
A15	A15	0.67	0.32	9.4	0.21	4.23	0.90				0.90	100% of R3 flows in this basin
A16	A16	0.28	0.63	5.0	0.18	5.17	0.93					
A17	A17	0.15	0.68	5.0	0.10	5.17	0.54				0.68	25% of R4 flows into this basin
A18	A18	0.90	0.17	11.3	0.15	3.95	0.59				2.62	100% of R2 flows in this basin
A19	A19	0.56	0.21	5.0	0.12	5.17	0.60				2.63	100% of R1 flows in this basin
A20	A20	0.52	0.08	12.2	0.04	3.83	0.16				2.19	100% of R5 flows in this basin
R1	R1	0.54	0.73	5.0	0.39	5.17	2.03					
R2	R2	0.54	0.73	5.0	0.39	5.17	2.03					
R3	R3	0.54	0.73	5.0	0.39	5.17	2.03					
R4	R4	0.15	0.73	5.0	0.11	5.17	0.57					
R5	R5	0.54	0.73	5.0	0.39	5.17	2.03					
A-OS1	A-OS1	0.10	0.08	7.3	0.01	4.60	0.04					Flows offsite but is still routed to Pond 1
A-OS2	A-OS2	0.07	0.33	6.2	0.02	4.85	0.11					Flows offsite but is still routed to Pond 2
A21	A21	0.17	0.08	9.7	0.01	4.17	0.06					Flows offsite but is still routed to Pond 3
A-UD1	A-UD1	0.08	0.08	5.0	0.01	5.17	0.03					Flows offsite and its not detained
O1	O1	1.94	0.08	12.4	0.16	3.81	0.59					Offsite basin routed around site

Veteran's Victory Lot 1 - Drainage Report
Proposed Runoff Calculations ***Design Storm*** ***100 Year***
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	NOTES
A1	A1	0.34	0.86	5.0	0.29	8.68	2.56					
A2	A2	0.49	0.83	5.0	0.41	8.68	3.54					
A3	A3	0.39	0.82	5.0	0.32	8.68	2.78				3.08	50% of A14 flows into this basin
A4	A4	0.54	0.74	6.9	0.40	7.87	3.16				3.45	50% of A14 flows into this basin
A5	A5	0.32	0.80	5.0	0.26	8.68	2.23				2.50	25% of R4 flows into this basin
A6	A6	0.11	0.64	7.9	0.07	7.53	0.52					
A7	A7	0.40	0.78	7.8	0.32	7.56	2.40				2.66	25% of R4 flows into this basin
A8	A8	0.25	0.88	5.0	0.22	8.68	1.90					
A9	A9	0.18	0.73	5.0	0.13	8.68	1.14					
A10	A10	0.22	0.77	5.0	0.17	8.68	1.46					
A11	A11	0.31	0.78	5.0	0.25	8.67	2.13					
A12	A12	0.32	0.67	8.7	0.21	7.28	1.55					
A13	A13	0.22	0.77	5.0	0.17	8.68	1.45				1.71	25% of R4 flows into this basin
A14	A14	0.07	0.96	5.0	0.07	8.68	0.59					
A15	A15	0.67	0.53	9.4	0.35	7.10	2.50				2.50	100% of R3 flows in this basin
A16	A16	0.28	0.76	5.0	0.22	8.68	1.87					
A17	A17	0.15	0.80	5.0	0.12	8.68	1.07				1.33	25% of R4 flows into this basin
A18	A18	0.90	0.42	11.3	0.37	6.62	2.46				6.24	100% of R2 flows in this basin
A19	A19	0.56	0.44	5.0	0.25	8.68	2.16				5.94	100% of R1 flows in this basin
A20	A20	0.52	0.35	12.2	0.18	6.43	1.17				4.95	100% of R5 flows in this basin
R1	R1	0.54	0.81	5.0	0.44	8.68	3.78					
R2	R2	0.54	0.81	5.0	0.44	8.68	3.78					
R3	R3	0.54	0.81	5.0	0.44	8.68	3.78					
R4	R4	0.15	0.81	5.0	0.12	8.68	1.07					
R5	R5	0.54	0.81	5.0	0.44	8.68	3.78					
A-OS1	A-OS1	0.10	0.35	7.3	0.03	7.73	0.27					Flows offsite but is still routed to Pond 1
A-OS2	A-OS2	0.07	0.53	6.2	0.04	8.15	0.31					Flows offsite but is still routed to Pond 2
A21	A21	0.17	0.35	9.7	0.06	7.00	0.41					Flows offsite but is still routed to Pond 3
A-UD1	A-UD1	0.08	0.35	5.0	0.03	8.68	0.24					Flows offsite and its not detained
O1	O1	1.94	0.68	12.4	1.32	6.39	8.47					Offsite basin routed around site

SUMMARY - PROPOSED RUNOFF TABLE							
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)	Weighted Imperviousness
A1	A1	0.34	1.35	2.56	1.35	2.56	83.5%
A2	A2	0.49	1.84	3.54	1.84	3.54	78.4%
A3	A3	0.39	1.44	2.78	1.60	3.08	77.8%
A4	A4	0.54	1.53	3.16	1.70	3.45	64.3%
A5	A5	0.32	1.14	2.23	1.28	2.50	74.8%
A6	A6	0.11	0.23	0.52	0.23	0.52	48.9%
A7	A7	0.40	1.21	2.40	1.35	2.66	71.8%
A8	A8	0.25	1.02	1.90	1.02	1.90	87.3%
A9	A9	0.18	0.55	1.14	0.55	1.14	63.5%
A10	A10	0.22	0.73	1.46	0.73	1.46	70.3%
A11	A11	0.31	1.07	2.13	1.07	2.13	71.6%
A12	A12	0.32	0.70	1.55	0.70	1.55	53.4%
A13	A13	0.22	0.72	1.45	0.86	1.71	68.9%
A14	A14	0.07	0.33	0.59	0.33	0.59	100.0%
A15	A15	0.67	0.90	2.50	0.90	2.50	30.2%
A16	A16	0.28	0.93	1.87	0.93	1.87	68.0%
A17	A17	0.15	0.54	1.07	0.68	1.33	73.5%
A18	A18	0.90	0.59	2.46	2.62	6.24	12.5%
A19	A19	0.56	0.60	2.16	2.63	5.94	17.2%
A20	A20	0.52	0.16	1.17	2.19	4.95	2.0%
R1	R1	0.54	2.03	3.78	2.03	3.78	90.0%
R2	R2	0.54	2.03	3.78	2.03	3.78	90.0%
R3	R3	0.54	2.03	3.78	2.03	3.78	90.0%
R4	R4	0.15	0.57	1.07	0.57	1.07	90.0%
R5	R5	0.54	2.03	3.78	2.03	3.78	90.0%
A-OS1	A-OS1	0.10	0.04	0.27	0.04	0.27	2.0%
A-OS2	A-OS2	0.07	0.11	0.31	0.11	0.31	31.4%
A21	A21	0.17	0.06	0.41	0.06	0.41	2.0%
A-UD1	A-UD1	0.08	0.03	0.24	0.03	0.24	2.0%
Total		9.97	26.51	56.06	-	-	58.5%

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer: Jessica McCallum
Company: Kimley-Horn and Associates
Date: August 8, 2023
Project: Veteran's Victory, Lot 1
Location: NEC of Powers Blvd and Bradley Rd

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth: 0.60 inches
Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	DCIA	SPA	UIA:RPA	UIA:RPA	UIA:RPA	UIA:RPA						
Area ID	DCIA	SPA	1	2	3	4						
Downstream Design Point ID	DCIA	SPA	1	2	3	4						
Downstream BMP Type	EDB	EDB	EDB	EDB	EDB	EDB						
DCIA (ft^2)	435,511	--	--	--	--	--						
UIA (ft^2)	--	--	25,184	25,184	12,592	6,993						
RPA (ft^2)	--	--	9,025	19,377	3,895	5,268						
SPA (ft^2)	--	147,696	--	--	--	--						
HSG A (%)	--		0%	0%	0%	0%						
HSG B (%)	--		100%	100%	100%	100%						
HSG C/D (%)	--		0%	0%	0%	0%						
Average Slope of RPA (ft/ft)	--	--	0.100	0.082	0.082	0.050						
UIA:RPA Interface Width (ft)	--	--	100.00	100.00	100.00	300.00						

CALCULATED RUNOFF RESULTS

Area ID	DCIA	SPA	1	2	3	4						
UIA:RPA Area (ft^2)	--	--	34,209	44,561	16,487	12,261						
L / W Ratio	--	--	3.42	4.46	1.65	0.14						
UIA / Area	--	--	0.7362	0.5652	0.7638	0.5703						
Runoff (in)	0.50	0.00	0.08	0.00	0.12	0.00						
Runoff (ft^3)	18146	0	231	0	172	0						
Runoff Reduction (ft^3)	0	7385	818	1049	353	291						

CALCULATED WQCV RESULTS

Area ID	DCIA	SPA	1	2	3	4						
WQCV (ft^3)	18146	0	1049	1049	525	291						
WQCV Reduction (ft^3)	0	0	818	1049	353	291						
WQCV Reduction (%)	0%	0%	78%	100%	67%	100%						
Untreated WQCV (ft^3)	18146	0	231	0	172	0						

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	DCIA	SPA	1	2	3	4						
DCIA (ft^2)	435,511	0	0	0	0	0						
UIA (ft^2)	0	0	25,184	25,184	12,592	6,993						
RPA (ft^2)	0	0	9,025	19,377	3,895	5,268						
SPA (ft^2)	0	147,696	0	0	0	0						
Total Area (ft^2)	435,511	147,696	34,209	44,561	16,487	12,261						
Total Impervious Area (ft^2)	435,511	0	25,184	25,184	12,592	6,993						
WQCV (ft^3)	18,146	0	1,049	1,049	525	291						
WQCV Reduction (ft^3)	0	0	818	1,049	353	291						
WQCV Reduction (%)	0%	0%	78%	100%	67%	100%						
Untreated WQCV (ft^3)	18,146	0	231	0	172	0						

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	690,725
Total Impervious Area (ft^2)	505,464
WQCV (ft^3)	21,061
WQCV Reduction (ft^3)	2,512
WQCV Reduction (%)	12%
Untreated WQCV (ft^3)	18,549

TEMPORARY SEDIMENT BASIN CALCULATIONS

PRISMOIDAL METHOD
Volume Required = Tributary Area (acres) X 3600 (cu. ft./acre)
Prismoidal Calculation Method = (1/3)*(ELEV1-ELEV2)*(AREA1+AREA2)+(SQRT(AREA1*AREA2))

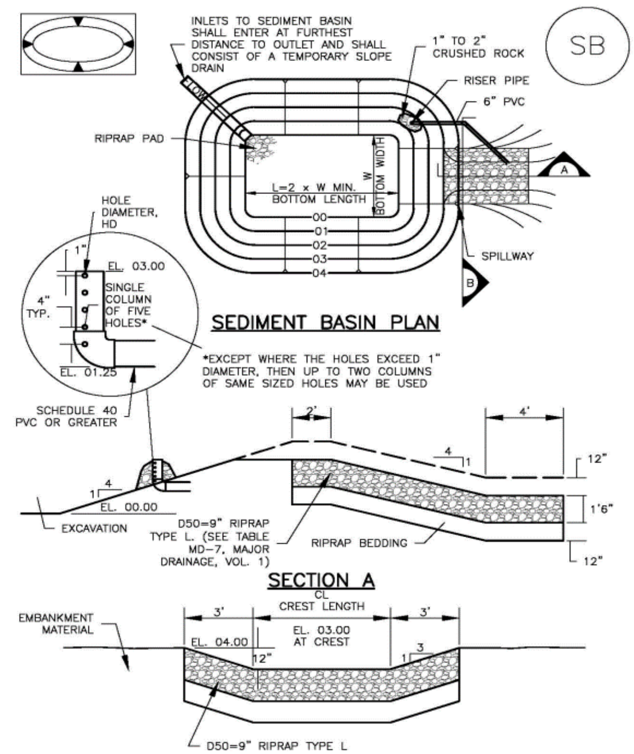
			ELEV. (FT)	AREA (SQ FT.)	VOLUME (CU FT)	ACCUM. VOL. (CU FT)	ACCUM. VOL. (AC-FT)
Sedimentation Basin ID:	**A**						
			58.5	3,830	0	0	0.00
Disturbed Tributary Area (ac) =	**3.91**		59.5	4,817	4,314	4,314	0.10
Undisturbed Tributary Area (ac) =	**0.00**	**3.91**	60.5	5,904	5,351	9,665	0.22
Disturbed Volume Required (cu-ft) =	**14,076**		61.5	7,092	6,489	16,154	0.37
Undisturbed Volume Required (cu-ft) =	**0**						
Total Volume Required (cu-ft) =	**14,076**						
Total Volume Required (ac-ft) =	**0.32**						
Required Outlet Pipe? (Y/N):	Y						
Sediment Cleanout Elevation **50% Storage Volume - Lowest Perforation			60.01	-	-	7,038	0.16
Riser Pipe Elevation **100% Storage Volume - Riser Elevation			61.63	-	-	14,076	0.32

Equation EDB-3 from UDFCD USDCM Vol 3
Extended Detention Basin Fact Sheet T-5

V=	0.32	acre-ft
T_D=	72	hrs
H=	1.62	ft
S=	0.005	ft/ft
Required A_O=	1.710	in^2 per row
	1.2	
d=	**1.10**	**in**
n_1=	**2**	**column**
n_2=	**2**	**rows**
Provided A_O=	**1.903**	**in^2 per row**

TABLE SB-1. SIZING INFORMATION FOR STANDARD SEDIMENT BASIN

Upstream Drainage Area (rounded to nearest acre), (ac)	Basin Bottom Width (W), (ft)	Spillway Crest Length (CL), (ft)	Hole Diameter (HD), (in)
1	12 ½	2	9/32
2	21	3	13/16
3	28	5	½
4	33 ½	6	9/16
5	38 ½	8	21/32
6	43	9	21/32
7	47 ¼	11	25/32
8	51	12	27/32
9	55	13	7/8
10	58 ¼	15	15/16
11	61	16	31/32
12	64	18	1
13	67 ½	19	1 1/16
14	70 ½	21	1 1/8
15	73 ¼	22	1 3/16



Temporary Pipe Outfall Design Summary									
Basin Name	Riser Diameter (IN)	100% Storage Elevation (Riser Top) (FT)	50% Storage Elevation (Center of Bottom Hole) (FT)	Hole Diameter (IN)	Number of Colummns	Number fo Rows	Upstream Invert of Pipe Outfall (FT)	Length of Pipe (FT)	Downstream Invert of Pipe Outfall (FT)
A	6	61.63	60.01	1.1	2	2	59.51	57.00	59.22

Description

A sediment basin is a temporary pond built on a construction site to capture eroded or disturbed soil transported in storm runoff prior to discharge from the site. Sediment basins are designed to capture site runoff and slowly release it to allow time for settling of sediment prior to discharge. Sediment basins are often constructed in locations that will later be modified to serve as post-construction stormwater basins.

Photograph SB-1. Sediment basin at the toe of a slope. Photo courtesy of WWE.

Appropriate Uses

Most large construction sites (typically greater than 2 acres) will require one or more sediment basins for effective management of construction site runoff. On linear construction projects, sediment basins may be impractical; instead, sediment traps or other combinations of BMPs may be more appropriate.

Sediment basins should not be used as stand-alone sediment controls. Erosion and other sediment controls should also be implemented upstream.

When feasible, the sediment basin should be installed in the same location where a permanent post-construction detention pond will be located.

Design and Installation

The design procedure for a sediment basin includes these steps:

- **Basin Storage Volume**: Provide a storage volume of at least 3,600 cubic feet per acre of drainage area. To the extent practical, undisturbed and/or off-site areas should be diverted around sediment basins to prevent “clean” runoff from mixing with runoff from disturbed areas. For undisturbed areas (both on-site and off-site) that cannot be diverted around the sediment basin, provide a minimum of 500 ft^3/acre of storage for undeveloped (but stable) off-site areas in addition to the 3,600 ft^3/acre for disturbed areas. For stable, developed areas that cannot be diverted around the sediment basin, storage volume requirements are summarized in Table SB-1.

- **Basin Geometry:** Design basin with a minimum length-to-width ratio of 2:1 (L:W). If this cannot be achieved because of site space constraints, baffling may be required to extend the effective distance between the inflow point(s) and the outlet to minimize short-circuiting.

- **Dam Embankment**: It is recommended that embankment slopes be 4:1 (H:V) or flatter and no steeper than 3:1 (H:V) in any location.

Sediment Basins	
Functions	
Erosion Control	No
Sediment Control	Yes
Site/Material Management	No

- **Inflow Structure**: For concentrated flow entering the basin, provide energy dissipation at the point of inflow.

Table SB-1. Additional Volume Requirements for Undisturbed and Developed Tributary Areas Draining through Sediment Basins

Imperviousness (%)	Additional Storage Volume (ft^3) Per Acre of Tributary Area
Undeveloped	500
10	800
20	1230
30	1600
40	2030
50	2470
60	2980
70	3560
80	4360
90	5300
100	6460

- **Outlet Works**: The outlet pipe shall extend through the embankment at a minimum slope of 0.5 percent. Outlet works can be designed using one of the following approaches:
  - **Riser Pipe (Simplified Detail):** Detail SB-1 provides a simplified design for basins treating no more than 15 acres.
  - **Orifice Plate or Riser Pipe**: Follow the design criteria for Full Spectrum Detention outlets in the EDB Fact Sheet provided in Chapter 4 of this manual for sizing of outlet perforations with an emptying time of approximately 72 hours. In lieu of the trash rack, pack uniformly sized 1½ - to 2-inch gravel in front of the plate or surrounding the riser pipe. This gravel will need to be cleaned out frequently during the construction period as sediment accumulates within it. The gravel pack will need to be removed and disposed of following construction to reclaim the basin for use as a permanent detention facility. If the basin will be used as a permanent extended detention basin for the site, a trash rack will need to be installed once contributing drainage areas have been stabilized and the gravel pack and accumulated sediment have been removed.
  - **Floating Skimmer**: If a floating skimmer is used, install it using manufacturer's recommendations. Illustration SB-1 provides an illustration of a Faircloth Skimmer Floating Outlet™, one of the more commonly used floating skimmer outlets. A skimmer should be designed to release the design volume in no less than 48 hours. The use of a floating skimmer outlet can increase the sediment capture efficiency of a basin significantly. A floating outlet continually decants cleanest water off the surface of the pond and releases cleaner water than would discharge from a perforated riser pipe or plate.

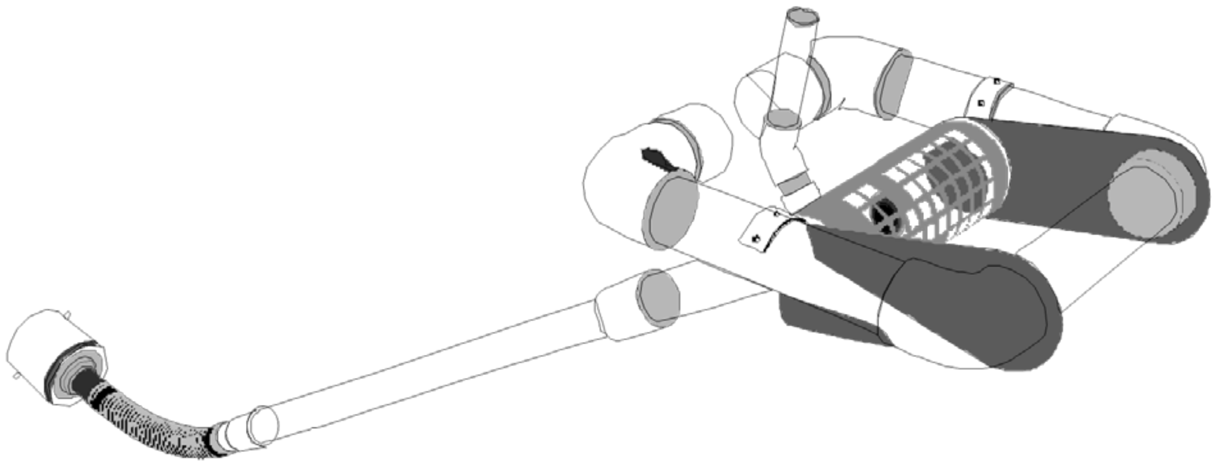


Illustration SB-1. Outlet structure for a temporary sediment basin - Faircloth Skimmer Floating Outlet. Illustration courtesy of J. W. Faircloth & Sons, Inc., FairclothSkimmer.com.

- **Outlet Protection and Spillway:** Consider all flow paths for runoff leaving the basin, including protection at the typical point of discharge as well as overtopping.
  - **Outlet Protection:** Outlet protection should be provided where the velocity of flow will exceed the maximum permissible velocity of the material of the waterway into which discharge occurs. This may require the use of a riprap apron at the outlet location and/or other measures to keep the waterway from eroding.
  - **Emergency Spillway:** Provide a stabilized emergency overflow spillway for rainstorms that exceed the capacity of the sediment basin volume and its outlet. Protect basin embankments from erosion and overtopping. If the sediment basin will be converted to a permanent detention basin, design and construct the emergency spillway(s) as required for the permanent facility. If the sediment basin will not become a permanent detention basin, it may be possible to substitute a heavy polyvinyl membrane or properly bedded rock cover to line the spillway and downstream embankment, depending on the height, slope, and width of the embankments.

Maintenance and Removal

Maintenance activities include the following:

- Dredge sediment from the basin, as needed to maintain BMP effectiveness, typically when the design storage volume is no more than one-third filled with sediment.
- Inspect the sediment basin embankments for stability and seepage.
- Inspect the inlet and outlet of the basin, repair damage, and remove debris. Remove, clean and replace the gravel around the outlet on a regular basis to remove the accumulated sediment within it and keep the outlet functioning.
- Be aware that removal of a sediment basin may require dewatering and associated permit requirements.
- Do not remove a sediment basin until the upstream area has been stabilized with vegetation.

Final disposition of the sediment basin depends on whether the basin will be converted to a permanent post-construction stormwater basin or whether the basin area will be returned to grade. For basins being converted to permanent detention basins, remove accumulated sediment and reconfigure the basin and outlet to meet the requirements of the final design for the detention facility. If the sediment basin is not to be used as a permanent detention facility, fill the excavated area with soil and stabilize with vegetation.

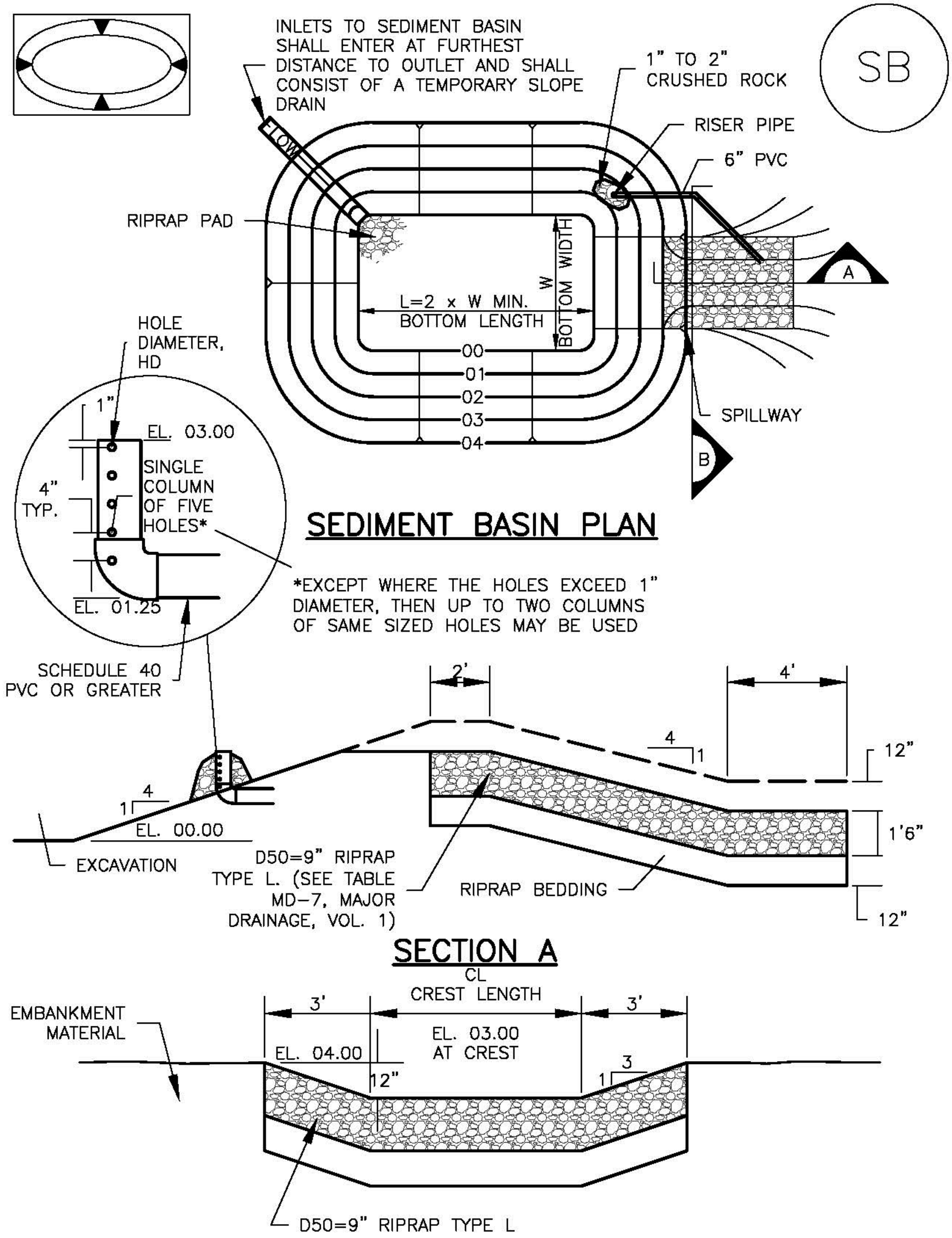

INLETS TO SEDIMENT BASIN SHALL ENTER AT FURTHEST DISTANCE TO OUTLET AND SHALL CONSIST OF A TEMPORARY SLOPE DRAIN
1" TO 2" CRUSHED ROCK
SB
RISER PIPE
6" PVC
FLOW
RIPRAP PAD
W BOTTOM WIDTH
L=2 x W MIN. BOTTOM LENGTH
00
01
02
03
04
A
B
SPILLWAY
HOLE DIAMETER, HD
1"
EL. 03.00
SINGLE COLUMN OF FIVE HOLES*
4" TYP.
EL. 01.25
SEDIMENT BASIN PLAN
*EXCEPT WHERE THE HOLES EXCEED 1" DIAMETER, THEN UP TO TWO COLUMNS OF SAME SIZED HOLES MAY BE USED
SCHEDULE 40 PVC OR GREATER
2'
4'
4
1
12"
1'6"
12"
EL. 00.00
EXCAVATION
D50=9" RIPRAP TYPE L. (SEE TABLE MD-7, MAJOR DRAINAGE, VOL. 1)
RIPRAP BEDDING
SECTION A
CL
CREST LENGTH
3'
3'
EMBANKMENT MATERIAL
EL. 04.00
EL. 03.00 AT CREST
12"
3
1
D50=9" RIPRAP TYPE L

TABLE SB-1. SIZING INFORMATION FOR STANDARD SEDIMENT BASIN			
Upstream Drainage Area (rounded to nearest acre), (ac)	Basin Bottom Width (W), (ft)	Spillway Crest Length (CL), (ft)	Hole Diameter (HD), (in)
1	12 1/2	2	9/32
2	21	3	13/16
3	28	5	1/2
4	33 1/2	6	9/16
5	38 1/2	8	21/32
6	43	9	21/32
7	47 1/4	11	25/32
8	51	12	27/32
9	55	13	7/8
10	58 1/4	15	15/16
11	61	16	31/32
12	64	18	1
13	67 1/2	19	1 1/16
14	70 1/2	21	1 1/8
15	73 1/4	22	1 3/16

SEDIMENT BASIN INSTALLATION NOTES

1. SEE PLAN VIEW FOR:
   - -LOCATION OF SEDIMENT BASIN.
   - -TYPE OF BASIN (STANDARD BASIN OR NONSTANDARD BASIN).
   - -FOR STANDARD BASIN, BOTTOM WIDTH W, CREST LENGTH CL, AND HOLE DIAMETER, HD.
   - -FOR NONSTANDARD BASIN, SEE CONSTRUCTION DRAWINGS FOR DESIGN OF BASIN INCLUDING RISER HEIGHT H, NUMBER OF COLUMNS N, HOLE DIAMETER HD AND PIPE DIAMETER D.

2. FOR STANDARD BASIN, BOTTOM DIMENSION MAY BE MODIFIED AS LONG AS BOTTOM AREA IS NOT REDUCED.

3. SEDIMENT BASINS SHALL BE INSTALLED PRIOR TO ANY OTHER LAND-DISTURBING ACTIVITY THAT RELIES ON ON BASINS AS AS A STORMWATER CONTROL.

4. EMBANKMENT MATERIAL SHALL CONSIST OF SOIL FREE OF DEBRIS, ORGANIC MATERIAL, AND ROCKS OR CONCRETE GREATER THAN 3 INCHES AND SHALL HAVE A MINIMUM OF 15 PERCENT BY WEIGHT PASSING THE NO. 200 SIEVE.

5. EMBANKMENT MATERIAL SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698.

6. PIPE SCH 40 OR GREATER SHALL BE USED.

7. THE DETAILS SHOWN ON THESE SHEETS PERTAIN TO STANDARD SEDIMENT BASIN(S) FOR DRAINAGE AREAS LESS THAN 15 ACRES. SEE CONSTRUCTION DRAWINGS FOR EMBANKMENT, STORAGE VOLUME, SPILLWAY, OUTLET, AND OUTLET PROTECTION DETAILS FOR ANY SEDIMENT BASIN(S) THAT HAVE BEEN INDIVIDUALLY DESIGNED FOR DRAINAGE AREAS LARGER THAN 15 ACRES.

SEDIMENT BASIN MAINTENANCE NOTES

1. INSPECT BMPs EACH WORKDAY, AND MAINTAIN THEM IN EFFECTIVE OPERATING CONDITION. MAINTENANCE OF BMPs SHOULD BE PROACTIVE, NOT REACTIVE. INSPECT BMPs AS SOON AS POSSIBLE (AND ALWAYS WITHIN 24 HOURS) FOLLOWING A STORM THAT CAUSES SURFACE EROSION, AND PERFORM NECESSARY MAINTENANCE.

2. FREQUENT OBSERVATIONS AND MAINTENANCE ARE NECESSARY TO MAINTAIN BMPs IN EFFECTIVE OPERATING CONDITION. INSPECTIONS AND CORRECTIVE MEASURES SHOULD BE DOCUMENTED THOROUGHLY.

3. WHERE BMPs HAVE FAILED, REPAIR OR REPLACEMENT SHOULD BE INITIATED UPON DISCOVERY OF THE FAILURE.

4. SEDIMENT ACCUMULATED IN BASIN SHALL BE REMOVED AS NEEDED TO MAINTAIN BMP EFFECTIVENESS, TYPICALLY WHEN SEDIMENT DEPTH REACHES ONE FOOT (I.E., TWO FEET BELOW THE SPILLWAY CREST).

5. SEDIMENT BASINS ARE TO REMAIN IN PLACE UNTIL THE UPSTREAM DISTURBED AREA IS STABILIZED AND GRASS COVER IS ACCEPTED BY THE LOCAL JURISDICTION.

6. WHEN SEDIMENT BASINS ARE REMOVED, ALL DISTURBED AREAS SHALL BE COVERED WITH TOPSOIL, SEEDED AND MULCHED OR OTHERWISE STABILIZED AS APPROVED BY LOCAL JURISDICTION.

(DETAILS ADAPTED FROM DOUGLAS COUNTY, COLORADO)

NOTE: MANY JURISDICTIONS HAVE BMP DETAILS THAT VARY FROM UDFCD STANDARD DETAILS. CONSULT WITH LOCAL JURISDICTIONS AS TO WHICH DETAIL SHOULD BE USED WHEN DIFFERENCES ARE NOTED.

APPENDIX D – HYDRAULIC CALCULATIONS

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	A19	A18	A20.2
Site Type (Urban or Rural)			
Inlet Application (Street or Area)	AREA	AREA	AREA
Hydraulic Condition	Swale	Swale	Swale
Inlet Type	CDOT Type C	CDOT Type C	CDOT Type D (In Series)

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.7	2.6	5.5
Major Q_{Known} (cfs)	6.0	6.3	11.5

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)	**2.7**	**2.6**	**5.5**
Major Total Design Peak Flow, Q (cfs)	**6.0**	**6.3**	**11.5**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0

MHFD-Inlet, Version 5.02 (August 2022)

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INLET MANAGEMENT

Worksheet Protected

INLET NAME	A20.1
Site Type (Urban or Rural)	
Inlet Application (Street or Area)	AREA
Hydraulic Condition	Swale
Inlet Type	CDOT Type D (In Series)

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	6.3
Major Q_{Known} (cfs)	12.4

Bypass (Carry-Over) Flow from Upstream

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

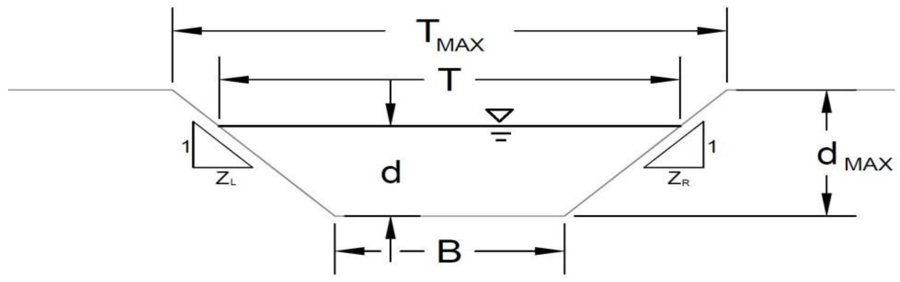
Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**6.3**
Major Total Design Peak Flow, Q (cfs)	**12.4**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Landscape Inlets)
A19



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =	A	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	5.00	ft/ft
Right Side Sloe	Z2 =	10.00	ft/ft

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

Choose One:
- ○ **Non-Cohesive**
- ○ **Cohesive**
- ○ **Paved**

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**5.00**	**10.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**2.00**	**ft**

Maximum Channel Capacity Based On Allowable Top Width

		Minor Storm	Major Storm	
Maximum Allowable Top Width	T_{MAX} =	**5.00**	**10.00**	**ft**
Water Depth	d =	0.33	0.67	ft
Flow Area	A =	0.83	3.33	sq ft
Wetted Perimeter	P =	5.05	10.10	ft
Hydraulic Radius	R =	0.17	0.33	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.275	0.284	
Flow Velocity	V =	0.23	0.35	fps
Velocity-Depth Product	VR =	0.04	0.12	ft^2/s
Hydraulic Depth	D =	0.17	0.33	ft
Froude Number	Fr =	0.10	0.11	
Maximum Flow Based on Allowable Water Depth	Q_T =	**0.2**	**1.2**	**cfs**

Maximum Channel Capacity Based On Allowable Water Depth

		Minor Storm	Major Storm	
Maximum Allowable Water Depth	d_{MAX} =	**1.00**	**2.00**	**ft**
Top Width	T =	15.00	30.00	ft
Flow Area	A =	7.50	30.00	sq ft
Wetted Perimeter	P =	15.15	30.30	ft
Hydraulic Radius	R =	0.50	0.99	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.321	0.357	
Flow Velocity	V =	0.41	0.59	fps
Velocity-Depth Product	VR =	0.20	0.58	ft^2/s
Hydraulic Depth	D =	0.50	1.00	ft
Froude Number	Fr =	0.10	0.10	
Maximum Flow Based On Allowable Water Depth	Q_d =	**3.1**	**17.6**	**cfs**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**0.2**	**1.2**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.33**	**0.67**	**ft**

Water Depth in Channel Based On Design Peak Flow

			Minor Storm	Major Storm	
	Design Peak Flow	Q_o =	**2.7**	**6.0**	**cfs**
	Water Depth	**d =**	**0.95**	**1.33**	**ft**
Warning 06	Top Width	T =	14.18	19.98	ft
	Flow Area	A =	6.70	13.31	sq ft
	Wetted Perimeter	P =	14.32	20.18	ft
	Hydraulic Radius	R =	0.47	0.66	ft
	Manning's n based on NRCS Vegetal Retardance	n =	0.315	0.354	
Warning 03	Flow Velocity	V =	0.40	0.45	fps
	Velocity-Depth Product	VR =	0.19	0.30	ft^2/s
	Hydraulic Depth	D =	0.47	0.67	ft
Warning 04	Froude Number	Fr =	0.10	0.10	

WARNING: MINOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'
WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

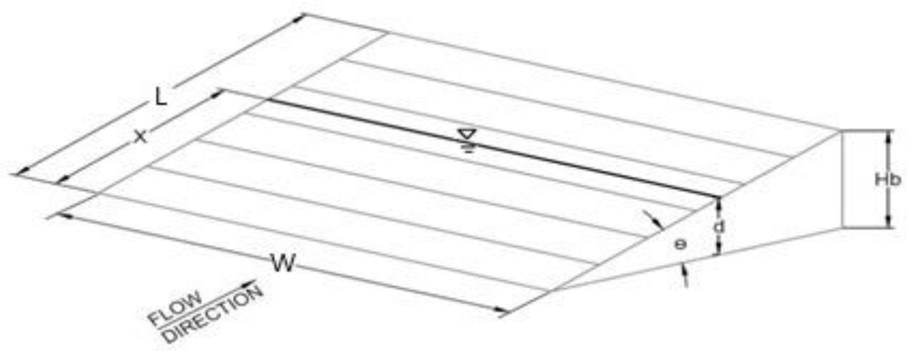
KIMLEY-HORN NOTE:
PLEASE REFERENCE THE FLOWMASTER SWALE CALCULATIONS FOR SWALE CAPACITY. THIS SPREAD SHEET WAS NOT USED TO SIZE THE SWALE.

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Landscape Inlets)
A19

Inlet Design Information (Input)

Type of Inlet: CDOT Type C	Inlet Type =	CDOT Type C		
Angle of Inclined Grate (must be <= 30 degrees)	θ =		0.00	degrees
Width of Grate	W =		3.00	ft
Length of Grate	L =		3.00	ft
Open Area Ratio	A_{RATIO} =		0.70	
Height of Inclined Grate	H_B =		0.00	ft
Clogging Factor	C_f =		0.50	
Grate Discharge Coefficient	C_d =		0.96	
Orifice Coefficient	C_o =		0.64	
Weir Coefficient	C_w =		2.05	



		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.95	1.33	
Grate Capacity as a Weir				
Submerged Side Weir Length	X =	3.00	3.00	ft
Inclined Side Weir Flow	Q_{ws} =	9.9	16.6	cfs
Base Weir Flow	Q_{wb} =	14.2	23.7	cfs
Interception Without Cloggging	Q_{wi} =	34.0	56.8	cfs
Interception With Clogging	Q_{wa} =	17.0	28.4	cfs
Grate Capacity as an Orifice				
Interception Without Clogging	Q_{oi} =	31.4	37.3	cfs
Interception With Clogging	Q_{oa} =	15.7	18.7	cfs
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**15.7**	**18.7**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

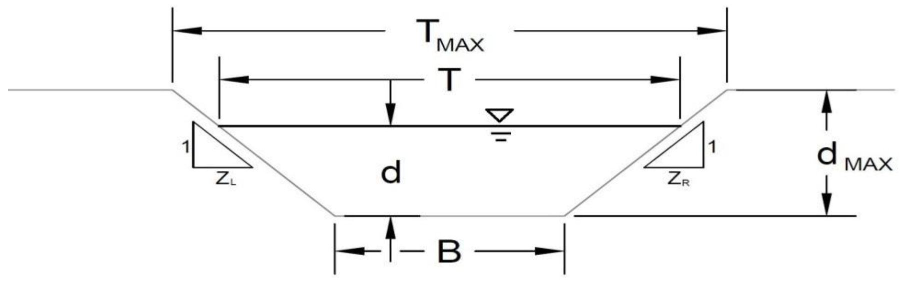
Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

Warning 06: Top Width (T) exceeds max allowable top width (Tmax).

KIMLEY-HORN NOTE:
PLEASE REFERENCE THE FLOWMASTER SWALE CALCULATIONS FOR SWALE CAPACITY. THIS SPREAD SHEET WAS NOT USED TO SIZE THE SWALE.

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Landscape Inlets)
A18



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =	B	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	25.00	ft/ft
Right Side Sloe	Z2 =	25.00	ft/ft

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

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**5.00**	**5.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**0.50**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**0.0**	**0.0**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.10**	**0.10**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**2.6**	**6.2**	**cfs**
Warning 05 Water Depth	d =	**0.59**	**0.83**	**ft**

WARNING: MINOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'
WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

KIMLEY-HORN NOTE:
PLEASE REFERENCE THE FLOWMASTER SWALE CALCULATIONS FOR SWALE CAPACITY. THIS SPREAD SHEET WAS NOT USED TO SIZE THE SWALE.

MHFD-Inlet, Version 5.02 (August 2022)

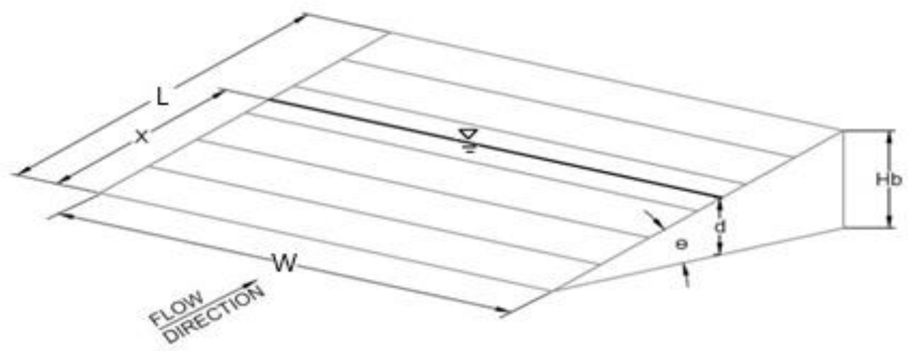
AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Landscape Inlets)

A18

Inlet Design Information (Input)

Type of Inlet	CDOT Type C	Inlet Type =	CDOT Type C	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	3.00	ft
Length of Grate		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient		C_d =	0.96	
Orifice Coefficient		C_o =	0.64	
Weir Coefficient		C_w =	2.05	



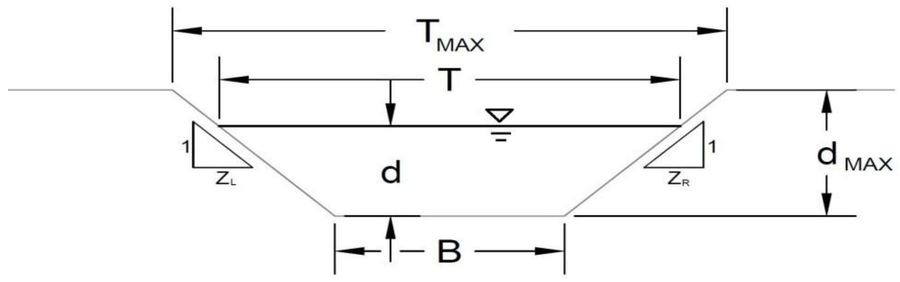
		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.59	0.83	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.5**	**14.0**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.
Warning 05: Depth (d) exceeds max allowable depth (dmax).
Warning 06: Top Width (T) exceeds max allowable top width (Tmax).

KIMLEY-HORN NOTE:
PLEASE REFERENCE THE FLOWMASTER SWALE CALCULATIONS FOR SWALE CAPACITY. THIS SPREAD SHEET WAS NOT USED TO SIZE THE SWALE.

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Landscape Inlets)
A20.2



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =	B	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0150	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	5.00	ft/ft
Right Side Sloe	Z2 =	100.00	ft/ft

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

Choose One:
- ○ **Non-Cohesive**
- ○ **Cohesive**
- ○ **Paved**

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	**T_{MAX} =**	**30.00**	**60.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	**d_{MAX} =**	**1.00**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	**Q_{allow} =**	**0.7**	**4.3**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	**d_{allow} =**	**0.29**	**0.57**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	**Q_o =**	**5.5**	**11.5**	**cfs**
Water Depth	**d =**	**0.63**	**0.83**	**ft**

WARNING: MINOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'
WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

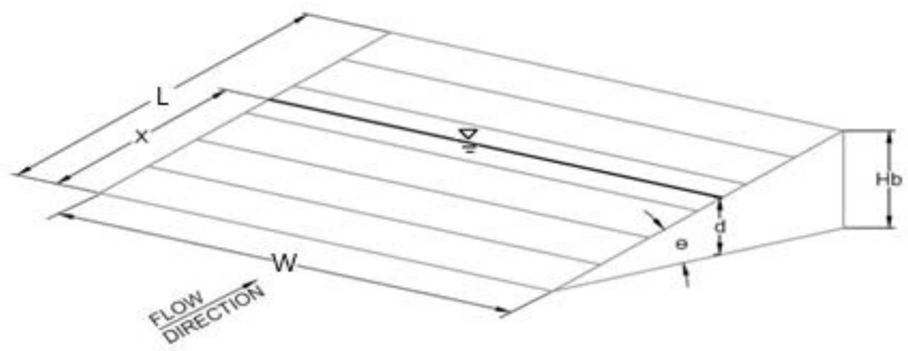
KIMLEY-HORN NOTE:
PLEASE REFERENCE THE FLOWMASTER SWALE CALCULATIONS FOR SWALE CAPACITY. THIS SPREAD SHEET WAS NOT USED TO SIZE THE SWALE.

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Landscape Inlets)
A20.2

Inlet Design Information (Input)

Type of Inlet: CDOT Type D (In Series) — Inlet Type = CDOT Type D (In Series)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	ft
Length of Grate	L =	6.00	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.78	
Orifice Coefficient	C_o =	0.52	
Weir Coefficient	C_w =	1.67	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.63	0.83	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**14.8**	**22.6**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

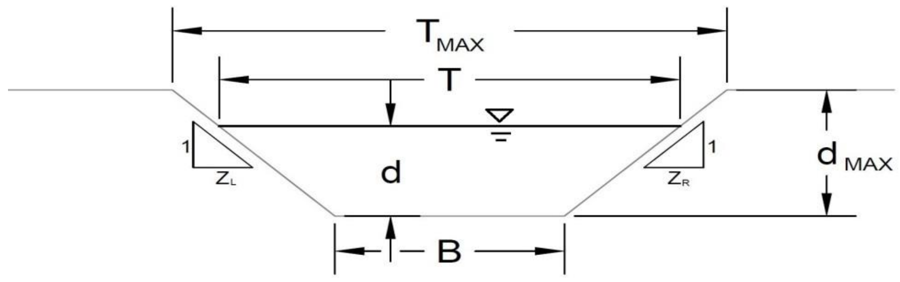
Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

Warning 06: Top Width (T) exceeds max allowable top width (Tmax).

KIMLEY-HORN NOTE:
PLEASE REFERENCE THE FLOWMASTER SWALE CALCULATIONS FOR SWALE CAPACITY. THIS SPREAD SHEET WAS NOT USED TO SIZE THE SWALE.

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Landscape Inlets)
A20.1



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =	B	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0150	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Sloe	Z2 =	100.00	ft/ft

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

Choose One:
- ○ Non-Cohesive
- ◉ Cohesive
- ○ Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**10.00**	**20.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**0.0**	**0.2**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.10**	**0.19**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**6.3**	**12.4**	**cfs**
Water Depth	d =	**0.66**	**0.86**	**ft**

WARNING: MINOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'
WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

KIMLEY-HORN NOTE:
PLEASE REFERENCE THE FLOWMASTER SWALE CALCULATIONS FOR SWALE CAPACITY. THIS SPREAD SHEET WAS NOT USED TO SIZE THE SWALE.

MHFD-Inlet, Version 5.02 (August 2022)

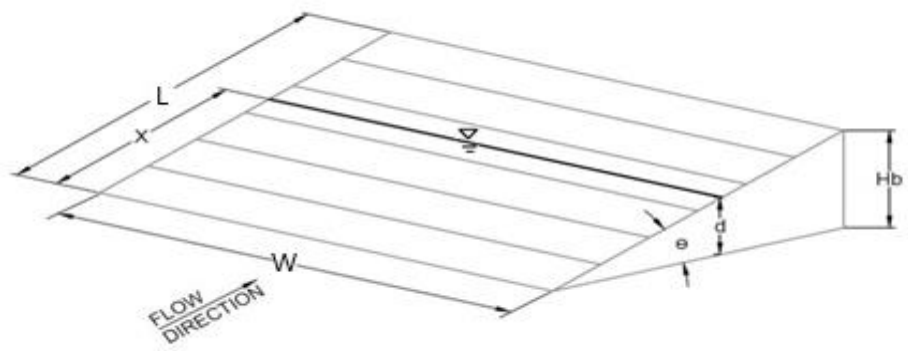
AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Landscape Inlets)

A20.1

Inlet Design Information (Input)

Type of Inlet: CDOT Type D (In Series) — Inlet Type = CDOT Type D (In Series)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	ft
Length of Grate	L =	6.00	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.78	
Orifice Coefficient	C_o =	0.52	
Weir Coefficient	C_w =	1.67	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.66	0.86	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**16.1**	**23.8**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

Warning 06: Top Width (T) exceeds max allowable top width (Tmax).

KIMLEY-HORN NOTE:
PLEASE REFERENCE THE FLOWMASTER SWALE CALCULATIONS FOR SWALE CAPACITY. THIS SPREAD SHEET WAS NOT USED TO SIZE THE SWALE.

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	A3	A4	A5
Site Type (Urban or Rural)			
Inlet Application (Street or Area)	AREA	AREA	AREA
Hydraulic Condition	Swale	Swale	Swale
Inlet Type	CDOT Type D (In Series)	CDOT Type D (In Series)	CDOT Type D (In Series)

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.9	3.0	1.4
Major Q_{Known} (cfs)	5.4	5.8	2.2

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	A3
Minor Bypass Flow Received, Q_b (cfs)	0.0		0.8
Major Bypass Flow Received, Q_b (cfs)	0.0		2.4

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)	**2.9**	**3.0**	**2.2**
Major Total Design Peak Flow, Q (cfs)	**5.4**	**5.8**	**4.6**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.8	0.8	0.4
Major Flow Bypassed Downstream, Q_b (cfs)	2.4	2.7	1.8

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	A6	A7	A8
Site Type (Urban or Rural)			
Inlet Application (Street or Area)	STREET	AREA	AREA
Hydraulic Condition	On Grade	Swale	Swale
Inlet Type	CDOT Type R Curb Opening	CDOT Type D (In Series)	CDOT Type D (In Series)

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.2	1.2	1.0
Major Q_{Known} (cfs)	0.5	2.4	1.9

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	A5	A7
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.4	0.1
Major Bypass Flow Received, Q_b (cfs)	0.0	1.8	1.6

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)	**0.2**	**1.6**	**1.1**
Major Total Design Peak Flow, Q (cfs)	**0.5**	**4.2**	**3.5**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.1	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	1.6	1.1

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	A9.1	A17	A13
Site Type (Urban or Rural)			
Inlet Application (Street or Area)	STREET	AREA	AREA
Hydraulic Condition	On Grade	Swale	Swale
Inlet Type	CDOT Type R Curb Opening	CDOT Type C	CDOT Type C

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.3	0.5	0.7
Major Q_{Known} (cfs)	1.1	1.1	1.5

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	A8	A4	A17
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.8	0.5
Major Bypass Flow Received, Q_b (cfs)	1.1	2.7	2.2

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**	**1.3**	**1.2**
Major Total Design Peak Flow, Q (cfs)	**2.2**	**3.8**	**3.7**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.5	0.4
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	2.2	2.2

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	A12	A11	A10.1
Site Type (Urban or Rural)			
Inlet Application (Street or Area)	AREA	AREA	STREET
Hydraulic Condition	Swale	Swale	On Grade
Inlet Type	CDOT Type D (In Series)	CDOT Type D (In Series)	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.7	1.1	0.4
Major Q_{Known} (cfs)	1.6	2.1	0.8

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	A13	A12	A11
Minor Bypass Flow Received, Q_b (cfs)	0.4	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	2.2	1.3	1.1

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)	**1.1**	**1.1**	**0.4**
Major Total Design Peak Flow, Q (cfs)	**3.8**	**3.4**	**1.9**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	1.3	1.1	0.0

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	A15	A16	A1
Site Type (Urban or Rural)			
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.9	0.9	1.4
Major Q_{Known} (cfs)	4.5	1.8	2.6

Bypass (Carry-Over) Flow from Upstream

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)	**2.9**	**0.9**	**1.4**
Major Total Design Peak Flow, Q (cfs)	**4.5**	**1.8**	**2.6**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.2	0.0	0.0

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	A2	P6 - LOT 2	A9.2
Site Type (Urban or Rural)			
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.8	0.5	0.3
Major Q_{Known} (cfs)	3.5	1.0	0.6

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	A9.1
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)	**1.8**	**0.5**	**0.3**
Major Total Design Peak Flow, Q (cfs)	**3.5**	**1.0**	**0.6**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	0.1	0.0

MHFD-Inlet, Version 5.02 (August 2022)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	A10.2
Site Type (Urban or Rural)	
Inlet Application (Street or Area)	STREET
Hydraulic Condition	On Grade
Inlet Type	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	0.4
Major Q_{Known} (cfs)	0.8

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	A10.1
Minor Bypass Flow Received, Q_b (cfs)	0.0
Major Bypass Flow Received, Q_b (cfs)	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

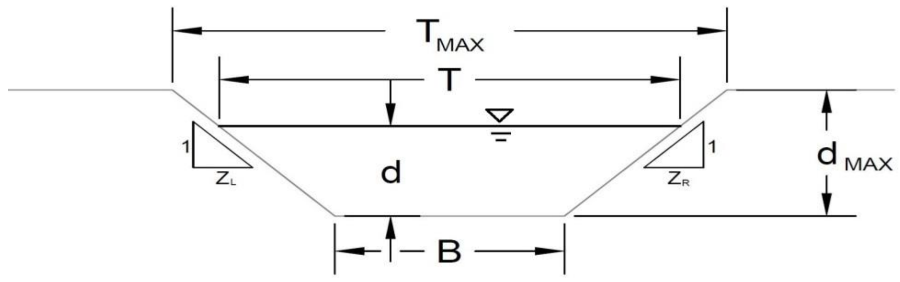
Design Storm Return Period, T_r (years)	
One-Hour Precipitation, P_1 (inches)	

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**0.4**
Major Total Design Peak Flow, Q (cfs)	**0.8**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	0.0

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)
A3



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.016	
Channel Invert Slope	S_O =	0.0050	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	76.00	ft/ft
Right Side Sloe	Z2 =	76.00	ft/ft

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

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**30.00**	**60.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**4.2**	**26.4**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.20**	**0.39**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**2.9**	**5.4**	**cfs**
Water Depth	d =	**0.17**	**0.22**	**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'

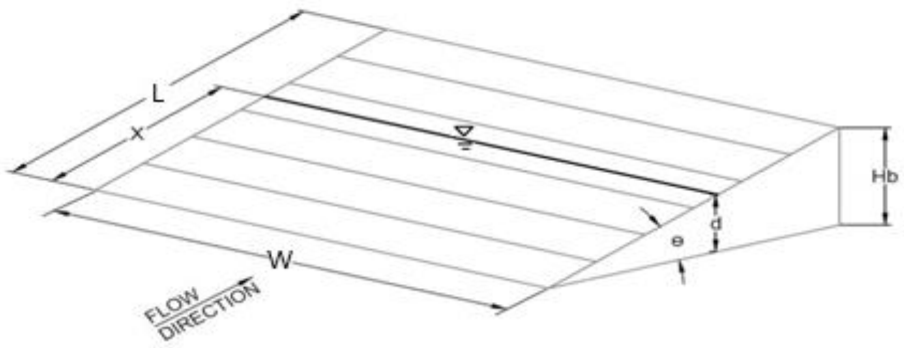
AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)

A3

Inlet Design Information (Input)

Type of Inlet: CDOT Type D (In Series) — Inlet Type = CDOT Type D (In Series)



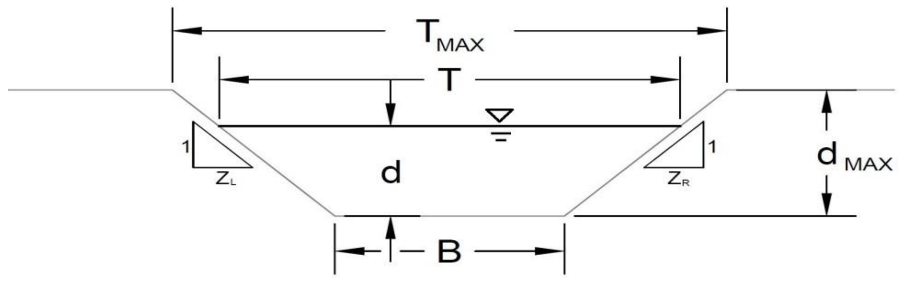
Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	ft
Length of Grate	L =	6.00	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.78	
Orifice Coefficient	C_o =	0.52	
Weir Coefficient	C_w =	1.67	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.17	0.22	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.1**	**3.0**	**cfs**
Bypassed Flow	**Q_b =**	**0.8**	**2.4**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**73**	**56**	**%**

Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)
A4



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.016	
Channel Invert Slope	S_O =	0.0050	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	76.00	ft/ft
Right Side Sloe	Z2 =	76.00	ft/ft

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

Choose One:
- ◯ **Non-Cohesive**
- ◯ **Cohesive**
- ◯ **Paved**

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**30.00**	**60.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**4.2**	**26.4**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.20**	**0.39**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**3.0**	**5.8**	**cfs**
Water Depth	d =	**0.17**	**0.22**	**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'

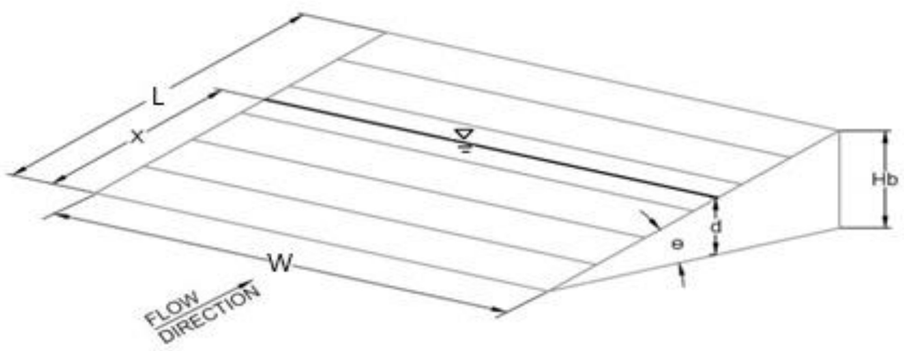
AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)

A4

Inlet Design Information (Input)

Type of Inlet: CDOT Type D (In Series) — Inlet Type = CDOT Type D (In Series)



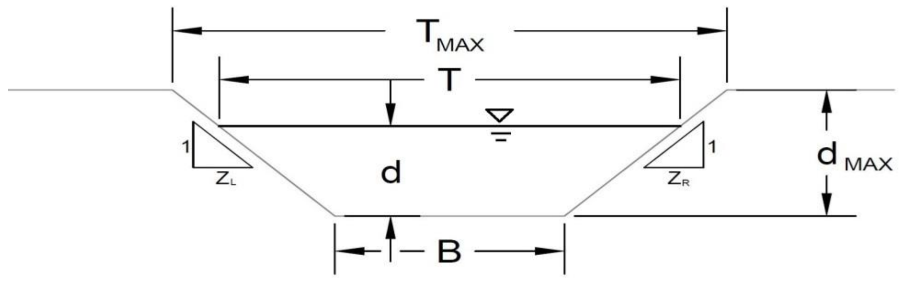
Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	ft
Length of Grate	L =	6.00	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.78	
Orifice Coefficient	C_o =	0.52	
Weir Coefficient	C_w =	1.67	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.17	0.22	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.2**	**3.1**	**cfs**
Bypassed Flow	**Q_b =**	**0.8**	**2.7**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**72**	**54**	**%**

Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)
A5



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.016	
Channel Invert Slope	S_O =	0.0050	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	76.00	ft/ft
Right Side Sloe	Z2 =	76.00	ft/ft

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

Choose One:
- ◯ **Non-Cohesive**
- ◯ **Cohesive**
- ◯ **Paved**

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**30.00**	**60.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**4.2**	**26.4**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.20**	**0.39**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**2.2**	**4.6**	**cfs**
Water Depth	d =	**0.15**	**0.20**	**ft**

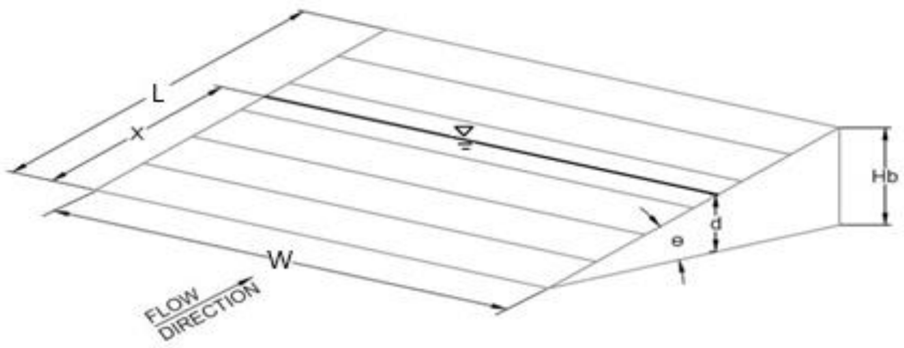
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)
A5

Inlet Design Information (Input)

Type of Inlet: CDOT Type D (In Series) — Inlet Type = CDOT Type D (In Series)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	ft
Length of Grate	L =	6.00	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.78	
Orifice Coefficient	C_o =	0.52	
Weir Coefficient	C_w =	1.67	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.15	0.20	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.8**	**2.8**	**cfs**
Bypassed Flow	**Q_b =**	**0.4**	**1.8**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**83**	**60**	**%**

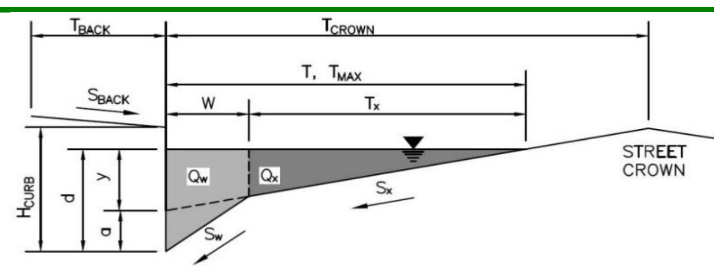
Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

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

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

Project: Veteran's Village - Lot 1 (Street Inlets)

Inlet ID: A6



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	6.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0		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 =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	2.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

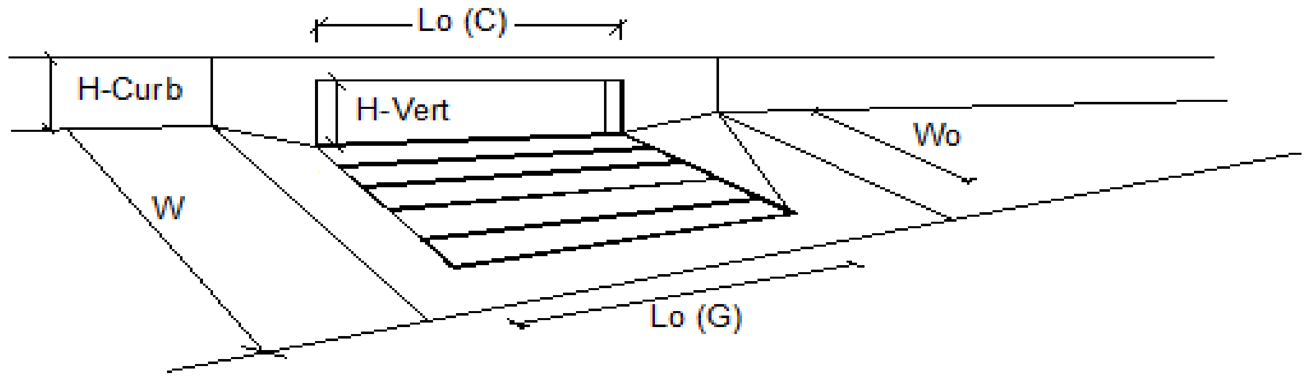
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**0.4**	**5.8**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.23 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 0.52 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)

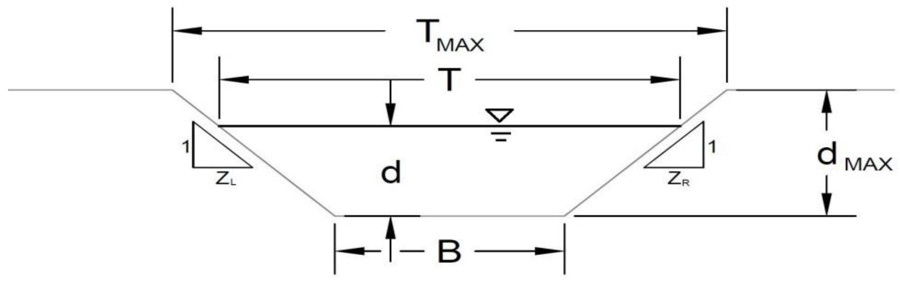


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.2**	**0.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)
A7



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.016	
Channel Invert Slope	S_O =	0.0050	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	76.00	ft/ft
Right Side Sloe	Z2 =	76.00	ft/ft

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

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**30.00**	**60.00**	ft
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**1.00**	ft

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**4.2**	**26.4**	cfs
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.20**	**0.39**	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**1.6**	**4.2**	cfs
Water Depth	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'

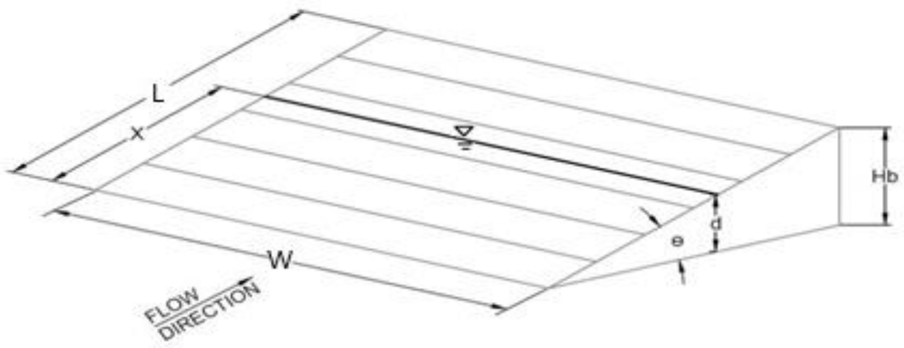
AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)

A7

Inlet Design Information (Input)

Type of Inlet	CDOT Type D (In Series)	Inlet Type =	CDOT Type D (In Series)	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	3.00	ft
Length of Grate		L =	6.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.38	
Grate Discharge Coefficient		C_d =	0.78	
Orifice Coefficient		C_o =	0.52	
Weir Coefficient		C_w =	1.67	

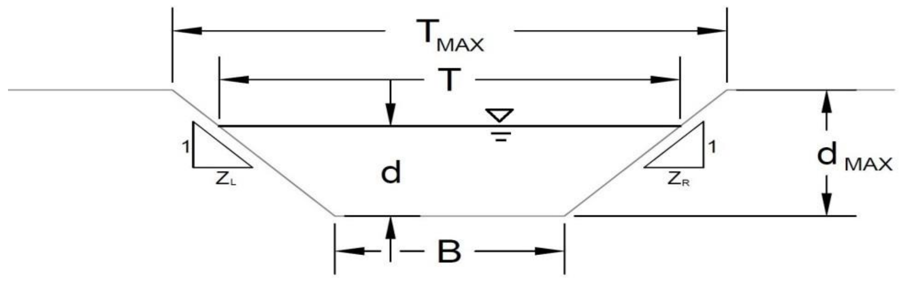


		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.14	0.20	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.5**	**2.6**	**cfs**
Bypassed Flow	**Q_b =**	**0.1**	**1.6**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**96**	**62**	**%**

Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)
A8



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.016	
Channel Invert Slope	S_O =	0.0050	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	76.00	ft/ft
Right Side Sloe	Z2 =	76.00	ft/ft

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

Choose One:
- ○ Non-Cohesive
- ○ Cohesive
- ○ Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**30.00**	**30.00**	ft
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**1.00**	ft

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**4.2**	**4.2**	cfs
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.20**	**0.20**	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**1.1**	**3.5**	cfs
Water Depth	d =	**0.12**	**0.18**	ft

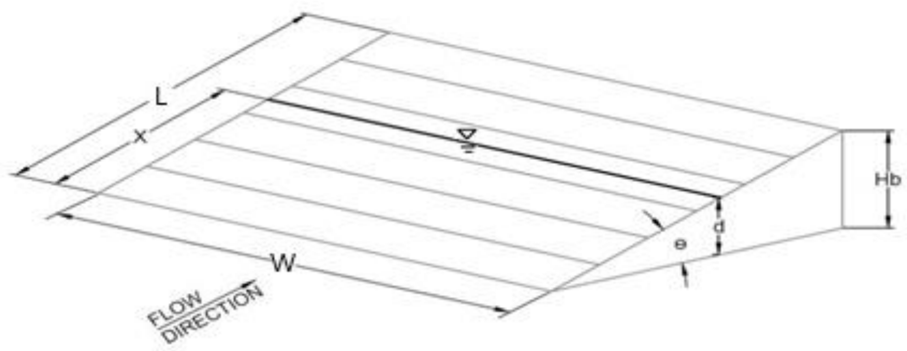
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)
A8

Inlet Design Information (Input)

Type of Inlet: CDOT Type D (In Series) — Inlet Type = CDOT Type D (In Series)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	ft
Length of Grate	L =	6.00	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.78	
Orifice Coefficient	C_o =	0.52	
Weir Coefficient	C_w =	1.67	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.12	0.18	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.2**	**2.4**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**1.1**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**68**	**%**

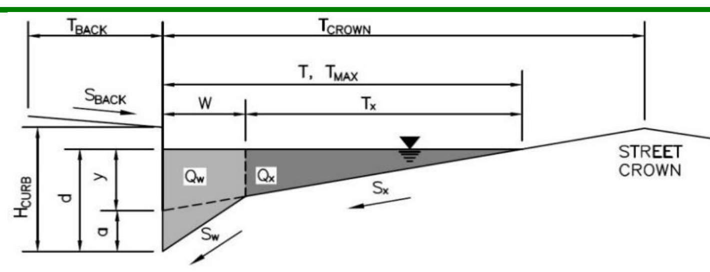
Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

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

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

Project: Veteran's Village - Lot 1 (Street Inlets)

Inlet ID: A9.1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =			ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0		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 =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.054		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		

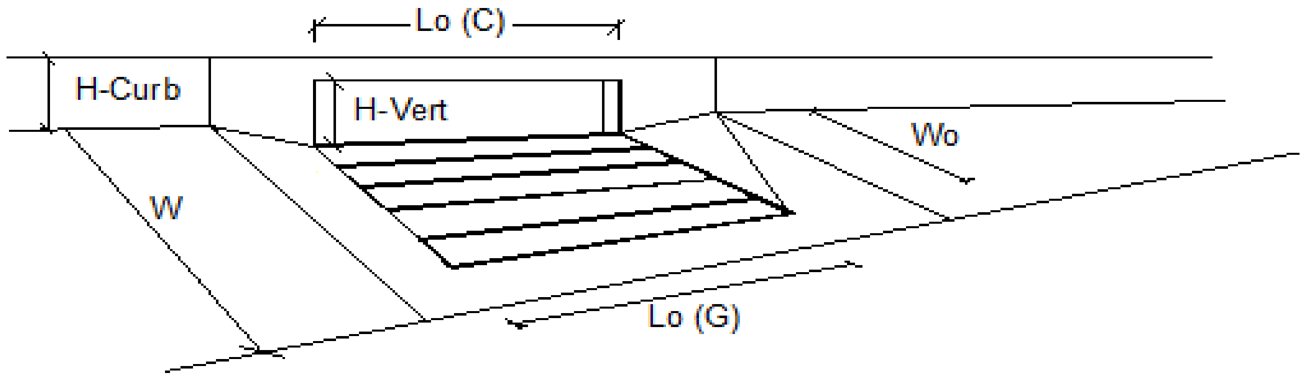
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	6.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	2.0	4.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**0.8**	**7.9**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.30 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 2.23 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)

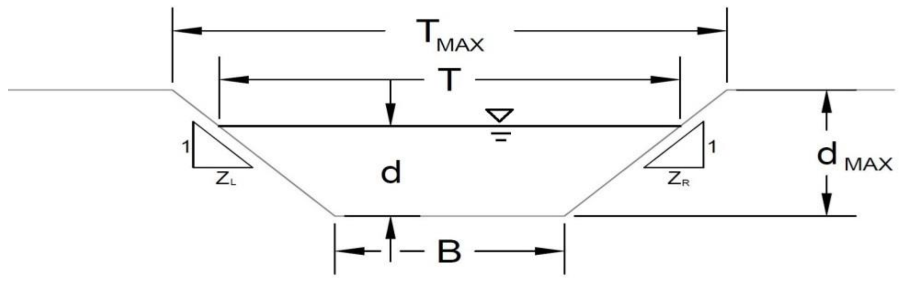


Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	10	10	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.3**	**2.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)
A17



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.016	
Channel Invert Slope	S_O =	0.0050	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	76.00	ft/ft
Right Side Sloe	Z2 =	76.00	ft/ft

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

Choose One:
- ○ Non-Cohesive
- ○ Cohesive
- ◉ Paved

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**30.00**	**60.00**	ft
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**1.00**	ft

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**4.2**	**26.4**	cfs
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.20**	**0.39**	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**1.3**	**3.8**	cfs
Water Depth	d =	**0.13**	**0.19**	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'

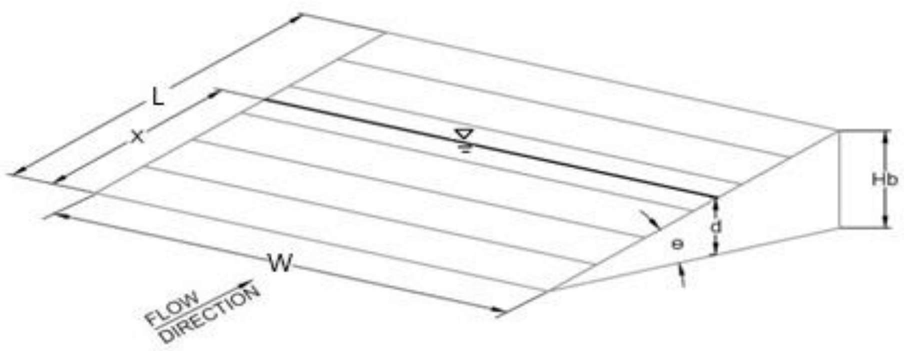
AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)

A17

Inlet Design Information (Input)

Type of Inlet	CDOT Type C	Inlet Type =	CDOT Type C	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	3.00	ft
Length of Grate		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient		C_d =	0.96	
Orifice Coefficient		C_o =	0.64	
Weir Coefficient		C_w =	2.05	

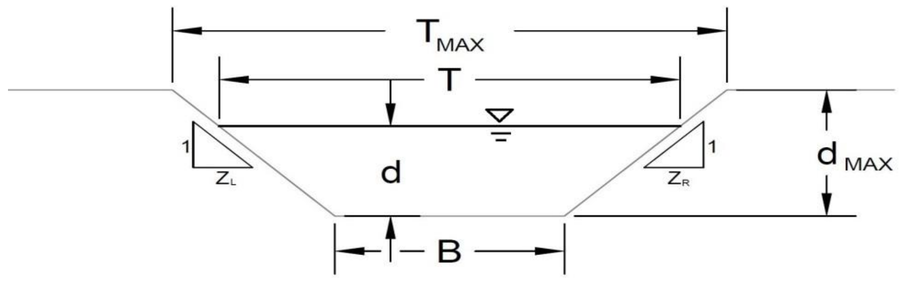


		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.13	0.19	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**0.9**	**1.5**	**cfs**
Bypassed Flow	**Q_b =**	**0.5**	**2.2**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**64**	**41**	**%**

Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)
A13



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.016	
Channel Invert Slope	S_O =	0.0050	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	76.00	ft/ft
Right Side Sloe	Z2 =	76.00	ft/ft

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

Choose One:
- ◯ **Non-Cohesive**
- ◯ **Cohesive**
- ◯ **Paved**

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**30.00**	**60.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**4.2**	**26.4**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.20**	**0.39**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**1.2**	**3.7**	**cfs**
Water Depth	d =	**0.12**	**0.19**	**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'

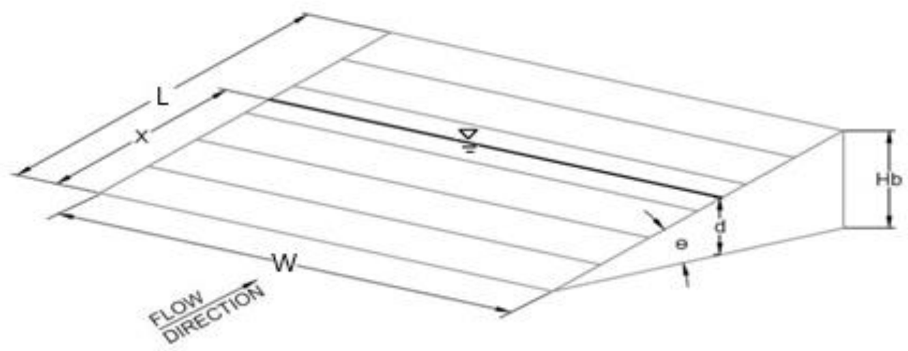
AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)

A13

Inlet Design Information (Input)

Type of Inlet	CDOT Type C	Inlet Type =	CDOT Type C	
Angle of Inclined Grate (must be <= 30 degrees)		θ =	0.00	degrees
Width of Grate		W =	3.00	ft
Length of Grate		L =	3.00	ft
Open Area Ratio		A_{RATIO} =	0.70	
Height of Inclined Grate		H_B =	0.00	ft
Clogging Factor		C_f =	0.50	
Grate Discharge Coefficient		C_d =	0.96	
Orifice Coefficient		C_o =	0.64	
Weir Coefficient		C_w =	2.05	

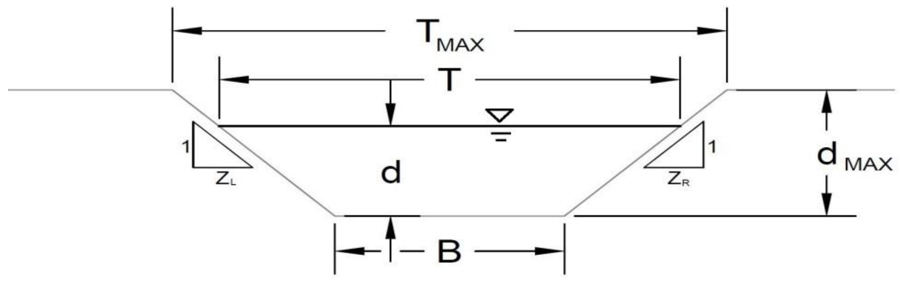


		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.12	0.19	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**0.8**	**1.5**	**cfs**
Bypassed Flow	**Q_b =**	**0.4**	**2.2**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**68**	**41**	**%**

Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)
A12



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.016	
Channel Invert Slope	S_O =	0.0050	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	76.00	ft/ft
Right Side Sloe	Z2 =	76.00	ft/ft

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

Choose One:
- ◯ **Non-Cohesive**
- ◯ **Cohesive**
- ◯ **Paved**

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**30.00**	**60.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**4.2**	**26.4**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.20**	**0.39**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**1.1**	**3.8**	**cfs**
Water Depth	d =	**0.12**	**0.19**	**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'

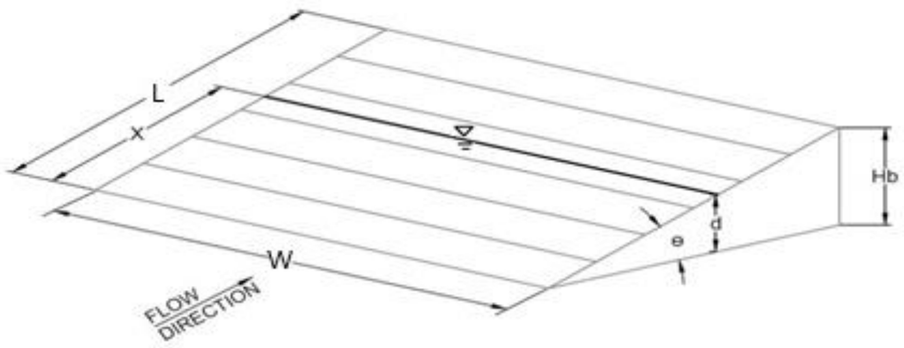
AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)

A12

Inlet Design Information (Input)

Type of Inlet: CDOT Type D (In Series) — Inlet Type = CDOT Type D (In Series)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	ft
Length of Grate	L =	6.00	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.78	
Orifice Coefficient	C_o =	0.52	
Weir Coefficient	C_w =	1.67	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.12	0.19	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.2**	**2.5**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**1.3**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**65**	**%**

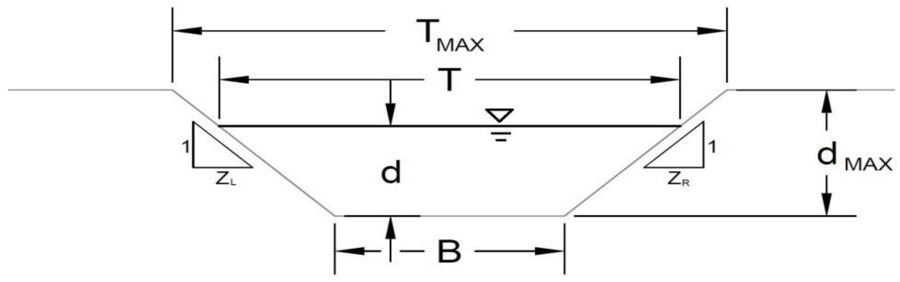
Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

MHFD-Inlet, Version 5.02 (August 2022)

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)

A11



This worksheet uses the NRCS vegetal 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)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.016	
Channel Invert Slope	S_O =	0.0050	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	76.00	ft/ft
Right Side Sloe	Z2 =	76.00	ft/ft

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

Choose One:
- ○ **Non-Cohesive**
- ○ **Cohesive**
- ○ **Paved**

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**24.00**	**24.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**0.50**	**1.00**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**2.3**	**2.3**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.16**	**0.16**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**1.1**	**3.4**	**cfs**
Water Depth	d =	**0.12**	**0.18**	**ft**

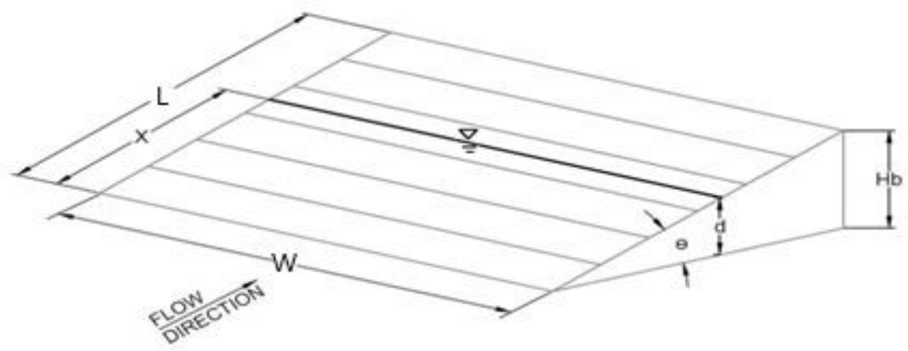
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

Veteran's Village - Lot 1 (Street Inlets)
A11

Inlet Design Information (Input)

Type of Inlet: CDOT Type D (In Series) — Inlet Type = CDOT Type D (In Series)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	ft
Length of Grate	L =	6.00	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.78	
Orifice Coefficient	C_o =	0.52	
Weir Coefficient	C_w =	1.67	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.12	0.18	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.2**	**2.3**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**1.1**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**68**	**%**

Warning 03: Velocity exceeds USDCM Volume I recommendation.
Warning 04: Froude No. exceeds USDCM Volume I recommendation.

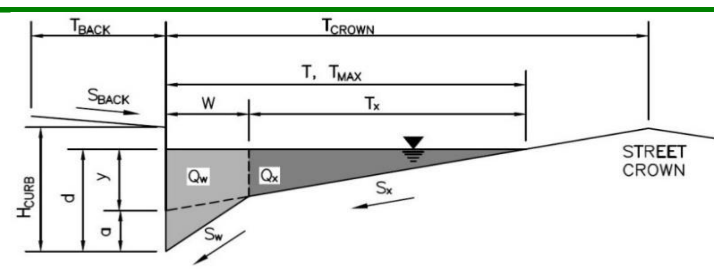
Warning 06: Top Width (T) exceeds max allowable top width (Tmax).

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

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

Project: Veteran's Village - Lot 1 (Street Inlets)

Inlet ID: A10.1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =			ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0		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 =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.054		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	6.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	2.0	3.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

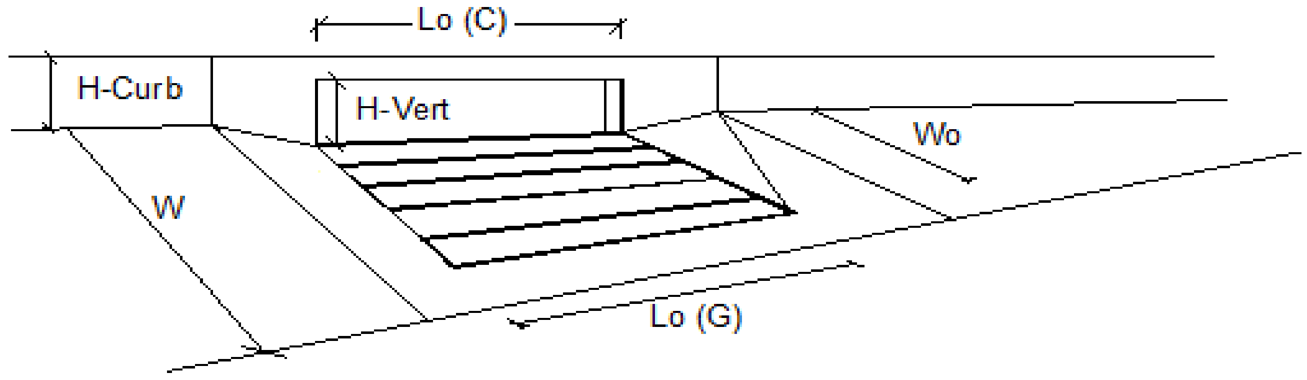
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**0.8**	**2.8**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.40 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 1.89 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.4**	**1.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

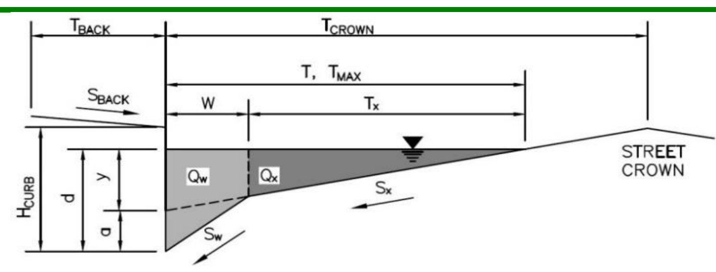
MHFD-Inlet, Version 5.02 (August 2022)

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

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

Project: Veteran's Village - Lot 1 (Street Inlets)

Inlet ID: A15



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.030	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} =	12.0	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.030	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

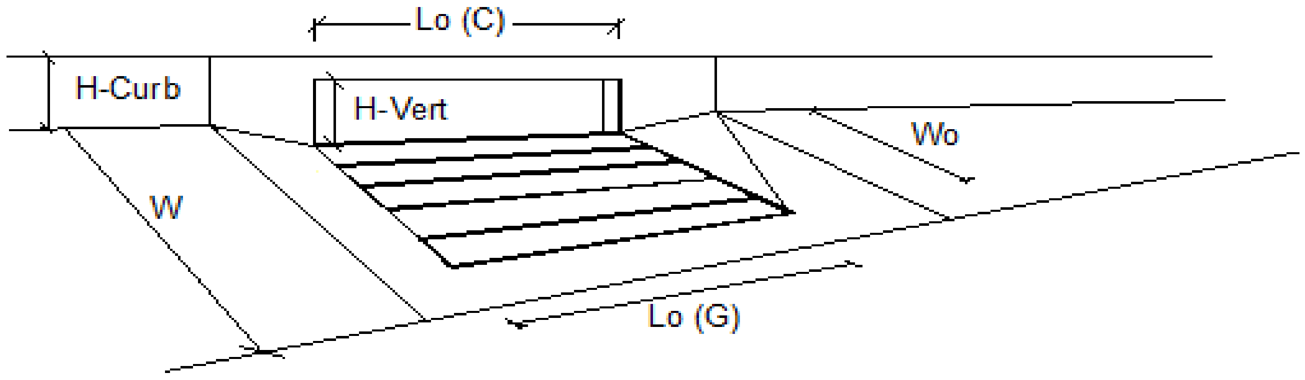
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**8.2**	**8.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.92 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.50 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



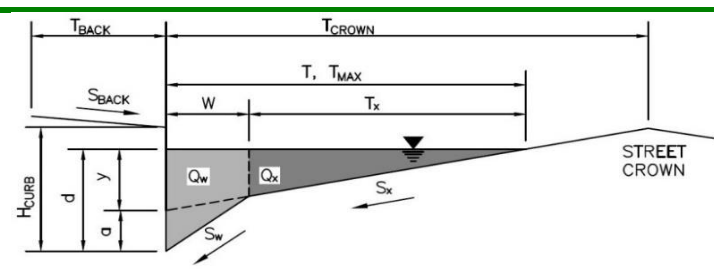
Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.9**	**4.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.2**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**96**	**%**

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

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

Project: **Veteran's Village - Lot 1 (Street Inlets)**
Inlet ID: **A16**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.005	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} =	12.0	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	3.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

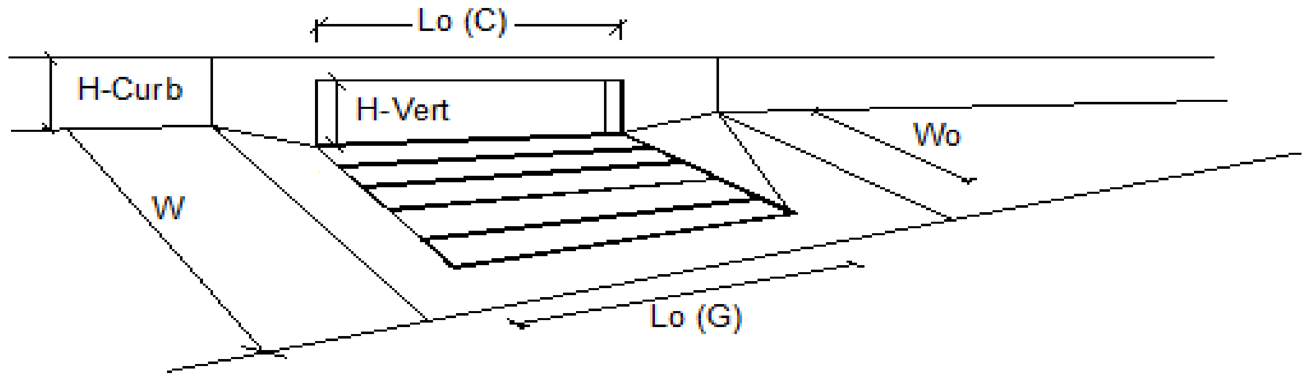
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.2**	**4.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.90 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 1.80 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	

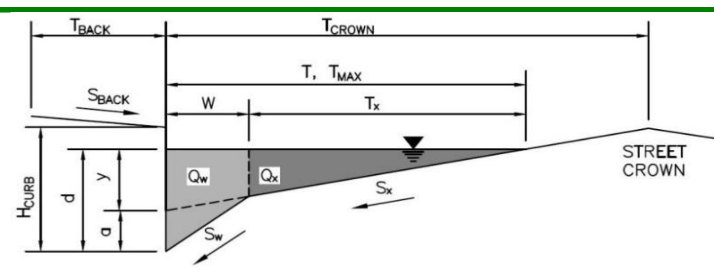
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.9**	**1.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

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

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

Project: Veteran's Village - Lot 1 (Street Inlets)

Inlet ID: A1



Gutter Geometry:

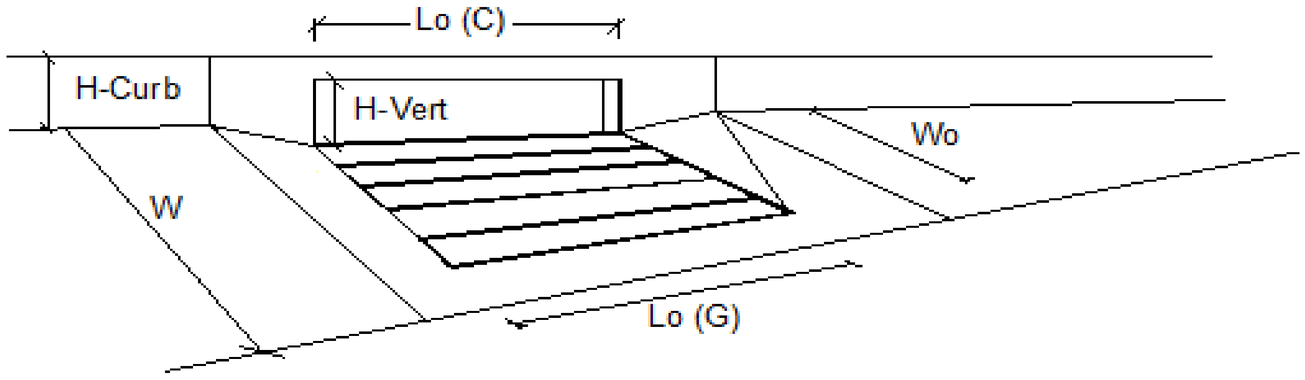
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =			ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.010		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.030		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	3.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**2.5**	**3.3**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.40 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 2.60 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



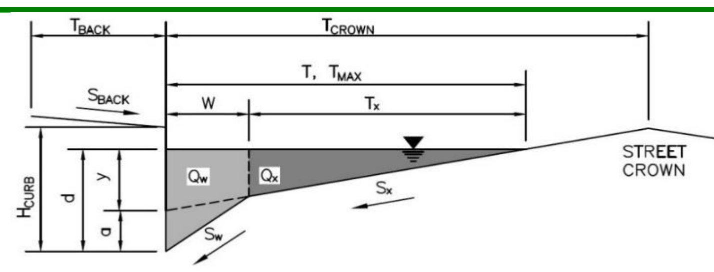
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.4**	**2.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

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

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

Project: Veteran's Village - Lot 1 (Street Inlets)
Inlet ID: A2



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		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} =	12.0	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 =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.030	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

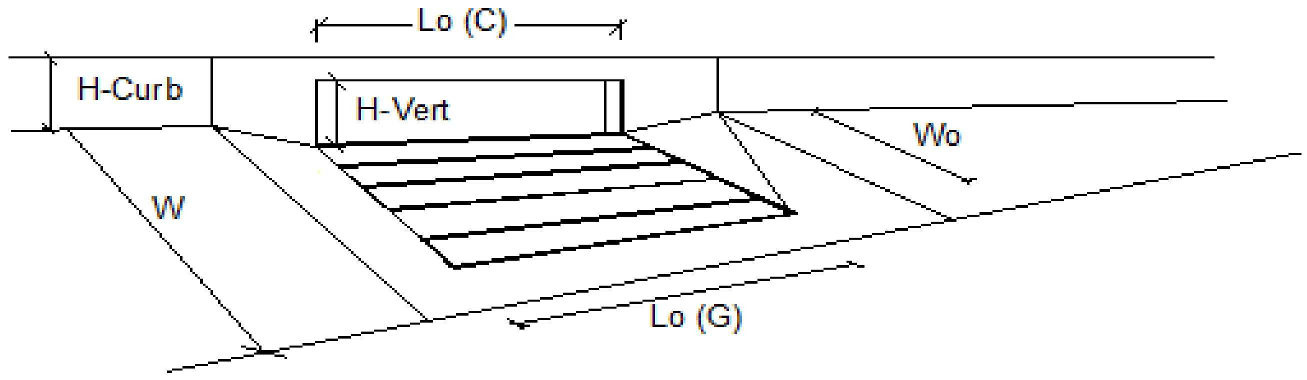
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**5.9**	**8.2**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 1.80 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 3.50 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



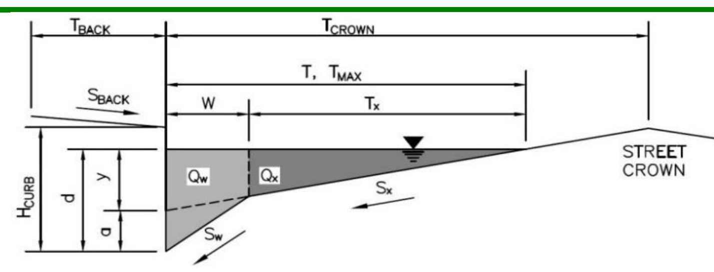
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.8**	**3.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

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

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

Project: **Veteran's Village - Lot 1 (Street Inlets)**
Inlet ID: **P6 - LOT 2**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	6.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.015		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.035		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	2.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	6.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

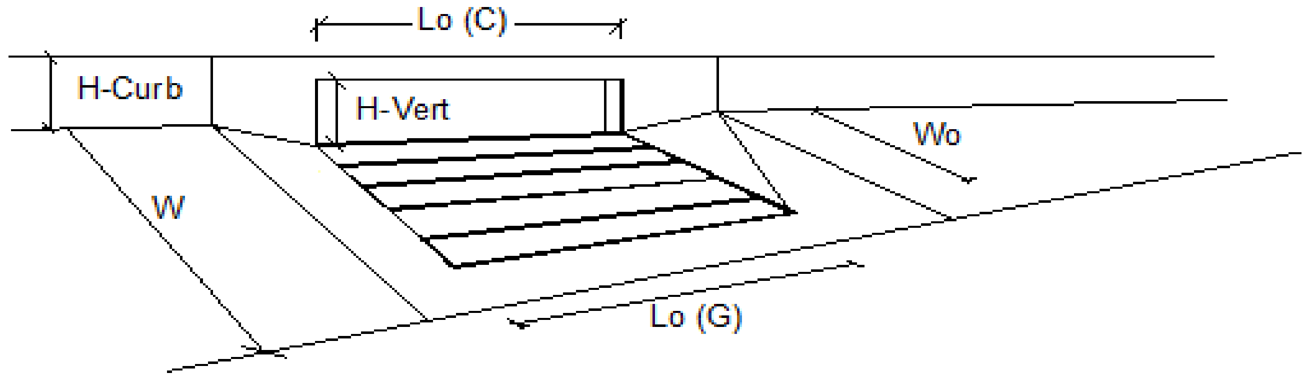
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**4.4**	**4.4**	**cfs**

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'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	

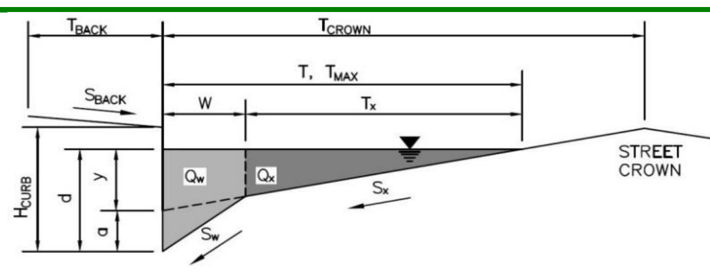
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.5**	**0.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**92**	**%**

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

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

Project: Veteran's Village - Lot 1 (Street Inlets)

Inlet ID: A9.2



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.030	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.050	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

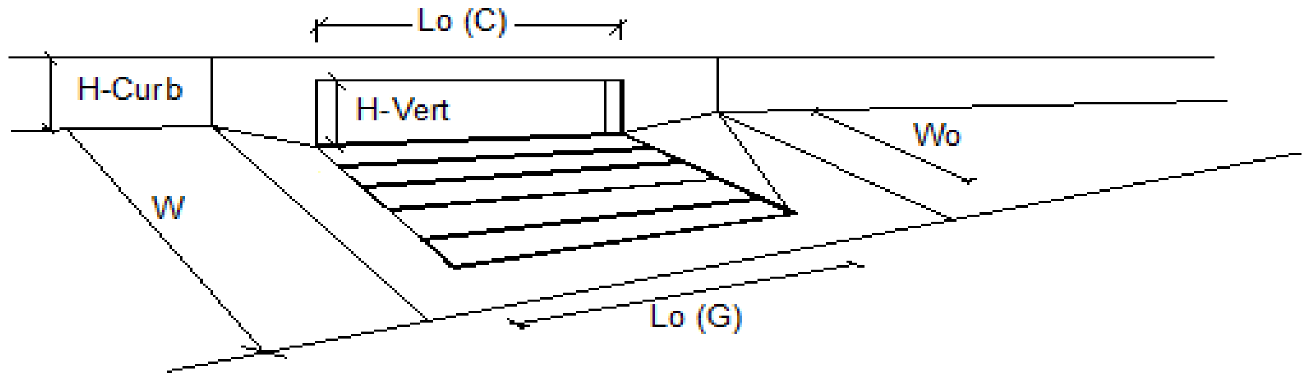
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**11.8**	**11.8**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.30 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 0.60 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	

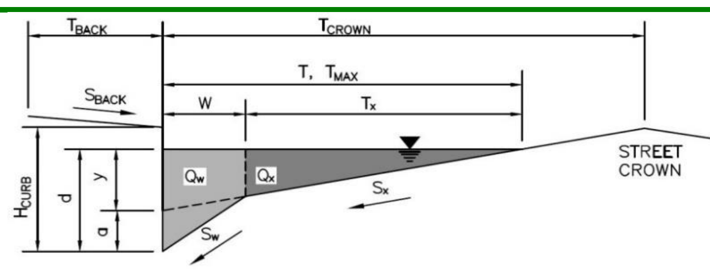
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.3**	**0.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

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

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

Project: Veteran's Village - Lot 1 (Street Inlets)

Inlet ID: A10.2



Gutter Geometry:

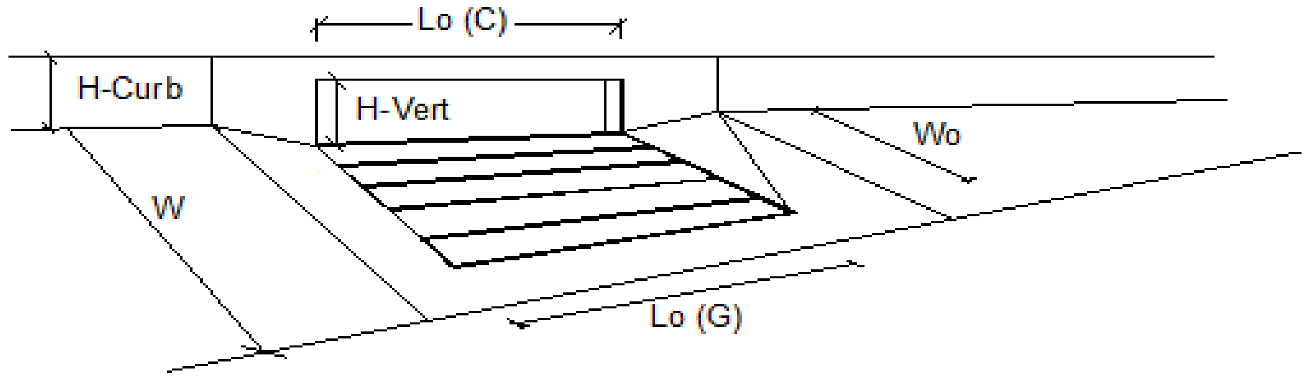
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =			ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.030		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.050		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**11.8**	**11.8**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.40 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 0.80 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.02 (August 2022)



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.4**	**0.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

Worksheet for Gutter Pan Cross Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.005 ft/ft
Discharge	1.70 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.300
0+02.50	0.000
0+05.00	0.300

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.300)	(0+05.00, 0.300)	0.013

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	3.60 in
Roughness Coefficient	0.013
Elevation	0.300 ft
Elevation Range	0.0 to 0.3 ft
Flow Area	0.7 ft²
Wetted Perimeter	5.0 ft
Hydraulic Radius	1.79 in
Top Width	5.00 ft
Normal Depth	3.60 in
Critical Depth	3.64 in
Critical Slope	0.005 ft/ft
Velocity	2.27 ft/s
Velocity Head	0.080 ft
Specific Energy	0.38 ft
Froude Number	1.034
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 in

Worksheet for Gutter Pan Cross Section

GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.60 in
Critical Depth	3.64 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

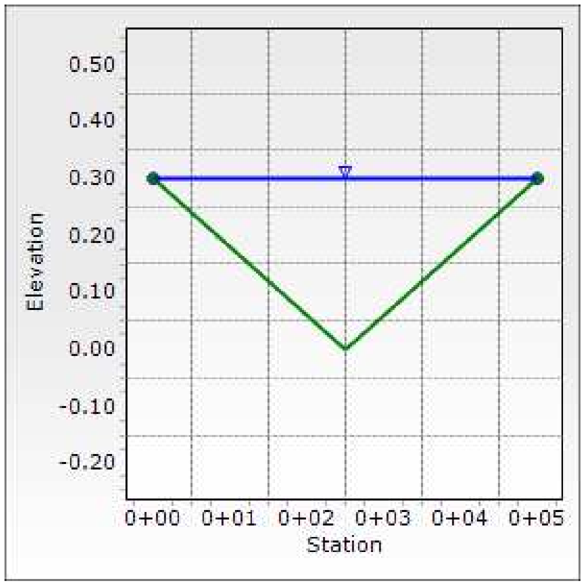
Cross Section for Gutter Pan Cross Section

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.005 ft/ft
Normal Depth	3.60 in
Discharge	1.70 cfs



Worksheet for Inlet A20.1 cross section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.015 ft/ft
Discharge	12.42 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+19.55	59.060
0+26.86	57.700
0+46.93	59.100

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+19.55, 59.060)	(0+46.93, 59.100)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	7.93 in
Roughness Coefficient	0.030
Elevation	58.361 ft
Elevation Range	57.7 to 59.1 ft
Flow Area	4.3 ft²
Wetted Perimeter	13.1 ft
Hydraulic Radius	3.94 in
Top Width	13.02 ft
Normal Depth	7.93 in
Critical Depth	7.55 in
Critical Slope	0.019 ft/ft
Velocity	2.89 ft/s
Velocity Head	0.130 ft
Specific Energy	0.79 ft
Froude Number	0.886
Flow Type	Subcritical

GVF Input Data

Worksheet for Inlet A20.1 cross section

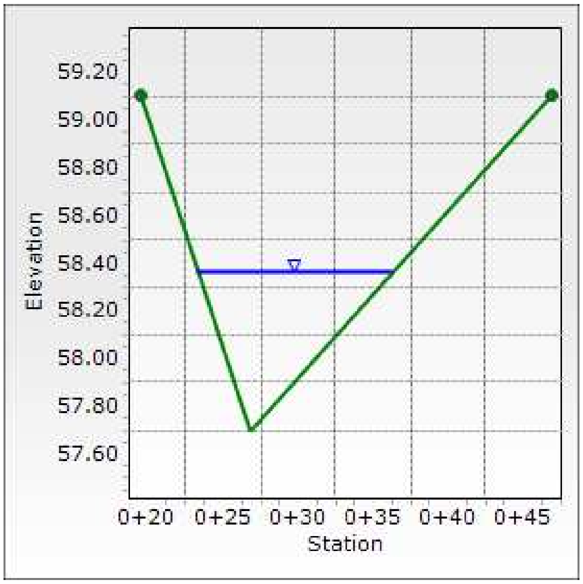
GVF Input Data	
Downstream Depth	0.00 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	7.93 in
Critical Depth	7.55 in
Channel Slope	0.015 ft/ft
Critical Slope	0.019 ft/ft

Cross Section for Inlet A20.1 cross section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.015 ft/ft
Normal Depth	7.93 in
Discharge	12.42 cfs



Worksheet for Inlet A20.2 cross section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.015 ft/ft
Discharge	12.42 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+51.86	55.600
0+56.47	55.000
1+02.75	55.600

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+51.86, 55.600)	(1+02.75, 55.600)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	4.58 in
Roughness Coefficient	0.030
Elevation	55.382 ft
Elevation Range	55.0 to 55.6 ft
Flow Area	6.2 ft²
Wetted Perimeter	32.4 ft
Hydraulic Radius	2.29 in
Top Width	32.40 ft
Normal Depth	4.58 in
Critical Depth	4.21 in
Critical Slope	0.023 ft/ft
Velocity	2.01 ft/s
Velocity Head	0.063 ft
Specific Energy	0.44 ft
Froude Number	0.810
Flow Type	Subcritical

GVF Input Data

Worksheet for Inlet A20.2 cross section

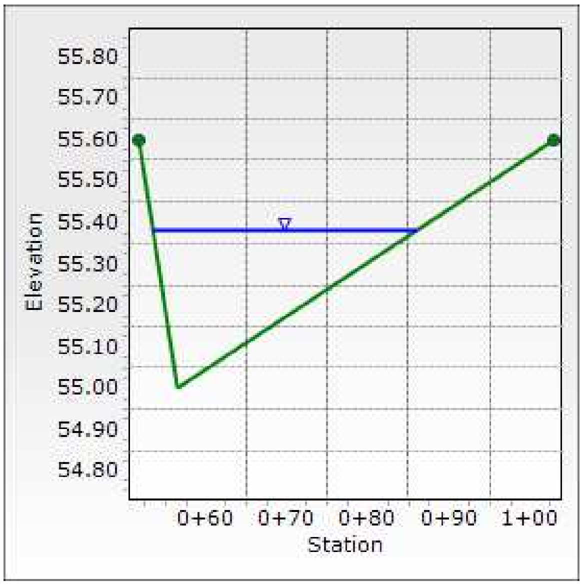
GVF Input Data	
Downstream Depth	0.00 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	4.58 in
Critical Depth	4.21 in
Channel Slope	0.015 ft/ft
Critical Slope	0.023 ft/ft

Cross Section for Inlet A20.2 cross section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.015 ft/ft
Normal Depth	4.58 in
Discharge	12.42 cfs



Worksheet for Street Cross Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.005 ft/ft
Discharge	3.60 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.600
0+30.00	0.000
0+60.00	0.600

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.600)	(0+60.00, 0.600)	0.016

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	2.62 in
Roughness Coefficient	0.016
Elevation	0.219 ft
Elevation Range	0.0 to 0.6 ft
Flow Area	2.4 ft²
Wetted Perimeter	21.9 ft
Hydraulic Radius	1.31 in
Top Width	21.87 ft
Normal Depth	2.62 in
Critical Depth	2.40 in
Critical Slope	0.008 ft/ft
Velocity	1.51 ft/s
Velocity Head	0.035 ft
Specific Energy	0.25 ft
Froude Number	0.803
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 in

Worksheet for Street Cross Section

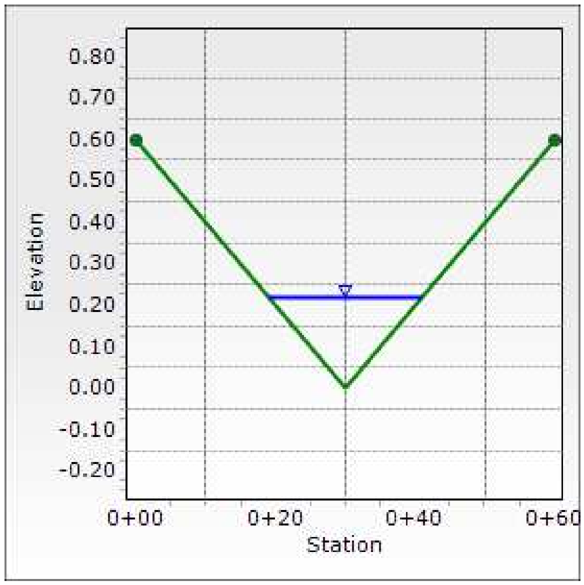
GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.62 in
Critical Depth	2.40 in
Channel Slope	0.005 ft/ft
Critical Slope	0.008 ft/ft

Cross Section for Street Cross Section

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.005 ft/ft
Normal Depth	2.62 in
Discharge	3.60 cfs



Worksheet for Swala A: Basin O1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.020 ft/ft
Discharge	8.61 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.800
0+04.00	0.000
0+08.00	0.800

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.800)	(0+08.00, 0.800)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	8.48 in
Roughness Coefficient	0.030
Elevation	0.706 ft
Elevation Range	0.0 to 0.8 ft
Flow Area	2.5 ft²
Wetted Perimeter	7.2 ft
Hydraulic Radius	4.16 in
Top Width	7.06 ft
Normal Depth	8.48 in
Critical Depth	8.55 in
Critical Slope	0.019 ft/ft
Velocity	3.45 ft/s
Velocity Head	0.185 ft
Specific Energy	0.89 ft
Froude Number	1.024
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.00 in

Worksheet for Swala A: Basin O1

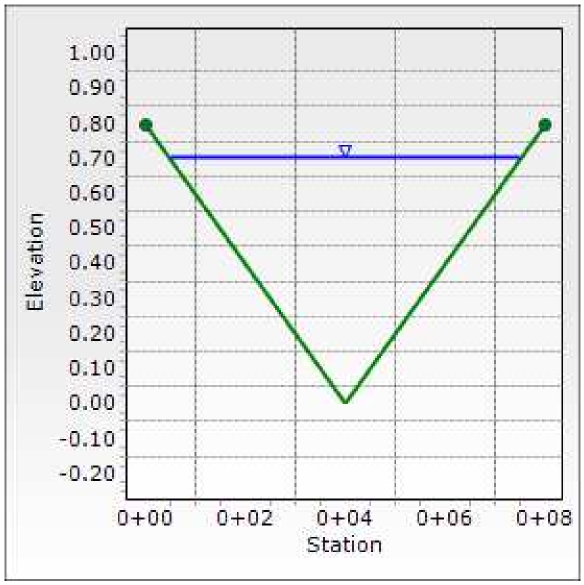
GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	8.48 in
Critical Depth	8.55 in
Channel Slope	0.020 ft/ft
Critical Slope	0.019 ft/ft

Cross Section for Swala A: Basin O1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.020 ft/ft
Normal Depth	8.48 in
Discharge	8.61 cfs



Worksheet for Swale B: Basin A18

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.018 ft/ft
Discharge	6.24 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.600
0+02.50	0.000
0+14.50	0.600

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.600)	(0+14.50, 0.600)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	5.49 in
Roughness Coefficient	0.030
Elevation	0.457 ft
Elevation Range	0.0 to 0.6 ft
Flow Area	2.5 ft²
Wetted Perimeter	11.1 ft
Hydraulic Radius	2.73 in
Top Width	11.05 ft
Normal Depth	5.49 in
Critical Depth	5.29 in
Critical Slope	0.022 ft/ft
Velocity	2.47 ft/s
Velocity Head	0.095 ft
Specific Energy	0.55 ft
Froude Number	0.911
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.00 in

Worksheet for Swale B: Basin A18

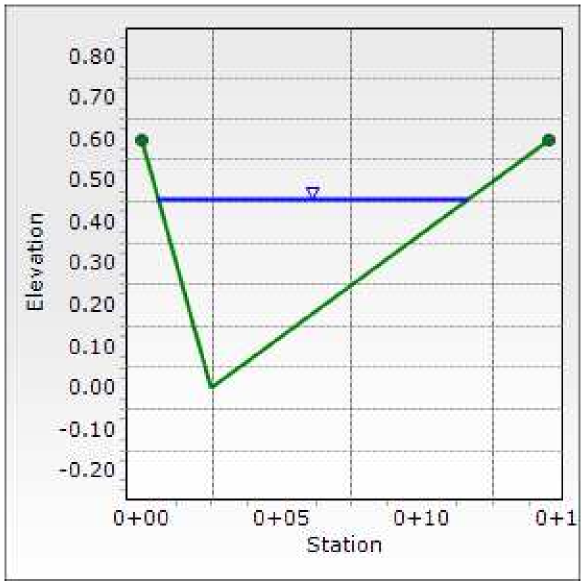
GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.49 in
Critical Depth	5.29 in
Channel Slope	0.018 ft/ft
Critical Slope	0.022 ft/ft

Cross Section for Swale B: Basin A18

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.018 ft/ft
Normal Depth	5.49 in
Discharge	6.24 cfs



Worksheet for Swale C: Basin A18

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.050 ft/ft
Discharge	0.70 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.700
0+02.50	0.500
0+05.00	0.700

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.700)	(0+05.00, 0.700)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	1.97 in
Roughness Coefficient	0.030
Elevation	0.664 ft
Elevation Range	0.5 to 0.7 ft
Flow Area	0.3 ft²
Wetted Perimeter	4.1 ft
Hydraulic Radius	0.98 in
Top Width	4.10 ft
Normal Depth	1.97 in
Critical Depth	2.17 in
Critical Slope	0.029 ft/ft
Velocity	2.09 ft/s
Velocity Head	0.068 ft
Specific Energy	0.23 ft
Froude Number	1.285
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 in

Worksheet for Swale C: Basin A18

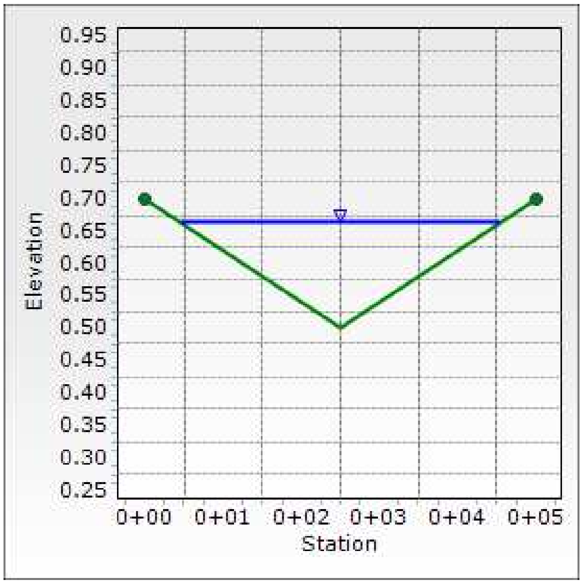
GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.97 in
Critical Depth	2.17 in
Channel Slope	0.050 ft/ft
Critical Slope	0.029 ft/ft

Cross Section for Swale C: Basin A18

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.050 ft/ft
Normal Depth	1.97 in
Discharge	0.70 cfs



Worksheet for Swale D: Basin UD1

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.028 ft/ft
Discharge	0.25 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.700
0+02.50	0.500
0+05.00	0.700

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.700)	(0+05.00, 0.700)	0.030

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	1.49 in
Roughness Coefficient	0.030
Elevation	0.624 ft
Elevation Range	0.5 to 0.7 ft
Flow Area	0.2 ft²
Wetted Perimeter	3.1 ft
Hydraulic Radius	0.74 in
Top Width	3.10 ft
Normal Depth	1.49 in
Critical Depth	1.44 in
Critical Slope	0.034 ft/ft
Velocity	1.30 ft/s
Velocity Head	0.026 ft
Specific Energy	0.15 ft
Froude Number	0.918
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 in

Worksheet for Swale D: Basin UD1

GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.49 in
Critical Depth	1.44 in
Channel Slope	0.028 ft/ft
Critical Slope	0.034 ft/ft

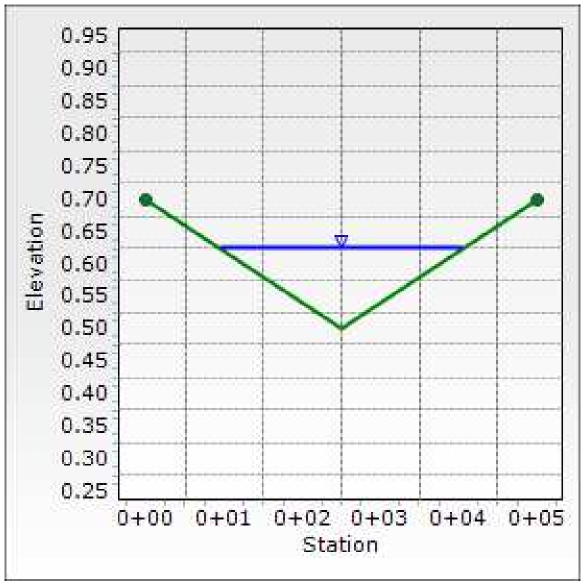
Cross Section for Swale D: Basin UD1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.028 ft/ft
Normal Depth	1.49 in
Discharge	0.25 cfs



Worksheet for Swale E: Basin OS3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.028 ft/ft
Discharge	0.41 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.700
0+02.50	0.500
0+05.00	0.700

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.700)	(0+05.00, 0.700)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	1.80 in
Roughness Coefficient	0.030
Elevation	0.650 ft
Elevation Range	0.5 to 0.7 ft
Flow Area	0.3 ft²
Wetted Perimeter	3.8 ft
Hydraulic Radius	0.90 in
Top Width	3.74 ft
Normal Depth	1.80 in
Critical Depth	1.76 in
Critical Slope	0.031 ft/ft
Velocity	1.46 ft/s
Velocity Head	0.033 ft
Specific Energy	0.18 ft
Froude Number	0.944
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.00 in

Worksheet for Swale E: Basin OS3

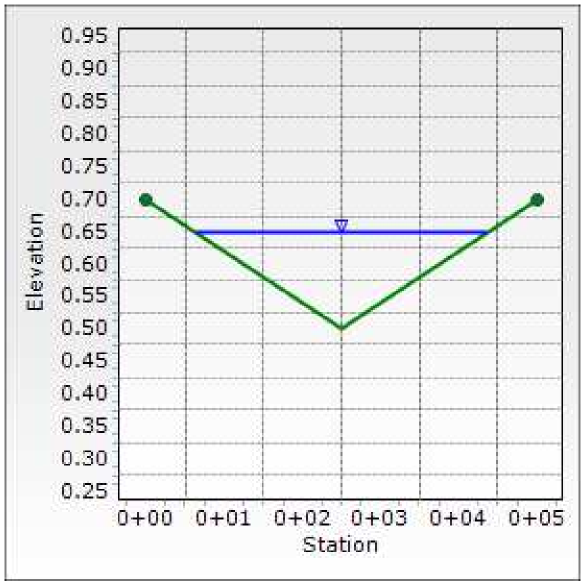
GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.80 in
Critical Depth	1.76 in
Channel Slope	0.028 ft/ft
Critical Slope	0.031 ft/ft

Cross Section for Swale E: Basin OS3

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.028 ft/ft
Normal Depth	1.80 in
Discharge	0.41 cfs



Worksheet for Swale F: Basin O2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.028 ft/ft
Discharge	4.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.000
0+04.00	0.000
0+08.00	1.000

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.000)	(0+08.00, 1.000)	0.030

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	6.50 in
Roughness Coefficient	0.030
Elevation	0.542 ft
Elevation Range	0.0 to 1.0 ft
Flow Area	1.2 ft²
Wetted Perimeter	4.5 ft
Hydraulic Radius	3.16 in
Top Width	4.34 ft
Normal Depth	6.50 in
Critical Depth	6.88 in
Critical Slope	0.021 ft/ft
Velocity	3.40 ft/s
Velocity Head	0.180 ft
Specific Energy	0.72 ft
Froude Number	1.153
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.00 in

Worksheet for Swale F: Basin O2

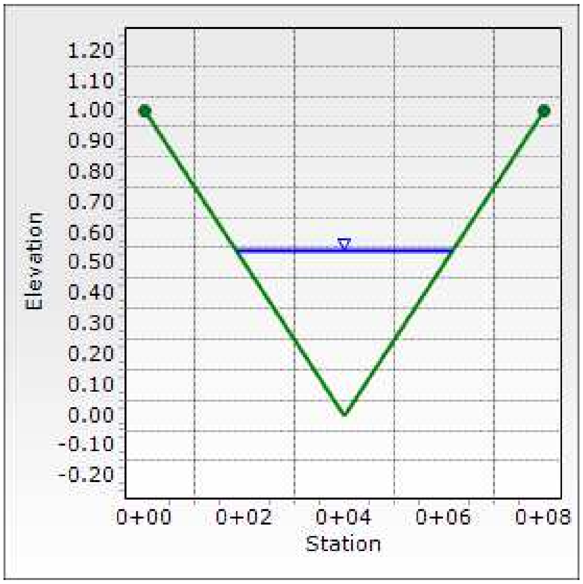
GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.50 in
Critical Depth	6.88 in
Channel Slope	0.028 ft/ft
Critical Slope	0.021 ft/ft

Cross Section for Swale F: Basin O2

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.028 ft/ft
Normal Depth	6.50 in
Discharge	4.00 cfs



APPENDIX E - DRAINAGE EXHIBITS

LEGEND

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

= DESIGN POINT

FLOW DIRECTION

PROPERTY BOUNDARY

EASEMENT

EXISTING STORM SEWER

EXISTING STORM MANHOLE

EXISTING STORM INLET

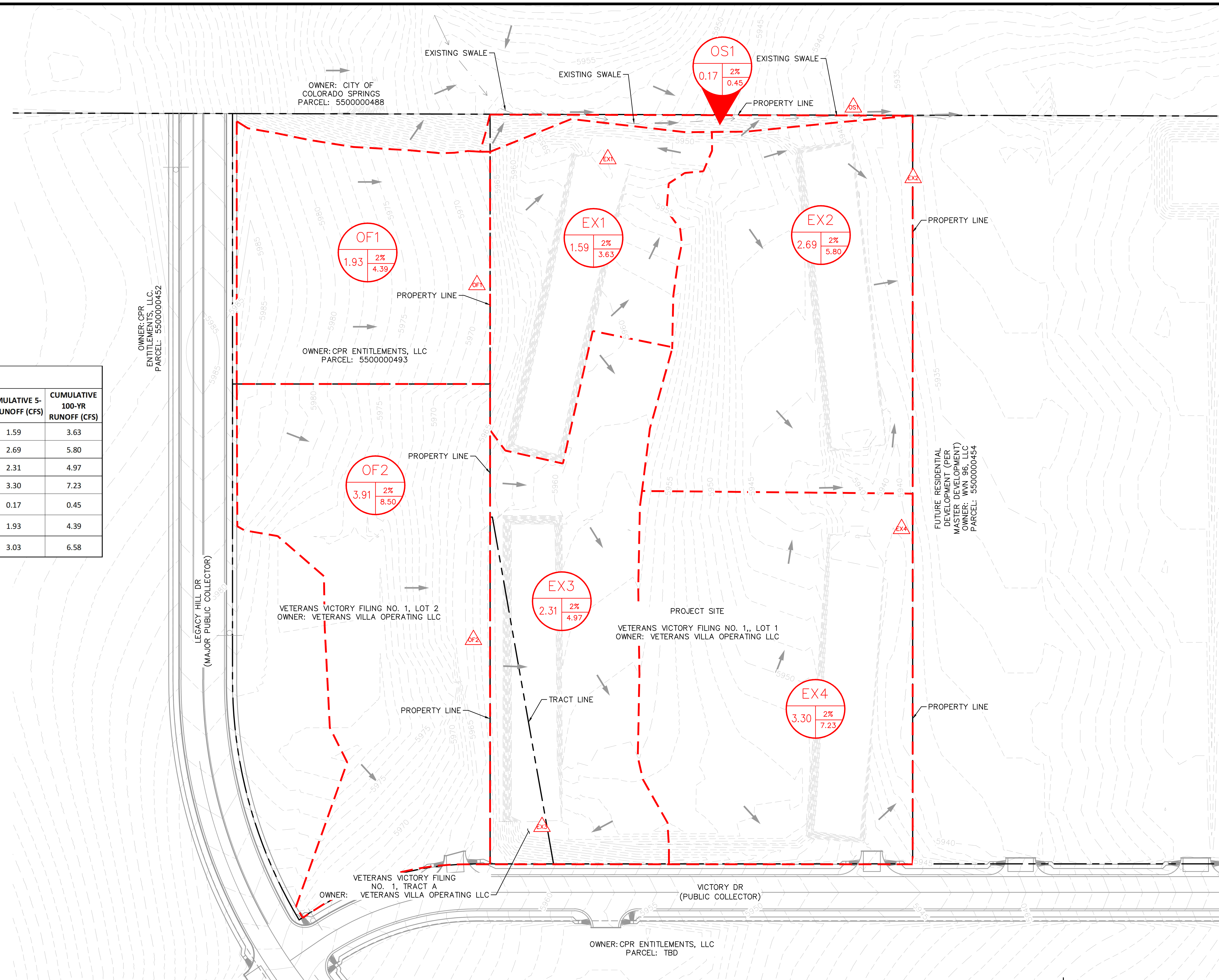
DRAINAGE BASIN BOUNDARY

EXISTING MAJOR CONTOUR

EXISTING MINOR CONTOUR

SUMMARY - EXISTING RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
EX-1	EX-1	1.59	0.49	3.63	1.59	3.63
EX-2	EX-2	2.69	0.79	5.80	2.69	5.80
EX-3	EX-3	2.31	0.68	4.97	2.31	4.97
EX-4	EX-4	3.30	0.98	7.23	3.30	7.23
OS1	OS1	0.17	0.06	0.45	0.17	0.45
OF1	OF1	1.93	0.60	4.39	1.93	4.39
OF2	OF2	3.03	0.90	6.58	3.03	6.58



NORTH

GRAPHIC SCALE IN FEET
0 30 60 120

NORTH

GRAPHIC SCALE IN FEET
0 30 60 120

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Kimley»Horn

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2 North Nevada Avenue, Suite 900
Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: SLG
DRAWN BY: SLG
CHECKED BY: JJM
DATE: 07/21/23

VETERANS VICTORY
LOT 1 VILLAGES AT WATERVIEW NORTH
EXISTING DRAINAGE MAP

PRELIMINARY
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Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
096955000

SHEET
1 OF 1

LEGEND

A = BASIN DESIGNATION
B = AREA (ACRES)
C = BASIN IMPERVIOUSNESS
D = 100YR DESIGN STORM RUNOFF (CFS)
# = DESIGN POINT

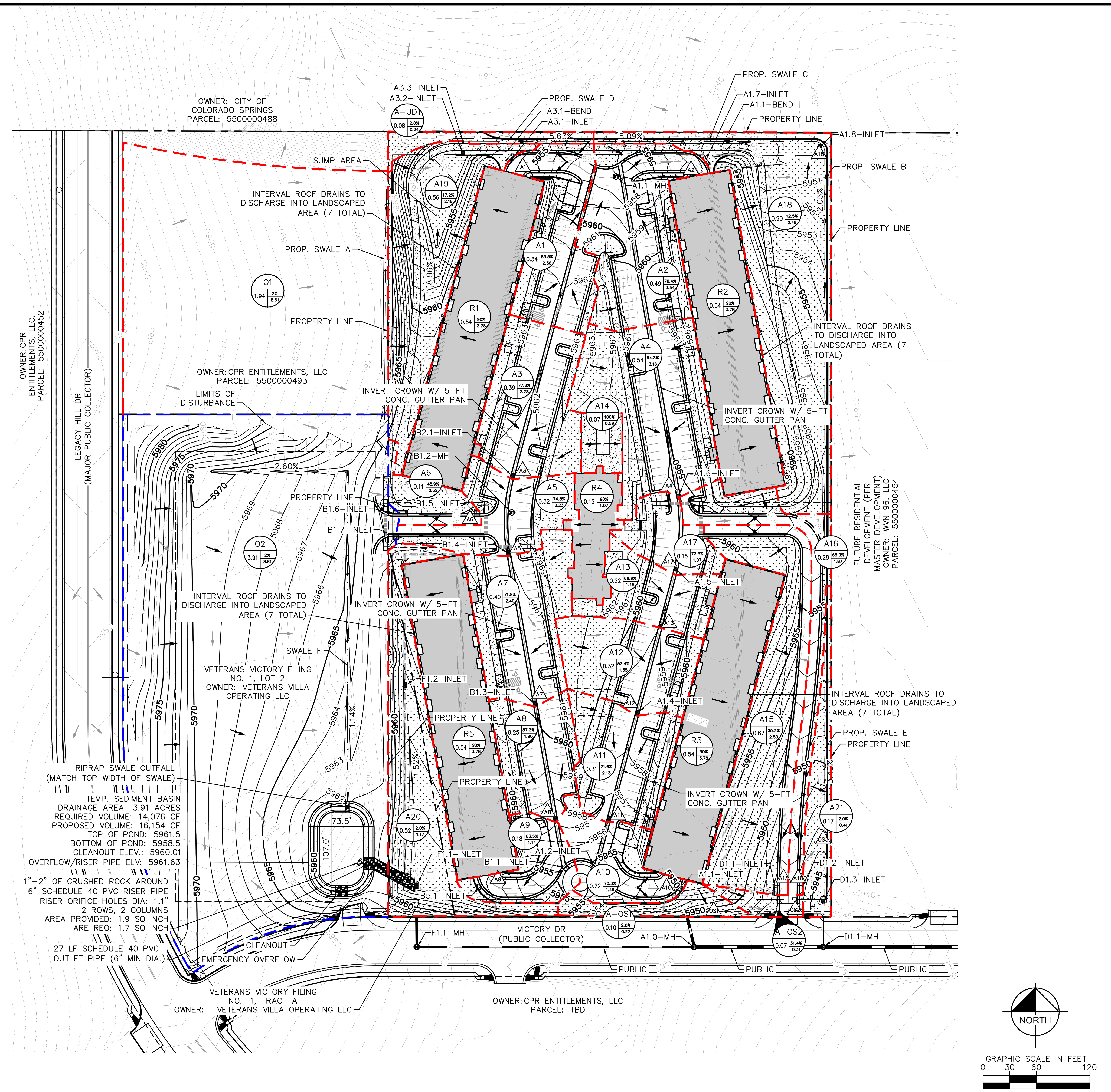
FLOW DIRECTION
PROPERTY BOUNDARY
EASEMENT
LIMITS OF DISTURBANCE
EXISTING STORM SEWER
PROPOSED STORM SEWER
EXISTING/PROPOSED STORM MH
EXISTING/PROPOSED STORM INLET
DRAINAGE BASIN BOUNDARY
XXXX PROPOSED MAJOR CONTOUR
XXXX PROPOSED MINOR CONTOUR
XXXX EXISTING MAJOR CONTOUR
XXXX EXISTING MINOR CONTOUR
REF. VETERAN'S VICTORY FILING NO. 1 LOT 2 FDR FOR DESIGN IN THIS AREA. TEMPORARY OVERLOT GRADING SHOWN FOR PURPOSE OF THIS REPORT

NOTES

1. ALL PROPOSED CURB AND GUTTER COS STD TYPE-2 UNLESS OTHERWISE NOTED IN PLAN.
2. ALL STORM SEWER IS PRIVATE UNLESS OTHERWISE NOTED ON PLAN.
3. REFERENCE SHEET 2 FOR THE PIPE AND STRUCTURE INFORMATION (PIPE: SIZE, MATERIAL. STRC: SIZE, TYPE, OWNERSHIP)
4. REFERENCE VETERAN'S VICTORY FILING NO. 1 LOT 2 FDR FOR DESIGN OF ADJACENT SW LOT.

SUMMARY - PROPOSED RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)	Weighted Imperviousness
A1	A1	0.34	1.35	2.56	1.35	2.56	83.5%
A2	A2	0.49	1.84	3.54	1.84	3.54	78.4%
A3	A3	0.39	1.44	2.78	1.60	3.08	77.8%
A4	A4	0.54	1.53	3.16	1.70	3.45	64.3%
A5	A5	0.32	1.14	2.23	1.28	2.50	74.8%
A6	A6	0.11	0.23	0.52	0.23	0.52	48.9%
A7	A7	0.40	1.21	2.40	1.35	2.66	71.8%
A8	A8	0.25	1.02	1.90	1.02	1.90	87.3%
A9	A9	0.18	0.55	1.14	0.55	1.14	63.5%
A10	A10	0.22	0.73	1.46	0.73	1.46	70.3%
A11	A11	0.31	1.07	2.13	1.07	2.13	71.6%
A12	A12	0.32	0.70	1.55	0.70	1.55	53.4%
A13	A13	0.22	0.72	1.45	0.86	1.71	68.9%
A14	A14	0.07	0.33	0.59	0.33	0.59	100.0%
A15	A15	0.67	0.90	2.50	0.90	2.50	30.2%
A16	A16	0.28	0.93	1.87	0.93	1.87	68.0%
A17	A17	0.15	0.54	1.07	0.68	1.33	73.5%
A18	A18	0.90	0.59	2.46	2.62	6.24	12.5%
A19	A19	0.56	0.60	2.16	2.63	5.94	17.2%
A20	A20	0.52	0.16	1.17	2.19	4.95	2.0%
R1	R1	0.54	2.03	3.78	2.03	3.78	90.0%
R2	R2	0.54	2.03	3.78	2.03	3.78	90.0%
R3	R3	0.54	2.03	3.78	2.03	3.78	90.0%
R4	R4	0.15	0.57	1.07	0.57	1.07	90.0%
R5	R5	0.54	2.03	3.78	2.03	3.78	90.0%
A-OS1	A-OS1	0.10	0.04	0.27	0.04	0.27	2.0%
A-OS2	A-OS2	0.07	0.11	0.31	0.11	0.31	31.4%
A-OS3	A-OS3	0.17	0.06	0.41	0.06	0.41	2.0%
A-UD1	A-UD1	0.08	0.03	0.24	0.03	0.24	2.0%
Total		9.97	26.51	56.06	-	-	58.5%
O1	O1	1.94	1.94	0.06	1.94	0.06	2.0%
O2	O2	3.91	3.91	0.10	3.91	0.10	2.0%



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DESIGNED BY: SLG
DRAWN BY: SLG
CHECKED BY: JJM
DATE: 08/08/23

VETERANS VICTORY
LOT 1 VILLAGES AT WATERVIEW NORTH
PROPOSED DRAINAGE MAP (1 OF 2)

PRELIMINARY
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Kimley»Horn Kimley-Horn and Associates, Inc.

PROJECT NO. 096955000

SHEET 1 OF 2

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STRUCTURE TABLE			
STRUCTURE NAME:	DETAILS:	PIPES IN:	PIPES OUT
A1.0–MH	EX. PUBLIC 5' COS TYPE II MH	FROM 30" REINFORCED CONCRETE (N)	TO 42" REINFORCED CONCRETE (E) TO 24" REINFORCED CONCRETE (W)
A1.1–BEND	45° BEND	FROM 12" REINFORCED CONCRETE (E)	TO 12" REINFORCED CONCRETE (SW)
A1.1–INLET	PROP. 5' TYPE R INLET	FROM 30" REINFORCED CONCRETE (W)	TO 30" REINFORCED CONCRETE (S)
A1.1–MH	PROP. 5' COS TYPE II MH	FROM 18" REINFORCED CONCRETE (W) FROM 18" REINFORCED CONCRETE (E)	TO 18" REINFORCED CONCRETE (S)
A1.2–INLET	PROP. 5' TYPE R INLET	FROM 24" REINFORCED CONCRETE (W) FROM 24" REINFORCED CONCRETE (N)	TO 30" REINFORCED CONCRETE (E)
A1.3–INLET	PROP. CDOT TYPE D INLET	FROM 24" REINFORCED CONCRETE (N)	TO 24" REINFORCED CONCRETE (S)
A1.4–INLET	PROP. CDOT TYPE D INLET	FROM 24" REINFORCED CONCRETE (N)	TO 24" REINFORCED CONCRETE (S)
A1.5–INLET	PROP. CDOT TYPE C INLET	FROM 18" REINFORCED CONCRETE (N)	TO 24" REINFORCED CONCRETE (S)
A1.6–INLET	PROP. CDOT TYPE C INLET	FROM 18" REINFORCED CONCRETE (N)	TO 18" REINFORCED CONCRETE (S)
A1.7–INLET	PROP. 10' TYPE R INLET	FROM 12" REINFORCED CONCRETE (NE)	TO 18" REINFORCED CONCRETE (W)
A1.8–INLET	PROP. CDOT TYPE C INLET		TO 12" REINFORCED CONCRETE (W)
A3.1–BEND	45° BEND	FROM 12" REINFORCED CONCRETE (W)	TO 12" REINFORCED CONCRETE (SE)
A3.1–INLET	PROP. 10' TYPE R INLET	FROM 12" REINFORCED CONCRETE (NW)	TO 18" REINFORCED CONCRETE (E)
A3.2–INLET	PROP. CDOT TYPE C INLET	FROM 8" PVC (N)	TO 12" REINFORCED CONCRETE (E)
A3.3–INLET	PROP. 12" NYLOPLAST AREA DRAIN		TO 8" PVC (S)
B1.1–INLET	PROP. 5' TYPE R INLET	FROM 24" REINFORCED CONCRETE (N) FROM 12" REINFORCED CONCRETE (W)	TO 24" REINFORCED CONCRETE (E)
B1.2–INLET	PROP. CDOT TYPE D INLET	FROM 24" REINFORCED CONCRETE (N)	TO 24" REINFORCED CONCRETE (S)
B1.2–MH	PROP. 5' COS TYPE II MH	FROM 18" REINFORCED CONCRETE (W) FROM 12" REINFORCED CONCRETE (N)	TO 18" REINFORCED CONCRETE (S)
B1.3–INLET	PROP. CDOT TYPE D INLET	FROM 24" REINFORCED CONCRETE (N)	TO 24" REINFORCED CONCRETE (S)
B1.4–INLET	PROP. CDOT TYPE D INLET	FROM 18" REINFORCED CONCRETE (N)	TO 24" REINFORCED CONCRETE (S)
B1.5 INLET	PROP. 5' TYPE R INLET	FROM 18" REINFORCED CONCRETE (W)	TO 18" REINFORCED CONCRETE (E)
B1.6–INLET	PROP. 15' TYPE R INLET	FROM 8" (S)	TO 18" REINFORCED CONCRETE (E)
B1.7–INLET	PROP. 5' TYPE R INLET		TO 8" (N)
B2.1–INLET	PROP. CDOT TYPE D INLET		TO 12" REINFORCED CONCRETE (S)
B5.1–INLET	PROP. 5' TYPE R INLET		TO 12" REINFORCED CONCRETE (E)
D1.1–INLET	PROP. 10' TYPE R INLET		TO 12" REINFORCED CONCRETE (E)
D1.1–MH	EX. PUBLIC 5' COS TYPE II MH	FROM 42" REINFORCED CONCRETE (W)	TO 12" REINFORCED CONCRETE (N)
D1.2–INLET	PROP. 10' TYPE R INLET	FROM 12" REINFORCED CONCRETE (W) FROM 12" REINFORCED CONCRETE (SE)	
D1.3–INLET	PROP. CDOT TYPE C INLET	FROM 12" REINFORCED CONCRETE (S)	TO 12" REINFORCED CONCRETE (NW)
F1.1–INLET	PROP. CDOT TYPE D INLET	FROM 24" REINFORCED CONCRETE (N)	TO 27" REINFORCED CONCRETE (S)
F1.1–MH	EX. PUBLIC 5' COS TYPE II MH	FROM 27" REINFORCED CONCRETE (N) FROM 24" REINFORCED CONCRETE (E)	
F1.2–INLET	PROP. CDOT TYPE D INLET		TO 24" REINFORCED CONCRETE (S)

NOTE: ALL STORM SEWER IS PRIVATE UNLESS OTHERWISE NOTED ON PLAN.

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Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: SLG
DRAWN BY: SLG
CHECKED BY: JJM
DATE: 08/08/23

VETERANS VICTORY
LOT 1 VILLAGES AT WATERVIEW NORTH
PROPOSED DRAINAGE MAP (2 OF 2)

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PROJECT NO.
096955000

SHEET
2 OF 2

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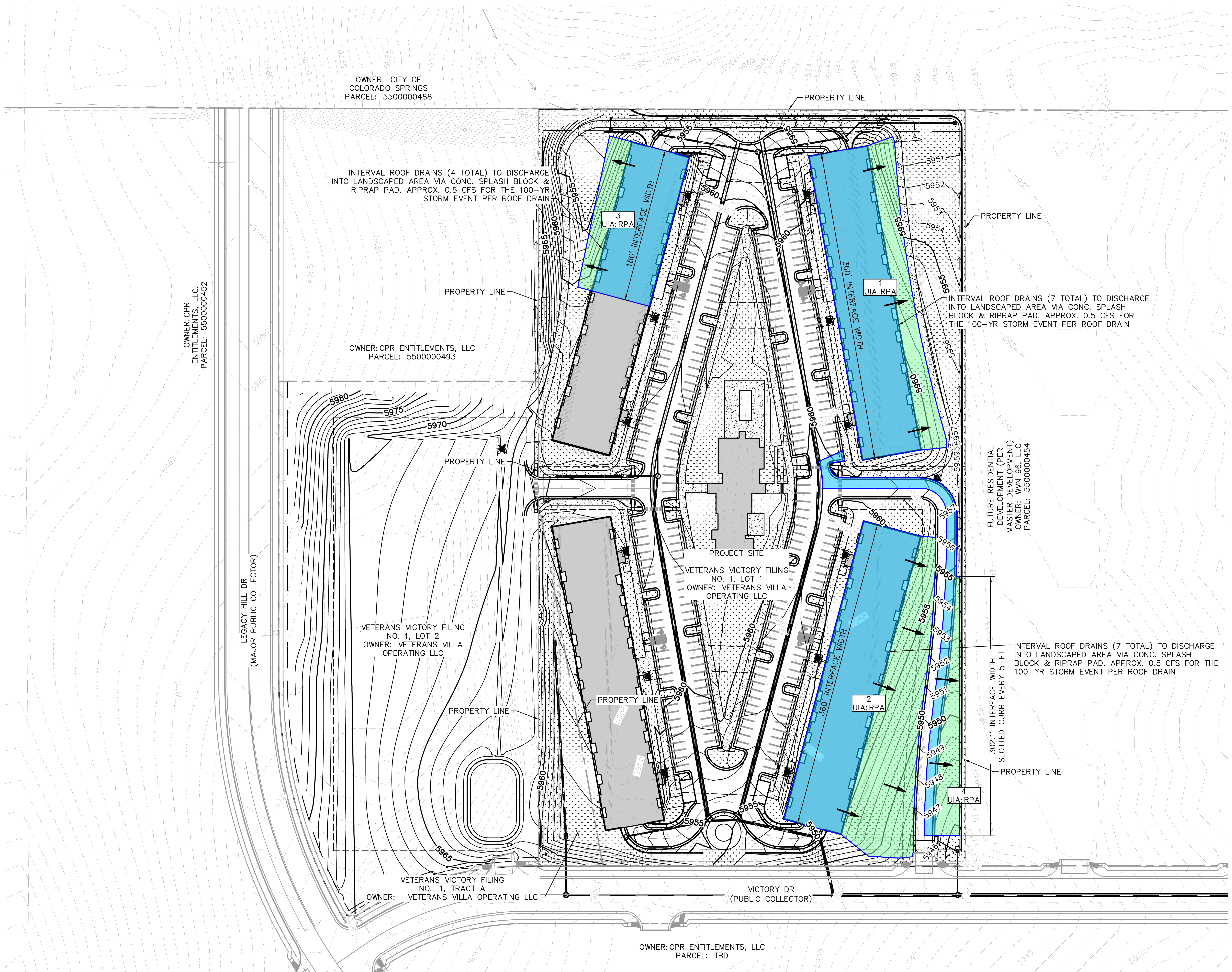
VETERANS VICTORY - LOT 1
GREEN INFRASTRUCTURE EXHIBIT

LEGEND

PROPERTY BOUNDARY
AREA ID BOUNDARY
PROPOSED BUILDING ROOF (DCIA)
PROPOSED LANDSCAPE AREA (RPA)
PROPOSED CONCRETE SIDEWALK (UIA)
PROPOSED LANDSCAPE AREA (SPA)
PROPOSED BUILDING ROOF (UIA)
PROPOSED ASPHALT (UIA)
FLOW DIRECTION
PROPOSED EASEMENT
EXISTING STORM SEWER
PROPOSED STORM SEWER
EXISTING/PROPOSED STORM MANHOLE
EXISTING/PROPOSED STORM INLET
PROPOSED MAJOR CONTOUR
PROPOSED MINOR CONTOUR
EXISTING MAJOR CONTOUR
EXISTING MINOR CONTOUR

RUNOFF REDUCTION RESULTS



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APPENDIX F – REFERENCE REPORT EXCERPTS

MASTER DEVELOPMENT DRAINAGE PLAN

Villages at Waterview North
Colorado Springs, CO

Prepared for:

CPR Entitlements, LLC
31 N. Tejon Street, Suite 500
Colorado Springs, CO 80903
Contact: P. A. Koscielski, Manager
719-377-0244

Prepared by:

Kimley-Horn and Associates, Inc.
2 North Nevada Avenue, Suite 900
Colorado Springs, Colorado 80903
(719) 453-0180
Contact: Jessica McCallum, P.E.

Project #: 096955000

Submitted: August 15, 2022
Resubmitted: September 29, 2022
Resubmitted: November 1, 2022
Resubmitted: December 23, 2022
Resubmitted: January 12, 2023

Kimley»Horn

INTRODUCTION

PURPOSE AND SCOPE OF STUDY

The purpose of this report is to outline the Master Development Drainage Plan (the "MDDP") associated with the Villages at Waterview North Concept Plan (the "Concept Plan") and annexation/ zone change into the City of Colorado Springs (the "City"). The Project is located on three parcels at the northeast corner of S. Powers Blvd and Bradley Rd (the "Site"), City of Colorado Springs, Colorado.

This MDDP identifies on-site and offsite drainage patterns, areas tributary to the site and proposes to safely route developed storm water to adequate outfalls at or less than historic flow rates. A Final Drainage Report for the master development roadways and infrastructure and for each individual lot and use containing detailed proposed site stormwater infrastructure design will be submitted at a later date and prior to construction of the individual lots and roadways. The Project will be processed through the City of Colorado Springs and is currently going through the annexation process with the City. Additional outside agency review or processing is not anticipated as part of the Project.

DBPS INVESTIGATIONS

This Site is located within West Fork Jimmy Camp Creek and Jimmy Camp Creek Drainage Basins per the "West Fork Jimmy Camp Creek Drainage Basin Planning Study" prepared by Kiowa Engineering Corporation, dated October 2003, and "Jimmy Camp Creek Drainage Basin Planning Study" prepared by Wilson & Company, dated 1987. The Site is also located in the Big Johnson Drainage Basin per the "Big Johnson Reservoir/Crews Gulch Drainage Basin Planning Study" prepared by Kiowa Engineering Corporation, dated September 1991. These reports serve as the current, approved DBPS for these basins. The proposed development will comply with the standards and required improvements set by the DBPS's.

GENERAL PROJECT DESCRIPTION

The Project is located on three parcels at the northeast corner of S. Powers Blvd and Bradley Rd within a portion of Section 8 and Section 9, both in Township 15 South, Range 65 West of the 6^{th} P.M. El Paso County, Colorado. The Site is located within the Jimmy Camp Creek and Big Johnson Drainage Basins which are mostly vacant land. The Site is surrounded by:

North: Peak Innovation Parkway, Lot 7 Colorado Springs Airport Filing No. 1D

South: Bradley Road

East: Colorado Centre Metro District, Lot 4 Colorado Centre Foreign Trade Zone & Business Park Filing No. 1

West: S. Powers Boulevard

DESCRIPTION OF PROPERTY

The proposed improvements consist of community commercial, regional commercial, and medium and high to very high residential uses within the Site. The Project will also include construction of internal roadways and utility infrastructure which will be detailed in the infrastructure Final Drainage Report submitted at a later date.

The total Site is approximately 116.5 acres and consists of vacant land with native vegetation within the Jimmy Camp Creek Basin and Big Johnson Basin. There is a ridge located in the western portion of the Site that splits the site into the two basins. The Jimmy Camp Creek Basin portion of the Site drains approximately west to east at grades that vary from 3% to 9%. The Big Johnson Basin portion of the Site drains approximately northeast to southwest at grades that vary from 3% to 10%.

There are no major irrigation facilities within the Site. The Site does not currently provide on-site water quality or detention for the Project area. There is no regional detention pond for the Project Site.

There is an existing gas main that runs along the east side of the property.

PROJECT CHARACTERISTICS

The Project Site is 116.5 acres and the proposed improvements consist of community commercial, regional commercial, and medium and high to very high residential uses within the Site.

The proposed project will route stormwater to the private temporary sediment basins ("TSB's") via the proposed temporary drainage swales. It is intended that the temporary sediment basins in the northwest corner, southwest corner, and southeast corner of the Site will be upgraded to full spectrum detention basins. The Full Spectrum Detention Basins will be designed and further discussed in the infrastructure Final Drainage Report.

There are no major irrigation facilities within the Site. The Site does not currently provide on-site water quality or detention for the Project area. There is no regional detention pond for the Project Site. The existing land use is vacant land.

DBPS COMPLIANCE

The proposed development will comply with the requirements, recommendations, and design intent set forth by West Fork Jimmy Camp Creek, Jimmy Camp Creek, and Big Johnson Reservoir DBPS's. The Project is not adjacent to any major drainage ways located within West Fork Jimmy Camp Creek, Jimmy Camp Creek or Big Johnson Reservoir.

SOIL CONDITIONS

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

MAJOR DRAINAGEWAYS & STRUCTURES

Jimmy Camp Creek is located approximately 3,000 feet east of the Site. The Big Johnson Reservoir is located approximately 3,700 feet southwest of the Site.

EXISTING AND PROPOSED LAND USES

The existing use of the Site is vacant land. The proposed uses will consist of community commercial, regional commercial, and medium and high to very high residential uses within the Site.

Sub-Basin 6

Sub-basin 6 is 26.44 acres and is anticipated to be developed into a residential high and very high use. The runoff within this sub-basin will be captured by the basin 6 north, 6 south, and 6 east temporary swales and routed to the private temporary sediment basin 6. The 5-year and 100-year storm event runoffs are 49.21 cfs and 104.53 cfs, respectively. The runoff developed within this sub-basin ultimately discharges into the Jimmy Camp Creek Drainage Basin.

Sub-Basin 7

Sub-basin 7 is 22.41 acres and is anticipated to be developed into a residential medium use. The runoff within this sub-basin will be captured by the basin 7 temporary swale and routed to the private temporary sediment basin 6. The 5-year and 100-year storm event runoffs are 41.88 cfs and 88.96 cfs, respectively. The runoff developed within this sub-basin ultimately discharges into the Jimmy Camp Creek Drainage Basin.

Sub-Basin RW-1 through RW-5

Sub-Basins RW-1 through RW-5 consist of the main shared access roads that connect each phase of the development. The roads traverse from Bradley Road to the north adjacent parcel and east to tie back into Bradley Road. Sub-Basins RW-1 through RW-5 are 1.61 acres, 1.33 acres, 0.60 acres, 0.65 acres, and 0.47 acres respectively. The 5-year storm event runoffs are 6.02 cfs, 5.72 cfs, 2.69 cfs, 2.79 cfs, and 2.16 cfs respectively. The 100-year storm event runoffs are 10.77 cfs, 10.25 cfs, 4.83 cfs, 5.01 cfs, and 3.87 cfs respectively.

HYDRAULIC ANALYSIS

The proposed private temporary sediment basins are designed in accordance with the MANUAL and the fact sheet provided in **Appendix C**.

The proposed temporary sediment basins are designed to capture and slow runoff during construction to allow time for the settling of sediment prior to discharge downstream. The temporary sediment basins were sized with at least 3,600 cubic feet per acre of drainage area upstream of the basin. The orifice plate or riser pipes were designed to accommodate an emptying time of approximately 72 hours. Temporary sediment basins 1, 2, and 6 have orifice plates and spillways sized utilizing the MHFCD UD Detention spreadsheet due to the drainage area going to these basins exceeding 15 acres. Temporary sediment basins 3A, 3B, 4A, 4B, and 5 are sized utilizing Table SB-1 for the Temporary Sediment Basin detail in the City of Colorado Springs Stormwater Construction Manual.

Hydraulic calculations for the temporary drainage swales were computed using Flowmaster. Hydraulic calculations are included in **Appendix D**.

The inlet, storm sewer sizing, and full spectrum detention designs will be complete with the infrastructure Drainage Report.

OUTLET REQUIREMENTS

The water quality standards established by the CRITERIA will be met by the proposed full spectrum extended detention basins designed by the infrastructure Final Drainage Report. The orifice plates will allow the WQCV to be drained from the structure in at least 40 hours and the EURV in 68-72 hours.

OUTLET REQUIREMENTS

The water quality standards established by the CRITERIA will be met by the proposed full spectrum extended detention basins. The water quality outlet structures will be designed per the specifications in the CRITERIA. The outlet structure for the extended detention basin will meet the micro-pool requirement that it be integrated into the design of the structure with an additional surcharge volume. The orifice plates of the structures will be designed based on the CRITERIA. The orifice plates will allow the WQCV to be drained from the structure in at least 40 hours and the EURC in 72 hours.

GRADING AND EROSION CONTROL PLAN

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

OFFSITE DRAINAGE ANALYSIS

Per the MDDP Amendment, sub-basins BJD-12a, BJD-12b, JCD OS-1.A, and JCD OS-1.B on the offsite northern property surface flow south towards the Project Site. In the Final Drainage Report a 20' wide berm with a height of 2' will be designed spanning the portion of the northern property where the offsite drainage sheet flows south to the Project Site. This berm will then direct flow east following historical drainage patterns. If the north adjacent parcel is in construction for their proposed project, the berm will not be required as it is the responsibility of the north adjacent owner to capture and treat their on-site storm runoff.

Temporary sediment basin 3 discharges east to the east property line and eventually discharges to an existing drainage channel along Bradley Road. A proposed riprap pad was provided at the outfall of this discharge pipe. The riprap sizing will be re-evaluated during final design of the extended detention basin and these calculations will be provided in that Final Drainage Report.

DEVELOPMENT FEES

DRAINAGE AND BRIDGE FEES

The Project Site is located in the Big Johnson, West Fork Jimmy Camp Creek, and Jimmy Camp Creek Basins. Fees are not applicable with the Concept Plan. Fees will be calculated with each subsequent subdivision plat's final drainage report and the drainage fees will be paid at the time of final plat recordation.

CONSTRUCTION COST OPINION

An opinion of probable construction cost for the construction of the private and public drainage facilities for the Project will be included in the infrastructure Final Drainage Report. Each individual lot will provide their own construction cost opinion in the Final Drainage Report for their specific development.

SUMMARY

COMPLIANCE WITH STANDARDS

The drainage design presented within this report for Villages at Waterview North conforms to the CRITERIA and MANUAL. Site runoff and storm drain facilities are not anticipated to adversely affect the downstream and surrounding developments.

Weighted Imperviousness Calculations

SUB-BASIN	AREA (SF)	AREA (Acres)	BASIN DESIGNATION	SOIL GROUP DESIGNATION	WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS			
						C2	C5	C10	C100
1	830,188	19.06	COMMERCIAL	A	95.0%	0.79	0.81	0.83	0.88
2	904,811	20.77	COMMERCIAL	B	95.0%	0.79	0.81	0.83	0.88
3	355,415	8.16	COMMERCIAL	A	95.0%	0.79	0.81	0.83	0.88
4	342,309	7.86	RESIDENTIAL	A	70.0%	0.45	0.49	0.53	0.62
5	423,625	9.73	RESIDENTIAL	A	70.0%	0.45	0.49	0.53	0.62
6	1,151,520	26.44	RESIDENTIAL	B	70.0%	0.45	0.49	0.53	0.62
7	976,336	22.41	RESIDENTIAL	B	70.0%	0.45	0.49	0.53	0.62
TOTAL	4,984,204	114.42							

ROADWAYS

SUB-BASIN	AREA (SF)	AREA (Acres)	BASIN DESIGNATION	WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS			
					C2	C5	C10	C100
RW-1	70025	1.60755	ROADWAY	100.0%	0.89	0.9	0.92	0.96
RW-2	57797	1.32684	ROADWAY	100.0%	0.89	0.9	0.92	0.96
RW-3	26088	0.5989	ROADWAY	100.0%	0.89	0.9	0.92	0.96
RW-4	28224	0.64793	ROADWAY	100.0%	0.89	0.9	0.92	0.96
RW-5	20293	0.46586	ROADWAY	100.0%	0.89	0.9	0.92	0.96
TOTAL	202,427	4.65			0.89	0.9	0.92	0.96

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Waterview North - Drainage Report

Proposed Runoff Calculations

Time of Concentration

Watercourse Coefficient

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

	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
1	1	830,188	19.06	0.81	100	2.0%	4.2	817	2.0%	20.00	2.8	4.8	9.0	917	15.1	9.0
2	2	904,811	20.77	0.81	100	4.0%	3.3	1350	4.0%	20.00	4.0	5.6	8.9	1450	18.1	8.9
3	3	355,415	8.16	0.81	100	6.0%	2.9	690	5.0%	20.00	4.5	2.6	5.5	790	14.4	5.5
4	4	342,309	7.86	0.49	100	5.0%	6.5	690	5.0%	20.00	4.5	2.6	9.1	790	14.4	9.1
5	5	423,625	9.73	0.49	100	5.0%	6.5	440	5.0%	20.00	4.5	1.6	8.1	540	13.0	8.1
6	6	1,151,520	26.44	0.49	100	5.0%	6.5	1600	5.0%	20.00	4.5	6.0	12.5	1700	19.4	12.5
7	7	976,336	22.41	0.49	100	3.9%	7.1	1700	7.3%	20.00	5.4	5.2	12.3	1800	20.0	12.3
RW-1	RW-1	70,025	1.61	0.90	50	1.0%	2.6	1368	2.5%	20.00	3.2	7.2	9.8	1418	17.9	9.8
RW-2	RW-2	57,797	1.33	0.90	50	1.0%	2.6	920	4.0%	20.00	4.0	3.8	6.4	970	15.4	6.4
RW-3	RW-3	26,088	0.60	0.90	50	1.0%	2.6	720	4.0%	20.00	4.0	3.0	5.6	770	14.3	5.6
RW-4	RW-4	28,224	0.65	0.90	50	1.0%	2.6	795	3.0%	20.00	3.5	3.8	6.4	845	14.7	6.4
RW-5	RW-5	20,293	0.47	0.90	50	1.0%	2.6	550	3.5%	20.00	3.7	2.4	5.0	600	13.3	5.0

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Waterview North - Drainage Report
Proposed Runoff Calculations **Design Storm** ***5 Year***
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	1	19.06	0.81	9.0	15.44	4.28	66.15					
2	2	20.77	0.81	8.9	16.82	4.30	72.34					
3	3	8.16	0.81	5.5	6.61	5.03	33.27					
4	4	7.86	0.49	9.1	3.85	4.28	16.46					
5	5	9.73	0.49	8.1	4.77	4.44	21.15					
6	6	26.44	0.49	12.5	12.95	3.80	49.21					
7	7	22.41	0.49	12.3	10.98	3.81	41.88					
RW-1	RW-1	1.61	0.90	9.8	1.45	4.16	6.02					
RW-2	RW-2	1.33	0.90	6.4	1.19	4.79	5.72					
RW-3	RW-3	0.60	0.90	5.6	0.54	5.00	2.69					
RW-4	RW-4	0.65	0.90	6.4	0.58	4.79	2.79					
RW-5	RW-5	0.47	0.90	5.0	0.42	5.15	2.16					

COS-Approved-1-19-23

Waterview North - Drainage Report
Proposed Runoff Calculations **Design Storm** ***100 Year***
(Rational Method Procedure)

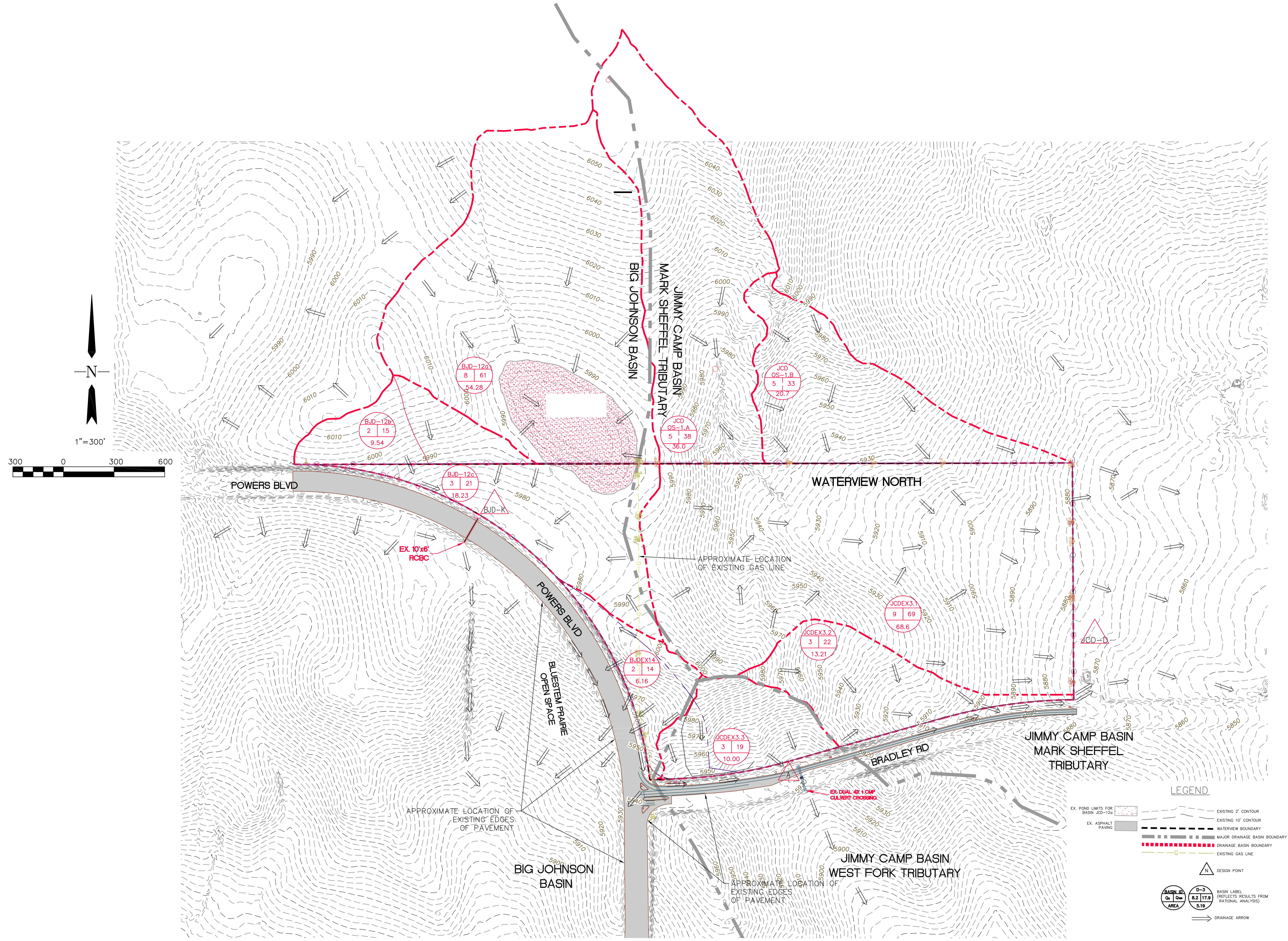
BASIN INFORMATION				DIRECT RUNOFF				CUMMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	1	19.06	0.88	9.0	16.77	7.19	120.65					
2	2	20.77	0.88	8.9	18.28	7.22	131.96					
3	3	8.16	0.88	5.5	7.18	8.45	60.69					
4	4	7.86	0.62	9.1	4.87	7.18	34.97					
5	5	9.73	0.62	8.1	6.03	7.45	44.93					
6	6	26.44	0.62	12.5	16.39	6.38	104.53					
7	7	22.41	0.62	12.3	13.90	6.40	88.96					
RW-1	RW-1	1.61	0.96	9.8	1.54	6.98	10.77					
RW-2	RW-2	1.33	0.96	6.4	1.27	8.04	10.25					
RW-3	RW-3	0.60	0.96	5.6	0.57	8.39	4.83					
RW-4	RW-4	0.65	0.96	6.4	0.62	8.05	5.01					
RW-5	RW-5	0.47	0.96	5.0	0.45	8.65	3.87					

COS-Approved-1-19-23

SUMMARY - PROPOSED RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	IMPERVIOUSNESS (%)
1	1	19.06	66.15	120.65	0.95
2	2	20.77	72.34	131.96	0.95
3	3	8.16	33.27	60.69	0.95
4	4	7.86	16.46	34.97	0.70
5	5	9.73	21.15	44.93	0.70
6	6	26.44	49.21	104.53	0.70
7	7	22.41	41.88	88.96	0.70
RW-1	RW-1	1.61	6.02	10.77	100.00
RW-2	RW-2	1.33	5.72	10.25	100.00
RW-3	RW-3	0.60	2.69	4.83	100.00
RW-4	RW-4	0.65	2.79	5.01	100.00
RW-5	RW-5	0.47	2.16	3.87	100.00

PRE-DEVELOPMENT BASIN MAP



BASIN ID	BASIN AREA (Ac.)	DESIGN POINT	RATIONAL ANALYSIS RESULTS	
			Q_5 (CFS)	Q_{100} (CFS)
BJD-12a	54.28		8	61
BJD-12b	9.54		2	15
BJD-12c	18.23		3	21
		BJD-K	4	31
JCD OS-1A	36.0		5	38
JCD OS-1B	20.7		5	33
JCDEX-3.1	68.6		9	69
JCDEX-3.2	13.21		3	22
		JCD-D	12	84
JCDEX-3.3	10.0		3	19
BJDEX14	6.16		2	14
		A	3	19
		A*	5	25

A* – MODELLED AS BASIN OS-1 IN THE FINAL DRAINAGE REPORT FOR FILING 1 OF TRAILS AT ASPEN RIDGE, APP'D ON FEBRUARY 13, 2020.

REVISIONS:

NO.	DESCRIPTION	DATE

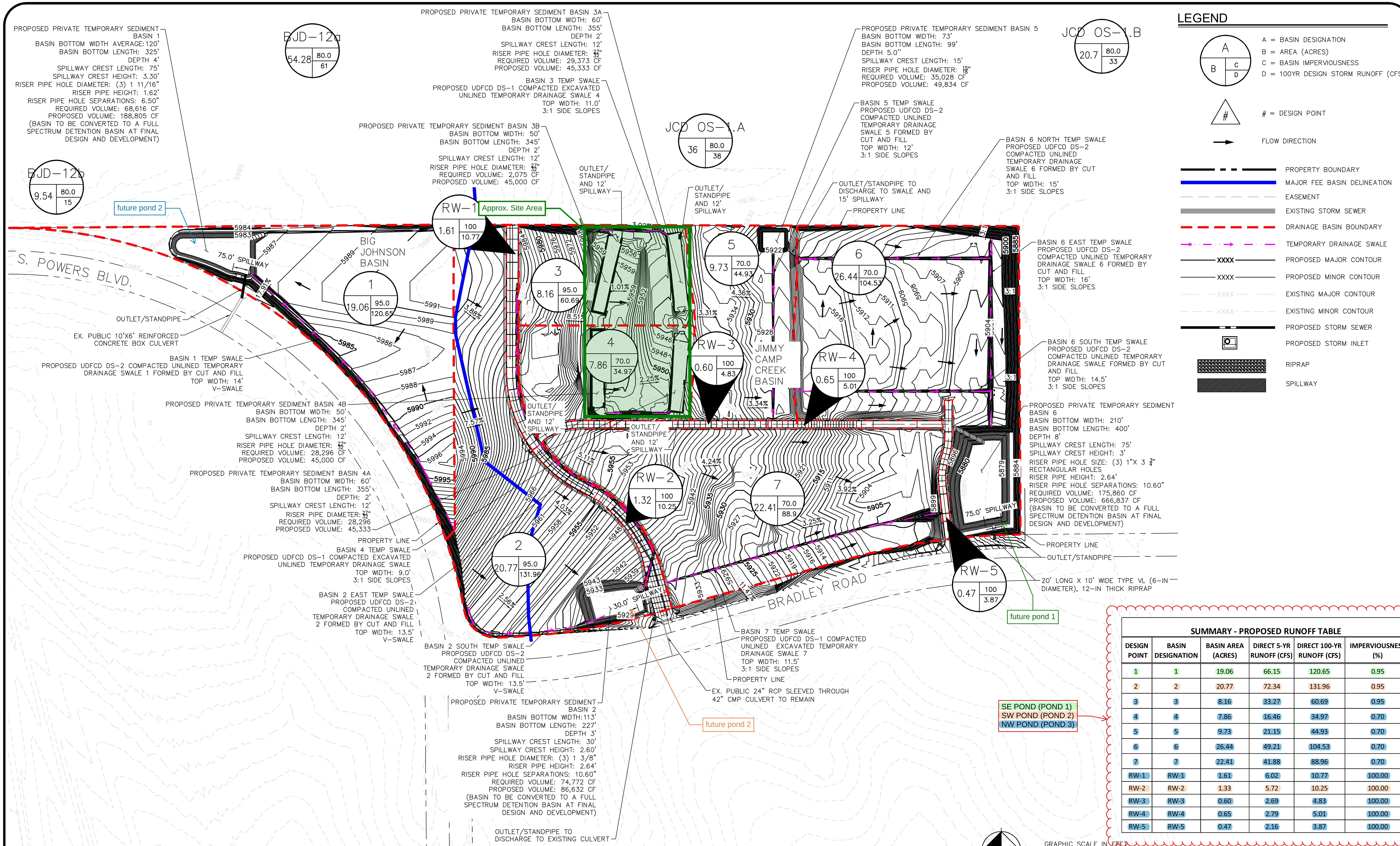
ENGINEER:
DESIGNED BY: CEB DATE: 11-05-20
DRAWN BY: CEB DATE: 11-05-20
CHECKED BY: CKC DATE: 11-05-20

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
1-800-922-1987
CITY OF COLORADO SPRINGS DEPT. OF UTILITIES GAS, ELECTRIC, WATER AND WASTEWATER

DSE Dakota Springs Engineering
31 N. TEJON, SUITE 518
COLORADO SPRINGS, CO 80903
P: (719) 227-7388
F: (719) 227-7392

PROJECT WATERVIEW NORTH
SHEET TITLE PRE-DEVELOPMENT BASIN MAP
FROM n/a TO n/a
JOB NO. 02-19-05 SHEET 2 OF 3

COS-Approved-1-19-23



SUMMARY - PROPOSED RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	IMPERVIOUSNESS (%)
1	1	19.06	66.15	120.65	0.95
2	2	20.77	72.34	131.96	0.95
3	3	8.16	33.27	60.69	0.95
4	4	7.86	16.46	34.97	0.70
5	5	9.73	21.15	44.93	0.70
6	6	26.44	49.21	104.53	0.70
7	7	22.41	41.88	88.96	0.70
RW-1	RW-1	1.61	6.02	10.77	100.00
RW-2	RW-2	1.33	5.72	10.25	100.00
RW-3	RW-3	0.60	2.69	4.83	100.00
RW-4	RW-4	0.65	2.79	5.01	100.00
RW-5	RW-5	0.47	2.16	3.87	100.00

DRAINAGE EXHIBIT – WATERVIEW NORTH COLORADO SPRINGS, CO

Kimley»Horn

FINAL DRAINAGE REPORT for

Metro Roads
Villages at Waterview North
Colorado Springs, CO

Prepared for:

Dakota Springs Engineering
31 N. Tejon Street, Suite 514
Colorado Springs, CO 80903
Contact: P. A. Koscielski, PM/Partner
719-377-0244

Prepared by:

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(719) 453-0180
Contact: Jessica McCallum P.E.

Project #: 096955000

Kimley»Horn

Weighted Imperviousness Calculations

SUB-BASIN	AREA (SF)	AREA (Acres)	BASIN DESIGNATION	SOIL GROUP DESIGNATION	IMPERVIOUS-NESS	COEFFICIENTS			
						C2	C5	C10	C100
1	830,188	19.06	COMMERCIAL	A	95.0%	0.79	0.81	0.83	0.88
2	904,811	20.77	COMMERCIAL	B	95.0%	0.79	0.81	0.83	0.88
3	355,415	8.16	COMMERCIAL	A	95.0%	0.79	0.81	0.83	0.87
4	342,309	7.86	RESIDENTIAL	A	70.0%	0.45	0.49	0.53	0.62
5	423,625	9.73	RESIDENTIAL	A	70.0%	0.45	0.49	0.53	0.62
6	1,151,520	26.44	RESIDENTIAL	B	70.0%	0.45	0.49	0.53	0.62
7	976,336	22.41	RESIDENTIAL	B	70.0%	0.45	0.49	0.53	0.62
TOTAL	4,984,204	114.42							

SUB-BASIN	AREA (SF)	AREA (Acres)	BASIN DESIGNATION	IMPERVIOUSNESS	COEFFICIENTS			
					C2	C5	C10	C100
RW-1	70025	1.61	ROADWAY	100.0%	0.89	0.90	0.92	0.96
RW-2	57797	1.33	ROADWAY	100.0%	0.89	0.90	0.92	0.96
RW-3	26088	0.60	ROADWAY	100.0%	0.89	0.90	0.92	0.96
RW-4	28224	0.65	ROADWAY	100.0%	0.89	0.90	0.92	0.96
RW-5	20293	0.47	ROADWAY	100.0%	0.89	0.90	0.92	0.96
TOTAL	202,427	4.65						

POND TOTALS	AREA (sf)	AREA (acres)	WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS			
SE POND TOTAL	3,393,835	77.91	73.9%	0.50	0.54	0.58	0.66
SW POND TOTAL	962,608	22.10	95.3%	0.80	0.82	0.84	0.88
NW POND TOTAL	830,188	19.06	8.4%	0.79	0.81	0.83	0.08

Waterview North - Drainage Report
Proposed Runoff Calculations
Time of Concentration

Watercourse Coefficient

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

	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c)
DESIGN POINT	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(i) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	min.
1	1	830,188	19.06	0.81	100	2.0%	4.2	817	2.0%	20.00	2.8	4.8	9.0	917	15.1	9.0
2	2	904,811	20.77	0.81	100	4.0%	3.3	1350	4.0%	20.00	4.0	5.6	8.9	1450	18.1	8.9
3	3	355,415	8.16	0.81	100	6.0%	2.9	690	5.0%	20.00	4.5	2.6	5.5	790	14.4	5.5
4	4	342,309	7.86	0.49	100	5.0%	6.5	690	5.0%	20.00	4.5	2.6	9.1	790	14.4	9.1
5	5	423,625	9.73	0.49	100	5.0%	6.5	440	5.0%	20.00	4.5	1.6	8.1	540	13.0	8.1
6	6	1,151,520	26.44	0.49	100	5.0%	6.5	1600	5.0%	20.00	4.5	6.0	12.5	1700	19.4	12.5
7	7	976,336	22.41	0.49	100	3.9%	7.1	1700	7.3%	20.00	5.4	5.2	12.3	1800	20.0	12.3
RW-1	RW-1	70,025	1.61	0.90	50	1.0%	2.6	1368	2.5%	20.00	3.2	7.2	9.8	1418	17.9	9.8
RW-2	RW-2	57,797	1.33	0.90	50	1.0%	2.6	920	4.0%	20.00	4.0	3.8	6.4	970	15.4	6.4
RW-3	RW-3	26,088	0.60	0.90	50	1.0%	2.6	720	4.0%	20.00	4.0	3.0	5.6	770	14.3	5.6
RW-4	RW-4	28,224	0.65	0.90	50	1.0%	2.6	795	3.0%	20.00	3.5	3.8	6.4	845	14.7	6.4
RW-5	RW-5	20,293	0.47	0.90	50	1.0%	2.6	550	3.5%	20.00	3.7	2.4	5.0	600	13.3	5.0

Waterview North - Drainage Report
Proposed Runoff Calculations **Design Storm** ***5 Year***
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	1	19.06	0.81	9.0	15.44	4.28	66.15					
2	2	20.77	0.81	8.9	16.82	4.30	72.34					
3	3	8.16	0.81	5.5	6.61	5.03	33.27					
4	4	7.86	0.49	9.1	3.85	4.28	16.46					
5	5	9.73	0.49	8.1	4.77	4.44	21.15					
6	6	26.44	0.49	12.5	12.95	3.80	49.21					
7	7	22.41	0.49	12.3	10.98	3.81	41.88					
RW-1	RW-1	1.61	0.90	9.8	1.45	4.16	6.02					
RW-2	RW-2	1.33	0.90	6.4	1.19	4.79	5.72					
RW-3	RW-3	0.60	0.90	5.6	0.54	5.00	2.69					
RW-4	RW-4	0.65	0.90	6.4	0.58	4.79	2.79					
RW-5	RW-5	0.47	0.90	5.0	0.42	5.15	2.16					

Waterview North - Drainage Report
Proposed Runoff Calculations **Design Storm** ***100 Year***
(Rational Method Procedure)

BASIN INFORMATION				DIRECT RUNOFF				CUMMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	1	19.06	0.88	9.0	16.77	7.19	120.65					
2	2	20.77	0.88	8.9	18.28	7.22	131.96					
3	3	8.16	0.87	5.5	7.10	8.45	60.00					
4	4	7.86	0.62	9.1	4.87	7.18	34.97					
5	5	9.73	0.62	8.1	6.03	7.45	44.93					
6	6	26.44	0.62	12.5	16.39	6.38	104.53					
7	7	22.41	0.62	12.3	13.90	6.40	88.96					
RW-1	RW-1	1.61	0.96	9.8	1.54	6.98	10.77					
RW-2	RW-2	1.33	0.96	6.4	1.27	8.04	10.25					
RW-3	RW-3	0.60	0.96	5.6	0.57	8.39	4.83					
RW-4	RW-4	0.65	0.96	6.4	0.62	8.05	5.01					
RW-5	RW-5	0.47	0.96	5.0	0.45	8.65	3.87					

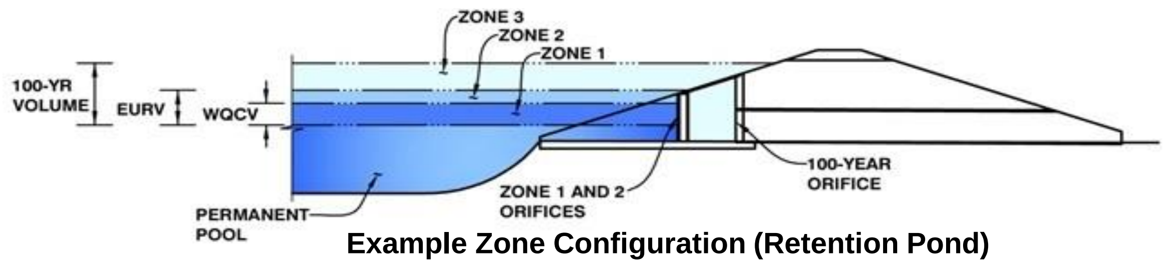
SUMMARY - PROPOSED RUNOFF TABLE					
DESIGN POINT	**BASIN DESIGNATION**	**BASIN AREA (ACRES)**	**DIRECT 5-YR RUNOFF (CFS)**	**DIRECT 100-YR RUNOFF (CFS)**	**IMPERVIOUSNESS (%)**
1	1	19.06	66.15	120.65	95.00%
2	2	20.77	72.34	131.96	95.00%
3	3	8.16	33.27	60.00	95.00%
4	4	7.86	16.46	34.97	70.00%
5	5	9.73	21.15	44.93	70.00%
6	6	26.44	49.21	104.53	70.00%
7	7	22.41	41.88	88.96	70.00%
RW-1	RW-1	1.61	6.02	10.77	100.00%
RW-2	RW-2	1.33	5.72	10.25	100.00%
RW-3	RW-3	0.60	2.69	4.83	100.00%
RW-4	RW-4	0.65	2.79	5.01	100.00%
RW-5	RW-5	0.47	2.16	3.87	100.00%
TOTAL		119.07	319.84	620.72	81.25%
SE POND TOTAL		77.91	175.63	357.87	73.90%
SW POND TOTAL		22.10			95.30%
NW POND TOTAL		19.06	66.15	120.65	95.00%

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Waterview North - Metro Roads - SE Regional Pond (POND 1)

Basin ID: MDDP Basins 3-7, RWDY 1, RWDY 3-5



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**			
Watershed Area =	77.91	acres		
Watershed Length =	2,760	ft		
Watershed Length to Centroid =	1,380	ft		
Watershed Slope =	0.050	ft/ft		
Watershed Imperviousness =	73.00%	percent		
Percentage Hydrologic Soil Group A =	33.1%	percent		
Percentage Hydrologic Soil Group B =	66.9%	percent		
Percentage Hydrologic Soil Groups C/D =	0.0%	percent		
Target WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	Denver - Capitol Building			

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.878	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	6.606	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.83 in.) =	3.494	acre-feet		inches
5-yr Runoff Volume (P1 = 1.09 in.) =	4.856	acre-feet		inches
10-yr Runoff Volume (P1 = 1.33 in.) =	6.121	acre-feet		inches
25-yr Runoff Volume (P1 = 1.69 in.) =	8.565	acre-feet		inches
50-yr Runoff Volume (P1 = 1.99 in.) =	10.483	acre-feet		inches
100-yr Runoff Volume (P1 = 2.31 in.) =	12.763	acre-feet		inches
500-yr Runoff Volume (P1 = 3.14 in.) =	18.264	acre-feet		inches
Approximate 2-yr Detention Volume =	3.375	acre-feet		
Approximate 5-yr Detention Volume =	4.670	acre-feet		
Approximate 10-yr Detention Volume =	6.043	acre-feet		
Approximate 25-yr Detention Volume =	7.464	acre-feet		
Approximate 50-yr Detention Volume =	8.271	acre-feet		
Approximate 100-yr Detention Volume =	9.194	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.878	acre-feet
Zone 2 Volume (EURV - Zone 1) =	4.728	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.588	acre-feet
Total Detention Basin Volume =	9.194	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	61,020	1.401		
	--	1.00	--	--	--	65,230	1.497	63,125	1.449
	--	2.00	--	--	--	69,568	1.597	130,524	2.996
	--	3.00	--	--	--	74,034	1.700	202,325	4.645
	--	4.00	--	--	--	78,626	1.805	278,655	6.397
	--	5.00	--	--	--	83,346	1.913	359,642	8.256
	--	6.00	--	--	--	88,194	2.025	445,412	10.225
	--	7.00	--	--	--	93,169	2.139	536,093	12.307
	--	8.00	--	--	--	98,271	2.256	631,812	14.504
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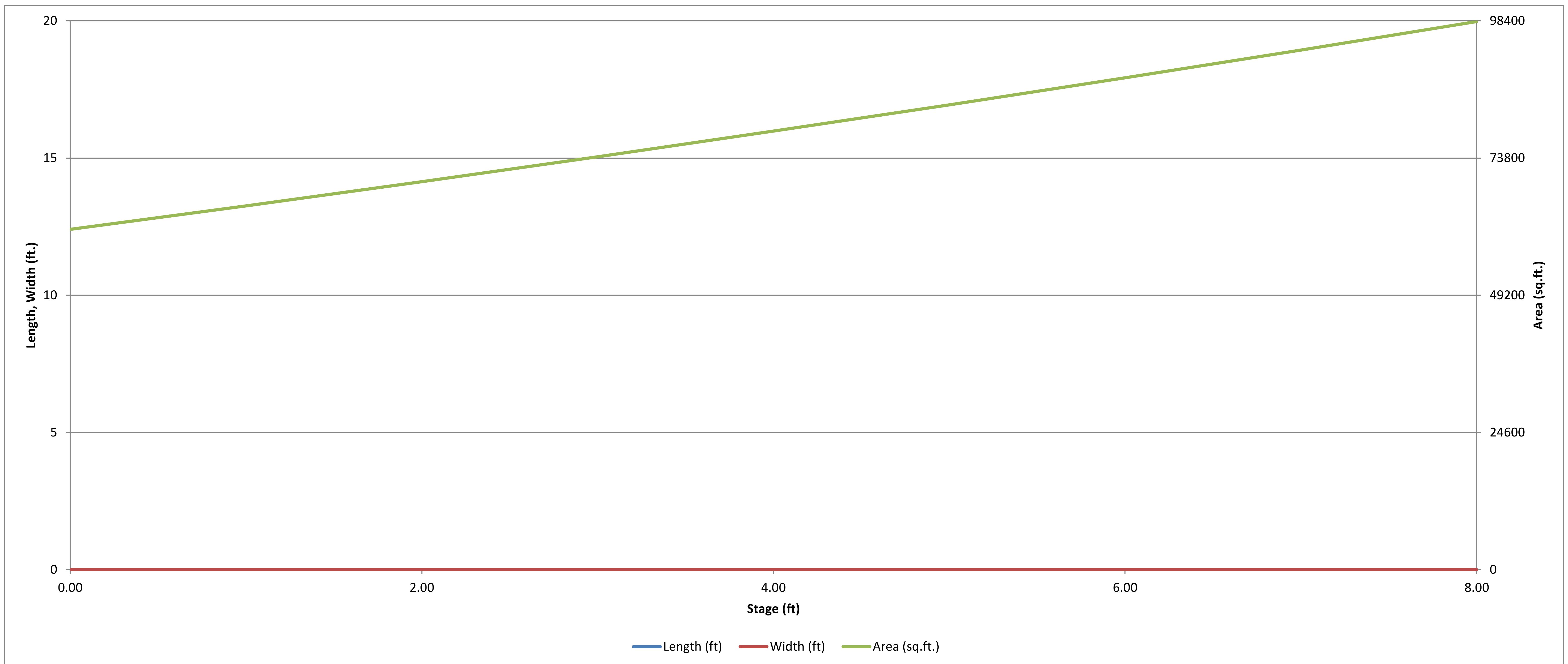
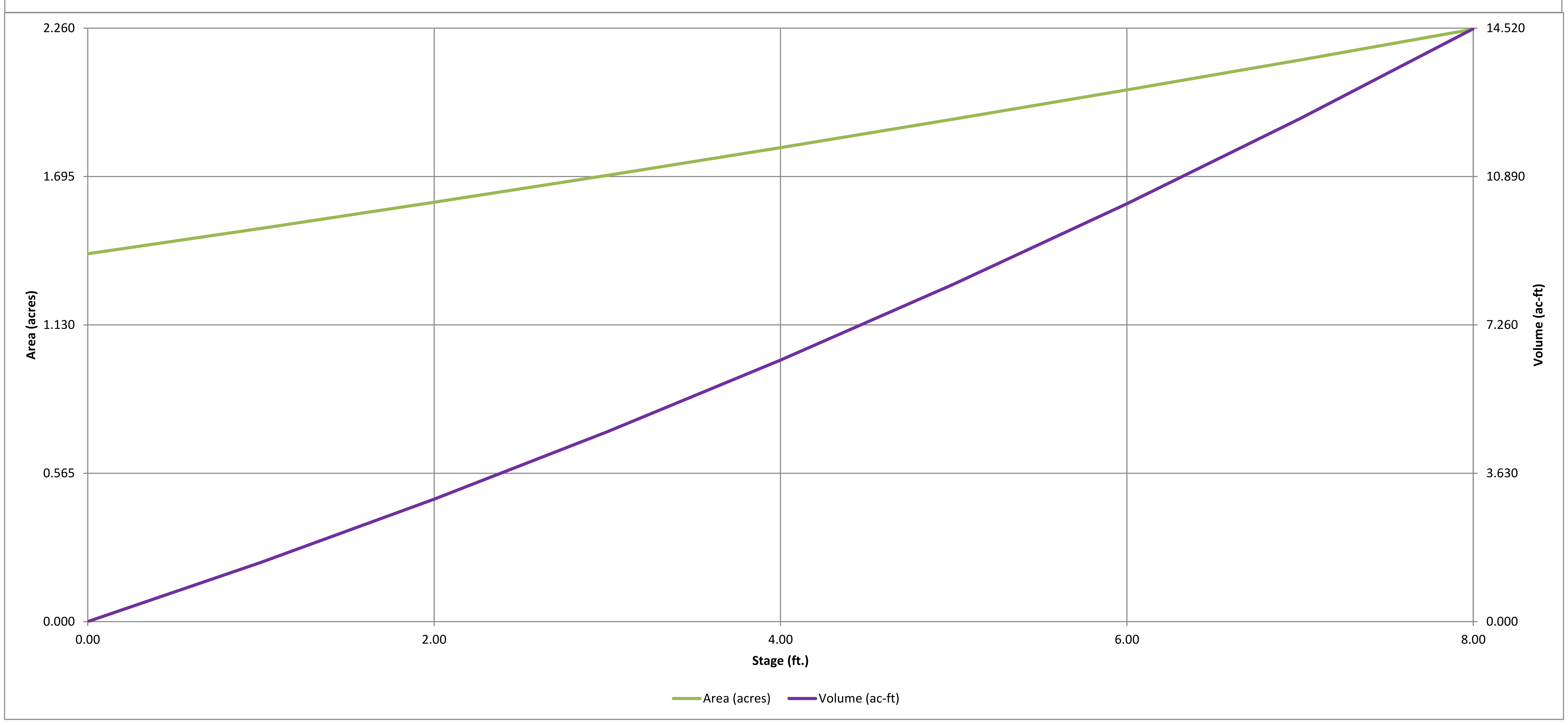
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



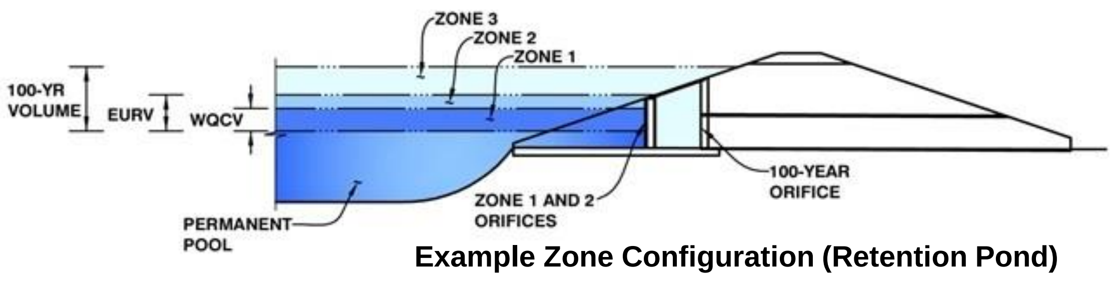


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Waterview North - Metro Roads - SE Regional Pond (POND 1)

Basin ID: MDDP Basins 3-7, RWDY 1, RWDY 3-5



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.29	1.878	Orifice Plate
Zone 2 (EURV)	4.12	4.728	Orifice Plate
Zone 3 (100-year)	5.49	2.588	Weir&Pipe (Restrict)
Total (all zones)		9.194	

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

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

Calculated Parameters for Underdrain

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

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	4.13	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

Calculated Parameters for Plate

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 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.50	2.75					
Orifice Area (sq. inches)	23.76	23.76	23.76					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.12	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	2.92	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V
Horiz. Length of Weir Sides =	2.92	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	4.85	N/A	feet
Overflow Weir Slope Length =	3.01	N/A	feet
Grate Open Area / 100-yr Orifice Area =	11.86	N/A	
Overflow Grate Open Area w/o Debris =	6.12	N/A	ft^2
Overflow Grate Open Area w/ Debris =	3.06	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	6.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.52	N/A	ft^2
Outlet Orifice Centroid =	0.29	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.23	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.90	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	82.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.97	feet
Stage at Top of Freeboard =	8.87	feet
Basin Area at Top of Freeboard =	2.26	acres
Basin Volume at Top of Freeboard =	14.50	acre-ft

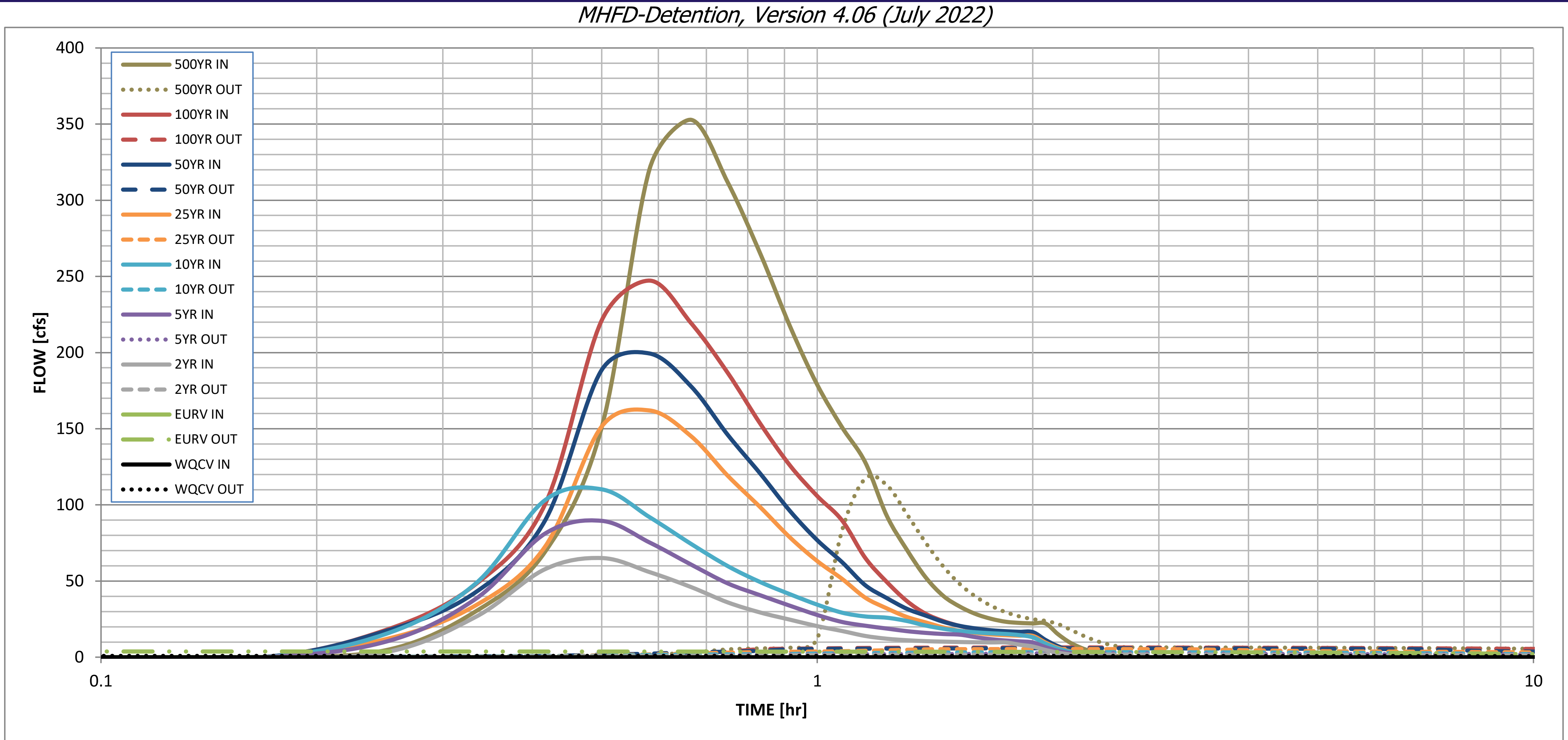
Routed Hydrograph Results

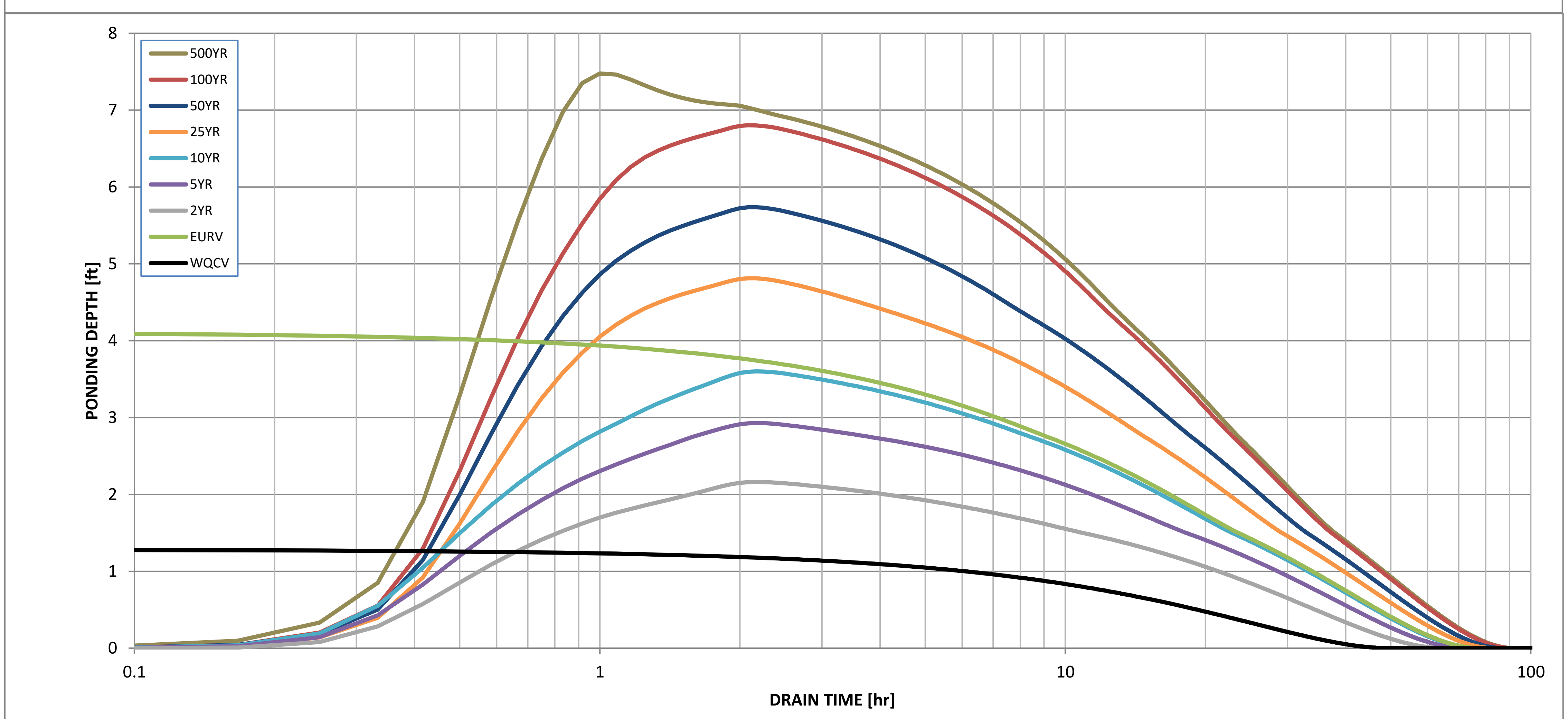
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

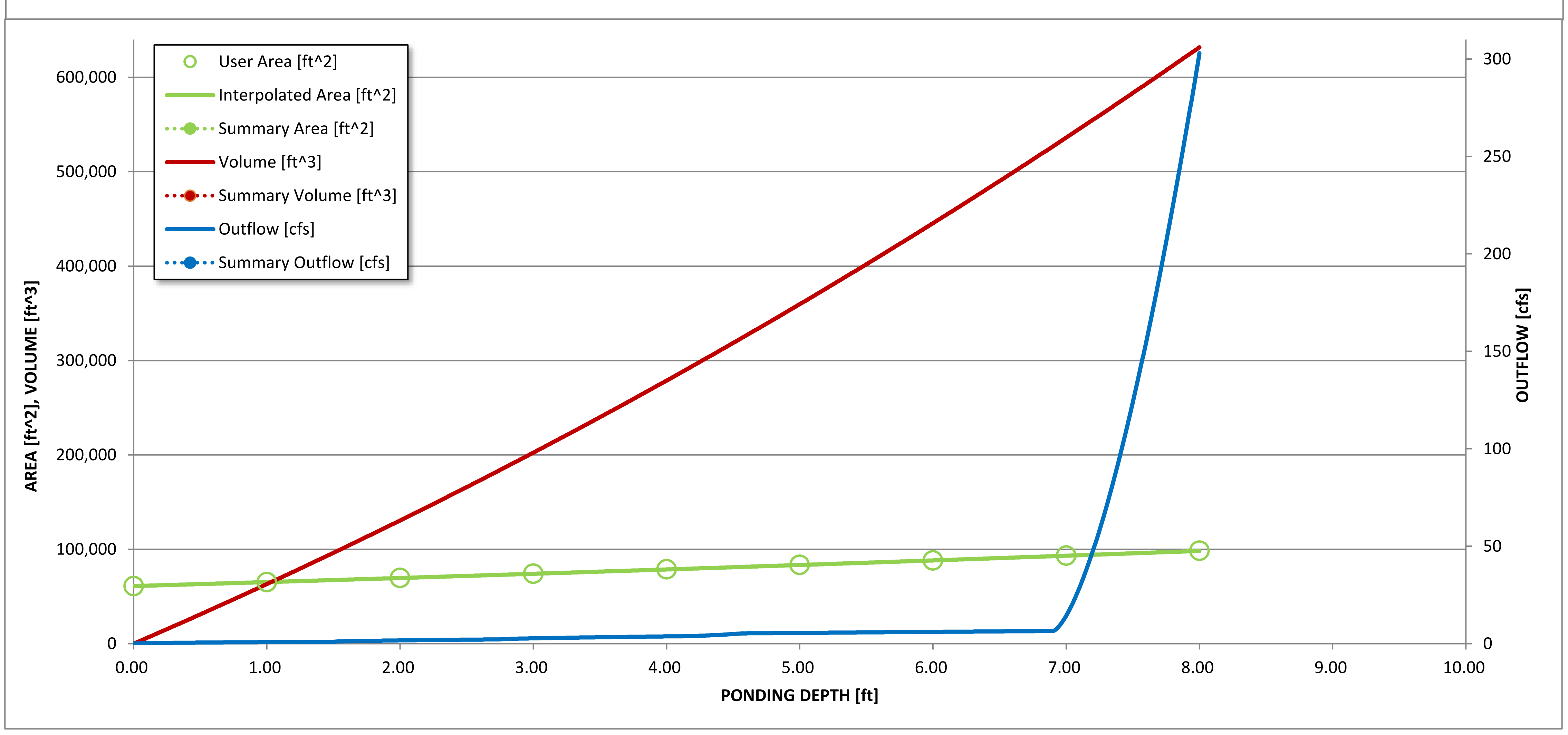
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.83	1.09	1.33	1.69	1.99	2.31	3.14
CUHP Runoff Volume (acre-ft) =	1.878	6.606	3.494	4.856	6.121	8.565	10.483	12.763	18.264
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.494	4.856	6.121	8.565	10.483	12.763	18.264
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.5	1.1	2.1	34.9	56.4	84.4	144.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.03	0.45	0.72	1.08	1.85
Peak Inflow Q (cfs) =	N/A	N/A	65.1	89.5	110.2	162.0	199.4	247.2	352.8
Peak Outflow Q (cfs) =	0.9	3.8	1.8	2.6	3.4	5.4	5.9	6.5	117.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.5	1.6	0.2	0.1	0.1	0.8
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Plate	Plate	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.2	0.2	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	41	62	53	59	62	65	67	69	65
Time to Drain 99% of Inflow Volume (hours) =	**45**	68	58	64	68	73	76	79	77
Maximum Ponding Depth (ft) =	1.29	4.12	2.16	2.93	3.60	4.81	5.74	6.80	7.48
Area at Maximum Ponding Depth (acres) =	1.53	1.82	1.61	1.69	1.76	1.89	1.99	2.12	2.19
Maximum Volume Stored (acre-ft) =	1.888	6.614	3.253	4.509	5.683	7.895	9.683	11.882	13.325

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	0.00	4.67
	0:15:00	0.00	0.00	3.38	10.27	15.36	11.91	17.28	17.96	30.05
	0:20:00	0.00	0.00	26.43	38.24	48.29	33.98	42.62	47.86	69.09
	0:25:00	0.00	0.00	57.79	81.13	103.07	72.45	89.59	100.18	150.65
	0:30:00	0.00	0.00	65.13	89.55	110.25	151.41	188.50	221.00	320.51
	0:35:00	0.00	0.00	55.90	75.35	91.98	162.00	199.40	247.25	352.78
	0:40:00	0.00	0.00	46.07	60.84	74.40	145.08	177.78	219.34	311.74
	0:45:00	0.00	0.00	36.03	48.49	59.85	119.16	146.02	186.69	264.59
	0:50:00	0.00	0.00	29.34	40.65	49.29	98.34	120.37	153.08	217.01
	0:55:00	0.00	0.00	24.65	33.78	41.33	78.52	95.88	125.75	178.90
	1:00:00	0.00	0.00	20.45	27.77	34.54	63.15	76.87	105.84	150.91
	1:05:00	0.00	0.00	17.23	23.16	29.28	51.44	62.40	89.79	128.09
	1:10:00	0.00	0.00	14.01	20.72	26.79	39.16	47.35	65.30	93.08
	1:15:00	0.00	0.00	12.18	18.87	25.97	32.15	38.91	49.53	70.75
	1:20:00	0.00	0.00	11.18	17.16	23.84	26.48	31.87	37.00	52.54
	1:25:00	0.00	0.00	10.59	16.02	20.83	22.90	27.38	28.59	40.25
	1:30:00	0.00	0.00	10.26	15.27	18.72	19.58	23.29	23.76	33.15
	1:35:00	0.00	0.00	10.01	14.82	17.29	17.34	20.55	20.47	28.29
	1:40:00	0.00	0.00	9.84	13.15	16.35	15.95	18.86	18.39	25.23
	1:45:00	0.00	0.00	9.75	11.84	15.74	15.01	17.71	17.09	23.31
	1:50:00	0.00	0.00	9.72	10.99	15.29	14.50	17.08	16.57	22.56
	1:55:00	0.00	0.00	8.24	10.43	14.53	14.18	16.69	16.35	22.23
	2:00:00	0.00	0.00	7.06	9.73	13.07	14.02	16.51	16.32	22.18
	2:05:00	0.00	0.00	4.80	6.63	8.91	9.65	11.35	11.27	15.30
	2:10:00	0.00	0.00	3.06	4.24	5.75	6.24	7.33	7.28	9.87
	2:15:00	0.00	0.00	1.95	2.67	3.65	4.00	4.69	4.66	6.31
	2:20:00	0.00	0.00	1.15	1.61	2.21	2.42	2.83	2.81	3.79
	2:25:00	0.00	0.00	0.65	0.98	1.31	1.49	1.74	1.73	2.33
	2:30:00	0.00	0.00	0.31	0.52	0.66	0.79	0.92	0.91	1.22
	2:35:00	0.00	0.00	0.12	0.20	0.24	0.31	0.36	0.35	0.46
	2:40:00	0.00	0.00	0.02	0.03	0.04	0.04	0.05	0.05	0.06
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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]

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).

FINAL DRAINAGE REPORT for

Veteran's Victory Filing No. 1 Lot 2

Villages at Waterview North
Colorado Springs, CO

Prepared for:

Veterans Villa Operating, LLC
17332 Edna St.
Omaha, NE 68136
402-639-8855

Prepared by:

Kimley-Horn and Associates, Inc.
2 North Nevada Avenue, Suite 900
Colorado Springs, Colorado 80903
(719) 453-0180
Contact: Jessica McCallum, P.E.

Kimley-Horn Project #: 096955000
SWENT Project #: STM-REV23-0663
SWENT Master Project #: STM-MP23-0157

Prepared: August 14, 2023

Kimley»Horn

SUMMARY - PROPOSED RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)	Weighted Imperviousness
P1	P1	0.66	2.78	5.12	2.78	5.12	90.3%
P2	P2	1.06	2.18	4.95	3.06	6.59	49.7%
P3	P3	0.74	2.15	4.43	2.93	5.88	64.6%
P4	P4	0.18	0.64	1.25	0.64	1.25	74.7%
P5	P5	0.14	0.57	1.06	1.01	1.88	87.5%
P6	P6	0.07	0.24	0.48	0.68	1.30	68.7%
R1	R1	0.47	1.77	3.29	1.77	3.29	90.0%
R2	R2	0.41	1.56	2.91	1.56	2.91	90.0%
P-OS1	P-OS1	0.05	0.12	0.27	3.91	7.27	50.1%
P-OS2	P-OS2	0.11	0.19	0.51	6.54	12.77	31.5%
P-OS3	P-OS3	0.03	0.11	0.22	0.11	0.22	74.2%

LEGEND

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

= DESIGN POINT

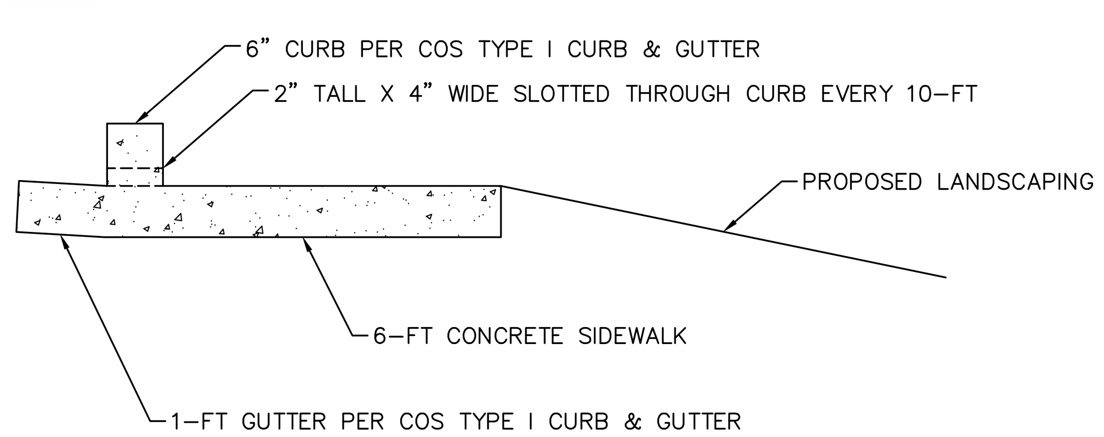
FLOW DIRECTION (PROPOSED/EXISTING)
PROPERTY BOUNDARY
EASEMENT
EXISTING STORM SEWER
PROPOSED STORM SEWER
EXISTING/PROPOSED STORM MANHOLE
EXISTING/PROPOSED STORM INLET
DRAINAGE BASIN BOUNDARY
XXXX PROPOSED MAJOR CONTOUR
XXXX PROPOSED MINOR CONTOUR
XXXX EXISTING MAJOR CONTOUR
XXXX EXISTING MINOR CONTOUR
REF. VETERAN'S VICTORY FILING NO. 1 LOT 1 FDR FOR DESIGN IN THIS AREA.

NOTES

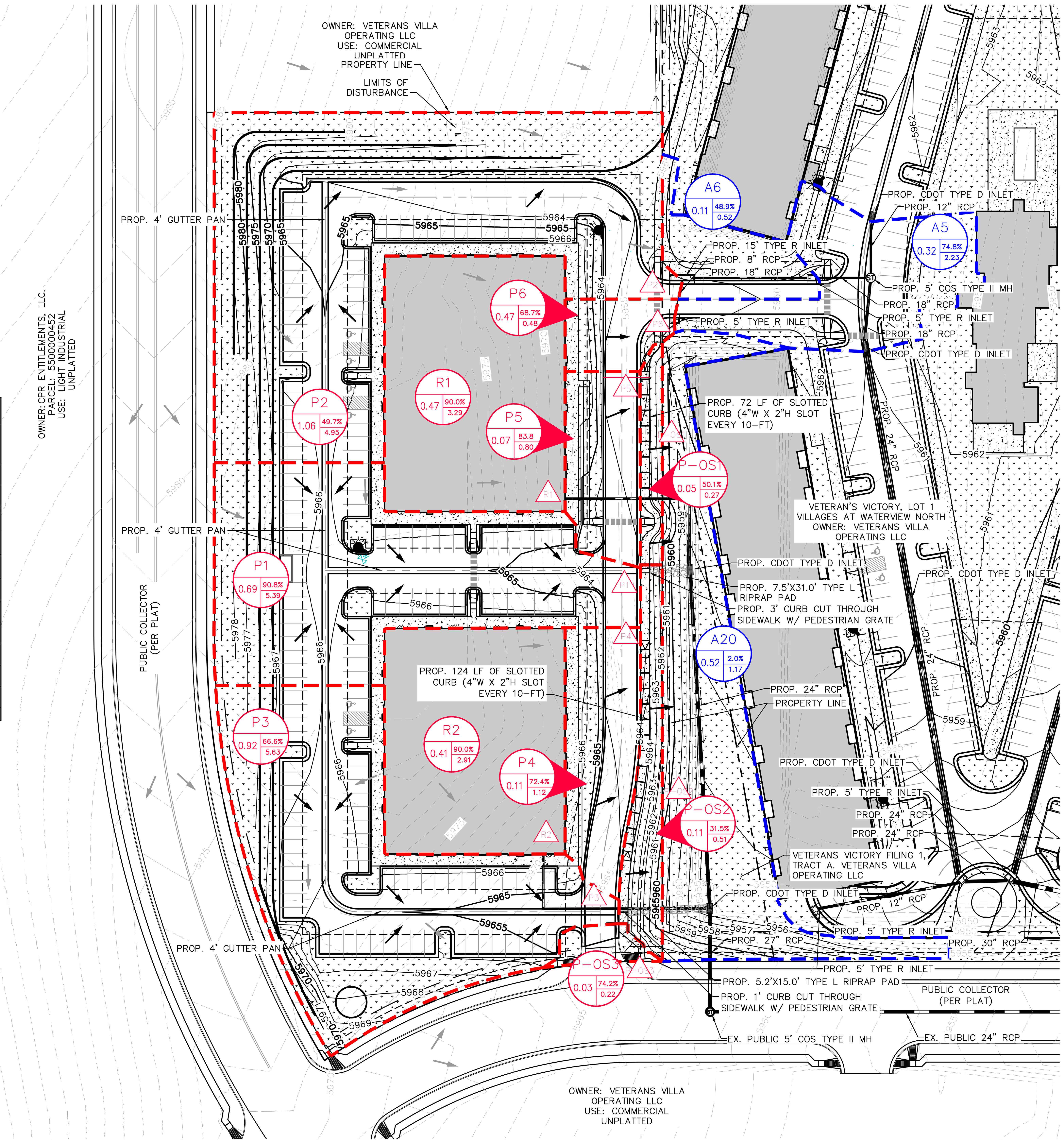
1. ALL PROPOSED CURB AND GUTTER IS COS STD TYPE-1 6" UNLESS OTHERWISE NOTED IN PLAN.
2. ALL PROPOSED STORM SEWER IS PRIVATE UNLESS OTHERWISE NOTED ON PLAN.
3. ALL STORM SEWER IS PROPOSED PER VETERAN'S VICTORY FILING NO. 1 – LOT 1 FDR.

SUMMARY - PROPOSED RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)	Weighted Imperviousness
P1	P1	0.66	2.78	5.12	2.78	5.12	90.3%
P2	P2	1.06	2.18	4.95	3.06	6.59	49.7%
P3	P3	0.74	2.15	4.43	2.93	5.88	64.6%
P4	P4	0.18	0.64	1.25	0.64	1.25	74.7%
P5	P5	0.14	0.57	1.06	1.01	1.88	87.5%
P6	P6	0.07	0.24	0.48	0.68	1.30	68.7%
R1	R1	0.47	1.77	3.29	1.77	3.29	90.0%
R2	R2	0.41	1.56	2.91	1.56	2.91	90.0%
P-OS1	P-OS1	0.05	0.12	0.27	3.91	7.27	50.1%
P-OS2	P-OS2	0.11	0.19	0.51	6.54	12.77	31.5%
P-OS3	P-OS3	0.03	0.11	0.22	0.11	0.22	74.2%
Total		**3.91**	**12.30**	**24.49**	**-**	**-**	**70.9%**



SLOTTED CURB DTL
(N.T.S.)



NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

K:\COS_LA\096955001- Waterview North (2021)\CADD\PlanSheets\Vet Village\CD_DR-Commercial.dwg Green, Shelby 8/14/2023 9:03 AM

Kimley»Horn
2023 KIMLEY-HORN AND ASSOCIATES, INC.
2 North Nevada Avenue, Suite 900
Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: JAR
DRAWN BY: JAR
CHECKED BY: JRH
DATE: 08/10/23

VETERANS VICTORY
LOT 2 VILLAGES AT WATERVIEW NORTH
PROPOSED DRAINAGE MAP

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley-Horn and Associates, Inc.

PROJECT NO.
096955000

SHEET
1 OF 1

APPENDIX G – ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COSTS

Kimley»Horn

Kimley-Horn & Associates, Inc. **Opinion of Probable Construction Cost**

Client:	**Veterans Villa Operating LLC**		
Project:	**Veteran's Village Residential, Lot 1**	**Prepared By:**	**SLG**
		Checked By:	**JJM**

No: **Sheet:** **1 of 1**

Kimley-Horn & Associates, Inc. has not prepared fully engineered construction drawings for this site; therefore, the final quantities are subject to change. Additionally, the final land plan could change significantly through the development process. This OPC is not intended for basing financial decisions, or securing funding. Review all notes and assumptions. Since Kimley-Horn & Associates, Inc. has no control over the cost of labor, materials, equipment, or services furnished by others, or over methods of determining price, or over competitive bidding or market conditions, any and all opinions as to the cost herein, including but not limited to opinions as to the costs of construction materials, shall be made on the basis of experience and best available data. Kimley-Horn & Associates, Inc. cannot and does not guarantee that proposals, bids, or actual costs will not vary from the opinions on costs shown herein. The total costs and other numbers in this Opinion of Probable Cost have been rounded.

Item No.	Item Description	Quantity	Unit	Unit Price	Item Cost
	Storm Sewer Costs (Private)				
1	8" PVC Storm Sewer	30	LF	$60.00	$1,800
2	12" RCP Storm Sewer	390	LF	$55.00	$21,450
3	18" RCP Storm Sewer	800	LF	$70.00	$56,000
4	24" RCP Storm Sewer	910	LF	$85.00	$77,350
5	30" RCP Storm Sewer	155	LF	$105.00	$16,275
6	Type II 5' MH	2	EA	$5,000.00	$10,000
7	Type C inlets	6	EA	$5,000.00	$30,000
8	Type D inlets	8	EA	$6,000.00	$48,000
9	Type R inlet 5'	6	EA	$5,000.00	$30,000
10	Type R inlet 10'	4	EA	$7,000.00	$28,000
11	Type R inlet 15'	1	EA	$9,000.00	$9,000
		Subtotal:			$327,875
		Contingency (%,+/-)		10%	$32,788
		Project Total:			**$360,663**

Basis for Cost Projection:

- ☐ No Design Completed
- ☑ Preliminary Design
- ☐ Final Design

Design Engineer:

Jessica J. McCallum
Registered Professional Engineer, State of Colorado No. 59054