

**FINAL DRAINAGE REPORT  
FOR  
TAMLIN ROAD RV STORAGE-EXPANSION  
EL PASO COUNTY, COLORADO**

December 2024

Prepared For:

**Tamlin Storage, LLC**  
57 Newport Circle Unit B  
Colorado Springs, CO 80906  
(719) 659-7126

Prepared By:

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(719) 593-2593

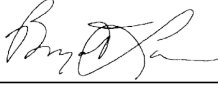
Job No. 25305.00

PCD File No.: PPR2437

**Preliminary Drainage Report for Tamlin Road RV Storage-Expansion**

**ENGINEER'S STATEMENT:**

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



Include the date.

\_\_\_\_\_  
Bryan T. Law, Colorado P.E. # 25043  
For and On Behalf of JR Engineering, LLC

\_\_\_\_\_  
Date

**DEVELOPER'S STATEMENT:**

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

Business Name: Tamlin Storage, LLC

By: \_\_\_\_\_  
Parker Samelson

Title: \_\_\_\_\_  
Address: 57 Newport Circle Unit B

Colorado Springs, CO 80906

Review 1 comment:  
Provide owner signature.  
Review 2 comment:  
Unresolved.

**El Paso County:**

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

\_\_\_\_\_  
Joshua Palmer, P.E.  
County Engineer/ ECM Administrator

\_\_\_\_\_  
Date

Conditions:



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## PURPOSE

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This document is the Final Drainage Report for Tamlin Road RV Storage-Expansion. The purpose of this report is to identify on-site and off-site drainage patterns, culverts, areas tributary to the site, and to safely route developed storm water to adequate outfall facilities.

## GENERAL LOCATION AND DESCRIPTION

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### General Location

The proposed Tamlin Road RV Storage-Expansion development (hereby referred to as the “site”) is located in a portion of Section 20, Township 13 South, Range 65 West of the Principal Meridian in unincorporated El Paso County, Colorado. The site is located northeast of the Tamlin Road and Marksheffel Road intersection. The site is bound by the existing Tamlin Road to the west and north, existing Tamlin Storage to the east, vacant land owned by BLH No. 2, LLC to the south. A vicinity map is presented in Appendix A.

### Description of Property

The proposed site development proposes gravel drive aisles, parking spaces and a full-spectrum Extended Detention Basin (EDB). The site is currently unoccupied and undeveloped with an existing gravel maintenance road connecting from Tamlin Road to the Cherokee Water & Sanitation District parcel to the south. The existing ground cover is native vegetation.

Per a NRCS web soil survey of the area, the site is made up of Hydrologic Group A soils. Type A soils are typically deep well-drained to excessively drained sands that have a high infiltration rate when thoroughly wet. A NRCS soil survey map is presented in Appendix A.

### Floodplain Statement

Based on the FEMA FIRM number 08041C0543G dated December 7, 2018, the site lies within Zone X. Zone X is defined as area outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. The FIRM panel is presented in Appendix A.

## MAJOR DRAINAGE BASINS AND SUB-BASINS

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### Major Basin Descriptions

The site lies within the West Tributary Sand Creek regional sub-basin within the Sand Creek Major Drainage Basin. The *Sand Creek Drainage Basin Planning Study* prepared by Kiowa Engineering revised in March 1996, evaluated the Sand Creek Major Drainage Basin, the existing facilities therein and provided recommendations for future development. A map of the Sand Creek regional sub-basins is presented in Appendix D.

## Preliminary Drainage Report for Tamlin Road RV Storage-Expansion

The Sand Creek Basin covers approximately 54 square miles in unincorporated El Paso County and Colorado Springs. The undeveloped portions of the basin are generally rolling range land with fair vegetative cover associated with semi-arid climates. The headwaters of the basin are in Black Forest and general topography trends south to southwest towards the ultimate outfall into Fountain Creek. Per the *Sand Creek Drainage Basin Planning Study*, the Sand Creek East Fork sub tributary runs outside the western boundary of the site.

The East Tamlin Road RV and Boat Storage (PCD File PPR1945) covers approximately 10 acres with an existing full spectrum detention pond. The area was developed in 2020 under EPC Project No. 25134.00. The pond is functioning normally and is in good condition. A drainage map of the area is presented in Appendix D.

PPR1945

## EXISTING DRAINAGE CONDITIONS

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### Existing Sub-basin Drainage

The existing basin delineation for the site as shown on the map within Appendix E is as follows:

Basin OS1 is approximately 1.10 acres and is comprised of undeveloped areas to the south of the project site. Flow will follow the historic path overland from the east to west and south to north towards DP1 ( $Q_5=0.3$  cfs,  $Q_{100}=2.3$  cfs). DP1 flows will then enter Basin EXA and follow the drainage patterns of that basin. The basin flows will combine at DP2.1.

Existing Basin EXA is approximately 3.18 acres and in the existing condition is comprised of undeveloped land and an existing gravel road. Runoff from this basin sheet flows from the eastern site boundary towards the western site boundary and to the low point located at DP2 ( $Q_5=1.2$  cfs,  $Q_{100}=6.9$  cfs). DP2 flows combine at DP2.1 ( $Q_5=1.5$  cfs,  $Q_{100}=9.1$  cfs) before flowing off-site to the southwest low point along Tamlin Road and continues downwards towards Marksheffel Rd.

A summary of existing basin parameters is presented in Appendix B.

## PROPOSED DRAINAGE CONDITIONS

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### Proposed Drainage Conveyance

In general, developed flows are collected in a curb and gutter that leads to a swale, which convey water to the proposed full-spectrum EDB. The Proposed swale will be designed per the typical county rural roadside ditch section and designed to ensure they are stable and have required capacity to satisfy criteria. A swale is considered stable with a velocity of 5 ft/s or less. To ensure capacity, swales will have a minimum of 1 ft. of freeboard over the water surface for flows anticipated in a 100-year storm event. The roadside swales shall comply with Table 6-1 of the EPC DCM Volume 1.

## Preliminary Drainage Report for Tamlin Road RV Storage-Expansion

Proposed Basin A is approximately 2.18 acres and in the proposed condition is comprised of proposed gravel drives, parking areas, and landscaping areas. Runoff from this basin sheet flows from the eastern site boundary towards the western site boundary towards the proposed swale. Runoff is then directed to the swale at DP1 ( $Q_5=3.8$  cfs,  $Q_{100}=9.2$  cfs) via curb and gutter. Captured flows are then directed to the proposed concrete bottom riprap berm forebay within the full-spectrum EDB (Pond A). Flows combine within Pond A at DP2.1

Proposed Basin B is approximately 0.62 acres and in the proposed condition is comprised of proposed parking areas and Pond A. Runoff from this basin sheet flows from the eastern site boundary towards Pond A at DP2 ( $Q_5=1.1$  cfs,  $Q_{100}=2.8$  cfs). DP2 flows combine with DP1 flows at the pond outlet structure, DP2.1 ( $Q_5=4.8$  cfs,  $Q_{100}=11.6$  cfs). Once treated, the flows are released through the proposed outlet structure at DP2.2 ( $Q_5=0.0$  cfs,  $Q_{100}=2.8$  cfs) and combine at DP4.1.

Basin OS1 is approximately 1.10 acres and is comprised of undeveloped areas to the south of the project site. Flow will follow the historic path overland from the east to west and south to north towards DP3 ( $Q_5=0.3$  cfs,  $Q_{100}=2.3$  cfs). DP3 flows will then enter Basin C and follow the drainage patterns of that basin. The basin flows will combine at DP4.1.

Proposed Basin C is approximately 0.37 acres and in the proposed condition is comprised of proposed grading to remain undeveloped once stabilized. Runoff from this basin sheet flows from north to south at DP4 ( $Q_5=0.2$  cfs,  $Q_{100}=1.2$  cfs). Runoff combines with DP3 and DP2.2 at DP4.1 ( $Q_5=0.5$  cfs,  $Q_{100}=5.9$  cfs) before flowing off-site to the low point along Tamlin Road.

A summary of proposed basin parameters is presented in Appendix B.

### Comparison of Flows

Flows leave the southwestern part of the site at existing DP2.1 and proposed DP4.1. Existing DP2.1 flows ( $Q_5=1.5$  cfs,  $Q_{100}=9.1$  cfs) are greater than the proposed DP4.1 ( $Q_5=0.5$  cfs,  $Q_{100}=5.9$  cfs). The proposed flows in both the minor and major storm leave the site at less than or equal to the historic flow rates. Therefore, there is no negative impact anticipated to downstream properties.

## DRAINAGE DESIGN CRITERIA

### Development Criteria Reference

Storm drainage analysis and design criteria for the project were taken from the “City of Colorado Spring/El Paso County Drainage Criteria Manual” Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the “Urban Storm Drainage Criteria Manual” Volumes 1 - 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the “Colorado Springs Drainage Criteria Manual (CCSDCM)”, dated May 2014, as adopted by El Paso County, as well as the El Paso County “Engineering Criteria Manual” (ECM), dated October 14, 2020.

Discuss where the suitable outfall is located beyond Tamlin. Explain if there is roadside swale that can adequately convey outfall out of the stiling basin and where the flow goes

## Hydrologic Criteria

All hydrologic data was obtained from the “El Paso Drainage Criteria Manual” Volumes 1 and 2, and the “Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual” Volumes 1, 2, and 3. On-site flows were determined based on the 5-year (minor) storm event and the 100-year (major) storm event. Runoff was calculated using the Rational Method, and rainfall intensities for the 5-year and the 100-year storm return frequencies were obtained from Figure 6-5 Intensity Duration Frequency Curve of the Colorado Springs DCM. Runoff coefficients were determined based on proposed land use and from data in Table 6-6 from the DCM. One-hour point rainfall data for the storm events are 1.50 inches for the 5-year and 2.52 inches for the 100-year storm.

## Hydraulic Criteria

The Rational Method and USDCM’s SF-2 and SF-3 forms were used to determine the runoff from the minor and major storms on the site. Autodesk Inc.’s Hydraflow Express Extension (Volume 10.5) was used to size the proposed drainage swales per criteria. The MHFD-Detention\_v4.06 spreadsheet was utilized for evaluating proposed detention and water quality for Pond A. Required detention volumes and allowable release rates were designed per USDCM and CCS/EPCDCM. See Appendix C for calculations and preliminary pond sizing spreadsheets. The hydraulic design will be finalized with the Final Drainage Report.

## DRAINAGE FACILITY DESIGN

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### General Concept

The proposed stormwater conveyance system was designed to convey the developed site flows to a full-spectrum EDB via swales and curb and gutter. The proposed full-spectrum EDB will be designed to release flows at less than or equal to historic rates to minimize adverse impacts downstream. Due to this, there are no drainage problems anticipated downstream of the site.

### Specific Details

The proposed full-spectrum EDB (Pond A) will have a proposed forebay at the inflow point, concrete trickle channel and outlet structure. The proposed pond forebays and weir contain the required percentage of the Water Quality Capture Volume (WQCV). The forebay weir will release 1% of the undetained peak 100-year inflow into Pond A to the proposed concrete trickle channel. The trickle channel will direct flows into the proposed outlet structure, which will detain water per times specified by criteria. The WQCV will be released within 40 hours and the EURV will be released within 72 hours.

### *Four Step Process to Minimize Adverse Impacts of Urbanization*

In accordance with the El Paso County Drainage Criteria Manual Volume 2, this site has implemented the four step process to minimize adverse impacts of urbanization. The four step process includes reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways and implement source controls.

## Preliminary Drainage Report for Tamlin Road RV Storage-Expansion

Step 1: Reducing Runoff Volumes – The site development consists of gravel drive aisles and parking spaces with lawn areas interspersed within the development. This layout will allow for increased infiltration and reduce runoff volume.

Step 2: Provide WQCV - Runoff from this development is treated through capture and slow release of the WQCV in the on-site permanent full-spectrum EDB that is designed per current El Paso County drainage criteria. The 2.5-acre (minimum) residential lots will be limited to a maximum of 10% imperviousness to meet the requirements of Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedure for water quality through a plat note. Should any lot exceed 10% imperviousness, a lot specific drainage report addressing the increased imperviousness must be submitted.

Step 3: Stabilize Drainageways – There are no major drainageways on the site that need to be stabilized. No drainage fees are due with this site development plan. If the site were to be platted in the future, drainage fees will be paid at that time in order to help fund major drainage improvements per the *Sand Creek Drainage Basin Planning Study*. Developed flows leaving the site are limited to below existing rates, and therefore no impact to downstream drainageways is anticipated.

Step 4: Implementing Long Term Source Controls - A site specific stormwater quality and erosion control plan and narrative shall be prepared in conjunction with the final drainage report. Site specific temporary source control BMPs as well as permanent BMP's will be detailed in that plan and narrative to protect receiving waters.

### ***Water Quality***

In accordance with Section 13.3.2.1 of the CCS/EPCDCM, full-spectrum water quality and detention will be provided for all of the development site not meeting exclusions present in the ECM - Stormwater Quality Policy and Procedures Section I.7.1.B. As previously stated, the applicable exclusions for Basin B fall under Section I.7.1.B.7 of the ECM Stormwater Quality Policy and Procedure for areas with land disturbance to undeveloped land that will remain undeveloped.

See the table below for the water quality treatment summary table indicating which basins are treated and which are excluded.

**Table 1 - Water quality treatment summary table.**

<b>PBMP Summary Table</b>		
<b>Basins</b>	<b>Tributary Area (acres)</b>	<b>PBMP</b>
A	2.18	POND A
B	0.62	POND A
C	0.37	EXCLUDED*
*EXCLUDED BASED ON LAND DISTURBANCE TO UNDEVELOPED LAND THAT WILL REMAIN UNDEVELOPED PER ECM APP. I.7.B.7		



## Preliminary Drainage Report for Tamlin Road RV Storage-Expansion

### Proposed Full-Spectrum EDB-Pond A

Water quality is provided for the site by a private full-spectrum detention pond. Table 2 below shows the basin parameters the proposed pond. Refer to Appendix C for the MHFD-Detention design sheets that include the tributary basin parameters as well as the stage-storage table and outlet structure design. The outlet structure includes an orifice plate, overflow grate, and restrictor plate to release stormwater at the appropriate rates. The 5-year and 100-year peak flows were overridden with the values of 1.2 and 6.9 found from a water analysis to size the pond more accurately, it is able to detain a higher volume of water than required. The WQCV will be released within 40 hours, the EURV will be released within 72 hours, and the minor and major flows will be released at or below the pre-development flow rate. Table 3 below gives the designed results for the Proposed Pond 1-5.

**Table 2 - Watershed design parameters for both EDBs**

Name	Watershed Area	Percent Impervious	Watershed Slope
<b>Pond A</b>	2.80 ac	50.00%	0.035 ft/ft

**Table 3- Full-spectrum EDB design for both EDBs**

Name	Required Volume (ac-ft)	Provided Volume (ac-ft)	WQCV (ac-ft)	EURV (ac-ft)	5-year Release (cfs)	100-year Release (cfs)
<b>Pond A</b>	0.205	0.233	0.05	0.16	0.0	2.8

Calculations and pond design parameters are presented in Appendix C.

For Pond A, a broad-crested weir lined with buried soil riprap is provided as an emergency spillway along the western embankment of the pond. Pond A emergency flows and outlet outfalls via an 18" RCP directed to a riprap reinforced low-tailwater basin before being released off-site per the historic pattern.

### ***Erosion Control Plan***

See the Erosion Control Plans and Financial Assurance Estimate by JR Engineering.

### ***Operation & Maintenance***

In order to ensure the function and effectiveness of the stormwater infrastructure, maintenance activities such as inspection, routine maintenance, restorative maintenance, rehabilitation and repair, are required. All proposed drainage structures within any platted County R.O.W. (roadside ditches and local road culverts) will be owned and maintained by El Paso County. All proposed drainage structures within easements or tracts (full-spectrum water quality ponds and drainageway improvements) will be owned and maintained by the property owner unless another party accepts such responsibility in writing and responsibility is properly assigned through legal documentation. Inspection access for El Paso County will be provided through a maintenance easement.

## Preliminary Drainage Report for Tamlin Road RV Storage-Expansion

### *Drainage and Bridge Fees*

The proposed site lies within the Sand Creek Drainage Basin. This site is not proposed to be platted.

### *Construction Cost Opinion*

Private Storm Facilities- (for Information Only):

Item	Description	Quantity	Unit	Unit Price	Cost
1	18" RCP	13	LF	\$ 82.00	\$ 1,066.00
2	18" FES	1	EA	\$ 492.00	
3	Emergency Spillway- Type LV Riprap	43	CY	\$ 60.00	\$ 2,580.00
4	Full-Spectrum EDB (inflow pipes, forebay, trickle channel, outlet structure, spillway, and maintenace trail)	1	EA	\$ 12,000.00	\$ 12,000.00
				Sub-Total	\$ 15,646.00
				10% Contingency	\$ 1,564.60
				<b>Total</b>	<b>\$ 17,210.60</b>
<b>Notes:</b> Cost estimate does not include: site landscaping, irrigation, fence/gate, site lighting, utilities off-site or public improvements. The cost estimate assumes no traffic/ public roadway improvements are required. Unit costs are from the 2024 El Paso County FAE form.					

Please Update to the 2025 FAE form

See FAE for proposed public improvements. JR Engineering cannot and does not guarantee that the construction cost will not vary from these opinions of probable construction costs.

## SUMMARY

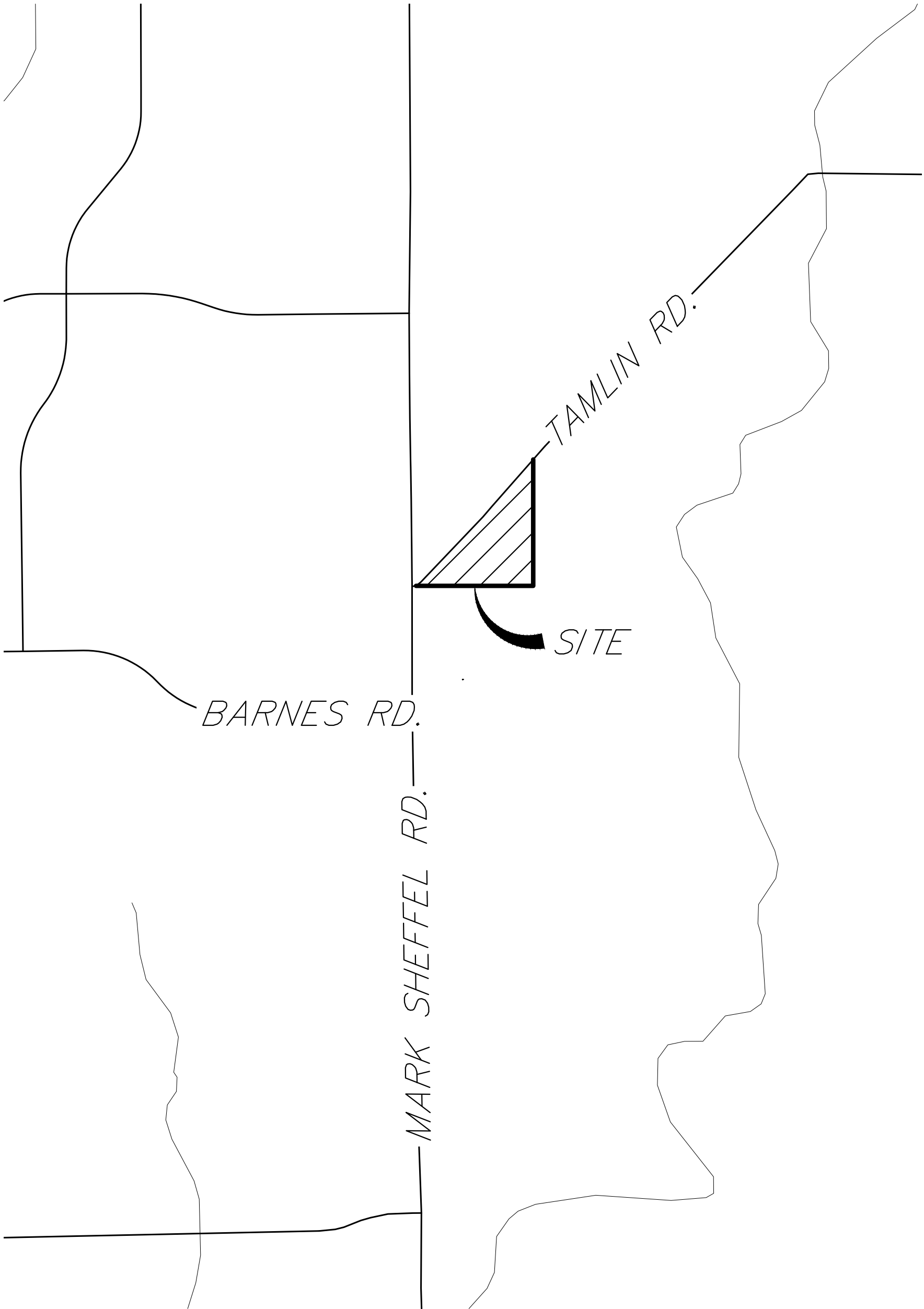
The Preliminary Drainage Report for Tamlin Road RV Storage-Expansion identifies on-site and off-site drainage patterns, storm sewer, areas tributary to the site and safely routes developed storm water to adequate outfall facilities. The proposed Tamlin Road RV Storage-Expansion development will not adversely affect the off-site major drainageways or surrounding development. This report meets the latest El Paso County Drainage Criteria requirements for this site.

## REFERENCES:

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1. Engineering Criteria Manual, El Paso County, October 14, 2020.
2. City of Colorado Springs Drainage Criteria Manual Volume 1, City of Colorado Springs, CO, May 2014.
3. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, Latest Revision.
4. Sand Creek Drainage Basin Planning Study Final Drainage Report, Kiowa Engineering Corporation, March 1996.
5. Final Drainage Report for Tamlin Road RV & Boat Storage, JR Engineering, LLC, July 2020.

**APPENDIX A**  
**FIGURES AND EXHIBITS**

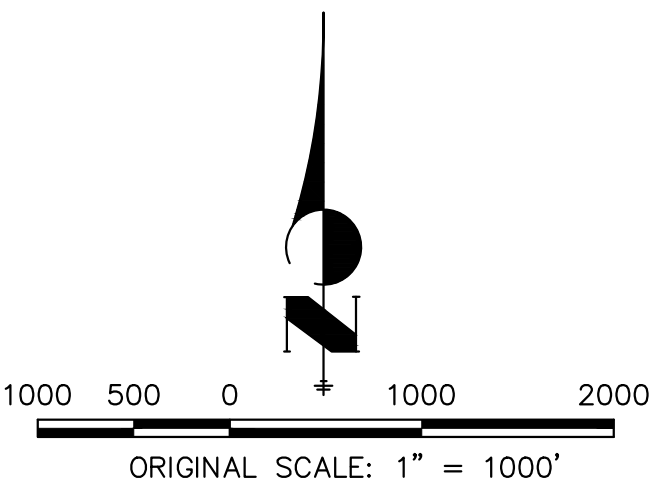


BARNES RD.

TAMLIN RD.

SITE

MARK SHEFFEL RD.

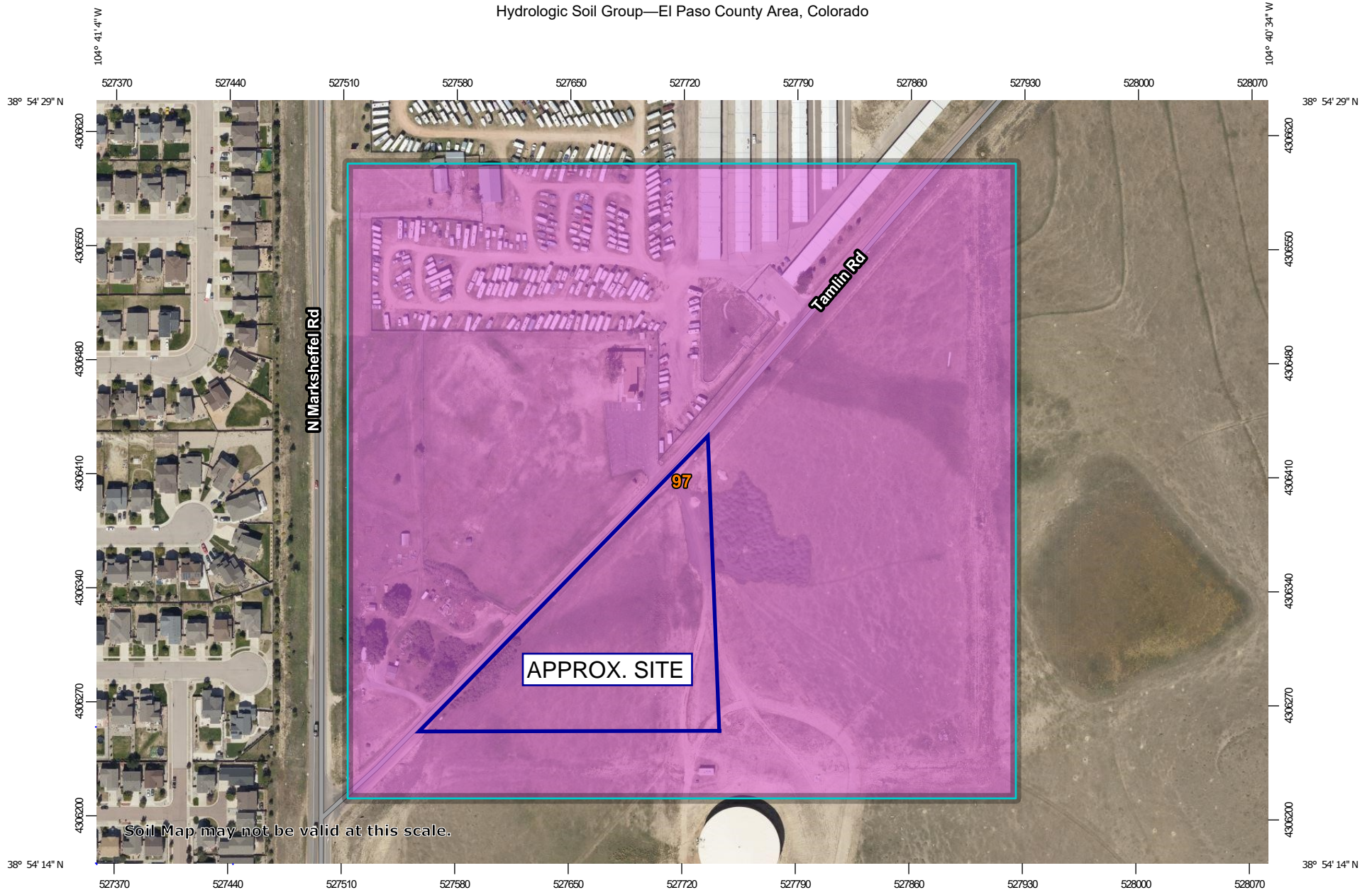


VICINITY MAP  
TAMLIN STORAGE LLC.  
JOB NO. 25305.00  
07/29/2024  
SHEET 1 OF 1

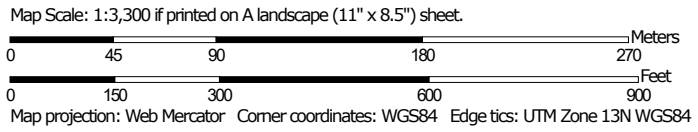
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A Westrian Company

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Fort Collins 970-491-9888 • [www.jrengineering.com](http://www.jrengineering.com)

Hydrologic Soil Group—El Paso County Area, Colorado



Soil Map may not be valid at this scale.



### MAP LEGEND

**Area of Interest (AOI)**









 Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**





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

**Soil Rating Lines**

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

**Soil Rating Points**






-  A
-  A/D
-  B
-  B/D

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


**Water Features**

 Streams and Canals

**Transportation**

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

**Background**

 Aerial Photography

### MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado  
 Survey Area Data: Version 21, Aug 24, 2023

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.

## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
97	Truckton sandy loam, 3 to 9 percent slopes	A	39.8	100.0%
<b>Totals for Area of Interest</b>			<b>39.8</b>	<b>100.0%</b>

### Description

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

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

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

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

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

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

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

### Rating Options

*Aggregation Method: Dominant Condition*

*Component Percent Cutoff: None Specified*



*Tie-break Rule:* Higher

**NOTES TO USERS**

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

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

**Coastal Base Flood Elevations** shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

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

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

NGS Information Services  
NOAA, NIMS12  
National Geodetic Survey  
SSMC-3, #9202  
1315 East-West Highway  
Silver Spring, MD 20910-3282

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

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

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

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

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

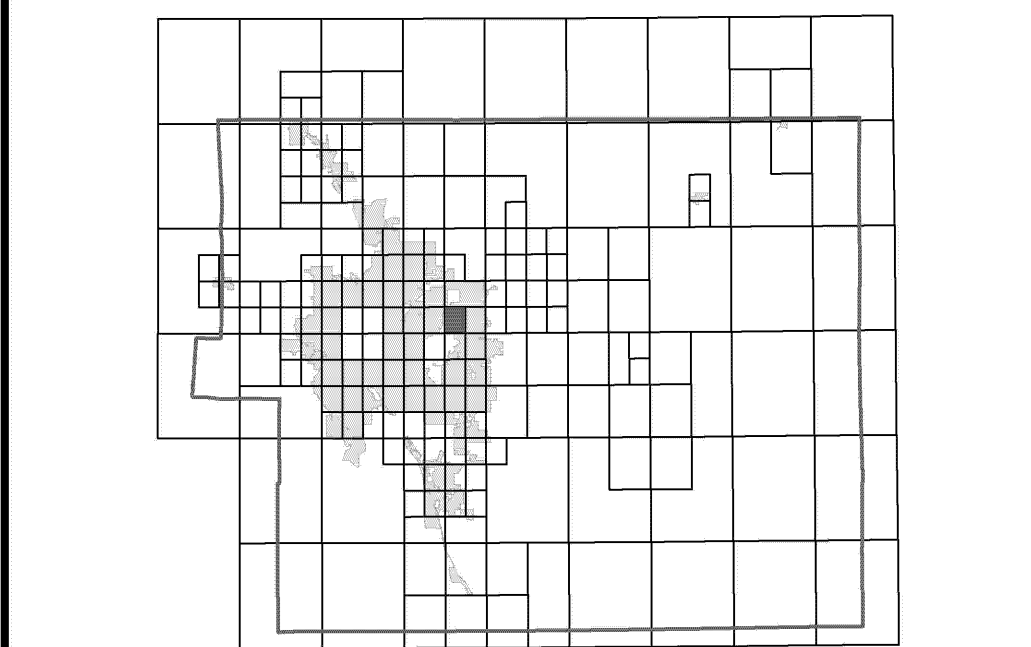
Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FIRM) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

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

El Paso County Vertical Datum Offset Table	
Flooding Source	Vertical Datum Offset (ft)

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

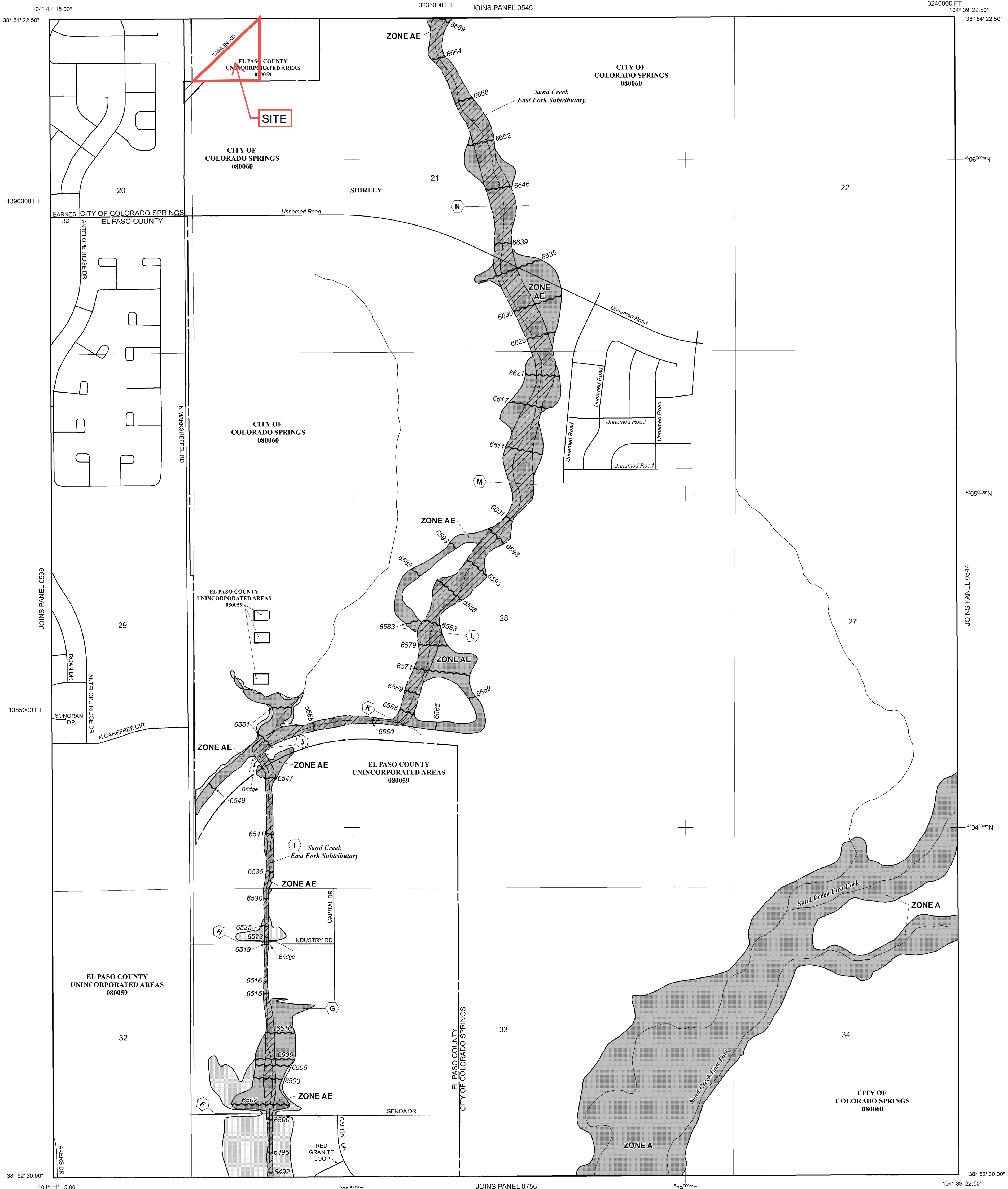
**Panel Location Map**



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



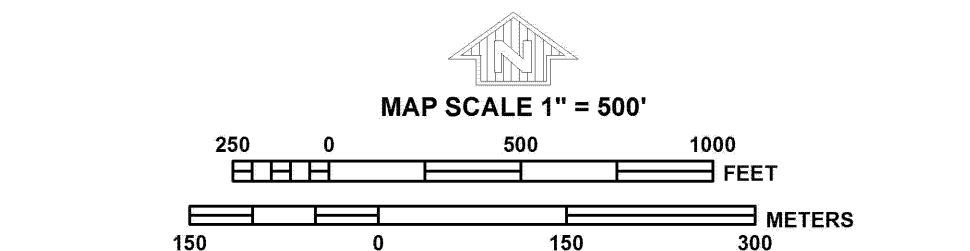
Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 65 WEST.

**LEGEND**

- SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
- The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE
- The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
- OTHER FLOOD AREAS
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- OTHER AREAS
- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
- OTHERWISE PROTECTED AREAS (OPAs)
- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
- Floodplain boundary
- Floodway boundary
- Zone D Boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Base Flood Elevation line and value; elevation in feet\* (EL 987)
- Base Flood Elevation value where uniform within zone; elevation in feet\*
- \* Referenced to the North American Vertical Datum of 1988 (NAVD 88)
- Cross section line
- Transect line
- 57° 07' 30.00" 32° 22' 30.00" Datums of 1983 (NAD 83)
- 4750000N 1000-meter Universal Transverse Mercator grid ticks, zone 13
- 6000000 FT 5000-foot grid ticks; Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
- DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 River Mile
- MAP REPOSITORIES Refer to Map Repositories list on Map Index
- EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP MARCH 17, 1997
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision
- For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.
- To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



**NFIP**

**PANEL 0543G**

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

**PANEL 543 OF 1300**  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0543	G
EL PASO COUNTY	080059	0543	G

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

**MAP NUMBER**  
**08041C0543G**

**MAP REVISED**  
**DECEMBER 7, 2018**

Federal Emergency Management Agency

**APPENDIX B**  
**HYDROLOGIC CALCULATIONS**

## EXISTING COMPOSITE % IMPERVIOUS/C VALUE CALCULATIONS

Subdivision: Tamlin Road RV Storage-Expansion  
 Location: Colorado Springs

Project Name: Tamlin Road RV Storage-Expansion  
 Project No.: 25305.00  
 Calculated By: GAG  
 Checked By: \_\_\_\_\_  
 Date: 8/2/24

Basin ID	Total Area (ac)	Paved Streets/Concrete (100% Impervious)				Gravel Streets (80% Impervious)				Lawns/ Undeveloped (2% Impervious)				Basin Total Weighted C		Basins Total Weighted % Imp.
		C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	
EXA	3.18	0.90	0.96	0.00	0.0%	0.59	0.70	0.12	3.0%	0.09	0.36	3.06	1.9%	0.11	0.37	4.9%
OS1	1.10	0.90	0.96	0.00	0.0%	0.59	0.70	0.00	0.0%	0.09	0.36	1.10	2.0%	0.09	0.36	2.0%
Total	4.28															4.2%
Total On-Site	3.18															4.9%

## EXISTING STANDARD FORM SF-2 TIME OF CONCENTRATION

Subdivision: Tamlin Road RV Storage-Expansion  
Location: Colorado Springs

Project Name: Tamlin Road RV Storage-Expansion  
Project No.: 25305.00  
Calculated By: GAG  
Checked By: \_\_\_\_\_  
Date: 8/2/24

SUB-BASIN						INITIAL/OVERLAND			TRAVEL TIME					t <sub>c</sub> CHECK			FINAL
DATA						(T <sub>i</sub> )			(T <sub>t</sub> )					(URBANIZED BASINS)			
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C <sub>5</sub>	C <sub>100</sub>	L (ft)	S <sub>o</sub> (%)	t <sub>i</sub> (min)	L <sub>t</sub> (ft)	S <sub>t</sub> (%)	K	VEL. (ft/s)	t <sub>t</sub> (min)	COMP. t <sub>c</sub> (min)	TOTAL LENGTH (ft)	Urbanized t <sub>c</sub> (min)	t <sub>c</sub> (min)
EXA	3.18	A	5%	0.11	0.37	300	9.7%	14.6	90	6.7%	7.0	1.8	0.8	15.5	390.0	25.8	15.5
OS1	1.10	A	2%	0.09	0.36	300	8.3%	15.7	25	3.8%	7.0	1.4	0.3	16.0	325.0	25.9	16.0

**NOTES:**

$$t_c = t_i + t_t$$

Equation 6-2

$$t_i = \frac{0.395(1.1 - C_2)\sqrt{L_i}}{S_o^{0.33}}$$

Equation 6-3

**Table 6-2. NRCS Conveyance factors, K**

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

Where:

t<sub>c</sub> = computed time of concentration (minutes)

t<sub>i</sub> = overland (initial) flow time (minutes)

t<sub>t</sub> = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

Equation 6-4

Where:

t<sub>i</sub> = overland (initial) flow time (minutes)

C<sub>5</sub> = runoff coefficient for 5-year frequency (from Table 6-4)

L<sub>i</sub> = length of overland flow (ft)

S<sub>o</sub> = average slope along the overland flow path (ft/ft).

$$t_t = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Equation 6-5

Where:

t<sub>t</sub> = channelized flow time (travel time, min)

L<sub>t</sub> = waterway length (ft)

S<sub>o</sub> = waterway slope (ft/ft)

V<sub>t</sub> = travel time velocity (ft/sec) = K√S<sub>o</sub>

K = NRCS conveyance factor (see Table 6-2).

Where:

t<sub>c</sub> = minimum time of concentration for first design point when less than t<sub>c</sub> from Equation 6-1.

L<sub>t</sub> = length of channelized flow path (ft)

i = imperviousness (expressed as a decimal)

S<sub>t</sub> = slope of the channelized flow path (ft/ft).

Use a minimum t<sub>c</sub> value of 5 minutes for urbanized areas and a minimum t<sub>c</sub> value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

EXISTING STANDARD FORM SF-3  
 STORM DRAINAGE SYSTEM DESIGN  
 (RATIONAL METHOD PROCEDURE)

Subdivision: Tamlin Road RV Storage-Expansion  
 Location: Colorado Springs  
 Design Storm: 5-Year

Project Name: Tamlin Road RV Storage-Expansion  
 Project No.: 25305.00  
 Calculated By: GAG  
 Checked By: \_\_\_\_\_  
 Date: 8/2/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t <sub>c</sub> (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t <sub>c</sub> (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q <sub>street</sub> (cfs)	C*A (ac)	Slope (%)	Q <sub>pipe</sub> (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t <sub>t</sub> (min)	
	1	OS1	1.10	0.09	16.0	0.10	3.42	0.3															Off-site flows from the south towards DP1 Combines flow at DP2.1
	2	EXA	3.18	0.11	15.5	0.35	3.47	1.2															Sheet flows to the western boundary at DP2 Combines flow at DP2.1
	2.1								16.0	0.45	3.42	1.5											Combines flow of DP1 and DP2 at low point Flows offsite to existing low point in Tamlin Road
Notes: Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.																							

EXISTING STANDARD FORM SF-3  
STORM DRAINAGE SYSTEM DESIGN  
(RATIONAL METHOD PROCEDURE)

Subdivision: Tamlin Road RV Storage-Expansion  
 Location: Colorado Springs  
 Design Storm: 100-Year

Project Name: Tamlin Road RV Storage-Expansion  
 Project No.: 25305.00  
 Calculated By: GAG  
 Checked By: \_\_\_\_\_  
 Date: 8/2/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	$t_c$ (min)	C*A (ac)	I (in/hr)	Q (cfs)	$t_c$ (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street}$ (cfs)	C*A (ac)	Slope (%)	$Q_{pipe}$ (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	$t_t$ (min)	
	1	OS1	1.10	0.36	16.0	0.40	5.75	2.3															Off-site flows from the south towards DP1 Combines flow at DP2.1
	2	EXA	3.18	0.37	15.5	1.19	5.83	6.9															Sheet flows to the western boundary at DP2 Combines flow at DP2.1
	2.1								16.0	1.59	5.75	9.1											Combines flow of DP1 and DP2 at low point Flows offsite to existing low point in Tamlin Road
Notes: Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.																							

## PROPOSED COMPOSITE % IMPERVIOUS/C VALUE CALCULATIONS

**Subdivision:** Tamlin Road RV Storage-Expansion  
**Location:** Colorado Springs

**Project Name:** Tamlin Road RV Storage-Expansion  
**Project No.:** 25305.00  
**Calculated By:** DSG  
**Checked By:** \_\_\_\_\_  
**Date:** 9/3/24

Basin ID	Total Area (ac)	Paved Streets/Concrete (100% Impervious)				Gravel Streets (80% Impervious)				Lawns/ Undeveloped (2% Impervious)				Basin Total Weighted C		Basins Total Weighted % Imp.
		C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	
		A	2.18	0.90	0.96	0.00	0.0%	0.59	0.70	1.37	50.3%	0.09	0.36	0.81	0.7%	
B	0.62	0.90	0.96	0.01	1.6%	0.59	0.70	0.34	43.9%	0.09	0.36	0.27	0.9%	0.38	0.56	46.4%
C	0.37	0.90	0.96	0.00	0.0%	0.59	0.70	0.02	4.3%	0.09	0.36	0.35	1.9%	0.12	0.38	6.2%
OS1	1.10	0.90	0.96	0.00	0.0%	0.59	0.70	0.00	0.0%	0.09	0.36	1.10	2.0%	0.09	0.36	2.0%
<b>Total</b>	<b>4.27</b>															<b>33.8%</b>
<b>Total On-site</b>	<b>3.17</b>															<b>33.3%</b>
<b>Total Pond A (Basin A)</b>	<b>2.80</b>															<b>50.0%</b>



## PROPOSED STANDARD FORM SF-2 TIME OF CONCENTRATION

**Subdivision:** Tamlin Road RV Storage-Expansion  
**Location:** Colorado Springs

**Project Name:** Tamlin Road RV Storage-Expansion  
**Project No.:** 25305.00  
**Calculated By:** DSG  
**Checked By:**  
**Date:** 9/3/24

SUB-BASIN						INITIAL/OVERLAND			TRAVEL TIME					t <sub>c</sub> CHECK			FINAL
DATA						(T <sub>i</sub> )			(T <sub>t</sub> )					(URBANIZED BASINS)			
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C <sub>s</sub>	C <sub>100</sub>	L (ft)	S <sub>o</sub> (%)	t <sub>i</sub> (min)	L <sub>t</sub> (ft)	S <sub>t</sub> (%)	K	VEL. (ft/s)	t <sub>t</sub> (min)	COMP. t <sub>c</sub> (min)	TOTAL LENGTH (ft)	Urbanized t <sub>c</sub> (min)	t <sub>c</sub> (min)
A	2.18	A	51%	0.40	0.57	100	6.5%	6.8	340	2.5%	20.0	3.2	1.8	8.6	440.0	19.5	8.6
B	0.62	A	46%	0.38	0.56	100	15.0%	5.3	95	3.5%	15.0	2.8	0.6	5.9	195.0	18.7	5.9
C	0.37	A	6%	0.12	0.38	30	25.0%	3.4	0	0.0%	10.0	0.0	0.0	3.4	30.0	24.9	5.0
OS1	1.10	A	2%	0.09	0.36	300	8.3%	15.7	25	3.8%	7.0	1.4	0.3	16.0	325.0	25.9	16.0

**NOTES:**

$$t_c = t_i + t_t$$

Equation 6-2

$$t_i = \frac{0.395(1.1 - C_s)\sqrt{L_i}}{S_o^{0.33}}$$

Equation 6-3

Where:

t<sub>c</sub> = computed time of concentration (minutes)

t<sub>i</sub> = overland (initial) flow time (minutes)

t<sub>t</sub> = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

Equation 6-4

Where:

t<sub>i</sub> = overland (initial) flow time (minutes)

C<sub>s</sub> = runoff coefficient for 5-year frequency (from Table 6-4)

L<sub>i</sub> = length of overland flow (ft)

S<sub>o</sub> = average slope along the overland flow path (ft/ft).

$$t_t = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Equation 6-5

Where:

t<sub>t</sub> = channelized flow time (travel time, min)

L<sub>t</sub> = waterway length (ft)

S<sub>o</sub> = waterway slope (ft/ft)

V<sub>t</sub> = travel time velocity (ft/sec) = K√S<sub>o</sub>

K = NRCS conveyance factor (see Table 6-2).

Where:

t<sub>c</sub> = minimum time of concentration for first design point when less than t<sub>c</sub> from Equation 6-1.

L<sub>t</sub> = length of channelized flow path (ft)

i = imperviousness (expressed as a decimal)

S<sub>t</sub> = slope of the channelized flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

Use a minimum t<sub>c</sub> value of 5 minutes for urbanized areas and a minimum t<sub>c</sub> value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

**PROPOSED STANDARD FORM SF-3**  
**STORM DRAINAGE SYSTEM DESIGN**  
(RATIONAL METHOD PROCEDURE)

Subdivision: Tamlin Road RV Storage-Expansion  
Location: Colorado Springs  
Design Storm: 5-Year

Project Name: Tamlin Road RV Storage-Expansion  
Project No.: 25305.00  
Calculated By: DSG  
Checked By:  
Date: 9/3/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t <sub>c</sub> (min)	C*A (Ac)	γ (in/hr)	Q (cfs)	t <sub>c</sub> (min)	C*A (ac)	γ (in/hr)	Q (cfs)	Q <sub>street</sub> (cfs)	C*A (ac)	Slope (%)	Q <sub>pipe</sub> (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t <sub>t</sub> (min)	
	1	A	2.18	0.40	8.6	0.88	4.36	3.8															Flows along roadside swale to rundown at DP1 Combines flow at DP2.1 within Pond A
	2	B	0.62	0.38	5.9	0.23	4.92	1.1															Sheet flows into Pond A at DP2 Combines flow at DP2.1 within Pond A
	2.1								8.6	1.11	4.36	4.8											Combines flow of D1 and DP2 Combines at outlet structure at DP2.1
	2.2								-	-	-	0.0											Treats DP1 flow within Pond A Flows released to boundary along west
	3	OS1	1.10	0.09	16.0	0.10	3.42	0.3															Off-site flows from the south towards DP3 Combines flow at DP4.1
	4	C	0.37	0.12	5.0	0.04	5.17	0.2															Proposed flow around pond berm Combines flow at DP4.1
	4.1								16.0	0.14	3.42	0.5											Combines flow of DP2.2, DP3 and DP4 Flow released off-site to the west boundary
<b>Notes:</b> Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.																							

**PROPOSED STANDARD FORM SF-3**  
**STORM DRAINAGE SYSTEM DESIGN**  
(RATIONAL METHOD PROCEDURE)

**Subdivision:** Tamlin Road RV Storage-Expansion  
**Location:** Colorado Springs  
**Design Storm:** 100-Year

**Project Name:** Tamlin Road RV Storage-Expansion  
**Project No.:** 25305.00  
**Calculated By:** DSG  
**Checked By:**  
**Date:** 9/3/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	$t_c$ (min)	C*A (ac)	I (in/hr)	Q (cfs)	$t_c$ (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street}$ (cfs)	C*A (ac)	Slope (%)	$Q_{pipe}$ (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	$t_t$ (min)	
	1	A	2.18	0.57	8.6	1.25	7.32	9.2															Flows along roadside swale to rundown at DP1 Combines flow at DP2.1 within Pond A
	2	B	0.62	0.56	5.9	0.34	8.26	2.8															Sheet flows into Pond A at DP2 Combines flow at DP2.1 within Pond A
	2.1								8.6	1.59	7.32	11.6											Combines flow of D1 and DP2 Combines at outlet structure at DP2.1
	2.2								-	-	-	2.8											Treats DP1 flow within Pond A Flows released to boundary along west
	3	OS1	1.10	0.36	16.0	0.40	5.75	2.3															Off-site flows from the south towards DP3 Combines flow at DP4.1
	4	C	0.37	0.38	5.0	0.14	8.68	1.2															Proposed flow around pond berm Combines flow at DP4.1
	4.1								16.0	0.54	5.75	5.9											Combines flow of DP2.2, DP3 and DP4 Flow released off-site to the west boundary
<b>Notes:</b> Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.																							

**APPENDIX C**  
**HYDRAULIC CALCULATIONS**

# Channel Report

## DP1 Swale

### Triangular

Side Slopes (z:1) = 4.00, 4.00

Total Depth (ft) = 2.00

Invert Elev (ft) = 100.00

Slope (%) = 1.00

N-Value = 0.030

### Calculations

Compute by: Known Q

Known Q (cfs) = 11.00

### Highlighted

Depth (ft) = 0.97

Q (cfs) = 11.00

Area (sqft) = 3.76

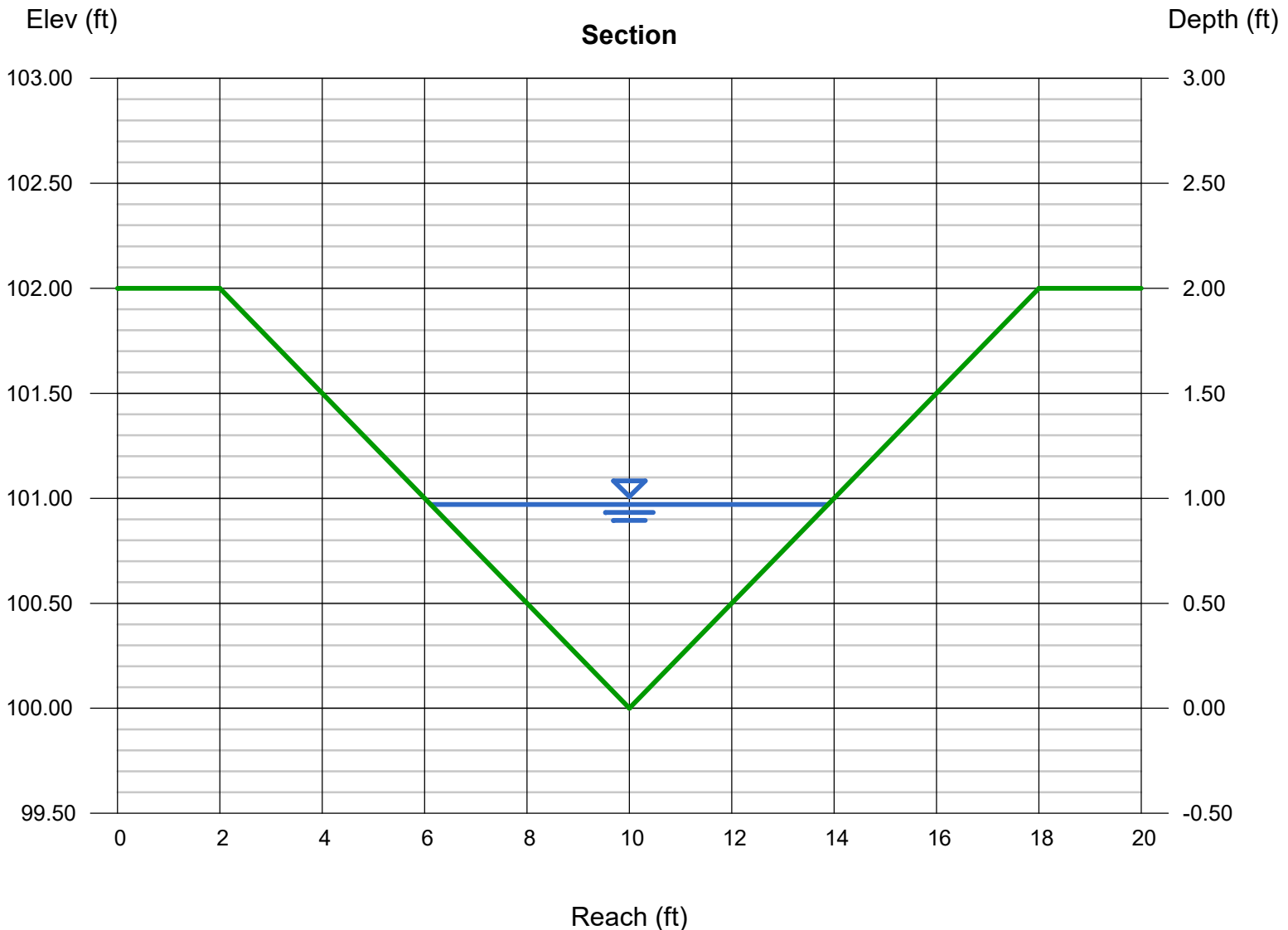
Velocity (ft/s) = 2.92

Wetted Perim (ft) = 8.00

Crit Depth, Yc (ft) = 0.86

Top Width (ft) = 7.76

EGL (ft) = 1.10



# Channel Report

## DP1 Rundown

### Triangular

Side Slopes (z:1) = 4.00, 4.00  
Total Depth (ft) = 1.75

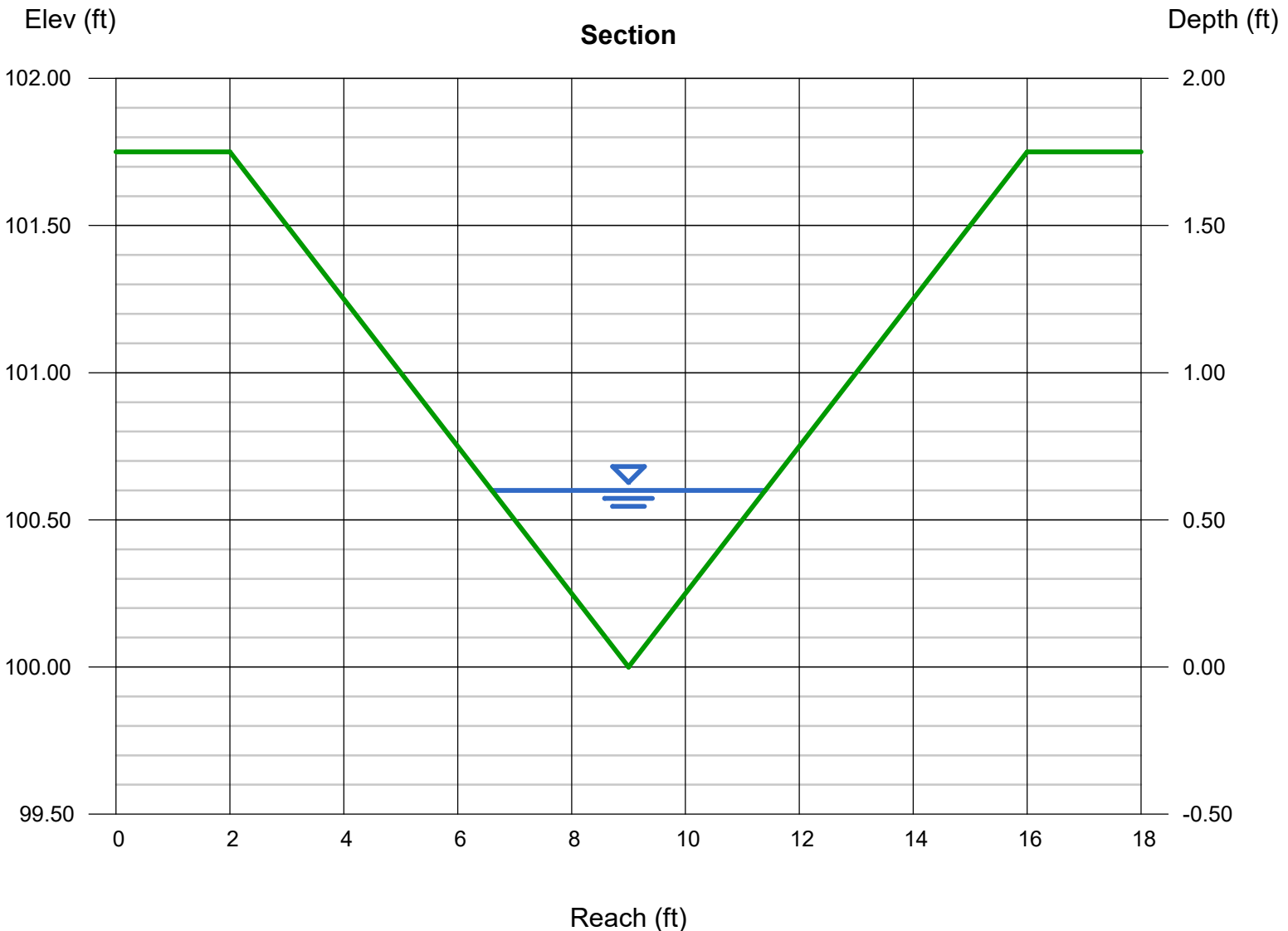
Invert Elev (ft) = 100.00  
Slope (%) = 13.00  
N-Value = 0.030

### Calculations

Compute by: Known Q  
Known Q (cfs) = 11.00

### Highlighted

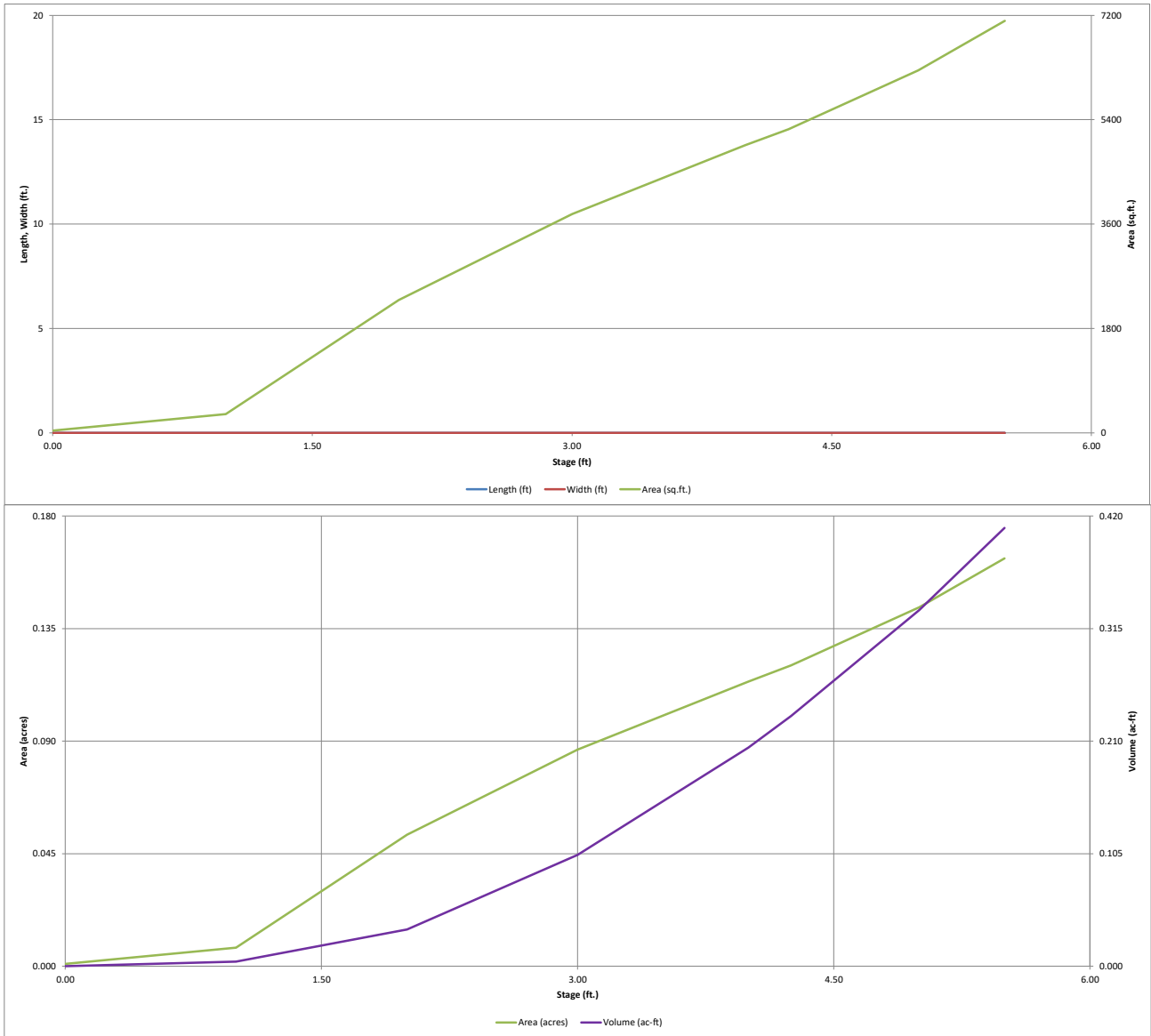
Depth (ft) = 0.60  
Q (cfs) = 11.00  
Area (sqft) = 1.44  
Velocity (ft/s) = 7.64  
Wetted Perim (ft) = 4.95  
Crit Depth, Yc (ft) = 0.86  
Top Width (ft) = 4.80  
EGL (ft) = 1.51





# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

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



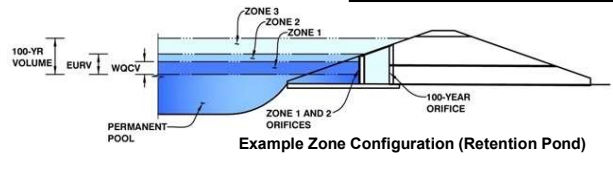


✓ = calcs match details in plans  
 X = calcs do not match details in plans

## DETENTION BASIN OUTLET STRUCTURE DESIGN

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

**Project:** Tamlin Road RV Storage-Expansion  
**Basin ID:** Pond A



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.25	0.048	Orifice Plate
Zone 2 (EURV)	3.61	0.113	Orifice Plate
Zone 3 (100-year)	4.44	0.095	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>0.257</b>	

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

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

**Calculated Parameters for Underdrain**

Underdrain Orifice Area =	N/A	ft <sup>2</sup>
Underdrain Orifice Centroid =	N/A	feet

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.71	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 <sup>2</sup>
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft <sup>2</sup>

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.06	1.70					
Orifice Area (sq. inches)	0.17	0.30	0.42					

	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 <sup>2</sup>
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 =	3.75	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.00	N/A	feet
Overflow Grate Type =	Close Mesh Grate	N/A	
Debris Clogging % =	50%	N/A	%

**Calculated Parameters for Overflow Weir**

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H <sub>u</sub> =	3.75	N/A	feet
Overflow Weir Slope Length =	3.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	4.03	N/A	
Overflow Grate Open Area w/o Debris =	7.12	N/A	ft <sup>2</sup>
Overflow Grate Open Area w/ Debris =	3.56	N/A	ft <sup>2</sup>

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.08	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 =	18.00	9" per plans	inches

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

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.77	N/A	ft <sup>2</sup>
Outlet Orifice Centroid =	0.75	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

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

Spillway Invert Stage =	4.25	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	14.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

**Calculated Parameters for Spillway**

Spillway Design Flow Depth =	0.25	feet
Stage at Top of Freeboard =	5.50	feet
Basin Area at Top of Freeboard =	0.16	acres
Basin Volume at Top of Freeboard =	0.41	acre-ft

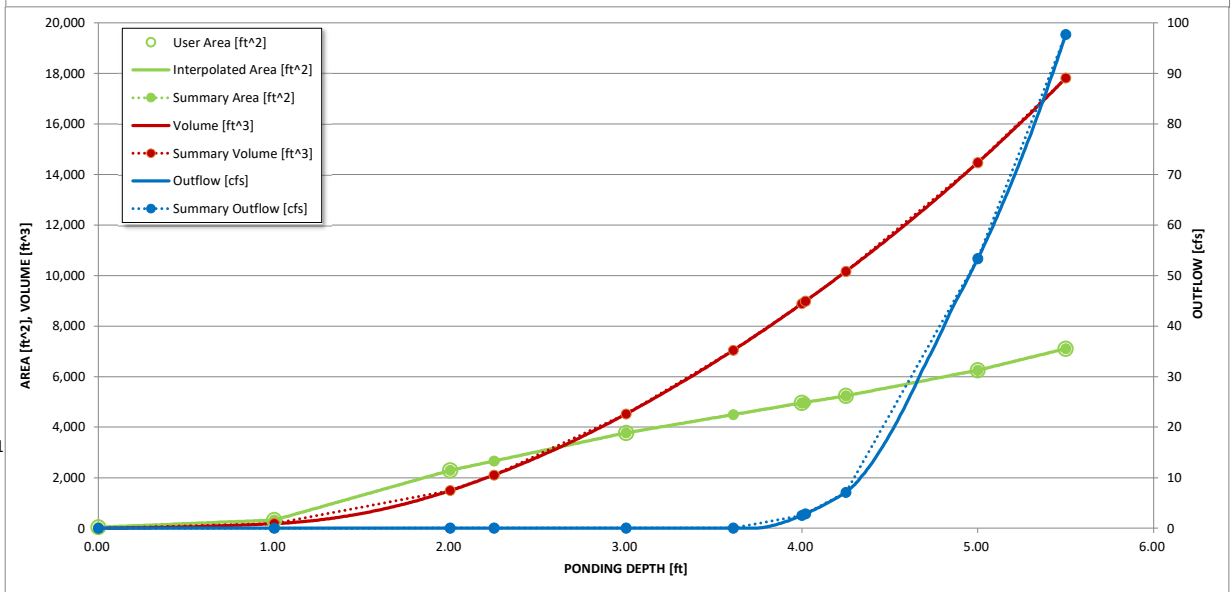
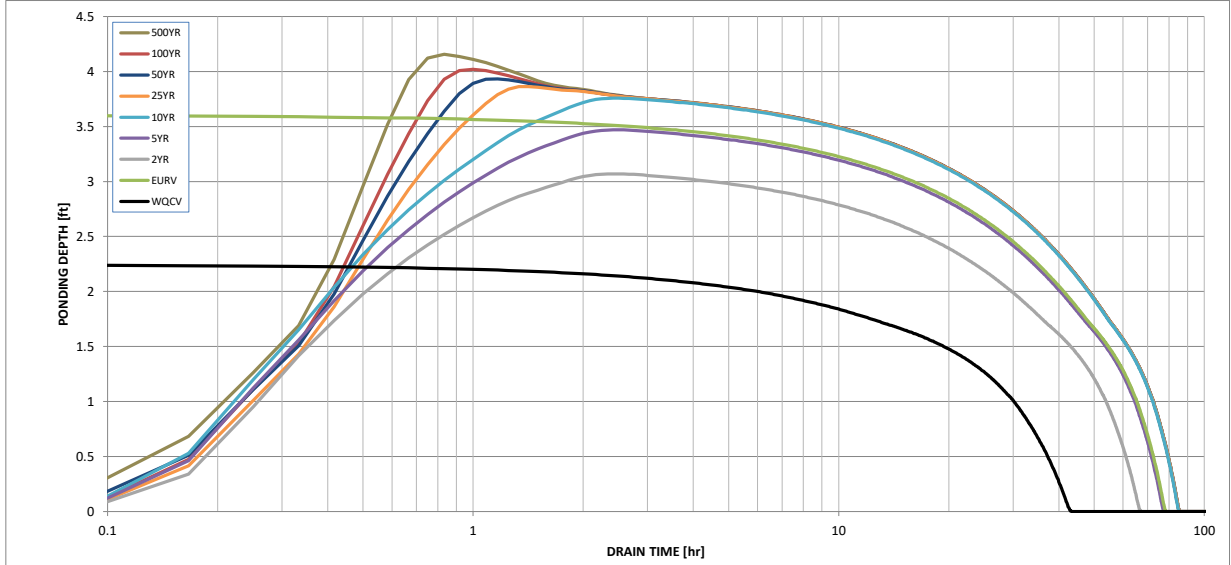
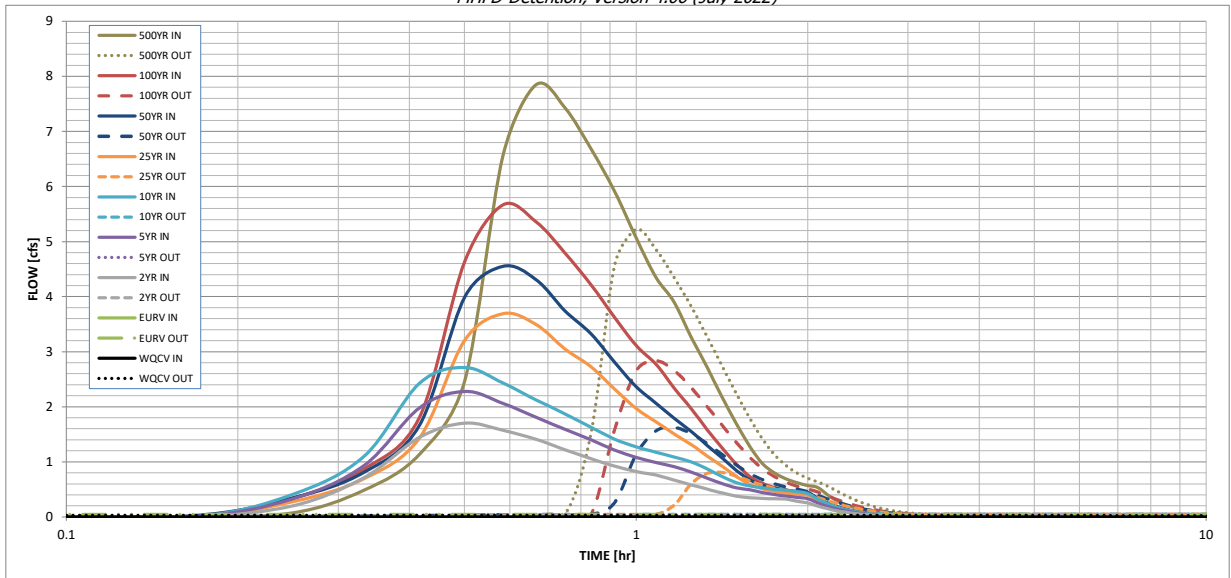
**Routed Hydrograph Results**

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.048	0.161	0.117	0.155	0.186	0.235	0.282	0.342	0.473
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.117	0.155	0.186	0.235	0.282	0.342	0.473
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.0	0.0	0.1	0.5	1.0	1.7	3.0
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.43	0.02	0.18	0.36	2.46	1.06
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	1.7	2.3	2.7	3.7	4.6	5.7	7.8
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.0	0.0	0.1	0.8	1.6	2.8	5.2
Peak Inflow Q (cfs) =	N/A	N/A	0.0	0.0	1.1	1.6	1.6	0.4	1.8
Peak Outflow Q (cfs) =	N/A	N/A	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Structure Controlling Flow =	N/A	N/A	N/A	N/A	0.0	0.1	0.2	0.4	0.7
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	37	64	55	64	70	68	67	65	61
Time to Drain 97% of Inflow Volume (hours) =	40	72	61	71	78	77	76	74	72
Time to Drain 99% of Inflow Volume (hours) =	2.25	3.61	3.07	3.47	3.76	3.86	3.93	4.02	4.16
Maximum Ponding Depth (ft) =	0.06	0.10	0.09	0.10	0.11	0.11	0.11	0.11	0.12
Area at Maximum Ponding Depth (acres) =	0.048	0.162	0.110	0.147	0.176	0.188	0.196	0.205	0.221
Maximum Volume Stored (acre-ft) =									

# 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	0.02	0.00
	0:15:00	0.00	0.00	0.20	0.33	0.41	0.28	0.35	0.34	0.49
	0:20:00	0.00	0.00	0.72	0.94	1.10	0.70	0.81	0.87	1.14
	0:25:00	0.00	0.00	1.44	1.98	2.43	1.44	1.67	1.81	2.47
	0:30:00	0.00	0.00	1.70	2.28	2.71	3.20	3.99	4.64	6.55
	0:35:00	0.00	0.00	1.57	2.06	2.43	3.69	4.55	5.67	7.85
	0:40:00	0.00	0.00	1.41	1.81	2.13	3.50	4.31	5.36	7.43
	0:45:00	0.00	0.00	1.22	1.59	1.87	3.05	3.74	4.79	6.68
	0:50:00	0.00	0.00	1.06	1.40	1.63	2.72	3.32	4.21	5.91
	0:55:00	0.00	0.00	0.92	1.21	1.41	2.32	2.81	3.62	5.07
	1:00:00	0.00	0.00	0.82	1.08	1.27	1.97	2.36	3.11	4.35
	1:05:00	0.00	0.00	0.76	0.99	1.17	1.73	2.06	2.77	3.89
	1:10:00	0.00	0.00	0.67	0.91	1.09	1.50	1.79	2.34	3.26
	1:15:00	0.00	0.00	0.58	0.81	1.00	1.31	1.55	1.96	2.71
	1:20:00	0.00	0.00	0.50	0.70	0.87	1.10	1.29	1.58	2.17
	1:25:00	0.00	0.00	0.43	0.60	0.73	0.92	1.07	1.25	1.69
	1:30:00	0.00	0.00	0.38	0.53	0.62	0.73	0.84	0.96	1.28
	1:35:00	0.00	0.00	0.35	0.49	0.56	0.59	0.67	0.73	0.97
	1:40:00	0.00	0.00	0.34	0.44	0.53	0.51	0.58	0.61	0.79
	1:45:00	0.00	0.00	0.33	0.40	0.50	0.46	0.52	0.53	0.69
	1:50:00	0.00	0.00	0.32	0.38	0.48	0.43	0.49	0.48	0.62
	1:55:00	0.00	0.00	0.28	0.35	0.46	0.41	0.46	0.45	0.57
	2:00:00	0.00	0.00	0.25	0.33	0.42	0.39	0.44	0.43	0.53
	2:05:00	0.00	0.00	0.19	0.25	0.32	0.30	0.34	0.32	0.40
	2:10:00	0.00	0.00	0.15	0.19	0.24	0.23	0.25	0.24	0.30
	2:15:00	0.00	0.00	0.11	0.14	0.18	0.17	0.19	0.18	0.22
	2:20:00	0.00	0.00	0.08	0.11	0.14	0.13	0.14	0.13	0.17
	2:25:00	0.00	0.00	0.06	0.08	0.10	0.09	0.10	0.10	0.12
	2:30:00	0.00	0.00	0.04	0.06	0.07	0.07	0.07	0.07	0.09
	2:35:00	0.00	0.00	0.03	0.04	0.05	0.05	0.05	0.05	0.06
	2:40:00	0.00	0.00	0.02	0.03	0.04	0.03	0.04	0.04	0.04
	2:45:00	0.00	0.00	0.01	0.02	0.02	0.02	0.03	0.02	0.03
	2:50:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	2:55:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	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	



## FOREBAY VOLUME AND RELEASE REQUIREMENTS

<b>Equation 3-1</b>	$WQCV = a(0.91I^3 - 1.19I^2 + 0.781I)$		
Pond Forebay	WQCV=watershed-inches, I=% Impervious, a=1 (40 hour drain time)		
	<i>I (Impervious,%) =</i>	50.00%	WQCV = 0.20625
<b>Equation 3-3</b>	$V = (WQCV/12)A$		
Pond Forebay	V=Volume (ac-ft.), A=Area (acres)		
	A (ac.) =	2.80	V (ac-ft.) = 0.0481
<b>1% OF WQCV</b>	$(V_{req}) = .01(V)$		
Forebay Required Volume			
		$V_{req} \text{ (ac-ft.)} =$	0.000
		$V_{req} \text{ (ft}^3\text{)} =$	21
Volume Provided For Pond (Forebay) =		$V_{prop} \text{ (ft}^3\text{)} =$	90
<b>Forebay Release Rate</b>	2% OF $Q_{100}$ Inflow Into Pond		
$Q_{100}$ Discharges			
		$Q_{100} \text{ (cfs)} =$	5.7
		$Q_{out} \text{ (cfs)} =$	0.11

# Weir Report

## Pond Forebay Notch

### V-Notch Weir

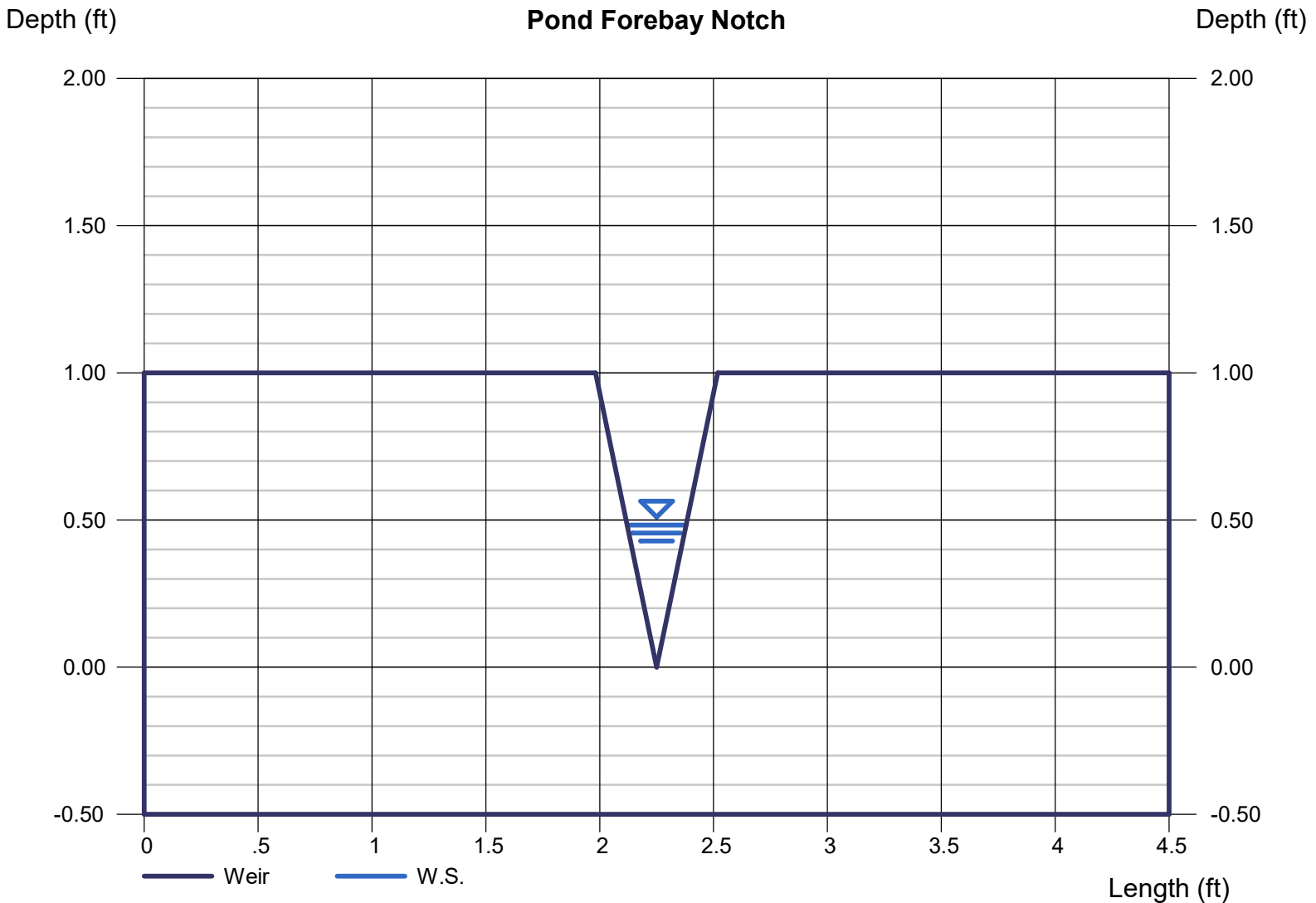
Crest = Sharp  
Angle (Deg) = 30  
Total Depth (ft) = 1.00

### Highlighted

Depth (ft) = 0.48  
Q (cfs) = 0.110  
Area (sqft) = 0.06  
Velocity (ft/s) = 1.76  
Top Width (ft) = 0.26

### Calculations

Weir Coeff. Cw = 0.68  
Compute by: Known Q  
Known Q (cfs) = 0.11



# Channel Report

## Pond Trickle Channel Capacity

### Rectangular

Bottom Width (ft) = 4.00  
Total Depth (ft) = 0.50

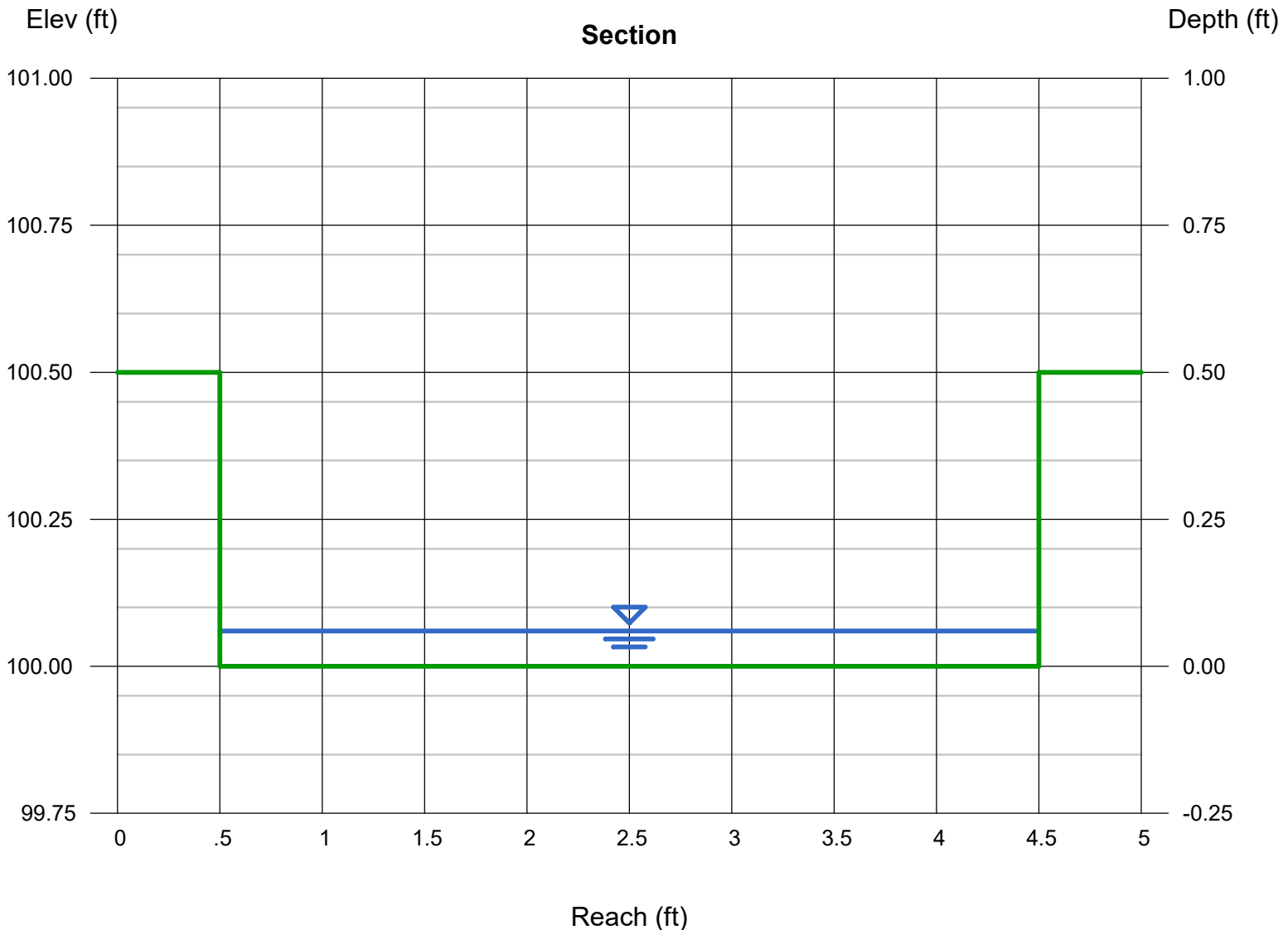
Invert Elev (ft) = 100.00  
Slope (%) = 0.50  
N-Value = 0.013

### Calculations

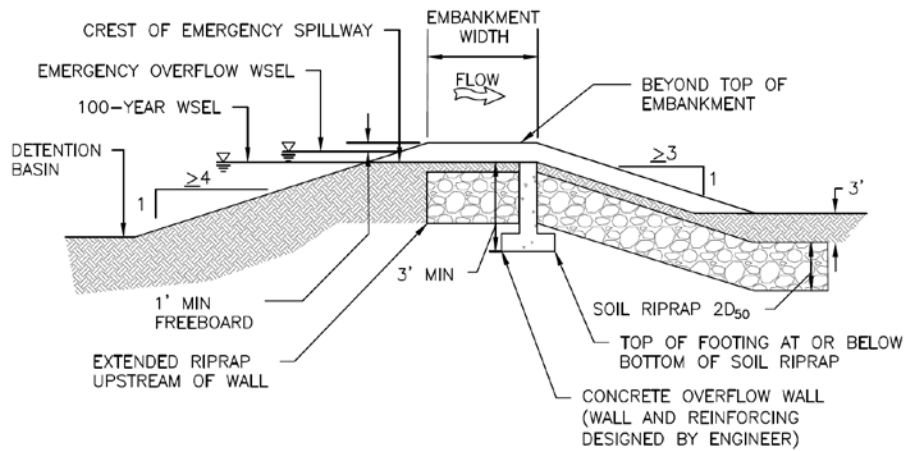
Compute by: Known Q  
Known Q (cfs) = 0.22

### Highlighted

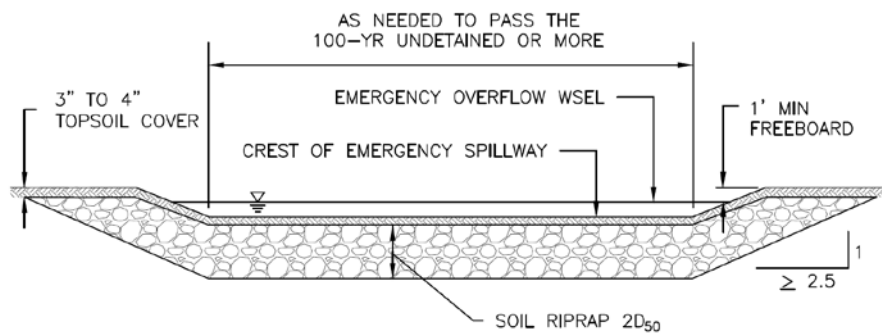
Depth (ft) = 0.06  
Q (cfs) = 0.220  
Area (sqft) = 0.24  
Velocity (ft/s) = 0.92  
Wetted Perim (ft) = 4.12  
Crit Depth, Yc (ft) = 0.05  
Top Width (ft) = 4.00  
EGL (ft) = 0.07



**SPILLWAY RIPRAP CALCULATION**



**EMERGENCY SPILLWAY PROFILE**



**EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL**

Slope=33%

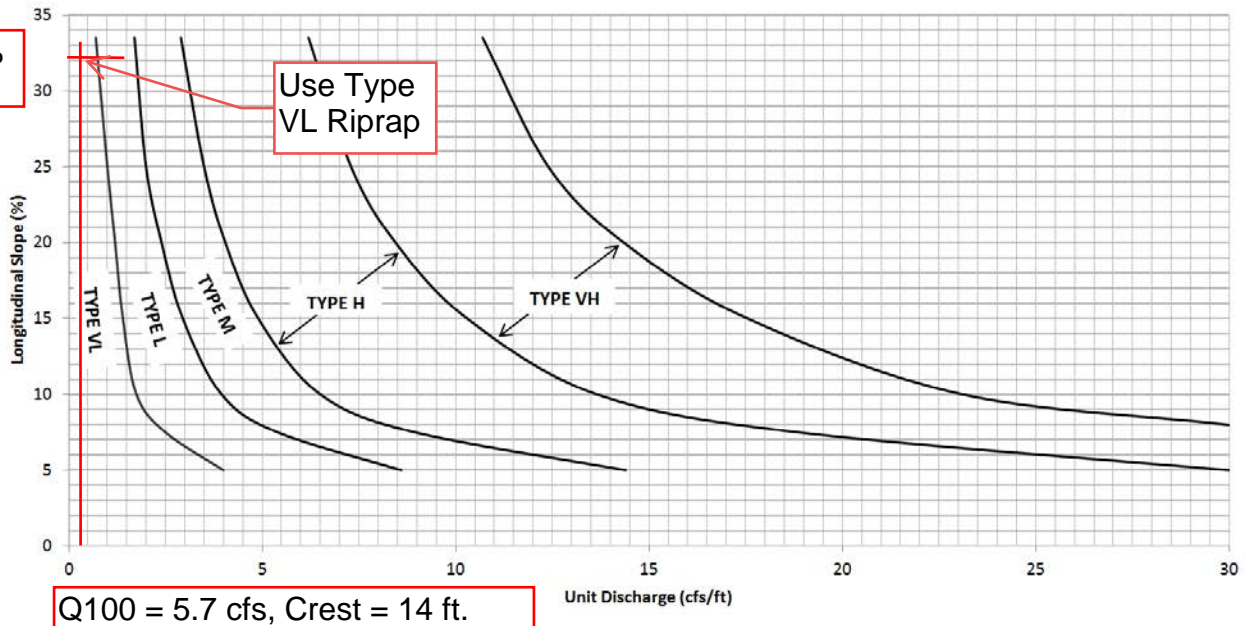


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)



# Channel Report

<Name>

Please identify this analysis.

### User-defined

Invert Elev (ft) = 6721.72  
Slope (%) = 1.00  
N-Value = 0.013

### Highlighted

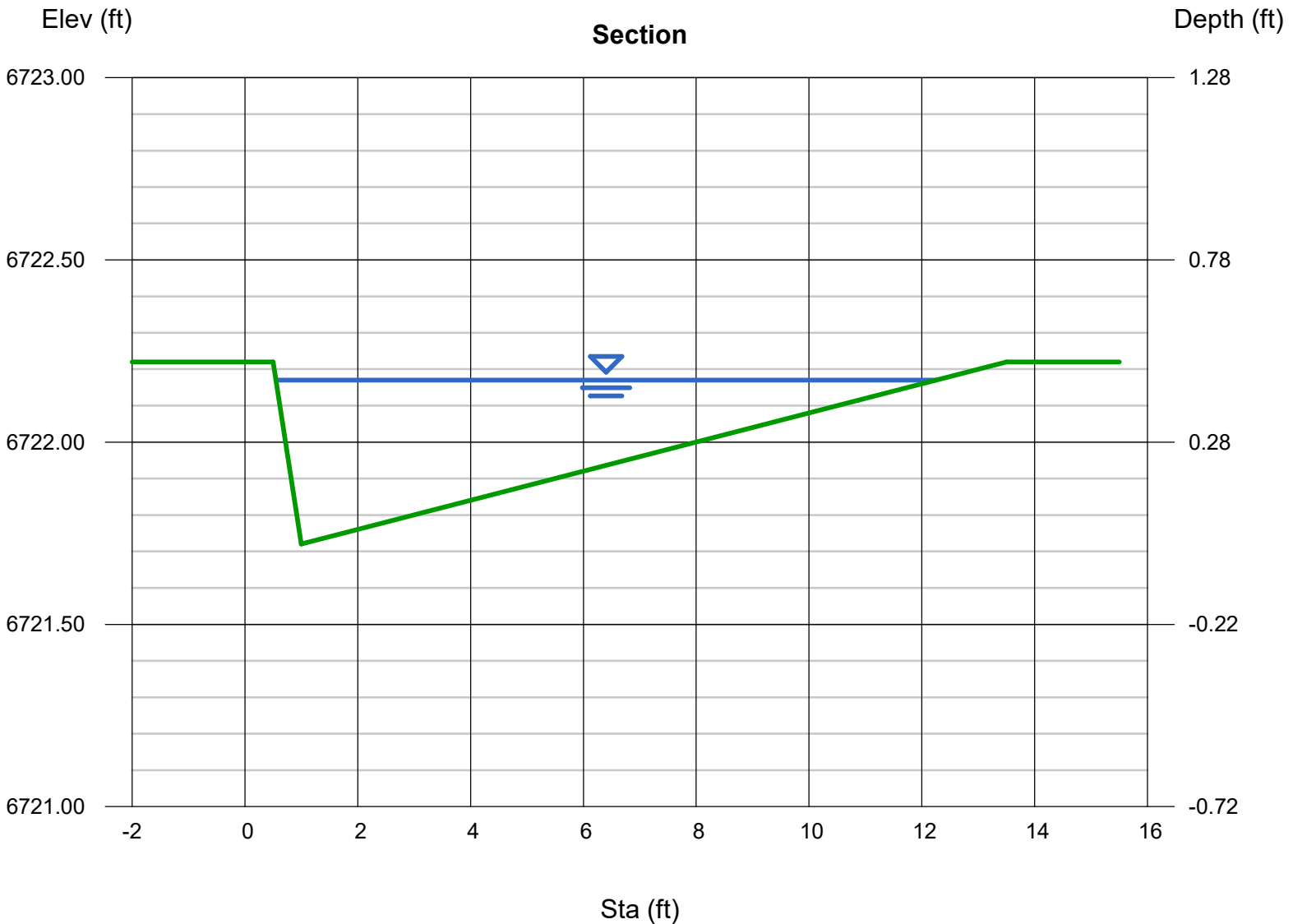
Depth (ft) = 0.45  
Q (cfs) = 11.00  
Area (sqft) = 2.63  
Velocity (ft/s) = 4.17  
Wetted Perim (ft) = 11.90  
Crit Depth, Yc (ft) = 0.50  
Top Width (ft) = 11.71  
EGL (ft) = 0.72

### Calculations

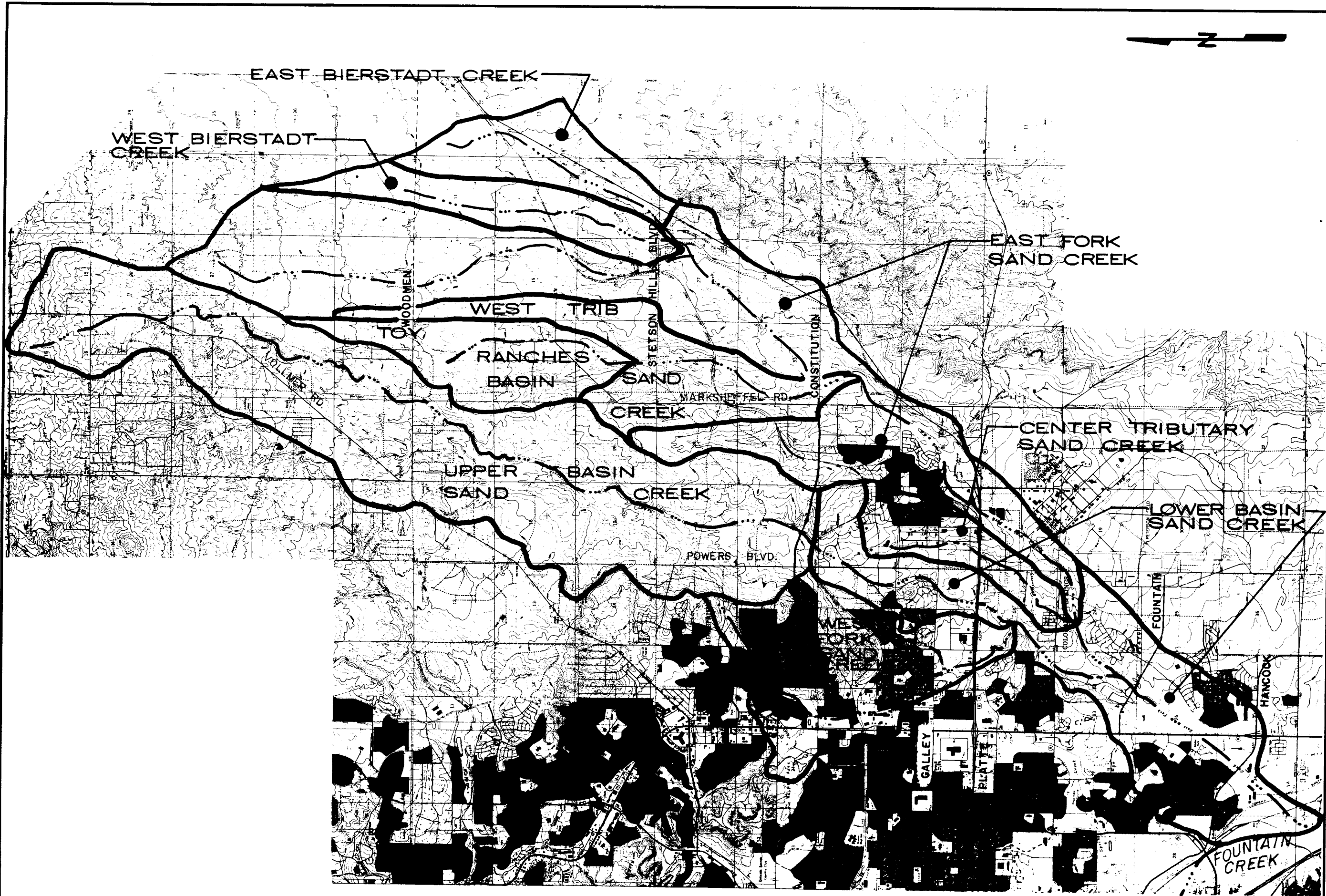
Compute by: Known Q  
Known Q (cfs) = 11.00

(Sta, El, n)-(Sta, El, n)...

(0.00, 6722.22)-(0.50, 6722.22, 0.013)-(1.00, 6721.72, 0.013)-(13.50, 6722.22, 0.013)



**APPENDIX D**  
**REFERENCE MATERIALS**



Kiowa Engineering Corporation  
 419 W. Bijou Street  
 Colorado Springs, Colorado  
 80905-1308

SAND CREEK DRAINAGE  
 BASIN PLANNING STUDY  
 REGIONAL SUB-BASINS

Project No	90-04-09
Date:	11/90
Design:	
Drawn:	EAK
Check:	
Revisions:	

FINAL DRAINAGE REPORT FOR  
TAMLIN ROAD RV & BOAT STORAGE

**FINAL DRAINAGE REPORT  
FOR  
TAMLIN ROAD RV & BOAT STORAGE**

**Prepared For:  
C&M Properties, LLC  
12748 Barossa Valley Road  
Colorado Springs, CO 80921**

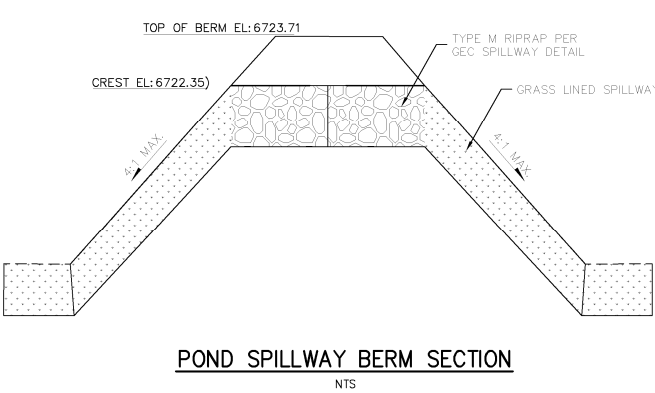
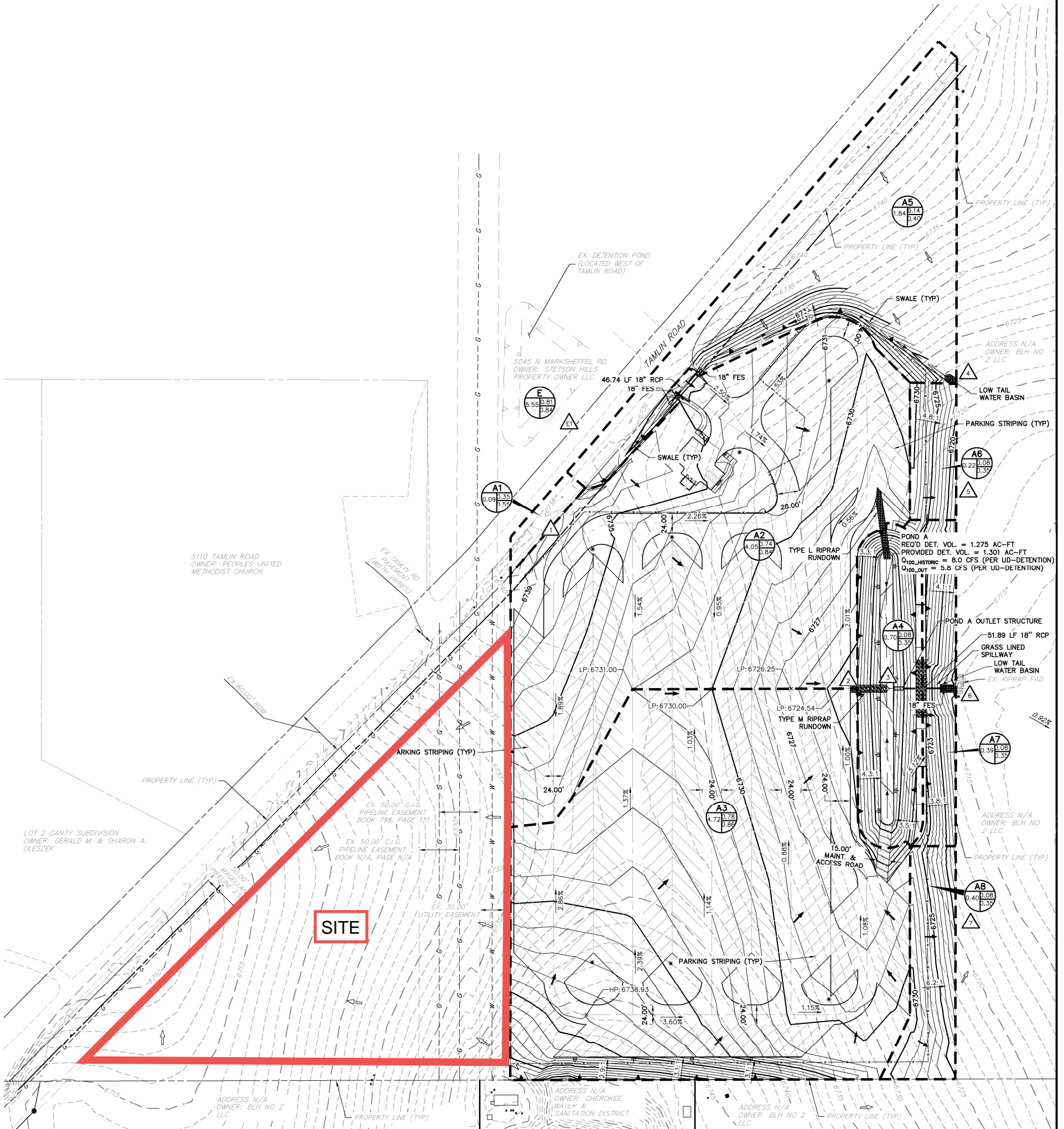
**July 2020  
Project No. 2513400**

**Prepared By:  
JR Engineering, LLC  
5475 Tech Center Drive, Suite 235  
Colorado Springs, CO 80919  
719-593-2593**

**PCD FILE NO.: PPR1945**



# TAMLIN ROAD RV & BOAT STORAGE PROPOSED DRAINAGE MAP



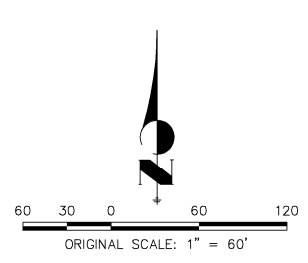
- LEGEND**
- I.D. BASIN DESIGNATION
  - I.D.: BASIN IDENTIFIER
  - A: BASIN AREA
  - B: C<sub>s</sub>
  - C: C<sub>100</sub>
  - DESIGN POINT
  - BASIN DELINEATION
  - EXISTING INDEX CONTOURS
  - EXISTING INTERMEDIATE CONTOURS
  - PROPOSED INDEX CONTOURS
  - PROPOSED INTERMEDIATE CONTOURS
  - EXISTING FLOW DIRECTION
  - PROPOSED FLOW DIRECTION

**BASIN SUMMARY TABLE**

Tributary Sub-basin	Area (acres)	Percent Impervious	C <sub>s</sub>	C <sub>100</sub>	t <sub>c</sub> (min)	Q <sub>s</sub> (cfs)	Q <sub>100</sub> (cfs)
A1	0.09	33%	0.35	0.55	5.0	0.2	0.4
A2	4.05	74%	0.71	0.81	6.8	13.5	26.0
A3	4.72	81%	0.78	0.86	8.5	16.0	30.0
A4	0.70	0%	0.08	0.35	7.0	0.3	1.9
A5	1.84	9%	0.15	0.40	8.5	1.2	5.5
A6	0.22	0%	0.08	0.35	5.0	0.1	0.7
A7	0.39	0%	0.08	0.35	5.0	0.2	1.2
A8	0.40	0%	0.08	0.35	5.0	0.2	1.2
E	5.55	86%	0.79	0.84	n/a	n/a	5.6

**DESIGN POINT SUMMARY TABLE**

DPI#	Q <sub>s</sub> (cfs)	Q <sub>100</sub> (cfs)
1	0.2	0.4
2	28.7	54.6
3	28.8	56.3
4	1.2	11.0
5	0.1	0.7
6	0.2	1.2
7	0.2	1.2
E1	n/a	5.6



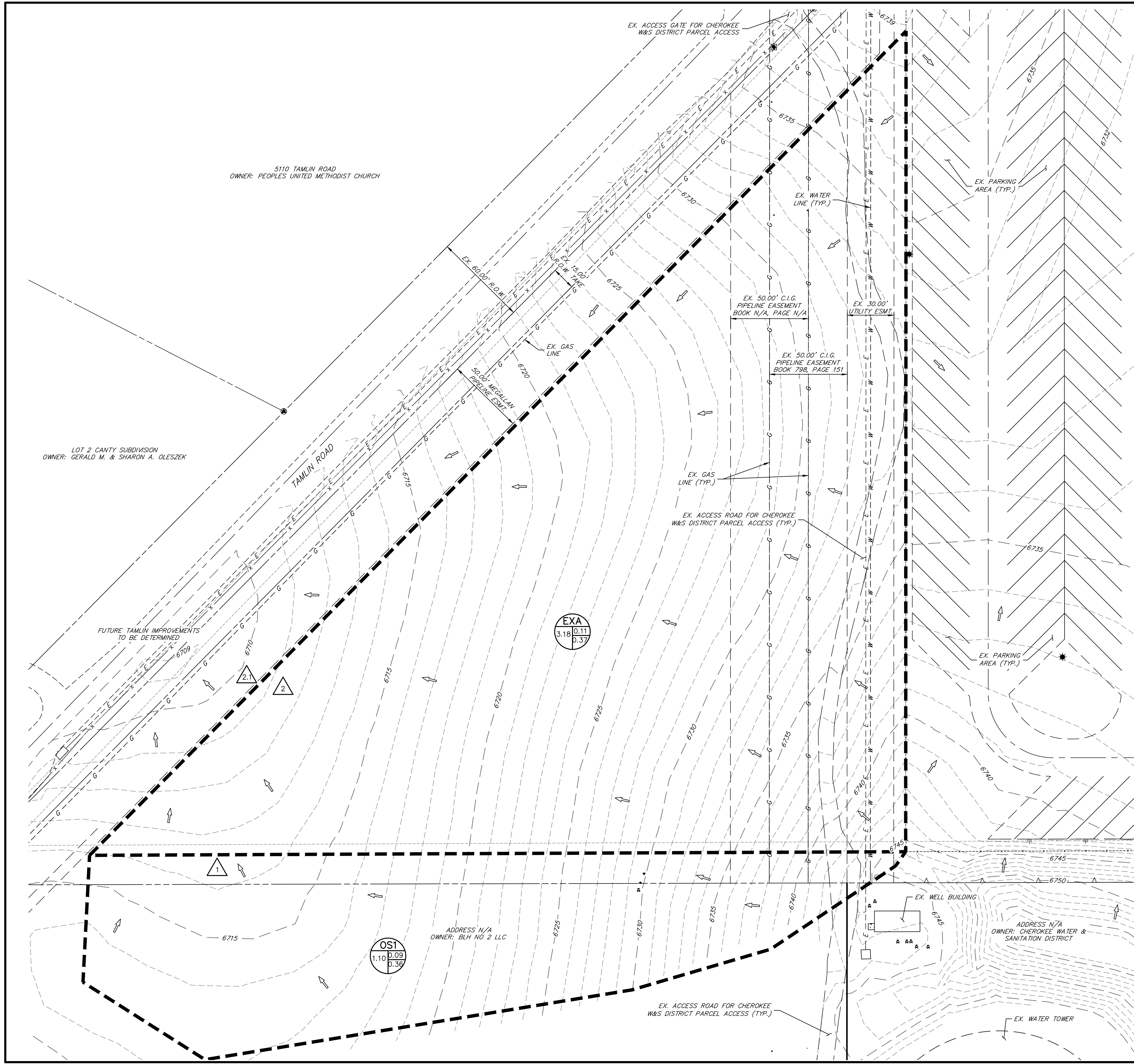
TAMLIN ROAD RV & BOAT STORAGE  
DRAINAGE MAP  
25134.00  
06/08/2020  
SHEET 1 OF 1

**J-R ENGINEERING**  
A Westrian Company

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Fort Collins 970-491-9888 • www.jrengineering.com

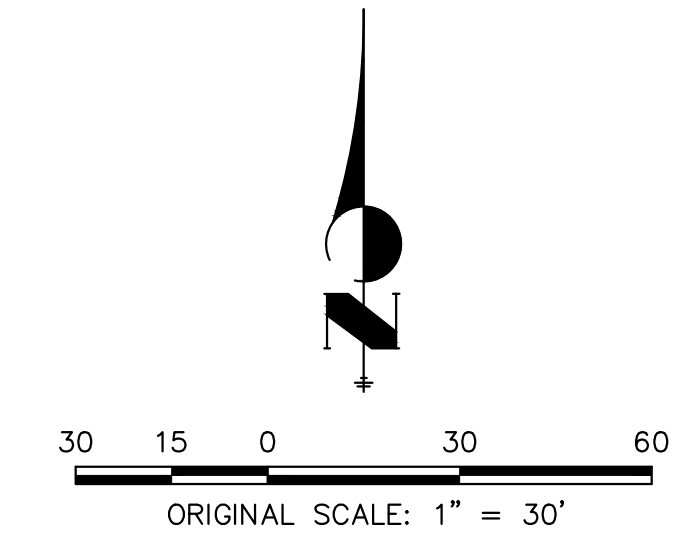
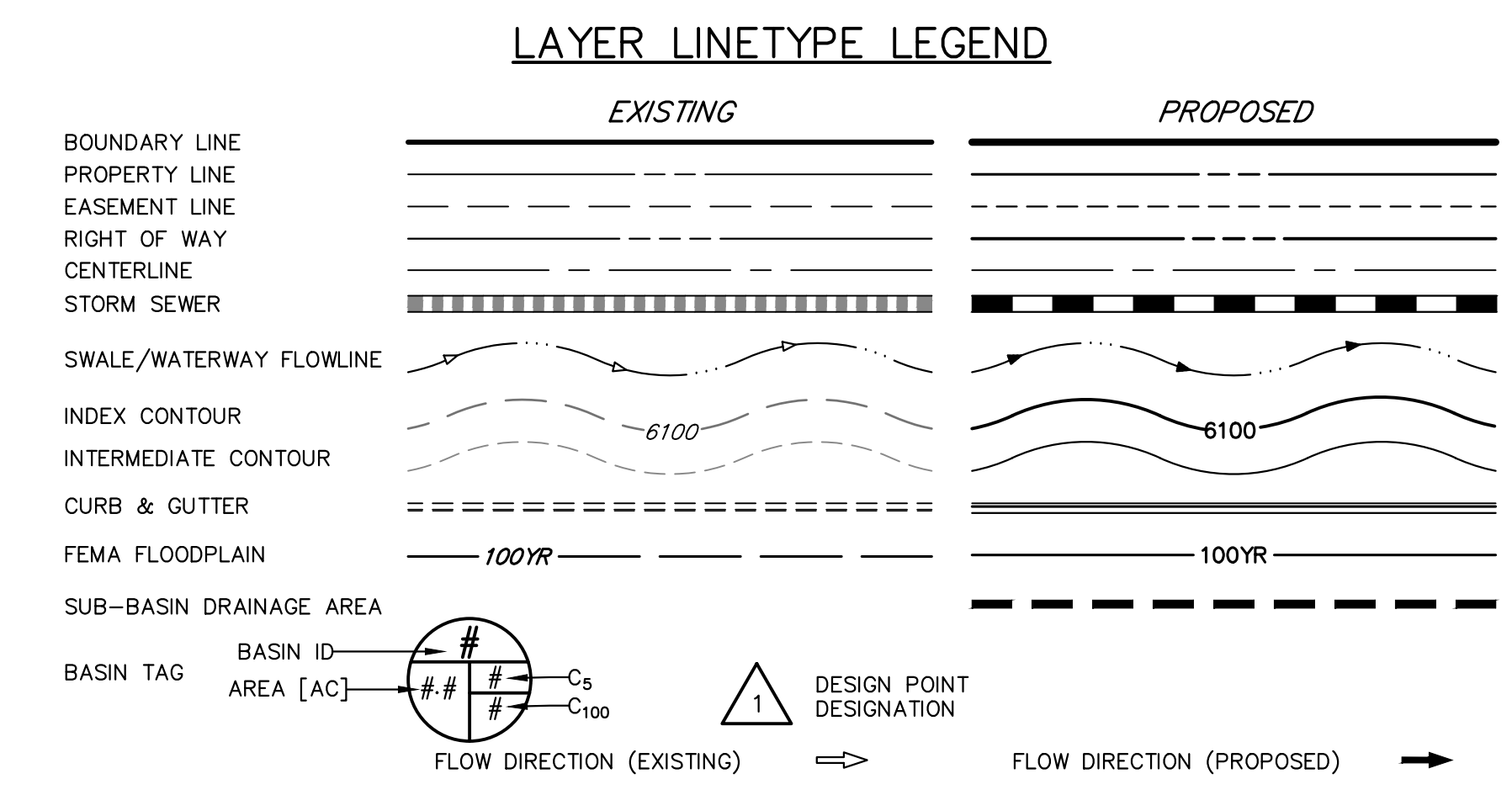
X:\25134000\ar\25134000\Drawings\Sheet\Drainage\Drainage Map.dwg, 6/17/2020 10:22:38 AM, GE

**APPENDIX E**  
**DRAINAGE MAPS**



BASIN SUMMARY TABLE							
Tributary	Area	Percent	$C_s$	$C_{100}$	$t_e$	$Q_s$	$Q_{100}$
Sub-basin	(acres)	Impervious			(min)	(cfs)	(cfs)
EXA	3.18	4.9%	0.11	0.37	15.5	1.2	6.9
OS1	1.10	2.0%	0.09	0.36	16.0	0.3	2.3

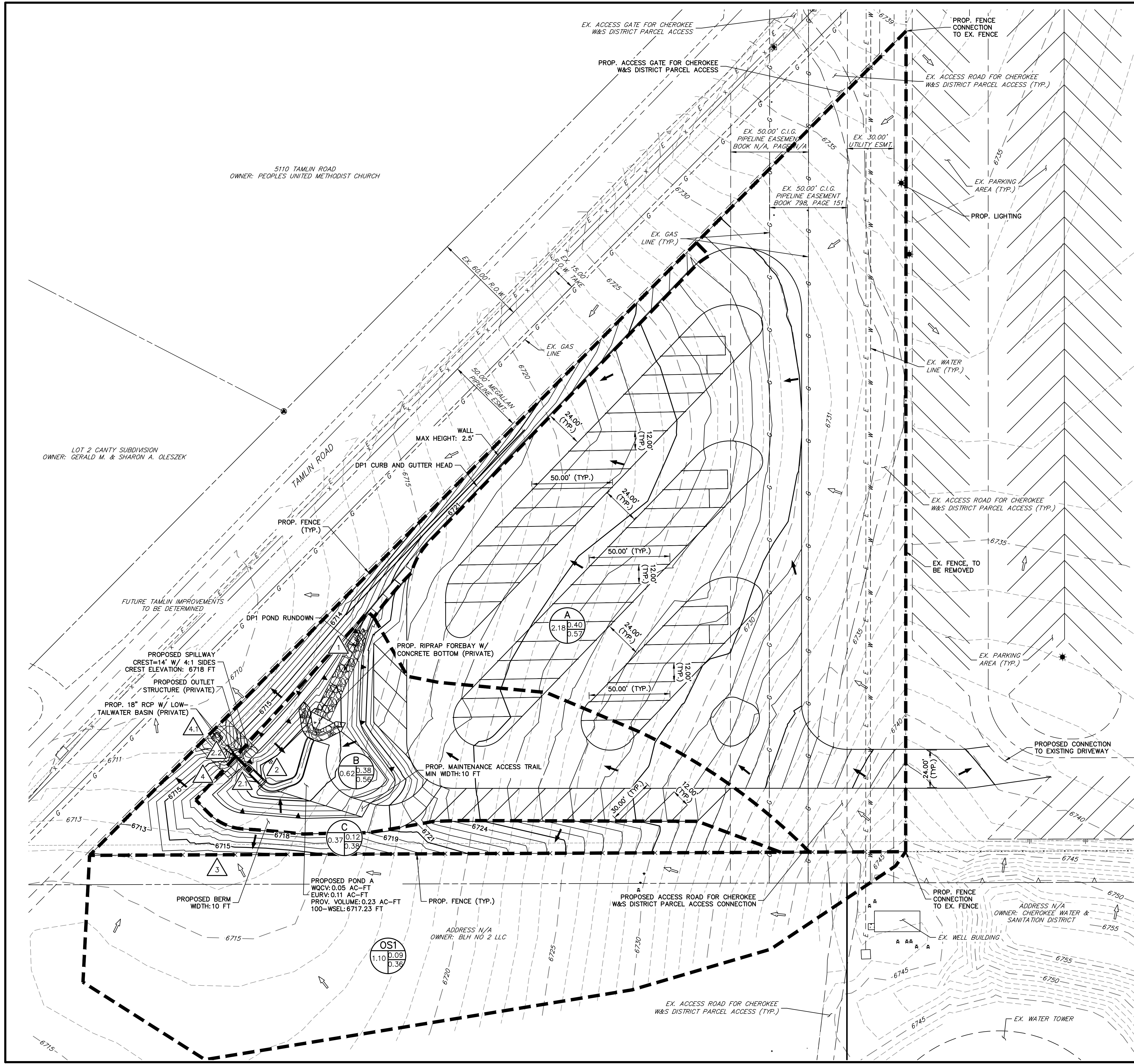
DESIGN POINT SUMMARY TABLE		
DP#	$Q_s$	$Q_{100}$
1	0.3	2.3
2	1.2	6.9
2.1	1.5	9.1



PROPOSED EXISTING MAP  
 TAMLIN RD RV STORAGE-EXPANSION  
 JOB NO. 25305.00  
 11/26/2024  
 SHEET 1 OF 1



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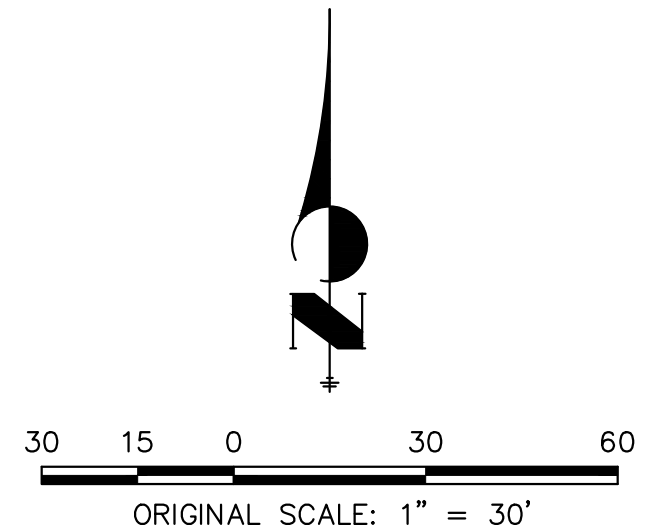
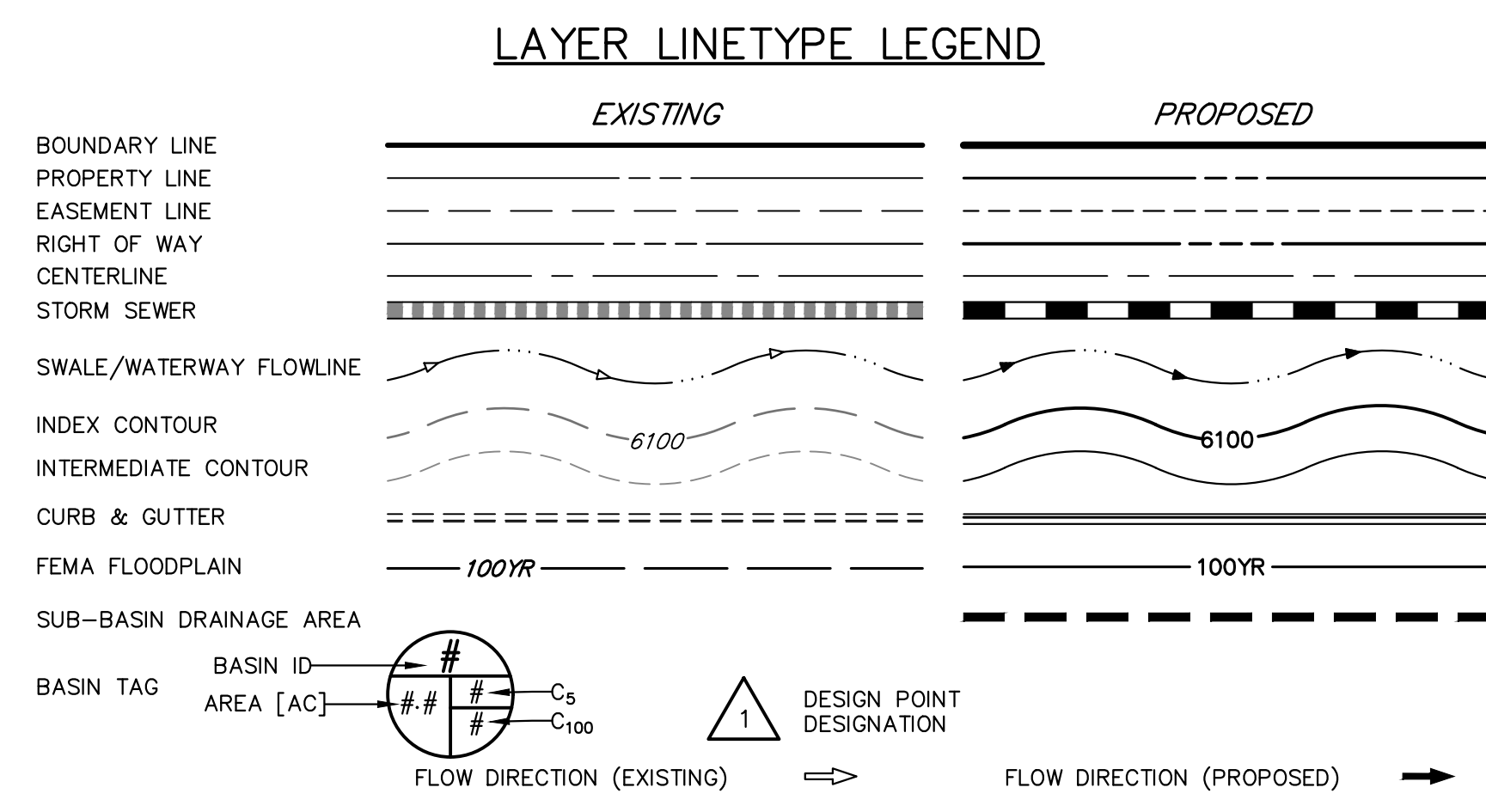


BASIN SUMMARY TABLE							
Tributary	Area	Percent			$t_c$	$Q_5$	$Q_{100}$
Sub-basin	(acres)	Impervious	$C_5$	$C_{100}$	(min)	(cfs)	(cfs)
A	2.18	51%	0.40	0.57	8.6	3.8	9.2
B	0.62	46%	0.38	0.56	5.9	1.1	2.8
C	0.37	6%	0.12	0.38	5.0	0.2	1.2
OS1	1.10	2%	0.09	0.36	16.0	0.3	2.3

DESIGN POINT SUMMARY TABLE		
DP#	$Q_5$	$Q_{100}$
1	3.8	9.2
2	1.1	2.8
2.1	4.8	11.6
2.2	0.0	2.8
3	0.3	2.3
4	0.2	1.2
4.1	0.5	5.9

PBMP Summary Table		
Basins	Tributary Area (acres)	PBMP
A	2.18	POND A
B	0.62	POND A
C	0.37	EXCLUDED*

\*EXCLUDED BASED ON LAND DISTURBANCE TO UNDEVELOPED LAND THAT WILL REMAIN UNDEVELOPED PER ECM APP. I.7.B.7



PROPOSED DRAINAGE MAP  
 TAMLIN RD RV STORAGE-EXPANSION  
 JOB NO. 25305.00  
 11/26/2024  
 SHEET 1 OF 1



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