CONSULTING ENGINEERS

Drainage Report

FOR

Salisbury Regional Park Phase 1

AT

11700 MOTSENBOCKER RD

PARKER CO 80134

FOR

Town of Parker

PARKER
COLORADO

April 29, 2025

JVA, Incorporated
1319 Spruce Street
Boulder, CO 80302
303.444.1951
info@jvajva.com

www.jvajva.com

April 29th, 2025

Mr. Michael Walton, PE, CFM, Senior Development Review Engineer
Town of Parker
Engineering and Development
20120 E. Main Street
Parker, CO 80138

RE: Drainage Report for Salisbury Regional Park Phase 1
JVA, Inc. Project No. 3752c

Dear Michael:

The following Drainage Report has been prepared for Salisbury Regional Park Phase 1. The stormwater report and drainage maps have been produced in accordance with the Storm Drainage and Environmental Policies for Parker, Colorado and the latest Mile High Flood Control District recommendations.

It is our understanding that the information provided herein meets the requirements specified in the Storm Drainage and Environmental Criterial Manual.

Please contact us if you have any questions regarding this submission.

Sincerely,

JVA, Inc.

Jacob A. Zeigler, P.E.
Project Engineer

Kelley A. McKinney
Design Engineer

CONSULTING ENGINEERS

Engineer's Statement:

This report for Salisbury Regional Park Phase 1 was prepared by me (or under my direct supervision) in accordance with the provisions of the Storm Drainage and Environmental Criterial Manual for the owners thereof. I understand that the Town of Parker does not and will not assume liability for drainage facilities designed by others.

_____

Cody F. Gratny
Registered Professional Engineer
State of Colorado No. 45353

_____

Seal and Date

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DRAINAGE REPORT

Salisbury Regional Park Phase 1

I. General Location and Description

The following report details the drainage design for Phase 1 of the Salisbury Regional Park Project. As described in the Salisbury Regional Park Master Drainage Report, this project will be constructed in four phases. Phase 1 of the project will include the construction of four baseball fields with supporting dugouts, bull pens, and batting cages. A centralized plaza will be constructed within the center of the four baseball fields that will contain bleachers and facilities buildings. In addition to the baseball fields, that are two proposed multipurpose fields that have been included as an alternate. Parking will be built south of the multipurpose fields and east of the northeast baseball diamond. Five detention ponds will be built to provide WQCV for this portion of the site.

In general, the proposed development of Phase 1 will result in a 36.8% overall increase in site imperviousness. A summary of the historic and developed impervious values is shown in Table 1 below:

Table 1 - Impervious Surface Summary

	Site Area (acres)	**Imperviousness**
Historic	75.57	5.8%
Phase 1 Developed	74.62	25.4%
Master Plan Developed	74.62	36.0%

II. Drainage Basins and Sub-basins

A. Major Basin Description

The project site is located within the Cherry Creek Watershed. In general, the proposed development will match historic drainage patterns. Stormwater generally flows from the south to the north across the site. A network of proposed water quality basins will be constructed along the northern extents of the proposed site. Stormwater will be treated for water quality in these basins before it is discharged along historic drainage paths into Cherry Creek via storm sewer and overland flow.

B. Site Sub-Basin Description

The proposed site has been divided into major basins with minor sub-basins. The basin delineations are shown within the Developed Drainage Map with corresponding design points for each basin. The naming convention for these basins generally matches the naming convention established in the Master Drainage Report. The pond that receives flows from Major Basin B in the Master Drainage Report will not be constructed in Phase 1; therefore, no basins in this report are labeled Basin B. The Developed Drainage Map is included in Appendix E.

Basins A1-A8 (13.96 acres) are onsite disturbed areas which comprise the east half of the proposed site. Contained within these basins are proposed baseball fields, batting cages, the HQ building, pickleball courts, and associated parking. Runoff generated within these basins is tributary to proposed WQCV Pond A. Conveyance to this pond is achieved with a network of overland flow channels, storm lines, and culverts. Outfall from Pond A is directed to the north along a proposed swale into an existing drainage culvert, and ultimately into Cherry Creek. Major Basin A in this report is contained entirely within Major Basin A in the Master Drainage Plan.

Basins C1-C5 (11.40 acres) are onsite disturbed areas that contain the drainage channel along the southern extent of the site, the two western baseball fields, and a parking area. Runoff generated within these basins is tributary to the proposed WQCV Pond C. A network of storm sewer and overland drainage channels will convey runoff to the Pond. Outfall from Pond C is directed along a proposed swale to an existing drainage culvert, and ultimately into Cherry Creek. Major Basin C in this report is contained entirely within Major Basin C in the Master Drainage Plan.

Basins D1-D4 (7.42 acres) are onsite disturbed areas that contain two multi-purpose fields, a basketball court, a workout area, and associated walks and open spaces. This entire basin is an alternate. Runoff generated within these basins is tributary to proposed WQCV Pond D. A network of storm lines will provide conveyance to the Pond. Outfall from Pond D is directed to the north along a proposed swale into an existing drainage culvert, and ultimately into Cherry Creek. Major Basin D in this report is contained entirely within Basins B1 and B2 the Master Drainage Plan.

Basin E1 (1.65 acres) contains a drive isle and associated parking stalls along the west side of the site. In the phase one condition, runoff generated within this basin will flow to the north via curb & gutter into proposed WQCV Pond E. Outfall from Pond E will be directed into a bypass swale which runs to the north into an existing drainage culvert, and ultimately into Cherry Creek. This basin is contained within Basin A7 on the Master Drainage Plan.

Basin OS1 (2.87 acres) contains a portion of the site which is flowing offsite, untreated. This basin contains some undisturbed native grasses, and some landscaped areas. A swale has been constructed in the northeastern portion of this basin which will capture all flows and convey it to a culvert passing under the road. Major Basin OS1 in this report is contained within Major Basin A in the Master Drainage Plan.

Basins BP1 & BP2 (3.73 acres) contain portions of the site which will be flowing offsite to the bypass swale along the northwestern edge of the site. These basins contain some undisturbed native areas and some landscaped areas. Flows from this basin will combine with the flows from the upstream bypass pipe. Calculations for this bypass pipe can be found in Appendix D of this report.

Basins EX1 & EX2 (18.75 acres) contain portions of the site that are mostly undisturbed, where nothing will be built in this phase. Basin EX2 is identical to Basin H4 in the historic drainage map, and has been included for comparison purposes only. Basin EX1 is contained within basin H1 in the historic drainage map.

III. Drainage Design Criteria

A. Regulations

It is JVA's understanding that the work presented within this drainage report complies with all applicable Town of Parker and Mile High Flood District design standards, unless otherwise noted as a variance within the Master Drainage Report. Point rainfall data that was used for design was taken from the Storm Drainage and Environmental Criteria Manual from the Town of Parker and the calculation methods specified are used. This site is located within a floodplain, and the floodplain development application has been included in Appendix B. Per State and Town regulations, any development within the Special Flood Hazard Area (SFHA), otherwise known as the 100-year regulatory floodplain, which increases the base flood elevations more than 0.50-feet shall require a CLOMR be submitted on the community's behalf. Any development which increases or decreases the base flood elevations more than 0.30-feet shall require a LOMR be submitted on the community's behalf. The proposed development will not raise the base flood elevations by more than 0.30', therefore neither a CLOMR nor a LOMR has been provided.

Due to grading constraints, not all basins can be captured and treated onsite. The lowpoint of Basin OS1 is located below the rest of the surrounding basins, and since this basin is composed entirely of undeveloped area, it is flowing offsite. In the final condition, when this portion of the site is developed, this basin will be captured in Pond A.

Per Section 7.2.3 of the Storm Drainage and Environmental Criteria Manual from the Town of Parker, the 100-year release from the developed site is less than the historic release rate.

B. Hydrology

The Rational Method (Q=CIA) was used to determine the storm runoff (Q) from the areas tributary to the new storm system, with composite runoff coefficients (C) and contributing areas (A) given for design points in sub-basins. Swale calculations were performed using Autodesk Civil 3D Hydraflow Express Extension, version 2024. More information about hydrologic calculation methods can be found in the Master Drainage Report. The results from these methods can be found in Appendix C.

C. Hydraulics

Design storm recurrence intervals are consistent with the Town of Parker requirements: the minor storm analysis is the 5-year event, and the major storm is the 100-year event. Water surface profiles and pipe hydraulic grade line computations for main storm lines were performed using Autodesk Civil 3D Hydraflow Storm Sewers Extension, version 2024. A SWMM model was used to model the bypass pipes, and HY8 was used to model the onsite culverts. The results of these three methods can be found in Appendix D.

D. Water Quality Enhancement

Detention and water quality for the site's developed basins is provided through a network of proposed extended detention basins located generally along the north extents of the site

improvements. These facilities will slow down runoff and encourage infiltration, sedimentation, and filtration, thus aiding in the removal of excess sediment, solids, nutrients, metals and grit, and other typical pollutants from stormwater.

IV. Drainage Facility Design

A. Stormwater Conveyance Facilities

A network of new storm sewers and drainage swales will convey captured runoff northward towards a series of proposed extended detention basins and water quality treatment facilities. These basins will discharge stormwater to the north along historic drainage paths. All proposed storm sewers and drainage swales will be maintained by the Town of Parker. The swale calculations for the proposed drainage swales have been included in Appendix D. All of the onsite swales have bottom widths of 2' or wider.

A series of swales and culverts will bypass offsite flows along the west side of the site. The offsite flowrate was approximated by summing the release flowrates of several upstream detention ponds. The Horseshoe Ridge Detention Ponds 1 and 2, which have a peak outflow of 137.7 cfs and the Salisbury Heights Pond C, which has a peak outflow of 7.24 cfs. Therefore, approximately 145 cfs is expected to flow from these ponds towards the Salisbury Park site. With the time of concentration of the combined upstream flow paths considered, approximately 135 cfs will enter our bypass system. An existing depression located at the upstream end of the bypass storm system acts as a pond, which provide temporary storage and attenuation of the incoming flows. The storm system itself consists of parallel 45"x29" HERCP's which change to 36" RCP's downstream and provides a conveyance of approximately 91.35 cfs. Coupled with the available storage and attenuation of the upstream "pond", all offsite flows are safely passed through the system with no overflow to the rest of the site. A SWMM model has been created to fully model the bypass system, and those results can be seen in Appendix D.

Note: 5-year and 100-year HGL's have been provided with calculations for on-site pipes. However, due to limited available historic information, the storm sewers associated with the bypass flow along the west side of the site have been modeled with 2-year and 100-year flows.

B. Stormwater Storage Facilities

The Town of Parker's Storm Drainage and Environmental Criteria Manual requires the implementation of full-spectrum detention. This approach is designed to control peak discharge across all runoff events, from frequent storms to the 100-year event, effectively replicating pre-development conditions. Due to site constraints onsite water quality ponds are proposed instead of full-spectrum detention. This variance along with any others is discussed in the Master Drainage Report.

The Water Quality Basin designs include one of two outlet structure designs. The first design is an outlet structure with a water quality orifice plate and overflow pipe. The second design is a weir with a water quality orifice plate and an overflow weir. This approach meets the Town's stormwater management requirements for water quality and keeps fill within the adjacent floodplain as minimal as possible.

Ponds D and E will only be constructed for Phase 1 and Phase 2. In Phase 3, these ponds will be removed, and runoff will be redirected to a different pond. Ponds A and C will exist in their current condition in the final condition and therefore have been sized for a larger flow than they will receive in this phase. A summary of the proposed detention basin volumes is shown in Table 2 below:

Table 2 – Detention Basin Volumes

Basin ID	Watershed Area (ac)	Provided Volume (ac-ft)	Required Volume (ac-ft)	WQ Peak Outflow Q (cfs)	100 Year Outflow Q (cfs)
Pond A	13.96	0.746	0.221	0.14	11.14
Pond C	11.40	0.920	0.169	0.12	17.07
Pond D	7.42	0.207	0.131	0.09	2.90
Pond E	1.65	0.100	0.036	0.03	2.66

The total release rate from the site in the 100-year event will be less than the historic release rate. The total 100-year release from the site at DP28 is 112.63 cfs, while the historic release rate is 116.85 cfs. Calculations for the release rates can be found in the rational spreadsheet in Appendix C.

C. Water Quality & Permanent Best Management Practices

This development is classified as a Tier 3 Development under the Town's Permanent BMP (PBMP) requirements, subjecting it to the most comprehensive PBMP standards outlined in the Town's regulations.

The PBMP proposed for this project includes multiple water quality control volume ponds, as specified in Section 7.2.1.2 of the Town of Parker's Storm Drainage and Environmental Criteria Manual. The design calculations given in this report, including outlet design, strictly adhere to the procedure outlined in Volume 3 of the Urban Storm Drainage Criteria Manual.

The design considers the site's soil conditions and geologic features, notably Type B soils with moderate infiltration potential, and aligns with the Town of Parker's regional drainage and stormwater quality plans.

Long-term operation and maintenance of the PBMPs will be the sole responsibility of the Town of Parker, with easements and legal provisions included in the final design to ensure access for operation, maintenance, and inspection.

This PBMP plan has been developed in full compliance with the Town of Parker's requirements for New Development, as defined in Section 1.4 of the Town's regulations, and meets all applicable standards for Tier 3 Developments.

V. Conclusions

A. Compliance with Standards

The stormwater facilities and design proposed for the Salisbury Regional Park have been designed and analyzed in accordance with the Town of Parker Storm Drainage and Environmental Criteria Manual, the Mile High Flood District recommendations set forth in the Urban Storm Drainage Criteria Manuals and engineering best practices within the State of Colorado. The proposed drainage design will maintain existing runoff conditions by attenuating and treating developed flows and reduce the potential for adverse effects downstream.

B. Drainage Concept

The proposed stormwater management infrastructure and techniques are in substantial compliance with all applicable regulations and will improve existing site drainage conditions. The design incorporates strategic grading, Best Management Practices, and control measures to provide stormwater quality treatment and attenuate developed flows to mimic historic flows for a variety of return events. The improvements presented in this report are intended to improve existing conditions and minimize flood risk. It is believed that the proposed improvements will not adversely impact properties upstream or downstream, and do not adversely impact drainageways downstream.

VI. References

1. “Final Roadway Drainage Report for Dransfeldt Road Extension” Douglas County, Colorado, August 2023.
2. “Salisbury Regional Park Phase 1 Floodplain Development Permit Application” Town of Parker, Colorado, November 2023.
3. “Storm Drainage and Environmental Criteria Manual”, Town of Parker, Colorado, February 2014.
4. “Urban Storm Drainage Criteria Manual”, Mile High Flood District, Latest Edition.
5. https://www.fema.gov/flood-maps. Accessed 14 May 2024.
6. https://websoilsurvey.nrcs.usda.gov/app/. Accessed 14 May 2024.
7. https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/. Accessed 14 May 2024.

APPENDIX A – LOCATION INFORMATION

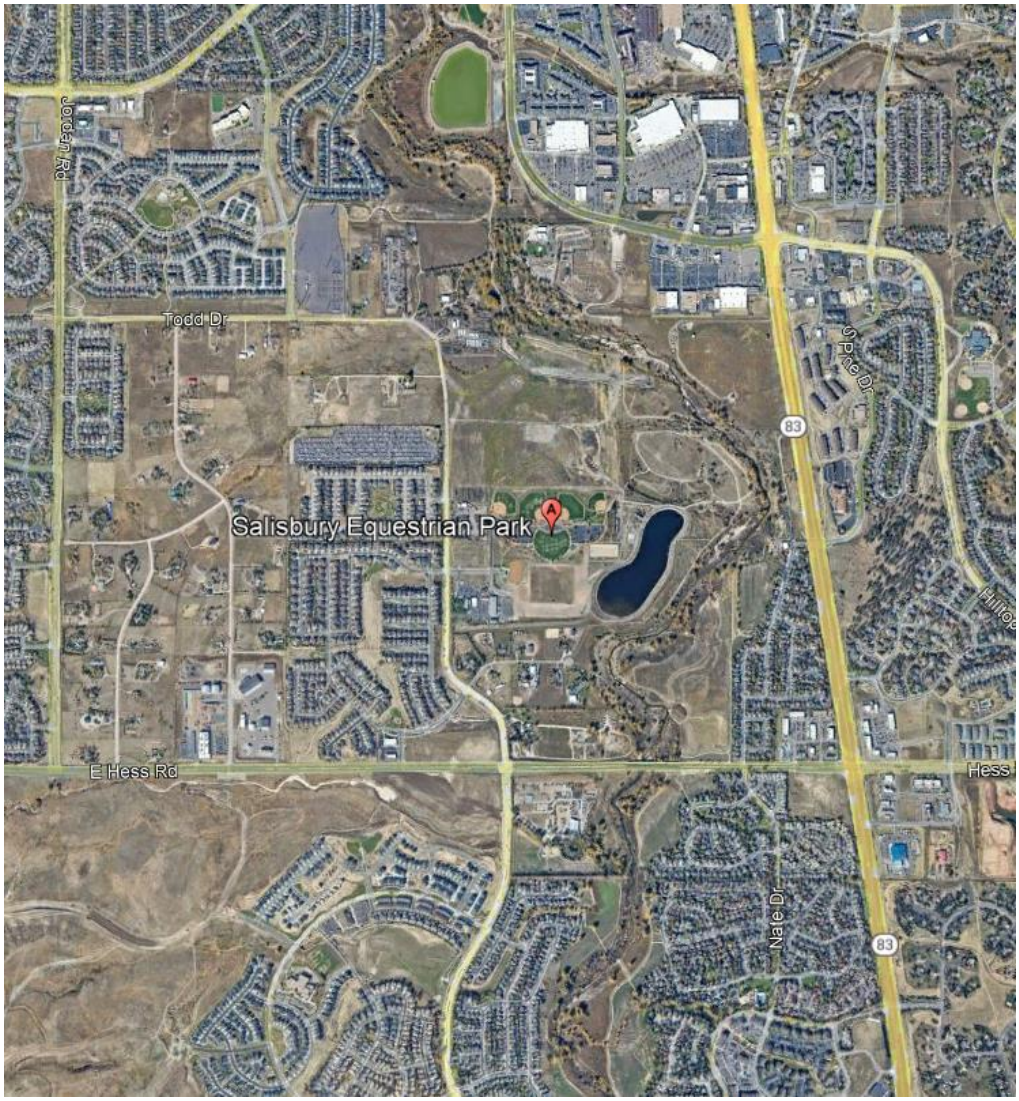
Salisbury Park North

Development

AT

11700 Motsenbocker Road

Parker, CO

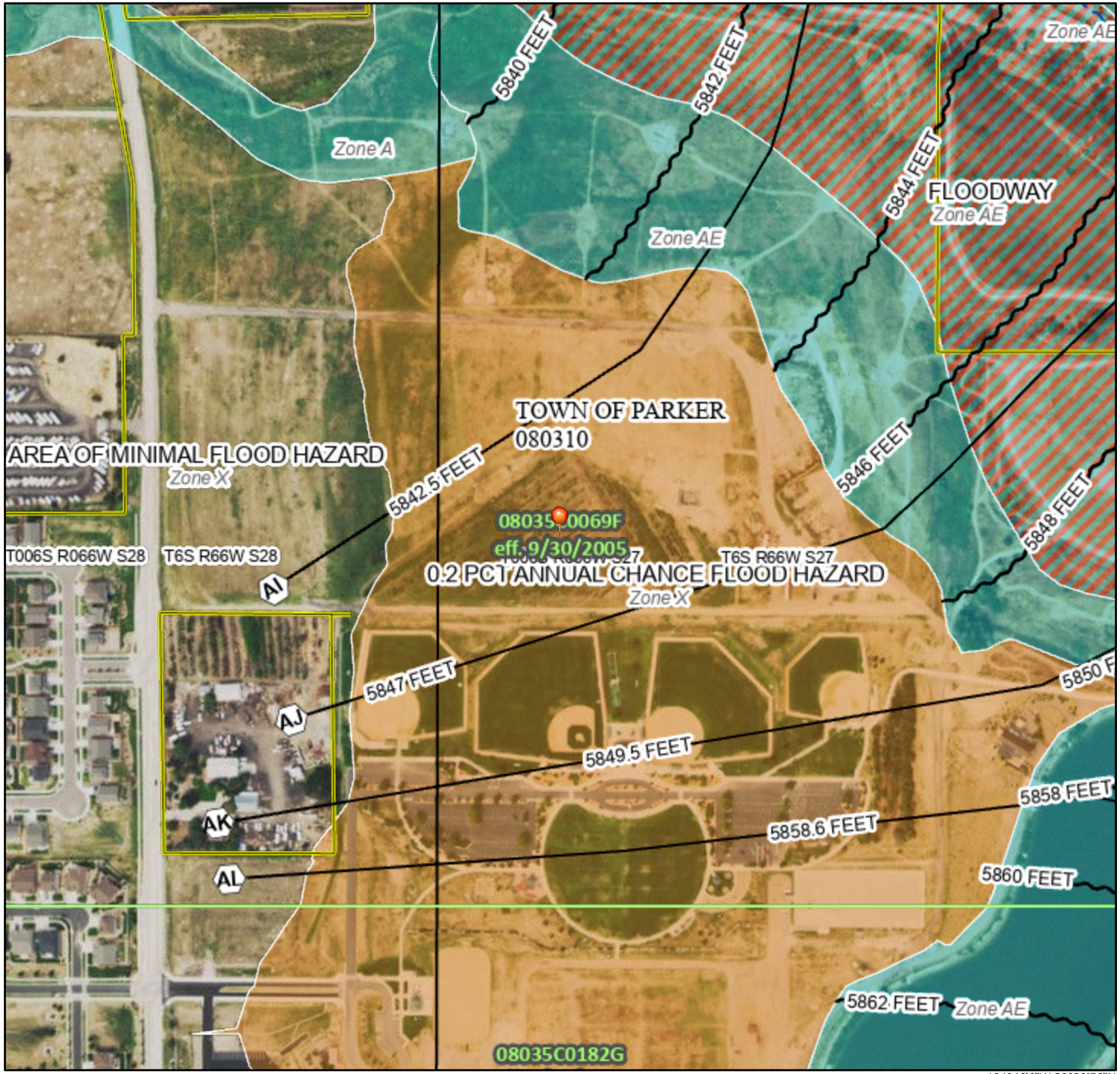


VICINITY MAP NOT TO SCALE

National Flood Hazard Layer FIRMette

FEMA

104°46'43"W 39°30'24"N



104°46'6"W 39°29'56"N

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

1:6,000

Basemap Imagery Source: USGS National Map 2023

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
- 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

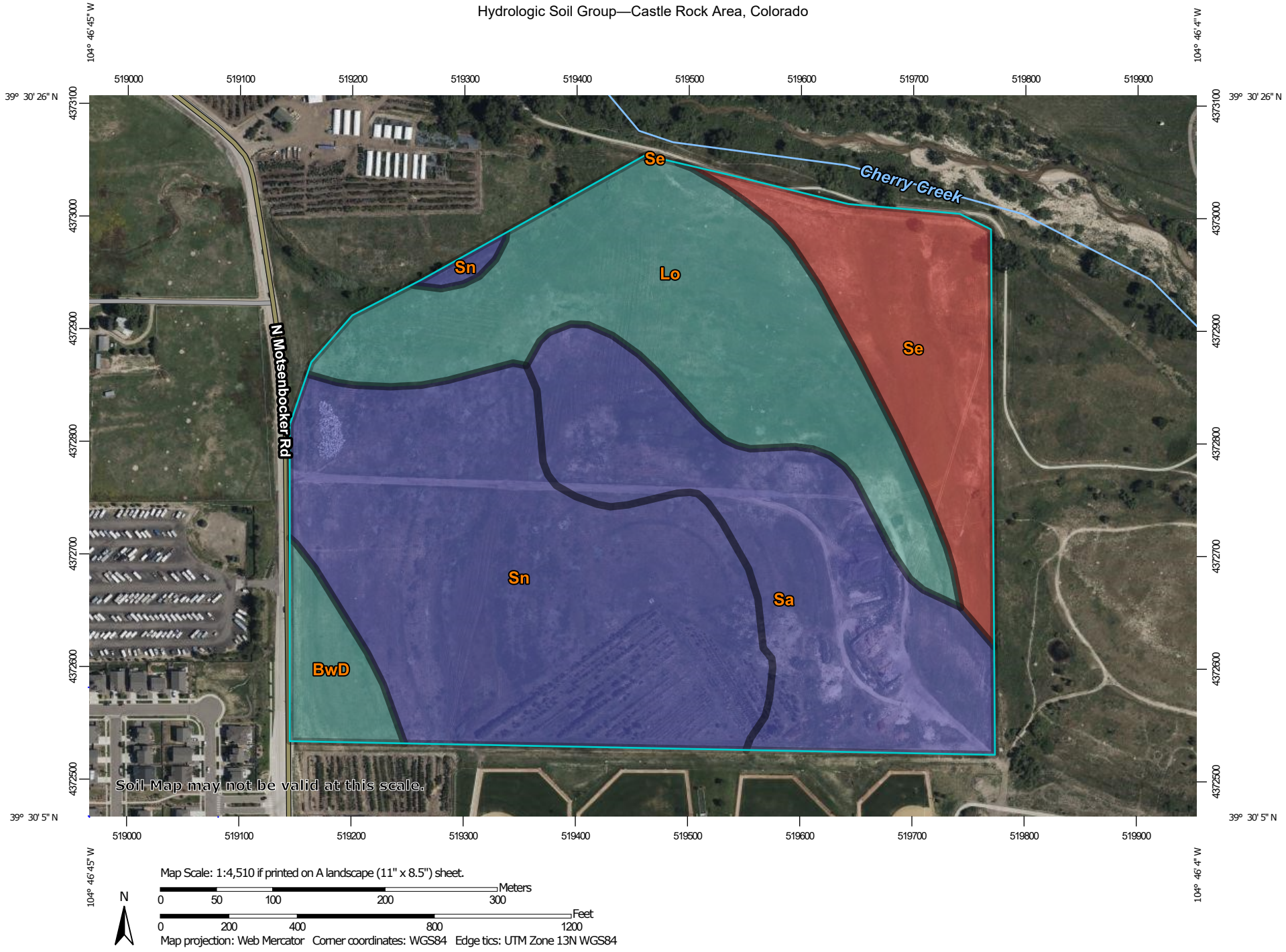
N

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 6/16/2023 at 4:40 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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



Map Scale: 1:4,510 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Castle Rock Area, Colorado
Survey Area Data: Version 17, Aug 29, 2024

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

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
BwD	Buick-Satanta loams, 3 to 9 percent slopes	C	2.6	3.7%
Lo	Loamy alluvial land	C	18.0	24.9%
Sa	Sampson loam	B	16.0	22.2%
Se	Sandy wet alluvial land	D	9.4	13.1%
Sn	Satanta loam	B	26.0	36.1%
Totals for Area of Interest			**72.1**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOAA Atlas 14, Volume 8, Version 2
Location name: Parker, Colorado, USA*
Latitude: 39.5054°, Longitude: -104.7733°
Elevation: 5837 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.224** (0.183-0.276)	**0.281** (0.229-0.347)	**0.379** (0.308-0.470)	**0.463** (0.374-0.577)	**0.585** (0.458-0.760)	**0.684** (0.520-0.898)	**0.785** (0.577-1.06)	**0.893** (0.627-1.23)	**1.04** (0.701-1.48)	**1.16** (0.757-1.66)
10-min	**0.327** (0.267-0.404)	**0.411** (0.336-0.509)	**0.555** (0.451-0.688)	**0.679** (0.548-0.845)	**0.857** (0.670-1.11)	**1.00** (0.762-1.31)	**1.15** (0.844-1.55)	**1.31** (0.918-1.81)	**1.52** (1.03-2.16)	**1.69** (1.11-2.43)
15-min	**0.399** (0.326-0.493)	**0.502** (0.409-0.620)	**0.676** (0.550-0.838)	**0.827** (0.669-1.03)	**1.04** (0.817-1.36)	**1.22** (0.929-1.60)	**1.40** (1.03-1.89)	**1.59** (1.12-2.20)	**1.86** (1.25-2.64)	**2.06** (1.35-2.96)
30-min	**0.527** (0.431-0.652)	**0.664** (0.542-0.821)	**0.895** (0.728-1.11)	**1.10** (0.885-1.36)	**1.38** (1.08-1.80)	**1.62** (1.23-2.12)	**1.86** (1.36-2.50)	**2.11** (1.48-2.91)	**2.45** (1.65-3.48)	**2.72** (1.78-3.91)
60-min	**0.667** (0.545-0.824)	**0.823** (0.672-1.02)	**1.10** (0.891-1.36)	**1.34** (1.08-1.66)	**1.69** (1.32-2.20)	**1.98** (1.51-2.61)	**2.29** (1.68-3.08)	**2.61** (1.84-3.62)	**3.07** (2.07-4.36)	**3.43** (2.25-4.93)
2-hr	**0.806** (0.662-0.988)	**0.983** (0.807-1.21)	**1.30** (1.06-1.59)	**1.58** (1.28-1.95)	**2.00** (1.58-2.59)	**2.35** (1.80-3.07)	**2.72** (2.02-3.64)	**3.12** (2.21-4.29)	**3.68** (2.51-5.20)	**4.14** (2.73-5.89)
3-hr	**0.906** (0.747-1.11)	**1.09** (0.897-1.33)	**1.42** (1.16-1.74)	**1.72** (1.40-2.12)	**2.18** (1.73-2.82)	**2.56** (1.98-3.35)	**2.98** (2.22-3.98)	**3.43** (2.45-4.70)	**4.07** (2.79-5.73)	**4.59** (3.04-6.50)
6-hr	**1.11** (0.917-1.34)	**1.32** (1.09-1.60)	**1.69** (1.40-2.06)	**2.04** (1.67-2.49)	**2.57** (2.06-3.30)	**3.02** (2.35-3.90)	**3.50** (2.62-4.63)	**4.02** (2.89-5.46)	**4.77** (3.28-6.64)	**5.37** (3.59-7.54)
12-hr	**1.35** (1.12-1.62)	**1.61** (1.34-1.94)	**2.07** (1.72-2.50)	**2.48** (2.05-3.00)	**3.08** (2.48-3.90)	**3.58** (2.80-4.58)	**4.12** (3.10-5.39)	**4.68** (3.38-6.29)	**5.48** (3.80-7.55)	**6.12** (4.12-8.50)
24-hr	**1.64** (1.38-1.96)	**1.94** (1.63-2.32)	**2.47** (2.06-2.96)	**2.93** (2.43-3.52)	**3.59** (2.89-4.49)	**4.13** (3.24-5.22)	**4.69** (3.56-6.07)	**5.29** (3.84-7.01)	**6.11** (4.26-8.32)	**6.76** (4.58-9.31)
2-day	**1.95** (1.65-2.31)	**2.28** (1.92-2.70)	**2.83** (2.38-3.37)	**3.32** (2.77-3.96)	**4.01** (3.25-4.97)	**4.58** (3.62-5.73)	**5.16** (3.94-6.62)	**5.78** (4.23-7.60)	**6.64** (4.67-8.95)	**7.31** (5.00-9.97)
3-day	**2.11** (1.79-2.49)	**2.47** (2.09-2.91)	**3.07** (2.59-3.63)	**3.59** (3.01-4.26)	**4.33** (3.52-5.32)	**4.92** (3.90-6.12)	**5.53** (4.24-7.04)	**6.17** (4.53-8.06)	**7.05** (4.97-9.44)	**7.73** (5.31-10.5)
4-day	**2.23** (1.90-2.62)	**2.61** (2.22-3.07)	**3.26** (2.76-3.84)	**3.80** (3.20-4.50)	**4.58** (3.73-5.61)	**5.20** (4.14-6.44)	**5.84** (4.48-7.39)	**6.50** (4.78-8.44)	**7.39** (5.23-9.86)	**8.09** (5.57-10.9)
7-day	**2.55** (2.18-2.98)	**2.97** (2.53-3.47)	**3.67** (3.12-4.30)	**4.27** (3.61-5.02)	**5.12** (4.19-6.22)	**5.79** (4.63-7.12)	**6.48** (5.01-8.15)	**7.20** (5.33-9.28)	**8.17** (5.82-10.8)	**8.93** (6.19-12.0)
10-day	**2.85** (2.44-3.31)	**3.28** (2.81-3.82)	**4.02** (3.42-4.68)	**4.64** (3.94-5.43)	**5.53** (4.54-6.68)	**6.23** (5.00-7.63)	**6.96** (5.39-8.71)	**7.71** (5.73-9.90)	**8.74** (6.25-11.5)	**9.54** (6.64-12.7)
20-day	**3.74** (3.23-4.32)	**4.22** (3.64-4.88)	**5.03** (4.32-5.82)	**5.72** (4.88-6.64)	**6.69** (5.53-8.01)	**7.46** (6.03-9.04)	**8.25** (6.44-10.2)	**9.07** (6.80-11.5)	**10.2** (7.34-13.3)	**11.1** (7.75-14.6)
30-day	**4.49** (3.88-5.15)	**5.05** (4.36-5.80)	**5.98** (5.15-6.88)	**6.76** (5.79-7.81)	**7.84** (6.50-9.31)	**8.68** (7.03-10.4)	**9.53** (7.47-11.7)	**10.4** (7.82-13.1)	**11.6** (8.37-15.0)	**12.5** (8.78-16.3)
45-day	**5.41** (4.70-6.19)	**6.14** (5.32-7.02)	**7.30** (6.31-8.37)	**8.25** (7.09-9.49)	**9.53** (7.91-11.2)	**10.5** (8.52-12.5)	**11.4** (8.98-14.0)	**12.4** (9.34-15.5)	**13.6** (9.87-17.4)	**14.5** (10.3-18.9)
60-day	**6.19** (5.39-7.05)	**7.09** (6.17-8.09)	**8.52** (7.38-9.73)	**9.65** (8.32-11.1)	**11.1** (9.25-13.0)	**12.2** (9.95-14.5)	**13.3** (10.5-16.1)	**14.3** (10.8-17.8)	**15.6** (11.3-19.8)	**16.5** (11.7-21.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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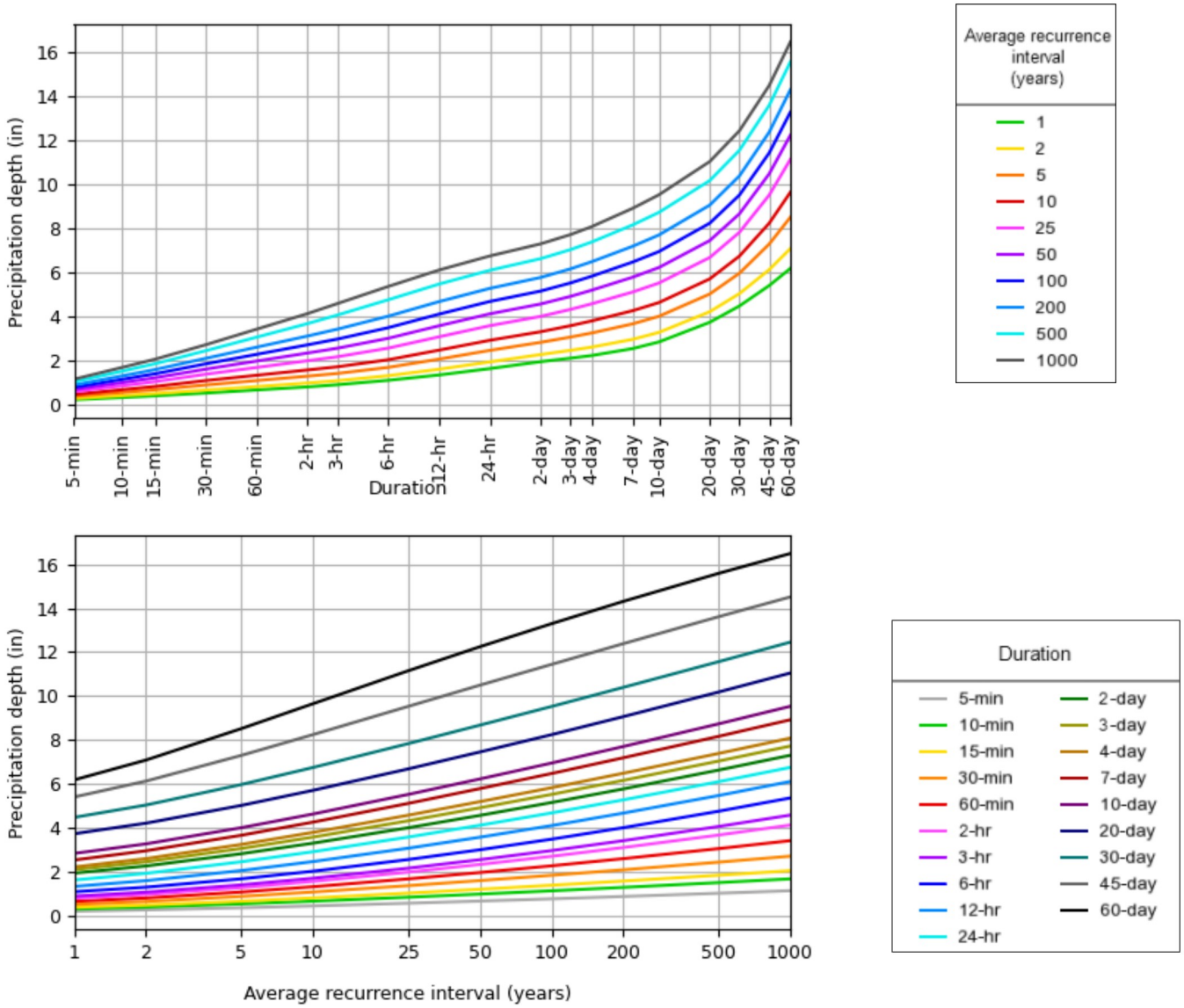
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 39.5054°, Longitude: -104.7733°



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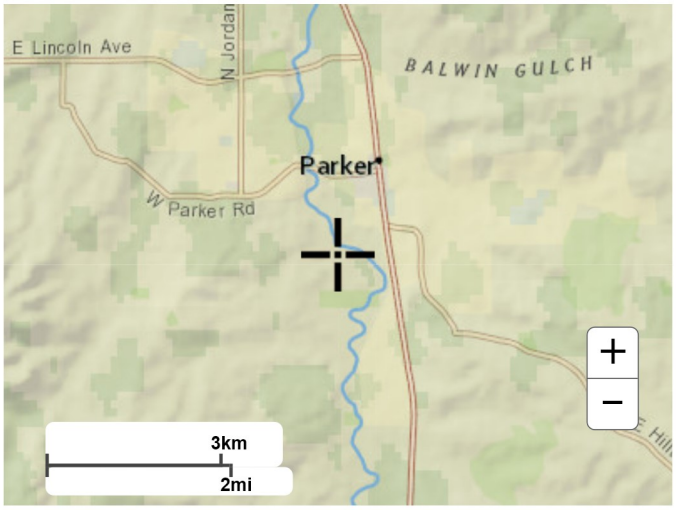
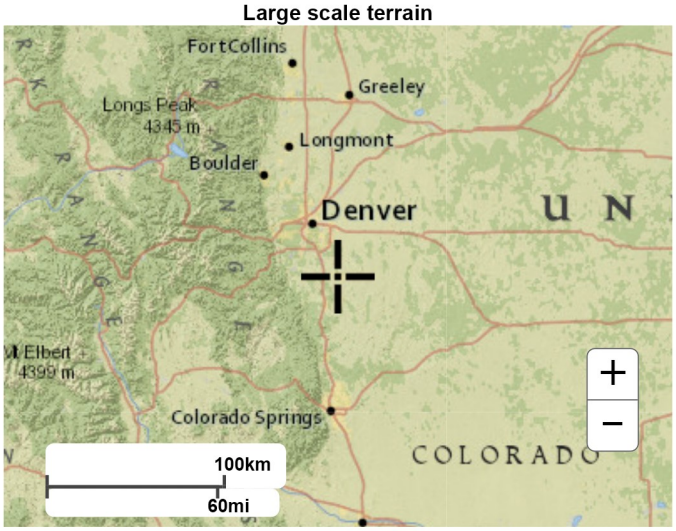
Maps & aerials

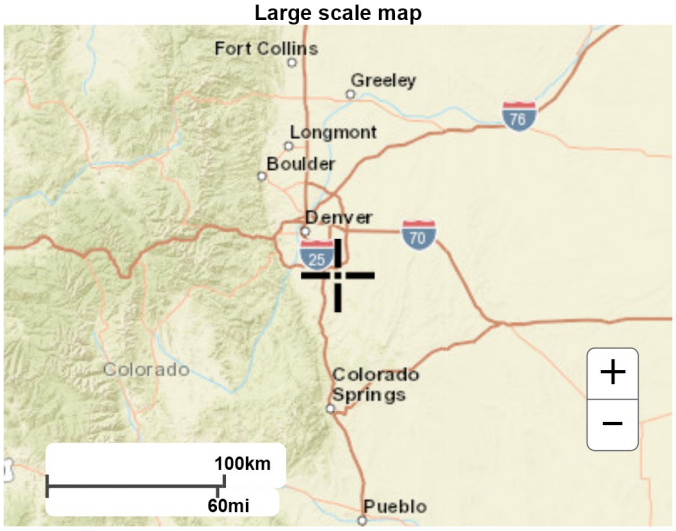
Small scale terrain



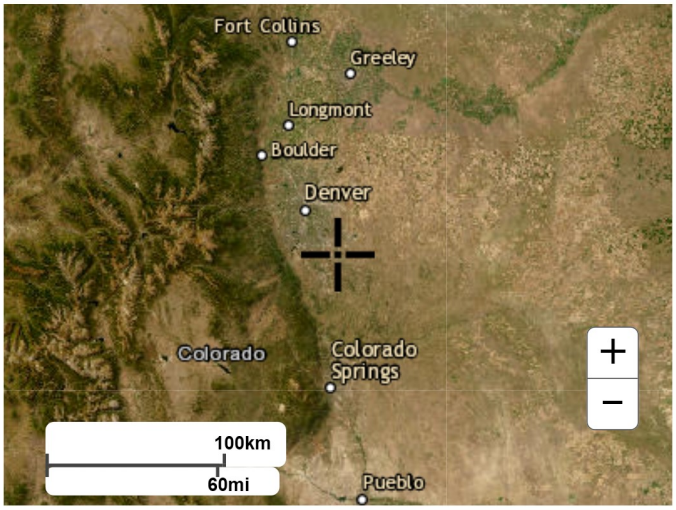
Large scale terrain



Large scale map



Large scale aerial



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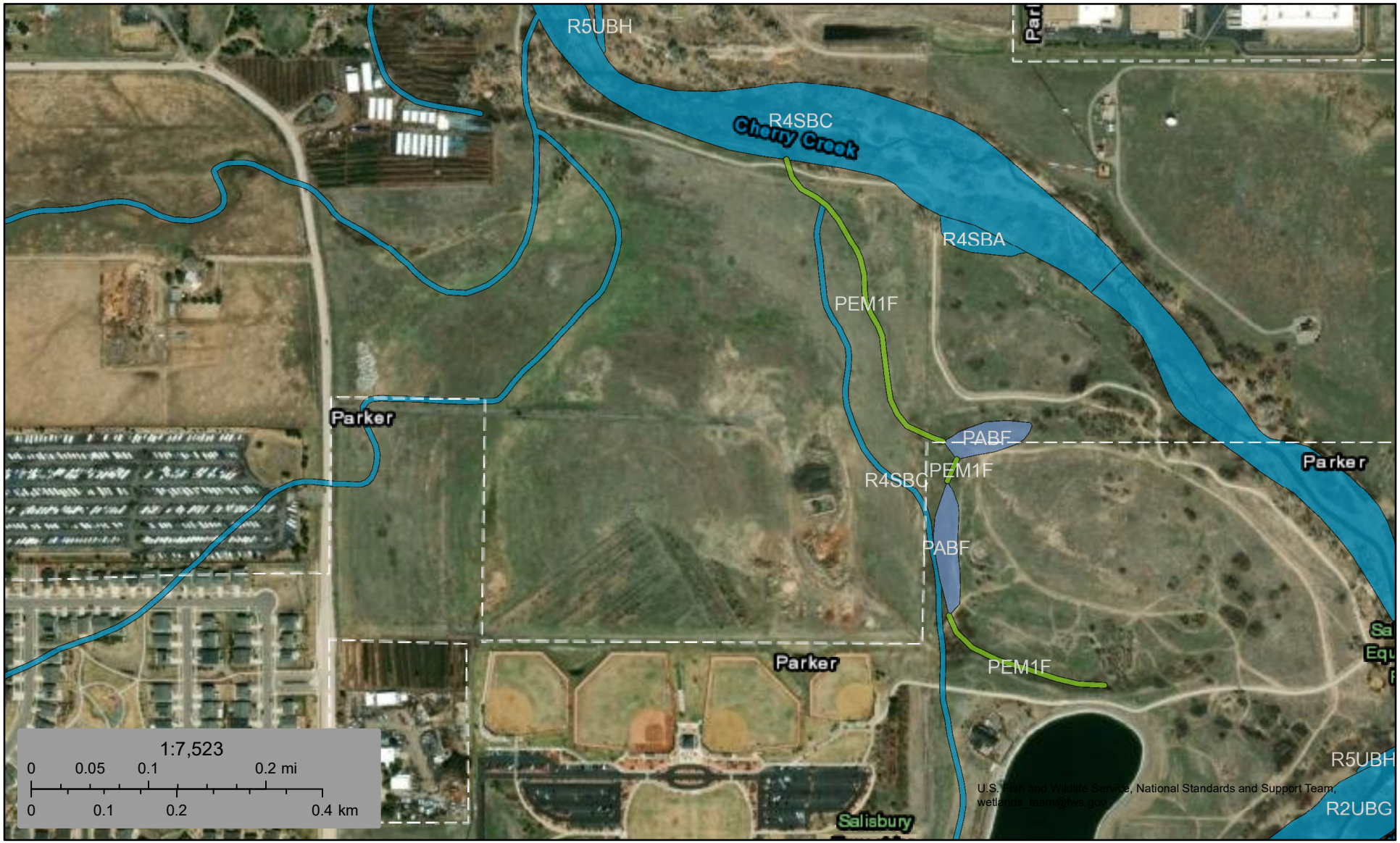
Disclaimer

U.S. Fish and Wildlife Service
National Wetlands Inventory

Salisbury Park North Wetlands Inventory



November 14, 2024

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

APPENDIX B – EXCERPTS

SALISBURY PARK NORTH PHASE 1 FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

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November 20th, 2024

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A – Town of Parker Floodplain Development Permit Application
B – Effective Floodplain Information
C – Annotated / Proposed Floodplain Information
D – Hydraulic Computations
E – Topographic Workmaps
F – Proposed Salisbury Park North Phase 1 Plans
G – Digital Data

1.0 INTRODUCTION

1.1 Purpose

The purpose of this report and supporting documentation is to request a Floodplain Development Permit (FDP) from the Town of Parker for the Salisbury Park North project. On behalf of Hord Coplan Macht, ICON Engineering is requesting that the Town of Parker review the proposed phase 1 construction at the Salisbury Park North site west of Cherry Creek and issue an FDP. The Town's FDP application can be found in Appendix A.

1.2 Background

The September 30, 2005, and March 16, 2016, effective FIRMs and December 2, 2021, Flood Insurance Study (FIS) for the Town of Parker include the effective flood information for this project site. Excerpts from the effective flood information are included in Appendix B.

This FDP application is based on the proposed development of the Salisbury Park North – Phase 1 site. The site plan for phase 1 consists of landscaping and grade changes throughout the project site, construction of several sports fields, construction of two parking areas and associated roadways, construction of Park amenities and facilities, and construction of associated water quality amenities, and drainage utilities.

Though this FDP application is for the first phase of construction at the Salisbury Park North site, there are three subsequent phases of this project to be constructed. The floodplain impacts of phases two through four have been studied and are discussed in more detail in Section 5.0 Hydraulics of this application.

The Dransfeldt Road Bridge and Channel project, just downstream of the proposed Salisbury Park North project, is currently under construction and a LOMR will be issued upon completion. The Dransfeldt Road CLOMR (Case No. 22-08-051R) modeling was used as pre-project conditions for the Salisbury Park North project, further discussion on this is found in Section 5.0 Hydraulics of this application. See Appendix B for FEMA CLOMR documentation for the Dransfeldt Road project.

1.3 Site Location

The proposed Salisbury Park North site is located on the west bank of Cherry Creek. The project site is partially within the Zone AE FEMA floodplain. Located entirely within and owned by the Town of Parker, Colorado, the project area is bound by Cherry Creek to the north and east, Salisbury Equestrian Park to the south, and North Motsenbocker Road to the west. The following vicinity map illustrates the project location.

1.4 Site Description

Pre-Project

As previously mentioned, the Dransfeldt Road Bridge and Channel Improvement project is currently under construction to the north of the proposed Salisbury Park North project site. The Salisbury Park North roadway ties into the proposed Dransfeldt Road alignment and has proposed grade changes and water quality features that abut the Dransfeldt Road project grading to the north.

ICON ENGINEERING

Figure 1: Vicinity Map

Salisbury Park North - Phase 1 - Floodplain Development Permit (FDP) Application

hcm

PARKER COLORADO

N

US Feet

0 250 500

Additionally, the proposed project will have a roadway alignment and pedestrian promenade that connects to the existing Salisbury Equestrian Park to the south. Barring the Dransfeldt Road project to the north and the Salisbury Equestrian Park to the south, the site is otherwise undeveloped.

Proposed

Hord Coplan Macht and the Town of Parker are proposing multi-sport fields, ball fields, several parking lots and other park amenities within the Phase 1 Salisbury Park North project site. Proposed site plans are detailed in **Appendix F**. The Salisbury Park North Site is partially within the Zone AE designated flood zone with Base Flood Elevations (BFEs) and a floodway, and almost entirely within the Zone X flood zone. The project site is entirely outside of the effective floodway. All phases of the project involve a significant amount of earthwork and phase 1 involves the largest area of earthwork out of all phases. The most noteworthy aspect of the phase 1 grade changes is adding fill on the eastern side of the project site. This fill encroaches on the Zone AE flood zone which causes a rise in the water surface elevation (WSEL) through the project reach. The two proposed structures have finished floor elevations well above two feet above the existing BFEs on the project site which adheres to the town of Parker Title 13 Chapter 13.05.010(e)(2)(b) regulations.

Additional discussion on this modeling approach of the proposed structures is included in **Section 5.0 HYDRAULICS** of this application.

1.5 Floodplains

Cherry Creek is defined as an area of Zone AE 1% A.C. floodplain with base flood elevations (BFEs) and a 1-foot regulatory floodway. The 1-foot regulatory floodway is a variance from the Town of Parker Title 13 Chapter 13.05.010(b) definition of a floodway as the effective floodway in this area is delineated to be 1-foot above the 100-year BFE, more discussion on this variance can be found in **Section 2.1 Regulations** of this application. Areas of 0.2% A.C. flooding are symbolized by Zone X (shaded) designation. The effective floodplain delineations are illustrated in **Figure E.1** in **Appendix E**.

Study Limits

The project site is bound on the southern (upstream) side by FHAD cross section 146 along Cherry Creek and on the northern (downstream) side by FHAD cross section128 AF along Cherry Creek. The Salisbury Park North project does not propose any changes within the Cherry Creek channel but the grade changes on the overbanks will cause acceptable rises (less than 0.5 foot) in the Zone X and Zone AE floodplains through the project reach. Cherry Creek is mapped as Zone AE as shown on Flood Insurance Rate Map (FIRM) panels 08035C0069F and 08035C0182G which are included in **Appendix B**.

2.0 ANALYSIS CRITERIA

2.1 Regulations

A Floodplain Development Permit is requested from the Town of Parker, based on the proposed project resulting in acceptable rises in WSEL (<0.5 feet) compared to pre-project conditions. All Town of Parker Title 13 Chapter 13.05.010 Floodplain regulations have been adhered to for the Salisbury Park North proposed development, barring (e)(2)(b) listed below.

"(b) Definitions

Floodway (regulatory floodway) means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one-half (½) foot (six [6] inches)."

The Town of Parker maintained the 1-foot floodway for the ongoing Cherry Creek Channel Improvement and Dransfeldt Road Extension CLOMR due to potential impacts on adjacent private property, thus, the same standard has been maintained for this project as well.

2.2 Drainage Studies, Master Plans, Site Constraints

Once the Dransfeldt Road project is complete and a LOMR is issued, this will become the effective information for most of the project reach, up to FHAD cross section 140. The effective model for the Dransfeldt Road CLOMR is the 2003 Flood Hazard Area Delineation (FHAD) study of Cherry Creek Corridor – Reservoir to Scott Road. The effective study for the Salisbury Park Phase 1 project upstream of FHAD cross section 140 is the Hess Road LOMR (Case No. 10-08-0769P) completed in 2010. The construction of the Salisbury Park North Phase 1 development along Cherry Creek is consistent with the site constraints.

3.0 TOPOGRAPHIC MAPPING

3.1 Pre-Project Topography

Topographic mapping for the project area was taken from The Dransfeldt Road CLOMR. This mapping is a combination of 2021 survey data by Aztec Consultants, Inc., 2013 USGS LiDAR and proposed project surface for the Dransfeldt Road CLOMR. No additional survey was completed for the Salisbury Park North Project as the Aztec survey covered the entire project site. It is important to note that the detailed survey and Dransfeldt Road CLOMR proposed surface were mapped on local project coordinates and the USGS LiDAR data was in Colorado state plane coordinates. The following formulas can be used to transform the coordinates from state plane to project coordinates:

PROJECT NORTHING = (STATE PLANE NORTHING * 1.0003179891) - 1000000.026'

PROJECT EASTING = (STATE PLANE EASTING * 1.0003179891) - 3000000.031'

The topographic mapping for the floodplain workmaps was prepared with one-foot contour intervals on the NAVD 1988 vertical datum, using the horizontal datum and mapping projection described below:

Projected Coordinate System: NAD83 / Colorado Central (ftUS)
Projection: Lambert_Conformal_Conic
False_Easting: 3000000.0000000
False_Northing: 1000000. 0000000
Central_Meridian: -105.50000000
Standard_Parallel_1: 39.75000000
Standard_Parallel_2: 38.45000000
Latitude_Of_Origin: 37.833333333
Linear Unit: Foot_US

Geographic Coordinate System: GCS_North_American_1983
Datum: D_North_American_1983
Prime Meridian: Greenwich
Angular Unit: Degree

3.2 Proposed Topography

Proposed 1-foot contour grading is presented on the Salisbury Park North – Phase 1 Detailed Grading & Drainage plan sheets in **Appendix F.** The proposed grading is on the local project coordinates, with the proposed floodplain workmaps on the same horizontal and vertical datum and mapping projection as the pre-project floodplain workmap topography.

4.0 HYDROLOGY

4.1 Peak Flows

There are no proposed changes to the effective peak discharges along Cherry Creek as part of this request. Table 4.1 below summarizes the effective discharges (per Dransfeldt Road CLOMR and LOMR no. 10-08-0769P) through the proposed revision area.

Table 4.1: Summary of Effective Discharges for Cherry Creek

Effective Cross Section	2003 FHAD Cross Section	ICON FDP Cross Section	10% A.C. Discharge (cfs)	2% A.C. Discharge (cfs)	1% A.C. Discharge (cfs)	0.2% A.C. Discharge (cfs)
146842.2	146	146936.9	7,033	20,873	33,407	109,400
145613.8	144	145708.5	7,080	21,018	33,658	109,980
145065.8 AL	143	145160.5	7,127	21,163	33,900	110,560
144326.2	142	144420.9	7,173	21,307	34,161	111,140
143060.4 AK	139	143154.0	7,220	21,452	34,412	111,720
142698.9	138	142773.5	7,267	21,597	34,663	112,300
142267.7 AJ	137	142344.6	7,313	21,741	34,915	112,880
N/A	N/A	141463.7	7,360	21,886	35,166	113,460
140831.7	135	140857.7	7,407	22,031	35,417	114,040
N/A	N/A	139505.2	7,453	22,175	35,669	114,620
138860 AG	131	138887.3	7,500	22,320	35,920	115,200
138067.2	129	138067.2	7,547	22,465	36,171	115,780

5.0 HYDRAULICS

5.1 Hydraulic Analysis

Effective Model

The effective hydraulic model for this reach of Cherry Creek comes from the 2010 Hess Road LOMR (Case No. 10-08-0769P).

Duplicate Effective

The effective model was copied and run on ICON engineering equipment in HEC-RAS version 5.0.7 creating the Duplicate Effective model.

Corrected Effective

The Corrected Effective model is an expanded version of the Corrected Effective model from the Dransfeldt Road CLOMR. There were changes to the alignment of cross-sections due to information provided by 2D modeling as well as the addition of four new cross-sections. The Corrected Effective model for Salisbury North goes upstream six cross sections past the extent of the Corrected Effective model for the Dransfeldt Road CLOMR. The additional cross section and centerline geometry upstream of FHAD cross section 140 do not differ from the Duplicate Effective model.

Pre-Project Conditions

The Pre-Project Conditions model is an expanded version of the Dransfeldt Road CLOMR Proposed Conditions (PC) model. The Dransfeldt Road CLOMR PC model has a different centerline alignment for Cherry Creek and the cross-section geometry differs from the Corrected Effective model. There are three additional cross section in the Pre-Project Conditions model. Six cross sections and the associated stream centerline were added to the Dransfeldt Road CLOMR PC modeling such that the modeling would expand upstream beyond the proposed grade changes for Salisbury Park North Phase 1. The additional cross section and centerline geometry upstream of FHAD cross section 140 do not differ from the Duplicate Effective model.

Post-Project Conditions

The Post-Project Conditions model incorporates the proposed grade changes of the Salisbury Park North Phase 1 project. Ineffective flow areas were updated based on the effects of grade changes through the project site. Manning's n-values were adjusted, from 0.060 to 0.055 on the left overbank of cross sections most affected by the proposed grade changes as there is significantly more concrete and general smooth surfaces on these sections versus pre-project conditions. There are no additional cross-sections or changes to centerline geometry between pre- and post-project conditions so a direct comparison can be made between the two models. See Table 5.1 for a comparison in WSEL between all HEC-RAS plans for the Salisbury Park North Phase 1 project

Post-Project Conditions were also modeled for Salisbury Park Phases 2-4, though these phases aren't finalized and this FDP Application is only for Phase 1 – Table 5.2 shows WSEL comparisons for all subsequent phases.

Table 5.1: Water Surface Elevation Comparisons - Salisbury Park North Phase 1 FDP
ICON Engineering Inc.

Location Description	Effective Cross Section	Corrected Effective Cross Section	Pre-Project Conditions Cross Section	Post-Project Conditions Cross Section	Effective Conditions [1]		Duplicate Effective Conditions [2]			Corrected Effective Conditions [3]			Pre-Project Conditions [4]				Post-Project Conditions [5] 10-24-2024 Phase 1			
					Discharge (cfs)	WSEL (NGVD 29)	Discharge (cfs)	WSEL (NGVD 29)	Δ WSEL vs. Effective	Discharge (cfs)	WSEL (NAVD 88)	Δ WSEL vs. Duplicate Effective	Discharge (cfs)	WSEL (NAVD 88)	Δ WSEL vs. Duplicate Effective	Δ WSEL vs. Corrected Effective	Discharge (cfs)	WSEL (NAVD 88)	Δ WSEL vs. Corrected Effective	Δ WSEL vs. Pre-Project
FHAD XS 128 FEMA lettered section AF	137545.3	137545.3	137545.3	137545.3	36171	5828.68	36171	5828.67	-0.01	36171	5828.67	0.00	36171	5828.67	0.00	0.00	36171	5828.67	0.00	0.00
FHAD XS 129	138067.2	138067.2	138067.2	138067.2	36171	5829.69	36171	5829.68	-0.01	36171	5829.49	-0.19	36171	5829.70	**0.02**	**0.21**	36171	5829.70	**0.21**	0.00
FHAD XS 129.6	*138361.5*	138360.5	138360.5	138360.5	--	*5830.70*	--	*5830.69*	0.00	35920	5830.52	-0.17	35920	5830.68	-0.01	**0.16**	35920	5830.68	**0.16**	0.00
FHAD XS 130	138526.8	*138534.2*	*138534.2*	*138534.2*	35920	5831.26	35920	5831.26	0.00	--	*5832.01*	**0.75**	--	*5832.07*	**0.81**	**0.06**	--	*5832.07*	**0.06**	0.00
FHAD XS 130.4	*138672.8*	138658.4	138658.4	138658.4	--	*5832.41*	--	*5832.42*	0.00	35920	5833.08	**0.66**	35920	5833.06	**0.64**	-0.02	35920	5833.06	-0.02	0.00
FHAD XS 131 FEMA lettered section AG	138860	138889.1	138887.3	138887.3	35920	5833.89	35920	5833.90	0.01	35920	5834.83	**0.93**	35920	5833.95	**0.05**	-0.88	35920	5833.95	-0.88	0.00
FHAD XS 131.3	*138977.5*	138996.1	139005.3	139005.3	--	*5834.95*	--	*5834.96*	0.00	35669	5837.00	**2.04**	35669	5835.62	**0.66**	-1.38	35669	5835.62	-1.38	0.00
	139061	*139085.7*	*139079.3*	*139079.3*	35669	5835.71	35669	5835.71	0.00	--	*5837.78*	**2.07**	--	*5836.64*	**0.93**	-1.14	--	*5836.64*	-1.14	0.00
FHAD XS 131.7	*139166.3*	139174	139186.6	139186.6	--	*5835.97*	--	*5835.97*	0.00	35669	5838.54	**2.57**	35669	5838.11	**2.14**	-0.43	35669	5838.11	-0.43	0.00
FHAD XS 132	139262.6	*139302.6*	*139296.2*	*139296.2*	35669	5836.21	35669	5836.21	0.00	--	*5838.79*	**2.58**	--	*5838.43*	**2.22**	-0.37	--	*5838.43*	-0.37	0.00
FHAD XS 132.1	*139299.3*	139341.3	139338.2	139338.2	--	*5836.26*	--	*5836.26*	0.00	35669	5838.87	**2.61**	35669	5838.55	**2.29**	-0.32	35669	5838.55	-0.32	0.00
	139419.6	139470.2	*139457.6*	*139457.6*	--	*5836.43*	--	*5836.43*	0.00	35669	5838.90	**2.47**		*5838.50*	**2.07**	-0.40		*5838.50*	-0.40	0.00
FHAD XS 132.9 Proposed FEMA section AH	*139471.3*	*139530.7*	139505.2	139505.2	--	*5836.50*	--	*5836.50*	0.00	--	*5838.95*	**2.45**	35669	5838.48	**1.98**	-0.47	35669	5838.48	-0.47	0.00
FHAD XS 132 FEMA lettered section AH	139529.7	*139602.4*	*139567*	*139567*	35669	5836.58	35669	5836.58	0.00	--	*5839.01*	**2.43**	--	*5838.75*	**2.17**	-0.26	--	*5838.75*	-0.26	0.00
FHAD XS 133.1	*139585.3*	*139659.3*	139624.0	139624.0	--	*5836.89*	--	*5836.89*	0.00	--	*5839.05*	**2.16**	35417	5838.99	**2.10**	-0.06	35417	5838.99	-0.06	0.00
FHAD XS 133.3	*139755.8*	139847.6	139794.7	139794.7	--	*5837.85*	--	*5837.84*	-0.01	35669	5839.20	**1.36**	35417	5839.63	**1.79**	**0.43**	35417	5839.63	**0.43**	0.00
	139822	*139979.9*	*139942.3*	*139942.3*	35417	5838.22	35417	5838.21	-0.01	--	*5839.70*	**1.49**	--	*5839.81*	**1.60**	**0.11**	--	*5839.81*	**0.11**	0.00
	139908.4	140071.7	*140039.6*	*140039.6*	--	*5838.64*	--	*5838.63*	-0.01	35417	5840.05	**1.42**		*5839.94*	**1.31**	-0.11		*5839.94*	-0.11	0.00
FHAD XS 134	140116.2	*140173.6*	140155.1	140155.1	35417	5839.64	35417	5839.64	0.00	--	*5840.20*	**0.56**	35417	5840.08	**0.44**	-0.12	35417	5840.08	-0.12	0.00
	140186	140276.2	*140233.0*	*140233.0*	--	*5840.02*	--	*5840.02*	0.00	35417	5840.35	**0.33**		*5840.30*	**0.29**	-0.05		*5840.30*	-0.05	0.00
FHAD XS 134.3	140354	*140479.6*	140397.3	140397.3	35417	5840.92	35417	5840.92	0.00	--	*5841.26*	**0.34**	35417	5840.77	-0.15	-0.49	35417	5840.77	-0.49	0.00
FHAD XS 134.5	*140479.6*	140620.5	140533.5	140533.5	--	*5841.44*	--	*5841.44*	0.00	35417	5841.89	**0.45**	35417	5841.24	-0.20	-0.65	35417	5841.24	-0.65	0.00
	140593	*140758.6*	*140658*	*140658*	35417	5841.90	35417	5841.90	0.00	--	*5842.58*	**0.68**	--	*5841.57*	-0.33	-1.01	--	*5841.57*	-1.01	0.00
FHAD XS 135 FEMA lettered section AI	140831.7	*140947.2*	140857.7	140857.7	35417	5842.53	35417	5842.53	0.00	--	5843.53	**1.00**	35417	5842.09	-0.44	-1.44	35417	5842.09	-1.44	0.00
	140896.5	141016	*140918.3*	*140918.3*	--	*5842.71*	--	*5842.71*	0.00	35417	5843.87	**1.16**		*5842.32*	-0.38	-1.55		*5842.32*	-1.55	0.00
FHAD XS 135.3	*141091.3*	*141263.3*	141128.6	141128.6	--	*5843.24*	--	*5843.24*	0.00	--	*5844.37*	**1.13**	35166	5843.14	-0.10	-1.23	35166	5843.14	-1.23	0.00
FHAD XS 135.7	*141409.8*	*141594.8*	141463.7	141463.7	--	*5844.11*	--	*5844.11*	0.00	--	*5845.04*	**0.94**	35166	5844.17	**0.06**	-0.87	35166	5844.17	-0.87	0.00
FHAD XS 136	141564.8	*141752.4*	*141620.7*	*141620.7*	35166	5844.53	35166	5844.53	0.00	--	*5845.36*	**0.83**	--	*5844.76*	**0.23**	-0.61	--	*5844.76*	-0.61	0.00
	141660.6	141854.4	*141722.7*	*141722.7*	--	*5844.86*	--	*5844.86*	0.00	35166	5845.57	**0.71**		*5845.14*	**0.27**	-0.43		*5845.14*	-0.43	0.00
FHAD XS 136.4	*141859.2*	*142070.403*	141938.6	141938.6	--	*5845.55*	--	*5845.55*	0.00	--	*5846.22*	**0.66**	34915	5845.94	**0.39**	-0.28	34915	5845.94	-0.28	0.00
FHAD XS 136.6	*142053*	142241.8	142110.2	142110.2	--	*5846.22*	--	*5846.22*	0.00	34915	5846.73	**0.51**	34915	5846.59	**0.37**	-0.14	34915	5846.77	**0.04**	**0.18**
FHAD XS 137 FEMA lettered section AJ	142267.7	142476.1137	142344.6	142344.6	34915	5846.97	34915	5846.97	0.00	34915	5847.76	**0.79**	34915	5847.71	**0.74**	-0.05	34915	5848.05	**0.29**	**0.34**
FHAD XS 138	142698.9	142905.1138	142773.5	142773.5	34663	5848.44	34663	5848.44	0.00	34663	5848.85	**0.41**	34663	5848.82	**0.38**	-0.03	34663	5849.02	**0.17**	**0.20**
FHAD XS 139 FEMA lettered section AK	143060.4	143285.5139	143154.0	143154.0	34412	5849.42	34412	5849.42	0.00	34412	5849.67	**0.25**	34412	5849.66	**0.24**	-0.01	34412	5849.79	**0.12**	**0.13**
FHAD XS 140	143567.7	143794.014	143662.4	143662.4	34161	5851.53	34161	5851.53	0.00	34161	5851.22	-0.31	34161	5851.22	-0.31	0.00	34161	5851.25	**0.03**	**0.03**
FHAD XS 141	143882.2	144108.5	143976.9	143976.9	34161	5852.88	34161	5852.88	0.00	34161	5852.82	-0.06	34161	5852.82	-0.06	0.00	34161	5852.82	0.00	0.00
FHAD XS 142	144326.2	144552.5	144420.9	144420.9	34161	5854.77	34161	5854.78	0.01	34161	5854.78	0.00	34161	5854.78	0.00	0.00	34161	5854.78	0.00	0.00
FHAD XS 143 FEMA lettered section AL	145065.8	145292.1	145160.5	145160.5	33900	5858.46	33900	5858.46	0.00	33900	5858.45	-0.01	33900	5858.45	-0.01	0.00	33900	5858.45	0.00	0.00
FHAD XS 144	145613.8	145840.1	145708.5	145708.5	33658	5861.75	33658	5861.75	0.00	33658	5861.75	0.00	33658	5861.75	0.00	0.00	33658	5861.75	0.00	0.00
FHAD XS 145 FEMA lettered section AM	146281.2	146507.5	146375.9	146375.9	33407	5864.02	33407	5864.02	0.00	33407	5864.02	0.00	33407	5864.02	0.00	0.00	33407	5864.02	0.00	0.00
FHAD XS 146	146842.2	147068.5	146936.9	146936.9	33407	5865.98	33407	5865.98	0.00	33407	5865.98	0.00	33407	5865.98	0.00	0.00	33407	5865.98	0.00	0.00

138361.5 = Interpolated station

5830.70 = Interpolated elevation

[1] Effective model from Hess Rd CLOMR no. 10-08-0769P (HEC-RAS v.3.1.3 plan name: as-built PPM)

[2] Duplicate Effective model from Dransfeldt Road CLOMR with extended centerline and 6 cross sections upstream of FHAD XS 140 from Hess Rd LOMR (HEC-RAS v.5.0.7 plan name: 01_DE_10-YR/50-YR/100-YR)

[3] Corrected Effective model from Dransfeldt Road CLOMR with extended centerline and 6 cross sections upstream of FHAD XS 140 from Hess Rd LOMR (HEC-RAS v.6.4.1 plan name: 03_CE_10-YR/50-YR/100-YR)

[4] Post-Project model from Dransfeldt Road CLOMR with extended centerline and 6 cross sections upstream of FHAD XS 140 from Hess Rd LOMR(HEC-RAS v.6.4.1 plan name: 05_Pre-Project_10-YR/50-YR/100-YR)

[5] Salisbury Park Post-Project Conditions Model with 08-30-2024 JVA Phase 1 grading (HEC-RAS v.6.4.1 plan name: 48_Post-Project_PH1)

Table 5.2: Water Surface Elevation Comparisons - Salisbury Park North All Phases
ICON Engineering Inc.

Location Description	Effective Cross Section	Corrected Effective Cross Section	Pre-Project Conditions Cross Section	Post-Project Conditions Cross Section	Effective Conditions [1]		Duplicate Effective Conditions [2]			Corrected Effective Conditions [3]			Pre-Project Conditions [4]				Post-Project Conditions [5] 10-24-2024 Phase 1				Post-Project Conditions [6] 10-24-2024 Phase 1 & 2				Post-Project Conditions [7] 10-24-2024 Phase 1, 2 & 3				Post-Project Conditions [8] 10-24-2024 Phase 1, 2, 3 & 4			
					Discharge (cfs)	WSEL (NGVD 29)	Discharge (cfs)	WSEL (NGVD 29)	Δ WSEL vs. Effective	Discharge (cfs)	WSEL (NAVD 88)	Δ WSEL vs. Duplicate Effective	Discharge (cfs)	WSEL (NAVD 88)	Δ WSEL vs. Duplicate Effective	Δ WSEL vs. Corrected Effective	Discharge (cfs)	WSEL (NAVD 88)	Δ WSEL vs. Corrected Effective	Δ WSEL vs. Pre-Project	Discharge (cfs)	WSEL (NAVD 88)	Δ WSEL vs. Corrected Effective	Δ WSEL vs. Pre-Project	Discharge (cfs)	WSEL (NAVD 88)	Δ WSEL vs. Corrected Effective	Δ WSEL vs. Pre-Project	Discharge (cfs)	WSEL (NAVD 88)	Δ WSEL vs. Corrected Effective	Δ WSEL vs. Pre-Project
FHAD XS 128 FEMA lettered section AF	137545.3	137545.3	137545.3	137545.3	36171	5828.68	36171	5828.67	-0.01	36171	5828.67	0.00	36171	5828.67	0.00	0.00	36171	5828.67	0.00	0.00	36171	5828.67	0.00	0.00	36171	5828.67	0.00	0.00	36171	5828.67	0.00	0.00
FHAD XS 129	138067.2	138067.2	138067.2	138067.2	36171	5829.69	36171	5829.68	-0.01	36171	5829.49	-0.19	36171	5829.70	**0.02**	**0.21**	36171	5829.70	**0.21**	0.00	36171	5829.70	**0.21**	0.00	36171	5829.70	**0.21**	0.00	36171	5829.70	**0.21**	0.00
FHAD XS 129.6	*138361.5*	138360.5	138360.5	138360.5	--	*5830.70*	--	*5830.69*	0.00	35920	5830.52	-0.17	35920	5830.68	-0.01	**0.16**	35920	5830.68	**0.16**	0.00	35920	5830.68	**0.16**	0.00	35920	5830.68	**0.16**	0.00	35920	5830.68	**0.16**	0.00
FHAD XS 130	138526.8	*138534.2*	*138534.2*	*138534.2*	35920	5831.26	35920	5831.26	0.00	--	*5832.01*	**0.75**	--	*5832.07*	**0.81**	**0.06**	--	*5832.07*	**0.06**	0.00	--	*5832.07*	**0.06**	0.00	--	*5832.07*	**0.06**	0.00	--	*5832.07*	**0.06**	0.00
FHAD XS 130.4	*138672.8*	138658.4	138658.4	138658.4	--	*5832.41*	--	*5832.42*	0.00	35920	5833.08	**0.66**	35920	5833.06	**0.64**	-0.02	35920	5833.06	-0.02	0.00	35920	5833.06	-0.02	0.00	35920	5833.06	-0.02	0.00	35920	5833.06	-0.02	0.00
FHAD XS 131 FEMA lettered section AG	138860	138889.1	138887.3	138887.3	35920	5833.89	35920	5833.90	0.01	35920	5834.83	**0.93**	35920	5833.95	**0.05**	-0.88	35920	5833.95	-0.88	0.00	35920	5833.95	-0.88	0.00	35920	5833.95	-0.88	0.00	35920	5833.95	-0.88	0.00
FHAD XS 131.3	*138977.5*	138996.1	139005.3	139005.3	--	*5834.95*	--	*5834.96*	0.00	35669	5837.00	**2.04**	35669	5835.62	**0.66**	-1.38	35669	5835.62	-1.38	0.00	35669	5835.62	-1.38	0.00	35669	5835.62	-1.38	0.00	35669	5835.62	-1.38	0.00
	139061	*139085.7*	*139079.3*	*139079.3*	35669	5835.71	35669	5835.71	0.00	--	*5837.78*	**2.07**	--	*5836.64*	**0.93**	-1.14	--	*5836.64*	-1.14	0.00	--	*5836.64*	-1.14	0.00	--	*5836.64*	-1.14	0.00	--	*5836.64*	-1.14	0.00
FHAD XS 131.7	*139166.3*	139174	139186.6	139186.6	--	*5835.97*	--	*5835.97*	0.00	35669	5838.54	**2.57**	35669	5838.11	**2.14**	-0.43	35669	5838.11	-0.43	0.00	35669	5838.11	-0.43	0.00	35669	5838.11	-0.43	0.00	35669	5838.11	-0.43	0.00
FHAD XS 132	139262.6	*139302.6*	*139296.2*	*139296.2*	35669	5836.21	35669	5836.21	0.00	--	*5838.79*	**2.58**	--	*5838.43*	**2.22**	-0.37	--	*5838.43*	-0.37	0.00	--	*5838.43*	-0.37	0.00	--	*5838.43*	-0.37	0.00	--	*5838.43*	-0.37	0.00
FHAD XS 132.1	*139299.3*	139341.3	139338.2	139338.2	--	*5836.26*	--	*5836.26*	0.00	35669	5838.87	**2.61**	35669	5838.55	**2.29**	-0.32	35669	5838.55	-0.32	0.00	35669	5838.55	-0.32	0.00	35669	5838.55	-0.32	0.00	35669	5838.55	-0.32	0.00
	139419.6	139470.2	*139457.6*	*139457.6*	--	*5836.43*	--	*5836.43*	0.00	35669	5838.90	**2.47**		*5838.50*	**2.07**	-0.40		*5838.50*	-0.40	0.00		*5838.50*	-0.40	0.00		*5838.50*	-0.40	0.00		*5838.50*	-0.40	0.00
FHAD XS 132.9 Proposed FEMA section AH	*139471.3*	*139530.7*	139505.2	139505.2	--	*5836.50*	--	*5836.50*	0.00	--	*5838.95*	**2.45**	35669	5838.48	**1.98**	-0.47	35669	5838.48	-0.47	0.00	35669	5838.48	-0.47	0.00	35669	5838.48	-0.47	0.00	35669	5838.48	-0.47	0.00
FHAD XS 132 FEMA lettered section AH	139529.7	*139602.4*	*139567*	*139567*	35669	5836.58	35669	5836.58	0.00	--	*5839.01*	**2.43**	--	*5838.75*	**2.17**	-0.26	--	*5838.75*	-0.26	0.00	--	*5838.75*	-0.26	0.00	--	*5838.75*	-0.26	0.00	--	*5838.75*	-0.26	0.00
FHAD XS 133.1	*139585.3*	*139659.3*	139624.0	139624.0	--	*5836.89*	--	*5836.89*	0.00	--	*5839.05*	**2.16**	35417	5838.99	**2.10**	-0.06	35417	5838.99	-0.06	0.00	35417	5838.99	-0.06	0.00	35417	5838.99	-0.06	0.00	35417	5838.99	-0.06	0.00
FHAD XS 133.3	*139755.8*	139847.6	139794.7	139794.7	--	*5837.85*	--	*5837.84*	-0.01	35669	5839.20	**1.36**	35417	5839.63	**1.79**	**0.43**	35417	5839.63	**0.43**	0.00	35417	5839.63	**0.43**	0.00	35417	5839.63	**0.43**	0.00	35417	5839.63	**0.43**	0.00
	139822	*139979.9*	*139942.3*	*139942.3*	35417	5838.22	35417	5838.21	-0.01	--	*5839.70*	**1.49**	--	*5839.81*	**1.60**	**0.11**	--	*5839.81*	**0.11**	0.00	--	*5839.81*	**0.11**	0.00	--	*5839.81*	**0.11**	0.00	--	*5839.81*	**0.11**	0.00
	139908.4	140071.7	*140039.6*	*140039.6*	--	*5838.64*	--	*5838.63*	-0.01	35417	5840.05	**1.42**		*5839.94*	**1.31**	-0.11		*5839.94*	-0.11	0.00		*5839.94*	-0.11	0.00		*5839.94*	-0.11	0.00		*5839.94*	-0.11	0.00
FHAD XS 134	140116.2	*140173.6*	140155.1	140155.1	35417	5839.64	35417	5839.64	0.00	--	*5840.20*	**0.56**	35417	5840.08	**0.44**	-0.12	35417	5840.08	-0.12	0.00	35417	5840.08	-0.12	0.00	35417	5840.08	-0.12	0.00	35417	5840.08	-0.12	0.00
	140186	140276.2	*140233.0*	*140233.0*	--	*5840.02*	--	*5840.02*	0.00	35417	5840.35	**0.33**		*5840.30*	**0.29**	-0.05		*5840.30*	-0.05	0.00		*5840.30*	-0.05	0.00		*5840.30*	-0.05	0.00		*5840.30*	-0.05	0.00
FHAD XS 134.3	140354	*140479.6*	140397.3	140397.3	35417	5840.92	35417	5840.92	0.00	--	*5841.26*	**0.34**	35417	5840.77	-0.15	-0.49	35417	5840.77	-0.49	0.00	35417	5840.77	-0.49	0.00	35417	5840.77	-0.49	0.00	35417	5840.77	-0.49	0.00
FHAD XS 134.5	*140479.6*	140620.5	140533.5	140533.5	--	*5841.44*	--	*5841.44*	0.00	35417	5841.89	**0.45**	35417	5841.24	-0.20	-0.65	35417	5841.24	-0.65	0.00	35417	5841.24	-0.65	0.00	35417	5841.21	-0.68	-0.03	35417	5841.11	-0.78	-0.13
	140593	*140758.6*	*140658*	*140658*	35417	5841.90	35417	5841.90	0.00	--	*5842.58*	**0.68**	--	*5841.57*	-0.33	-1.01	--	*5841.57*	-1.01	0.00	--	*5841.57*	-1.03	-0.02	--	*5841.55*	-1.03	-0.02	--	*5841.52*	-1.06	-0.05
FHAD XS 135 FEMA lettered section AI	140831.7	*140947.2*	140857.7	140857.7	35417	5842.53	35417	5842.53	0.00	--	5843.53	**1.00**	35417	5842.09	-0.44	-1.44	35417	5842.09	-1.44	0.00	35417	5842.09	-1.44	0.00	35417	5842.09	-1.44	0.00	35417	5842.17	-1.36	**0.08**
	140896.5	141016	*140918.3*	*140918.3*	--	*5842.71*	--	*5842.71*	0.00	35417	5843.87	**1.16**		*5842.32*	-0.38	-1.55		*5842.32*	-1.55	0.00		*5842.33*	-1.54	**0.00**		*5842.33*	-1.54	**0.01**		*5842.40*	-1.47	**0.08**
FHAD XS 135.3	*141091.3*	*141263.3*	141128.6	141128.6	--	*5843.24*	--	*5843.24*	0.00	--	*5844.37*	**1.13**	35166	5843.14	-0.10	-1.23	35166	5843.14	-1.23	0.00	35166	5843.16	-1.21	**0.02**	35166	5843.17	-1.20	**0.03**	35166	5843.21	-1.16	**0.07**
FHAD XS 135.7	*141409.8*	*141594.8*	141463.7	141463.7	--	*5844.11*	--	*5844.11*	0.00	--	*5845.04*	**0.94**	35166	5844.17	**0.06**	-0.87	35166	5844.17	-0.87	0.00	35166	5844.15	-0.89	-0.02	35166	5844.15	-0.89	-0.02	35166	5844.19	-0.85	**0.02**
FHAD XS 136	141564.8	*141752.4*	*141620.7*	*141620.7*	35166	5844.53	35166	5844.53	0.00	--	*5845.36*	**0.83**	--	*5844.76*	**0.23**	-0.61	--	*5844.76*	-0.61	0.00	--	*5844.78*	-0.59	**0.02**	--	*5844.78*	-0.59	**0.02**	--	*5844.82*	-0.55	**0.06**
	141660.6	141854.4	*141722.7*	*141722.7*	--	*5844.86*	--	*5844.86*	0.00	35166	5845.57	**0.71**		*5845.14*	**0.27**	-0.43		*5845.14*	-0.43	0.00		*5845.19*	-0.38	**0.05**		*5845.19*	-0.38	**0.05**		*5845.23*	-0.34	**0.09**
FHAD XS 136.4	*141859.2*	*142070.403*	141938.6	141938.6	--	*5845.55*	--	*5845.55*	0.00	--	*5846.22*	**0.66**	34915	5845.94	**0.39**	-0.28	34915	5845.94	-0.28	0.00	34915	5846.05	-0.17	**0.11**	34915	5846.05	-0.17	**0.11**	34915	5846.09	-0.13	**0.15**
FHAD XS 136.6	*142053*	142241.8	142110.2	142110.2	--	*5846.22*	--	*5846.22*	0.00	34915	5846.73	**0.51**	34915	5846.59	**0.37**	-0.14	34915	5846.77	**0.04**	**0.18**	34915	5846.83	**0.10**	**0.24**	34915	5846.83	**0.10**	**0.24**	34915	5846.86	**0.13**	**0.27**
FHAD XS 137 FEMA lettered section AJ	142267.7	142476.1137	142344.6	142344.6	34915	5846.97	34915	5846.97	0.00	34915	5847.76	**0.79**	34915	5847.71	**0.74**	-0.05	34915	5848.05	**0.29**	**0.34**	34915	5848.07	**0.31**	**0.36**	34915	5848.07	**0.31**	**0.36**	34915	5848.06	**0.30**	**0.35**
FHAD XS 138	142698.9	142905.1138	142773.5	142773.5	34663	5848.44	34663	5848.44	0.00	34663	5848.85	**0.41**	34663	5848.82	**0.38**	-0.03	34663	5849.02	**0.17**	**0.20**	34663	5849.02	**0.17**	**0.20**	34663	5849.02	**0.17**	**0.20**	34663	5849.02	**0.17**	**0.20**
FHAD XS 139 FEMA lettered section AK	143060.4	143285.5139	143154.0	143154.0	34412	5849.42	34412	5849.42	0.00	34412	5849.67	**0.25**	34412	5849.66	**0.24**	-0.01	34412	5849.79	**0.12**	**0.13**	34412	5849.79	**0.12**	**0.13**	34412	5849.79	**0.12**	**0.13**	34412	5849.79	**0.12**	**0.13**
FHAD XS 140	143567.7	143794.014	143662.4	143662.4	34161	5851.53	34161	5851.53	0.00	34161	5851.22	-0.31	34161	5851.22	-0.31	0.00	34161	5851.25	**0.03**	**0.03**	34161	5851.25	**0.03**	**0.03**	34161	5851.25	**0.03**	**0.03**	34161	5851.25	**0.03**	**0.03**
FHAD XS 141	143882.2	144108.5	143976.9	143976.9	34161	5852.88	34161	5852.88	0.00	34161	5852.82	-0.06	34161	5852.82	-0.06	0.00	34161	5852.82	0.00	0.00	34161	5852.82	0.00	0.00	34161	5852.82	0.00	0.00	34161	5852.82	0.00	0.00
FHAD XS 142	144326.2	144552.5	144420.9	144420.9	34161	5854.77	34161	5854.78	0.01	34161	5854.78	0.00	34161	5854.78	0.00	0.00	34161	5854.78	0.00	0.00	34161	5854.78	0.00	0.00	34161	5854.78	0.00	0.00	34161	5854.78	0.00	0.00
FHAD XS 143 FEMA lettered section AL	145065.8	145292.1	145160.5	145160.5	33900	5858.46	33900	5858.46	0.00	33900	5858.45	-0.01	33900	5858.45	-0.01	0.00	33900	5858.45	0.00	0.00	33900	5858.45	0.00	0.00	33900	5858.45	0.00	0.00	33900	5858.45	0.00	0.00
FHAD XS 144	145613.8	145840.1	145708.5	145708.5	33658	5861.75	33658	5861.75	0.00	33658	5861.75	0.00	33658	5861.75	0.00	0.00	33658	5861.75	0.00	0.00	33658	5861.75	0.00	0.00	33658	5861.75	0.00	0.00	33658	5861.75	0.00	0.00
FHAD XS 145 FEMA lettered section AM	146281.2	146507.5	146375.9	146375.9	33407	5864.02	33407	5864.02	0.00	33407	5864.02	0.00	33407	5864.02	0.00	0.00	33407	5864.02	0.00	0.00	33407	5864.02	0.00	0.00	33407	5864.02	0.00	0.00	33407	5864.02	0.00	0.00
FHAD XS 146	146842.2	147068.5	146936.9	146936.9	33407	5865.98	33407	5865.98	0.00	33407	5865.98	0.00	33407	5865.98	0.00	0.00	33407	5865.98	0.00	0.00	33407	5865.98	0.00	0.00	33407	5865.98	0.00	0.00	33407	5865.98	0.00	0.00

138361.5 = Interpolated station

5830.70 = Interpolated elevation

[1] Effective model from Hess Rd CLOMR no. 10-08-0769P

[2] Duplicate Effective model from Dransfeldt Road CLOMR with extended centerline and 6 cross sections upstream of FHAD XS 140 from Hess Rd LOMR (HEC-RAS v.5.0.7 plan name: 01_DE_10-YR/50-YR/100-YR)

[3] Corrected Effective model from Dransfeldt Road CLOMR with extended centerline and 6 cross sections upstream of FHAD XS 140 from Hess Rd LOMR (HEC-RAS v.6.4.1 plan name: 03_CE_10-YR/50-YR/100-YR)

[4] Post-Project model from Dransfeldt Road CLOMR with extended centerline and 6 cross sections upstream of FHAD XS 140 from Hess Rd LOMR(HEC-RAS v.6.4.1 plan name: 05_Pre-Project_10-YR/50-YR/100-YR)

[5] Salisbury Park Post-Project Conditions Model with 08-30-2024 JVA Phase 1 grading (HEC-RAS v.6.4.1 plan name: 48_Post-Project_PH1)

[6] Salisbury Park Post-Project Conditions Model with 08-30-2024 JVA Phase 1 & 2 grading (HEC-RAS v.6.4.1 plan name: 49_Post-Project_PH2)

[7] Salisbury Park Post-Project Conditions Model with 08-30-2024 JVA Phase 1, 2 & 3 grading (HEC-RAS v.6.4.1 plan name: 50_Post-Project_PH3)

[8] Salisbury Park Post-Project Conditions Model with 08-30-2024 JVA Phase 1, 2, 3 & 4 grading (HEC-RAS v.6.4.1 plan name: 51_Post-Project_PH4)

5.2 Input Parameters

The hydraulic parameters remain unchanged from the Dransfeldt Road CLOMR or Hess Road LOMR modeling through pre-project conditions. In the Post-Project Conditions model changes were made to the cross-section geometry, ineffective flow areas and manning's n-values through the Salisbury Park North Phase 1 sections as mentioned above.

5.3 Results

See Table 5.1 and 5.2 for WSEL comparison between all HEC-RAS model plans. No insurable structures are negatively impacted due to the proposed Salisbury Park North project. All rises in WSEL are under a half-foot which is within the acceptable tolerance of a rise without applying for a CLOMR.

5.4 Tie-Ins

The downstream Cherry Creek tie-in occurs at FHAD cross section 128. The upstream tie-in occurs at FHAD cross section 146. Both cross sections are duplicate effective hydraulic cross section, known starting water surface elevations, and the effective floodway encroachment stations are used at this location to ensure exact tie-ins.

6.0 FLOODPLAIN MAPPING

6.1 Floodplain Work Map

The effective 1%- and 0.2%-Annual-Chance floodplains and floodway for Cherry Creek is shown on the FIRM included in Appendix B as well as Figure E.1 in Appendix E. For Chery Creek, the proposed 1%- and 0.2%-Annual-Chance floodplain boundaries were delineated from cross section top widths, locations of cross sections along the channel centerline, proposed grading, and existing conditions topography. The proposed regulatory floodway was delineated to match the modeled encroachment stations at hydraulic cross sections, there was no change to the floodway encroachment stationing from pre- to post-project conditions. The floodway is plotted to match the modeled encroachment stations at all locations. A floodplain work map depicting the effective and proposed floodplain and floodway boundaries, as well as the pre-project floodplain, is located in Appendix E. The datum and mapping projection are as described in Section 3.1 and are listed on the workmaps. All elevations shown on the workmaps are presented on vertical datum NAVD 1988.

GIS files of the proposed floodplain and floodway revisions are included in Appendix G. A mapping agreement table is included in Appendix C.

7.0 CONCLUSIONS

The proposed project will cause changes to the FEMA Flood Insurance Rate Map (FIRM) number 08035C0069F and 08035C0182G. The effective dates for these FIRM panels are September 30, 2005, and March 16, 2016, they are panels 69 and 182 of 495 for Douglas County, Colorado and incorporated areas. The impacted community is the Town of Parker, community number 080310.

7.1 Compliance with Standards

FEMA Criteria

In compliance with the Code of Federal Regulations 44, Section 60.3, we certify that the fill within the flood fringe will not cause a rise in BFEs greater than a half foot. Thus, no CLOMR is required for the Salisbury Park North project.

Town of Parker Criteria

The Salisbury Park North Phase 1 project is in compliance with all Title 13 Chapter 13.05.010 regulations from the Town of Parker barring the definition of a Floodway in section (e)(2)(b) listed below.

"(b) Definitions

Floodway (regulatory floodway) means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one-half (½) foot (six [6] inches)."

The Town of Parker maintained the 1-foot floodway for the ongoing Cherry Creek Channel Improvement and Dransfeldt Road Extension CLOMR due to potential impacts on adjacent private property, thus, the same standard has been maintained for this project as well.

APPENDIX A: TOWN OF PARKER FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

FLOODPLAIN DEVELOPMENT PERMIT APPLICATION

Public Works - Stormwater Division
20120 E. Mainstreet
Parker, Colorado 80138
303.840.9546

PERMIT #: _____

DATE: _____

Applicant Information

Owner: Town of Parker	Contractor: ICON Engineering, Inc.
Address: 20120 E Mainstreet	Address: 7000 S Yosemite St STE 120
Parker, CO 80134-7335	Centennial, CO 80112
Phone: 303.805.3276	Phone: 303.221.0802
Contact Name: Brett Collins	Contact Name: Brian LeDoux
Contact Phone and Email:303.805.3276 bcollins@parkerco.gov	Contact Phone and Email: 303.638.2304 bledoux@iconeng.com

Project Information

Project Location/Directions:

The Salisbury Park North Phase 1bound by Cherry Creek to the north and east, Salisbury Equestrian Park to the south, and North Motsenbocker Road to the west.

☐ Bridge/Culvert	☑ Utility Line	☑ Substantial Improvement >50%
☑ New Structure	☐ Structure Addition	☐ Manufactured (Mobile) Home
☑ Non-Residential	☑ Grading/Fill	☐ Channelization
☐ Levee	☑ Trail Construction	☑ Drainage Infrastructure Improvement

Project Description:

Newly constructed park features, including several sports fields, parking, roadways, trail connections, two new structures, drainage and utilities.

Flood Hazard Data

Watercourse Name: Cherry Creek

The proposed project is in the: ☐ Floodway ☑ Floodway Fringe

Flood Zone: ☐ A ☑ AE ☑ X (Shaded) ☐ Other (Specify) _____

Base Flood (1% Annual Chance Flood) Elevation at project site: Varies - see floodplain workmaps

Flood Insurance Rate Map Number: 8035C0069F & 182G Effective: September 30, 2005

*Attach a copy of FIRM with approximate limits of proposed project shown

Elevation required for lowest floor: __Varies_____ Floodproofing: ___N/A_____

Proposal Review Checklist

Yes/No	Site development plans are complete/attached and depict flood hazard data
If "No", Explain:	
Yes/No	Engineering data and analysis is attached (Signed/Sealed by a Professional Engineer)
If "No", Explain:	
Yes/No	Floodway Certificate and data documents no increase in base flood elevation
If "No", Explain: Project is outside of effective floodway	
Yes/No	Subdivision proposals minimize flood damage and protect utilities
If "No", Explain: Not applicable to project	
Yes/No	Lowest floor elevations are two feet above the base (1% Annual Chance) flood level
If "No", Explain:	
Yes/No	Manufactured homes address elevation and anchoring requirements
If "No", Explain: Not applicable to project	
Yes/No	Floodproofing certification by a registered Professional Engineer or Architect
If "No", Explain: Not applicable to project	

Structure Information See proposed floodplain workmaps for FFE and BFEs

	Elevation in relation to mean sea level of lowest floor (including basement)*
	Elevation in relation to mean sea level to which structure has been floodproofed*
*If more than one structure, attach list with respective elevations	

Applicant Signature

Property Owner Name: _____ Title: _____
Property Owner Signature (Required): _____ Date: _____
Owner's Designated Agent: Name:_____ Company:_____
Owner's Designated Agent Signature: _____ Date:_____
**Note: Applicant is responsible for obtaining all other applicable federal, state and local permits*

Permit Action

Recommendation for approval Designated Town Authority: _____ Date:_____	
	Permit Approved: The information submitted for the proposed project was reviewed and is in compliance with Town floodplain regulations.
	Permit Denied: The proposed project does not meet Town floodplain regulations
	Variance Granted: A variance was granted from the base (1% Annual Chance) flood elevations established by FEMA consistent with variance requirements fo NFIP regulations Part 60.6 (variance action documentation is attached)
Floodplain Administrator's Signature: _____ Date:_____	
Comments:_____	

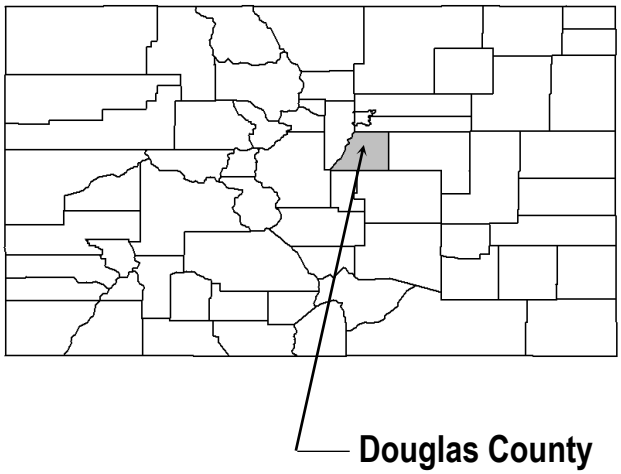
APPENDIX B: EFFECTIVE FLOODPLAIN INFORMATION

FLOOD INSURANCE STUDY

VOLUME 1 OF 5

DOUGLAS COUNTY, COLORADO
AND INCORPORATED AREAS

Community Name	Community Number
CASTLE PINES, CITY OF	080231
CASTLE ROCK, TOWN OF	080050
DOUGLAS COUNTY (UNINCORPORATED AREAS)	080049
LARKSPUR, TOWN OF	080309
LONE TREE, CITY OF	080319
PARKER, TOWN OF	080310



REVISED
December 2, 2021

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
08035CV001E

Table 4: Summary of Discharges (continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
BIG DRY CREEK TRIBUTARY C					
At Confluence with Big Dry Creek	3.07	*	*	2,400	*
At McArthur Ranch Road	1.63	*	*	1,350	*
At Upstream Limit of Detailed Study	0.12	*	*	250	*
CARPENTER CREEK					
At Denver & Rio Grande Western Railroad	10.1	1,220	2,510	3,350	5,570
At County Road 74	9.4	1,300	2,660	3,530	5,840
CHERRY CREEK					
At County Limits	*	8,950	26,800	43,710	133,200
At Cottonwood Drive	*	8,670	25,940	42,200	129,700
At E-470	*	8,480	25,360	41,200	129,700
At Lincoln Avenue	*	8,100	24,200	39,190	122,740
At West Parker Road	*	7,730	23,040	37,180	118,100
At Stroh Avenue	*	6,610	19,570	31,510	104,200
At Scott Road	*	6,000	17,500	27,120	100,000
At State Highway 86	*	5,500	12,600	19,080	79,000
COTTONWOOD CREEK					
At Inverness Drive South	*	1,293	1,963	2,498	3,662
At Inverness Drive South	*	1,214	1,830	2,336	3,466
At Liberty Boulevard	*	1,214	1,830	2,336	3,466
At E-470 Off Ramp	*	1,123	1,695	2,149	3,179
At E-470	2.4	1,123	1,695	2,149	3,179
At E-470 On Ramp	*	1,123	1,695	2,149	3,179
At Meridian Boulevard	*	1,298	2,177	2,657	3,451
At Pedestrian Bridge	*	304	514	665	1,022
At Golf Cart Bridge	*	304	514	665	1,022
At Meridian Boulevard	*	304	514	665	1,022
At Lincoln Avenue	0.8	304	514	665	1,022
At I-25 (Upstream Limit of Detailed Study)	0.7	185	416	541	863

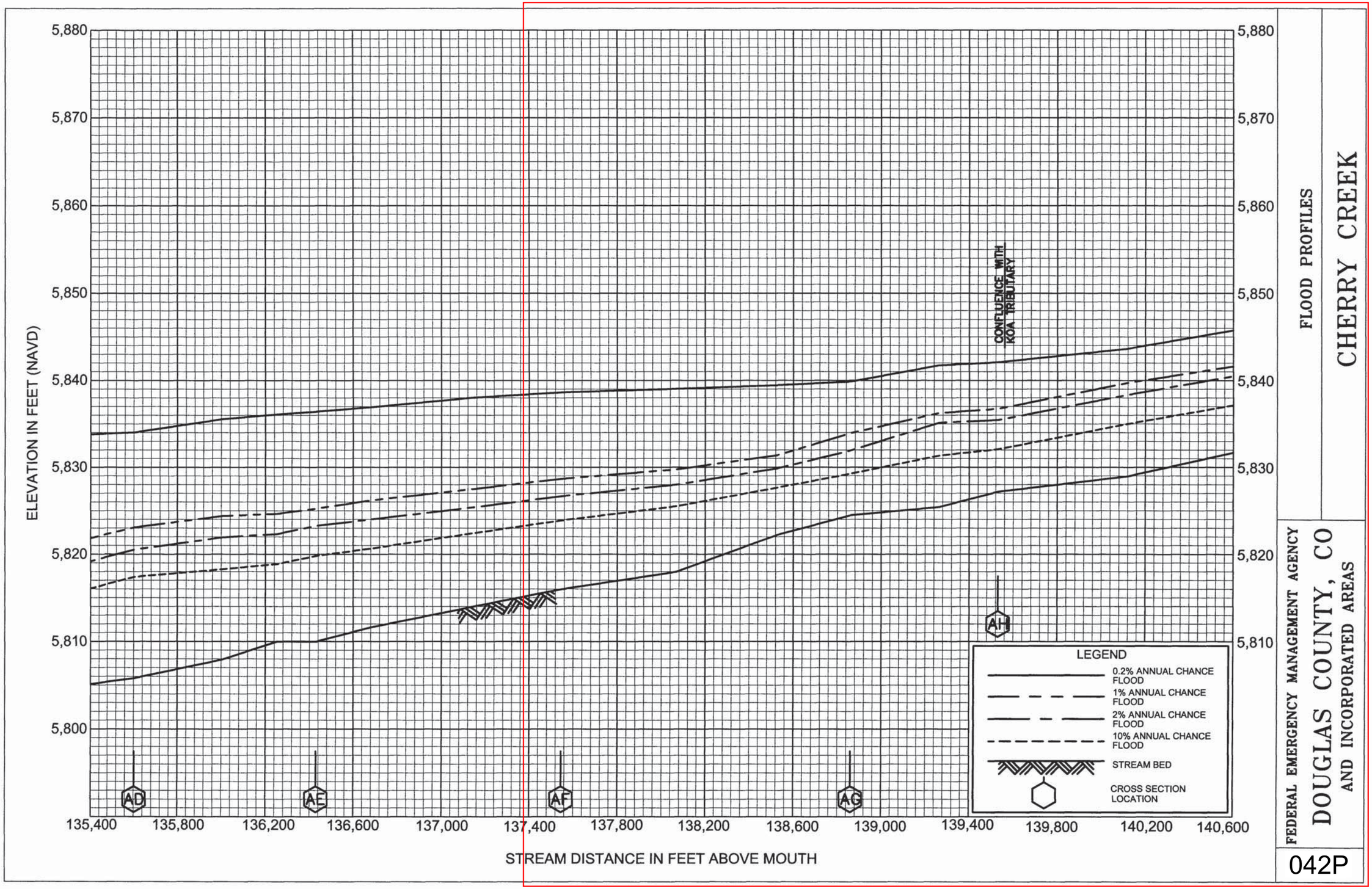
*Data not available

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cherry Creek (continued)								
L	119,499	626	5,751	7.1	5,754.3	5,754.3	5,754.3	0.0
M	120,641	648	4,771	8.5	5,757.2	5,757.2	5,757.6	0.4
N	121,333	740	6,106	6.6	5,760.2	5,760.2	5,761.0	0.8
O	121,923	500	4,025	10.0	5,763.8	5,763.8	5,763.8	0.0
P	122,751	480	3,449	11.6	5,766.8	5,766.8	5,767.6	0.8
Q	123,592	405	4,530	8.7	5,771.8	5,771.8	5,772.7	0.9
R	124,887	570	5,324	7.4	5,777.0	5,777.0	5,777.8	0.8
S	126,073	492	3,874	10.1	5,779.8	5,779.8	5,780.5	0.7
T	126,330	497	5,144	7.5	5,782.0	5,782.0	5,782.2	0.2
U	127,590	796	4,063	9.5	5,785.3	5,785.3	5,786.0	0.7
V	128,405	548	3,757	10.2	5,790.8	5,790.8	5,790.9	0.1
W	129,561	377	3,795	10.1	5,799.0	5,799.0	5,799.9	0.9
X	130,779	574	6,462	5.9	5,803.8	5,803.8	5,804.4	0.6
Y	131,933	585	5,037	7.5	5,806.2	5,806.2	5,806.9	0.7
Z	132,970	325	3,724	10.1	5,810.2	5,810.2	5,811.0	0.8
AA	133,384	240	2,397	15.5	5,811.7	5,811.7	5,812.2	0.5
AB	133,547	240	2,898	12.7	5,815.4	5,815.4	5,815.5	0.1
AC	134,530	740	7,430	5.0	5,819.7	5,819.7	5,819.9	0.2
AD	135,602	399	4,279	8.6	5,822.9	5,822.9	5,823.7	0.8
AE	136,429	492	4,616	7.9	5,825.2	5,825.2	5,825.9	0.7
AF	137,545	758	6,541	5.5	5,828.7	5,828.7	5,829.6	0.9
AG	138,860	520	3,274	11.0	5,833.9	5,833.9	5,834.3	0.4
AH	139,530	825	5,653	6.3	5,836.7	5,836.7	5,837.5	0.8
AI	140,832	750	5,534	6.4	5,842.5	5,842.5	5,843.4	0.9
AJ	142,268	1,105	6,442	5.4	5,847.0	5,847.0	5,847.9	0.9

[1] Feet above mouth

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cherry Creek (continued)								
AK	143,060	1,120	5,614	6.1	5,849.5	5,849.5	5,850.3	0.8
AL	145,066	495	3,435	9.9	5,858.6	5,858.6	5,859.0	0.4
AM	146,281	515	4,425	7.6	5,864.0	5,864.0	5,864.7	0.7
AN	147,121	1,000	5,802	5.8	5,866.9	5,866.9	5,867.5	0.6
AO	148,101	745	5,160	6.4	5,870.5	5,870.5	5,871.1	0.6
AP	149,230	580	4,097	8.0	5,875.7	5,875.7	5,875.8	0.1
AQ	150,306	511	2,908	11.2	5,879.9	5,879.9	5,880.3	0.4
AR	151,381	510	3,863	8.4	5,886.1	5,886.1	5,886.4	0.3
AS	152,510	705	3,814	8.4	5,891.4	5,891.4	5,891.8	0.4
AT	153,421	771	5,096	6.3	5,896.6	5,896.6	5,896.6	0.0
AU	153,849	564	3,536	9.0	5,897.8	5,897.8	5,897.9	0.1
AV	154,516	609	4,922	6.4	5,901.6	5,901.6	5,902.3	0.7
AW	155,178	404	3,187	9.9	5,903.6	5,903.6	5,904.3	0.7
AX	155,618	297	2,508	12.4	5,906.0	5,906.0	5,906.2	0.2
AY	155,832	272	3,276	9.4	5,909.0	5,909.0	5,909.1	0.1
AZ	156,821	425	3,658	8.4	5,911.3	5,911.3	5,911.3	0.0
BA	157,140	377	3,131	9.8	5,911.7	5,911.7	5,912.1	0.4
BB	157,734	420	3,960	7.7	5,915.1	5,915.1	5,916.0	0.9
BC	158,847	498	3,737	8.1	5,918.5	5,918.5	5,918.7	0.2
BD	160,060	777	5,168	5.8	5,922.2	5,922.2	5,923.0	0.8
BE	161,047	680	4,202	7.1	5,927.0	5,927.0	5,927.7	0.7
BF	162,009	1,133	6,472	4.5	5,930.4	5,930.4	5,931.3	0.9
BG	163,157	567	3,665	7.9	5,936.3	5,936.3	5,937.0	0.7
BH	164,393	750	4,345	6.6	5,942.3	5,942.3	5,943.0	0.7
BI	165,197	524	3,606	7.8	5,946.4	5,946.4	5,947.1	0.7

[1] Feet above mouth



FLOOD PROFILES

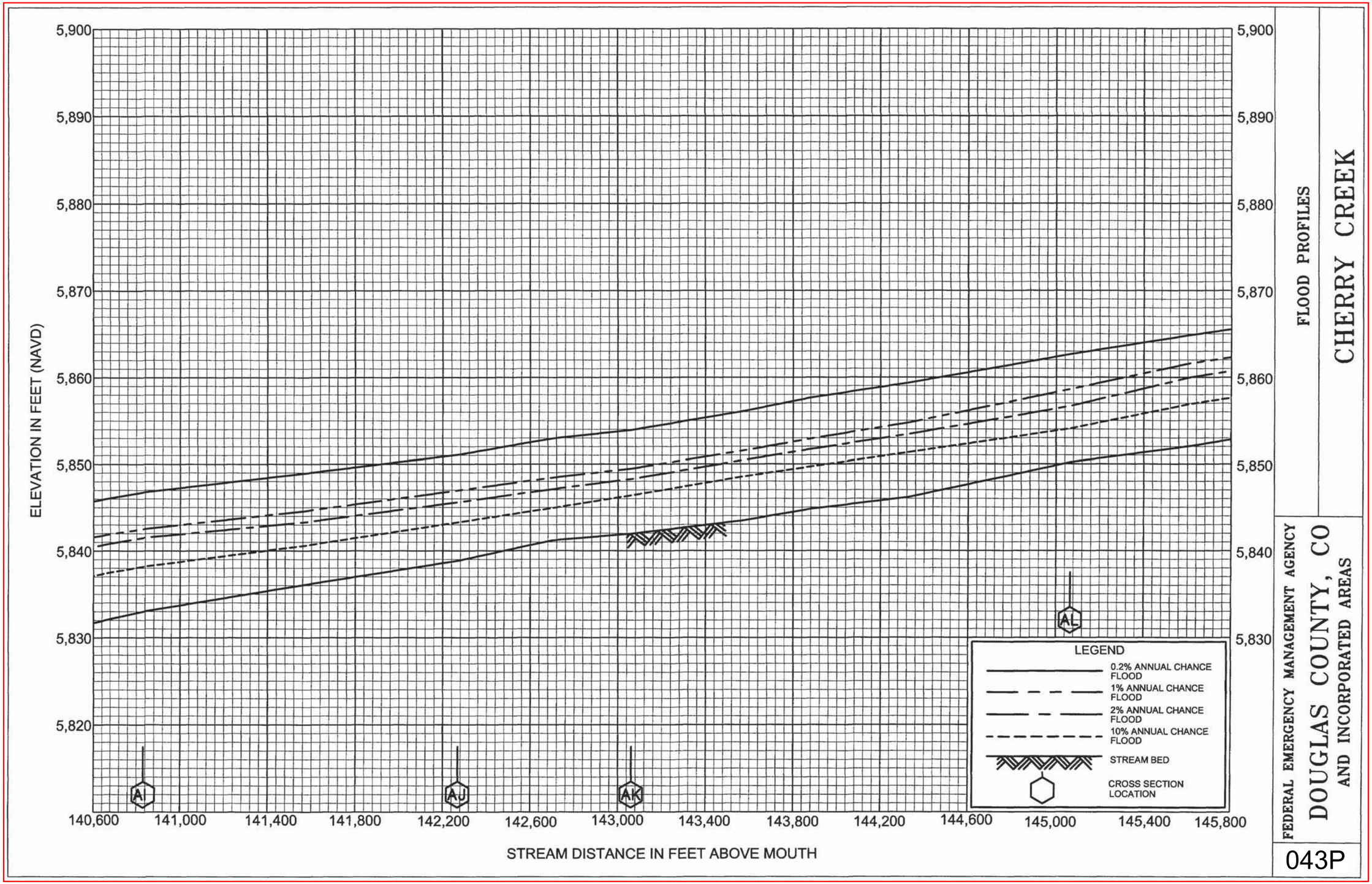
CHERRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

DOUGLAS COUNTY, CO

AND INCORPORATED AREAS

042P



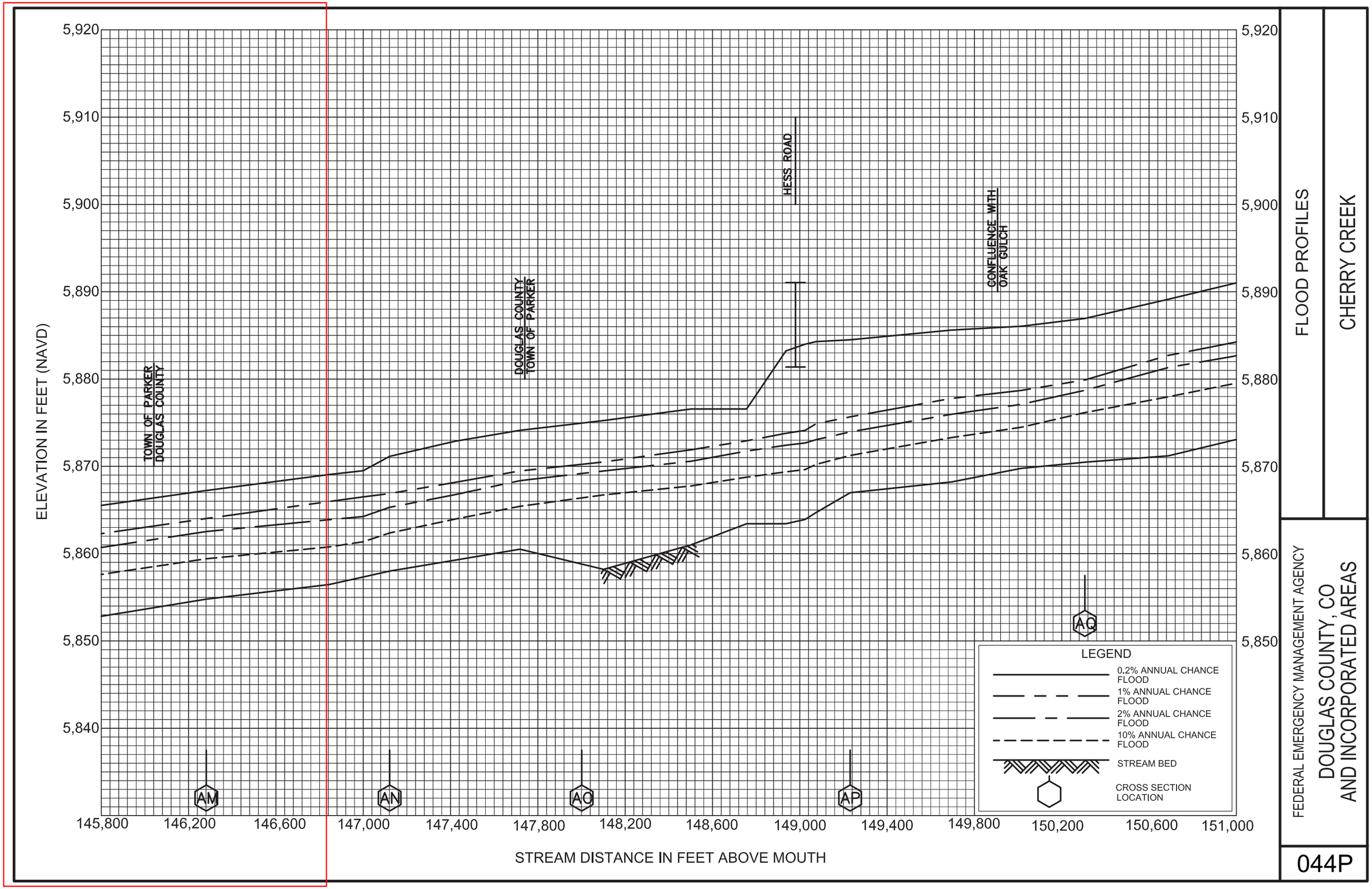
FLOOD PROFILES

CHERRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

DOUGLAS COUNTY, CO
AND INCORPORATED AREAS

043P



FLOOD PROFILES

CHERRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

DOUGLAS COUNTY, CO
AND INCORPORATED AREAS

044P

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.

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 NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane 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 (NAVD 88). These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. An average offset between NAVD 88 and the National Geodetic Vertical Datum of 1929 (NGVD 29) has been computed for each Douglas County flooding source. This offset was then applied to the NGVD 29 flood elevations that were not revised during the creation of this countywide format FIRM. The offsets for each flooding source shown on this FIRM are shown in the Douglas County Vertical Datum Offset Table below. 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:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

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. For information about additional control points maintained by Douglas County, please visit http://www.publicstaging.douglas.co.us/website/control/viewer.htm.

Base map information shown on this FIRM was provided by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2003.

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. 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. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

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 the **FEMA Map Service Center** at 1-800-358-9616 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 Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov.

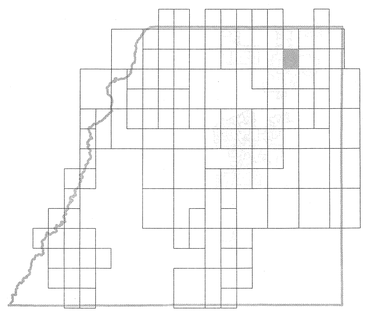
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

Douglas County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)	Flooding Source	Vertical Datum Offset (ft)
Baldwin Gulch	3.10	Newlin Gulch	3.14
Bayou Gulch	3.22	Plum Creek, Cross Section A to D	3.12
Big Dry Creek Tributary C	3.15	Section 34 Tributary	3.62
Carpenter Creek	3.93	Sellers Gulch	3.43
Cherry Creek, Cross Section BZ to CU	3.23	Sellers Gulch, Unnamed Tributary	3.39
East Plum Creek, Cross Section W to AY	3.26	Sulphur Gulch	3.13
East Plum Creek, Cross Section AZ to CZ	3.49	Tallman Gulch	3.16
East Plum Creek, Cross Section DA to EM	3.71	West Plum Creek, Cross Section W to AM	3.68
Glade Gulch	3.65		
Happy Canyon Creek	3.12		

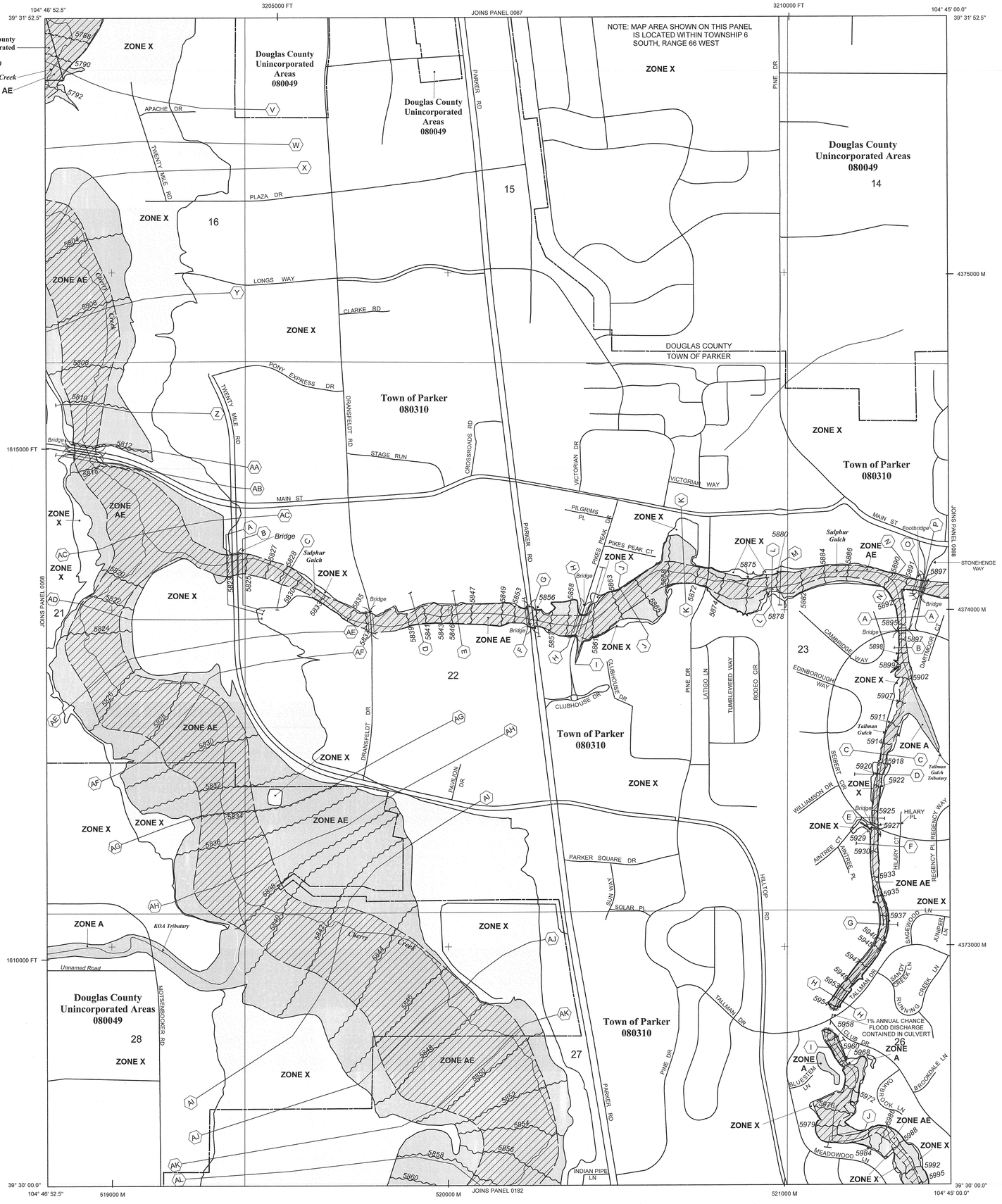
Example: To convert Baldwin Gulch elevations to NAVD 88, 3.10 feet were added to the NGVD 29 elevations.

Panel Location Map



This digital Flood Insurance Rate Map (FIRM) was produced through a cooperative partnership between the State of Colorado Water Conservation Board, the Urban Drainage and Flood Control District, and the Federal Emergency Management Agency (FEMA). The State of Colorado Water Conservation Board and the Urban Drainage and Flood Control District have implemented a long-term approach of floodplain management to reduce the costs associated with flooding. As part of this effort, both the State of Colorado and the Urban Drainage and Flood Control District have joined in Cooperating Technical Partner agreements with FEMA to produce this digital FIRM.

Additional flood hazard information and resources are available from local communities, the Colorado Water Conservation Board, and the Urban Drainage and Flood Control District.



LEGEND

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

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include 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 Areas 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.

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.

Floodplain boundary

Floodway boundary

Zone D boundary

Boundary dividing Special Flood Hazard Area zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 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

A — A Cross section line

104° 50' 37.5" , 39° 30' 00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

4276000 M 1000-meter Universal Transverse Mercator grid ticks, zone 13

3180000 FT 5000-foot ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 502), Lambert Conformal Conic projection

KK6400 National Geodetic Survey bench mark (see explanation in Notes to Users section of this FIRM panel

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0069F

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 69 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
DOUGLAS COUNTY	080049	0069	F
PARKER, TOWN OF	080310	0069	F

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
08035C0069F

EFFECTIVE DATE:
SEPTEMBER 30, 2005

Federal Emergency Management Agency

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 shown on 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 Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

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 Floodway Data table shown on this FIRM.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. 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, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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 by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

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 **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

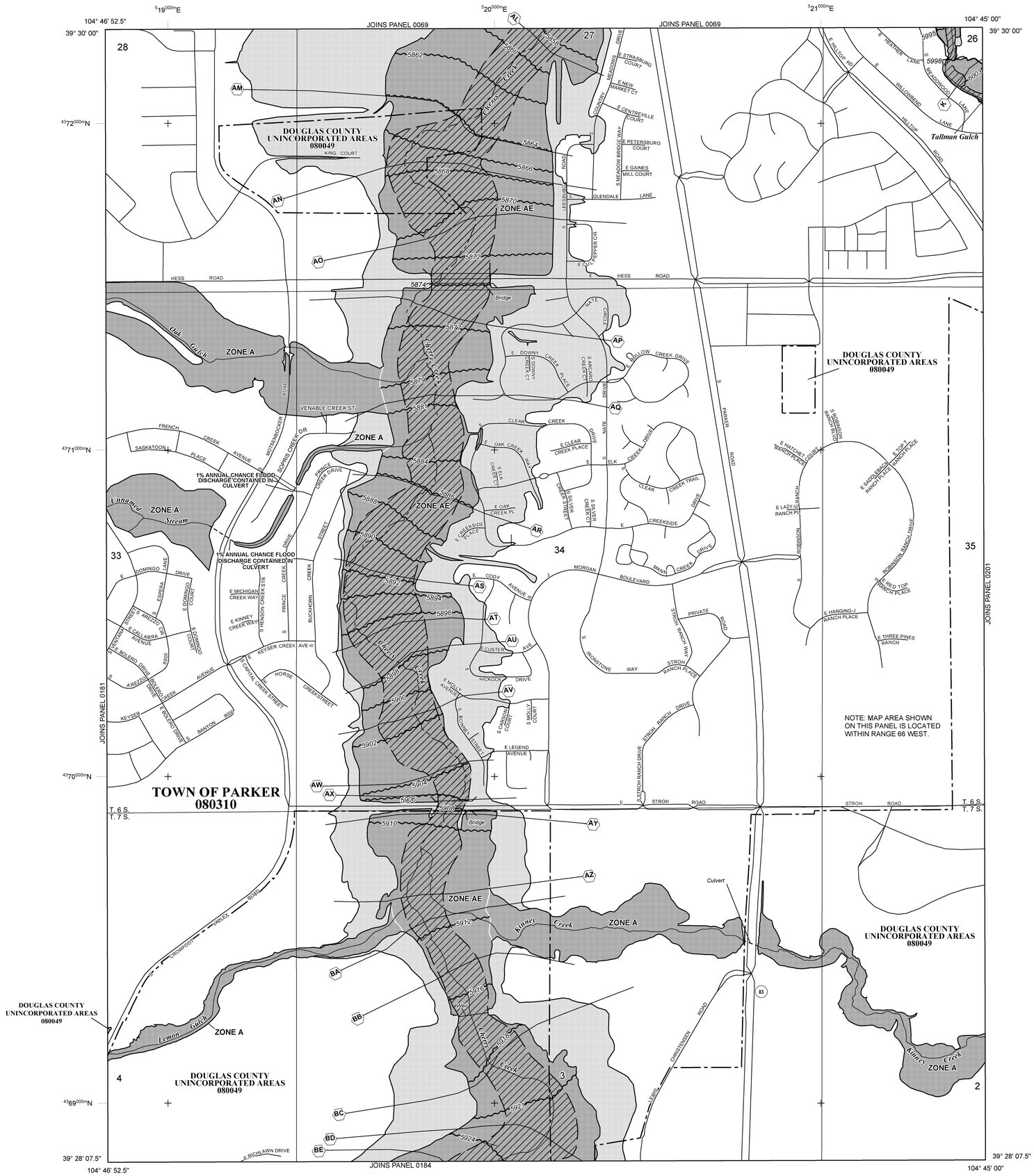
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

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.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

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

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include 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 Areas 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.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- 513 — 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

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 4388000m N — 1000-meter Universal Transverse Mercator grid values, zone 13
- 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

SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, 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.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0182G

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 182 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DOUGLAS COUNTY	080049	0182	G
PARKER, TOWN OF	080310	0182	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
08035C0182G
MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT

COMMUNITY INFORMATION		PROPOSED PROJECT DESCRIPTION	BASIS OF CONDITIONAL REQUEST
COMMUNITY	Town of Parker Douglas County Colorado	BRIDGE CHANNELIZATION CHANNEL RELOCATION CULVERT FILL	1D HYDRAULIC ANALYSIS FLOODWAY UPDATED TOPOGRAPHIC DATA
	COMMUNITY NO.: 080310		
IDENTIFIER	Cherry Creek at Dransfeldt Reach A	APPROXIMATE LATITUDE & LONGITUDE: 39.508, -104.774 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

AFFECTED MAP PANELS	
TYPE: FIRM* NO.: 08035C0069F DATE: September 30, 2005	* FIRM - Flood Insurance Rate Map

FLOODING SOURCES AND REACH DESCRIPTION See Page 2 for Additional Flooding Sources

Cherry Creek – from approximately 2,130 feet downstream to approximately 3,890 feet upstream of the confluence with KOA Tributary

PROPOSED PROJECT DESCRIPTION

Flooding Source	Proposed Project	Location of Proposed Project
Cherry Creek	New Bridge	Approximately 530 feet upstream of the confluence with KOA Tributary
	Channelization	From approximately 870 feet downstream to approximately 1,490 feet upstream of the confluence with KOA Tributary

SUMMARY OF IMPACTS TO FLOOD HAZARD DATA

Flooding Source	Effective Flooding	Proposed Flooding	Increases	Decreases
Cherry Creek	Floodway	Floodway	Yes	Yes
	Zone AE	Zone AE	Yes	Yes
	BFEs*	BFEs	Yes	Yes
	Zone X (shaded)	Zone X (shaded)	Yes	Yes

* BFEs - Base (1-percent-annual-chance) Flood Elevations

COMMENT

This document provides the Federal Emergency Management Agency's (FEMA's) comment regarding a request for a CLOMR for the project described above. This document is not a final determination; it only provides our comment on the proposed project in relation to the flood hazard information shown on the effective National Flood Insurance Program (NFIP) map. We reviewed the submitted data and the data used to prepare the effective flood hazard information for your community and determined that the proposed project meets the minimum floodplain management criteria of the NFIP. Your community is responsible for approving all floodplain development and for ensuring that all permits required by Federal or State/Commonwealth law have been received. State/Commonwealth, county, and community officials, based on their knowledge of local conditions and in the interest of safety, may set higher standards for construction in the Special Flood Hazard Area (SFHA), the area subject to inundation by the base flood). If the State/Commonwealth, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on the FEMA website at https://www.fema.gov/flood-insurance.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

ADDITIONAL FLOODING SOURCES AFFECTED BY THIS CONDITIONAL REQUEST

FLOODING SOURCE(S) AND REACH DESCRIPTION

Cherry Creek – from approximately 2,130 feet downstream to approximately 3,890 feet upstream of the confluence with KOA Tributary

KOA Tributary – from the confluence with Cherry Creek to approximately 1,040 feet upstream of Motsenbocker Road

PROPOSED PROJECT DESCRIPTION

Flooding Source	Proposed Project	Location of Proposed Project
Cherry Creek	3 New 13.33 ft x 3.5 ft Culvert	Approximately 770 feet upstream of the confluence with KOA Tributary
	Fill Placement	From approximately 380 feet upstream to approximately 770 feet upstream of the confluence with KOA Tributary
KOA Tributary	Channel Relocation	From the confluence with Cherry Creek to approximately 570 feet upstream of Motsenbocker Road
	2 New 10 ft x 6 ft Culvert	At Motsenbocker Road
	New 12 ft x 4 ft Culvert	Approximately 280 feet upstream of the confluence with Cherry Creek

SUMMARY OF IMPACTS TO FLOOD HAZARD DATA

Flooding Source	Effective Flooding	Proposed Flooding	Increases	Decreases
KOA Tributary	Zone A	Zone A	Yes	Yes

* BFEs - Base (1-percent-annual-chance) Flood Elevations

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on the FEMA website at https://www.fema.gov/flood-insurance.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

OTHER COMMUNITIES AFFECTED BY THIS CONDITIONAL REQUEST

CID Number: 080049 **Name:** Douglas County, Colorado

AFFECTED MAP PANELS

TYPE: FIRM NO.: 08035C0069F DATE: September 30, 2005

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on the FEMA website at https://www.fema.gov/flood-insurance.

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Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

To determine the changes in flood hazards that will be caused by the proposed project, we compared the hydraulic modeling reflecting the proposed project (referred to as the proposed conditions model) to the hydraulic modeling used to prepare the Flood Insurance Study (FIS) (referred to as the effective model). If the effective model does not provide enough detail to evaluate the effects of the proposed project, an existing conditions model must be developed to provide this detail. This existing conditions model is then compared to the effective model and the proposed conditions model to differentiate the increases or decreases in flood hazards caused by more detailed modeling from the increases or decreases in flood hazards that will be caused by the proposed project.

The table below shows the changes in the BFEs:

BFE Comparison Table

Flooding Source: Cherry Creek		BFE Change (feet)	Location of maximum change
Existing vs. Effective	Maximum increase	3.0	Approximately 520 feet downstream of the confluence with KOA Tributary
	Maximum decrease	0.9	Approximately 1,320 feet downstream of the confluence with KOA Tributary
Proposed vs. Existing	Maximum increase	0.4	Approximately 80 feet upstream of the confluence with KOA Tributary
	Maximum decrease	1.5	Approximately 1,970 feet upstream of the confluence with KOA Tributary
Proposed vs. Effective	Maximum increase	2.4	Approximately 500 feet downstream of the confluence with KOA Tributary
	Maximum decrease	0.7	Approximately 1,320 feet downstream of the confluence with KOA Tributary

Increases due to the proposed project that exceed those permitted under Paragraphs (c)(10) or (d)(3) of Section 60.3 of the NFIP regulations must adhere to Section 65.12 of the NFIP regulations. With this request, your community has complied with all requirements of Paragraph 65.12(a) of the NFIP regulations. Compliance with Paragraph 65.12(b) also is necessary before FEMA can issue a Letter of Map Revision when a community proposes to permit encroachments into the effective regulatory floodway that will cause BFE increases in excess of those permitted under Paragraph 60.3(d)(3).

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on the FEMA website at https://www.fema.gov/flood-insurance.

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CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

To determine the changes in flood hazards that will be caused by the proposed project, we compared the hydraulic modeling reflecting the proposed project (referred to as the proposed conditions model) to the hydraulic modeling reflecting the existing conditions.

The table below shows the changes in the base flood water-surface elevations (WSELs).

Base Flood WSEL Comparison Table

Flooding Source: KOA Tributary		Base Flood WSEL Change (feet)	Location of maximum change
Proposed vs. Existing	Maximum increase	3.5	Approximately 340 feet upstream of the confluence with Cherry Creek
	Maximum decrease	1.8	Approximately 1,460 feet upstream of the confluence with Cherry Creek

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management ordinances; therefore, responsibility for maintenance of the altered or relocated watercourse, including any related appurtenances such as bridges, culverts, and other drainage structures, rests with your community. We may request that your community submit a description and schedule of maintenance activities necessary to ensure this requirement.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on the FEMA website at https://www.fema.gov/flood-insurance.

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Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

DATA REQUIRED FOR FOLLOW-UP LOMR

Upon completion of the project, your community must submit the data listed below and request that we make a final determination on revising the effective FIRM and FIS report. If the project is built as proposed and the data below are received, a revision to the FIRM and FIS report would be warranted.

• Detailed application and certification forms must be used for requesting final revisions to the maps. Therefore, when the map revision request for the area covered by this letter is submitted, Form 1, entitled "Overview and Concurrence Form," must be included. A copy of this form may be accessed at https://www.fema.gov/flood-maps/change-your-flood-zone/paper-application-forms/mt-2.

• The detailed application and certification forms listed below may be required if as-built conditions differ from the proposed plans. If required, please submit new forms, which may be accessed at https://www.fema.gov/flood-maps/change-your-flood-zone/paper-application forms/mt-2, or annotated copies of the previously submitted forms showing the revised information.

Form 2, entitled "Riverine Hydrology and Hydraulics Form." Hydraulic analyses for as-built conditions of the base flood, the 10-percent, 2-percent, and 0.2-percent-annual-chance floods, and the regulatory floodway, must be submitted with Form 2.

Form 3, entitled "Riverine Structures Form."

• A certified topographic work map showing the revised and effective base and 0.2-percent-annual-chance floodplain and floodway boundaries. Please ensure that the revised information ties in with the current effective information at the downstream and upstream ends of the revised reach.

• An annotated copy of the FIRM, at the scale of the effective FIRM, that shows the revised base and 0.2-percent-annual-chance floodplain and floodway boundary delineations shown on the submitted work map and how they tie-in to the base and 0.2-percent-annual-chance floodplain and floodway boundary delineations shown on the current effective FIRM at the downstream and upstream ends of the revised reach.

• As-built plans, certified by a registered Professional Engineer, of all proposed project elements.

• A copy of the public notice distributed by your community stating its intent to revise the regulatory floodway, or a signed statement by your community that it has notified all affected property owners and affected adjacent jurisdictions.

• Documentation of the individual legal notices sent to property owners who will be affected by any widening or shifting of the base floodplain and/or any BFE increases along Cherry Creek and KOA Tributary.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on the FEMA website at https://www.fema.gov/flood-insurance.

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CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

DATA REQUIRED FOR FOLLOW-UP LOMR (continued)

• FEMA's fee schedule for reviewing and processing requests for conditional and final modifications to published flood information and maps may be accessed at https://www.fema.gov/flood-maps/change-your-flood-zone/status/flood-map-related-fees. The fee at the time of the map revision submittal must be received before we can begin processing the request. Payment of this fee can be made through a check or money order, made payable in U.S. funds to the National Flood Insurance Program, or by credit card (Visa or MasterCard only). Please either forward the payment, along with the revision application, to the following address:

Mile High Flood District
2480 West 26th Avenue, Suite 156-B
Denver, CO 80211

or submit the LOMR using the Online LOMC portal at: https://hazards.fema.gov/femaportal/onlinelomc/signin

After receiving appropriate documentation to show that the project has been completed, FEMA will initiate a revision to the FIRM and FIS report. Because the flood hazard information (i.e., base flood elevations, base flood depths, SFHAs, zone designations, and/or regulatory floodways) will change as a result of the project, a 90-day appeal period will be initiated for the revision, during which community officials and interested persons may appeal the revised flood hazard information based on scientific or technical data.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on the FEMA website at https://www.fema.gov/flood-insurance.

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Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION
COMMENT DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

COMMUNITY REMINDERS

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Jeanine P. Petterson
Director, Mitigation Division
Federal Emergency Management Agency, Region VIII
Denver Federal Center, Building 710
P.O. Box 25267
Denver, CO 80225-0267
(303) 235-4830

Although a portion of the proposed area of revision is shown on the effective FIRM as located within the Unincorporated Areas of Douglas County, this area has been annexed by the Town of Parker.

This comment is based on the flood data presently available. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on the FEMA website at https://www.fema.gov/flood-insurance.

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Federal Insurance and Mitigation Administration

APPENDIX C: ANNOTATED / PROPOSED FLOODPLAIN INFORMATION

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cherry Creek (cont.)								
L	119,499	626	5,751	7.1	5,754.3	5,754.3	5,754.3	0.0
M	120,641	648	4,771	8.5	5,757.2	5,757.2	5,757.6	0.4
N	121,333	740	6,106	6.6	5,760.2	5,760.2	5,761.0	0.8
O	121,923	500	4,025	10.0	5,763.8	5,763.8	5,763.8	0.0
P	122,751	480	3,449	11.6	5,766.8	5,766.8	5,767.6	0.8
Q	123,592	405	4,530	8.7	5,771.8	5,771.8	5,772.7	0.9
R	124,887	570	5,324	7.4	5,777.0	5,777.0	5,777.8	0.8
S	126,073	492	3,874	10.1	5,779.8	5,779.8	5,780.5	0.7
T	126,330	497	5,144	7.5	5,782.0	5,782.0	5,782.2	0.2
U	127,590	796	4,063	9.5	5,785.3	5,785.3	5,786.0	0.7
V	128,405	548	3,757	10.2	5,790.8	5,790.8	5,790.9	0.1
W	129,561	377	3,795	10.1	5,799.0	5,799.0	5,799.9	0.9
X	130,779	574	6,462	5.9	5,803.8	5,803.8	5,804.4	0.6
Y	131,933	585	5,037	7.5	5,806.2	5,806.2	5,806.9	0.7
Z	132,970	325	3,724	10.1	5,810.2	5,810.2	5,811.0	0.8
AA	133,384	240	2,397	15.5	5,811.7	5,811.7	5,812.2	0.5
AB	133,547	240	2,898	12.7	5,815.4	5,815.4	5,815.5	0.1
AC	134,530	740	7,430	5.0	5,819.7	5,819.7	5,819.9	0.2
AD	135,602	399	4,279	8.6	5,822.9	5,822.9	5,823.7	0.8
AE	136,429	492	4,616	7.9	5,825.2	5,825.2	5,825.9	0.7
AF	137,545	758	5,872	6.2	5,828.7	5,828.7	5,828.7	0.0
AG	138,860	428	6,442	12.7	5,834.0	5,834.0	5,834.3	0.3
AH	139,530	474	4,475	8.0	5,838.5	5,838.5	5,839.3	0.8
AI	140,832	599	4,524	7.8	5,842.1	5,842.1	5,842.7	0.6
AJ	142,268	1,165	7,373	4.7	5,848.1	5,848.1	5,848.5	0.4

Proposed Revised Data

[1] Feet above mouth

TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

DOUGLAS COUNTY, CO AND INCORPORATED AREAS

FLOODWAY DATA

CHERRY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Cherry Creek (cont.)								
AK	143,060	1230	6,513	5.3	5,849.8	5,849.8	5,850.4	0.6
AL	145,066	495	3,193	10.6	5,858.5	5,858.5	5,858.5	0.0
AM	146,281	515	4,454	7.5	5,864.0	5,864.0	5,864.7	0.7
AN	147,121	1000	5,802	5.8	5,866.9	5,866.9	5,867.5	0.6
AO	148,101	745	5,160	6.4	5,870.5	5,870.5	5,871.1	0.6
AP	149,230	580	4,097	8.0	5,875.7	5,875.7	5,875.8	0.1
AQ	150,306	511	2,908	11.2	5,879.9	5,879.9	5,880.3	0.4
AR	151,381	510	3,863	8.4	5,886.1	5,886.1	5,886.4	0.3
AS	152,510	705	3,814	8.4	5,891.4	5,891.4	5,891.8	0.4
AT	153,421	771	5,096	6.3	5,896.6	5,896.6	5,896.6	0.0
AU	153,849	564	3,536	9.0	5,897.8	5,897.8	5,897.9	0.1
AV	154,516	609	4,922	6.4	5,901.6	5,901.6	5,902.3	0.7
AW	155,178	404	3,187	9.9	5,903.6	5,903.6	5,904.3	0.7
AX	155,618	297	2,508	12.4	5,906.0	5,906.0	5,906.2	0.2
AY	155,832	272	3,276	9.4	5,909.0	5,909.0	5,909.1	0.1
AZ	156,821	425	3,658	8.4	5,911.3	5,911.3	5,911.3	0.0
BA	157,140	377	3,131	9.8	5,911.7	5,911.7	5,912.1	0.4
BB	157,734	420	3,960	7.7	5,915.1	5,915.1	5,916.0	0.9
BC	158,847	498	3,737	8.1	5,918.5	5,918.5	5,918.7	0.2
BD	160,060	777	5,168	5.8	5,922.2	5,922.2	5,923.0	0.8
BE	161,047	680	4,202	7.1	5,927.0	5,927.0	5,927.7	0.7
BF	162,009	1133	6,472	4.5	5,930.4	5,930.4	5,931.3	0.9
BG	163,157	567	3,665	7.9	5,936.3	5,936.3	5,937.0	0.7
BH	164,393	750	4,345	6.6	5,942.3	5,942.3	5,943.0	0.7
BI	165,197	524	3,606	7.8	5,946.4	5,946.4	5,947.1	0.7

Proposed Revised Data

[1] Feet above mouth

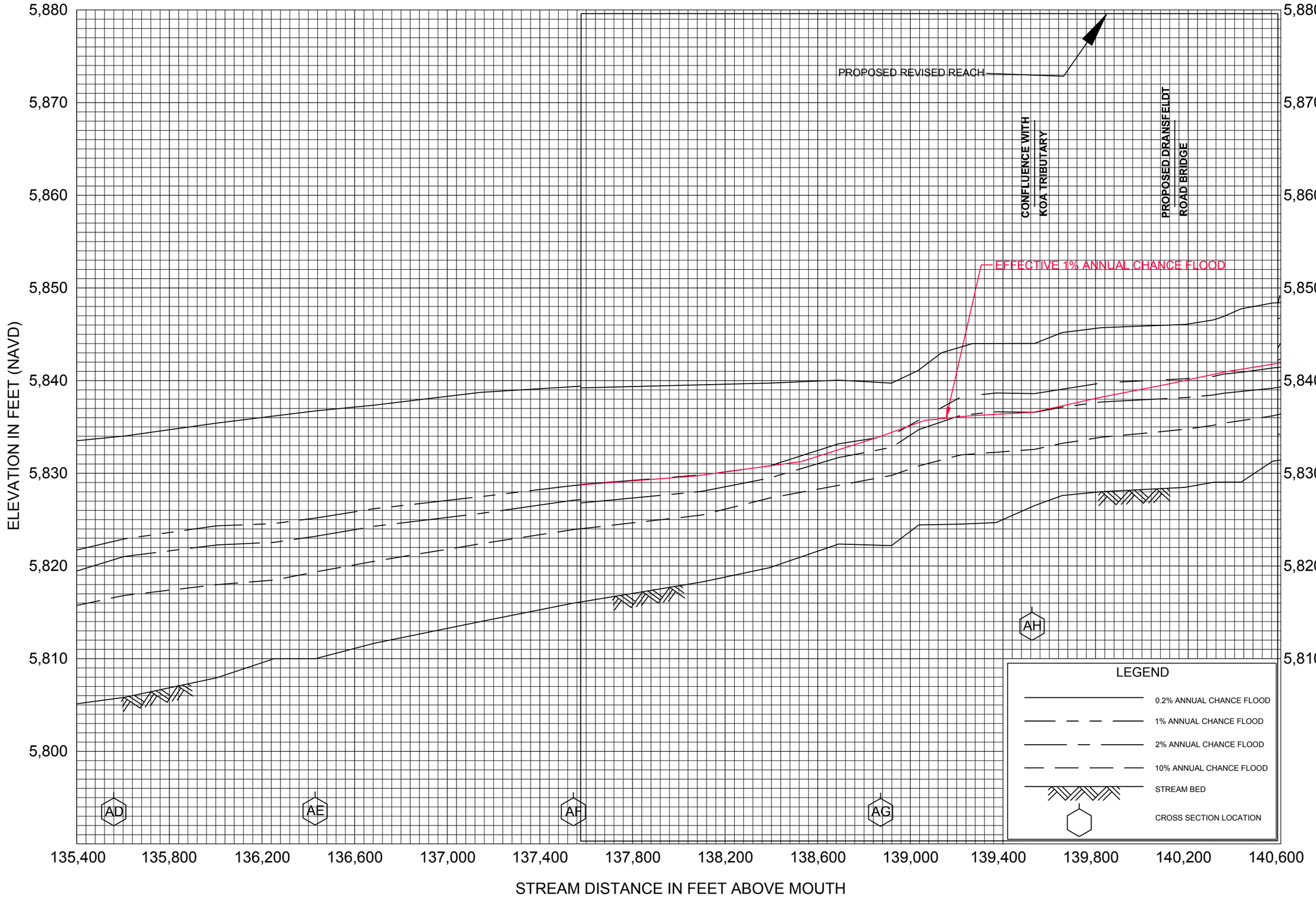
TABLE 7

FEDERAL EMERGENCY MANAGEMENT AGENCY

DOUGLAS COUNTY, CO AND INCORPORATED AREAS

FLOODWAY DATA

CHERRY CREEK



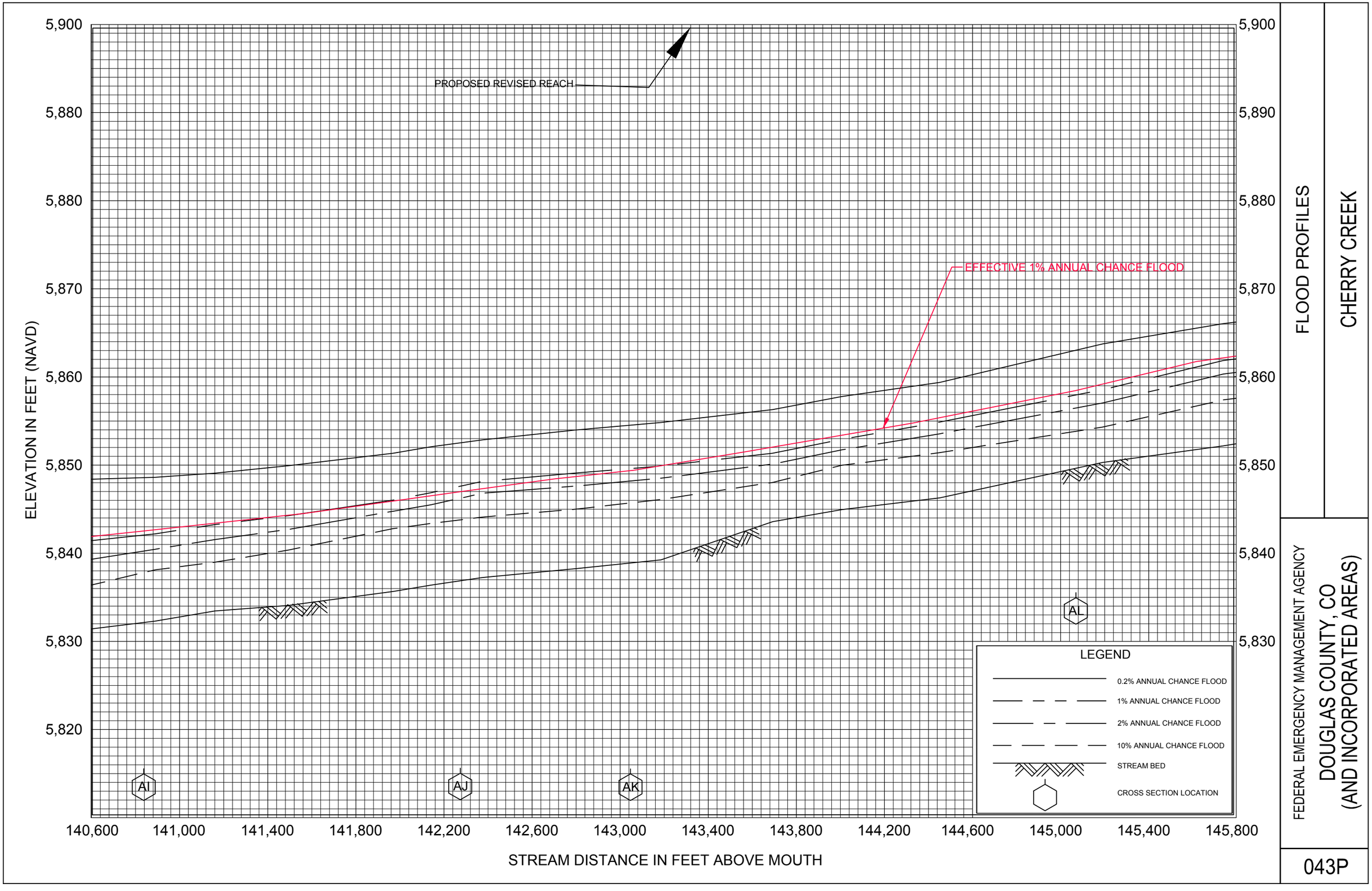
FLOOD PROFILES

CHERRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

DOUGLAS COUNTY, CO
(AND INCORPORATED AREAS)

042P



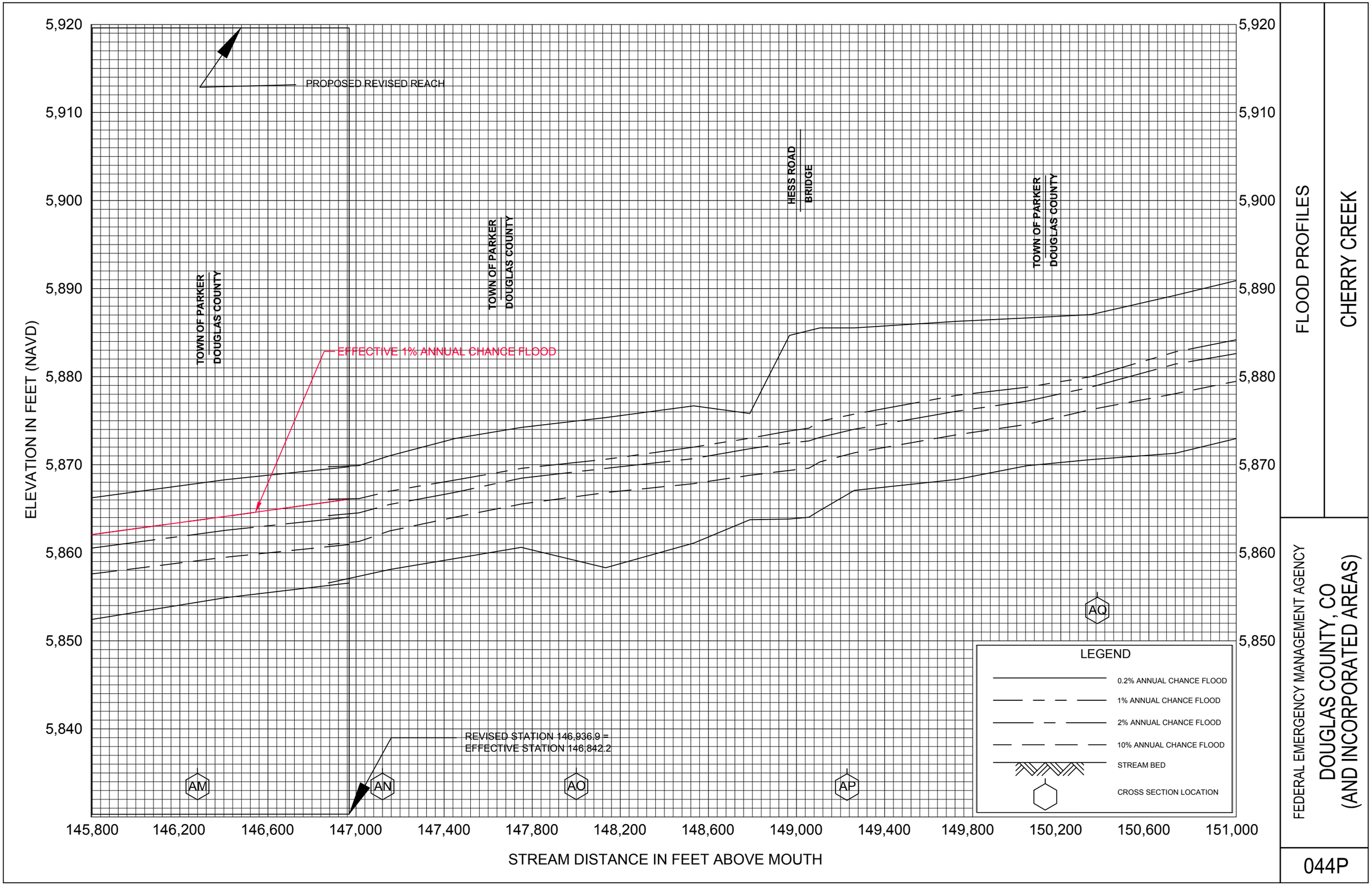
FLOOD PROFILES

CHERRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

DOUGLAS COUNTY, CO
(AND INCORPORATED AREAS)

043P



FLOOD PROFILES

CHERRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

DOUGLAS COUNTY, CO
(AND INCORPORATED AREAS)

044P

Legend

- FEMA Effective Cross Sections
- Proposed Zone X
- Proposed Floodway
- Proposed Zone AE

COLORADO LICENSED
BRIAN LEDOUX
40262
2023-10-19
PROFESSIONAL ENGINEER

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0069F

FIRM
FLOOD INSURANCE RATE MAP
DOUGLAS COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 69 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
DOUGLAS COUNTY	080049	0069	F
PARKER, TOWN OF	080310	0069	F

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
08035C0069F

EFFECTIVE DATE:
SEPTEMBER 30, 2005

Federal Emergency Management Agency

See changes to KOA Tributary Zone A delineation on Dransfeldt Rd CLOMR (Case No. 22-08-0451R)

Figure C1: Annotated FIRM 0069F
Salisbury Park North - Phase 1 - Floodplain Development Permit (FDP) Application

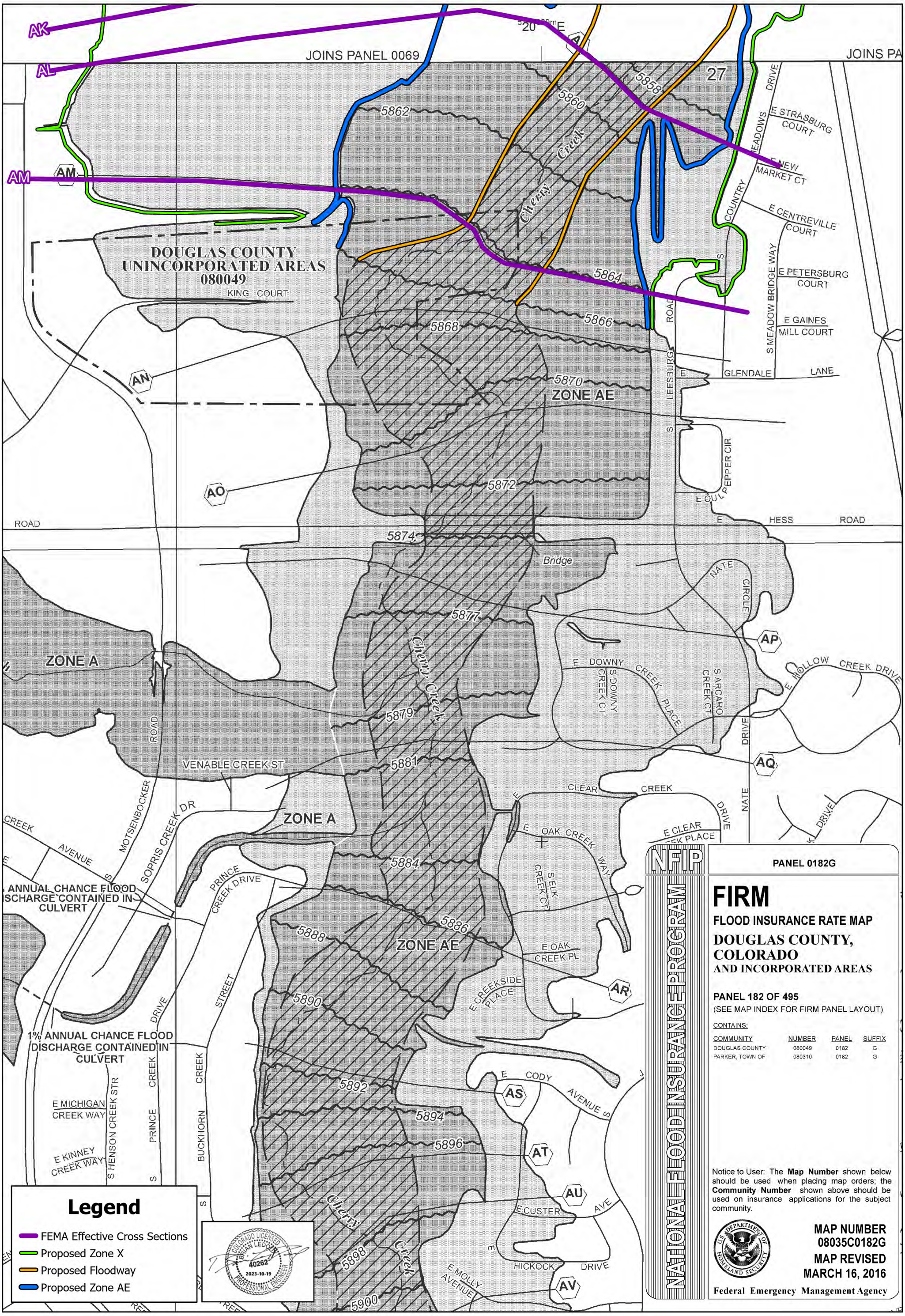
ICON ENGINEERING

hcm

PARKER COLORADO

N

US Feet
0 200 400



ICON ENGINEERING

Figure C2: Annotated FIRM 0182G

Salisbury Park North - Floodplain Development Permit (FDP) Application

hcm PARKER COLORADO

N

US Feet 0 200 400

Table C.1: Map-Model Agreement Table - Cherry Creek

ICON Engineering Inc.

Project Name:	**Salisbury Park North Phase 1**
Flooding: Source	**Cherry Creek**
Model Run:	**48_Post-Project_PH1**

Location Description	Stream Station	Post-Project Conditions Cross Section	Channel Distance (ft)			Cumulative Channel Distance			Base Floodplain Width (ft)			Floodway Width (ft)			Comments
			Model	Map	% Difference	Model	Map	%Difference	Model	Map	Difference (ft)	Model	Map	Difference (ft)	
FHAD XS 128 FEMA lettered section AF	137545.3	137545.3	0.00	0.00	0%	0.00	0.00	0%	1347.08	1357.83	**10.75**	758.02	759.01	0.99	Matches effective floodplain limits
FHAD XS 129	138067.2	138067.2	521.88	521.91	0%	521.88	521.91	0%	1399.59	1402.20	2.61	625.00	624.90	0.10	
FHAD XS 129.6	138360.5	138360.5	293.35	293.37	0%	815.23	815.28	0%	1342.51	1396.24	**53.73**	550.00	550.01	0.01	Matches Dransfeldt Road CLOMR delineation
FHAD XS 130.4	138658.4	138658.4	297.86	297.83	0%	591.21	591.20	0%	1289.91	1289.98	0.07	522.16	522.16	0.00	
FHAD XS 131 FEMA lettered section AG	138887.3	138887.3	228.87	228.87	0%	526.73	526.70	0%	1263.35	1344.35	**81.00**	428.00	428.03	0.03	Matches Dransfeldt Road CLOMR delineation
FHAD XS 131.3	139005.3	139005.3	118.08	118.08	0%	346.95	346.95	0%	1074.92	1280.00	**205.08**	470.00	470.01	0.01	Matches Dransfeldt Road CLOMR delineation
FHAD XS 131.7	139186.6	139186.6	181.27	181.28	0%	299.35	299.36	0%	1249.92	1438.35	**188.43**	499.00	499.01	0.01	Matches Dransfeldt Road CLOMR delineation
FHAD XS 132.1	139338.2	139338.2	151.64	151.65	0%	332.91	332.93	0%	1344.01	1522.69	**178.68**	530.00	530.02	0.02	Matches Dransfeldt Road CLOMR delineation
FHAD XS 132.9	139505.2	139505.2	166.95	166.96	0%	318.59	318.61	0%	1383.27	1556.17	**172.90**	474.00	474.41	0.41	Matches Dransfeldt Road CLOMR delineation
FHAD XS 133.1	139624.0	139624.0	118.77	118.78	0%	285.72	285.74	0%	1247.00	1392.74	**145.74**	595.00	595.04	0.04	Matches Dransfeldt Road CLOMR delineation
FHAD XS 133.3	139794.7	139794.7	170.69	170.33	0%	289.46	289.11	0%	1167.82	1165.43	2.39	768.00	767.94	0.06	
FHAD XS 134 FEMA lettered section AH	140155.1	140155.1	360.41	360.40	0%	531.10	530.73	0%	947.13	942.25	4.88	559.00	559.02	0.02	
FHAD XS 134.3	140397.3	140397.3	242.19	240.14	1%	602.60	600.54	0%	851.52	851.56	0.04	549.00	549.09	0.09	
FHAD XS 134.5	140533.5	140533.5	136.19	140.87	3%	378.38	381.01	1%	1287.78	1247.12	**40.66**	579.00	579.06	0.06	Matches Dransfeldt Road CLOMR delineation
FHAD XS 135 FEMA lettered section AI	140857.7	140857.7	324.25	311.89	4%	460.44	452.76	2%	1070.99	1072.73	1.74	599.00	599.13	0.13	
FHAD XS 135.3	141128.6	141128.6	270.94	269.32	1%	595.19	581.21	2%	1239.01	1239.70	0.69	733.00	733.09	0.09	
FHAD XS 135.7	141463.7	141463.7	335.01	335.00	0%	605.95	604.32	0%	1501.24	1528.18	**26.94**	828.00	828.09	0.09	Perched backwater area not shown in Model
FHAD XS 136.4	141938.6	141938.6	474.94	474.95	0%	809.95	809.95	0%	1402.75	1405.10	2.35	975.00	975.05	0.05	
FHAD XS 136.6	142110.2	142110.2	171.59	171.61	0%	646.53	646.56	0%	1238.12	1234.70	3.42	1015.00	1015.11	0.11	
FHAD XS 137 FEMA lettered section AJ	142344.6	142344.6	234.38	234.38	0%	405.97	405.99	0%	1339.28	1340.12	0.84	1165.00	1165.11	0.11	
FHAD XS 138	142773.5	142773.5	428.95	428.97	0%	663.33	663.35	0%	1791.82	1793.46	1.64	1380.00	1380.00	0.00	
FHAD XS 139 FEMA lettered section AK	143154.0	143154.0	380.44	380.45	0%	809.39	809.42	0%	1608.56	1607.51	1.05	1230.00	1229.93	0.07	
FHAD XS 140	143662.4	143662.4	507.29	508.45	0%	887.73	888.90	0%	1296.10	1294.92	1.18	844.76	844.63	0.13	
FHAD XS 141	143976.9	143976.9	314.45	314.12	0%	821.74	822.57	0%	1187.59	1532.75	**345.16**	762.29	761.65	0.64	Matches effective floodplain limits
FHAD XS 142	144420.9	144420.9	444.04	444.03	0%	758.49	758.15	0%	1535.34	1593.05	**57.71**	784.63	784.52	0.11	Matches effective floodplain limits
FHAD XS 143 FEMA lettered section AL	145160.5	145160.5	739.63	739.45	0%	1183.67	1183.48	0%	2486.06	1762.56	**723.50**	495.00	494.99	0.01	Matches effective floodplain limits
FHAD XS 144	145708.5	145708.5	547.96	547.97	0%	1287.59	1287.42	0%	2932.82	1693.47	**1239.35**	450.00	450.24	0.24	Matches effective floodplain limits
FHAD XS 145 FEMA lettered section AM	146375.9	146375.9	667.37	667.31	0%	1215.33	1215.28	0%	1838.46	1830.74	**7.72**	515.00	515.23	0.23	Matches effective floodplain limits
FHAD XS 146	146936.9	146936.9	561	561.00	0%	1228.37	1228.31	0%	2081.29	1744.46	**336.83**	892.00	891.97	0.03	Matches effective floodplain limits
ACCEPTABLE TOLERANCES =			**+ / - 5% of Model**			**+ / - 5% of Model**			**+ / - 5 Feet**						

APPENDIX D: HYDRAULIC COMPUTATIONS

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X       X
X     X  X        X    X      X   X    X    X       X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Cherry Creek at Hess Road
Project File : CC_HessRd.prj
Run Date and Time: 10/29/2024 12:45:24 PM

Project in English units

PLAN DATA

Plan Title: as-built PPM
Plan File : p:\P\23-018_Salisbury Park\04A_DataReceived\ICON\10-08-0769P LOMR\HEC-RAS 4.0\Superseded 10-04-10\HEC-RAS 3.1.3\CC_HessRd.p09

Geometry Title: as-built PPM
Geometry File : p:\P\23-018_Salisbury Park\04A_DataReceived\ICON\10-08-0769P LOMR\HEC-RAS 4.0\Superseded 10-04-10\HEC-RAS 3.1.3\CC_HessRd.g09

Flow Title : Proposed Flows _ 10-YR/50-YR/100-YR
Flow File : p:\P\23-018_Salisbury Park\04A_DataReceived\ICON\10-08-0769P LOMR\HEC-RAS 4.0\Superseded 10-04-10\HEC-RAS 3.1.3\CC_HessRd.f04

Plan Summary Information:
Number of: Cross Sections = 68 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 1 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

Encroachment Data
Equal Conveyance = True
Left Offset = 0
Right Offset = 0

River = Cherry Creek Reach = Main Corridor

RS	Profile	Method	Value1	Value2
155617.850	year	1	1227.93	1546
155178.450	year	1	1150	1554
154852.450	year	1	745	1289
154684.150	year	1	554.21	1134
154515.950	year	1	313.14	922
154218.050	year	1	563.49	1053
153849.450	year	1	596.54	1160.6
153420.950	year	1	222.94	993.6
153082.650	year	1	73.42	838
152510.050	year	1	149.85	855
151956.150	year	1	306.4	1000
151699.450	year	1	556.59	1175
151381.350	year	1	780	1290
151190.250	year	1	1190	1741
150988.450	year	1	1100	1693
150688.050	year	1	1107.49	1662.4
150305.850	year	1	660	1171
150013.950	year	1	860	1380
149696.650	year	1	620	1280
149230.350	year	1	1120	1700
149074.250	year	1	1245	1820
148756.050	year	1	1320	1875
148501.050	year	1	1310	1850
148101.150	year	1	1075	1820
147718.450	year	1	915	1924
147419.*50	year	1	1100	2020
147121.050	year	1	1130	2130
146981.*50	year	1	1300	2040
146842.250	year	1	1461	2353
146281.250	year	1	2475	2990
145613.850	year	1	2650	3100
145065.850	year	1	2975	3470
144326.250	year	1	3055	3839.63
143882.250	year	1	3022.5	3784.79
143567.750	year	1	2976.88	3821.64
143060.450	year	1	2680	3800
142698.950	year	1	2350	3666
142267.750	year	1	1915	3020
141564.850	year	1	1970	2855
140831.750	year	1	1750	2500
140593.*50	year	1	1520	2195
140354.*50	year	1	1160	1890
140116.250	year	1	1020	1599
139822.*50	year	1	750	1500
139529.750	year	1	610	1435
139262.650	year	1	700	1400
139061.*50	year	1	750	1350
138860.050	year	1	830	1350

138526.850 year	1	850	1380
138067.250 year	1	690	1540
137545.350 year	1	661.5	1419.52
137141.450 year	1	481.94	1078.8
136682.050 year	1	235.96	836.94
136429.250 year	1	376.96	868.85
136251.350 year	1	282.75	801.04
136002.450 year	1	200	760
135602.450 year	1	216.3	615.04
135068.250 year	1	367.41	710.21
134948.*50 year	1	411.67	834.98
134828.*50 year	1	430.42	952.48
134708.150 year	1	480	1140
134529.550 year	1	430	1170
134352.150 year	1	350	1090
134105.050 year	1	400	980
133923.250 year	1	329	870
133802.950 year	1	220	730
133666.550 year	1	250	710
133547.250 year	1	178.89	418.89

FLOW DATA

Flow Title: Proposed Flows _ 10-YR/50-YR/100-YR
Flow File : p:\P\23-018_Salisbury Park\04A_DataReceived\ICON\10-08-0769P LOMR\HEC-RAS 4.0\Superseded 10-04-10\HEC-RAS 3.1.3\CC_HessRd.f04

Flow Data (cfs)

River	Reach	RS	10 year	50 year	100 year
Cherry Creek	Main Corridor	155617.8	6613	19571	31145
Cherry Creek	Main Corridor	155178.4	6660	19716	31396
Cherry Creek	Main Corridor	154515.9	6707	19861	31647
Cherry Creek	Main Corridor	153849.4	6753	20005	31899
Cherry Creek	Main Corridor	153082.6	6800	20150	32150
Cherry Creek	Main Corridor	151381.3	6847	20295	32401
Cherry Creek	Main Corridor	150688.0	6893	20439	32653
Cherry Creek	Main Corridor	149696.6	6940	20584	32904
Cherry Creek	Main Corridor	148101.1	6987	20729	33155
Cherry Creek	Main Corridor	147121.0	7033	20873	33407
Cherry Creek	Main Corridor	145613.8	7080	21018	33658
Cherry Creek	Main Corridor	145065.8	7127	21163	33900
Cherry Creek	Main Corridor	144326.2	7173	21307	34161
Cherry Creek	Main Corridor	143060.4	7220	21452	34412
Cherry Creek	Main Corridor	142698.9	7267	21597	34663
Cherry Creek	Main Corridor	142267.7	7313	21741	34915
Cherry Creek	Main Corridor	141564.8	7360	21886	35166
Cherry Creek	Main Corridor	140831.7	7407	22031	35417
Cherry Creek	Main Corridor	139529.7	7453	22175	35669
Cherry Creek	Main Corridor	138860.0	7500	22320	35920
Cherry Creek	Main Corridor	138067.2	7547	22465	36171
Cherry Creek	Main Corridor	136682.0	7593	22009	36423
Cherry Creek	Main Corridor	136251.3	7640	22754	36674
Cherry Creek	Main Corridor	133547.2	7687	22899	36925

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Cherry Creek	Main Corridor	10 year		Known WS = 5808.03
Cherry Creek	Main Corridor	50 year		Known WS = 5812.65
Cherry Creek	Main Corridor	100 year		Known WS = 5815.29

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Corridor	133547.2	10 year	7687.00	5799.34	5808.03	5805.84	5808.81	0.003259	7.52	1184.99	206.93	0.51
Main Corridor	133547.2	50 year	22899.00	5799.34	5812.65	5810.06	5814.72	0.004481	12.50	2225.13	238.49	0.65
Main Corridor	133547.2	100 year	36925.00	5799.34	5815.29	5813.20	5818.49	0.005354	15.71	2864.71	555.27	0.74
Main Corridor	133666.5	10 year	7640.00	5799.09	5808.99		5809.19	0.000993	3.93	2550.49	629.15	0.28
Main Corridor	133666.5	50 year	22754.00	5799.09	5815.02		5815.41	0.000805	5.57	4986.96	460.00	0.28
Main Corridor	133666.5	100 year	36674.00	5799.09	5819.20		5819.50	0.000477	5.22	9830.07	788.40	0.23
Main Corridor	133802.9	10 year	7640.00	5799.45	5809.11		5809.37	0.001349	4.50	2334.76	664.70	0.32
Main Corridor	133802.9	50 year	22754.00	5799.45	5815.13		5815.53	0.000897	5.81	5132.39	510.00	0.29
Main Corridor	133802.9	100 year	36674.00	5799.45	5819.28		5819.57	0.000512	5.34	9885.27	782.55	0.23
Main Corridor	133923.2	10 year	7640.00	5799.81	5809.30		5809.55	0.001667	4.45	2283.76	671.08	0.35
Main Corridor	133923.2	50 year	22754.00	5799.81	5815.28		5815.64	0.000878	5.43	5296.59	541.00	0.29
Main Corridor	133923.2	100 year	36674.00	5799.81	5819.34		5819.63	0.000547	5.28	9781.32	832.47	0.24
Main Corridor	134105.0	10 year	7640.00	5800.00	5809.65		5810.03	0.004124	6.08	1926.45	714.74	0.53
Main Corridor	134105.0	50 year	22754.00	5800.00	5815.43		5815.85	0.001428	6.40	4945.03	580.00	0.36
Main Corridor	134105.0	100 year	36674.00	5800.00	5819.47		5819.74	0.000669	5.51	9930.60	872.38	0.26
Main Corridor	134352.1	10 year	7640.00	5802.00	5810.48		5810.74	0.002290	4.29	2034.53	788.08	0.39
Main Corridor	134352.1	50 year	22754.00	5802.00	5815.86		5816.15	0.001062	5.26	5740.14	740.00	0.31
Main Corridor	134352.1	100 year	36674.00	5802.00	5819.67		5819.89	0.000541	4.73	10622.12	1163.56	0.23
Main Corridor	134529.5	10 year	7640.00	5802.00	5810.80		5811.44	0.006085	7.25	1235.85	491.88	0.64
Main Corridor	134529.5	50 year	22754.00	5802.00	5815.95		5816.46	0.001908	6.85	4495.80	740.00	0.41
Main Corridor	134529.5	100 year	36674.00	5802.00	5819.72		5820.03	0.000899	5.96	9044.36	1273.02	0.30
Main Corridor	134708.1	10 year	7640.00	5803.00	5811.87		5812.44	0.006628	6.57	1398.04	531.56	0.64
Main Corridor	134708.1	50 year	22754.00	5803.00	5816.26		5816.86	0.002493	6.98	4092.43	660.00	0.45
Main Corridor	134708.1	100 year	36674.00	5803.00	5819.82		5820.27	0.001232	6.38	7701.30	1233.44	0.34
Main Corridor	134828.*	10 year	7640.00	5803.33	5812.54	5811.78	5813.21	0.006452	7.00	1319.12	448.23	0.65
Main Corridor	134828.*	50 year	22754.00	5803.33	5816.33	5814.39	5817.32	0.003989	8.85	3280.35	522.06	0.57
Main Corridor	134828.*	100 year	36674.00	5803.33	5819.73	5816.11	5820.57	0.002259	8.57	5973.87	771.49	0.46
Main Corridor	134948.*	10 year	7640.00	5803.67	5813.18	5812.42	5814.00	0.006451	7.71	1258.16	458.16	0.66
Main Corridor	134948.*	50 year	22754.00	5803.67	5816.44	5815.36	5818.08	0.006529	11.37	2601.69	423.31	0.73
Main Corridor	134948.*	100 year	36674.00	5803.67	5819.64	5817.08	5821.07	0.003913	11.17	4734.33	592.32	0.60

Main Corridor	135068.2	10 year	7640.00	5804.00	5813.97		5814.82	0.007639	7.84	1220.10	401.39	0.68
Main Corridor	135068.2	50 year	22754.00	5804.00	5816.92		5819.19	0.010371	12.97	2145.95	342.80	0.86
Main Corridor	135068.2	100 year	36674.00	5804.00	5819.76		5821.81	0.006493	13.01	3837.61	468.43	0.73
Main Corridor	135602.4	10 year	7640.00	5805.81	5816.81	5815.37	5817.31	0.003205	6.19	1592.09	474.34	0.48
Main Corridor	135602.4	50 year	22754.00	5805.81	5821.01	5818.14	5821.97	0.003088	8.80	3209.60	398.74	0.51
Main Corridor	135602.4	100 year	36674.00	5805.81	5822.92	5819.95	5824.11	0.003168	10.36	4821.29	545.54	0.54
Main Corridor	136002.4	10 year	7640.00	5807.92	5817.97		5818.31	0.002136	5.12	2005.49	639.80	0.40
Main Corridor	136002.4	50 year	22754.00	5807.92	5822.26		5822.86	0.001864	7.14	4223.98	560.00	0.41
Main Corridor	136002.4	100 year	36674.00	5807.92	5824.32		5825.00	0.001797	7.99	6545.10	757.37	0.41
Main Corridor	136251.3	10 year	7640.00	5810.00	5818.48		5819.05	0.003972	6.20	1401.14	475.91	0.52
Main Corridor	136251.3	50 year	22754.00	5810.00	5822.55		5823.48	0.003004	8.37	3324.12	513.90	0.51
Main Corridor	136251.3	100 year	36674.00	5810.00	5824.57		5825.56	0.002723	9.19	5620.06	851.44	0.50
Main Corridor	136429.2	10 year	7593.00	5810.00	5819.35		5819.86	0.004769	6.92	1616.25	569.71	0.57
Main Corridor	136429.2	50 year	22009.00	5810.00	5823.19		5824.11	0.003944	9.49	3288.08	491.89	0.58
Main Corridor	136429.2	100 year	36423.00	5810.00	5825.16		5826.15	0.003773	10.68	5530.40	795.95	0.59
Main Corridor	136682.0	10 year	7593.00	5811.64	5820.50		5820.95	0.003668	5.98	1696.88	624.79	0.50
Main Corridor	136682.0	50 year	22009.00	5811.64	5824.28		5824.96	0.002673	7.73	3849.42	600.98	0.48
Main Corridor	136682.0	100 year	36423.00	5811.64	5826.17		5826.94	0.002573	8.72	6092.96	818.06	0.49
Main Corridor	137141.4	10 year	7547.00	5814.00	5822.39		5822.91	0.005105	6.85	1699.35	730.29	0.59
Main Corridor	137141.4	50 year	22465.00	5814.00	5825.66		5826.44	0.003975	8.76	3603.85	596.86	0.57
Main Corridor	137141.4	100 year	36171.00	5814.00	5827.47		5828.22	0.003291	9.31	6234.14	977.62	0.54
Main Corridor	137545.3	10 year	7547.00	5816.00	5823.93		5824.15	0.002111	4.27	2397.26	904.49	0.38
Main Corridor	137545.3	50 year	22465.00	5816.00	5827.08		5827.53	0.002064	6.18	4670.67	758.02	0.41
Main Corridor	137545.3	100 year	36171.00	5816.00	5828.68		5829.16	0.001899	6.83	7776.98	1348.78	0.41
Main Corridor	138067.2	10 year	7547.00	5818.00	5825.35		5825.75	0.006665	6.36	1773.77	853.96	0.64
Main Corridor	138067.2	50 year	22465.00	5818.00	5828.24		5828.92	0.004812	8.35	3847.60	850.00	0.61
Main Corridor	138067.2	100 year	36171.00	5818.00	5829.69		5830.27	0.003726	8.51	6975.49	1398.69	0.55
Main Corridor	138526.8	10 year	7500.00	5822.23	5827.70		5828.06	0.004311	4.82	1582.00	506.97	0.47
Main Corridor	138526.8	50 year	22320.00	5822.23	5830.26		5831.23	0.005495	7.97	2905.70	530.00	0.58
Main Corridor	138526.8	100 year	35920.00	5822.23	5831.26		5832.61	0.006866	9.89	5201.48	1551.77	0.66
Main Corridor	138860.0	10 year	7500.00	5824.50	5829.46		5830.23	0.009465	7.08	1059.20	322.63	0.69
Main Corridor	138860.0	50 year	22320.00	5824.50	5832.45		5833.91	0.011222	9.70	2326.13	520.00	0.79
Main Corridor	138860.0	100 year	35920.00	5824.50	5833.89	5833.50	5835.44	0.010324	10.34	4351.35	1463.43	0.78
Main Corridor	139061.*	10 year	7453.00	5824.96	5830.82		5831.17	0.002535	4.76	1708.12	589.89	0.42
Main Corridor	139061.*	50 year	22175.00	5824.96	5834.23		5834.90	0.002435	6.91	3684.23	600.00	0.45
Main Corridor	139061.*	100 year	35669.00	5824.96	5835.71		5836.35	0.002196	7.42	7458.98	1840.82	0.44
Main Corridor	139262.6	10 year	7453.00	5825.42	5831.35		5831.63	0.002001	4.20	1876.32	850.47	0.37
Main Corridor	139262.6	50 year	22175.00	5825.42	5834.78		5835.35	0.001960	6.26	4010.27	700.00	0.40
Main Corridor	139262.6	100 year	35669.00	5825.42	5836.21		5836.76	0.001818	6.78	7926.61	2206.14	0.40
Main Corridor	139529.7	10 year	7453.00	5827.19	5832.08		5832.53	0.005919	5.39	1381.89	756.78	0.54
Main Corridor	139529.7	50 year	22175.00	5827.19	5835.36		5836.19	0.004391	7.47	3347.53	825.00	0.52
Main Corridor	139529.7	100 year	35669.00	5827.19	5836.58		5837.70	0.005146	9.09	5397.57	2275.05	0.58
Main Corridor	139822.*	10 year	7407.00	5828.08	5833.65		5834.17	0.005135	5.75	1294.51	379.35	0.52
Main Corridor	139822.*	50 year	22031.00	5828.08	5836.66		5837.67	0.005178	8.47	3177.43	718.41	0.57
Main Corridor	139822.*	100 year	35417.00	5828.08	5838.22		5839.18	0.004486	9.05	6527.13	2433.28	0.55
Main Corridor	140116.2	10 year	7407.00	5828.96	5835.51		5836.10	0.008586	6.18	1199.43	445.44	0.66
Main Corridor	140116.2	50 year	22031.00	5828.96	5838.35		5839.56	0.007399	8.80	2506.17	488.35	0.68
Main Corridor	140116.2	100 year	35417.00	5828.96	5839.64		5840.82	0.006286	9.12	5684.24	2269.21	0.65
Main Corridor	140354.*	10 year	7407.00	5830.31	5836.72		5837.13	0.002486	5.15	1529.13	659.77	0.42
Main Corridor	140354.*	50 year	22031.00	5830.31	5839.83		5840.63	0.002817	7.71	3636.18	689.90	0.49
Main Corridor	140354.*	100 year	35417.00	5830.31	5840.92		5841.90	0.003399	9.24	7189.02	2395.06	0.55
Main Corridor	140593.*	10 year	7407.00	5831.67	5837.38		5837.73	0.002533	4.77	1604.31	546.81	0.42
Main Corridor	140593.*	50 year	22031.00	5831.67	5840.56		5841.28	0.002637	7.15	3608.77	640.09	0.47
Main Corridor	140593.*	100 year	35417.00	5831.67	5841.90		5842.61	0.002523	7.82	7839.46	2417.84	0.47
Main Corridor	140831.7	10 year	7407.00	5833.02	5838.05	5836.46	5838.38	0.002884	4.62	1676.41	635.15	0.43
Main Corridor	140831.7	50 year	22031.00	5833.02	5841.31	5838.84	5841.89	0.002339	6.43	3979.26	735.45	0.43
Main Corridor	140831.7	100 year	35417.00	5833.02	5842.53	5840.57	5843.20	0.002509	7.44	7534.38	2574.45	0.46
Main Corridor	141564.8	10 year	7360.00	5836.08	5840.54	5839.72	5841.07	0.004784	6.18	1555.63	780.81	0.56
Main Corridor	141564.8	50 year	21886.00	5836.08	5843.30	5842.59	5844.30	0.004892	9.03	3447.14	883.55	0.62
Main Corridor	141564.8	100 year	35166.00	5836.08	5844.53	5843.19	5845.33	0.003900	9.04	6291.08	2225.64	0.57
Main Corridor	142267.7	10 year	7313.00	5838.86	5843.31	5841.77	5843.53	0.003121	4.70	2299.06	928.81	0.45
Main Corridor	142267.7	50 year	21741.00	5838.86	5846.29	5844.67	5846.80	0.003241	7.27	4700.81	1105.00	0.51
Main Corridor	142267.7	100 year	34915.00	5838.86	5846.97	5844.49	5847.52	0.003490	8.07	7034.80	1442.83	0.53
Main Corridor	142698.9	10 year	7267.00	5841.20	5845.15	5844.83	5845.99	0.011356	7.33	992.94	1037.09	0.81
Main Corridor	142698.9	50 year	21597.00	5841.20	5847.75	5845.85	5848.18	0.003343	6.33	4905.16	1316.00	0.49
Main Corridor	142698.9	100 year	34663.00	5841.20	5848.44	5845.85	5848.81	0.002699	6.22	8150.71	1808.99	0.46
Main Corridor	143060.4	10 year	7220.00	5841.97	5847.23	5845.95	5847.39	0.001841	3.69	2922.63	1510.86	0.35
Main Corridor	143060.4	50 year	21452.00	5841.97	5848.92	5847.95	5849.56	0.004347	7.36	4054.17	1120.00	0.57
Main Corridor	143060.4	100 year	34412.00	5841.97	5849.42	5848.35	5850.09	0.004764	8.19	6376.08	1604.41	0.60
Main Corridor	143567.7	10 year	7173.00	5843.47	5848.40	5847.43	5848.58	0.003949	4.17	2306.17	1077.29	0.48
Main Corridor	143567.7	50 year	21307.00	5843.47	5850.97	5849.16	5851.49	0.003933	6.74	3982.85	844.76	0.53
Main Corridor	143567.7	100 year	34161.00	5843.47	5851.53	5849.61	5852.15	0.004473	7.75	6021.57	1314.36	0.58
Main Corridor	143882.2	10 year	7173.00	5844.84	5849.76	5849.27	5850.09	0.007499	5.75	1775.55	917.43	0.65
Main Corridor	143882.2	50 year	21307.00	5844.84	5852.19	5850.84	5852.90	0.006030	8.16	3433.95	762.29	0.65
Main Corridor	143882.2	100 year	34161.00	5844.84	5852.88	5851.65	5853.84	0.007436	9.96	4862.15	1198.26	0.75
Main Corridor	144326.2	10 year	7173.00	5846.18	5851.33		5851.60	0.002625	4.55	2033.46	825.74	0.42
Main Corridor	144326.2	50 year	21307.00	5846.18	5853.80		5854.39	0.003129	6.94	3942.47	784.63	0.49
Main Corridor	144326.2	100 year	34161.00	5846.18	5854.77		5855.67	0.004168	8.89	5395.34	1533.46	0.59
Main Corridor	145065.8	10 year	7127.00	5850.20	5854.19		5854.79	0.008181	6.29	1204.44	498.82	0.59
Main Corridor	145065.8	50 year	21163.00	5850.20	5856.86		5858.30	0.009906	10.03	2388.55	495.00	0.71
Main Corridor	145065.8	100 year	33900.00	5850.20	5858.46		5859.89	0.008455	10.79	4532.97	2478.83	0.68
Main Corridor	145613.8	10 year	7080.00	5852.07	5857.30		5857.67	0.003608	4.91	1453.70	468.09	0.48
Main Corridor	145613.8	50 year	21018.00	5852.07	5860.44		5861.29	0.003349	7.41	2859.43	450.00	0.52
Main Corridor	145613.8	100 year	33658.00	5852.07	5861.75		5862.82	0.003649	8.76	5256.04	2932.68	0.56

Main Corridor	146281.2	10 year	7033.00	5854.80	5859.39		5859.65	0.002463	4.14	1720.19	551.16	0.40
Main Corridor	146281.2	50 year	20873.00	5854.80	5862.56		5863.18	0.002365	6.31	3337.65	515.00	0.43
Main Corridor	146281.2	100 year	33407.00	5854.80	5864.02		5864.98	0.002915	8.01	4990.30	1838.46	0.50
Main Corridor	146842.2	10 year	7033.00	5856.46	5860.82	5859.15	5860.98	0.002173	3.49	2414.87	810.69	0.33
Main Corridor	146842.2	50 year	20873.00	5856.46	5864.11	5861.29	5864.62	0.002717	6.12	3982.13	785.34	0.42
Main Corridor	146842.2	100 year	33407.00	5856.46	5865.98	5861.80	5866.35	0.001706	5.71	8064.22	2081.06	0.34
Main Corridor	146981.*	10 year	7033.00	5857.23	5861.17	5860.36	5861.77	0.008676	6.21	1151.96	429.12	0.62
Main Corridor	146981.*	50 year	20873.00	5857.23	5864.42	5862.87	5865.38	0.005764	8.19	3017.15	731.32	0.57
Main Corridor	146981.*	100 year	33407.00	5857.23	5866.04	5864.70	5867.08	0.005246	9.10	5581.82	1777.92	0.57
Main Corridor	147121.0	10 year	7033.00	5858.00	5862.37	5861.16	5862.79	0.005868	5.33	1501.45	555.99	0.50
Main Corridor	147121.0	50 year	20873.00	5858.00	5865.38	5863.44	5866.17	0.005490	7.72	3707.85	1000.00	0.53
Main Corridor	147121.0	100 year	33407.00	5858.00	5866.89	5864.87	5867.79	0.005345	8.75	6145.17	1709.33	0.54
Main Corridor	147419.*	10 year	6987.00	5859.25	5863.95	5862.71	5864.49	0.005384	5.93	1272.35	460.95	0.53
Main Corridor	147419.*	50 year	20729.00	5859.25	5866.77	5865.87	5867.73	0.005405	8.57	3327.19	908.77	0.59
Main Corridor	147419.*	100 year	33155.00	5859.25	5868.16	5867.25	5869.04	0.004614	8.99	6107.98	1784.13	0.56
Main Corridor	147718.4	10 year	6987.00	5860.51	5865.43	5864.27	5865.88	0.003829	5.75	1533.16	587.22	0.51
Main Corridor	147718.4	50 year	20729.00	5860.51	5868.37	5866.88	5868.95	0.002960	7.32	4252.83	1009.00	0.49
Main Corridor	147718.4	100 year	33155.00	5860.51	5869.48	5867.86	5870.03	0.002743	7.78	7160.52	1795.87	0.48
Main Corridor	148101.1	10 year	6987.00	5858.20	5866.73	5864.67	5866.93	0.001939	3.61	2010.62	611.76	0.32
Main Corridor	148101.1	50 year	20729.00	5858.20	5869.47	5866.74	5869.97	0.002496	5.84	3976.41	745.00	0.40
Main Corridor	148101.1	100 year	33155.00	5858.20	5870.50	5868.22	5871.27	0.003451	7.55	5542.46	1638.89	0.48
Main Corridor	148501.0	10 year	6940.00	5861.00	5867.75	5866.50	5868.07	0.004161	4.64	1605.00	589.44	0.45
Main Corridor	148501.0	50 year	20584.00	5861.00	5870.59	5868.65	5871.37	0.004412	7.27	3008.71	540.00	0.52
Main Corridor	148501.0	100 year	32904.00	5861.00	5871.90	5869.93	5872.80	0.004353	8.23	4760.18	1424.95	0.53
Main Corridor	148756.0	10 year	6940.00	5863.65	5868.69		5868.97	0.002984	4.32	1705.62	540.56	0.40
Main Corridor	148756.0	50 year	20584.00	5863.65	5871.72		5872.35	0.003154	6.61	3381.77	555.00	0.45
Main Corridor	148756.0	100 year	32904.00	5863.65	5872.90		5873.91	0.004219	8.51	4400.84	1363.33	0.53
Main Corridor	148965.8		Bridge									
Main Corridor	149074.2	10 year	6940.00	5864.70	5870.21	5869.19	5870.57	0.005094	4.95	1533.17	583.01	0.50
Main Corridor	149074.2	50 year	20584.00	5864.70	5873.00	5871.07	5873.74	0.004555	7.22	3112.14	575.00	0.53
Main Corridor	149074.2	100 year	32904.00	5864.70	5874.83	5872.46	5875.73	0.004064	8.17	4619.96	1315.12	0.52
Main Corridor	149230.3	10 year	6940.00	5866.98	5871.25	5870.50	5871.64	0.006777	5.30	1459.10	603.60	0.57
Main Corridor	149230.3	50 year	20584.00	5866.98	5873.92	5872.29	5874.72	0.005583	7.59	2985.27	580.00	0.58
Main Corridor	149230.3	100 year	32904.00	5866.98	5875.64	5873.54	5876.73	0.005564	9.11	4345.94	950.41	0.60
Main Corridor	149696.6	10 year	6940.00	5868.22	5873.30	5871.88	5873.55	0.003203	4.37	1836.23	615.46	0.44
Main Corridor	149696.6	50 year	20584.00	5868.22	5875.97	5873.81	5876.65	0.003769	7.24	3349.22	660.00	0.54
Main Corridor	149696.6	100 year	32904.00	5868.22	5877.78	5874.89	5878.52	0.003207	8.03	5678.97	1056.89	0.52
Main Corridor	150013.9	10 year	6893.00	5869.77	5874.48		5874.99	0.006367	5.86	1237.56	507.64	0.62
Main Corridor	150013.9	50 year	20439.00	5869.77	5877.11		5878.21	0.005759	8.71	2554.44	520.00	0.66
Main Corridor	150013.9	100 year	32653.00	5869.77	5878.69		5879.83	0.004734	9.35	4680.49	1119.78	0.62
Main Corridor	150305.8	10 year	6893.00	5870.48	5876.16		5876.67	0.005311	6.09	1329.96	467.18	0.58
Main Corridor	150305.8	50 year	20439.00	5870.48	5878.71		5880.29	0.007828	10.56	2142.72	413.58	0.77
Main Corridor	150305.8	100 year	32653.00	5870.48	5879.90		5881.81	0.008145	12.20	3292.65	637.49	0.81
Main Corridor	150688.0	10 year	6893.00	5871.20	5877.97		5878.61	0.004814	6.48	1153.13	498.43	0.57
Main Corridor	150688.0	50 year	20439.00	5871.20	5881.32		5882.39	0.004057	8.92	2854.81	554.91	0.58
Main Corridor	150688.0	100 year	32653.00	5871.20	5882.71		5884.04	0.004448	10.47	4309.96	756.02	0.62
Main Corridor	150988.4	10 year	6847.00	5873.01	5879.47		5880.32	0.006494	8.28	1155.60	543.24	0.68
Main Corridor	150988.4	50 year	20295.00	5873.01	5882.61		5883.78	0.005516	10.75	2910.71	591.79	0.68
Main Corridor	150988.4	100 year	32401.00	5873.01	5884.19		5885.39	0.005017	11.59	4569.54	784.34	0.67
Main Corridor	151190.2	10 year	6847.00	5874.00	5880.81		5881.19	0.002671	5.62	1673.43	486.44	0.44
Main Corridor	151190.2	50 year	20295.00	5874.00	5883.84		5884.73	0.003636	8.92	3158.48	551.00	0.55
Main Corridor	151190.2	100 year	32401.00	5874.00	5885.20		5886.33	0.004272	10.72	4940.15	997.09	0.61
Main Corridor	151381.3	10 year	6847.00	5874.00	5881.30		5881.88	0.004148	6.84	1441.96	536.62	0.54
Main Corridor	151381.3	50 year	20295.00	5874.00	5884.47		5885.56	0.004492	9.92	2887.25	510.00	0.61
Main Corridor	151381.3	100 year	32401.00	5874.00	5886.05		5887.12	0.004090	10.66	5065.68	1033.60	0.60
Main Corridor	151699.4	10 year	6800.00	5876.00	5883.01	5882.31	5884.08	0.010862	8.40	879.30	396.27	0.75
Main Corridor	151699.4	50 year	20150.00	5876.00	5886.20		5887.52	0.007534	10.30	2668.60	618.41	0.69
Main Corridor	151699.4	100 year	32150.00	5876.00	5887.54		5889.06	0.007739	11.76	4446.93	1073.44	0.72
Main Corridor	151956.1	10 year	6800.00	5877.27	5884.85		5885.34	0.002623	6.04	1561.77	656.03	0.45
Main Corridor	151956.1	50 year	20150.00	5877.27	5887.89		5888.71	0.003081	8.71	3582.26	693.60	0.52
Main Corridor	151956.1	100 year	32150.00	5877.27	5889.35		5890.31	0.003314	10.01	5317.98	895.98	0.55
Main Corridor	152510.0	10 year	6800.00	5880.00	5886.87		5887.60	0.006851	6.87	1017.75	322.41	0.64
Main Corridor	152510.0	50 year	20150.00	5880.00	5889.78		5891.35	0.007394	10.44	2414.31	705.15	0.72
Main Corridor	152510.0	100 year	32150.00	5880.00	5891.15		5893.18	0.007916	12.44	3499.16	757.34	0.78
Main Corridor	153082.6	10 year	6800.00	5882.00	5890.55	5890.39	5891.55	0.006996	8.53	1100.15	589.15	0.70
Main Corridor	153082.6	50 year	20150.00	5882.00	5893.55		5894.55	0.005126	9.98	3282.96	764.58	0.64
Main Corridor	153082.6	100 year	32150.00	5882.00	5895.20		5896.27	0.004716	11.11	5344.15	1191.24	0.64
Main Corridor	153420.9	10 year	6753.00	5884.00	5892.37		5892.74	0.002011	5.37	1934.86	831.85	0.39
Main Corridor	153420.9	50 year	20005.00	5884.00	5895.03		5895.72	0.002821	8.16	3873.44	770.66	0.49
Main Corridor	153420.9	100 year	31899.00	5884.00	5896.63		5897.39	0.002816	9.14	6239.28	1208.36	0.51
Main Corridor	153849.4	10 year	6753.00	5886.00	5893.30		5894.21	0.005381	7.88	1033.98	410.03	0.62
Main Corridor	153849.4	50 year	20005.00	5886.00	5896.08		5897.67	0.006424	11.57	2525.36	564.06	0.73
Main Corridor	153849.4	100 year	31899.00	5886.00	5897.57		5899.40	0.006679	13.27	4179.17	992.72	0.77
Main Corridor	154218.0	10 year	6707.00	5888.00	5895.36		5896.18	0.005524	7.64	1141.13	503.75	0.63
Main Corridor	154218.0	50 year	19861.00	5888.00	5898.35		5899.77	0.005775	10.89	2505.92	474.13	0.69
Main Corridor	154218.0	100 year	31647.00	5888.00	5899.94		5901.40	0.005343	11.88	4150.37	734.64	0.69
Main Corridor	154515.9	10 year	6707.00	5888.00	5896.82		5897.27	0.002584	5.89	1654.45	636.96	0.44
Main Corridor	154515.9	50 year	19861.00	5888.00	5900.17		5900.86	0.002584	8.06	3654.57	608.86	0.48
Main Corridor	154515.9	100 year	31647.00	5888.00	5901.62		5902.51	0.003016	9.63	5229.31	804.40	0.53
Main Corridor	154684.1	10 year	6660.00	5890.74	5897.41		5897.82	0.003641	6.01	1575.82	520.54	0.50
Main Corridor	154684.1	50 year	19716.00	5890.74	5900.68		5901.41	0.003380	8.37	3333.86	579.79	0.53
Main Corridor	154684.1	100 year	31396.00	5890.74	5902.25		5903.13	0.003709	9.93	5363.09	988.90	0.58
Main Corridor	154852.4	10 year	6660.00	5891.76	5897.94	5897.40	5898.61	0.004615	7.16	1340.66	582.99	0.57
Main Corridor	154852.4	50 year	19716.00	5891.76	5901.08	5899.91	5902.26	0.004836	10.24	2769.37	523.87	0.64

Main Corridor	154852.4	100 year	31396.00	5891.76	5902.79	5901.04	5903.88	0.003966	10.56	4572.37	994.34	0.60
Main Corridor	155178.4	10 year	6660.00	5892.22	5899.32	5897.49	5899.88	0.003463	6.12	1208.36	579.04	0.50
Main Corridor	155178.4	50 year	19716.00	5892.22	5902.42	5900.90	5903.71	0.004462	9.73	2431.44	402.59	0.61
Main Corridor	155178.4	100 year	31396.00	5892.22	5903.47	5902.69	5905.77	0.006862	13.13	2924.81	1124.73	0.78
Main Corridor	155617.8	10 year	6613.00	5894.00	5900.94		5901.80	0.005059	7.69	987.63	679.23	0.61
Main Corridor	155617.8	50 year	19571.00	5894.00	5904.22		5906.29	0.006678	12.37	1910.19	302.65	0.76
Main Corridor	155617.8	100 year	31145.00	5894.00	5906.01		5909.11	0.007949	15.37	2460.72	1087.64	0.85

HEC-RAS HEC-RAS 6.4.1 June 2023
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X       X
X     X  X        X    X      X   X    X    X       X
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PROJECT DATA
Project Title: Salisbury_Park_Cherry_Creek
Project File : SPN.prj
Run Date and Time: 10/31/2024 10:19:00 AM

Project in English units

Project Description:
Salisbury Park Hydraulic Modeling
ICON Engineering Inc. 2023

Previous
(un-numbered plans) Dransfeldt Road CLOMR description:

Project Name:
Dransfeldt Road Extension
Client: Town of Parker
Stream: Cherry
Creek
Community: Town of Parker, CO and Douglas County, CO
Upstream Limit:
1438+82.3 (FHAD Section 141)
Downstream Limit: 1362+51.3 (FHAD Section
124)
HEC-RAS version: 5.0.7

Topographic Contours:
The base mapping is a
combination of LiDAR flown in October 2013 and survey collected in April 2018
and supplemented with survey in November 2019. The horizontal projection is
local project coordinates modified from NAD83 (2011) Colorado State Plane (US
Feet). The vertical datum is NAVD88.
Survey and supplemental survey of the
channel and structures was obtained from Aztec Surveying, Inc. The survey
includes 1-foot contours. Project coordinates are modified Colorado State Plane
Central Zone NAD '83(2011) coordinates. The following equations are used to
convert State Plan coordinates to the project coordinates:
PROJECT NORTHING =
(STATE PLANE NORTHING * 1.0003179891) - 1000000.026'
PROJECT EASTING = (STATE
PLANE EASTING * 1.0003179891) - 3000000.031'

Coordinate System: Project
Coordinates (US Feet)
Vertical datum: NAVD88

Project Engineer (Modeler):
Taylor Hogan
Project Manager: Tracy Bolger
Muller Engineering
Company
January 24, 2023

PLAN DATA

Plan Title: 01_DE_10-YR/50-YR/100-YR
Plan File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.p01

Geometry Title: Duplicate_10-YR/50-YR/100-YR Geom
Geometry File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.g01

Flow Title : Duplicate_10-YR/50-YR/100-YR
Flow File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.f03

Plan Summary Information:
Number of: Cross Sections = 23 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Duplicate_10-YR/50-YR/100-YR

Flow File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.f03

Flow Data (cfs)

River	Reach	RS	10-YR	50-YR	100-YR
Cherry Creek	Main Corridor	146842.2	7033	20873	33407
Cherry Creek	Main Corridor	145613.8	7080	21018	33658
Cherry Creek	Main Corridor	145065.8	7127	21163	33900
Cherry Creek	Main Corridor	144326.2	7173	21307	34161
Cherry Creek	Main Corridor	143060.4	7220	21452	34412
Cherry Creek	Main Corridor	142698.9	7267	21597	34663
Cherry Creek	Main Corridor	142267.7	7313	21741	34915
Cherry Creek	Main Corridor	141564.8	7360	21886	35166
Cherry Creek	Main Corridor	140831.7	7407	22031	35417
Cherry Creek	Main Corridor	139529.7	7453	22175	35669
Cherry Creek	Main Corridor	138860.0	7500	22320	35920
Cherry Creek	Main Corridor	138067.2	7547	22465	36171

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Cherry Creek	Main Corridor	10-YR		Known WS = 5823.89
Cherry Creek	Main Corridor	50-YR		Known WS = 5826.68
Cherry Creek	Main Corridor	100-YR		Known WS = 5828.67

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main Corridor	137545.3 128 AF	50-YR	22465.00	5816.00	5826.68	5824.31	5827.08	0.002148	6.11	5272.93	1129.80	0.42
Main Corridor	138067.2 129	50-YR	22465.00	5818.00	5827.90		5828.47	0.005010	8.19	4530.26	1344.43	0.61
Main Corridor	138526.8 130	50-YR	22320.00	5822.23	5829.98		5830.92	0.005913	8.00	3451.30	1061.69	0.60
Main Corridor	138860.0 131 AG	50-YR	22320.00	5824.50	5832.48	5832.01	5833.78	0.012327	9.23	2614.85	979.78	0.81
Main Corridor	139061.*	50-YR	22175.00	5824.96	5834.17		5834.71	0.002130	6.43	4789.79	1591.50	0.42
Main Corridor	139262.6 132	50-YR	22175.00	5825.42	5834.66		5835.10	0.001714	5.79	5003.03	1557.64	0.38
Main Corridor	139529.7 133 AH	50-YR	22175.00	5827.19	5835.07		5835.99	0.005135	7.84	3274.00	1050.58	0.56
Main Corridor	139822.*	50-YR	22031.00	5828.08	5836.61		5837.49	0.004806	8.12	3615.21	972.77	0.55
Main Corridor	140116.2 134	50-YR	22031.00	5828.96	5838.24	5837.08	5839.23	0.006889	8.03	3048.09	1489.95	0.65
Main Corridor	140354.*	50-YR	22031.00	5830.31	5839.49	5837.89	5840.33	0.003248	8.03	4056.78	1866.53	0.52
Main Corridor	140593.*	50-YR	22031.00	5831.67	5840.40		5841.04	0.002560	6.93	4420.79	1920.84	0.46
Main Corridor	140831.7 135 AI	50-YR	22031.00	5833.02	5841.06	5838.84	5841.66	0.002552	6.56	4269.16	1560.47	0.45
Main Corridor	141564.8 136	50-YR	21886.00	5836.08	5843.15	5842.23	5843.82	0.003879	7.91	4442.95	1297.94	0.55
Main Corridor	142267.7 137 AJ	50-YR	21741.00	5838.86	5845.63	5843.91	5846.06	0.003491	7.02	5125.91	1397.24	0.52
Main Corridor	142698.9 138	50-YR	21597.00	5841.20	5847.12	5845.78	5847.40	0.002926	5.45	5828.64	1659.12	0.45
Main Corridor	143060.4 139 AK	50-YR	21452.00	5841.97	5848.23	5847.52	5848.80	0.005246	7.35	4473.66	1579.71	0.61
Main Corridor	143567.7 140	50-YR	21307.00	5843.47	5850.44	5848.74	5850.84	0.003841	6.21	4623.31	1230.41	0.52
Main Corridor	143882.2	50-YR	21307.00	5844.84	5851.68	5850.65	5852.36	0.007197	8.32	3560.23	977.72	0.71
Main Corridor	144326.2	50-YR	21307.00	5846.18	5853.45		5854.09	0.003788	7.39	3998.16	1244.18	0.54
Main Corridor	145065.8	50-YR	21163.00	5850.20	5856.95		5858.16	0.008560	9.42	2915.29	1945.79	0.66
Main Corridor	145613.8	50-YR	21018.00	5852.07	5860.22		5861.07	0.003580	7.49	3090.51	2134.77	0.53
Main Corridor	146281.2	50-YR	20873.00	5854.80	5862.44		5863.02	0.002365	6.23	3635.89	1193.61	0.43
Main Corridor	146842.2	50-YR	20873.00	5856.46	5863.95	5860.74	5864.24	0.001801	4.90	5226.94	1024.71	0.34

HEC-RAS HEC-RAS 6.4.1 June 2023
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
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X     X  X        X           X  X     X    X       X
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PROJECT DATA
Project Title: Salisbury_Park_Cherry_Creek
Project File : SPN.prj
Run Date and Time: 10/31/2024 12:28:33 PM

Project in English units

Project Description:
Salisbury Park Hydraulic Modeling
ICON Engineering Inc. 2023

Previous
(un-numbered plans) Dransfeldt Road CLOMR description:

Project Name:
Dransfeldt Road Extension
Client: Town of Parker
Stream: Cherry
Creek
Community: Town of Parker, CO and Douglas County, CO
Upstream Limit:
1438+82.3 (FHAD Section 141)
Downstream Limit: 1362+51.3 (FHAD Section
124)
HEC-RAS version: 5.0.7

Topographic Contours:
The base mapping is a
combination of LiDAR flown in October 2013 and survey collected in April 2018
and supplemented with survey in November 2019. The horizontal projection is
local project coordinates modified from NAD83 (2011) Colorado State Plane (US
Feet). The vertical datum is NAVD88.
Survey and supplemental survey of the
channel and structures was obtained from Aztec Surveying, Inc. The survey
includes 1-foot contours. Project coordinates are modified Colorado State Plane
Central Zone NAD '83(2011) coordinates. The following equations are used to
convert State Plan coordinates to the project coordinates:
PROJECT NORTHING =
(STATE PLANE NORTHING * 1.0003179891) - 1000000.026'
PROJECT EASTING = (STATE
PLANE EASTING * 1.0003179891) - 3000000.031'

Coordinate System: Project
Coordinates (US Feet)
Vertical datum: NAVD88

Project Engineer (Modeler):
Taylor Hogan
Project Manager: Tracy Bolger
Muller Engineering
Company
January 24, 2023

PLAN DATA

Plan Title: 03_CE_10-YR/50-YR/100-YR
Plan File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.p06

Geometry Title: Corrected_Eff_10-YR/50-YR/100-YR Geom
Geometry File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.g03

Flow Title : Corrected_Eff_10-YR/50-YR/100-YR
Flow File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.f02

Plan Summary Information:
Number of: Cross Sections = 26 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Corrected_Eff_10-YR/50-YR/100-YR

Flow File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.f02

Flow Data (cfs)

River	Reach	RS	10-YR	50-YR	100-YR
Cherry Creek	Cherry Creek	147068.5	7033	20873	33407
Cherry Creek	Cherry Creek	145840.1	7080	21018	33658
Cherry Creek	Cherry Creek	145292.1	7127	21163	33900
Cherry Creek	Cherry Creek	144552.5	7173	21307	34161
Cherry Creek	Cherry Creek	143285.5	7220	21452	34412
Cherry Creek	Cherry Creek	142905.1	7267	21597	34663
Cherry Creek	Cherry Creek	142476.1	7313	21741	34915
Cherry Creek	Cherry Creek	141854.4	7360	21886	35166
Cherry Creek	Cherry Creek	141016.0	7407	22031	35417
Cherry Creek	Cherry Creek	139847.6	7453	22175	35669
Cherry Creek	Cherry Creek	138889.1	7500	22320	35920
Cherry Creek	Cherry Creek	138067.2	7547	22465	36171

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Cherry Creek	Cherry Creek	10-YR		Known WS = 5823.89
Cherry Creek	Cherry Creek	50-YR		Known WS = 5826.68
Cherry Creek	Cherry Creek	100-YR		Known WS = 5828.67

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Cherry Creek	137545.3 128 AF	50-YR	22465.00	5816.00	5826.68	5824.31	5827.08	0.002148	6.11	5272.93	1129.80	0.42
Cherry Creek	138067.2 129	50-YR	22465.00	5818.15	5827.67		5828.53	0.007055	10.58	3965.30	1243.30	0.74
Cherry Creek	138360.5	50-YR	22320.00	5819.70	5829.34	5828.71	5830.56	0.006336	9.14	2960.79	1048.65	0.69
Cherry Creek	138658.4	50-YR	22320.00	5822.24	5831.48		5832.19	0.004619	7.03	3992.19	1225.47	0.52
Cherry Creek	138889.1	50-YR	22320.00	5822.91	5833.19	5833.19	5834.95	0.012707	11.19	2551.78	1006.97	0.86
Cherry Creek	138996.1	50-YR	22175.00	5823.20	5834.47	5834.47	5836.62	0.009609	12.08	2281.44	872.32	0.79
Cherry Creek	139174.0	50-YR	22175.00	5823.77	5836.83		5837.21	0.001013	5.13	5565.02	1581.96	0.30
Cherry Creek	139341.3	50-YR	22175.00	5824.51	5837.15		5837.36	0.000627	3.98	7112.14	1770.50	0.23
Cherry Creek	139470.2	50-YR	22175.00	5824.89	5837.15	5833.69	5837.52	0.001394	5.60	5458.55	1296.55	0.34
Cherry Creek	139847.6	50-YR	22175.00	5827.36	5837.63	5834.64	5838.21	0.002108	6.50	3895.18	960.36	0.42
Cherry Creek	140071.7	50-YR	22031.00	5828.35	5837.99	5835.59	5838.83	0.003064	7.62	3175.14	791.78	0.50
Cherry Creek	140276.2	50-YR	22031.00	5829.09	5838.35	5838.29	5840.23	0.009149	11.87	2497.24	955.41	0.84
Cherry Creek	140620.5	50-YR	22031.00	5830.73	5841.31	5839.88	5842.08	0.002786	7.65	4228.18	1511.76	0.48
Cherry Creek	141016.0	50-YR	22031.00	5831.93	5842.45	5839.40	5842.84	0.001494	5.75	5493.56	1212.49	0.36
Cherry Creek	141854.4	50-YR	21886.00	5834.22	5843.97	5842.79	5844.70	0.004618	8.53	4358.81	1360.93	0.60
Cherry Creek	142241.8	50-YR	21741.00	5836.28	5845.42	5843.68	5845.96	0.004022	8.19	4825.05	1331.78	0.56
Cherry Creek	142476.1 137 AJ	50-YR	21741.00	5837.15	5846.38	5843.97	5846.70	0.002161	6.03	5924.78	1393.19	0.41
Cherry Creek	142905.1 138	50-YR	21597.00	5838.16	5847.41	5845.78	5847.67	0.002531	5.23	6093.27	1686.58	0.42
Cherry Creek	143285.5 139 AK	50-YR	21452.00	5839.15	5848.34	5846.29	5848.66	0.003105	5.76	5472.45	1577.58	0.47
Cherry Creek	143794.0 140	50-YR	21307.00	5843.47	5850.01	5848.74	5850.52	0.005540	6.96	4099.61	1202.82	0.61
Cherry Creek	144108.5	50-YR	21307.00	5844.84	5851.63	5850.65	5852.33	0.007486	8.42	3515.47	972.69	0.72
Cherry Creek	144552.5	50-YR	21307.00	5846.18	5853.45		5854.10	0.003774	7.38	4004.11	1245.82	0.54
Cherry Creek	145292.1	50-YR	21163.00	5850.20	5856.95	5855.83	5858.16	0.008575	9.42	2912.91	1943.92	0.66
Cherry Creek	145840.1	50-YR	21018.00	5852.07	5860.22		5861.07	0.003578	7.49	3091.63	2135.41	0.53
Cherry Creek	146507.5	50-YR	20873.00	5854.80	5862.44		5863.02	0.002365	6.23	3635.89	1193.61	0.43
Cherry Creek	147068.5	50-YR	20873.00	5856.46	5863.95	5860.74	5864.24	0.001801	4.90	5226.94	1024.71	0.34

HEC-RAS HEC-RAS 6.4.1 June 2023
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
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X     X  X        X            X  X     X    X        X
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PROJECT DATA
Project Title: Salisbury_Park_Cherry_Creek
Project File : SPN.prj
Run Date and Time: 11/4/2024 1:18:03 PM

Project in English units

Project Description:
Salisbury Park Hydraulic Modeling
ICON Engineering Inc. 2023

Previous
(un-numbered plans) Dransfeldt Road CLOMR description:

Project Name:
Dransfeldt Road Extension
Client: Town of Parker
Stream: Cherry
Creek
Community: Town of Parker, CO and Douglas County, CO
Upstream Limit:
1438+82.3 (FHAD Section 141)
Downstream Limit: 1362+51.3 (FHAD Section
124)
HEC-RAS version: 5.0.7

Topographic Contours:
The base mapping is a
combination of LiDAR flown in October 2013 and survey collected in April 2018
and supplemented with survey in November 2019. The horizontal projection is
local project coordinates modified from NAD83 (2011) Colorado State Plane (US
Feet). The vertical datum is NAVD88.
Survey and supplemental survey of the
channel and structures was obtained from Aztec Surveying, Inc. The survey
includes 1-foot contours. Project coordinates are modified Colorado State Plane
Central Zone NAD '83(2011) coordinates. The following equations are used to
convert State Plan coordinates to the project coordinates:
PROJECT NORTHING =
(STATE PLANE NORTHING * 1.0003179891) - 1000000.026'
PROJECT EASTING = (STATE
PLANE EASTING * 1.0003179891) - 3000000.031'

Coordinate System: Project
Coordinates (US Feet)
Vertical datum: NAVD88

Project Engineer (Modeler):
Taylor Hogan
Project Manager: Tracy Bolger
Muller Engineering
Company
January 24, 2023

PLAN DATA

Plan Title: 05_Pre-Project_10-YR/50-YR/100-YR
Plan File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.p02

Geometry Title: Pre-Project_10-YR/50-YR/100-YR Geom
Geometry File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.g04

Flow Title : Pre-Project_10-YR/50-YR/100-YR
Flow File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.f01

Plan Description:
Proposed Conditions Model
Project Name: Dransfeldt Road Extension
Client:
Town of Parker
Stream: Cherry Creek
Community:Town of Parker, CO and Douglas
County, CO
HEC-RAS version: 5.0.7

Coordinate System: Project Coordinates
(US Feet)

Plan Summary Information:
Number of: Cross Sections = 29 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 1 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3

Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Pre-Project_10-YR/50-YR/100-YR
Flow File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.f01

Flow Data (cfs)

River	Reach	RS	10-YR	50-YR	100-YR
Cherry Creek	Cherry Creek	146936.9	7033	20873	33407
Cherry Creek	Cherry Creek	145708.5	7080	21018	33658
Cherry Creek	Cherry Creek	145160.5	7127	21163	33900
Cherry Creek	Cherry Creek	144420.9	7173	21307	34161
Cherry Creek	Cherry Creek	143154.0	7220	21452	34412
Cherry Creek	Cherry Creek	142773.5	7267	21597	34663
Cherry Creek	Cherry Creek	142344.6	7313	21741	34915
Cherry Creek	Cherry Creek	141463.7	7360	21886	35166
Cherry Creek	Cherry Creek	140857.7	7407	22031	35417
Cherry Creek	Cherry Creek	139505.2	7453	22175	35669
Cherry Creek	Cherry Creek	138887.3	7500	22320	35920
Cherry Creek	Cherry Creek	138067.2	7547	22465	36171

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Cherry Creek	Cherry Creek	10-YR		Known WS = 5823.89
Cherry Creek	Cherry Creek	50-YR		Known WS = 5826.68
Cherry Creek	Cherry Creek	100-YR		Known WS = 5828.67

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Cherry Creek	137545.3 128 (AF)	50-YR	22465.00	5816.00	5826.68	5824.31	5827.08	0.002148	6.11	5272.93	1129.80	0.42
Cherry Creek	138067.2 129	50-YR	22465.00	5818.15	5827.92		5828.66	0.005832	9.87	4233.26	1202.91	0.68
Cherry Creek	138360.5 129.6	50-YR	22320.00	5819.70	5829.36	5828.53	5830.65	0.006493	9.28	2848.57	1167.03	0.70
Cherry Creek	138658.4 130.4	50-YR	22320.00	5822.24	5831.58		5832.25	0.004324	6.87	4114.08	1233.75	0.51
Cherry Creek	138887.3 131 (AG)	50-YR	22320.00	5822.07	5832.68	5832.68	5835.13	0.011943	12.96	2073.74	734.54	0.87
Cherry Creek	139005.3 131.3	50-YR	22175.00	5824.40	5834.60	5833.19	5836.07	0.004766	10.25	2868.95	889.53	0.64
Cherry Creek	139186.6 131.7	50-YR	22175.00	5824.40	5836.14	5831.95	5836.59	0.001377	5.50	4550.96	1029.59	0.34
Cherry Creek	139338.2 132.1	50-YR	22175.00	5824.56	5836.52	5832.47	5836.77	0.000860	4.41	6149.07	1150.35	0.27
Cherry Creek	139505.2 132.9	50-YR	22175.00	5826.40	5836.47	5833.58	5837.17	0.003191	6.84	3641.65	1114.24	0.45
Cherry Creek	139624.0 133.1	50-YR	22031.00	5827.48	5837.02	5833.79	5837.51	0.002271	5.84	4393.38	1048.94	0.38
Cherry Creek	139794.7 133.3	50-YR	22031.00	5827.90	5837.58	5833.63	5837.85	0.001205	4.17	5360.59	946.68	0.28
Cherry Creek	140155.1 133.9	50-YR	22031.00	5828.36	5838.05	5835.30	5838.55	0.002355	5.81	4043.52	791.21	0.40
Cherry Creek	140296.9		Bridge									
Cherry Creek	140397.3 134.3	50-YR	22031.00	5828.93	5838.72	5836.18	5839.28	0.002389	6.14	3846.92	802.48	0.43
Cherry Creek	140533.5 134.5	50-YR	22031.00	5833.70	5839.07	5837.72	5839.78	0.003987	7.03	3702.42	1081.44	0.54
Cherry Creek	140857.7 135.1	50-YR	22031.00	5833.70	5840.35	5838.68	5841.10	0.003971	7.00	3367.58	942.56	0.54
Cherry Creek	141128.6 135.3	50-YR	21886.00	5833.70	5841.44	5839.84	5842.07	0.003275	7.01	4183.29	1083.66	0.50
Cherry Creek	141463.7 135.7	50-YR	21886.00	5833.98	5842.61	5841.81	5843.32	0.005169	7.66	3911.81	1180.97	0.61
Cherry Creek	141938.6 136.4	50-YR	21741.00	5835.56	5844.62	5842.52	5845.06	0.003517	6.51	4965.76	1403.09	0.51
Cherry Creek	142110.2 136.6	50-YR	21741.00	5836.28	5845.27	5843.95	5845.86	0.004575	8.49	4623.95	1325.30	0.60
Cherry Creek	142344.6 137 (AJ)	50-YR	21741.00	5837.15	5846.33	5843.97	5846.65	0.002242	6.10	5851.36	1391.29	0.42
Cherry Creek	142773.5 138	50-YR	21597.00	5838.16	5847.40	5844.96	5847.66	0.002582	5.22	6068.58	1684.50	0.43
Cherry Creek	143154.0 139 (AK)	50-YR	21452.00	5839.15	5848.34	5846.29	5848.66	0.003112	5.70	5472.45	1577.58	0.47
Cherry Creek	143662.4 140	50-YR	21307.00	5843.47	5850.01	5848.74	5850.52	0.005537	6.96	4100.20	1202.98	0.61
Cherry Creek	143976.9	50-YR	21307.00	5844.84	5851.63	5850.65	5852.33	0.007486	8.42	3515.47	972.69	0.72
Cherry Creek	144420.9	50-YR	21307.00	5846.18	5853.45		5854.10	0.003774	7.38	4004.11	1245.82	0.54
Cherry Creek	145160.5	50-YR	21163.00	5850.20	5856.95	5855.83	5858.16	0.008575	9.42	2912.91	1943.92	0.66
Cherry Creek	145708.5	50-YR	21018.00	5852.07	5860.22		5861.07	0.003578	7.49	3091.63	2135.41	0.53
Cherry Creek	146375.9	50-YR	20873.00	5854.80	5862.44		5863.02	0.002365	6.23	3635.89	1193.61	0.43
Cherry Creek	146936.9	50-YR	20873.00	5856.46	5863.95	5860.74	5864.24	0.001801	4.90	5226.94	1024.71	0.34

HEC-RAS HEC-RAS 6.4.1 June 2023
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X       X
X     X  X        X    X      X   X    X    X       X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
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PROJECT DATA
Project Title: Salisbury_Park_Cherry_Creek
Project File : SPN.prj
Run Date and Time: 11/7/2024 5:13:27 PM

Project in English units

Project Description:
Salisbury Park Hydraulic Modeling
ICON Engineering Inc. 2023

Previous
(un-numbered plans) Dransfeldt Road CLOMR description:

Project Name:
Dransfeldt Road Extension
Client: Town of Parker
Stream: Cherry
Creek
Community: Town of Parker, CO and Douglas County, CO
Upstream Limit:
1438+82.3 (FHAD Section 141)
Downstream Limit: 1362+51.3 (FHAD Section
124)
HEC-RAS version: 5.0.7

Topographic Contours:
The base mapping is a
combination of LiDAR flown in October 2013 and survey collected in April 2018
and supplemented with survey in November 2019. The horizontal projection is
local project coordinates modified from NAD83 (2011) Colorado State Plane (US
Feet). The vertical datum is NAVD88.
Survey and supplemental survey of the
channel and structures was obtained from Aztec Surveying, Inc. The survey
includes 1-foot contours. Project coordinates are modified Colorado State Plane
Central Zone NAD '83(2011) coordinates. The following equations are used to
convert State Plan coordinates to the project coordinates:
PROJECT NORTHING =
(STATE PLANE NORTHING * 1.0003179891) - 1000000.026'
PROJECT EASTING = (STATE
PLANE EASTING * 1.0003179891) - 3000000.031'

Coordinate System: Project
Coordinates (US Feet)
Vertical datum: NAVD88

Project Engineer (Modeler):
Taylor Hogan
Project Manager: Tracy Bolger
Muller Engineering
Company
January 24, 2023

PLAN DATA

Plan Title: 48_Post-Project_PH1
Plan File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.p48

Geometry Title: 48_Post-Project_PH1
Geometry File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.g48

Flow Title : 48_Post-Project_w_Dransfeldt
Flow File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.f46

Plan Description:
Previous Dransfeldt CLOMR Plan description:
Proposed Conditions Model
Project
Name: Dransfeldt Road Extension
Client: Town of Parker
Stream: Cherry
Creek
Community:Town of Parker, CO and Douglas County, CO
HEC-RAS version:
5.0.7

Coordinate System: Project Coordinates (US Feet)

2024-10-24
Phase 1 grading incorporated

Plan Summary Information:
Number of: Cross Sections = 29 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 1 Lateral Structures = 0

```
Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow

Encroachment Data
   Equal Conveyance = True
   Left Offset      =        0
   Right Offset     =        0

River = Cherry Creek     Reach = Cherry Creek
RS      Profile           Method  Value1  Value2
146936.9FW                     1    1461    2353
146375.9FW                     1    2475    2990
145708.5FW                     1    2650    3100
145160.5FW                     1    2975    3470
144420.9FW                     1    3055 3839.63
143976.9FW                     1  3022.5 3784.79
143662.4FW                     1 2976.88 3821.64
143154.0FW                     1    2600    3830
142773.5FW                     1    2300    3680
142344.6FW                     1    1875    3040
142110.2FW                     1    1875    2890
141938.6FW                     1    1825    2800
141463.7FW                     1    1875    2703
141128.6FW                     1    1875    2608
140857.7FW                     1    1883    2482
140533.5FW                     1    1575    2154
140397.3FW                     1    1277    1826
140155.1FW                     1    1214    1773
139794.7FW                     1     642    1410
139624.0FW                     1     725    1320
139505.2FW                     1     936    1410
139338.2FW                     1     855    1385
139186.6FW                     1     886    1385
139005.3FW                     1     895    1365
138887.3FW                     1     910    1338
138658.4FW                     1  932.22 1454.38
138360.5FW                     1     850    1400
138067.2FW                     1     800    1425
137545.3FW                     1   661.5 1419.52



FLOW DATA

Flow Title: 48_Post-Project_w_Dransfeldt
Flow File : p:\P\23-018_Salisbury Park\09_Hydraulics\FDP_HEC-RAS\SPN.f46

Flow Data (cfs)

  River           Reach           RS                100-YR             FW          10-YR          50-YR
  Cherry Creek    Cherry Creek    146936.9           33407           33407           7033          20873
  Cherry Creek    Cherry Creek    145708.5           33658           33658           7080          21018
  Cherry Creek    Cherry Creek    145160.5           33900           33900           7127          21163
  Cherry Creek    Cherry Creek    144420.9           34161           34161           7173          21307
  Cherry Creek    Cherry Creek    143154.0           34412           34412           7220          21452
  Cherry Creek    Cherry Creek    142773.5           34663           34663           7267          21597
  Cherry Creek    Cherry Creek    142344.6           34915           34915           7313          21741
  Cherry Creek    Cherry Creek    141463.7           35166           35166           7360          21886
  Cherry Creek    Cherry Creek    140857.7           35417           35417           7407          22031
  Cherry Creek    Cherry Creek    139505.2           35669           35669           7453          22175
  Cherry Creek    Cherry Creek    138887.3           35920           35920           7500          22320
  Cherry Creek    Cherry Creek    138067.2           36171           36171           7547          22465


Boundary Conditions

  River           Reach           Profile                     Upstream               Downstream

  Cherry Creek    Cherry Creek    100-YR                                          Known WS = 5828.67
  Cherry Creek    Cherry Creek    FW                                              Known WS = 5828.67
  Cherry Creek    Cherry Creek    10-YR                                           Known WS = 5823.89
  Cherry Creek    Cherry Creek    50-YR                                           Known WS = 5826.68

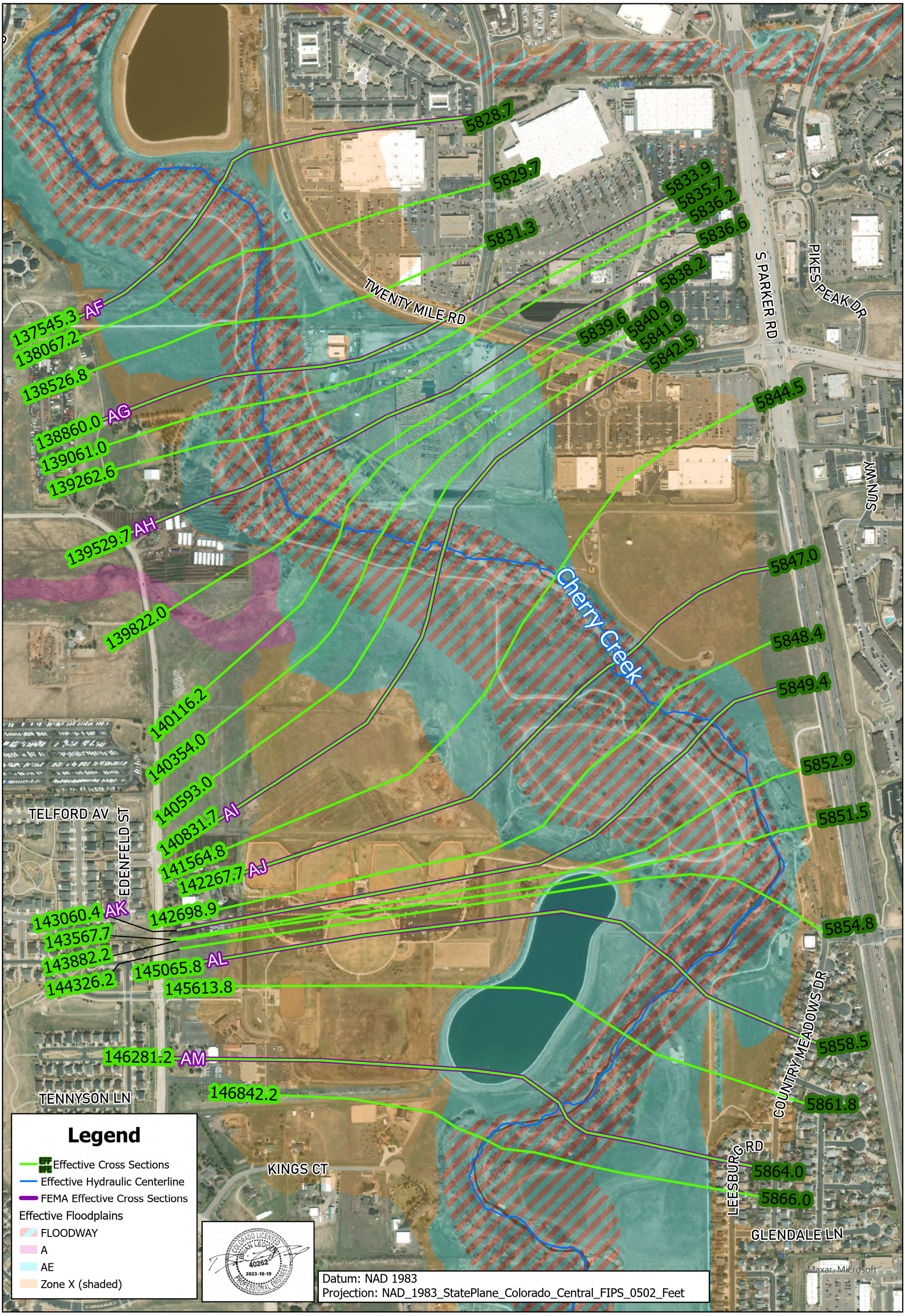

Profile Output Table - Standard Table 1

  Reach          River Sta                  Profile    Q Total   Min Ch El   W.S. Elev   Crit W.S.   E.G. Elev   E.G. Slope   Vel Chnl   Flow Area   Top Width   Froude # Chl
                                                          (cfs)        (ft)        (ft)        (ft)        (ft)      (ft/ft)     (ft/s)     (sq ft)        (ft)

  Cherry Creek   137545.3 128 (AF)          FW       36171.00     5816.00     5828.67     5825.51     5829.39     0.002574       7.87     5872.47      758.02          0.47
  Cherry Creek   138067.2 129               FW       36171.00     5818.15     5829.97                 5831.36     0.006461      12.46     4336.94      625.00          0.75
  Cherry Creek   138360.5 129.6             FW       35920.00     5819.70     5831.51                 5833.26     0.005668      10.80     3576.56      550.00          0.69
  Cherry Creek   138658.4 130.4             FW       35920.00     5822.24     5833.68                 5834.88     0.004931       8.78     4089.45      522.16          0.55
  Cherry Creek   138887.3 131 (AG)          FW       35920.00     5822.07     5834.28     5833.67     5836.91     0.010887      13.28     2927.18      428.00          0.85
  Cherry Creek   139005.3 131.3             FW       35669.00     5824.40     5835.65     5835.65     5838.88     0.008641      14.98     2819.36      470.00          0.87
  Cherry Creek   139186.6 131.7             FW       35669.00     5824.40     5838.94     5833.54     5839.65     0.001401       6.77     5324.93      499.00          0.36
  Cherry Creek   139338.2 132.1             FW       35669.00     5824.56     5839.21     5833.72     5839.86     0.001263       6.45     5628.67      530.00          0.34
  Cherry Creek   139505.2 132.9             FW       35669.00     5826.40     5839.25     5835.26     5840.28     0.002913       8.15     4474.59      474.00          0.46
  Cherry Creek   139624.0 133.1             FW       35417.00     5827.48     5839.88     5835.43     5840.60     0.002040       6.92     5481.72      595.00          0.38
  Cherry Creek   139794.7 133.3             FW       35417.00     5827.90     5840.60     5834.75     5840.94     0.000939       4.68     7622.84      768.00          0.26
  Cherry Creek   140155.1 133.9             FW       35417.00     5828.36     5840.88     5836.62     5841.60     0.002003       6.83     5188.56      559.00          0.40
  Cherry Creek   140296.9                              Bridge
  Cherry Creek   140397.3 134.3             FW       35417.00     5828.93     5841.48     5837.56     5842.28     0.002006       7.19     4932.43      549.00          0.42
  Cherry Creek   140533.5 134.5             FW       35417.00     5833.70     5841.71     5838.92     5842.71     0.003018       8.05     4473.82      579.00          0.51
  Cherry Creek   140857.7 135.1             FW       35417.00     5833.70     5842.73     5839.99     5843.69     0.003003       7.84     4523.62      599.00          0.50
  Cherry Creek   141128.6 135.3             FW       35166.00     5833.70     5843.63     5841.07     5844.49     0.002931       8.15     5203.90      733.00          0.50
  Cherry Creek   141463.7 135.7             FW       35166.00     5833.98     5844.59     5843.10     5845.66     0.004675       9.14     4746.95      828.00          0.61
  Cherry Creek   141938.6 136.4             FW       34915.00     5835.56     5846.61     5844.90     5847.41     0.003707       8.32     5459.93      975.00          0.55
  Cherry Creek   142110.2 136.6             FW       34915.00     5836.28     5847.32     5845.97     5848.19     0.004368      10.00     5502.51     1015.00          0.61
  Cherry Creek   142344.6 137 (AJ)          FW       34915.00     5837.15     5848.48     5844.66     5848.93     0.001993       6.96     7373.03     1165.00          0.42
  Cherry Creek   142773.5 138               FW       34663.00     5838.16     5849.42     5847.24     5849.88     0.002610       6.68     7373.54     1380.00          0.46
```

Cherry Creek	143154.0 139 (AK)	FW	34412.00	5839.15	5850.36	5848.42	5850.93	0.003236	7.41	6512.74	1230.00	0.51
Cherry Creek	143662.4 140	FW	34161.00	5843.47	5852.01	5850.20	5852.90	0.005244	8.82	4863.90	844.76	0.63
Cherry Creek	143976.9	FW	34161.00	5844.84	5853.53	5851.95	5854.60	0.006626	10.03	4450.46	762.29	0.71
Cherry Creek	144420.9	FW	34161.00	5846.18	5855.38		5856.23	0.003422	8.42	5179.56	784.63	0.53
Cherry Creek	145160.5	FW	33900.00	5850.20	5858.49		5860.54	0.010686	12.16	3193.41	495.00	0.76
Cherry Creek	145708.5	FW	33658.00	5852.07	5862.43		5863.70	0.003477	9.05	3756.79	450.00	0.55
Cherry Creek	146375.9	FW	33407.00	5854.80	5864.73		5865.62	0.002331	7.58	4454.16	515.00	0.45
Cherry Creek	146936.9	FW	33407.00	5856.46	5866.37	5862.64	5866.98	0.002319	6.86	5966.11	892.00	0.40

APPENDIX E: TOPOGRAPHIC WORKMAPS



ICON ENGINEERING

Figure E.1: Effective Floodplains

Salisbury Park North - Phase 1 - Floodplain Development Permit (FDP) Application

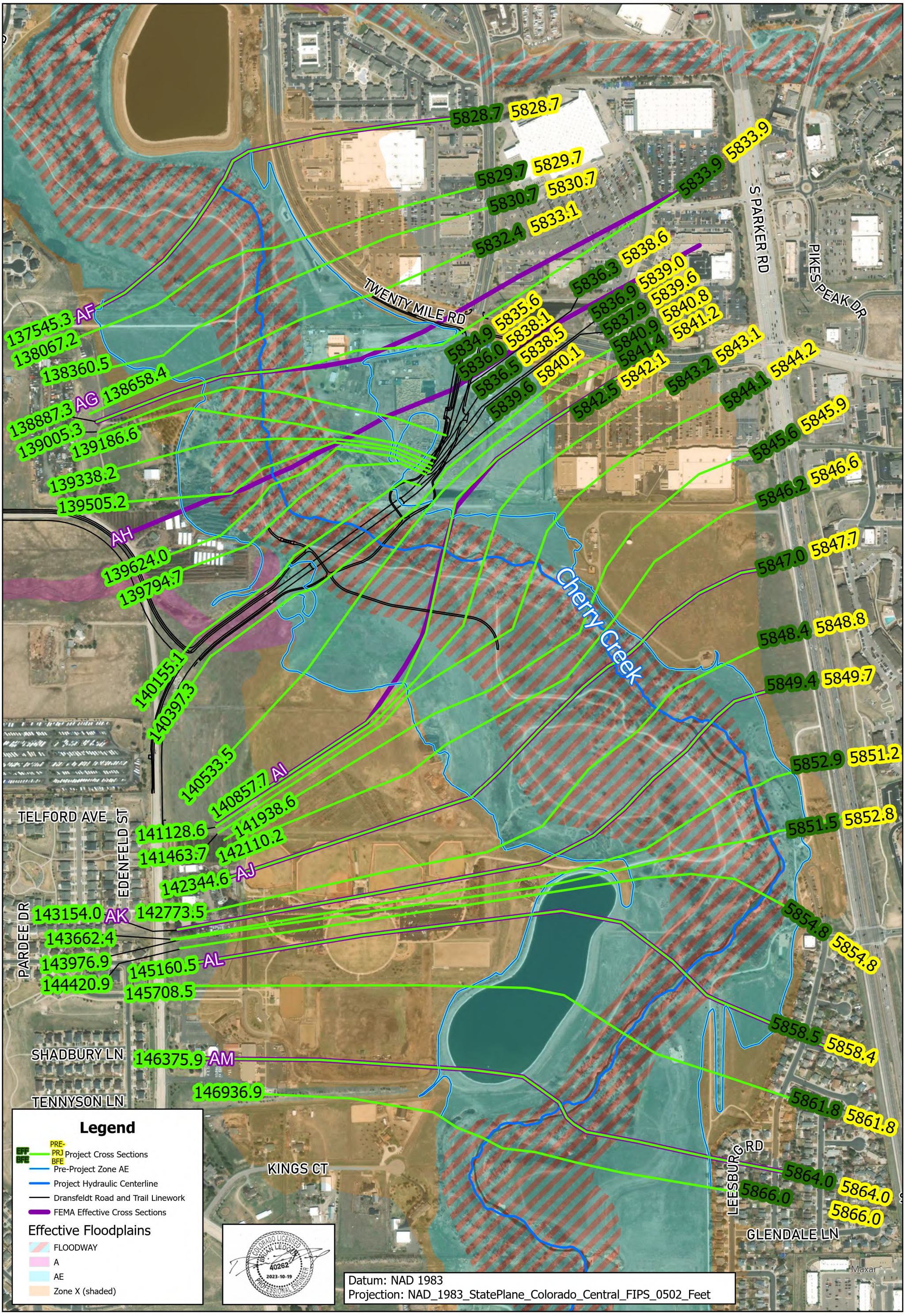
hcm

PARKER COLORADO

N

US Feet

0 200 400

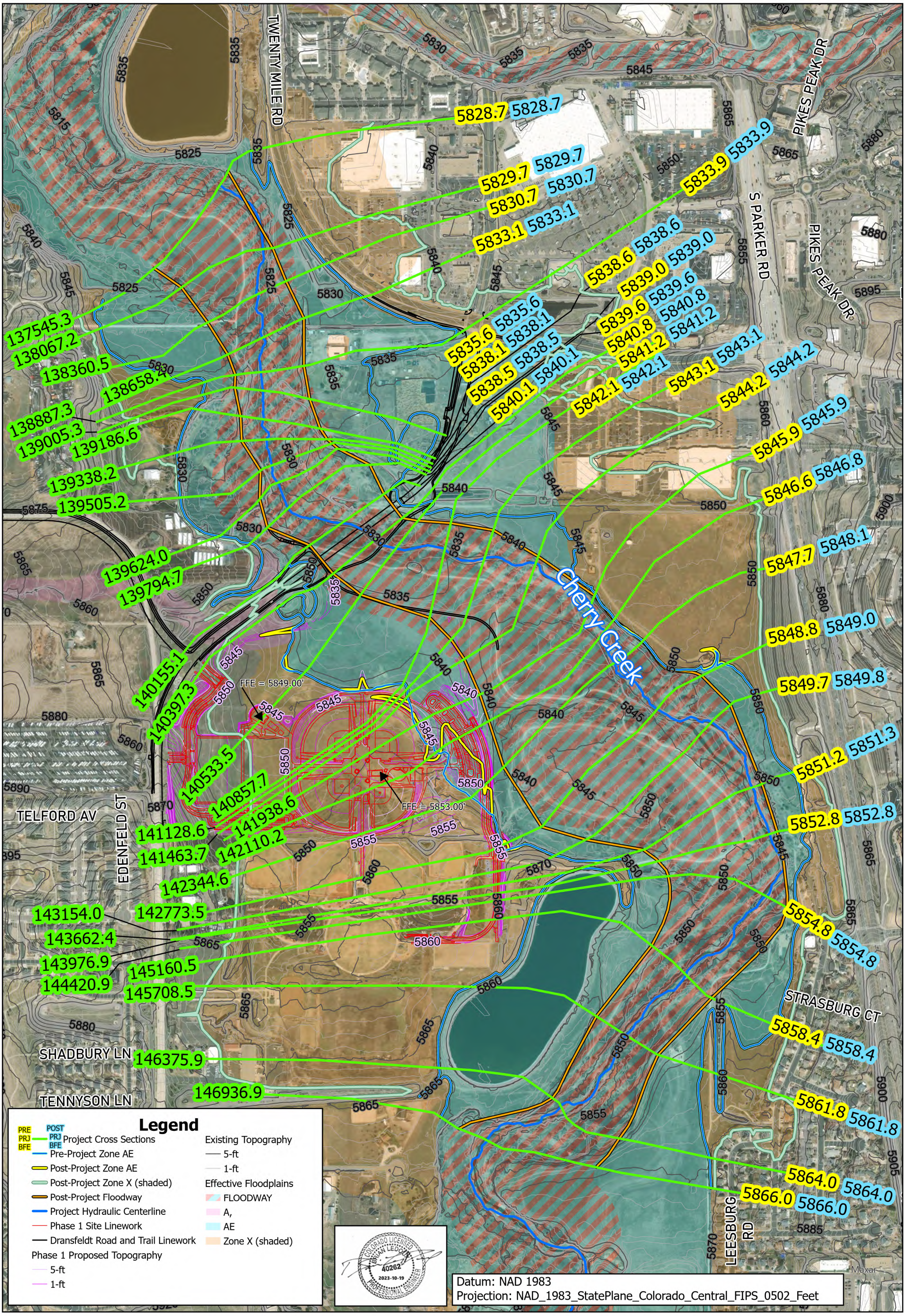


ICON ENGINEERING

Figure E.2: Effective Floodplain vs. Pre-Project

Salisbury Park North - Phase 1 - Floodplain Development Permit (FDP) Application

hcm PARKER COLORADO



ICON ENGINEERING

Figure E.3: Pre-Project vs. Post-Project Floodplains with Topography

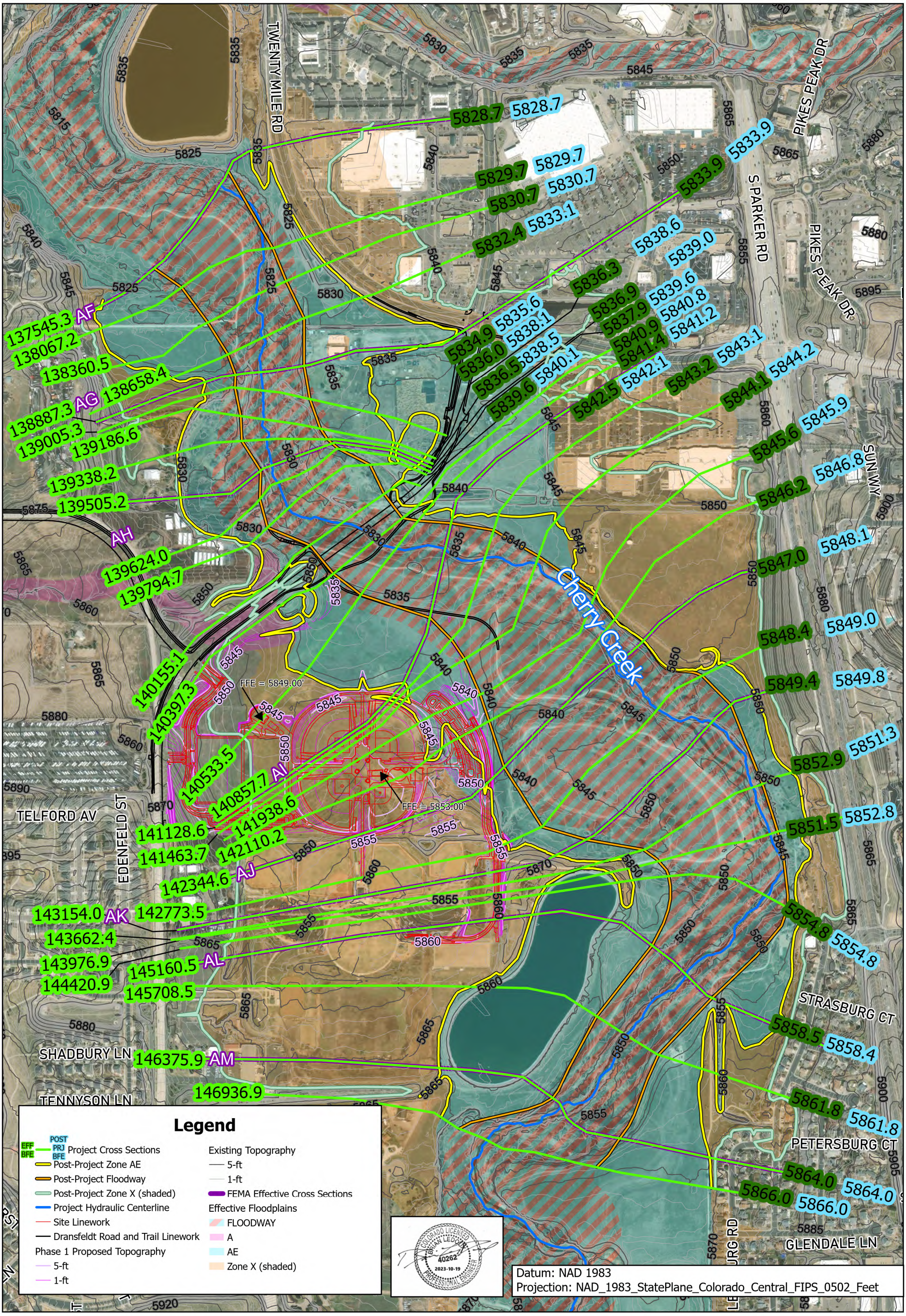
Salisbury Park North - Phase 1 - Floodplain Development Permit (FDP) Application

hcm PARKER COLORADO

N

US Feet

0 200 400



ICON ENGINEERING

Figure E.4: Effective Floodplain vs. Post-Project Floodplains with Topography

Salisbury Park North - Phase 1 - Floodplain Development Permit (FDP) Application

hcm PARKER COLORADO

APPENDIX F: PROPOSED SALISBURY PARK NORTH PHASE 1 PLANS

THE LINE SHOWN ABOVE IS EXACTLY 1" WHEN PLOTTED AT FULL SIZED SHEETS ORIGINAL PAGE SIZE

THE SQUARES ABOVE ARE COLOR, WITH BLACK AND WHITE LETTERS, IF PRINTED CORRECTLY

C1-110

C1-111

C1-112

C1-113

C1-114

C1-115

C1-116

C1-117

C1-118

C1-119

C1-120

C1-121

C1-122

C1-123

C1-124

C1-125

C1-126

C1-127

DRANSFELDT RD
ROW VARIES

COMMUNITY HUB BLDG
FFE=5849.00'

HQ BLDG
FFE=5853.00'

MOTSENBOCKER RD
ROW VARIES

LIMITS OF EXISTING
100-YR FLOODPLAIN

LIMITS OF PROPOSED
100-YR FLOODPLAIN

MATCHLINE – SEE THIS SHEET

MATCHLINE – SEE THIS SHEET

GRADING AND DRAINAGE NOTES:

1. CONTRACTOR TO FIELD VERIFY ALL EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. REFER TO GENERAL NOTES FOR UTILITY LOCATION AND PROTECTION.
2. CONTRACTOR TO POTHOLE EXISTING UTILITIES AT PROPOSED UTILITY CROSSINGS IN ROW PRIOR TO CONSTRUCTION.
3. REFER TO HORIZONTAL CONTROL PLAN FOR FURTHER INFORMATION PERTAINING TO CURB & GUTTER, CHASES, AND DRAINAGE PANS.
4. CONTRACTOR IS RESPONSIBLE FOR RESTORING ALL DISTURBED AREAS TO THEIR ORIGINAL CONDITIONS.
5. ALL SPOT ELEVATIONS ARE TO FINISHED GRADE OR FLOWLINE UNLESS OTHERWISE SPECIFIED.
6. IF WALL IS SHOWN, TG DENOTES THE FINISHED GRADE ADJACENT TO THE HIGH SIDE OF THE WALL. BG DENOTES THE FINISHED GRADE ADJACENT TO THE LOW SIDE OF THE WALL. REFER TO ARCH PLANS/DETAILS FOR WALL ELEVATIONS BEYOND THE ADJACENT FINISHED GRADES (EXPOSED WALL, CAP/FOOTER, ETC.)

100 0 100 200
SCALE IN FEET

hord | coplan | macht
LANDSCAPE ARCHITECT / ARCHITECT
1800 Wazee St., Suite 450
Denver, CO 80202
p. 303.607.0977

CIVIL ENGINEER / STRUCTURAL ENGINEER
JVA Incorporated
1675 Larimer Street, #500
Denver, CO 80202
p. 303.444.1951

ELECTRICAL ENGINEER
Ackerman Engineering, Inc.
3000 Youngfield Street, #264
Wheat Ridge, CO 80215
p. 303.278.7297

IRRIGATION
Avocet Irrigation
11757 W. Ken Caryl Ave., Suite F-509
Littleton, CO 80127
p. 303.986.2175

MECHANICAL ENGINEER
ENVISION Mechanical Engineers, Inc.
9777 Pyramid Court, #260
Englewood, CO 80112
p. 303.688.0223

Town of Parker
SALISBURY PARK NORTH - PHASE 1
1700 MOTSENBOCKER RD
PARKER, CO 80134

hord | coplan | macht
ARCHITECTURE
LANDSCAPE ARCHITECTURE
PLANNING
INTERIOR DESIGN

Δ	DATE	DESCRIPTION

Project Number:	223072.00
Sheet Issue Date:	2024-10-04
Drawn By:	AMF/MGG/MJS
Checked By:	WTP/CWK/CFG

Drawing
PHASE 1 OVERALL GRADING & DRAINAGE PLAN

C1-100

60% CONSTRUCTION DOCUMENTS

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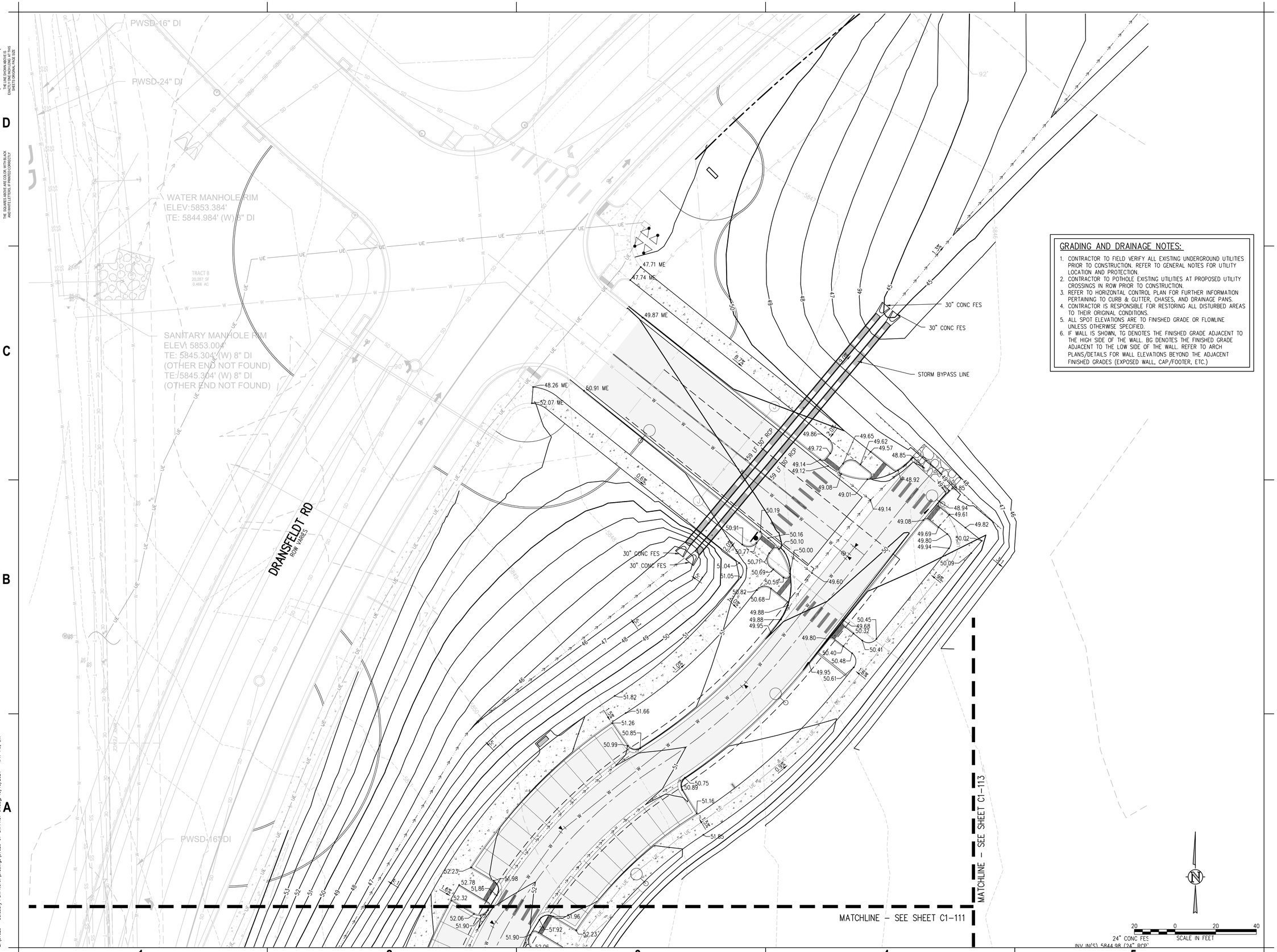

GRADING AND DRAINAGE NOTES:

1. CONTRACTOR TO FIELD VERIFY ALL EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. REFER TO GENERAL NOTES FOR UTILITY LOCATION AND PROTECTION.
2. CONTRACTOR TO POTHOLE EXISTING UTILITIES AT PROPOSED UTILITY CROSSINGS IN ROW PRIOR TO CONSTRUCTION.
3. REFER TO HORIZONTAL CONTROL PLAN FOR FURTHER INFORMATION PERTAINING TO CURB & GUTTER, CHASES, AND DRAINAGE PANS.
4. CONTRACTOR IS RESPONSIBLE FOR RESTORING ALL DISTURBED AREAS TO THEIR ORIGINAL CONDITIONS.
5. ALL SPOT ELEVATIONS ARE TO FINISHED GRADE OR FLOWLINE UNLESS OTHERWISE SPECIFIED.
6. IF WALL IS SHOWN, TG DENOTES THE FINISHED GRADE ADJACENT TO THE HIGH SIDE OF THE WALL. BG DENOTES THE FINISHED GRADE ADJACENT TO THE LOW SIDE OF THE WALL. REFER TO ARCH PLANS/DETAILS FOR WALL ELEVATIONS BEYOND THE ADJACENT FINISHED GRADES (EXPOSED WALL, CAP/FOOTER, ETC.)

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PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-110

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MATCHLINE – SEE SHEET C1-110

MATCHLINE – SEE SHEET C1-113

MATCHLINE – SEE SHEET C1-114

MATCHLINE – SEE SHEET C1-112

30" CONC FES

30" CONC FES

670 LF 30" RCP

663 LF 30" RCP

SD CLEANOUT
RIM 5852.91

270 LF 15" PERF HDPE

SYNTHETIC TURF
FLAT DRAIN (TYP)

SYNTHETIC TURF
MULTI-USE FIELDS
(RE: LSCAPE)

GRADING AND DRAINAGE NOTES:

1. CONTRACTOR TO FIELD VERIFY ALL EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. REFER TO GENERAL NOTES FOR UTILITY LOCATION AND PROTECTION.
2. CONTRACTOR TO POTHOLE EXISTING UTILITIES AT PROPOSED UTILITY CROSSINGS IN ROW PRIOR TO CONSTRUCTION.
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PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-111

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MATCHLINE – SEE SHEET C1-111

MATCHLINE – SEE SHEET C1-115

MOTSENBOCKER RD
ROW VARIES

670 LF 30" RCP

663 LF 30" RCP

4:1

SYNTHETIC TURF FLAT DRAIN (TYP)

0.5%

CONCRETE PAN (TYP)

SOUTHWEST PARKING LOT

PARCEL 2
25' PERMANENT PARKER WATER AND SANITATION DISTRICT EASEMENT
REC NO. 2019046082

5' SD MH (ECC)

STORM BYPASS LINE

405 LF 30" RCP

406 LF 30" RCP

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PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-112

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MATCHLINE – SEE SHEET C1–110

MATCHLINE – SEE SHEET C1–111

MATCHLINE – SEE SHEET C1–116

MATCHLINE – SEE SHEET C1–117

MATCHLINE – SEE SHEET C1–114

24" CONC FES
INV IN(S) 5844.98 (24" RCP)

136 LF 24" RCP

1.4%

0.5%

1.0%

1.3%

51.07

51.41

51.56

50.59

50.43

50.18

49.42

S 00°00'16" E 2648.99' (BASIS OF BEARINGS) EAST LINE OF THE NE 1/4 OF SEC. 28

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PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-113

60% CONSTRUCTION DOCUMENTS

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MATCHLINE – SEE SHEET C1–110

MATCHLINE – SEE SHEET C1–111

MATCHLINE – SEE SHEET C1–116

MATCHLINE – SEE SHEET C1–117

MATCHLINE – SEE SHEET C1–114

5' SHOULDER @ 2%

PAVILION STAGE STEPS (RE:LSCAPE)

GRADE BREAK LINE (TYP)

COMMUNITY HUB BUILDING AND AREA, ALTERNATE 1

6" RD CONNECTION GR 5848.82

33 LF 6" PVC

12" CONC FES INV 5846.00

43 LF 8" PVC

STM TEE

21 LF 8" PVC

6" RD CONNECTION GR 5849.00

27 LF 8" PVC

6" RD CONNECTION GR 5849.01

21 LF 6" PVC

6" RD CONNECTION GR 5848.83

33 LF 6" PVC

90° BEND

136 LF 24" RCP

N 89°59'16"E 2648.99' (BASIS OF BEARINGS) EAST LINE OF NE 1/4 OF SEC. 28

SCALE IN FEET

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PHASE 1 DETAILED GRADING AD DRAINAGE PLAN ALTERNATE 1

C1-113A

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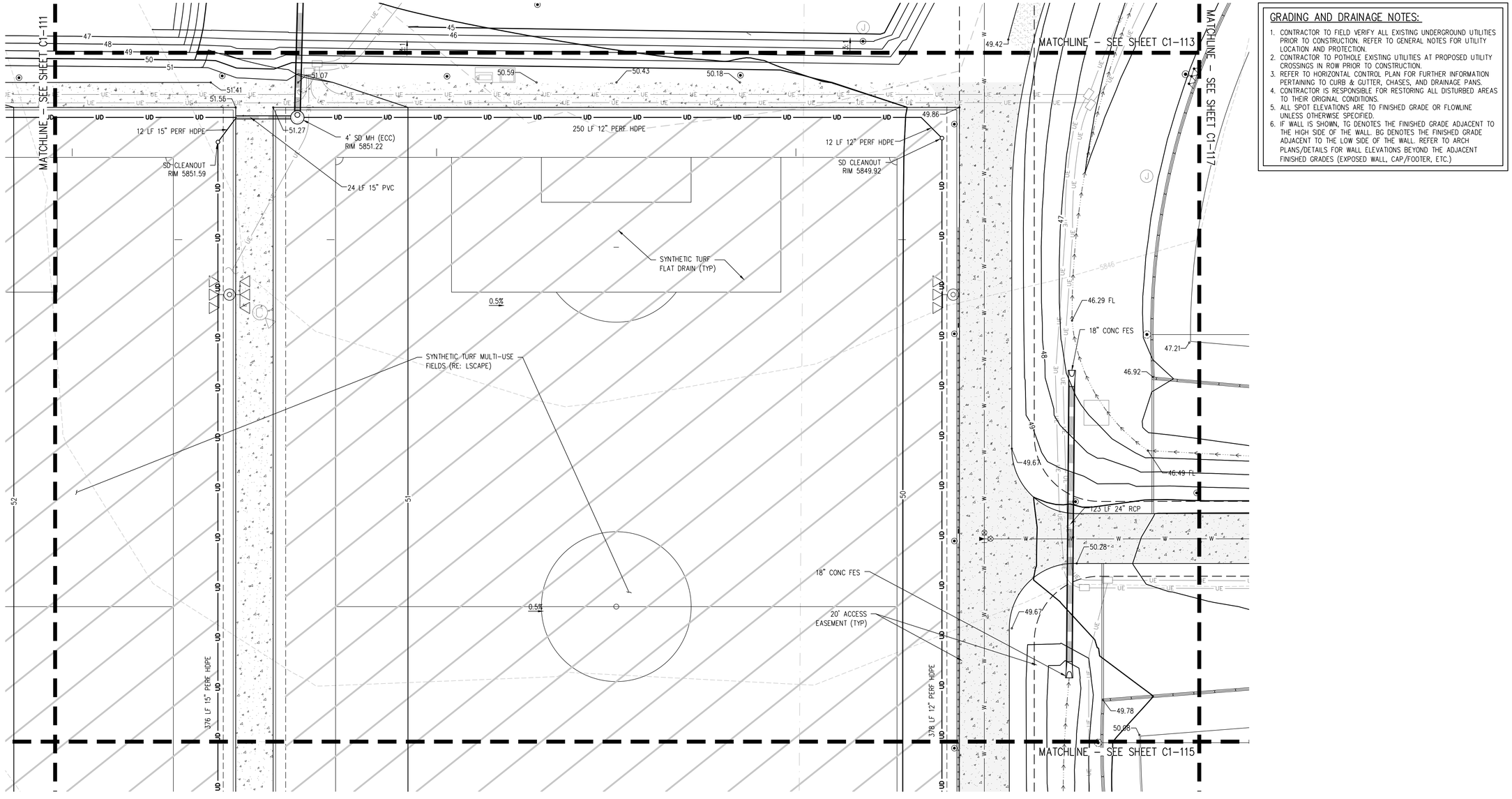

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N

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PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-114

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MATCHLINE – SEE SHEET C1-114

MATCHLINE – SEE SHEET C1-112

MATCHLINE – SEE SHEET C1-118

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SYNTHETIC TURF
FLAT DRAIN (TYP)

SD CLEANOUT
RIM 5851.59

SD CLEANOUT
RIM 5849.92

376 LF 15"

378 LF 12" PE

273 LF 18" PVC

27 LF 24" PVC

107 LF 24" PVC

SIDEWALK CHASE (TYP)

SINGLE COMBINATION INLET
GR 5852.72

SINGLE COMBINATION INLET
GR 5851.30

SINGLE COMBINATION INLET
GR 5851.62

SOUTHWEST PARKING LOT

5' SD MH (ECC)

5' SD MH (ECC)

35 LF 30" RCP

28 LF 30" RCP

30" CONC FES
GR 5853.44

30" CONC FES
GR 5853.44

24" CONC FES

48.08 FF

0.5%

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C1-115

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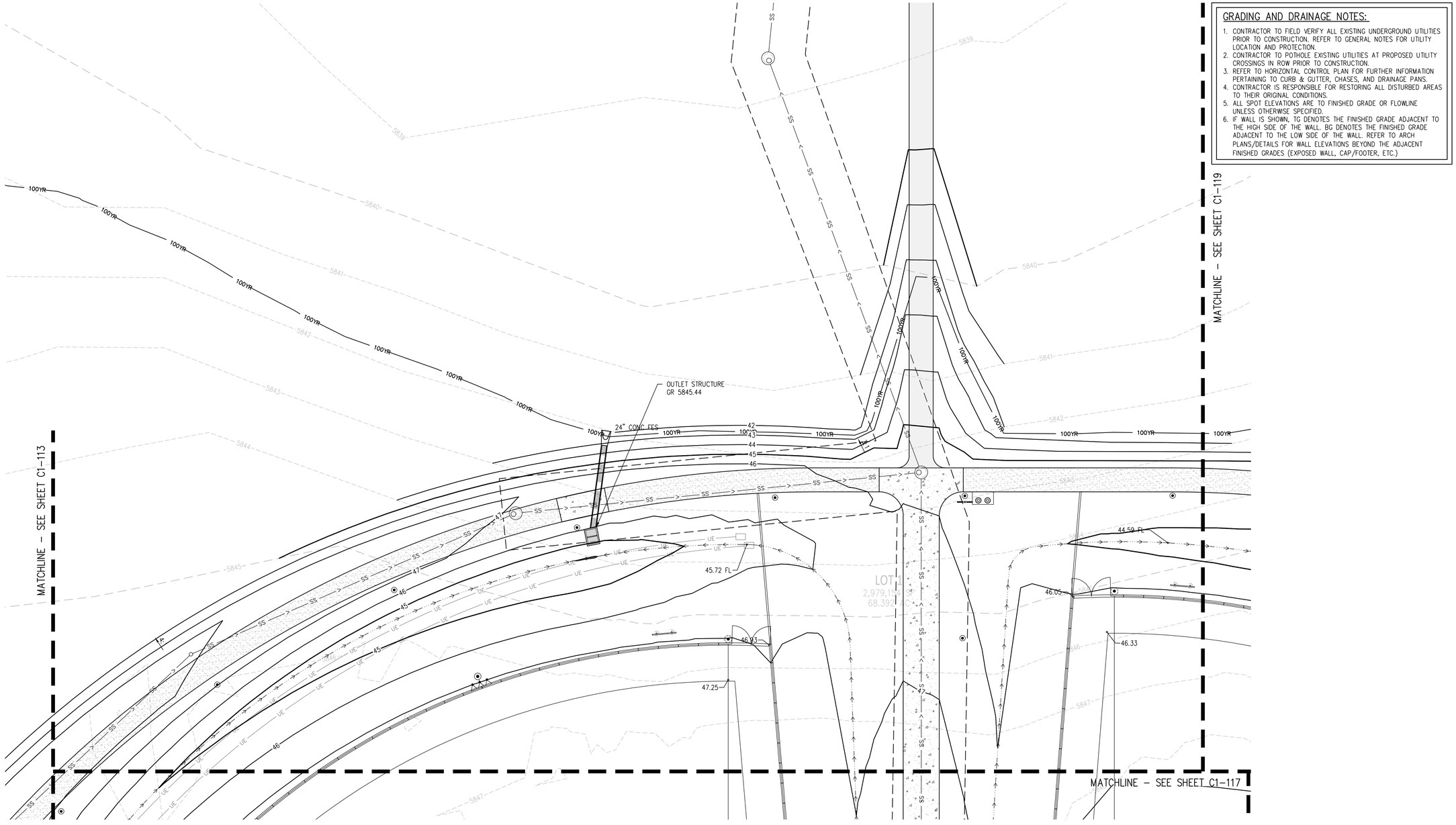

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PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-116

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MATCHLINE – SEE SHEET C1–116

MATCHLINE – SEE SHEET C1–113

MATCHLINE – SEE SHEET C1–120

MATCHLINE – SEE SHEET C1–118

BALLFIELD
(RE: LSCAPE)

SIDEWALK CHASE

18" TALL WALL (RE: LSCAPE)

188 LF 8" TRENCH DRAIN

112 LF 8" TRENCH DRAIN

NULL STRUCTURE
INV OUT(E) 5847.44 (4" PVC)

49 LF 4" PVC

120 LF 4" PVC

78 LF 4" PVC

91 LF 4" PVC

19 LF 12" PVC

6" RD CONNECTION
GR 5850.61
17 LF 6" PVC

6" RD CONNECTION
GR 5850.66

HQ BLDG
FFE=5853.00' (ARCH 100'-0")

GRADING AND DRAINAGE NOTES:

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Drawing
PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-117

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MATCHLINE – SEE SHEET C1–117

MATCHLINE – SEE SHEET C1–115

MATCHLINE – SEE SHEET C1–121

MATCHLINE – SEE SHEET C1–122

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BALLFIELD
(RE: LSCAPE)

PARCEL 3
25' PERMANENT FARMER WATER AND SANITATION DISTRICT EASEMENT
REC NO. 2017046082

STORM MANHOLE RIM
ELEV:5854.644'
INV OUT: 5846.334' (S) 36" RCP
NO FLOW

STORM MANHOLE RIM
ELEV:5852.875'
INV IN: 5847.375' (W) 36" RCP
INV OUT: 5847.325' (S) 36" RCP
NO FLOW

STORM MANHOLE RIM
ELEV:5852.775'
INV IN: 5847.925' (S) 36" RCP

TOP-36" RCP-QL C

TOP-36" RCP

TOP-36" RCP

PWSD-16" PVC

PWSD-16" PVC

19 LF 12" PVC

91 LF 4" PVC

ONC RES

INV INLET

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PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-118

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MATCHLINE – SEE SHEET C1–116

MATCHLINE – SEE SHEET C1–120

MATCHLINE – SEE SHEET C1–123

OUTLET STRUCTURE GR 5843.13

24" CONC FES

18" CONC FES

25 LF 18" RCP

30:1

135 LF 24" RCP

OUTLET STRUCTURE GR 5845.39

43.51 FL

100YR

UE

5840 5841 5842 5843 5844 5845 5846 5847

43.66 43.85 43.77 43.82 44.35 44.40 44.34 44.41 44.17 44.18 44.27 44.61 44.62 44.59 44.44 44.43 44.45 44.55 44.76 44.85 44.87 44.86 44.90 44.96 45.07 44.51 44.75 44.87 44.84 44.98 45.09 45.10 45.22 45.31 45.38 45.48 45.60 45.22

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PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-119

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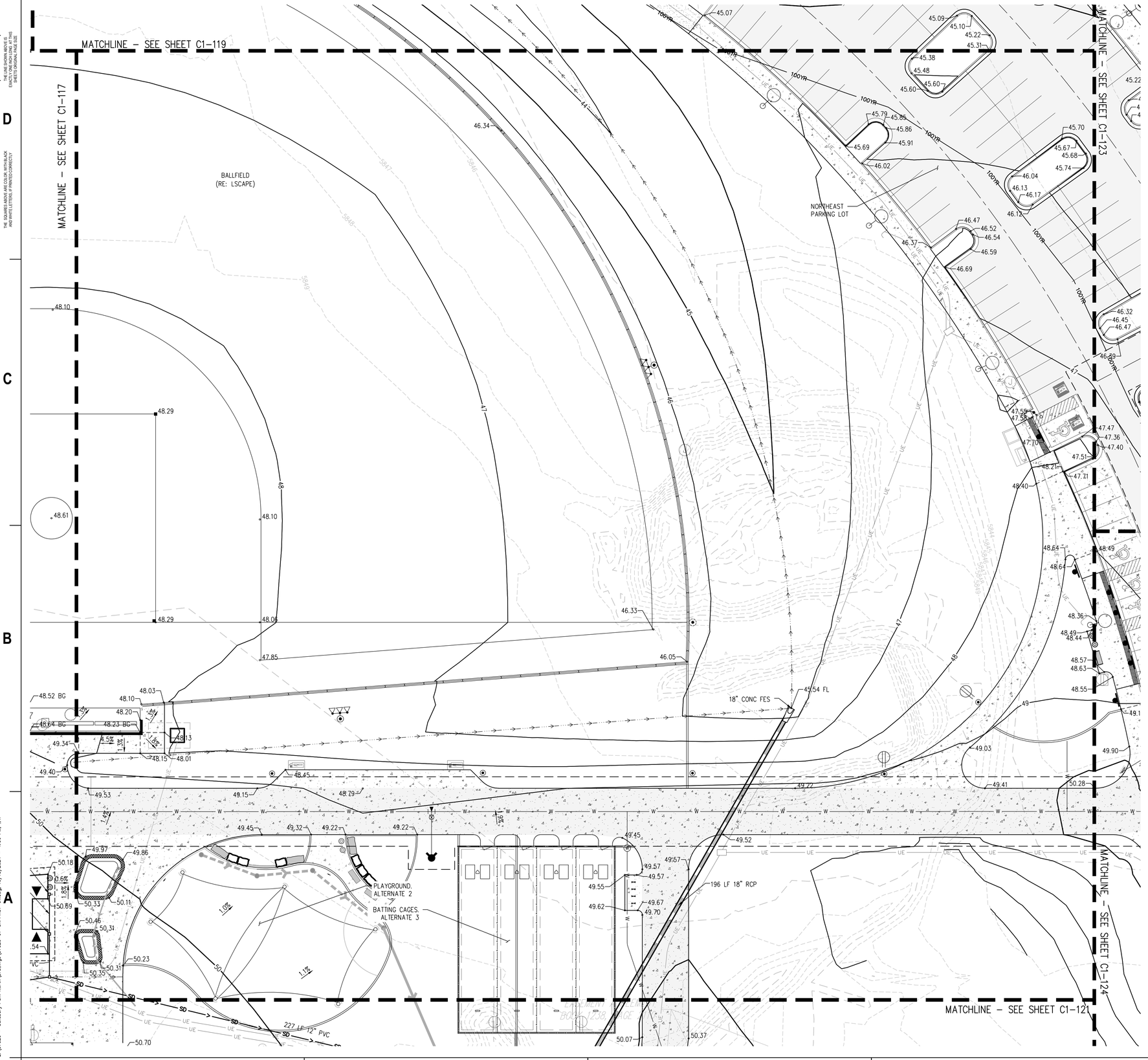

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C1-120

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MATCHLINE – SEE SHEET C1–120

MATCHLINE – SEE SHEET C1–118

MATCHLINE – SEE SHEET C1–124

MATCHLINE – SEE SHEET C1–125

MATCHLINE – SEE SHEET C1–122

19 LF 12" PVC

227 LF 12" PVC

12" CONC FES

18" CONC FES

STORM MANHOLE RIM
ELEV:5855.472
INV IN: 5845.772' (W) 36" RCP
INV OUT: 5845.762' (E) 36" RCP
NO FLOW

BALLFIELD
(RE: LSCAPE)

CULVERT
INV:5845.663 (W) 36" RCP
STAGNANT

10' UTILITY EASEMENT
REC. NO. 2009096862

STORM MANHOLE RIM
ELEV: 5852.469'
INV IN: 5845.309' (S) 36" RCP
INV OUT: 5845.109' (E) 36" RCP
NO FLOW

STORM DROP INLET RIM
ELEV: 5851.444'
INV OUT: 5845.324' (N) 36" RCP
NO FLOW

TOP-36" RCP

TOP-36" RCP

TOP-36" RCP-QL C

???.???

SCALE IN FEET

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PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-121

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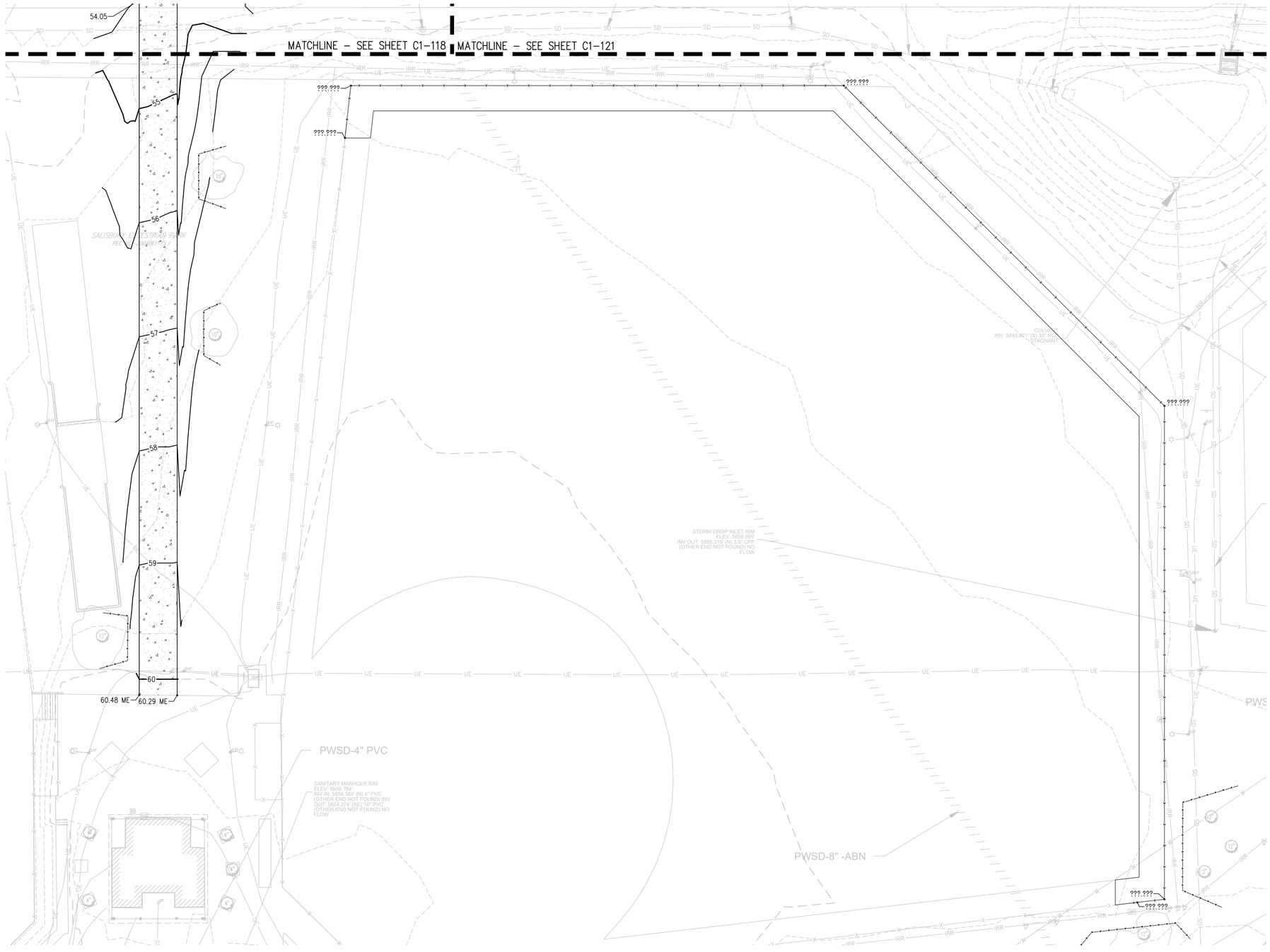

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N

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C1-122

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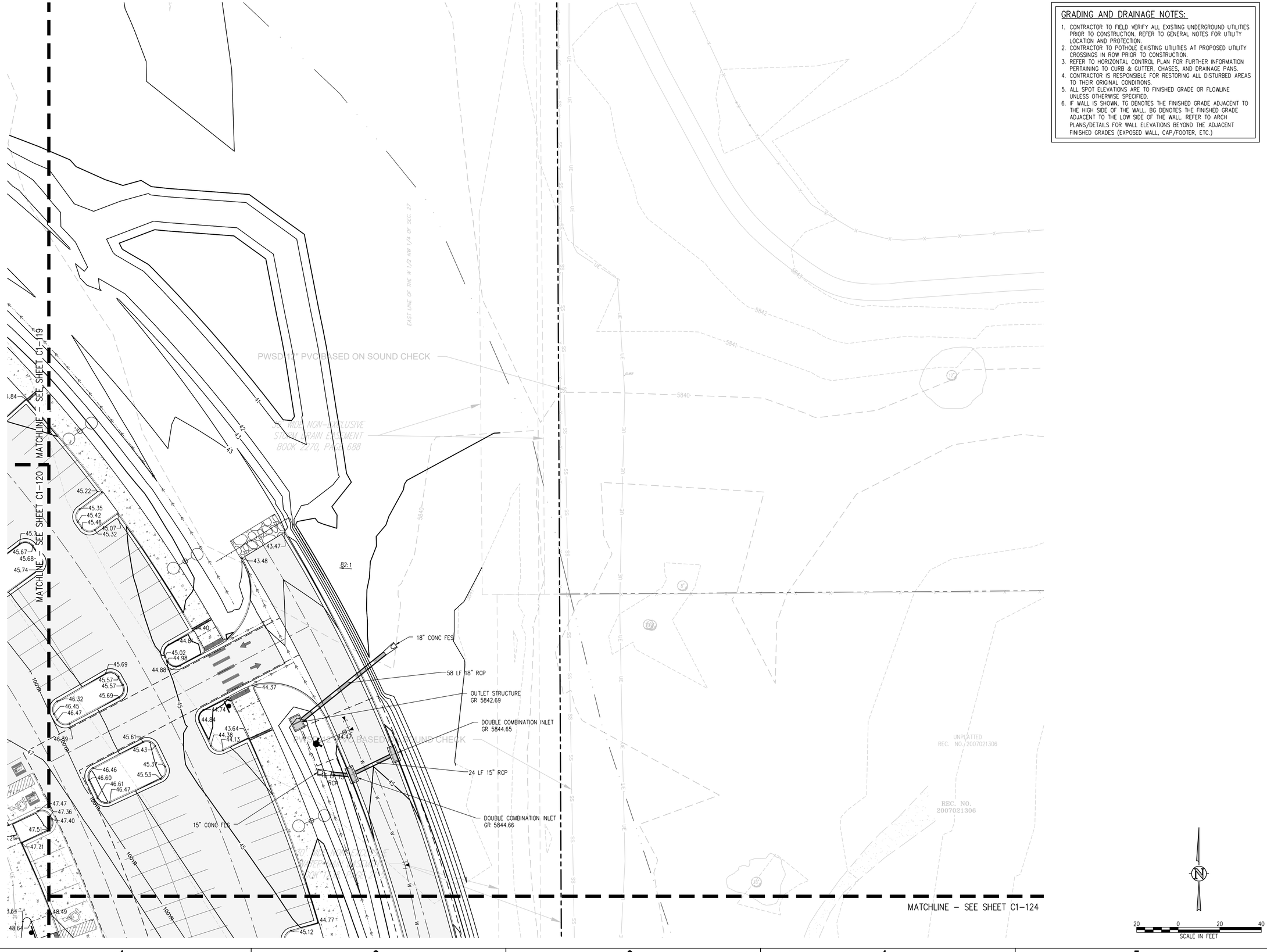

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C1-123

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MATCHLINE – SEE SHEET C1–123

MATCHLINE – SEE SHEET C1–120

MATCHLINE – SEE SHEET C1–121

MATCHLINE – SEE SHEET C1–125

DOES A PEDESTRIAN LIGHT NEED TO BE MOVED HERE FROM PHASE 2?

15" CONC FES

SALISBURY PARK SOUTH ACCESS

DOUBLE COMBINATION INLET
GR 5847.52

59 LF 15" RCP

18" CONC FES

110 LF 18" RCP

18" CONC FES

SIDEWALK CHASE (TYP)

SIDEWALK CHASE (TYP)

CULVERT
INV: 5841.713' (S) 36" RCP
STAGNANT

STORM MANHOLE RIM
ELEV:5846.939'
INV IN: 5842.139' (S) 36" RCP
INV OUT: 5842.069' (N) 36" RCP
NO FLOW

30' WIDE NON-EXCLUSIVE WATER MAIN EASEMENT BOOK 1238, PAGE 2115

10' UTILITY EASEMENT REC. NO. 2000047

TOP-36" RCP

EXIST. MH
RIM: 5851.27

PWSD-12" PVC BASED ON SOUND CHECK

SCALE IN FEET: 20 0 20 40

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Town of Parker
SALISBURY PARK NORTH - PHASE 1
1700 MOTSENBOCKER RD
PARKER, CO 80134

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ARCHITECTURE
LANDSCAPE ARCHITECTURE
PLANNING
INTERIOR DESIGN

Δ	DATE	DESCRIPTION

Project Number:	223072.00
Sheet Issue Date:	2024-10-04
Drawn By:	AMF/MGG/MJS
Checked By:	WTP/CWK/CFG

Drawing
PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-124

60% CONSTRUCTION DOCUMENTS

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MATCHLINE – SEE SHEET C1-121

MATCHLINE – SEE SHEET C1-124

MATCHLINE – SEE SHEET C1-126

GRADING AND DRAINAGE NOTES:

1. CONTRACTOR TO FIELD VERIFY ALL EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. REFER TO GENERAL NOTES FOR UTILITY LOCATION AND PROTECTION.
2. CONTRACTOR TO POTHOLE EXISTING UTILITIES AT PROPOSED UTILITY CROSSINGS IN ROW PRIOR TO CONSTRUCTION.
3. REFER TO HORIZONTAL CONTROL PLAN FOR FURTHER INFORMATION PERTAINING TO CURB & GUTTER, CHASES, AND DRAINAGE PANS.
4. CONTRACTOR IS RESPONSIBLE FOR RESTORING ALL DISTURBED AREAS TO THEIR ORIGINAL CONDITIONS.
5. ALL SPOT ELEVATIONS ARE TO FINISHED GRADE OR FLOWLINE UNLESS OTHERWISE SPECIFIED.
6. IF WALL IS SHOWN, TG DENOTES THE FINISHED GRADE ADJACENT TO THE HIGH SIDE OF THE WALL. BG DENOTES THE FINISHED GRADE ADJACENT TO THE LOW SIDE OF THE WALL. REFER TO ARCH PLANS/DETAILS FOR WALL ELEVATIONS BEYOND THE ADJACENT FINISHED GRADES (EXPOSED WALL, CAP/FOOTER, ETC.)

PWSD-12" PVC BASED ON FOUND CHECK

183 LF EXIST 36" RCP

DRAINAGE EASEMENT REC. NO. 2005025933

NO ACCESS

STORM DROP INLET RIM
ELEV: 5850.423'
INV IN: 5842.823' (W) 36" RCP
INV OUT: 5842.823' (N) 36" RCP
NO FLOW

PWSD-16" PVC

CULVERT
INV: 5849.133' (E) 16" DI
NO FLOW

TOP-16" DI-QL B

CULVERT
INV: 5848.5457' (W) 16" DI
NO FLOW

EXIST MH
RIM 5855.26

PWSD-12" PVC

PWSD-20" PVC

PWSD-12" PVC

PWSD-12" - ABN

TOP- 18" RCP-QL B

PWSD-12" PVC

PWSD-QL B

PWSD-QL D

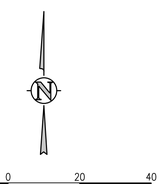
PWSD

WELL

GRASS

TP

100YR



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1800 Wazee St., Suite 450
Denver, CO 80202
p. 303.607.0977

CIVIL ENGINEER / STRUCTURAL ENGINEER
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p. 303.444.1951

ELECTRICAL ENGINEER
Ackerman Engineering, Inc.
3000 Youngfield Street, #264
Wheat Ridge, CO 80215
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IRRIGATION
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PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-125

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MATCHLINE – SEE SHEET C1-125

MATCHLINE – SEE SHEET C1-127

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Drawing
PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-126

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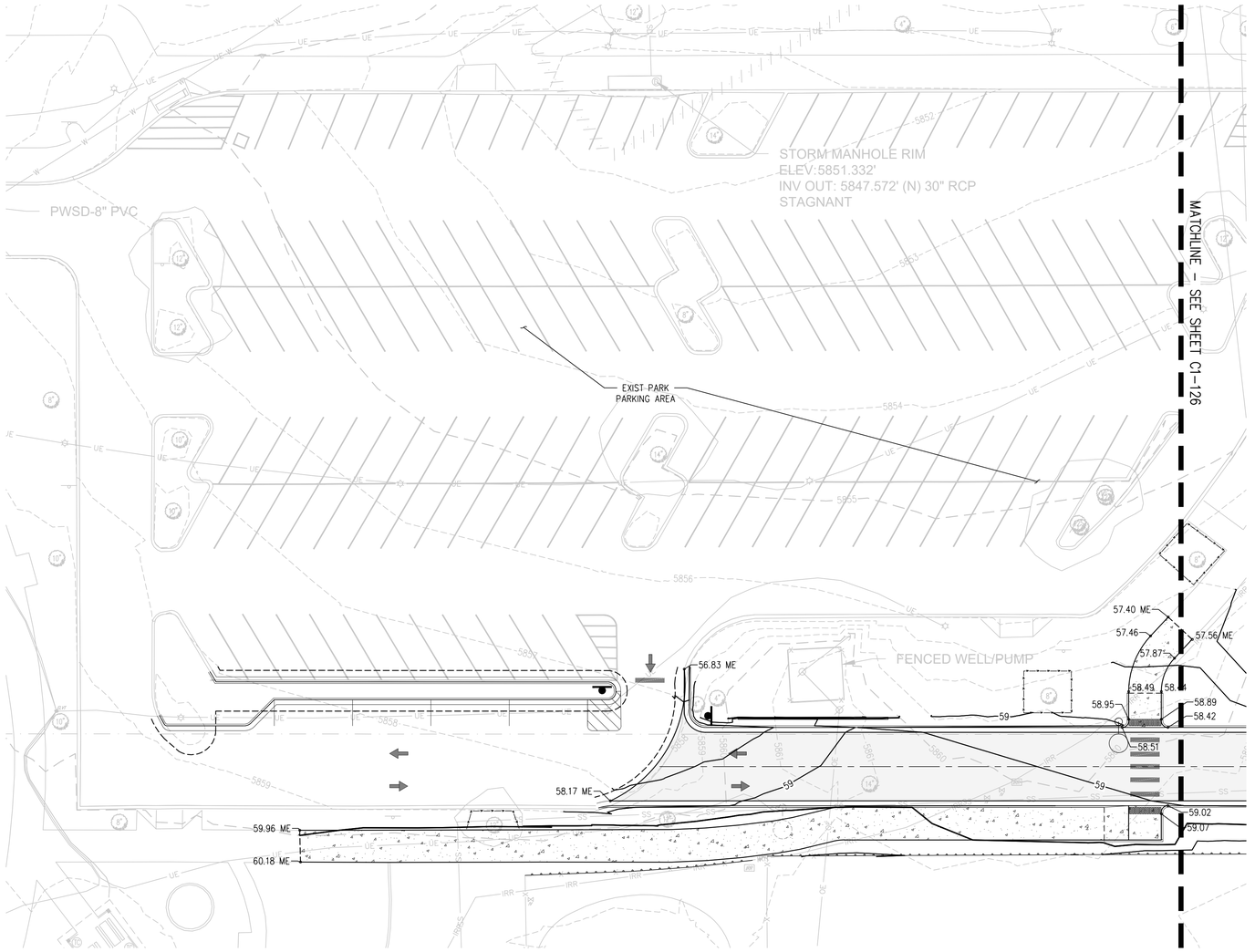

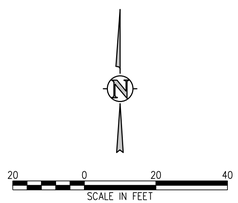

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PHASE 1 DETAILED GRADING & DRAINAGE PLAN

C1-127

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APPENDIX G: DIGITAL DATA

APPENDIX C – HYDROLOGIC COMPUTATIONS

JVA Incorporated
1319 Spruce Street
Boulder, CO 80302
Ph: (303) 444 1951

Project Information:

Job Name:	Salisbury Regional Park Phase 1
Job Number:	3752c
Date:	4/30/2025
Designed by:	KAM
Municipality :	Parker

Runoff Calculations:

Minor Design Storm:	5	year
Major Design Storm:	100	year

Detention Calculations:

Minor Storm Detention:	EURV	year
Major Storm Detention:	100	year
Detention Volume by:	EURV (MHFD)	

Allowable Release Rates (if applicable):

Max release rate 1 cfs / acre? Yes

Enter Offsite flows to bypass site (these will be added to the allowable release rates)

Qminor = 0.00 cfs (bypass flows)

Q100 = 0.00 cfs (bypass flows)

Rainfall Data Information:

Enter City, Town, or County: Parker

Frequency of Design Event	One Hour Point Rainfall P1	
2 yr	0.82	in
5 yr	1.10	in
10 yr	1.34	in
100 yr	2.29	in

Runoff Coefficient Calculations:

Use MHFD Equations? Yes

Intensity Duration Values:

I-D-F Calculate

JVA Incorpo
1319 Spruce S
Boulder, CO
Ph: (303) 44

Job Name: Salisbury Regional Park Phase 1
Number: 3752c
Date: 4/30/25
By: KAM

Municipality: Parker

Salisbury Regional Park Phase 1

Historic Runoff Coefficient & Time of Concentration Calculations

Municipality: Parker
Impervious Values: MHFD
Runoff Coefficients: MHFD Formulae
Major Design Storm: 100
Minor Design Storm: 5

Basin Design Data

		I (%) =	5%	95%			I (%)	Runoff Coefficients (MHFD Forumulae Table 6-5)				Initial Overland Time (t_i) MHFD Eq 6-3			Channelized Travel Time (t_t) MHFD Eq 6-4						t_c Comp	Regional Check ($t_{regional}$) MHFD Eq 6-5			t_c Final
Basin Name	Soil Type	Design Point	Area (sf) Undisturbed Native	Area (sf) Concrete Drives/Walks	A_{Total} (sf)	A_{Total} (ac)	Imp (%)	C2	C5	C10	C100	Length (ft)	Slope (%)	t_i (min)	Length (ft)	Slope (%)	Type of Land Surface	K	Velocity (fps)	t_t (min)	Time of Conc $t_i + t_t = t_c$	Channelized Length (ft)	Channelized Slope (ft/ft)	$t_{regional}$	t_c or $t_{regional}$
H1	C/D	1	759,288	5,897	765,185	17.57	5.7%	0.03	0.08	0.17	0.51	500	1.4%	37.8			Paved areas & shallow paved	20	0.0	0.0	37.8	0	0.000	N/A	37.8
H2	C/D	2	1,951,339		1,951,339	44.80	5.0%	0.03	0.08	0.17	0.50	500	1.0%	42.6			Paved areas & shallow paved	20	0.0	0.0	42.6	0	0.000	N/A	42.6
H3	C/D	3	35,811	970	36,780	0.84	7.4%	0.04	0.10	0.19	0.51	19	25.0%	2.7	163	1.8%	Paved areas & shallow paved	20	2.7	1.0	3.8	163	0.018	26.8	5.0
H4	C/D	4	516304.11	22422.37	538,726	12.37	8.7%	0.05	0.11	0.20	0.52	438	1.4%	34.1	570	0.5%	Grassed waterway	15	1.1	9.0	43.0	570	0.005	37.7	37.7
	TOTAL SITE		3,262,742	29,289	3,292,031	75.57	5.8%	0.03	0.08	0.17	0.51														

$I = (28.5\ P1) / ((10 + TC)\ 0.786)$

			Runoff Coeff's				Rainfall Intensities (in/hr)				Area		Flow Rates (cfs)			
Basin Name	Design Point	Time of Conc (tc)	C2	C5	C10	C100	2	5	10	100	A_{Total} (sf)	A_{Total} (ac)	Q2	Q5	Q10	Q100
H1	1	37.8	0.03	0.08	0.17	0.51	1.12	1.50	1.83	3.12	765,185	17.57	0.66	2.15	5.58	27.84
H2	2	42.6	0.03	0.08	0.17	0.50	1.04	1.39	1.70	2.90	1,951,339	44.80	1.35	4.72	12.82	65.50
H3	3	5.0	0.04	0.10	0.19	0.51	2.79	3.73	4.55	7.77	36,780	0.84	0.11	0.30	0.71	3.37
H4	4	37.7	0.05	0.11	0.20	0.52	1.13	1.50	1.83	3.13	538,726	12.37	0.75	1.98	4.45	20.13
										TOTAL SITE	3,292,031	75.57	2.87	9.15	23.57	116.85

JVA Incorporated
1319 Spruce Street
Boulder, CO 80302
Ph: (303) 444 1951

Job Name: Salisbury Regional Park Phase 1
Job Number: 3752c
Date: 4/30/25
By: KAM

Salisbury Regional Park Phase 1

Composite Runoff Coefficient Calculations

Municipality: Parker
Impervious Values: MHFD
Runoff Coefficients: MHFD Formulae

Basin Design Data

		I (%) =	95%	95%	95%	20%	60%	5%	40%			I (%)	Runoff Coefficients (MHFD Forumulae Table 6-5)			
Basin Name	Soil Type	Design Point	Area (sf) Streets Paved	Area (sf) Concrete Drives/Walks	Area (sf) Roof	Area (sf) Landscaping	Area (sf) Artificial Turf (Sports Fields)	Area (sf) Undisturbed Native	Area (sf) Gravel (Pedestrian)	A_{Total} (sf)	A_{Total} (ac)	Imp (%)	C2	C5	C10	C100
A1	C/D	1		6,899		18,922			1,070	26,891	0.62	40.0%	0.30	0.36	0.43	0.65
A2	C/D	2		28,471	3,467	11,513				43,451	1.00	75.1%	0.61	0.65	0.68	0.79
A3	C/D	3		8,883		99,366				108,249	2.49	26.2%	0.19	0.25	0.32	0.59
A4	C/D	4		41,552		191,216				232,768	5.34	33.4%	0.24	0.31	0.38	0.62
A5	C/D	5	26,219	12,784		28,084				67,088	1.54	63.6%	0.50	0.55	0.60	0.74
A6	C/D	6	14,455							14,455	0.33	95.0%	0.79	0.81	0.83	0.87
A7	C/D	7	14,203							14,203	0.33	95.0%	0.79	0.81	0.83	0.87
A8	C/D	8	34,562	2,630		63,598				100,790	2.31	47.7%	0.36	0.42	0.48	0.68
C1	C/D	10	31,860	7,024		64,739				103,623	2.38	48.1%	0.37	0.43	0.49	0.68
C2	C/D	11	30,714	5,552		6,425				42,691	0.98	83.7%	0.68	0.72	0.75	0.83
C3	C/D	12		4,026		21,919				25,945	0.60	31.6%	0.23	0.29	0.36	0.61
C4	C/D	13		18,552		130,571				149,123	3.42	29.3%	0.21	0.27	0.35	0.60
C5	C/D	14		28,629		146,505				175,134	4.02	32.3%	0.23	0.30	0.37	0.62
D1	C/D	16		291		19,932				20,223	0.46	21.1%	0.15	0.21	0.29	0.57
D2	C/D	17		15,076		2,449	106,872			124,397	2.86	63.5%	0.50	0.55	0.60	0.74
D3	C/D	18		12,608		7,725	110,436			130,768	3.00	61.0%	0.48	0.53	0.58	0.73
D4	C/D	20				21,187		26,722		47,909	1.10	11.6%	0.07	0.13	0.22	0.53
E1	C/D	22	31,290	14,149		26,650				72,089	1.65	67.3%	0.53	0.58	0.63	0.76
OS1	C/D	24				60,712		64,360		125,072	2.87	12.3%	0.08	0.14	0.22	0.53
BP1	C/D	25				44,401				44,401	1.02	20.0%	0.14	0.20	0.28	0.57
BP2	C/D	26				107,745		656,710		764,455	17.55	7.1%	0.04	0.09	0.18	0.51
EX1	C/D	27				44,886		233,292		278,178	6.39	7.4%	0.05	0.10	0.19	0.51
EX2	C/D	28		22,422				516,304		538,726	12.37	8.7%	0.05	0.11	0.20	0.52
	TOTAL PROPERTY		183,303	229,546	3,467	1,118,545	217,308	1,497,389	1,070	3,250,628	74.62	25.4%	0.19	0.24	0.32	0.59
	TOTAL POND A		89,439	101,218	3,467	412,700	0	0	1,070	607,894	13.96	44.0%				
	TOTAL POND C		62,574	63,782	0	370,159	0	0	0	496,516	11.40	39.1%				
	TOTAL POND D		0	27,974	0	51,293	217,308	26,722	0	323,297	7.42	52.1%				
	TOTAL POND E		31,290	14,149	0	26,650	0	0	0	72,089	1.65	67.3%				

JVA Incorporated
1319 Spruce Street
Boulder, CO 80302
Ph: (303) 444 1951

Municipality: Parker

Job Name: Salisbury Regional Park Phase 1
Job Number: 3752c
Date: 4/30/25
By: KAM

Salisbury Regional Park Phase 1

Time of Concentration Calculations

Municipality: Parker
Impervious Values: MHFD
Runoff Coefficients: MHFD Formulae

Sub-Basin Data				Initial Overland Time (t_i) MHFD Eq 6-3			Channelized Travel Time (t_t) MHFD Eq 6-4						t_c Comp	Regional Check ($t_{regional}$) Eq 6-5 MHFD			t_c Final
Basin Name	Design Point	A_{Total} (ac)	C5	Length (ft)	Slope (%)	t_i (min)	Length (ft)	Slope (%)	Type of Land Surface	C_v	Velocity (fps)	t_t (min)	Time of Conc $t_i + t_t = t_c$	Channelized Length (ft)	Channelized Slope (ft/ft)	$t_{regional}$	t_c or $t_{regional}$
A1	1	0.62	0.36	98	1.30%	12.3	141	0.70%	Grassed waterway	15	1.3	1.9	14.2	141	0.007	21.1	14.2
A2	2	1.00	0.65	21	2.00%	3.0			Paved areas & shallow paved swales	20	0.0	0.0	3.0	0	0.000	N/A	5.0
A3	3	2.49	0.25	186	1.50%	18.6	376	0.70%	Grassed waterway	15	1.3	5.0	23.6	376	0.007	27.5	23.6
A4	4	5.34	0.31	300	1.20%	23.7	442	0.60%	Grassed waterway	15	1.2	6.3	30.0	442	0.006	27.3	27.3
A5	5	1.54	0.55	106	2.40%	7.7	31	2.40%	Paved areas & shallow paved swales	20	3.1	0.2	7.9	31	0.024	15.4	7.9
A6	6	0.33	0.81	12	2.00%	1.5	1136	1.40%	Paved areas & shallow paved swales	20	2.4	8.0	9.5	1136	0.014	17.0	9.5
A7	7	0.33	0.81	12	2.00%	1.5	1152	1.40%	Paved areas & shallow paved swales	20	2.4	8.1	9.6	1152	0.014	17.1	9.6
A8	8	2.31	0.42	221	2.20%	14.2	304	0.50%	Paved areas & shallow paved swales	20	1.4	3.6	17.8	304	0.005	22.5	17.8
C1	10	2.38	0.43	118	2.10%	10.5	554	0.70%	Paved areas & shallow paved swales	20	1.7	5.5	16.0	554	0.007	24.8	16.0
C2	11	0.98	0.72	76	1.60%	5.2	201	0.50%	Paved areas & shallow paved swales	20	1.4	2.4	7.6	201	0.005	14.1	7.6
C3	12	0.60	0.29	76	1.40%	11.5	288	0.60%	Grassed waterway	15	1.2	4.1	15.7	288	0.006	25.2	15.7
C4	13	3.42	0.27	271	1.40%	22.3	497	0.40%	Grassed waterway	15	0.9	8.7	31.0	497	0.004	31.0	31.0
C5	14	4.02	0.30	143	1.00%	17.6	685	0.50%	Grassed waterway	15	1.1	10.8	28.3	685	0.005	32.5	28.3
D1	16	0.46	0.21	22	8.10%	3.8	151	0.60%	Grassed waterway	15	1.2	2.2	6.0	151	0.006	25.1	6.0
D2	17	2.86	0.55	276	0.50%	21.0			Short Pasture and lawns	7	0.0	0.0	21.0	0	0.000	N/A	21.0
D3	18	3.00	0.53	276	0.50%	21.8			Short Pasture and lawns	7	0.0	0.0	21.8	0	0.000	N/A	21.8
D4	20	1.10	0.13	275	1.90%	23.8			Paved areas & shallow paved swales	20	0.0	0.0	23.8	0	0.000	N/A	23.8
E1	22	1.65	0.58	39	2.70%	4.2	661	1.90%	Paved areas & shallow paved swales	20	2.8	4.0	8.2	661	0.019	18.9	8.2
OS1	24	2.87	0.14	287	2.00%	23.8	186	1.10%	Paved areas & shallow paved swales	20	2.1	1.5	25.3	186	0.011	26.7	25.3
BP1	25	1.02	0.20	173	8.00%	10.9	290	0.50%	Grassed waterway	15	1.1	4.6	15.4	290	0.005	28.4	15.4
BP2	26	17.55	0.09	125	6.80%	10.9	947	0.90%	Grassed waterway	15	1.4	11.1	22.0	947	0.009	41.4	22.0
EX1	27	6.39	0.10	125	6.80%	10.9	947	0.90%	Grassed waterway	15	1.4	11.1	22.0	947	0.009	41.3	22.0
EX2	28	12.37	0.11	438	1.40%	34.1	570	0.50%	Grassed waterway	15	1.1	9.0	43.0	570	0.005	37.7	37.7

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Job Name: Salisbury Regional Park Phase 1
Job Number: 3752c
Date: 4/30/25
By: KAM

Salisbury Regional Park Phase 1

Developed Storm Runoff Calculations

Design Storm : **100 Year**

Point Hour Rainfall (P_1) : **2.29**

$I = (28.5\ P1) / ((10 + TC)^{0.786})$

	Direct Runoff							Total Runoff				Inlets				Pipe					Pipe/Swale Travel Time				
Basin Name	Design Point	Area (ac)	C100	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Total tc (min)	ΣC*A (ac)	I (in/hr)	Q (cfs)	Inlet Type	Q intercepted	Q carryover	Q bypass	Pipe Size (in) or equivalent	Pipe Material	Slope (%)	Pipe Flow (cfs)	Max Pipe Capacity (cfs)	Length (ft)	Velocity (fps)	tt (min)	Total Time (min)	Notes
A1	1	0.62	0.65	14.2	0.40	5.34	2.14	14.16	0.40	5.34	2.14	Flared End Section	2.14	0.00	0.00	18 in	RCP	0.5%	2.1	8.0	31	3.6	0.15	14.30	Basin A1
A2	2	1.00	0.79	5.0	0.79	7.76	6.12	5.00	0.79	7.77	6.13	Perforated Drains	6.13	0.00	0.00	12 in	PVC	0.5%	**6.1**	3.5	487	4.2	1.95	6.95	Basin A2
A3	3	2.49	0.59	23.6	1.47	4.12	6.05	23.60	1.47	4.12	6.05														Basin A3
ROUTED TOTAL TO DP3								23.60	2.66	4.12	10.95	Flared End Section	10.95	0.00	0.00	18 in	RCP	0.3%	**11.0**	6.2	186	3.3	0.95	24.55	Basin A1+ A2 + A3
A4	4	5.34	0.62	27.3	3.32	3.79	12.57	27.28	3.32	3.80	12.59														Basin A4
ROUTED TOTAL TO DP4								27.28	5.97	3.80	22.69	Flared End Section	22.69	0.00	0.00	24 in	RCP	1.4%	22.7	28.9	327	9.5	0.58	27.86	DP3 + Basin A4
A5	5	1.54	0.74	7.9	1.15	6.76	7.75	7.87	1.15	6.77	7.76	Area Inlet	7.76	0.00	0.00	18 in	RCP	0.5%	7.8	8.0	14	4.2	0.06	7.93	Basin A5
A6	6	0.33	0.87	9.5	0.29	6.32	1.83	9.47	0.29	6.33	1.83														Basin A6
ROUTED TOTAL TO DP6								9.47	1.44	6.33	9.09	Combination Inlet	9.09	0.00	0.00	18 in	RCP	0.5%	**9.1**	8.0	24	4.2	0.10	9.56	Basin A5 + A6
A7	7	0.33	0.87	9.6	0.28	6.29	1.79	9.58	0.28	6.30	1.79														Basin A7
ROUTED TOTAL TO DP7								9.58	1.72	6.30	10.84	Combination Inlet	10.84	0.00	0.00	18 in	RCP	0.5%	**10.8**	8.0	11	4.2	0.04	9.62	DP6 + A7
A8	8	2.31	0.68	17.8	1.57	4.78	7.51	17.76	1.57	4.79	7.52	Sheet Flow to Pond	7.52	0.00	0.00										Basin A8
ROUTED TOTAL TO DP8								17.76	3.29	4.79	15.76	Pond	15.76	0.00	0.00										DP7 + Basin A8
OUTFLOW FROM POND @ DP9											**11.14**														From MHFD Detention Spreadsheet Pond A
C1	10	2.38	0.68	16.0	1.62	5.04	8.16	15.98	1.62	5.04	8.17	Combination Inlet	8.17	0.00	0.00	18 in	RCP	0.5%	**8.2**	8.0	273	4.2	1.08	17.06	Basin C1
C2	11	0.98	0.83	7.6	0.81	6.85	5.55	7.60	0.81	6.85	5.55														Basin C2
ROUTED TOTAL TO DP11								17.06	2.43	4.88	11.87	Combination Inlet	11.87	0.00	0.00	18 in	RCP	0.5%	**11.9**	8.0	331	4.2	1.31	18.38	Basin C1 + C2
C3	12	0.60	0.61	15.7	0.37	5.09	1.86	15.66	0.37	5.09	1.86	Flared End Section	1.86	0.00	0.00	12 in	RCP	0.5%	1.9	2.7	579	3.5	2.79	18.46	Basin C3
C4	13	3.42	0.60	31.0	2.07	3.52	7.28	31.01	2.07	3.52	7.29														Basin C4
ROUTED TOTAL TO DP13								31.01	4.86	3.52	17.13	Flared End Section	17.13	0.00	0.00	24 in	RCP	0.5%	17.1	17.2	123	5.1	0.40	31.41	DP11 + Basin C4 + C3
C5	14	4.02	0.62	28.3	2.48	3.71	9.19	28.35	2.48	3.71	9.20														Basin C5
ROUTED TOTAL TO DP14								31.41	7.34	3.50	25.66	Pond	25.66	0.00	0.00										DP13 + Basin C5
OUTFLOW FROM POND @ DP15											**17.07**														From MHFD Detention Spreadsheet Pond C
D1	16	0.46	0.57	6.0	0.26	7.38	1.95	5.99	0.26	7.39	1.96	Area inlets	1.96	0.00	0.00	12 in	PVC	0.5%	2.0	3.5	714	4.3	2.78	8.77	Basin D1
D2	17	2.86	0.74	21.0	2.12	4.38	9.30	21.02	2.12	4.39	9.32	Underdrain	9.32	0.00	0.00	12 in	HDPE	0.5%	**9.3**	2.9	410	3.5	1.97	22.99	Basin D2
D3	18	3.00	0.73	21.8	2.20	4.30	9.47	21.79	2.20	4.30	9.48	Underdrain	9.48	0.00	0.00	12 in	HDPE	0.5%	**9.5**	2.9	410	3.5	1.97	23.76	Basin D3
ROUTED TOTAL TO DP19								23.76	4.59	4.11	18.85		18.85	0.00	0.00	24 in	RCP	0.4%	**18.8**	14.4	100	4.3	0.39	24.15	Basin D1 + D2 + D3
D4	20	1.10	0.53	23.8	0.58	4.10	2.40	23.82	0.58	4.10	2.40	Sheet flow													Basin D4
ROUTED TOTAL TO DP20								24.15	5.17	4.07	21.05	Pond	21.05	0.00	0.00										DP19 + Basin D4
OUTFLOW FROM POND @ DP21											**2.90**		2.90												From MHFD Detention Spreadsheet Pond D
E1	22	1.65	0.76	8.2	1.26	6.65	8.35	8.24	1.26	6.66	8.37	Sheet Flow to Pond	8.37	0.00	0.00										Basin E1
OUTFLOW FROM POND @ DP23											**2.66**		2.66												From MHFD Detention Spreadsheet Pond E
OS1	24	2.87	0.53	25.3	1.53	3.96	6.07	25.27	1.53	3.97	6.09	Flared End Section	6.09	0.00	0.00	18 in	RCP	2.4%	6.1	17.4	110	8.3	0.22	25.49	Basin OS1
BP1	25	1.02	0.57	15.4	0.58	5.12	2.95	15.43	0.58	5.13	2.96	Flared End Section	2.96	0.00	0.00										Basin BP1 *
BP2	26	17.55	0.51	22.0	9.00	4.28	38.54	21.99	9.00	4.28	38.57														Basin BP2 *
TOTAL @ DP26 **											**61.20**	Ex. Flared End Section	61.20	0.00	0.00										DP15 + DP21 + DP23 + Basin BP2
EX1	27	6.39	0.51	22.0	3.28	4.28	14.06	21.96	3.28	4.29	14.08														
TOTAL @ DP27 **											**31.30**	Ex. Culvert													DP9 + Basin EX1 + OS1
EX2	28	12.37	0.52	37.7	6.43	3.13	20.12	37.65	6.43	3.13	20.13														
TOTAL @ DP28 **											**112.63**	Cherry Creek Drainageway	112.63	0.00	0.00										DP26 + DP27 + Basin EX2

* See the SWMM Model in this appendix for routed flows in the bypass pipes.

** Because these design points are receiving flows released from ponds, there is no C, A or tc to be used in the rational method. Therefore, these totals are summations of all tributary basins instead of routed flows.

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Job Name: Salisbury Regional Park Phase 1
Job Number: 3752c
Date: 4/30/25
By: KAM

Salisbury Regional Park Phase 1

Developed Storm Runoff Calculations

Design Storm : **5 Year**

Point Hour Rainfall (P_1) : **1.10**

$I = (28.5\ P1) / ((10 + TC)^{0.786})$

	Direct Runoff							Total Runoff				Inlets				Pipe					Pipe/Swale Travel Time				
Basin Name	Design Point	Area (ac)	C5	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Total tc (min)	ΣC*A (ac)	I (in/hr)	Q (cfs)	Inlet Type	Q intercepted	Q carryover	Q bypass	Pipe Size (in) or equivalent	Pipe Material	Slope (%)	Pipe Flow (cfs)	Max Pipe Capacity (cfs)	Length (ft)	Velocity (fps)	tt (min)	Total Time (min)	Notes
A1	1	0.62	0.36	14.2	0.22	2.56	0.57	14.16	0.22	2.57	0.57	Flared End Section	0.57	0.00	0.00	18 in	RCP	0.5%	0.6	8.0	31	2.4	0.22	14.37	Basin A1
A2	2	1.00	0.65	5.0	0.65	3.73	2.41	5.00	0.65	3.73	2.41	Perforated Drains	2.41	0.00	0.00	12 in	PVC	0.5%	2.4	3.5	487	4.5	1.81	6.81	Basin A2
A3	3	2.49	0.25	23.6	0.62	1.97	1.21	23.60	0.62	1.98	1.22														Basin A3
	ROUTED TOTAL TO DP3							23.60	1.49	1.98	2.94	Flared End Section	2.94	0.00	0.00	18 in	RCP	0.3%	2.9	6.2	186	3.2	0.97	24.57	Basin A1+ A2 + A3
A4	4	5.34	0.31	27.3	1.64	1.82	2.99	27.28	1.64	1.82	2.99														Basin A4
	ROUTED TOTAL TO DP4							27.28	3.13	1.82	5.70	Flared End Section	5.70	0.00	0.00	24 in	RCP	1.4%	5.7	28.9	327	6.7	0.81	28.09	DP3 + Basin A4
A5	5	1.54	0.55	7.9	0.85	3.25	2.77	7.87	0.85	3.25	2.77	Area Inlet	2.77	0.00	0.00	18 in	RCP	0.5%	2.8	8.0	14	3.8	0.06	7.93	Basin A5
A6	6	0.33	0.81	9.5	0.27	3.03	0.81	9.47	0.27	3.04	0.82														Basin A6
	ROUTED TOTAL TO DP6							9.47	1.12	3.04	3.41	Combination Inlet	3.41	0.00	0.00	18 in	RCP	0.5%	3.4	8.0	24	4.0	0.10	9.57	Basin A5 + A6
A7	7	0.33	0.81	9.6	0.26	3.02	0.80	9.58	0.26	3.03	0.80														Basin A7
	ROUTED TOTAL TO DP7							9.58	1.38	3.03	4.19	Combination Inlet	4.19	0.00	0.00	18 in	RCP	0.5%	4.2	8.0	11	4.3	0.04	9.62	DP6 + A7
A8	8	2.31	0.42	17.8	0.98	2.29	2.24	17.76	0.98	2.30	2.25	Sheet Flow to Pond	2.25	0.00	0.00										Basin A8
	ROUTED TOTAL TO DP8							17.76	2.36	2.30	5.44	Pond	5.44	0.00	0.00										DP7 + Basin A8
	OUTFLOW FROM POND @ DP9										**1.29**														From MHFD Detention Spreadsheet Pond A
C1	10	2.38	0.43	16.0	1.02	2.42	2.46	15.98	1.02	2.42	2.46	Combination Inlet	2.46	0.00	0.00	18 in	RCP	0.5%	2.5	8.0	273	3.7	1.23	17.21	Basin C1
C2	11	0.98	0.72	7.6	0.70	3.29	2.31	7.60	0.70	3.29	2.31														Basin C2
	ROUTED TOTAL TO DP11							17.21	1.72	2.34	4.02	Combination Inlet	4.02	0.00	0.00	18 in	RCP	0.5%	4.0	8.0	331	4.2	1.31	18.52	Basin C1 + C2
C3	12	0.60	0.29	15.7	0.17	2.44	0.43	15.66	0.17	2.45	0.43	Flared End Section	0.43	0.00	0.00	12 in	RCP	0.5%	0.4	2.7	579	2.4	4.10	19.76	Basin C3
C4	13	3.42	0.27	31.0	0.94	1.69	1.59	31.01	0.94	1.69	1.59														Basin C4
	ROUTED TOTAL TO DP13							31.01	2.83	1.69	4.79	Flared End Section	4.79	0.00	0.00	24 in	RCP	0.5%	4.8	17.2	123	4.4	0.47	31.48	DP11 + Basin C4 + C3
C5	14	4.02	0.30	28.3	1.20	1.78	2.13	28.35	1.20	1.78	2.14														Basin C5
	ROUTED TOTAL TO DP14							31.48	4.03	1.68	6.76	Pond	6.76	0.00	0.00										DP13 + Basin C5
	OUTFLOW FROM POND @ DP15										**0.32**														From MHFD Detention Spreadsheet Pond C
D1	16	0.46	0.21	6.0	0.10	3.54	0.34	5.99	0.10	3.55	0.34	Area inlets	0.34	0.00	0.00	12 in	PVC	0.5%	0.3	3.5	714	2.6	4.54	10.53	Basin D1
D2	17	2.86	0.55	21.0	1.58	2.10	3.31	21.02	1.58	2.11	3.32	Underdrain	3.32	0.00	0.00	12 in	HDPE	0.5%	**3.3**	2.9	410	3.5	1.97	22.99	Basin D2
D3	18	3.00	0.53	21.8	1.60	2.06	3.29	21.79	1.60	2.07	3.30	Underdrain	3.30	0.00	0.00	12 in	HDPE	0.5%	**3.3**	2.9	410	3.5	1.97	23.76	Basin D3
	ROUTED TOTAL TO DP19							23.76	3.27	1.97	6.45		6.45	0.00	0.00	24 in	RCP	0.4%	6.4	14.4	100	4.1	0.40	24.16	Basin D1 + D2 + D3
D4	20	1.10	0.13	23.8	0.14	1.96	0.28	23.82	0.14	1.97	0.28	Sheet flow													Basin D4
	ROUTED TOTAL TO DP20							24.16	3.41	1.95	6.67	Pond	6.67	0.00	0.00										DP19 + Basin D4
	OUTFLOW FROM POND @ DP21										**2.24**		2.24												From MHFD Detention Spreadsheet Pond D
E1	22	1.65	0.58	8.2	0.97	3.19	3.08	8.24	0.97	3.20	3.09	Sheet Flow to Pond	3.09	0.00	0.00										Basin E1
	OUTFLOW FROM POND @ DP23										**0.36**		0.36												From MHFD Detention Spreadsheet Pond E
OS1	24	2.87	0.14	25.3	0.39	1.90	0.74	25.27	0.39	1.91	0.74	Flared End Section	0.74	0.00	0.00	18 in	RCP	2.4%	0.7	17.4	110	4.4	0.42	25.68	Basin OS1
BP1	25	1.02	0.20	15.4	0.20	2.46	0.50	15.43	0.20	2.46	0.50	Flared End Section	0.50	0.00	0.00										Basin BP1 *
BP2	26	17.55	0.09	22.0	1.63	2.05	3.35	21.99	1.63	2.06	3.36														Basin BP2 *
	TOTAL TO DP26 **										**6.28**	Ex. Flared End Section	6.28	0.00	0.00										DP15 + DP21 + DP23 + Basin BP2
EX1	27	6.39	0.10	22.0	0.61	2.05	1.25	21.96	0.61	2.06	1.26														
	TOTAL TO DP27 **										**3.28**	Ex. Culvert													DP9 + Basin EX1 + OS1
EX2	28	12.37	0.11	37.7	1.31	1.50	1.97	37.65	1.31	1.50	1.98														
	TOTAL TO DP28 **										**11.54**	Cherry Creek Drainageway	11.54	0.00	0.00										DP26 + DP27 + Basin EX2

* See the SWMM Model in this appendix for routed flows in the bypass pipes.

** Because these design points are receiving flows released from ponds, there is no C, A or tc to be used in the rational method. Therefore, these totals are summations of all tributary basins instead of routed flows.

DEVELOPED RUNOFF SUMMARY TABLE

BASIN	DESIGN POINT	AREA (ACRES)	5-YR RUNOFF (CFS)	100-YR RUNOFF (CFS)
A1	1	0.62	0.57	2.14
A2	2	1.00	2.41	6.13
A3	3	2.49	1.22	6.05
	DP3 (ROUTED)		**2.94**	**10.95**
A4	4	5.34	2.99	12.59
	DP4 (ROUTED)		**5.70**	**22.69**
A5	5	1.54	2.77	7.76
A6	6	0.33	0.82	1.83
	DP6 (ROUTED)		**3.41**	**9.09**
A7	7	0.33	0.80	1.79
	DP7 (ROUTED)		**4.19**	**10.84**
A8	8	2.31	2.25	7.52
	DP8 (ROUTED)		**5.44**	**15.76**
	DP9 (POND A RELEASE)		**1.29**	**11.14**
C1	10	2.38	2.46	8.17
C2	11	0.98	2.31	5.55
	DP11 (ROUTED)		**4.02**	**11.87**
C3	12	0.60	0.43	1.86
C4	13	3.42	1.59	7.29
	DP13 (ROUTED)		**4.79**	**17.13**
C5	14	4.02	2.14	9.20
	DP14 (ROUTED)		**6.76**	**25.66**
	DP15 (POND C RELEASE)		**0.32**	**17.07**
D1	16	0.46	0.34	1.96
D2	17	2.86	3.32	9.32
D3	18	3.00	3.30	9.48
	DP19 (ROUTED)		**6.45**	**18.85**
D4	20	1.10	0.28	2.40
	DP20 (ROUTED)		**6.67**	**21.05**
	DP21 (POND D RELEASE)		**2.24**	**2.90**
E1	22	1.65	3.09	8.37
	DP23 (POND E RELEASE)		**0.36**	**2.66**
OS1	24	2.87	0.74	6.09
BP1	25	1.02	0.50	2.96
BP2	26	17.55	3.36	38.57
	DP26 (TOTAL)		**6.28**	**61.20**
EX1	27	6.39	1.26	14.08
	DP27 (TOTAL)		**3.28**	**31.30**
EX2	28	12.37	1.98	20.13
	DP28 (TOTAL)		**11.54**	**112.63**

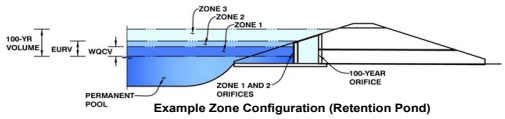
APPENDIX D – HYDRAULIC COMPUTATIONS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Salisbury Park North

Basin ID: Pond A - Phase 1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	13.96	acres
Watershed Length =	1,000	ft
Watershed Length to Centroid =	500	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	44.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Parker - Town Hall	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.221	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.575	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.82 in.) =	0.365	acre-feet	0.82	inches
5-yr Runoff Volume (P1 = 1.1 in.) =	0.576	acre-feet	1.10	inches
10-yr Runoff Volume (P1 = 1.34 in.) =	0.811	acre-feet	1.34	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	1.264	acre-feet		inches
50-yr Runoff Volume (P1 = 1.98 in.) =	1.597	acre-feet		inches
100-yr Runoff Volume (P1 = 2.29 in.) =	2.005	acre-feet	2.29	inches
500-yr Runoff Volume (P1 = 3.08 in.) =	2.952	acre-feet		inches
Approximate 2-yr Detention Volume =	0.347	acre-feet		
Approximate 5-yr Detention Volume =	0.566	acre-feet		
Approximate 10-yr Detention Volume =	0.675	acre-feet		
Approximate 25-yr Detention Volume =	0.812	acre-feet		
Approximate 50-yr Detention Volume =	0.879	acre-feet		
Approximate 100-yr Detention Volume =	1.053	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.221	acre-feet
Zone 2 Volume (10-year - Zone 1) =	0.453	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.675	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	

Total detention volume is less than 100-year volume.

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

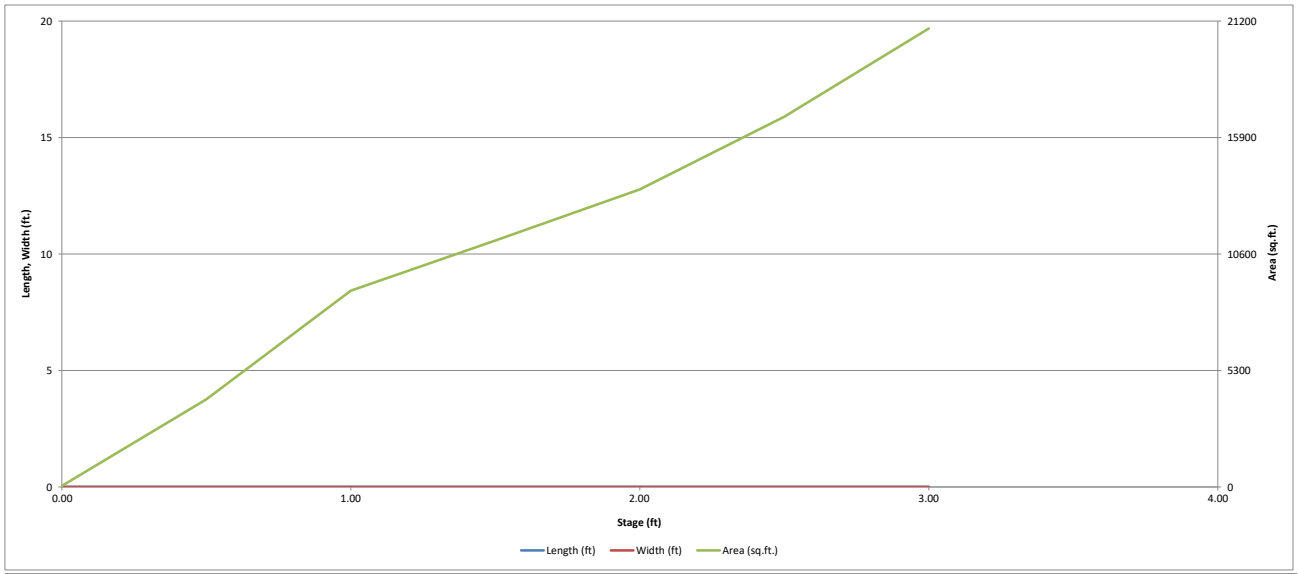
5838

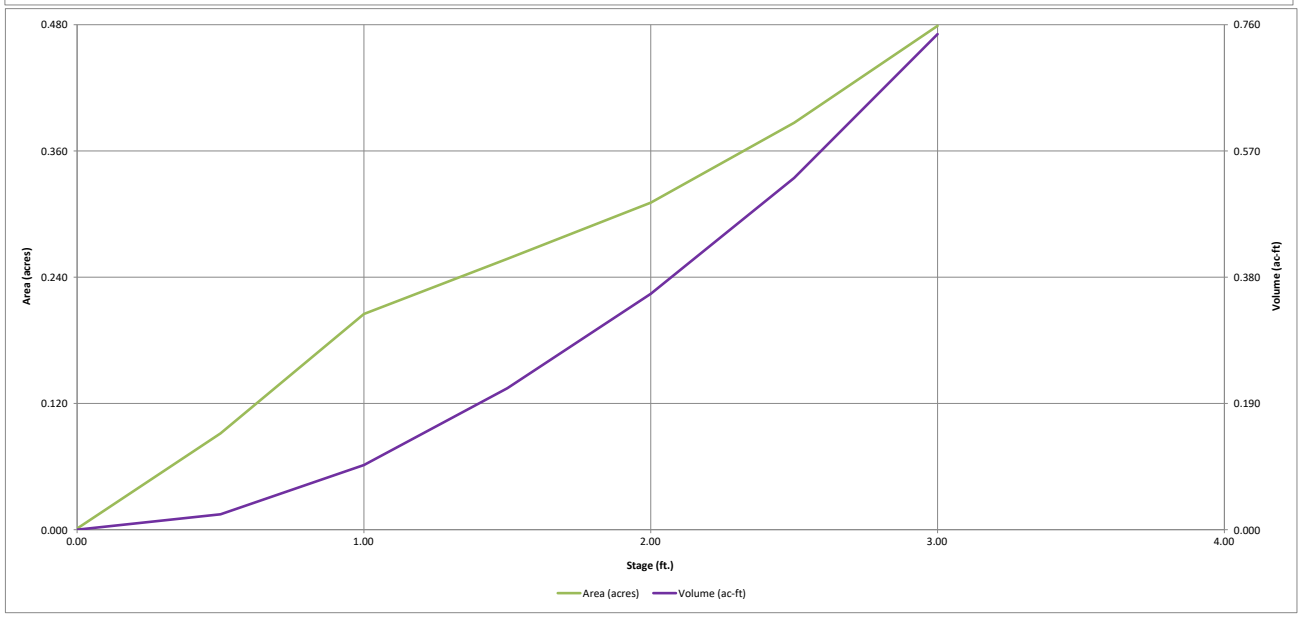
Depth Increment = 0.50 ft

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	--	--	--	47	0.001		
5838.5	--	0.50	--	--	--	3,987	0.092	1,008	0.023
5839	--	1.00	--	--	--	8,932	0.205	4,238	0.097
5839.5	--	1.50	--	--	--	11,214	0.257	9,274	0.213
5840	--	2.00	--	--	--	13,540	0.311	15,463	0.355
5840.5	--	2.50	--	--	--	16,849	0.387	23,060	0.529
5841	--	3.00	--	--	--	20,863	0.479	32,488	0.746

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



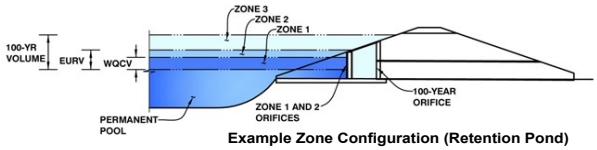


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Salisbury Park North**

Basin ID: **Pond A - Phase 1**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.54	0.221	Orifice Plate
Zone 2 (10-year)	2.85	0.453	Weir (No Pipe)
Zone 3			
Total (all zones)		0.675	

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

Underdrain Orifice Invert Depth =		ft (distance below the filtration media surface)	Underdrain Orifice Area =		ft²
Underdrain Orifice Diameter =		inches	Underdrain Orifice Centroid =		feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	7.292E-03	ft²
Depth at top of Zone using Orifice Plate =	1.50	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	4.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.05	sq. inches (diameter = 1-1/8 inches)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.50	0.80	1.10	1.40			
Orifice Area (sq. inches)	1.05	1.05	1.05	1.05	1.05			

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft²
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

Calculated Parameters for Vertical Orifice

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

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.00		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	N/A		feet
Overflow Weir Bottom Length =	2.00		feet	Overflow Weir Slope Length =	N/A		feet
Overflow Weir Side Slopes =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	N/A		
Horiz. Length of Weir Sides =	N/A		feet	Overflow Grate Open Area w/o Debris =	N/A		ft²
Overflow Grate Type =	N/A			Overflow Grate Open Area w/ Debris =	N/A		ft²
Debris Clogging % =	N/A		%				

Calculated Parameters for Overflow Weir

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

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	N/A		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	N/A		ft²
Circular Orifice Diameter =	N/A		inches	Outlet Orifice Centroid =	N/A		feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	2.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.16	feet
Spillway Crest Length =	5.00	feet	Stage at Top of Freeboard =	4.16	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.48	acres
Freeboard above Max Water Surface =	0.50	feet	Basin Volume at Top of Freeboard =	0.75	acre-ft
Spillway position relative to Overflow Weir =	Overlapping				

Calculated Parameters for Spillway

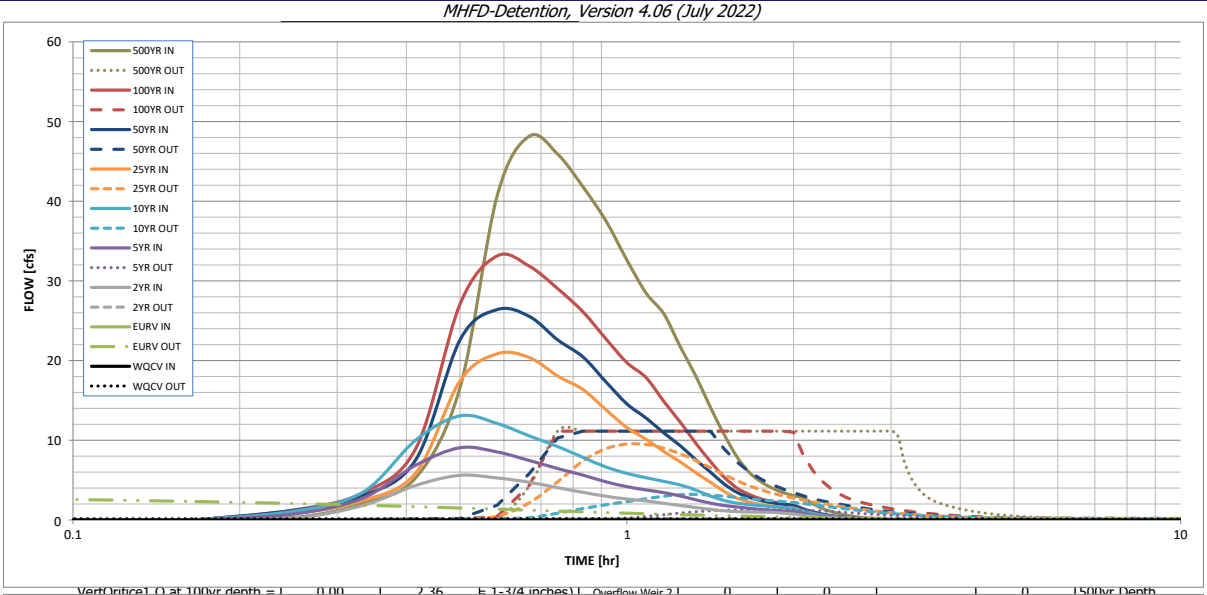
Routed Hydrograph Results

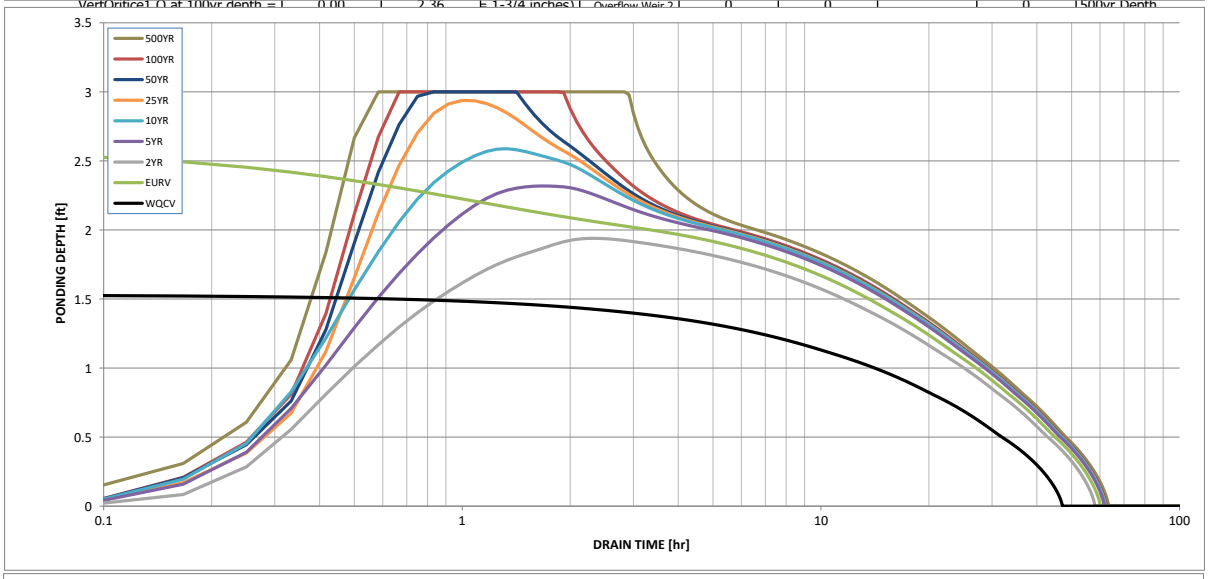
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

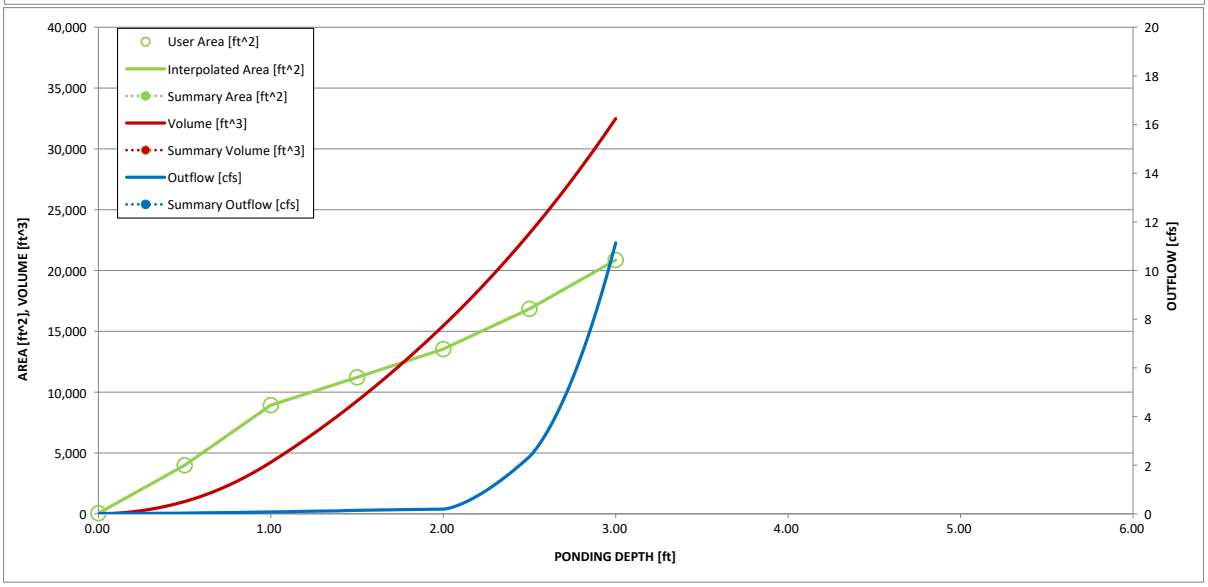
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.82	1.10	1.34	1.69	1.98	2.29	3.08
CUHP Runoff Volume (acre-ft) =	0.221	0.575	0.365	0.576	0.811	1.264	1.597	2.005	2.952
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.365	0.576	0.811	1.264	1.597	2.005	2.952
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	1.5	4.0	10.0	13.7	18.1	28.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.11	0.29	0.71	0.98	1.30	2.03
Peak Inflow Q (cfs) =	N/A	N/A	5.6	9.1	13.1	20.9	26.4	33.1	48.2
Peak Outflow Q (cfs) =	0.1	3.2	0.2	1.3	3.2	9.5	11.1	11.1	11.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	0.8	1.0	0.8	0.6	0.4
Structure Controlling Flow =	Plate	Spillway	Plate	Overflow Weir 1	Spillway	Spillway	N/A	N/A	N/A
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) =	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	48	49	50	46	42	39	36	32
Time to Drain 99% of Inflow Volume (hours) =	**45**	55	54	56	55	53	51	49	46
Maximum Ponding Depth (ft) =	1.54	2.62	1.94	2.32	2.59	2.94	3.00	3.00	3.00
Area at Maximum Ponding Depth (acres) =	0.26	0.41	0.30	0.36	0.40	0.47	0.48	0.48	0.48
Maximum Volume Stored (acre-ft) =	0.223	0.577	0.333	0.459	0.561	0.713	0.746	0.746	0.746
WSE =	5839.54	5840.62	5839.94	5840.32	5840.59	5840.94	5841.00	5841.00	5841.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







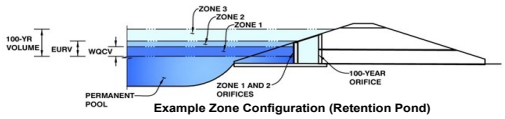
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Salisbury Park North

Basin ID: Pond C - Phase 1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	11.40	acres
Watershed Length =	1,000	ft
Watershed Length to Centroid =	500	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	39.10%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Parker - Town Hall	

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

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.169 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.413 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.82 in.) =	0.262 acre-feet		inches
5-yr Runoff Volume (P1 = 1.1 in.) =	0.424 acre-feet		inches
10-yr Runoff Volume (P1 = 1.34 in.) =	0.613 acre-feet		inches
25-yr Runoff Volume (P1 = 1.69 in.) =	0.985 acre-feet		inches
50-yr Runoff Volume (P1 = 1.98 in.) =	1.257 acre-feet		inches
100-yr Runoff Volume (P1 = 2.29 in.) =	1.594 acre-feet		inches
500-yr Runoff Volume (P1 = 3.08 in.) =	2.369 acre-feet		inches
Approximate 2-yr Detention Volume =	0.249 acre-feet		
Approximate 5-yr Detention Volume =	0.415 acre-feet		
Approximate 10-yr Detention Volume =	0.496 acre-feet		
Approximate 25-yr Detention Volume =	0.603 acre-feet		
Approximate 50-yr Detention Volume =	0.653 acre-feet		
Approximate 100-yr Detention Volume =	0.796 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.169	acre-feet
Zone 2 Volume (2-year - Zone 1) =	0.080	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.249	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	

Total detention volume is less than 100-year volume.

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

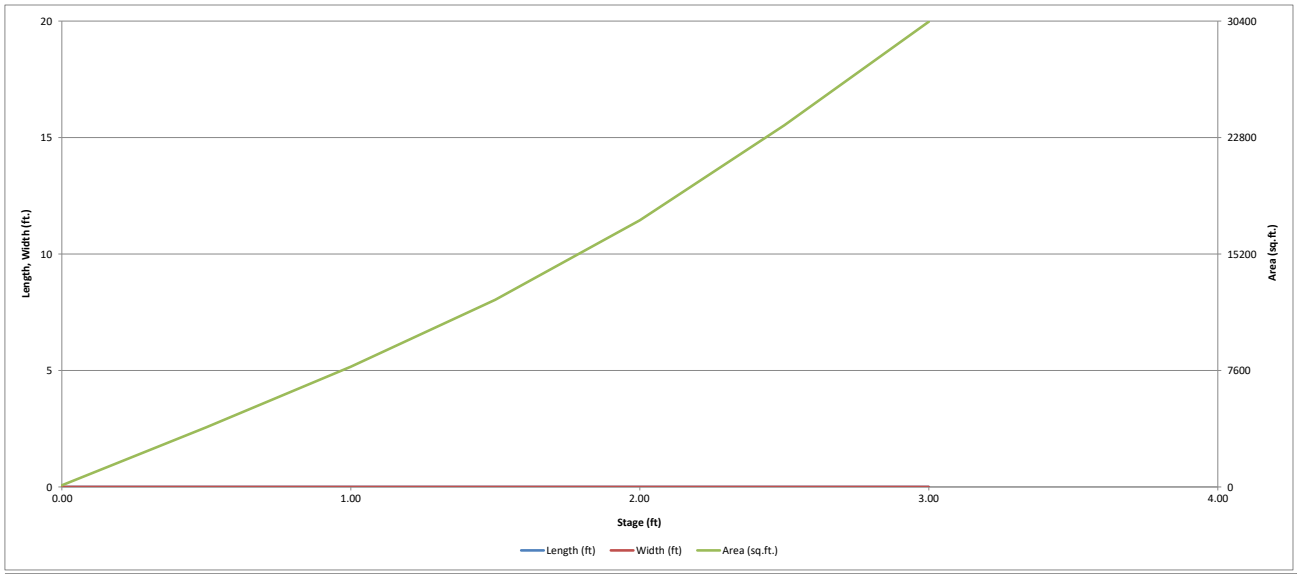
5844

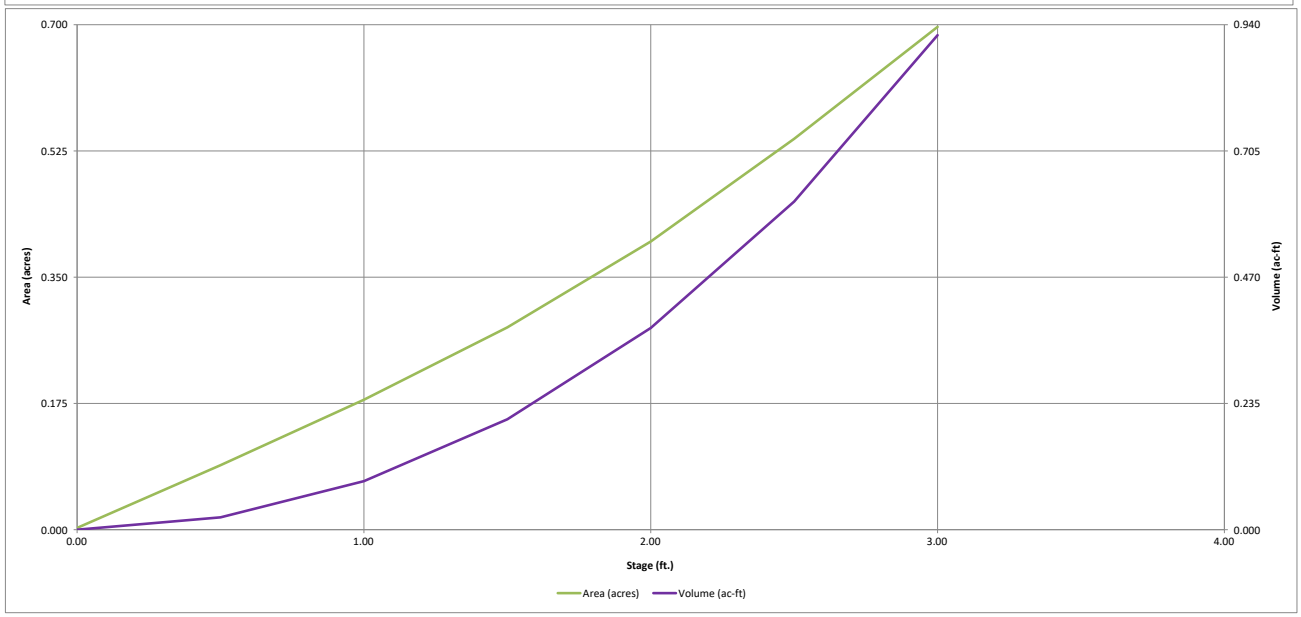
Depth Increment = 0.50 ft

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	--	--	--	107	0.002		
5844.5	--	0.50	--	--	--	3,894	0.089	1,000	0.023
5845	--	1.00	--	--	--	7,847	0.180	3,935	0.090
5845.5	--	1.50	--	--	--	12,216	0.280	8,951	0.205
5846	--	2.00	--	--	--	17,401	0.399	16,355	0.375
5846.5	--	2.50	--	--	--	23,601	0.542	26,606	0.611
5847	--	3.00	--	--	--	30,361	0.697	40,096	0.920

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



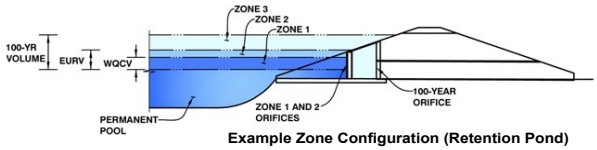


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Salisbury Park North**

Basin ID: **Pond C - Phase 1**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.37	0.169	Orifice Plate
Zone 2 (2-year)	1.65	0.080	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		0.249	

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 Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	7.153E-03	ft²
Depth at top of Zone using Orifice Plate =	1.36	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	4.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	1.03	sq. inches (diameter = 1-1/8 inches)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.50	0.80	1.10				
Orifice Area (sq. inches)	1.03	1.03	1.03	1.03				

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft²
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

Calculated Parameters for Vertical Orifice

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

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.00		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	2.00		feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	3.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	42.54		
Horiz. Length of Weir Sides =	3.00		feet	Overflow Grate Open Area w/o Debris =	8.35		ft²
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	4.18		ft²
Debris Clogging % =	50%		%				

Calculated Parameters for Overflow Weir

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

	Zone 2 Restrictor	Not Selected			Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.20		ft²
Outlet Pipe Diameter =	6.00		inches	Outlet Orifice Centroid =	0.25		feet
Restrictor Plate Height Above Pipe Invert =	10.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	2.25	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.43	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	3.18	feet
Spillway End Slopes =	21.00	H:V	Basin Area at Top of Freeboard =	0.70	acres
Freeboard above Max Water Surface =	0.50	feet	Basin Volume at Top of Freeboard =	0.92	acre-ft

Calculated Parameters for Spillway

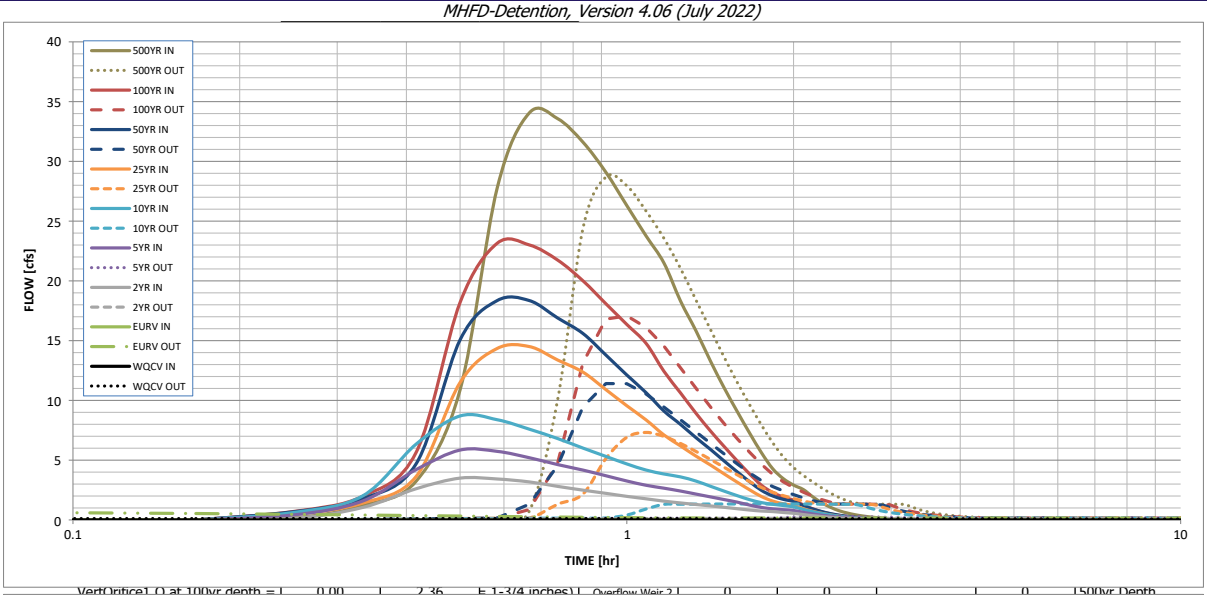
Routed Hydrograph Results

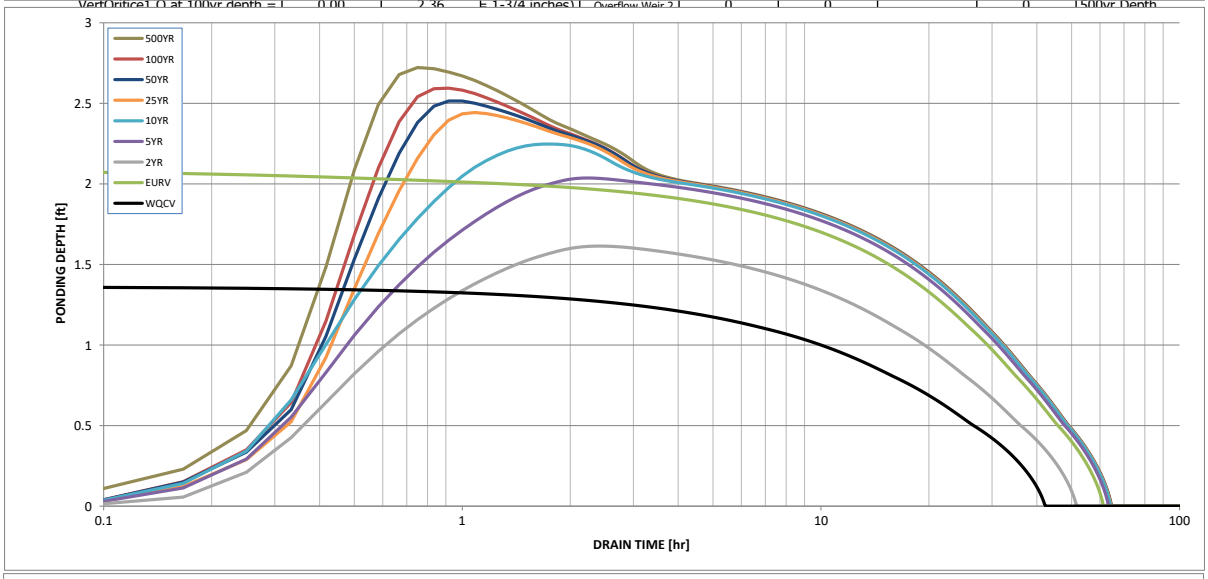
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

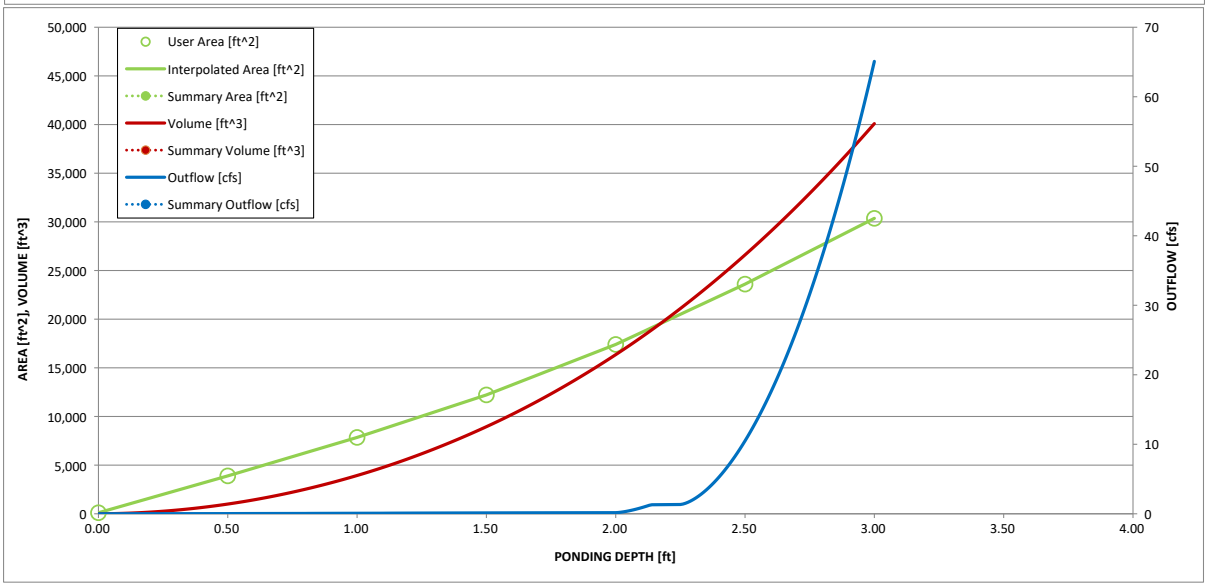
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.82	1.10	1.34	1.69	1.98	2.29	3.08
CUHP Runoff Volume (acre-ft) =	0.169	0.413	0.262	0.424	0.613	0.985	1.257	1.594	2.369
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.262	0.424	0.613	0.985	1.257	1.594	2.369
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	1.1	3.0	7.5	10.3	13.9	21.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.10	0.27	0.66	0.90	1.22	1.90
Peak Inflow Q (cfs) =	N/A	N/A	3.5	5.8	8.7	14.5	18.4	23.1	34.1
Peak Outflow Q (cfs) =	0.1	0.7	0.1	0.32	1.3	7.3	11.4	17.07	28.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	0.4	1.0	1.1	1.2	1.3
Structure Controlling Flow =	Plate	Overflow Weir 1	Plate	Overflow Weir 1	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.09	N/A	0.0	0.1	0.1	0.1	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) =	37	52	45	53	51	46	44	41	36
Time to Drain 99% of Inflow Volume (hours) =	**40**	57	48	59	58	56	55	53	49
Maximum Ponding Depth (ft) =	1.37	2.10	1.61	2.04	2.25	2.44	2.51	2.59	2.72
Area at Maximum Ponding Depth (acres) =	0.25	0.43	0.31	0.41	0.47	0.52	0.54	0.57	0.61
Maximum Volume Stored (acre-ft) =	0.171	0.417	0.238	0.388	0.480	0.579	0.616	0.661	0.737
WSE =	5845.37	5846.10	5845.61	5846.04	5846.25	5846.44	5846.51	5846.59	5846.72

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







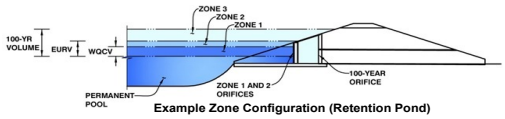
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Salisbury Park North

Basin ID: Pond D - Phase 1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	7.42	acres
Watershed Length =	1,000	ft
Watershed Length to Centroid =	500	ft
Watershed Slope =	0.015	ft/ft
Watershed Imperviousness =	52.10%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Parker - Town Hall	

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

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.131 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.367 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.82 in.) =	0.236 acre-feet		inches
5-yr Runoff Volume (P1 = 1.1 in.) =	0.359 acre-feet		inches
10-yr Runoff Volume (P1 = 1.34 in.) =	0.490 acre-feet		inches
25-yr Runoff Volume (P1 = 1.69 in.) =	0.731 acre-feet		inches
50-yr Runoff Volume (P1 = 1.98 in.) =	0.911 acre-feet		inches
100-yr Runoff Volume (P1 = 2.29 in.) =	1.127 acre-feet		inches
500-yr Runoff Volume (P1 = 3.08 in.) =	1.637 acre-feet		inches
Approximate 2-yr Detention Volume =	0.224 acre-feet		
Approximate 5-yr Detention Volume =	0.352 acre-feet		
Approximate 10-yr Detention Volume =	0.419 acre-feet		
Approximate 25-yr Detention Volume =	0.499 acre-feet		
Approximate 50-yr Detention Volume =	0.537 acre-feet		
Approximate 100-yr Detention Volume =	0.627 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.131	acre-feet
Zone 2 Volume (User Defined - Zone 1) =	0.070	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.201	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	

Total detention volume is less than 100-year volume.

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

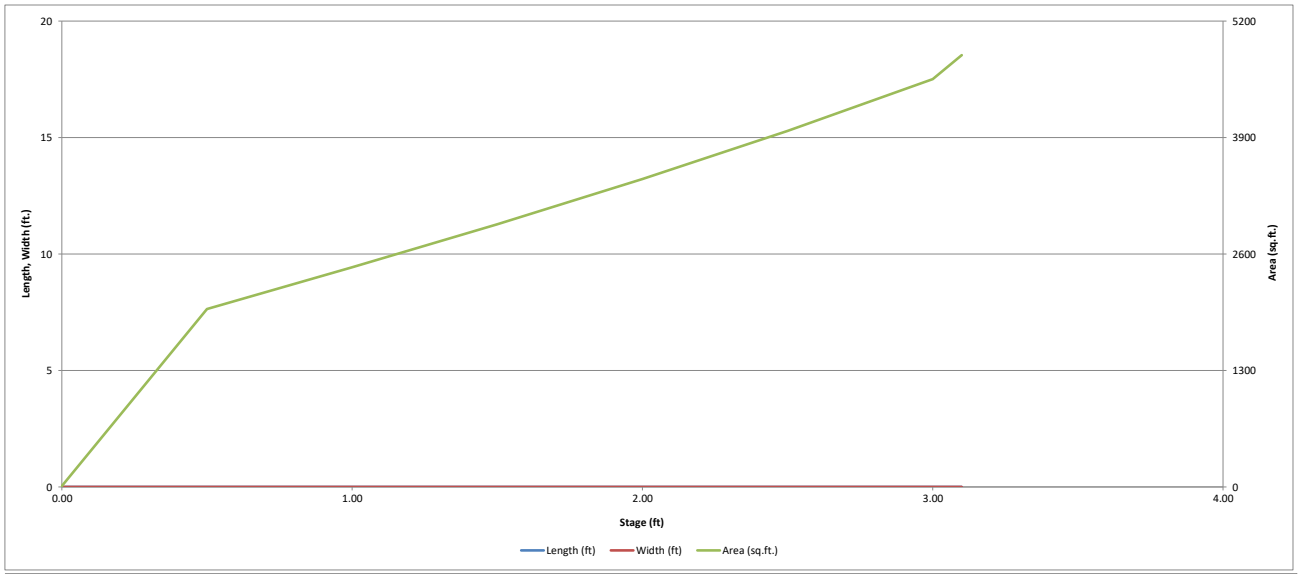
5845.7

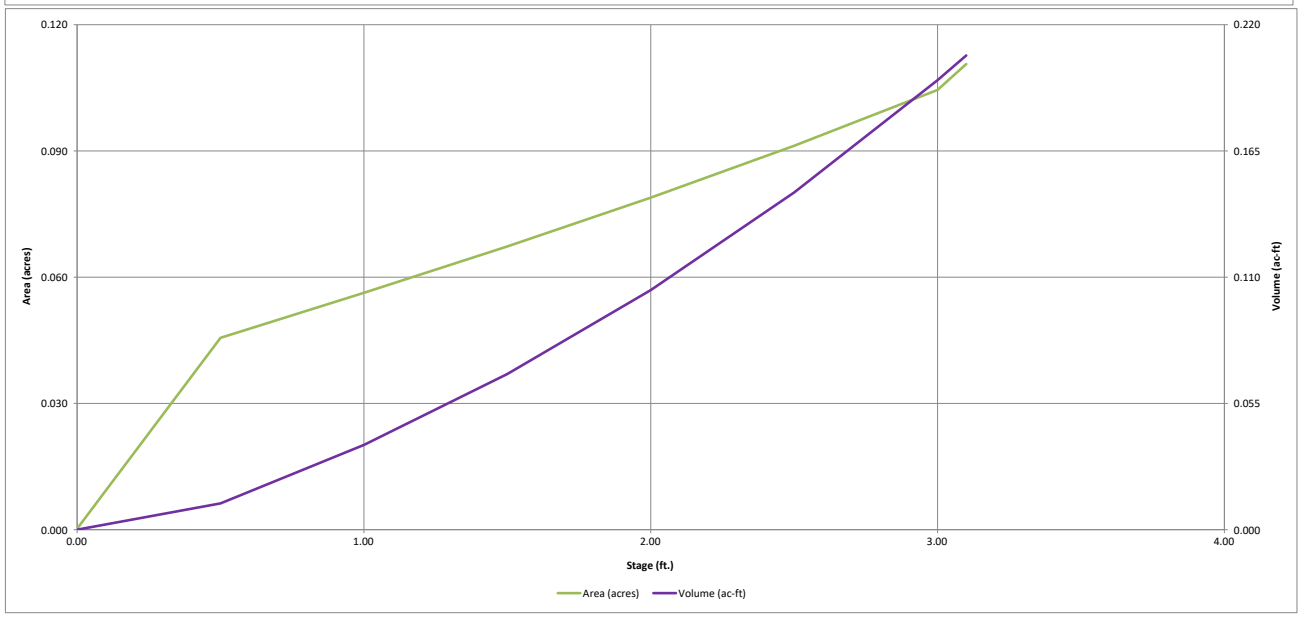
Depth Increment = 0.50 ft

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	--	--	--	10	0.000		
5846.2	--	0.50	--	--	--	1,986	0.046	499	0.011
5846.7	--	1.00	--	--	--	2,452	0.056	1,608	0.037
5847.2	--	1.50	--	--	--	2,932	0.067	2,954	0.068
5847.7	--	2.00	--	--	--	3,437	0.079	4,547	0.104
5848.2	--	2.50	--	--	--	3,974	0.091	6,399	0.147
5848.7	--	3.00	--	--	--	4,552	0.104	8,531	0.196
5848.8	--	3.10	--	--	--	4,820	0.111	9,000	0.207

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



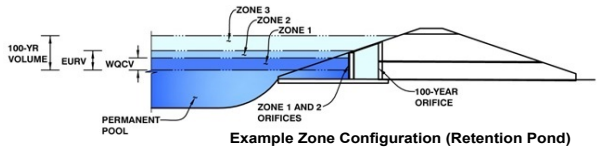


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Salisbury Park North

Basin ID: Pond D - Phase 1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.33	0.131	Orifice Plate
Zone 2 (User)	3.05	0.070	Weir (No Pipe)
Zone 3			
Total (all zones)		0.201	

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 Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	5.903E-03	ft²
Depth at top of Zone using Orifice Plate =	2.43	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	12.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.85	sq. inches (diameter = 1 inch)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.00	2.00					
Orifice Area (sq. inches)	0.85	0.85	0.85					

	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 =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =		ft²
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		feet
Vertical Orifice Diameter =			inches			

Calculated Parameters for Vertical Orifice

Not Selected	Not Selected

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

	Zone 2 Weir	Not Selected				
Overflow Weir Front Edge Height, Ho =	2.50		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	N/A	feet
Overflow Weir Bottom Length =	0.50		feet	Overflow Weir Slope Length =	N/A	feet
Overflow Weir Side Slopes =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	N/A	
Horiz. Length of Weir Sides =	N/A		feet	Overflow Grate Open Area w/o Debris =	N/A	ft²
Overflow Grate Type =	N/A			Overflow Grate Open Area w/ Debris =	N/A	ft²
Debris Clogging % =	N/A		%			

Calculated Parameters for Overflow Weir

Zone 2 Weir	Not Selected

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

	Not Selected	Not Selected				
Depth to Invert of Outlet Pipe =	N/A		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	N/A	ft²
Circular Orifice Diameter =	N/A		inches	Outlet Orifice Centroid =	N/A	feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Not Selected	Not Selected

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	2.80	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.93	feet
Spillway Crest Length =	3.50	feet	Stage at Top of Freeboard =	4.23	feet
Spillway End Slopes =	3.00	H:V	Basin Area at Top of Freeboard =	0.11	acres
Freeboard above Max Water Surface =	0.50	feet	Basin Volume at Top of Freeboard =	0.21	acre-ft
Spillway position relative to Overflow Weir =					

Calculated Parameters for Spillway

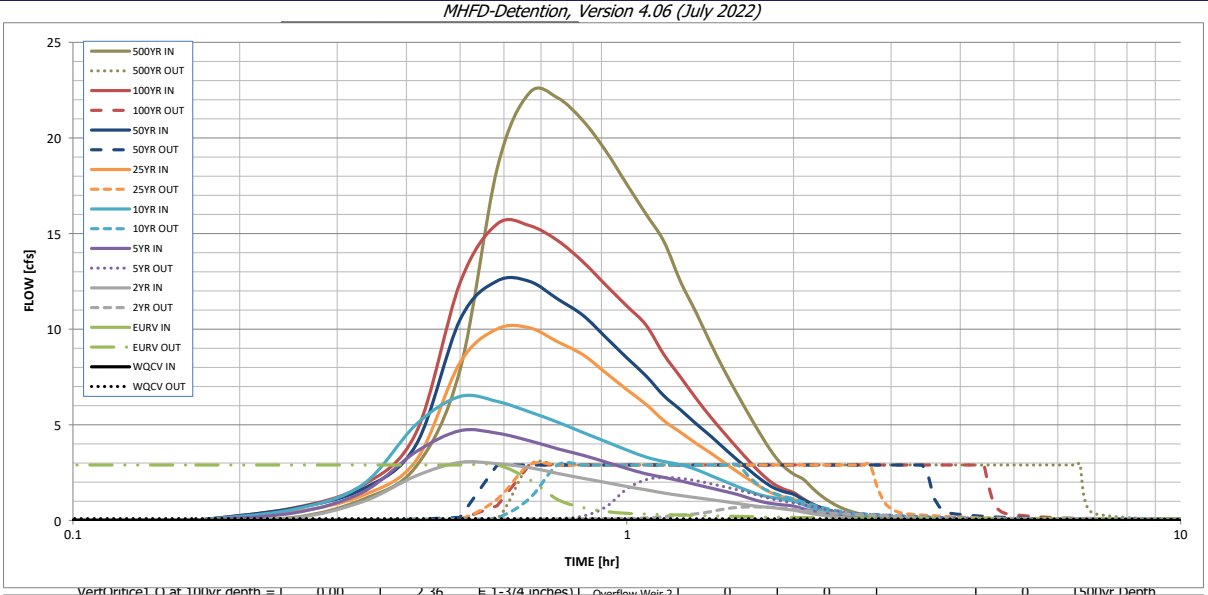
Routed Hydrograph Results

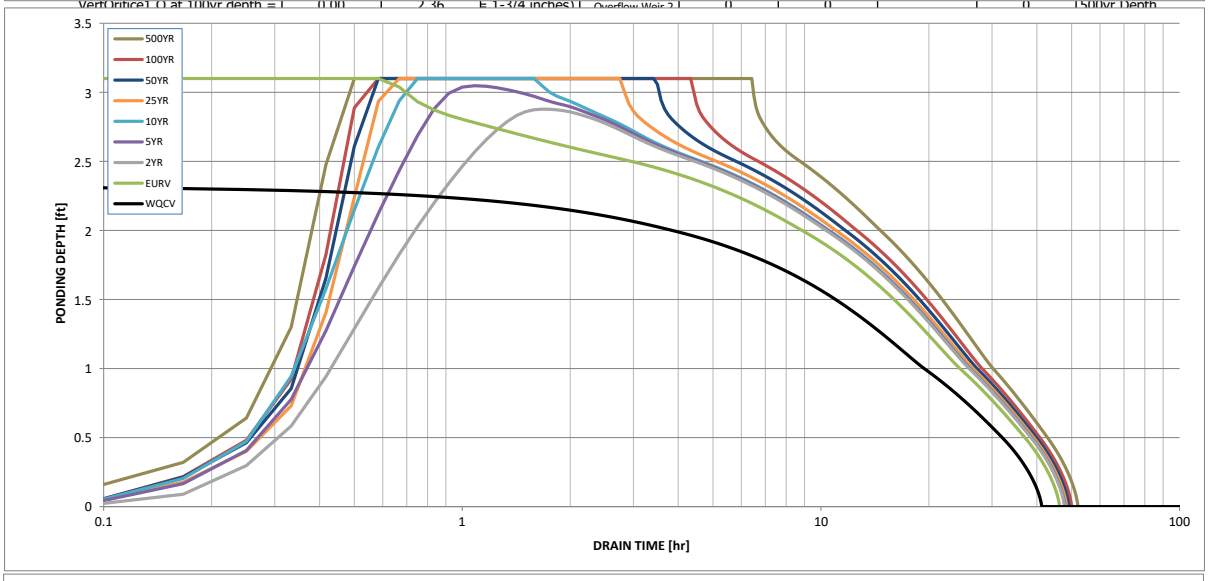
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

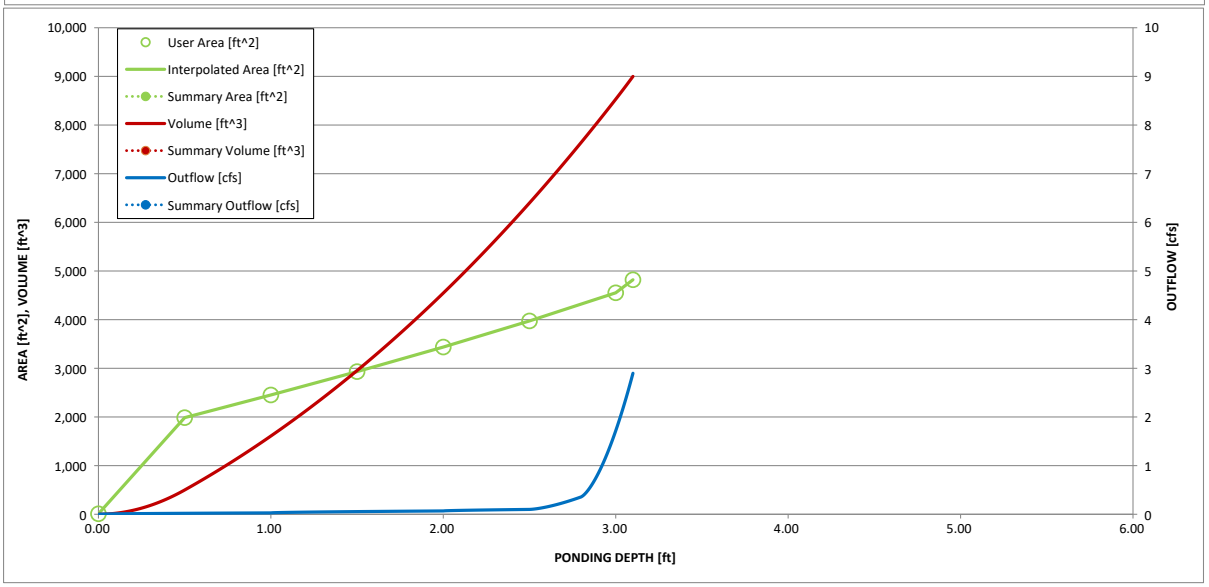
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.82	1.10	1.34	1.69	1.98	2.29	3.08
CUHP Runoff Volume (acre-ft) =	0.131	0.367	0.236	0.359	0.490	0.731	0.911	1.127	1.637
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.236	0.359	0.490	0.731	0.911	1.127	1.637
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.6	1.6	4.0	5.5	7.4	11.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.08	0.21	0.54	0.74	1.00	1.57
Peak Inflow Q (cfs) =	N/A	N/A	3.0	4.7	6.5	10.1	12.5	15.5	22.3
Peak Outflow Q (cfs) =	0.1	2.9	0.7	2.24	2.9	2.9	2.9	2.90	2.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.9	1.8	0.7	0.5	0.4	0.2
Structure Controlling Flow =	Plate	N/A	Spillway	Spillway	N/A	N/A	N/A	N/A	N/A
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) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	37	38	41	39	37	34	32	30	26
Time to Drain 99% of Inflow Volume (hours) =	**40**	42	45	44	43	42	41	41	40
Maximum Ponding Depth (ft) =	2.33	3.10	2.88	3.05	3.10	3.10	3.10	3.10	3.10
Area at Maximum Ponding Depth (acres) =	0.09	0.11	0.10	0.11	0.11	0.11	0.11	0.11	0.11
Maximum Volume Stored (acre-ft) =	0.132	0.207	0.182	0.200	0.207	0.207	0.207	0.207	0.207
WSE =	5847.63	5848.40	5848.18	5848.35	5848.40	5848.40	5848.40	5848.40	5848.40

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







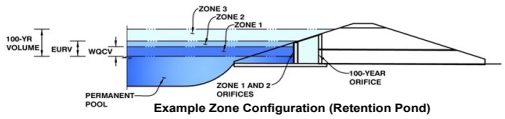
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Salisbury Park North

Basin ID: Pond E - Phase 1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB		**Note: L / W Ratio > 8**
Watershed Area =	1.65	acres	**L / W Ratio = 8.25**
Watershed Length =	770	ft	
Watershed Length to Centroid =	383	ft	
Watershed Slope =	0.018	ft/ft	
Watershed Imperviousness =	67.30%	percent	
Percentage Hydrologic Soil Group A =	0.0%	percent	
Percentage Hydrologic Soil Group B =	0.0%	percent	
Percentage Hydrologic Soil Groups C/D =	100.0%	percent	
Target WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	Parker - Town Hall		

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.036	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.108	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.82 in.) =	0.070	acre-feet	inches
5-yr Runoff Volume (P1 = 1.1 in.) =	0.102	acre-feet	inches
10-yr Runoff Volume (P1 = 1.34 in.) =	0.133	acre-feet	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	0.185	acre-feet	inches
50-yr Runoff Volume (P1 = 1.98 in.) =	0.226	acre-feet	inches
100-yr Runoff Volume (P1 = 2.29 in.) =	0.273	acre-feet	inches
500-yr Runoff Volume (P1 = 3.08 in.) =	0.388	acre-feet	inches
Approximate 2-yr Detention Volume =	0.067	acre-feet	
Approximate 5-yr Detention Volume =	0.099	acre-feet	
Approximate 10-yr Detention Volume =	0.119	acre-feet	
Approximate 25-yr Detention Volume =	0.140	acre-feet	
Approximate 50-yr Detention Volume =	0.150	acre-feet	
Approximate 100-yr Detention Volume =	0.168	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.036	acre-feet
Zone 2 Volume (2-year - Zone 1) =	0.030	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.067	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	

Total detention volume is less than 100-year volume.

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

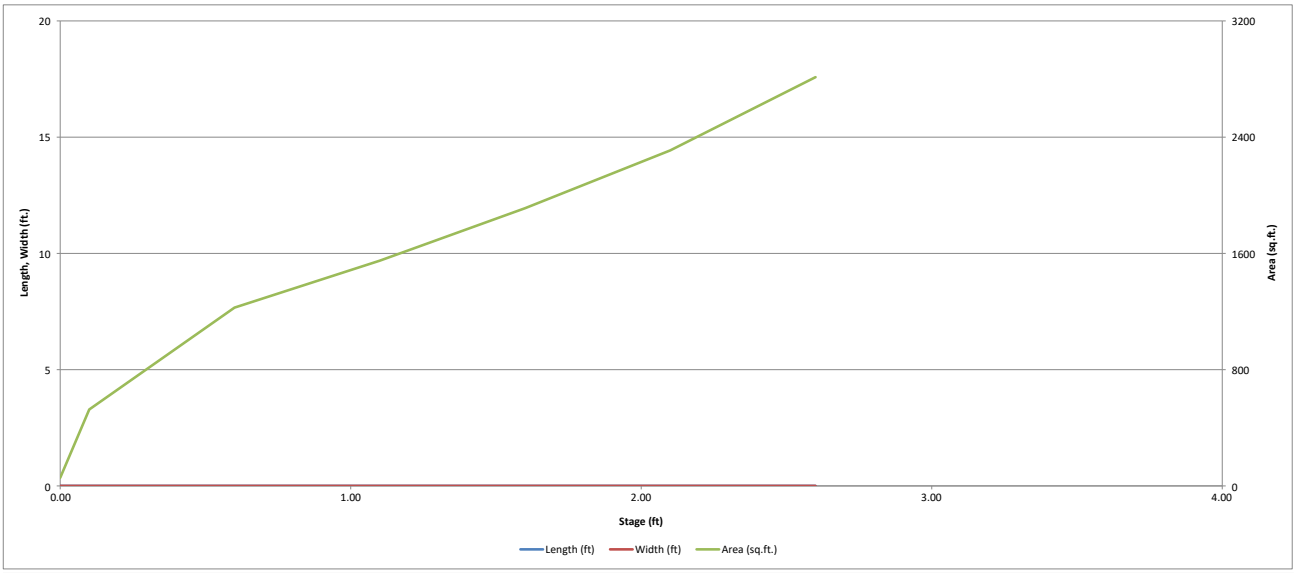
5845.9

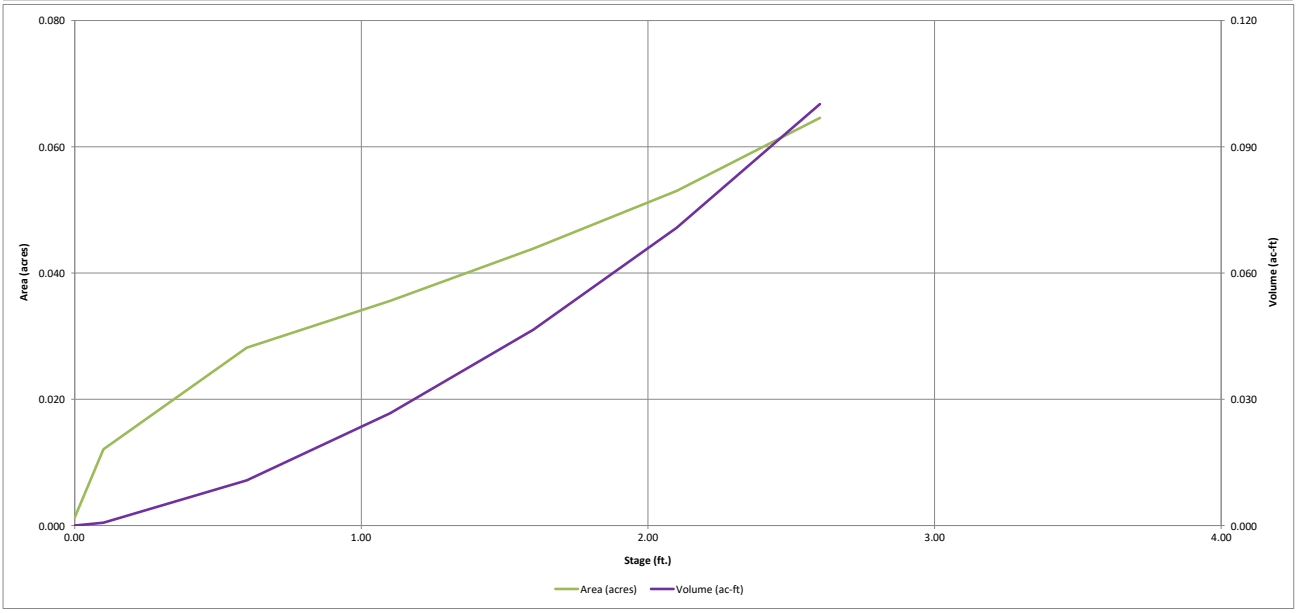
Depth Increment = ft

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	--	--	--	56	0.001		
5846	--	0.10	--	--	--	526	0.012	29	0.001
5846.5	--	0.60	--	--	--	1,227	0.028	467	0.011
5847	--	1.10	--	--	--	1,550	0.036	1,162	0.027
5847.5	--	1.60	--	--	--	1,911	0.044	2,027	0.047
5848	--	2.10	--	--	--	2,309	0.053	3,082	0.071
5848.5	--	2.60	--	--	--	2,813	0.065	4,362	0.100

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



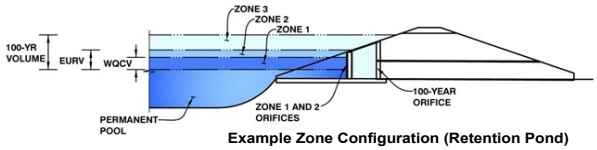


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Salisbury Park North

Basin ID: Pond E - Phase 1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.36	0.036	Orifice Plate
Zone 2 (2-year)	2.03	0.030	Weir (No Pipe)
Zone 3			
Total (all zones)		0.067	

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 Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.014E-03	ft²
Depth at top of Zone using Orifice Plate =	1.36	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	5.60	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.29	sq. inches (diameter = 5/8 inch)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.45	0.91					
Orifice Area (sq. inches)	0.29	0.29	0.29					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft²
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

Calculated Parameters for Vertical Orifice

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

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	1.75		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	N/A		feet
Overflow Weir Bottom Length =	0.50		feet	Overflow Weir Slope Length =	N/A		feet
Overflow Weir Side Slopes =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	N/A		
Horiz. Length of Weir Sides =	N/A		feet	Overflow Grate Open Area w/o Debris =	N/A		ft²
Overflow Grate Type =	N/A			Overflow Grate Open Area w/ Debris =	N/A		ft²
Debris Clogging % =	N/A		%				

Calculated Parameters for Overflow Weir

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

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	N/A		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	N/A		ft²
Circular Orifice Diameter =	N/A		inches	Outlet Orifice Centroid =	N/A		feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	2.10	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.48	feet
Spillway Crest Length =	2.00	feet	Stage at Top of Freeboard =	3.08	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.06	acres
Freeboard above Max Water Surface =	0.50	feet	Basin Volume at Top of Freeboard =	0.10	acre-ft
Spillway position relative to Overflow Weir =	Overlapping				

Calculated Parameters for Spillway

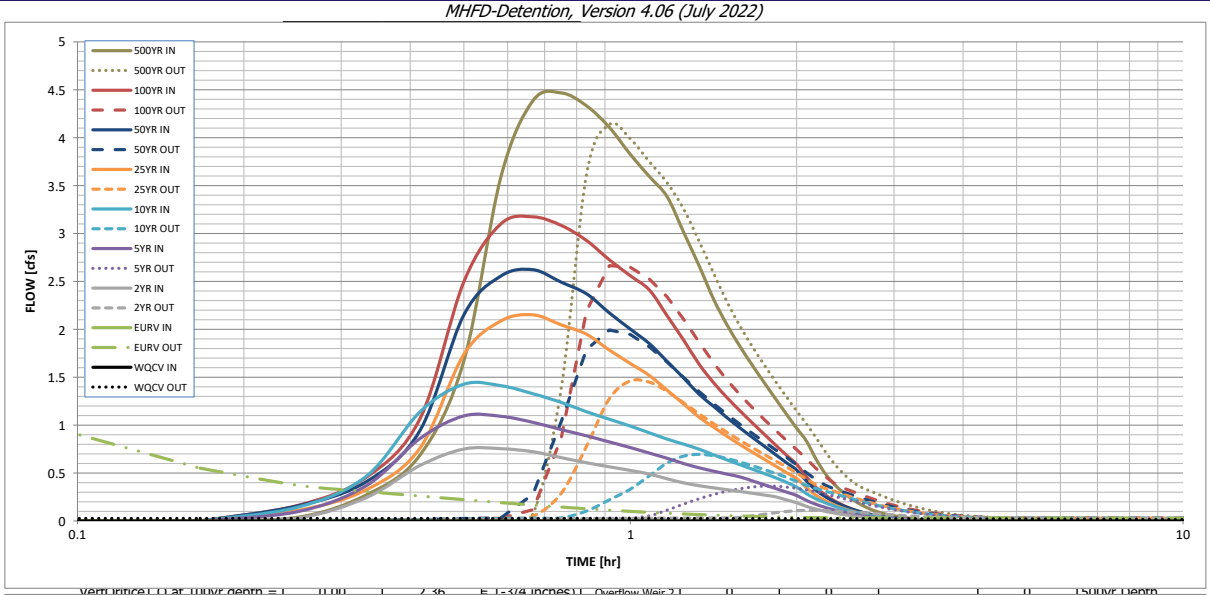
Routed Hydrograph Results

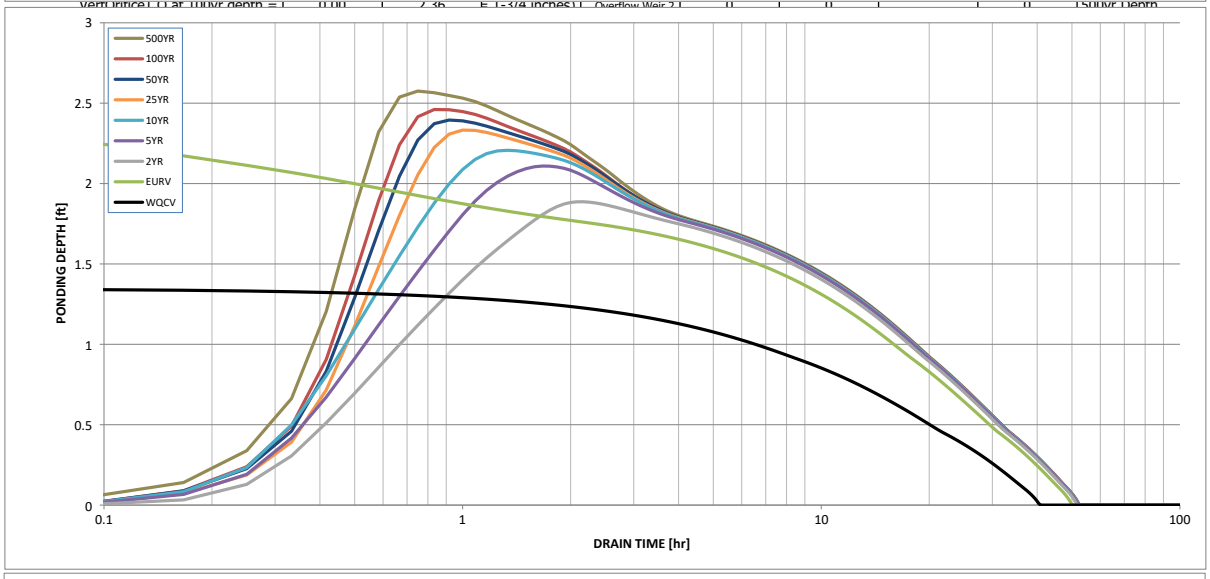
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

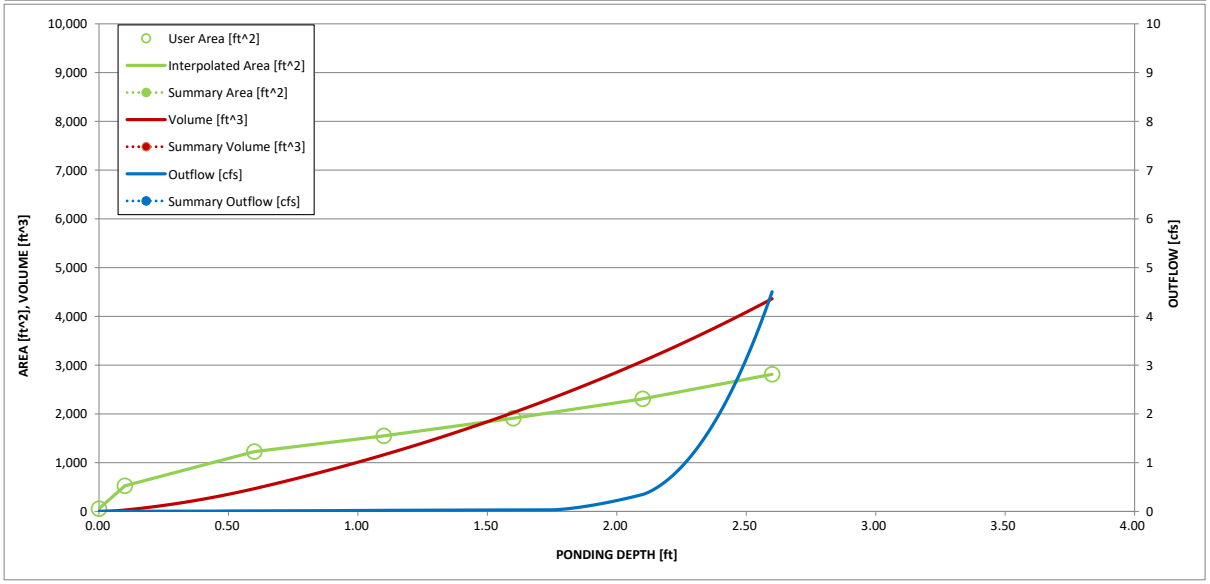
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.82	1.10	1.34	1.69	1.98	2.29	3.08
CUHP Runoff Volume (acre-ft) =	0.036	0.108	0.070	0.102	0.133	0.185	0.226	0.273	0.388
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.070	0.102	0.133	0.185	0.226	0.273	0.388
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.1	0.2	0.7	0.9	1.2	1.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.05	0.15	0.40	0.55	0.74	1.17
Peak Inflow Q (cfs) =	N/A	N/A	0.8	1.1	1.4	2.2	2.6	3.2	4.5
Peak Outflow Q (cfs) =	0.0	3.5	0.1	0.36	0.7	1.5	2.0	2.66	4.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	4.1	2.8	2.2	2.2	2.2	2.1
Structure Controlling Flow =	Plate	Spillway	Overflow Weir 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
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) =	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) =	36	40	43	41	39	36	34	32	28
Time to Drain 99% of Inflow Volume (hours) =	**38**	45	48	47	46	45	44	42	40
Maximum Ponding Depth (ft) =	1.35	2.27	1.89	2.11	2.21	2.33	2.40	2.46	2.58
Area at Maximum Ponding Depth (acres) =	0.04	0.06	0.05	0.05	0.06	0.06	0.06	0.06	0.06
Maximum Volume Stored (acre-ft) =	0.036	0.080	0.060	0.071	0.076	0.084	0.087	0.091	0.098
WSE =	5847.25	5848.17	5847.79	5848.01	5848.11	5848.23	5848.30	5848.36	5848.48

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			

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	INLET-A05.2 (BASIN A6)	INLET-A05.3 (BASIN A7)	INLET-C01.1 (BASIN C1)
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	In Sump
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)	0.8	0.8	2.5
Major Q_{Known} (cfs)	1.8	1.8	8.2

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

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

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

Minor Storm Rainfall Input

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

Major Storm Rainfall Input

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

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**0.8**	**0.8**	**2.5**
Major Total Design Peak Flow, Q (cfs)	**1.8**	**1.8**	**8.2**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	N/A

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	INLET-C01.2 (BASIN C2)
Site Type (Urban or Rural)	URBAN
Inlet Application (Street or Area)	STREET
Hydraulic Condition	In Sump
Inlet Type	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.3
Major Q_{Known} (cfs)	5.6

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)	**2.3**
Major Total Design Peak Flow, Q (cfs)	**5.6**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A

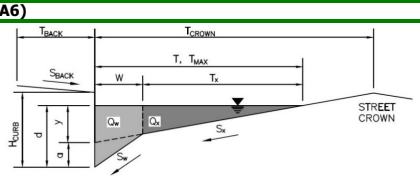
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: 3752c - Salisbury Regional Park

Inlet ID: INLET-A05.2 (BASIN A6)



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} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	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 =	0.010	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} =	13.0	13.0	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)		☐	☐	

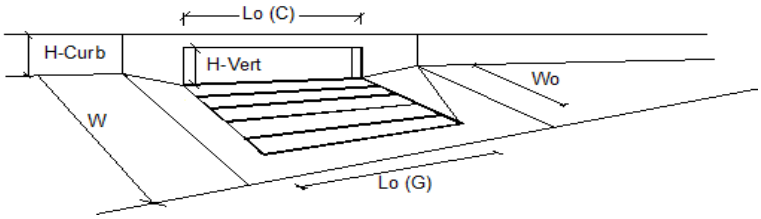
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**5.7**	**5.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 0.82 cfs on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design peak flow of 1.83 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



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 =	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 =**	**0.8**	**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**	**%**

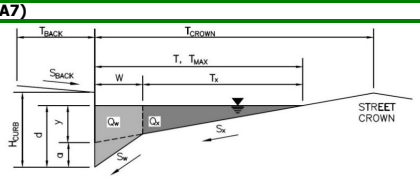
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: 3752c - Salisbury Regional Park

Inlet ID: INLET-A05.3 (BASIN A7)



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} =	13.0	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 =	0.010	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} =	13.0	13.0	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)		☐	☐	

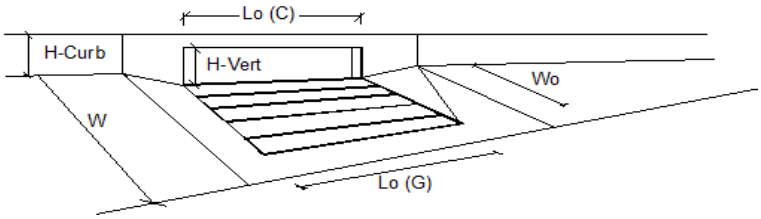
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**5.7**	**5.7**	**cfs**

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

Major storm max. allowable capacity GOOD - greater than the design peak flow of 1.79 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



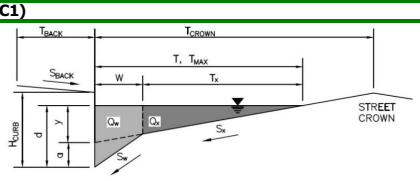
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	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 =**	**0.8**	**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: **3752c - Salisbury Regional Park**

Inlet ID: **INLET-C01.1 (BASIN C1)**



Gutter Geometry:

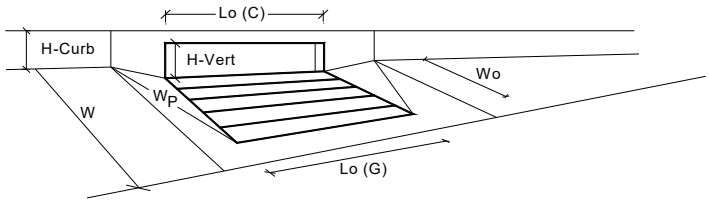
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.052	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	158.5	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.005	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 =	0.000	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} =	158.5	158.5	ft
Warning 02 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	8.0	8.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	8.0	8.0	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.50	0.50	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**9.3**	**9.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.5	8.2	cfs

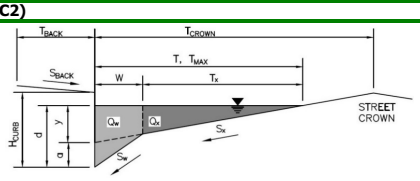
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: 3752c - Salisbury Regional Park

Inlet ID: INLET-C01.2 (BASIN C2)



Gutter Geometry:

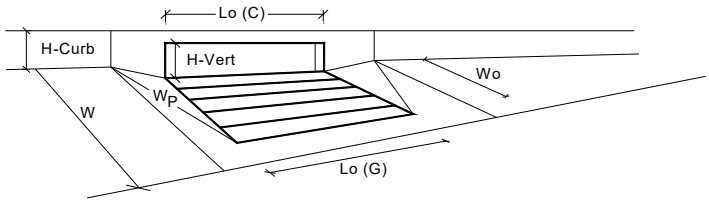
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	26.2	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.012	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	159.3	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.005	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 =	0.000	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} =	159.0	159.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	1.00	1.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.93	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.3**	**8.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.3	5.6	cfs

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Apr 3 2025

SWALE DP3

Trapezoidal

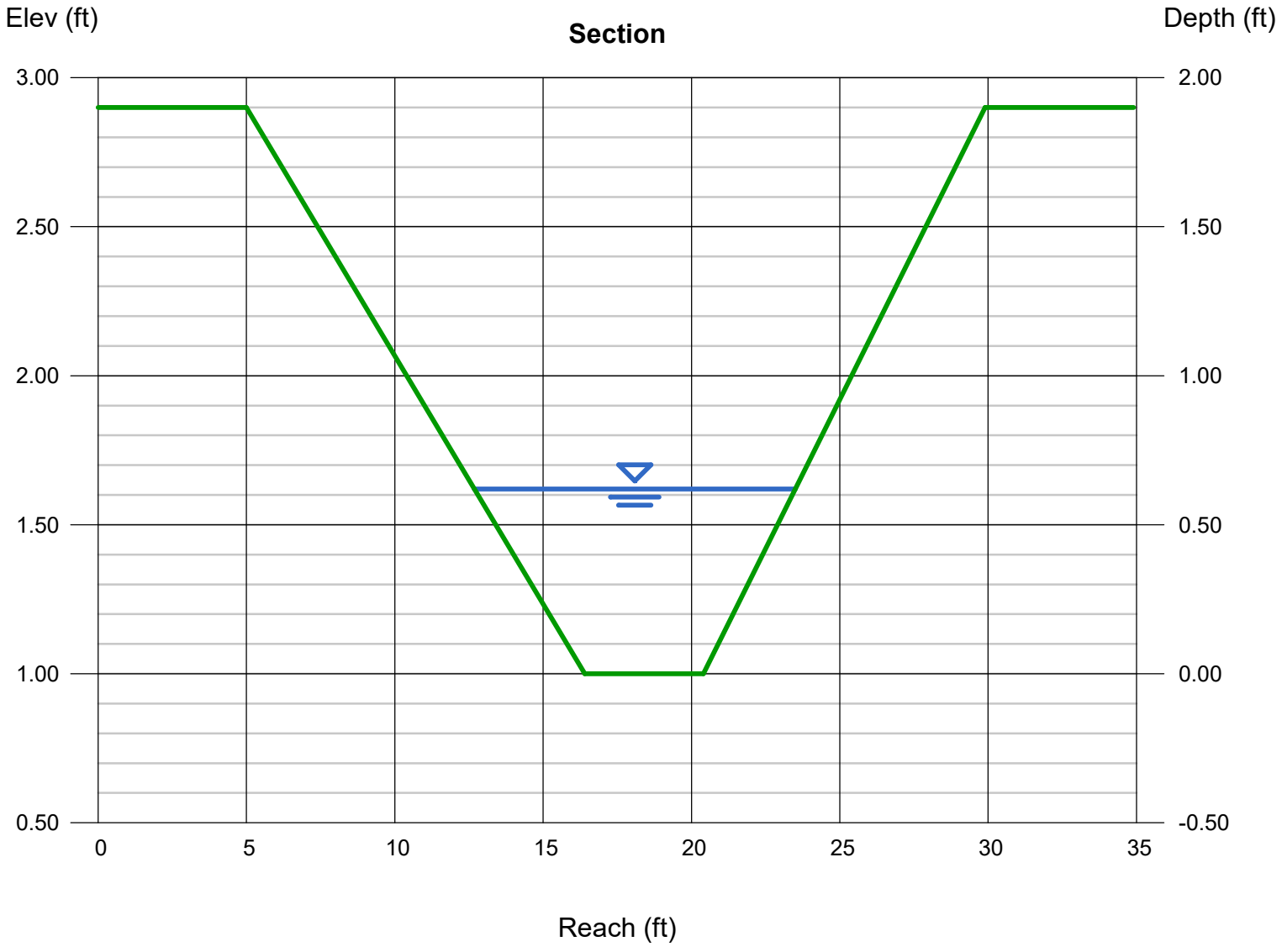
Bottom Width (ft)	= 4.00
Side Slopes (z:1)	= 6.00, 5.00
Total Depth (ft)	= 1.90
Invert Elev (ft)	= 1.00
Slope (%)	= 0.53
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.95

Highlighted

Depth (ft)	= 0.62
Q (cfs)	= 10.95
Area (sqft)	= 4.59
Velocity (ft/s)	= 2.38
Wetted Perim (ft)	= 10.93
Crit Depth, Yc (ft)	= 0.49
Top Width (ft)	= 10.82
EGL (ft)	= 0.71



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Apr 3 2025

SWALE DP4

Trapezoidal

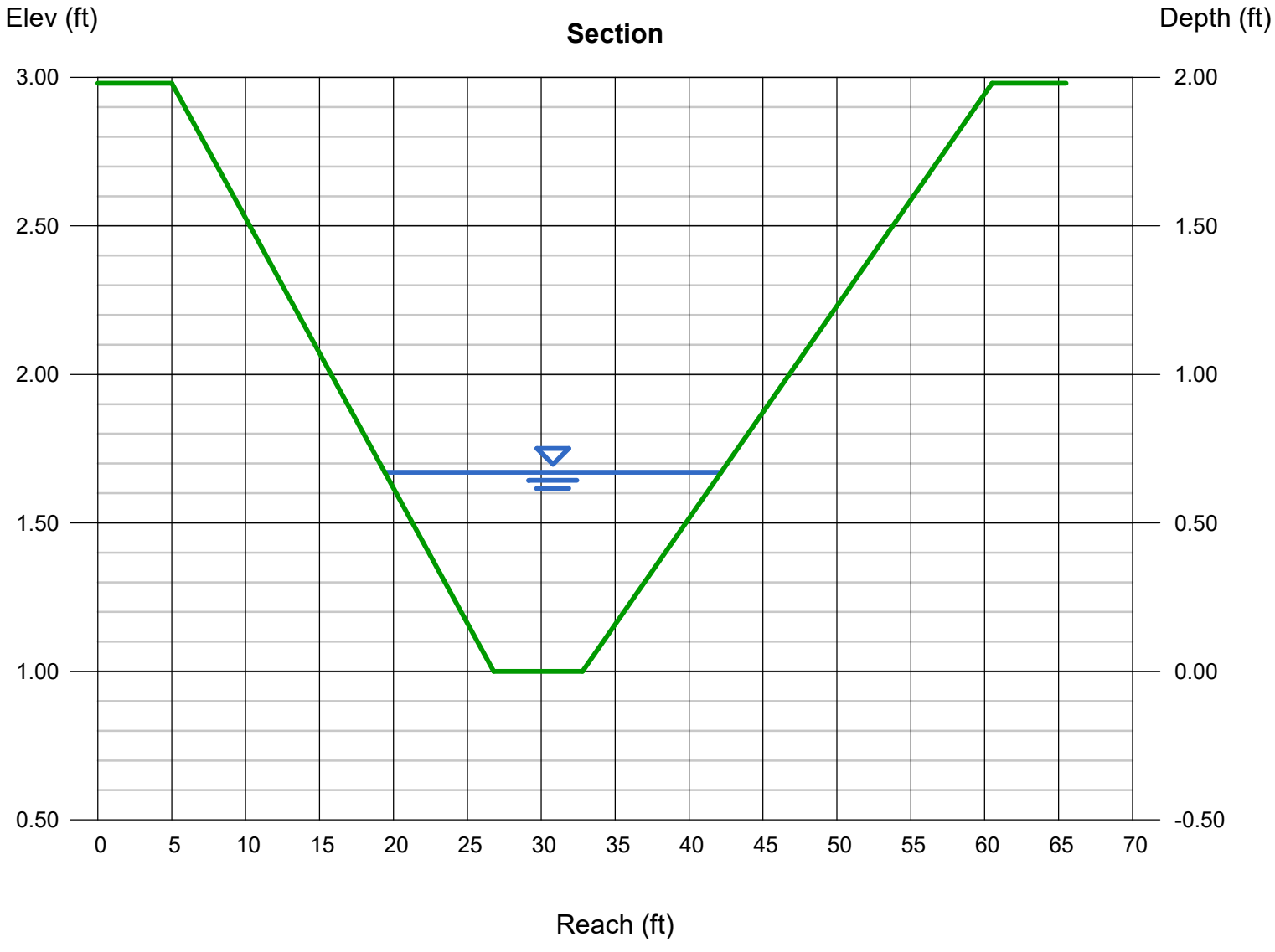
Bottom Width (ft)	= 6.00
Side Slopes (z:1)	= 11.00, 14.00
Total Depth (ft)	= 1.98
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 22.69

Highlighted

Depth (ft)	= 0.67
Q (cfs)	= 22.69
Area (sqft)	= 9.63
Velocity (ft/s)	= 2.36
Wetted Perim (ft)	= 22.80
Crit Depth, Yc (ft)	= 0.54
Top Width (ft)	= 22.75
EGL (ft)	= 0.76



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Apr 3 2025

SWALE DP5

Trapezoidal

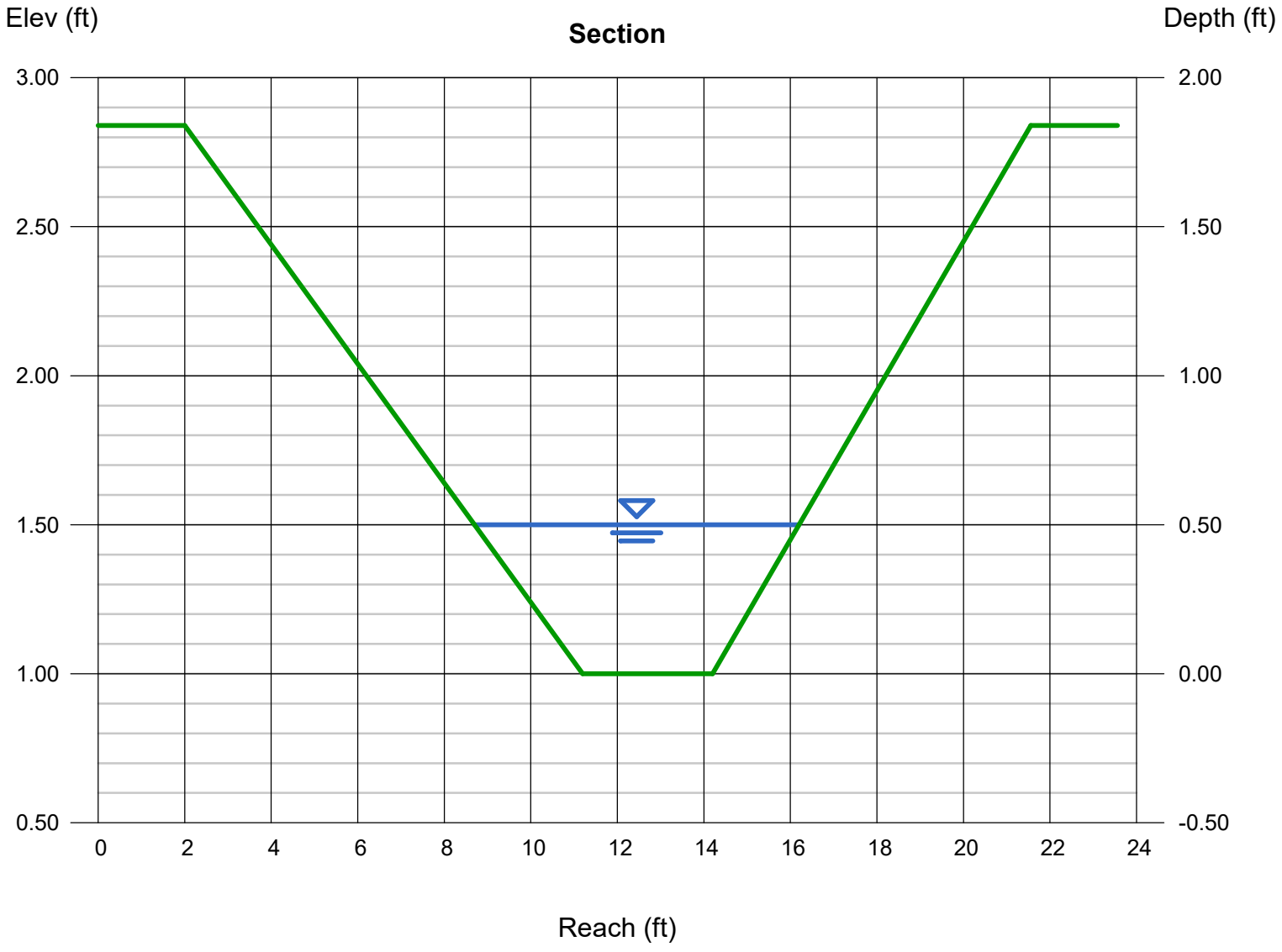
Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 5.00, 4.00
Total Depth (ft)	= 1.84
Invert Elev (ft)	= 1.00
Slope (%)	= 1.10
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 7.76

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 7.760
Area (sqft)	= 2.62
Velocity (ft/s)	= 2.96
Wetted Perim (ft)	= 7.61
Crit Depth, Yc (ft)	= 0.47
Top Width (ft)	= 7.50
EGL (ft)	= 0.64



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Apr 3 2025

SWALE DP13

Trapezoidal

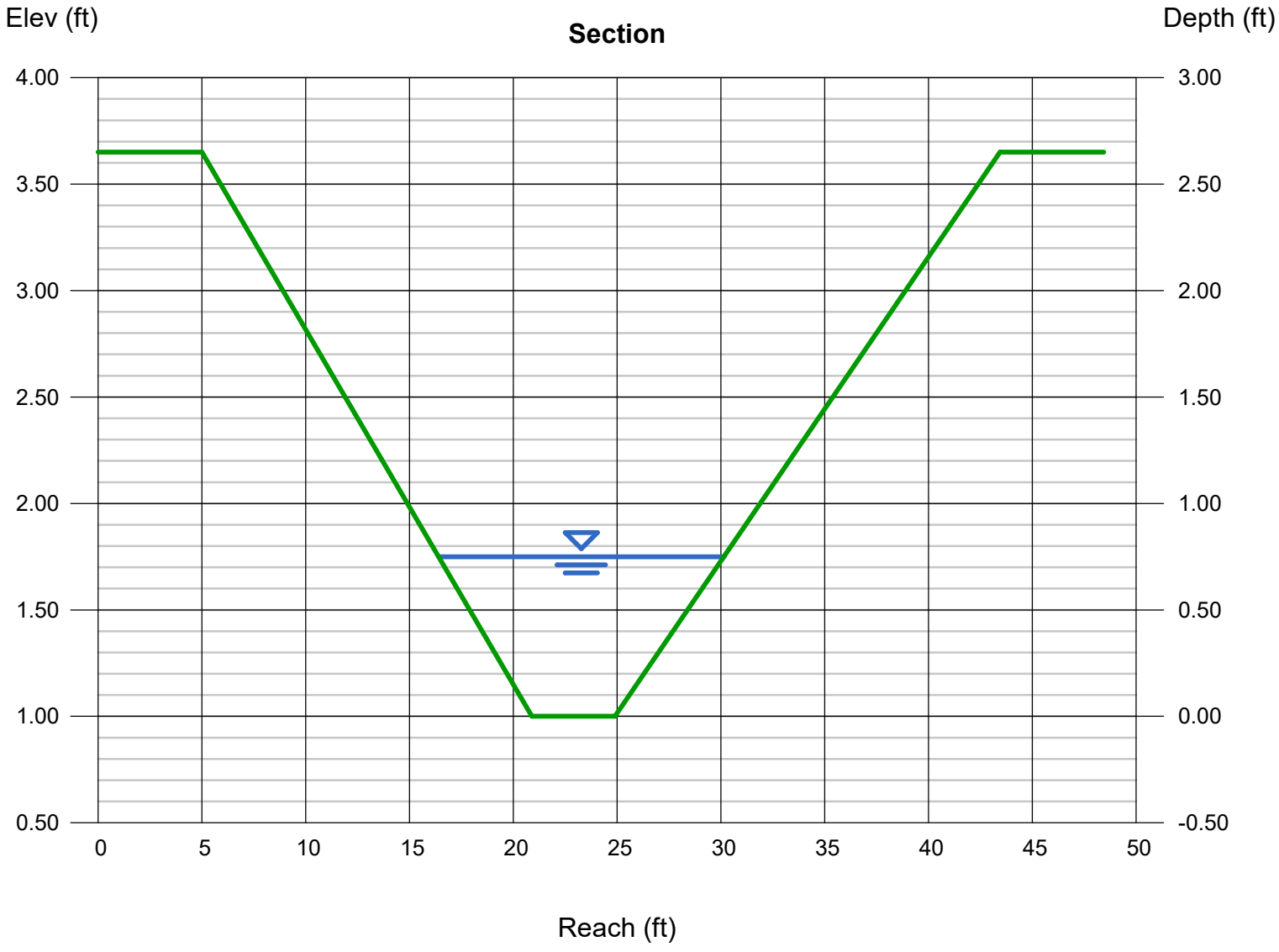
Bottom Width (ft)	= 4.00
Side Slopes (z:1)	= 6.00, 7.00
Total Depth (ft)	= 2.65
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 17.13

Highlighted

Depth (ft)	= 0.75
Q (cfs)	= 17.13
Area (sqft)	= 6.66
Velocity (ft/s)	= 2.57
Wetted Perim (ft)	= 13.87
Crit Depth, Yc (ft)	= 0.61
Top Width (ft)	= 13.75
EGL (ft)	= 0.85



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Apr 3 2025

BYPASS 1 SWALE (BASIN BP1)

User-defined

Invert Elev (ft)	= 5843.94
Slope (%)	= 0.50
N-Value	= 0.025

Calculations

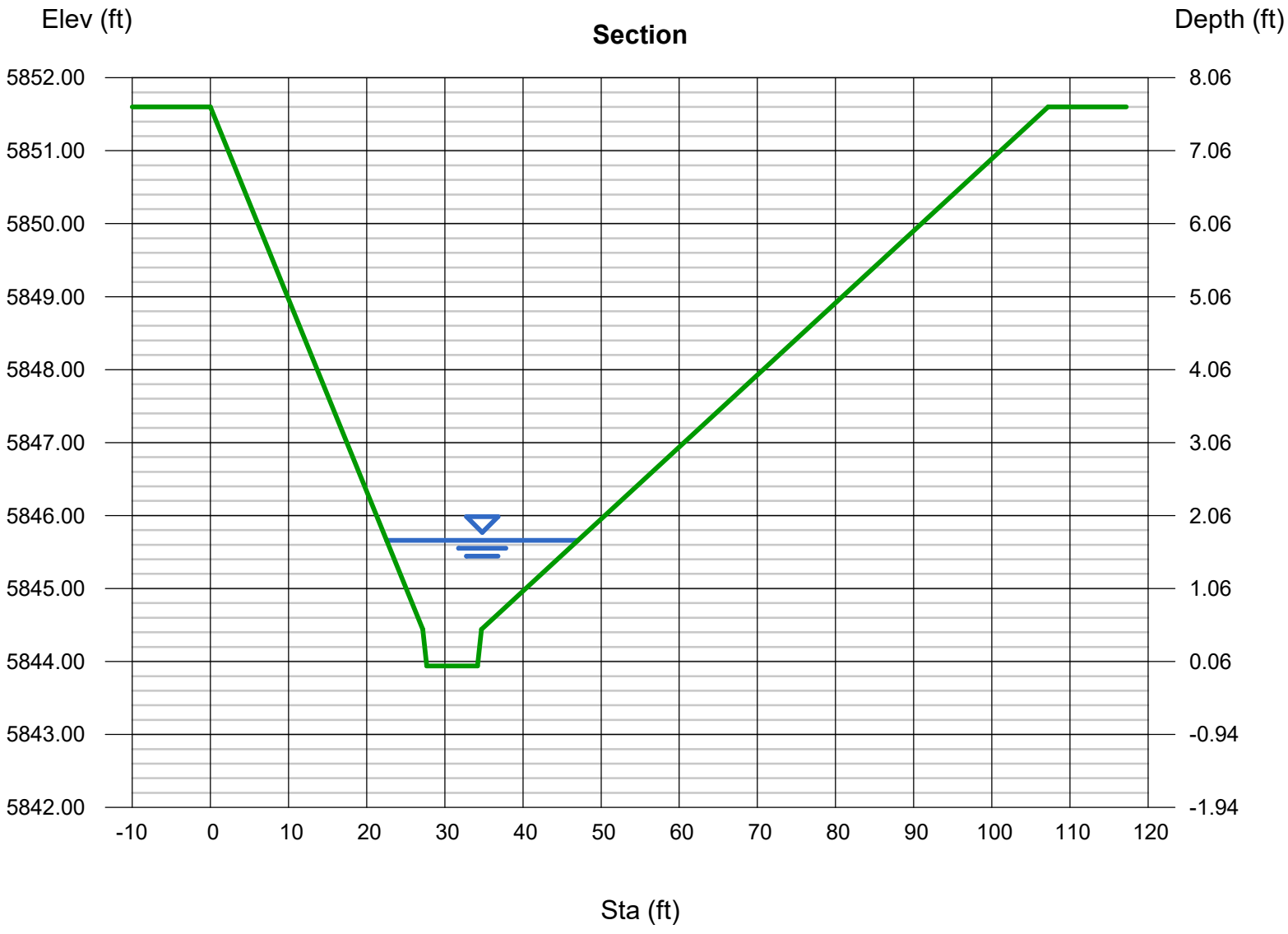
Compute by:	Known Q
Known Q (cfs)	= 91.03

Highlighted

Depth (ft)	= 1.72
Q (cfs)	= 91.03
Area (sqft)	= 23.02
Velocity (ft/s)	= 3.95
Wetted Perim (ft)	= 25.12
Crit Depth, Yc (ft)	= 1.49
Top Width (ft)	= 24.49
EGL (ft)	= 1.96

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

(0.00, 5851.60)-(27.18, 5844.44, 0.025)-(27.68, 5843.94, 0.025)-(34.18, 5843.94, 0.025)-(34.68, 5844.44, 0.025)-(107.21, 5851.60, 0.025)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Apr 3 2025

BYPASS 2 SWALE (BASIN BP2)

Triangular

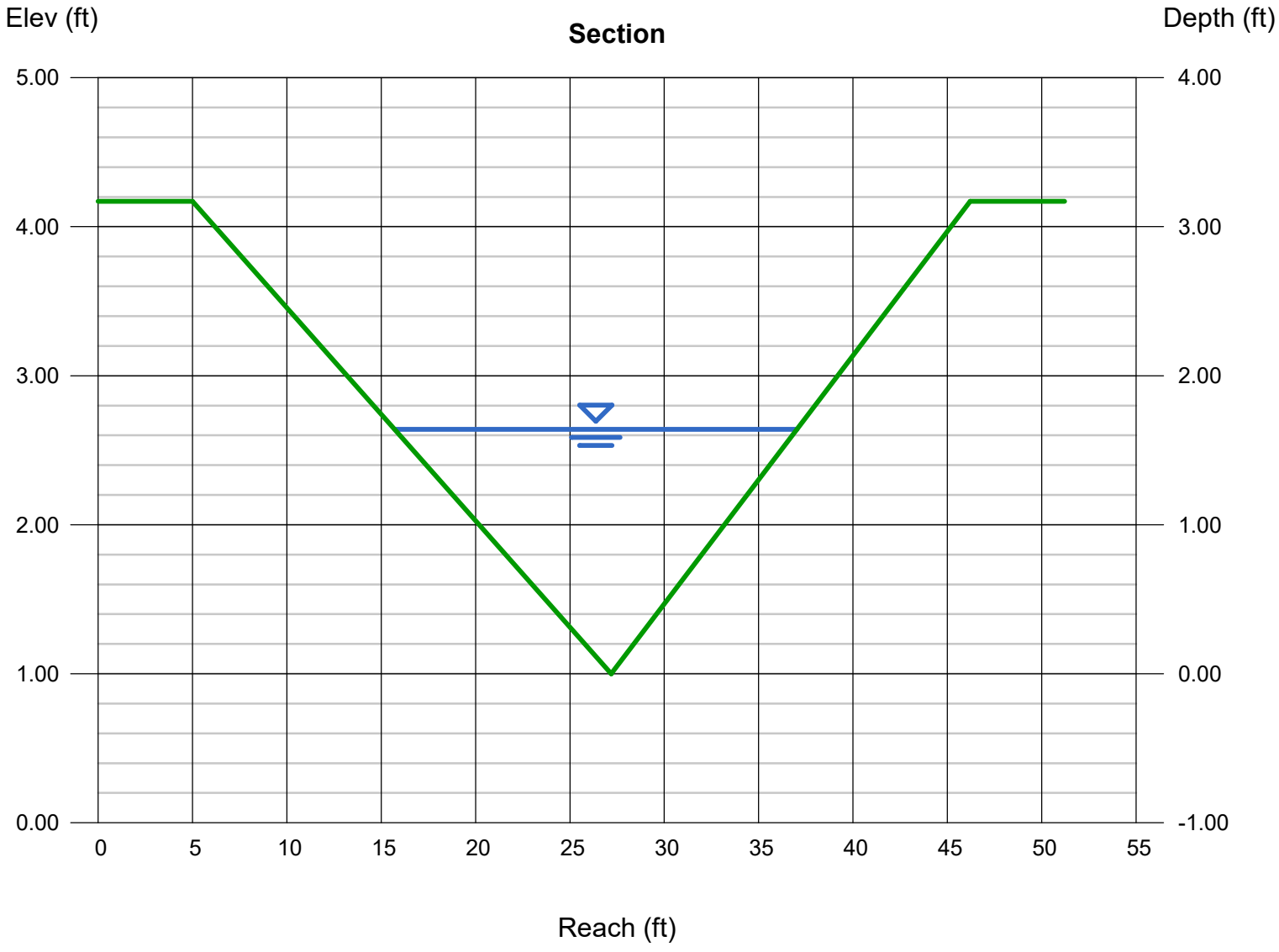
Side Slopes (z:1)	= 7.00, 6.00
Total Depth (ft)	= 3.17
Invert Elev (ft)	= 1.00
Slope (%)	= 1.00
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 89.58

Highlighted

Depth (ft)	= 1.64
Q (cfs)	= 89.58
Area (sqft)	= 17.48
Velocity (ft/s)	= 5.12
Wetted Perim (ft)	= 21.57
Crit Depth, Yc (ft)	= 1.64
Top Width (ft)	= 21.32
EGL (ft)	= 2.05



HY-8 Culvert Analysis Report

Table 1 - Project Headwater Table

Crossing Name	Culvert Name	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Outlet Velocity (ft/s)
Storm Line A01 - 100yr	Storm Line A01 - 100yr	2.14	2.14	5849.57	0.80	0.457	0.53	0.54	0.55	0.54	3.77
Storm Line C02 - 100yr	Storm Line C02 - 100yr	1.86	1.86	5850.45	0.89	0.380	0.89	0.47	0.58	0.47	5.13
Storm Line C03 - 100yr	Storm Line C03 - 100yr	17.13	17.13	5849.74	2.72	2.664	1.36	1.62	1.49	1.49	6.82
Storm Line OS01 - 100yr	Storm Line OS01 - 100yr	6.09	6.09	5844.31	1.31	0.0*	0.65	0.54	0.87	0.54	8.87
Storm Line A01 - 5yr	Storm Line A01 - 5yr	0.57	0.57	5849.17	0.40	0.138	0.26	0.27	0.28	0.27	2.57
Storm Line C02 - 5yr	Storm Line C02 - 5yr	0.43	0.43	5849.95	0.39	0.0*	0.39	0.22	0.27	0.22	3.45
Storm Line C03	Storm Line C03	4.79	4.79	5848.13	1.12	0.262	0.56	0.72	0.77	0.72	4.72

- 5yr	- 5yr										
Storm Line OS01 - 5yr	Storm Line OS01 - 5yr	0.74	0.74	5843.43	0.43	0.0*	0.21	0.19	0.30	0.19	4.78

* Full Flow Headwater elevation is below inlet invert.

STORM LINE A01 – 100-YR

Crossing Input: Storm Line A01 - 100yr

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	1.000	cfs
Design Flow	2.140	cfs
Maximum Flow	4.000	cfs
TAILWATER DATA		
Channel Type	Trapezoidal Channel	
Bottom Width	4.000	ft
Side Slope (H:V)	4.000	_:1
Channel Slope	0.0050	ft/ft
Manning's n (channel)	0.035	
Channel Invert Elevation	5848.625	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	ft
Crest Length	18.500	ft
Crest Elevation	5851.200	ft
Roadway Surface	Paved	
Top Width	18.500	ft

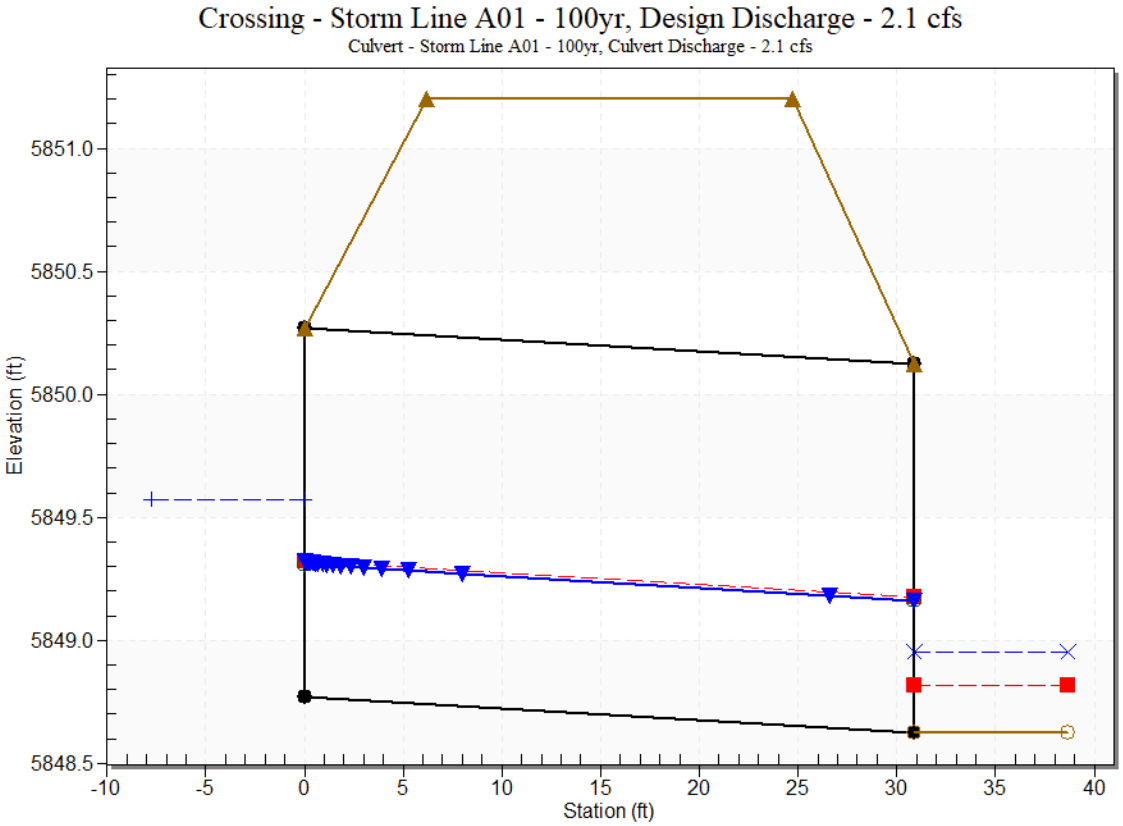
Culvert Input: Storm Line A01 - 100yr

Parameter	Value	Units
CULVERT DATA		
Name	Storm Line A01 - 100yr	
Shape	Circular	
Material	Concrete	
Diameter	1.500	ft
Embedment Depth	0.000	in
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Mitered to Conform to Slope (Ke=0.7)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	5848.770	ft
Outlet Station	30.920	ft
Outlet Elevation	5848.625	ft
Number of Barrels	1	
Computed Culvert Slope	0.004690	ft/ft

Table 2 - Culvert Summary Table: Storm Line A01 - 100yr

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
1.00	1.00	5849.30	0.53	0.239	0.35	1-S2n	0.36	0.37	0.36	0.21	3.04	0.96
1.30	1.30	5849.38	0.61	0.300	0.41	1-S2n	0.41	0.43	0.41	0.25	3.28	1.05
1.60	1.60	5849.45	0.68	0.358	0.45	1-S2n	0.46	0.47	0.46	0.28	3.47	1.12
1.90	1.90	5849.52	0.75	0.413	0.50	1-S2n	0.50	0.52	0.50	0.31	3.65	1.18
2.14	2.14	5849.57	0.80	0.457	0.53	1-S2n	0.54	0.55	0.54	0.33	3.77	1.22
2.50	2.50	5849.64	0.87	0.521	0.58	1-S2n	0.58	0.60	0.58	0.36	3.92	1.28
2.80	2.80	5849.70	0.93	0.575	0.62	1-S2n	0.62	0.64	0.62	0.38	4.05	1.33
3.10	3.10	5849.76	0.99	0.629	0.66	1-S2n	0.66	0.67	0.66	0.40	4.16	1.37
3.40	3.40	5849.81	1.04	0.683	0.69	1-S2n	0.69	0.70	0.69	0.42	4.27	1.41
3.70	3.70	5849.86	1.09	0.738	0.73	1-S2n	0.73	0.73	0.73	0.44	4.36	1.45
4.00	4.00	5849.91	1.14	0.794	0.76	1-S2n	0.76	0.77	0.76	0.46	4.45	1.48
10.55	9.83	5851.26	2.49	2.269	1.66	7-M2c	1.50	1.21	1.21	0.77	6.44	1.95

Water Surface Profile Plot for Culvert: Storm Line A01 - 100yr



STORM LINE C02 – 100-YR

Crossing Input: Storm Line C02 - 100yr

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	0.500	cfs
Design Flow	1.860	cfs
Maximum Flow	2.000	cfs
TAILWATER DATA		
Channel Type	Rectangular Channel	
Bottom Width	2.000	ft
Channel Slope	0.0050	ft/ft
Manning's n (channel)	0.035	
Channel Invert Elevation	5849.106	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	ft
Crest Length	17.500	ft
Crest Elevation	5851.000	ft
Roadway Surface	Paved	
Top Width	17.500	ft

Culvert Input: Storm Line C02 - 100yr

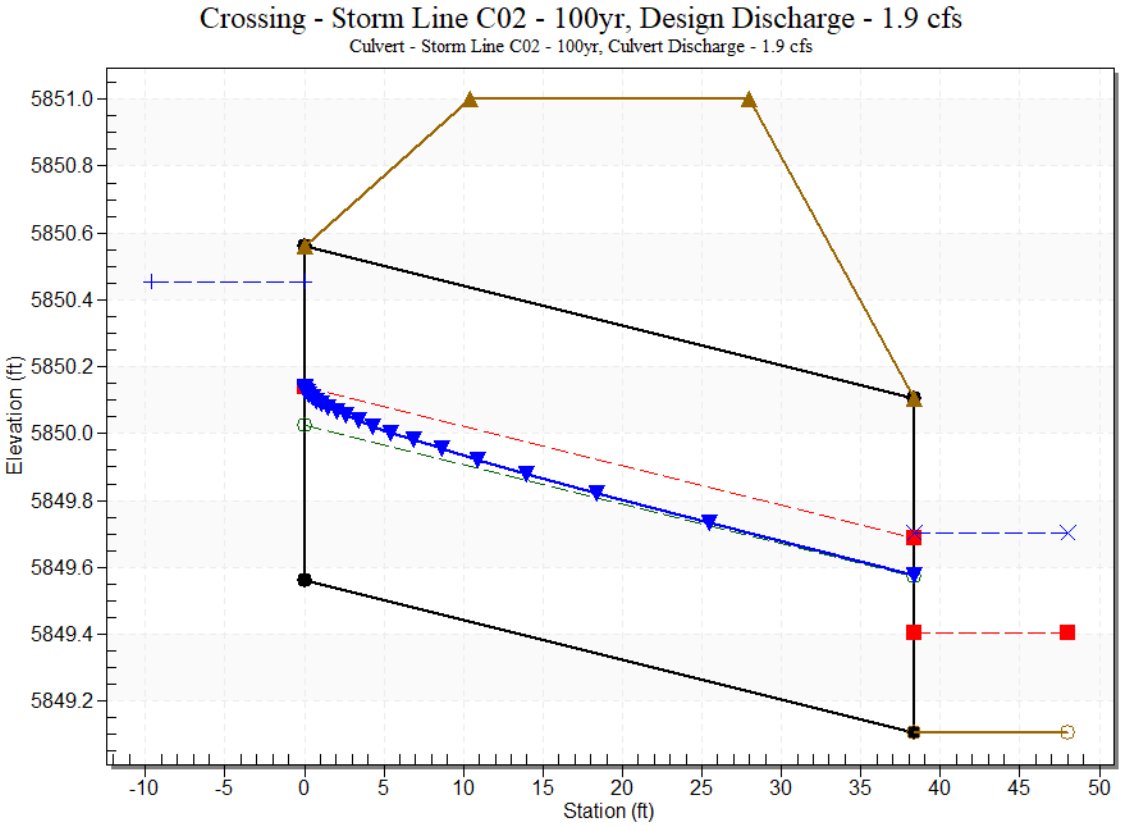
Parameter	Value	Units
CULVERT DATA		
Name	Storm Line C02 - 100yr	
Shape	Circular	
Material	Concrete	
Diameter	1.000	ft
Embedment Depth	0.000	in
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Mitered to Conform to Slope (Ke=0.7)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	5849.560	ft
Outlet Station	38.400	ft
Outlet Elevation	5849.106	ft
Number of Barrels	1	
Computed Culvert Slope	0.011823	ft/ft

Table 3 - Culvert Summary Table: Storm Line C02 - 100yr

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.50	0.50	5849.98	0.42	0.0*	0.42	1-S2n	0.23	0.29	0.23	0.25	3.60	1.02
0.65	0.65	5850.05	0.49	0.0*	0.49	1-S2n	0.27	0.34	0.27	0.29	3.89	1.11
0.80	0.80	5850.11	0.55	0.0*	0.55	1-S2n	0.30	0.37	0.30	0.33	4.12	1.19
0.95	0.95	5850.16	0.60	0.017	0.60	1-S2n	0.32	0.41	0.32	0.38	4.33	1.26
1.10	1.10	5850.21	0.65	0.070	0.65	1-S2n	0.35	0.44	0.35	0.42	4.47	1.33
1.25	1.25	5850.26	0.70	0.125	0.70	1-S2n	0.37	0.47	0.37	0.45	4.67	1.38
1.40	1.40	5850.31	0.75	0.181	0.75	1-S2n	0.40	0.50	0.40	0.49	4.82	1.43
1.55	1.55	5850.36	0.80	0.238	0.80	1-S2n	0.42	0.53	0.42	0.53	4.95	1.48
1.70	1.70	5850.40	0.84	0.304	0.84	1-S2n	0.44	0.55	0.45	0.56	5.02	1.52
1.86	1.86	5850.45	0.89	0.380	0.89	1-S2n	0.47	0.58	0.47	0.60	5.13	1.56
2.00	2.00	5850.50	0.94	0.448	0.94	1-S2n	0.49	0.60	0.49	0.63	5.23	1.59
3.45	3.22	5851.03	1.47	1.191	1.47	5-S2n	0.66	0.77	0.66	0.93	5.84	1.85

* Full Flow Headwater elevation is below inlet invert.

Water Surface Profile Plot for Culvert: Storm Line C02 - 100yr



STORM LINE C03 – 100-YR

Crossing Input: Storm Line C03 - 100yr

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	5.000	cfs
Design Flow	17.130	cfs
Maximum Flow	20.000	cfs
TAILWATER DATA		
Channel Type	Trapezoidal Channel	
Bottom Width	28.000	ft
Side Slope (H:V)	4.000	_:1
Channel Slope	0.0050	ft/ft
Manning's n (channel)	0.035	
Channel Invert Elevation	5846.397	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	ft
Crest Length	21.440	ft
Crest Elevation	5850.260	ft
Roadway Surface	Paved	
Top Width	21.440	ft

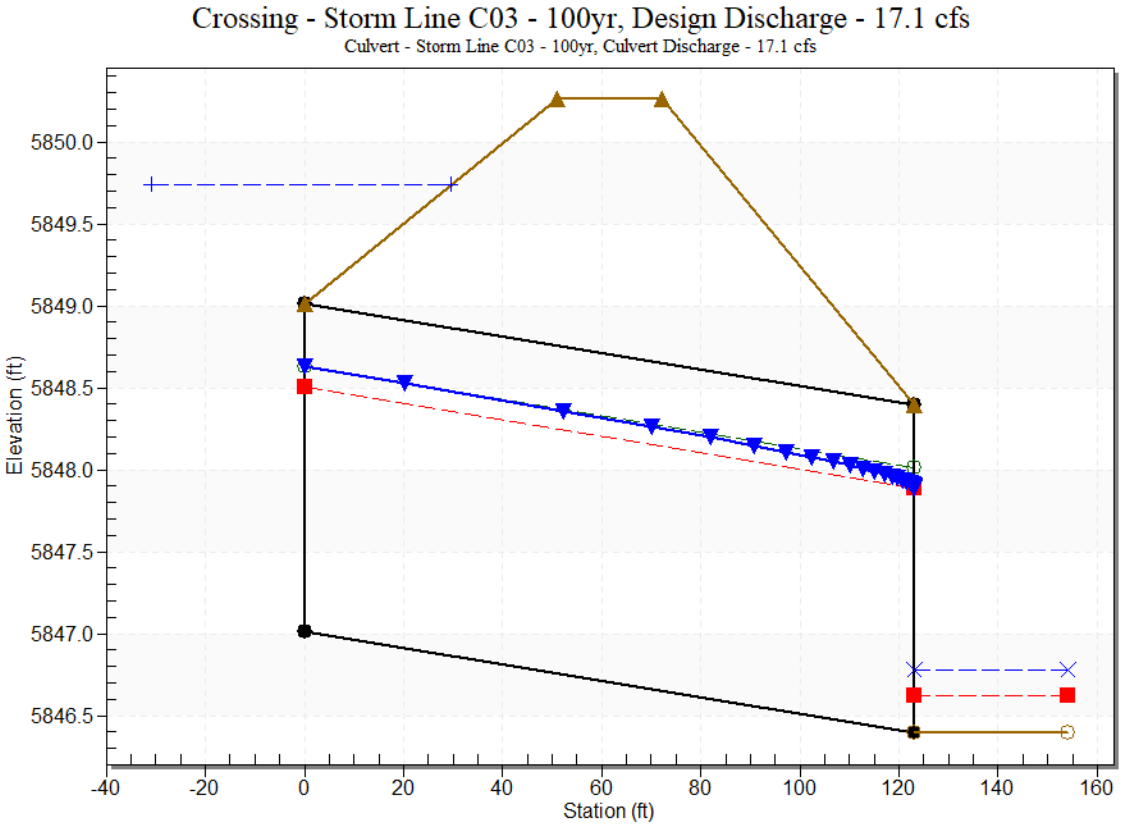
Culvert Input: Storm Line C03 - 100yr

Parameter	Value	Units
CULVERT DATA		
Name	Storm Line C03 - 100yr	
Shape	Circular	
Material	Concrete	
Diameter	2.000	ft
Embedment Depth	0.000	in
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Mitered to Conform to Slope (Ke=0.7)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	5847.013	ft
Outlet Station	123.210	ft
Outlet Elevation	5846.397	ft
Number of Barrels	1	
Computed Culvert Slope	0.005000	ft/ft

Table 4 - Culvert Summary Table: Storm Line C03 - 100yr

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.00	5.00	5848.16	1.15	0.289	0.57	1-S2n	0.73	0.79	0.73	0.18	4.78	0.95
6.50	6.50	5848.34	1.33	0.486	0.66	1-S2n	0.85	0.90	0.85	0.21	5.13	1.05
8.00	8.00	5848.51	1.50	0.692	0.75	1-S2n	0.95	1.01	0.95	0.24	5.41	1.14
9.50	9.50	5848.67	1.66	0.911	0.83	1-S2n	1.06	1.10	1.06	0.27	5.65	1.22
11.00	11.00	5848.85	1.83	1.144	0.92	1-S2n	1.16	1.19	1.16	0.29	5.85	1.29
12.50	12.50	5849.03	2.02	1.392	1.01	5-S2n	1.26	1.27	1.26	0.32	6.02	1.35
14.00	14.00	5849.37	2.22	2.360	1.18	7-M2c	1.36	1.35	1.35	0.34	6.22	1.41
15.50	15.50	5849.52	2.45	2.505	1.25	7-M2c	1.47	1.42	1.42	0.36	6.50	1.47
17.13	17.13	5849.74	2.72	2.664	1.36	7-M2c	1.62	1.49	1.49	0.38	6.82	1.52
18.50	18.50	5849.99	2.98	2.814	1.49	7-M2c	2.00	1.55	1.55	0.40	7.09	1.57
20.00	19.90	5850.27	3.26	3.003	1.63	7-M2c	2.00	1.60	1.60	0.42	7.38	1.61
23.64	20.50	5850.39	3.38	3.109	1.69	7-M2c	2.00	1.62	1.62	0.46	7.50	1.72

Water Surface Profile Plot for Culvert: Storm Line C03 - 100yr



STORM LINE OS01 – 100-YR

Crossing Input: Storm Line OS01 - 100yr

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	4.000	cfs
Design Flow	6.090	cfs
Maximum Flow	10.000	cfs
TAILWATER DATA		
Channel Type	Rectangular Channel	
Bottom Width	12.600	ft
Channel Slope	0.0220	ft/ft
Manning's n (channel)	0.035	
Channel Invert Elevation	5840.395	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	ft
Crest Length	63.000	ft
Crest Elevation	5848.360	ft
Roadway Surface	Paved	
Top Width	63.000	ft

Culvert Input: Storm Line OS01 - 100yr

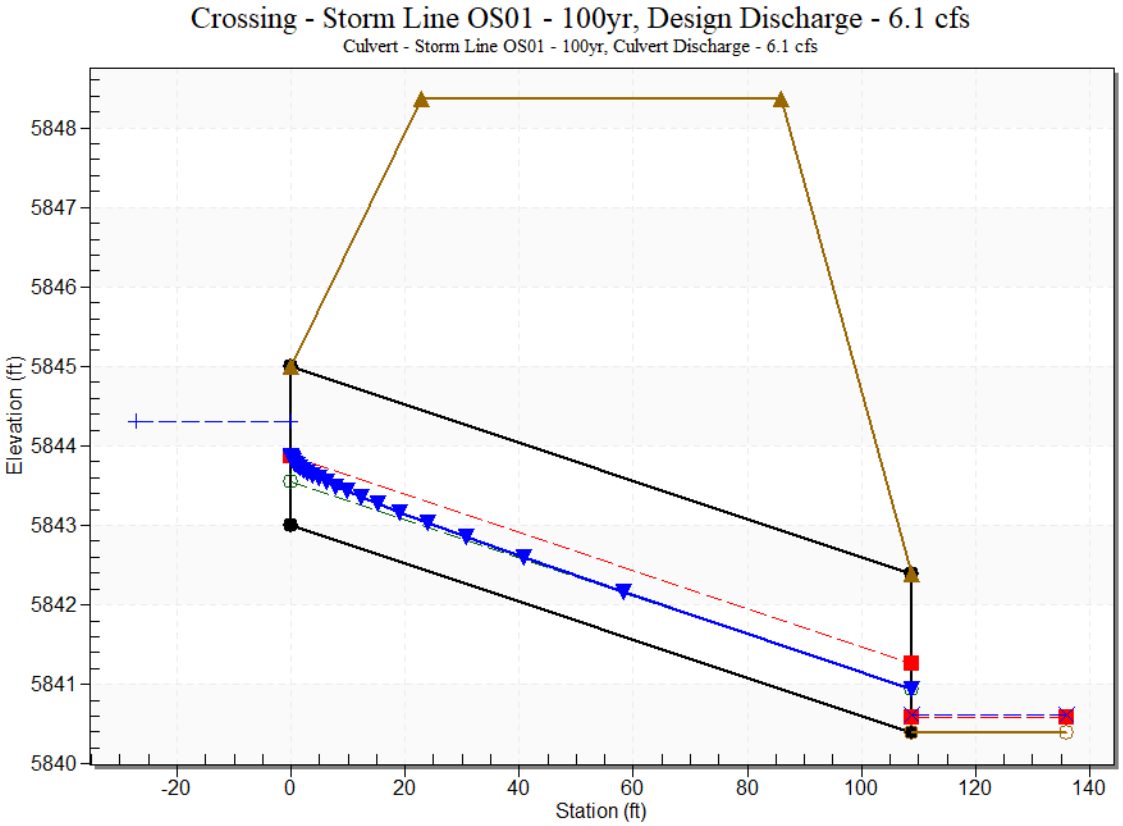
Parameter	Value	Units
CULVERT DATA		
Name	Storm Line OS01 - 100yr	
Shape	Circular	
Material	Concrete	
Diameter	2.000	ft
Embedment Depth	0.000	in
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Mitered to Conform to Slope (Ke=0.7)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	5843.000	ft
Outlet Station	108.790	ft
Outlet Elevation	5840.395	ft
Number of Barrels	1	
Computed Culvert Slope	0.023945	ft/ft

Table 5 - Culvert Summary Table: Storm Line OS01 - 100yr

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
4.00	4.00	5844.04	1.04	0.0*	0.52	1-S2n	0.44	0.70	0.44	0.17	7.86	1.89
4.60	4.60	5844.12	1.12	0.0*	0.56	1-S2n	0.47	0.75	0.47	0.18	8.06	1.99
5.20	5.20	5844.20	1.20	0.0*	0.60	1-S2n	0.50	0.80	0.50	0.20	8.48	2.09
6.09	6.09	5844.31	1.31	0.0*	0.65	1-S2n	0.54	0.87	0.54	0.22	8.87	2.22
6.40	6.40	5844.34	1.34	0.0*	0.67	1-S2n	0.55	0.90	0.55	0.22	9.00	2.27
7.00	7.00	5844.41	1.41	0.0*	0.71	1-S2n	0.58	0.94	0.58	0.24	9.23	2.35
7.60	7.60	5844.48	1.48	0.0*	0.74	1-S2n	0.61	0.98	0.61	0.25	9.45	2.43
8.20	8.20	5844.55	1.55	0.0*	0.77	1-S2n	0.63	1.02	0.64	0.26	9.43	2.50
8.80	8.80	5844.61	1.61	0.0*	0.81	1-S2n	0.65	1.06	0.65	0.27	9.85	2.57
9.40	9.40	5844.68	1.68	0.0*	0.84	1-S2n	0.68	1.10	0.68	0.28	10.03	2.64
10.00	10.00	5844.74	1.74	0.0*	0.87	1-S2n	0.70	1.13	0.73	0.29	9.68	2.70
29.09	28.52	5848.38	5.38	2.955	2.69	5-S2n	1.29	1.84	1.35	0.57	12.68	4.07

* Full Flow Headwater elevation is below inlet invert.

Water Surface Profile Plot for Culvert: Storm Line OS01 - 100yr



STORM LINE A01 – 5-YR

Crossing Input: Storm Line A01 - 5yr

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	0.250	cfs
Design Flow	0.570	cfs
Maximum Flow	4.000	cfs
TAILWATER DATA		
Channel Type	Trapezoidal Channel	
Bottom Width	4.000	ft
Side Slope (H:V)	4.000	_:1
Channel Slope	0.0050	ft/ft
Manning's n (channel)	0.035	
Channel Invert Elevation	5848.625	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	ft
Crest Length	18.500	ft
Crest Elevation	5851.200	ft
Roadway Surface	Paved	
Top Width	18.500	ft

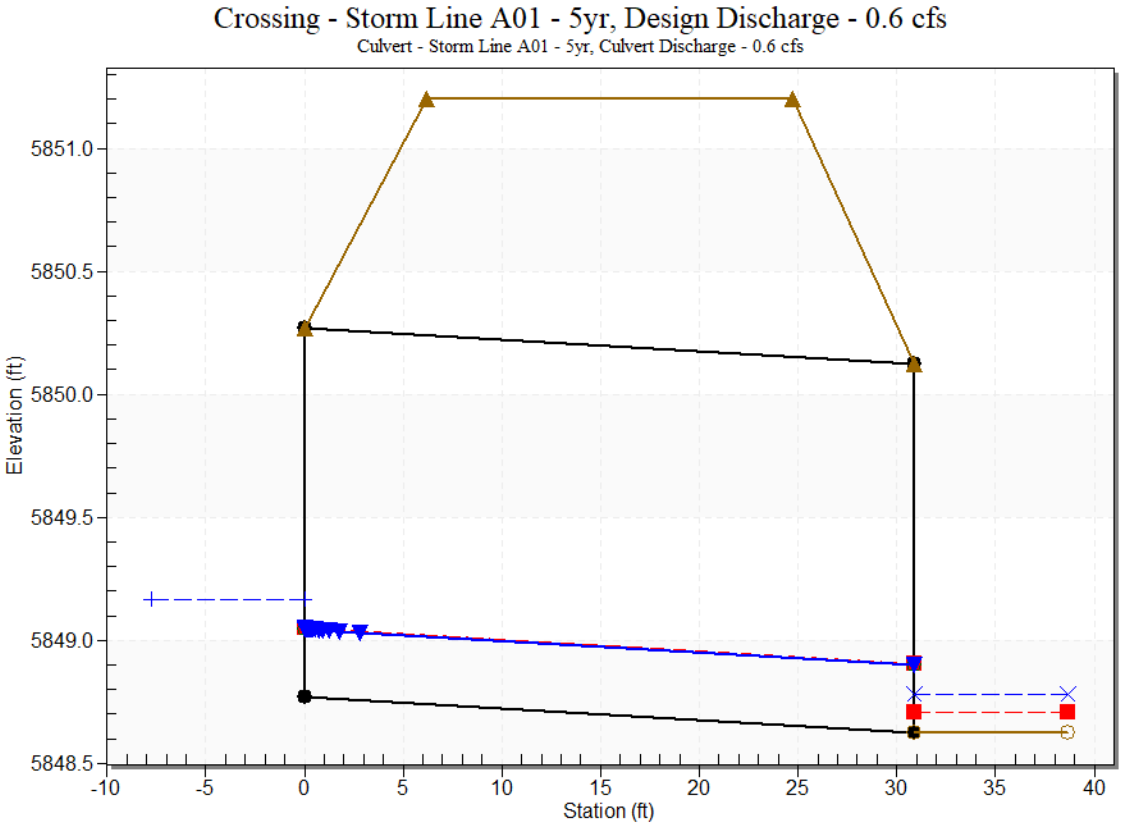
Culvert Input: Storm Line A01 - 5yr

Parameter	Value	Units
CULVERT DATA		
Name	Storm Line A01 - 5yr	
Shape	Circular	
Material	Concrete	
Diameter	1.500	ft
Embedment Depth	0.000	in
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Mitered to Conform to Slope (Ke=0.7)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	5848.770	ft
Outlet Station	30.920	ft
Outlet Elevation	5848.625	ft
Number of Barrels	1	
Computed Culvert Slope	0.004690	ft/ft

Table 6 - Culvert Summary Table: Storm Line A01 - 5yr

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.25	0.25	5849.03	0.26	0.040	0.17	1-S2n	0.18	0.18	0.18	0.10	2.02	0.59
0.57	0.57	5849.17	0.40	0.138	0.26	1-S2n	0.27	0.28	0.27	0.16	2.57	0.79
1.00	1.00	5849.30	0.53	0.239	0.35	1-S2n	0.36	0.37	0.36	0.21	3.04	0.96
1.38	1.38	5849.40	0.63	0.315	0.42	1-S2n	0.43	0.44	0.43	0.26	3.33	1.06
1.75	1.75	5849.48	0.71	0.386	0.48	1-S2n	0.48	0.50	0.48	0.29	3.56	1.15
2.12	2.12	5849.57	0.80	0.454	0.53	1-S2n	0.53	0.55	0.54	0.33	3.76	1.22
2.50	2.50	5849.64	0.87	0.521	0.58	1-S2n	0.58	0.60	0.58	0.36	3.92	1.28
2.88	2.88	5849.71	0.94	0.588	0.63	1-S2n	0.63	0.64	0.63	0.39	4.08	1.34
3.25	3.25	5849.78	1.01	0.656	0.67	1-S2n	0.67	0.69	0.67	0.41	4.22	1.39
3.62	3.62	5849.85	1.08	0.724	0.72	1-S2n	0.72	0.73	0.72	0.44	4.34	1.44
4.00	4.00	5849.91	1.14	0.794	0.76	1-S2n	0.76	0.77	0.76	0.46	4.45	1.48
10.55	9.83	5851.26	2.49	2.269	1.66	7-M2c	1.50	1.21	1.21	0.77	6.44	1.95

Water Surface Profile Plot for Culvert: Storm Line A01 - 5yr



STORM LINE C02 – 5-YR

Crossing Input: Storm Line C02 - 5yr

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	0.200	cfs
Design Flow	0.430	cfs
Maximum Flow	1.000	cfs
TAILWATER DATA		
Channel Type	Rectangular Channel	
Bottom Width	2.000	ft
Channel Slope	0.0050	ft/ft
Manning's n (channel)	0.035	
Channel Invert Elevation	5849.106	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	ft
Crest Length	17.500	ft
Crest Elevation	5851.000	ft
Roadway Surface	Paved	
Top Width	17.500	ft

Culvert Input: Storm Line C02 - 5yr

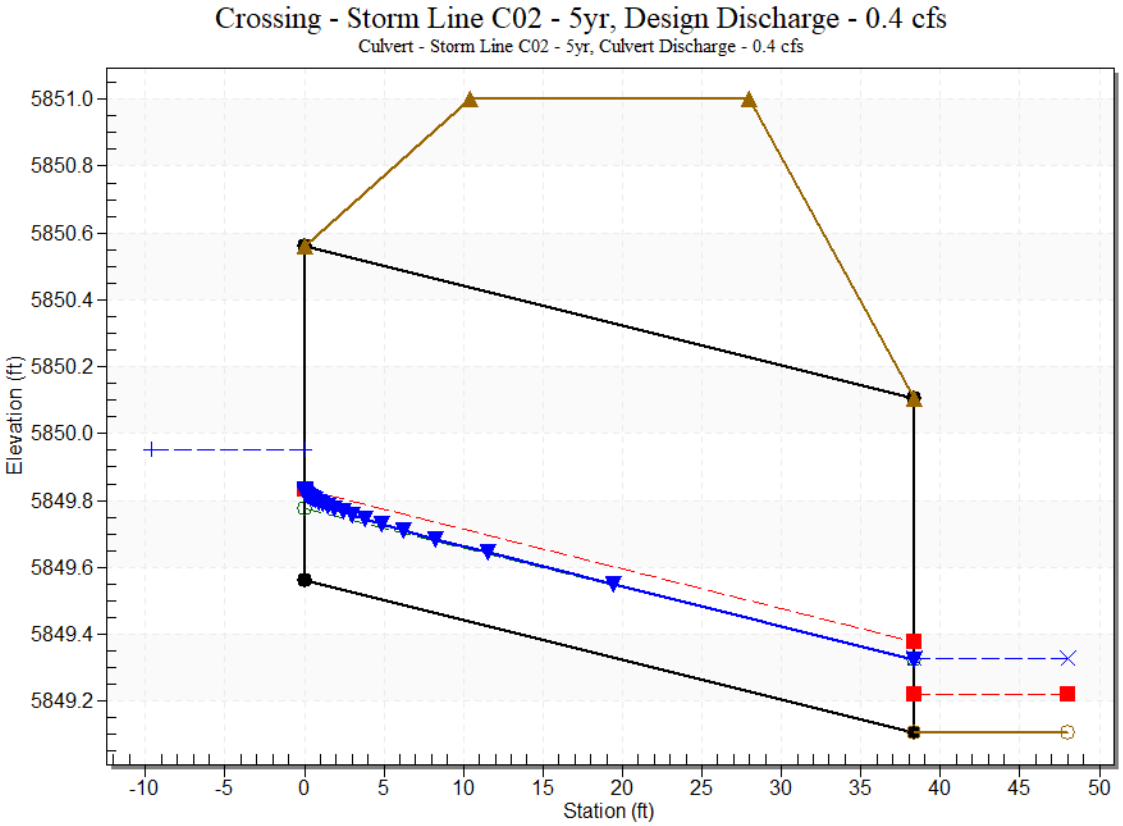
Parameter	Value	Units
CULVERT DATA		
Name	Storm Line C02 - 5yr	
Shape	Circular	
Material	Concrete	
Diameter	1.000	ft
Embedment Depth	0.000	in
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Mitered to Conform to Slope (Ke=0.7)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	5849.560	ft
Outlet Station	38.400	ft
Outlet Elevation	5849.106	ft
Number of Barrels	1	
Computed Culvert Slope	0.011823	ft/ft

Table 7 - Culvert Summary Table: Storm Line C02 - 5yr

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.20	0.20	5849.82	0.26	0.0*	0.26	1-S2n	0.15	0.18	0.15	0.14	2.76	0.73
0.28	0.28	5849.87	0.31	0.0*	0.31	1-S2n	0.17	0.22	0.17	0.17	3.04	0.83
0.36	0.36	5849.92	0.36	0.0*	0.36	1-S2n	0.20	0.25	0.20	0.20	3.28	0.91
0.43	0.43	5849.95	0.39	0.0*	0.39	1-S2n	0.22	0.27	0.22	0.22	3.45	0.96
0.52	0.52	5849.99	0.43	0.0*	0.43	1-S2n	0.24	0.30	0.24	0.25	3.65	1.03
0.60	0.60	5850.03	0.47	0.0*	0.47	1-S2n	0.26	0.32	0.26	0.28	3.80	1.08
0.68	0.68	5850.06	0.50	0.0*	0.50	1-S2n	0.27	0.34	0.27	0.30	3.94	1.13
0.76	0.76	5850.09	0.53	0.0*	0.53	1-S2n	0.29	0.36	0.29	0.32	4.06	1.17
0.84	0.84	5850.12	0.56	0.0*	0.56	1-S2n	0.30	0.38	0.30	0.35	4.15	1.21
0.92	0.92	5850.15	0.59	0.006	0.59	1-S2n	0.32	0.40	0.32	0.37	4.26	1.25
1.00	1.00	5850.18	0.62	0.034	0.62	1-S2n	0.33	0.42	0.33	0.39	4.36	1.29
3.36	3.21	5851.02	1.46	1.167	1.46	5-S2n	0.65	0.77	0.66	0.92	5.83	1.84

* Full Flow Headwater elevation is below inlet invert.

Water Surface Profile Plot for Culvert: Storm Line C02 - 5yr



STORM LINE C03 – 5-YR

Crossing Input: Storm Line C03 - 5yr

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	4.000	cfs
Design Flow	4.790	cfs
Maximum Flow	8.000	cfs
TAILWATER DATA		
Channel Type	Trapezoidal Channel	
Bottom Width	28.000	ft
Side Slope (H:V)	4.000	_:1
Channel Slope	0.0050	ft/ft
Manning's n (channel)	0.035	
Channel Invert Elevation	5846.397	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	ft
Crest Length	21.440	ft
Crest Elevation	5850.260	ft
Roadway Surface	Paved	
Top Width	21.440	ft

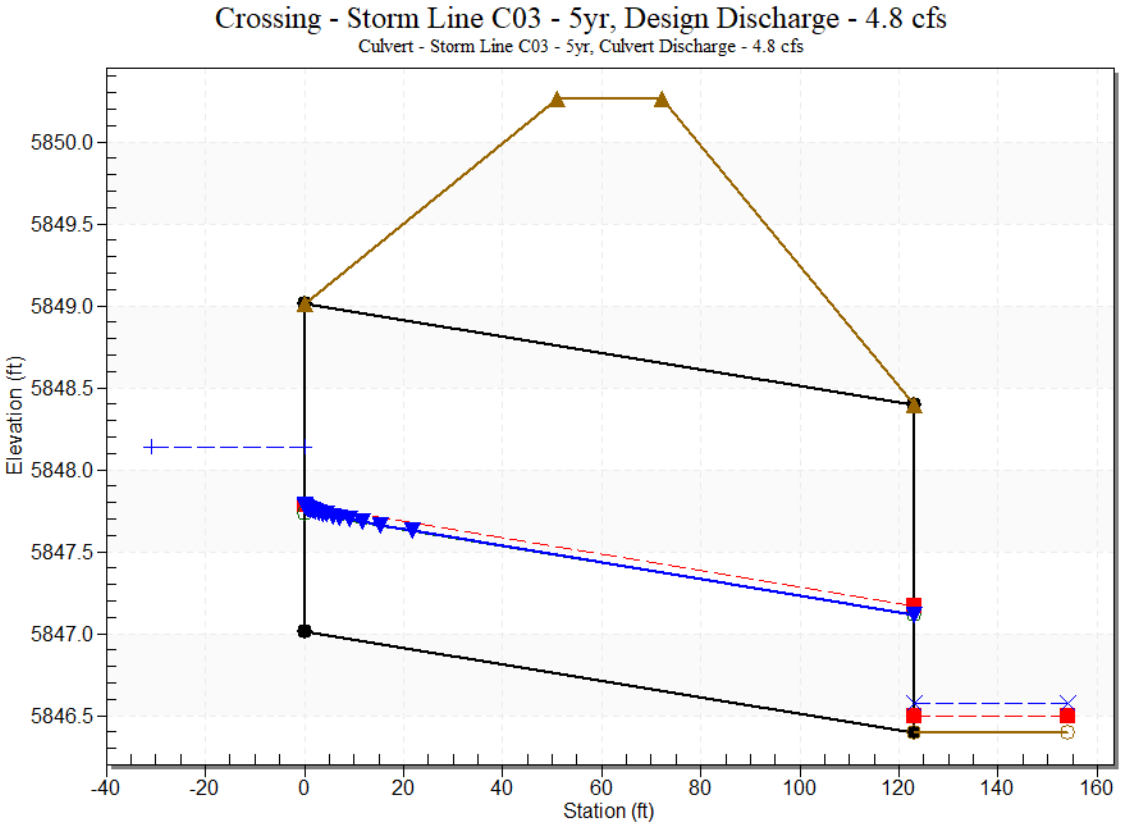
Culvert Input: Storm Line C03 - 5yr

Parameter	Value	Units
CULVERT DATA		
Name	Storm Line C03 - 5yr	
Shape	Circular	
Material	Concrete	
Diameter	2.000	ft
Embedment Depth	0.000	in
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Mitered to Conform to Slope (Ke=0.7)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	5847.013	ft
Outlet Station	123.210	ft
Outlet Elevation	5846.397	ft
Number of Barrels	1	
Computed Culvert Slope	0.005000	ft/ft

Table 8 - Culvert Summary Table: Storm Line C03 - 5yr

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
4.00	4.00	5848.02	1.01	0.161	0.51	1-S2n	0.65	0.70	0.65	0.16	4.49	0.87
4.40	4.40	5848.08	1.07	0.212	0.53	1-S2n	0.69	0.74	0.69	0.17	4.61	0.90
4.79	4.79	5848.13	1.12	0.262	0.56	1-S2n	0.72	0.77	0.72	0.18	4.72	0.94
5.20	5.20	5848.19	1.17	0.315	0.59	1-S2n	0.75	0.80	0.75	0.19	4.83	0.97
5.60	5.60	5848.24	1.22	0.367	0.61	1-S2n	0.78	0.84	0.78	0.20	4.93	0.99
6.00	6.00	5848.28	1.27	0.420	0.64	1-S2n	0.81	0.87	0.81	0.20	5.02	1.02
6.40	6.40	5848.33	1.32	0.473	0.66	1-S2n	0.84	0.90	0.84	0.21	5.11	1.05
6.80	6.80	5848.38	1.36	0.527	0.68	1-S2n	0.87	0.92	0.87	0.22	5.19	1.07
7.20	7.20	5848.42	1.41	0.581	0.70	1-S2n	0.90	0.95	0.90	0.23	5.27	1.09
7.60	7.60	5848.47	1.45	0.636	0.73	1-S2n	0.93	0.98	0.93	0.23	5.34	1.12
8.00	8.00	5848.51	1.50	0.692	0.75	1-S2n	0.95	1.01	0.95	0.24	5.41	1.14
21.09	20.15	5850.32	3.31	3.043	1.65	7-M2c	2.00	1.61	1.61	0.43	7.43	1.65

Water Surface Profile Plot for Culvert: Storm Line C03 - 5yr



STORM LINE OS01 – 5-YR

Crossing Input: Storm Line OS01 - 5yr

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	0.500	cfs
Design Flow	0.740	cfs
Maximum Flow	1.200	cfs
TAILWATER DATA		
Channel Type	Rectangular Channel	
Bottom Width	12.600	ft
Channel Slope	0.0220	ft/ft
Manning's n (channel)	0.035	
Channel Invert Elevation	5840.395	ft
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	ft
Crest Length	63.000	ft
Crest Elevation	5848.360	ft
Roadway Surface	Paved	
Top Width	63.000	ft

Culvert Input: Storm Line OS01 - 5yr

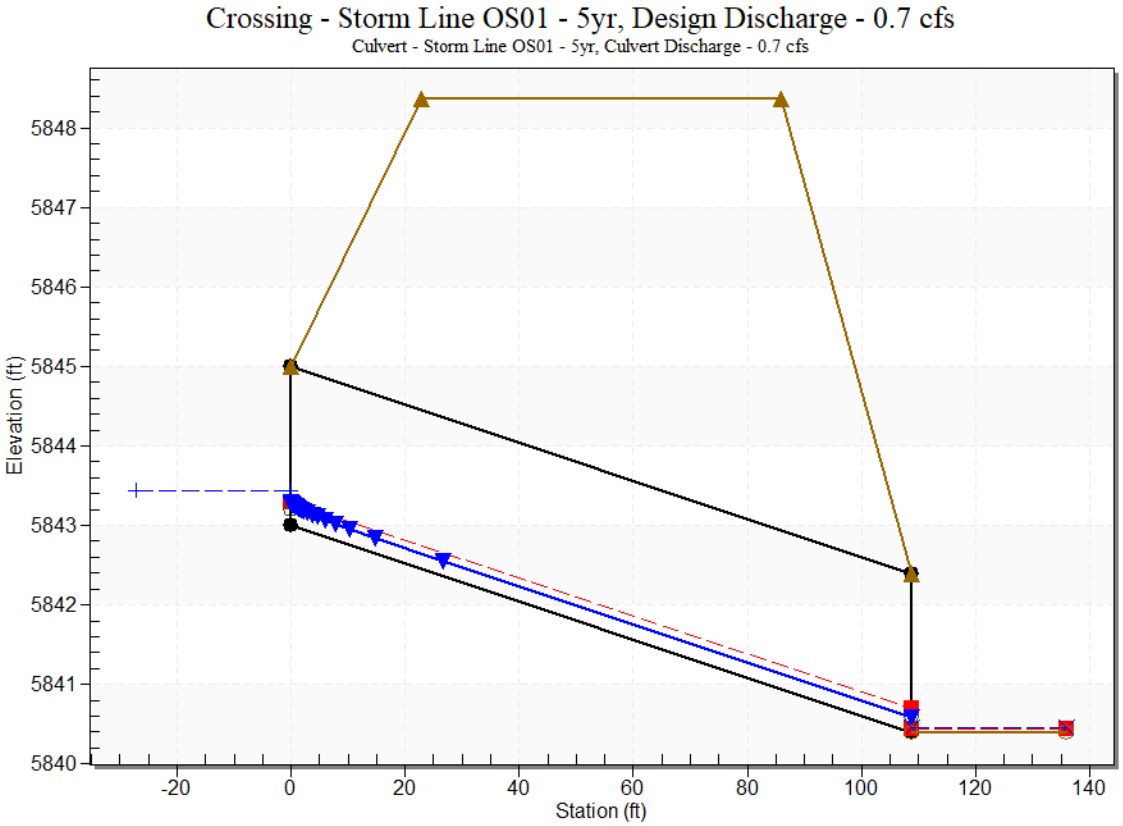
Parameter	Value	Units
CULVERT DATA		
Name	Storm Line OS01 - 5yr	
Shape	Circular	
Material	Concrete	
Diameter	2.000	ft
Embedment Depth	0.000	in
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Mitered to Conform to Slope (Ke=0.7)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	5843.000	ft
Outlet Station	108.790	ft
Outlet Elevation	5840.395	ft
Number of Barrels	1	
Computed Culvert Slope	0.023945	ft/ft

Table 9 - Culvert Summary Table: Storm Line OS01 - 5yr

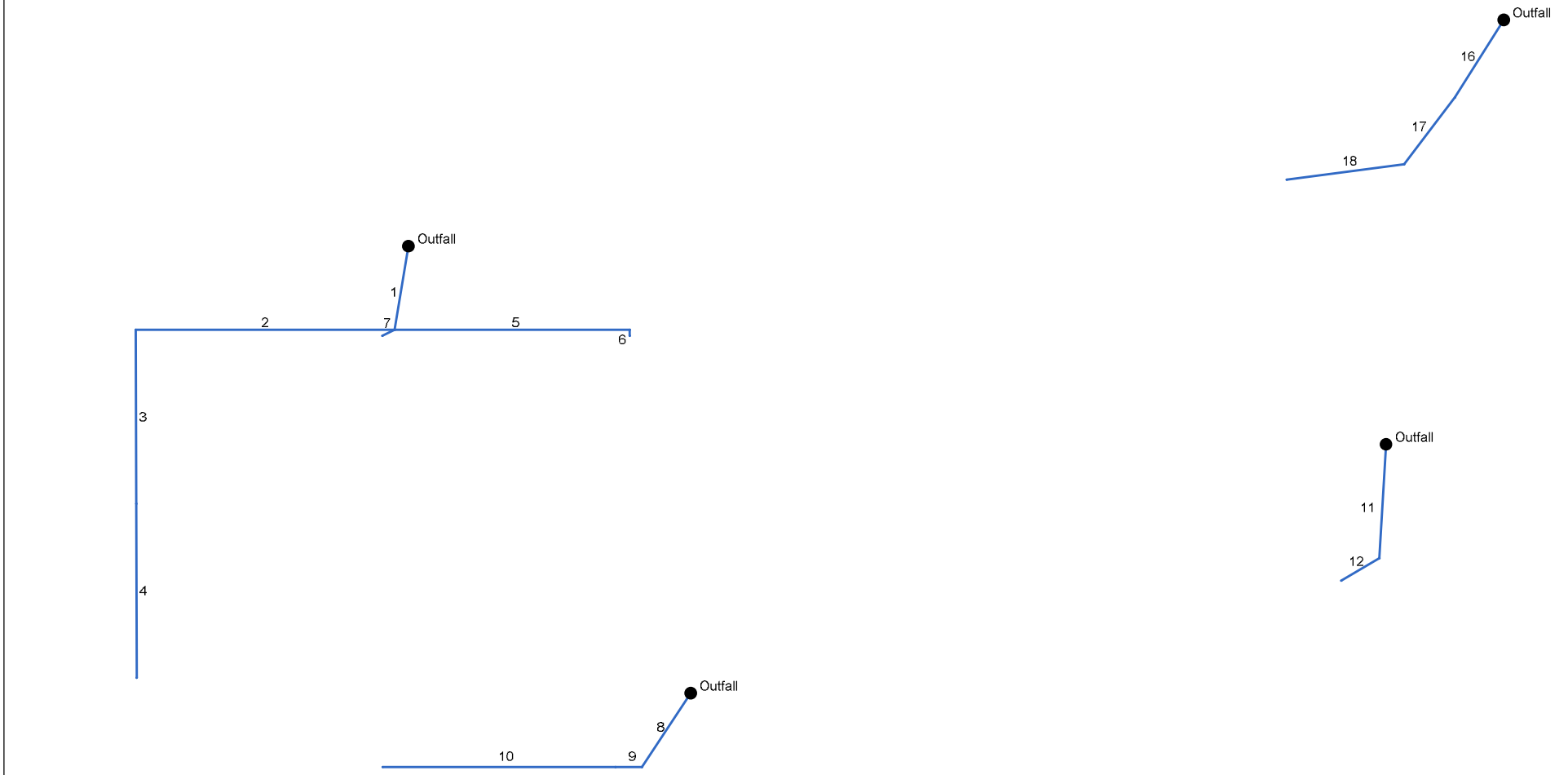
Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.50	0.50	5843.35	0.35	0.0*	0.17	1-S2n	0.16	0.24	0.16	0.05	4.24	0.83
0.57	0.57	5843.37	0.37	0.0*	0.19	1-S2n	0.17	0.26	0.17	0.05	4.43	0.87
0.64	0.64	5843.40	0.40	0.0*	0.20	1-S2n	0.18	0.27	0.18	0.06	4.59	0.91
0.74	0.74	5843.43	0.43	0.0*	0.21	1-S2n	0.19	0.30	0.19	0.06	4.78	0.97
0.78	0.78	5843.44	0.44	0.0*	0.22	1-S2n	0.20	0.30	0.20	0.06	4.85	0.99
0.85	0.85	5843.46	0.46	0.0*	0.23	1-S2n	0.21	0.32	0.21	0.07	4.96	1.02
0.92	0.92	5843.48	0.48	0.0*	0.24	1-S2n	0.21	0.33	0.21	0.07	5.09	1.06
0.99	0.99	5843.50	0.50	0.0*	0.25	1-S2n	0.22	0.34	0.22	0.07	5.21	1.09
1.06	1.06	5843.51	0.51	0.0*	0.26	1-S2n	0.23	0.35	0.23	0.08	5.32	1.11
1.13	1.13	5843.53	0.53	0.0*	0.27	1-S2n	0.24	0.37	0.24	0.08	5.42	1.14
1.20	1.20	5843.55	0.55	0.0*	0.27	1-S2n	0.24	0.38	0.24	0.08	5.52	1.17
28.58	28.47	5848.37	5.37	2.941	2.68	5-S2n	1.29	1.84	1.34	0.56	12.68	4.04

* Full Flow Headwater elevation is below inlet invert.

Water Surface Profile Plot for Culvert: Storm Line OS01 - 5yr



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



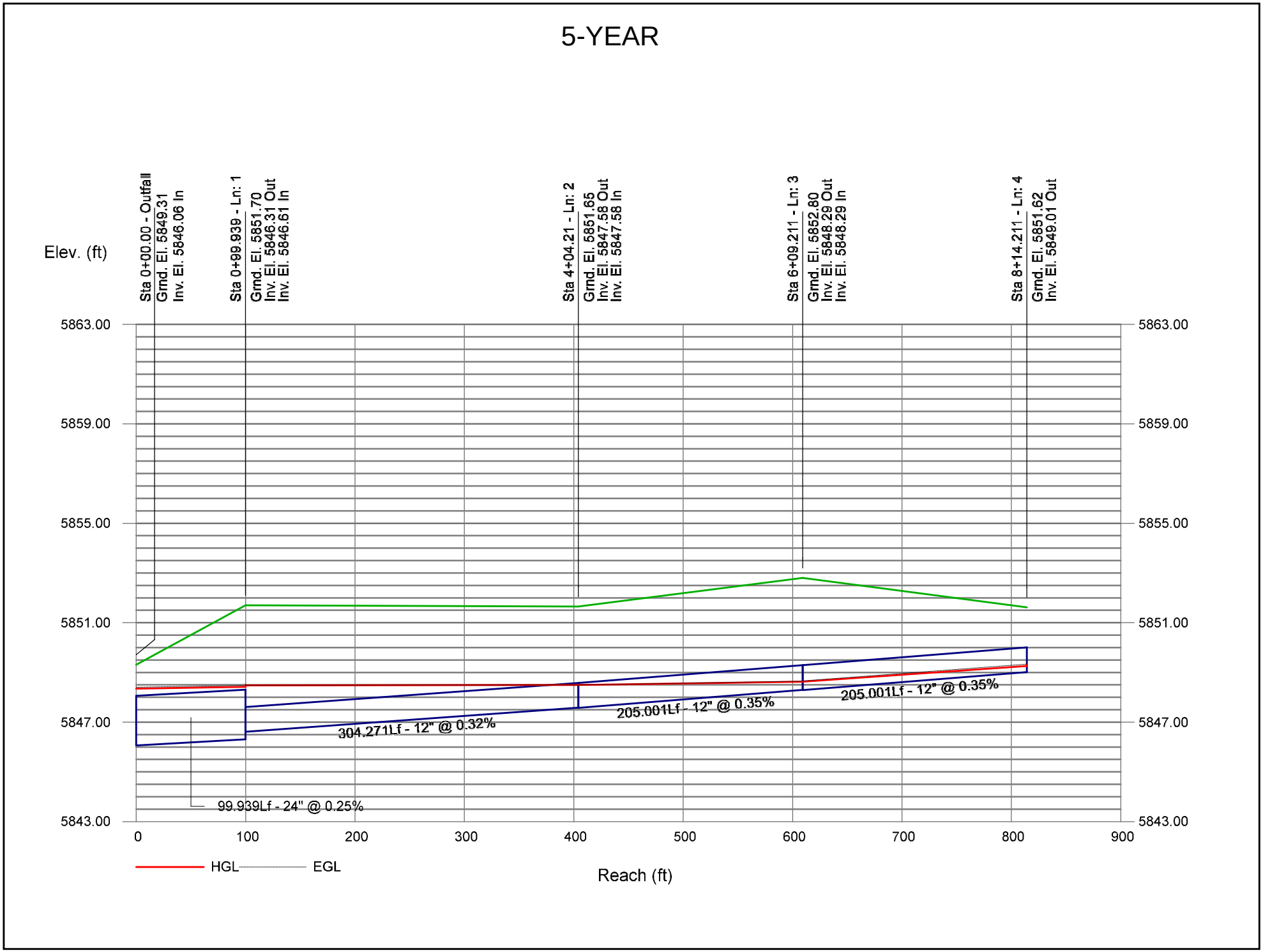
	Number of lines: 18	Date: 4/25/2025

5-YEAR

Line No.	Line ID	Flow Rate	Line Size	Line Length	Invert Dn	Invert Up	Line Slope	HGL Dn	HGL Up
		(cfs)	(in)	(ft)	(ft)	(ft)	(%)	(ft)	(ft)
1	STM_phase3-P(60)	6.00	24	99.939	5846.06	5846.31	0.25	5848.35	5848.42
2	STM_phase3-P(59)	0.27	12	304.271	5846.61	5847.58	0.32	5848.48	5848.49
3	STM_phase3-P(58)	0.31	12	205.001	5847.58	5848.29	0.35	5848.50	5848.62
4	STM_phase3-P(57)	0.34	12	205.001	5848.29	5849.01	0.35	5848.63	5849.26
5	STM_phase3-P(62)	3.10	18	275.530	5846.31	5847.00	0.25	5848.48	5848.68
6	STM_phase3-P(61)	3.11	18	6.993	5847.00	5847.02	0.29	5848.73	5848.74
7	STM_phase3-P(63)	3.16	15	16.210	5846.61	5847.03	2.59	5848.48	5848.51
8	Pipe - (132)	4.02	24	104.352	5848.00	5848.54	0.51	5849.35	5849.19
9	Pipe - (131)	4.04	24	31.000	5848.56	5848.69	0.42	5849.25	5849.38
10	Pipe - (128) (1)	2.48	18	273.333	5848.73	5850.09	0.50	5849.38	5850.66 j
11	Pipe - (68)	2.94	18	134.463	5845.89	5846.29	0.29	5846.97	5847.10
12	Pipe - (68) (2)	2.94	18	52.163	5846.37	5846.52	0.29	5847.22	5847.29
13	Pipe - (11)	4.18	18	6.000	5841.24	5841.35	1.83	5842.38	5841.91
14	Pipe - (10)	3.38	18	24.000	5841.35	5841.59	1.00	5841.94	5842.18
15	Pipe - (124)	2.75	18	10.000	5841.59	5842.54	9.50	5842.18	5842.84
16	Pipe - (67) (1)	5.70	24	107.600	5839.23	5839.78	0.51	5840.32	5840.60 j
17	Pipe - (28)	5.70	24	99.000	5839.78	5840.28	0.51	5840.60	5841.10
18	Pipe - (67)	5.70	24	139.000	5840.28	5843.50	2.32	5841.10	5844.05
	Notes: j-Line contains hyd. jump								

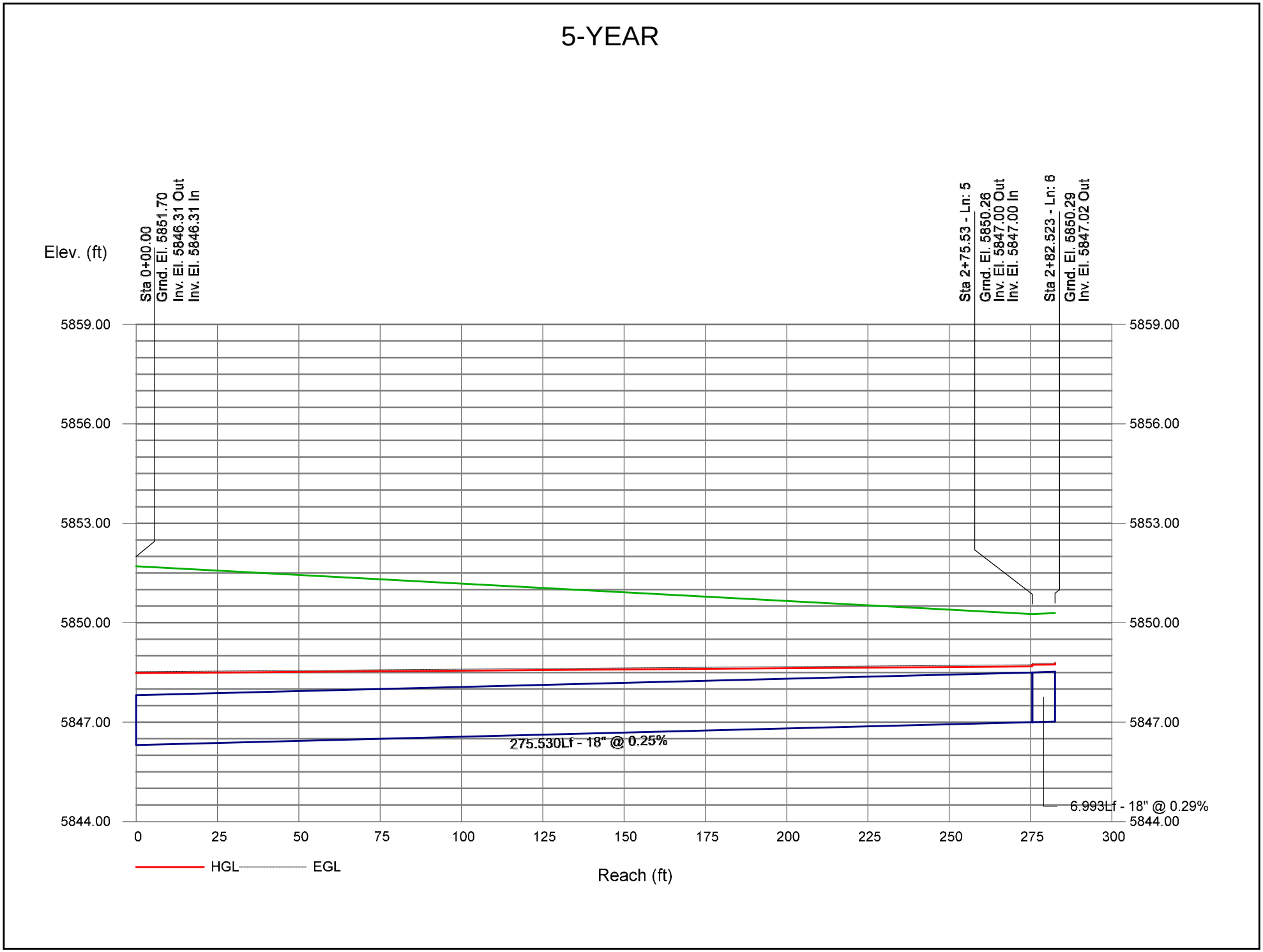
Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-5yr.stm



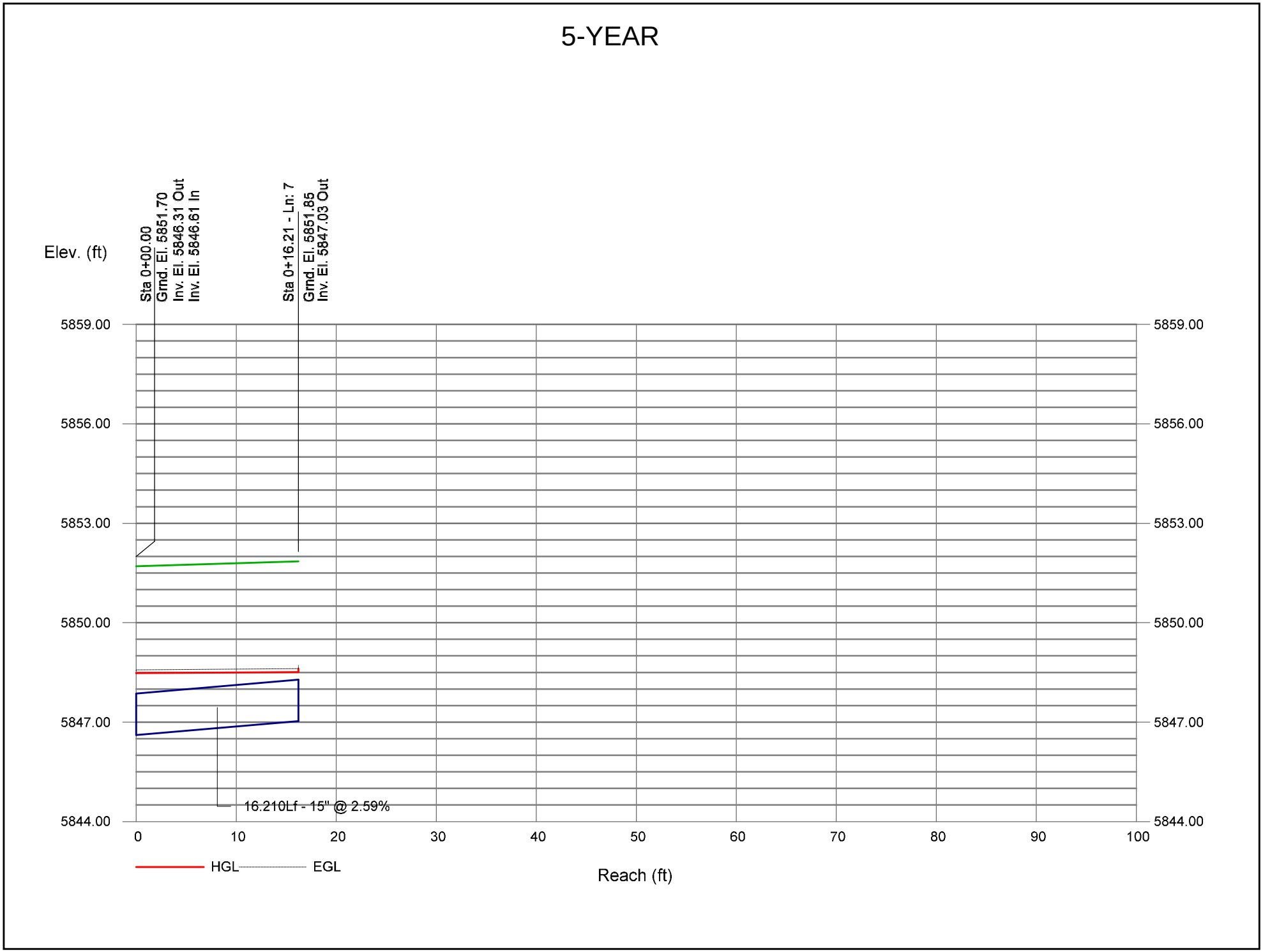
Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-5yr.stm



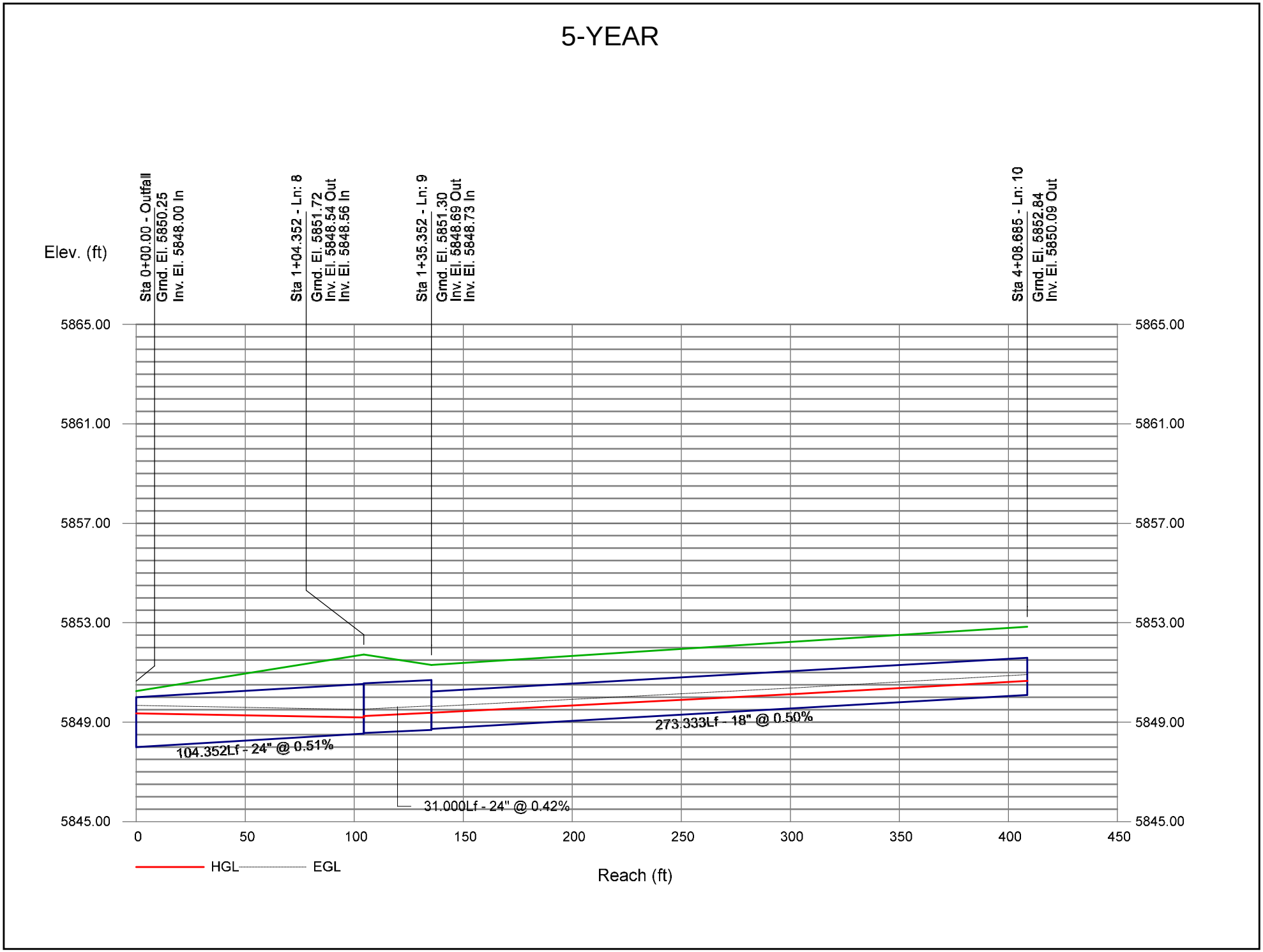
Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-5yr.stm



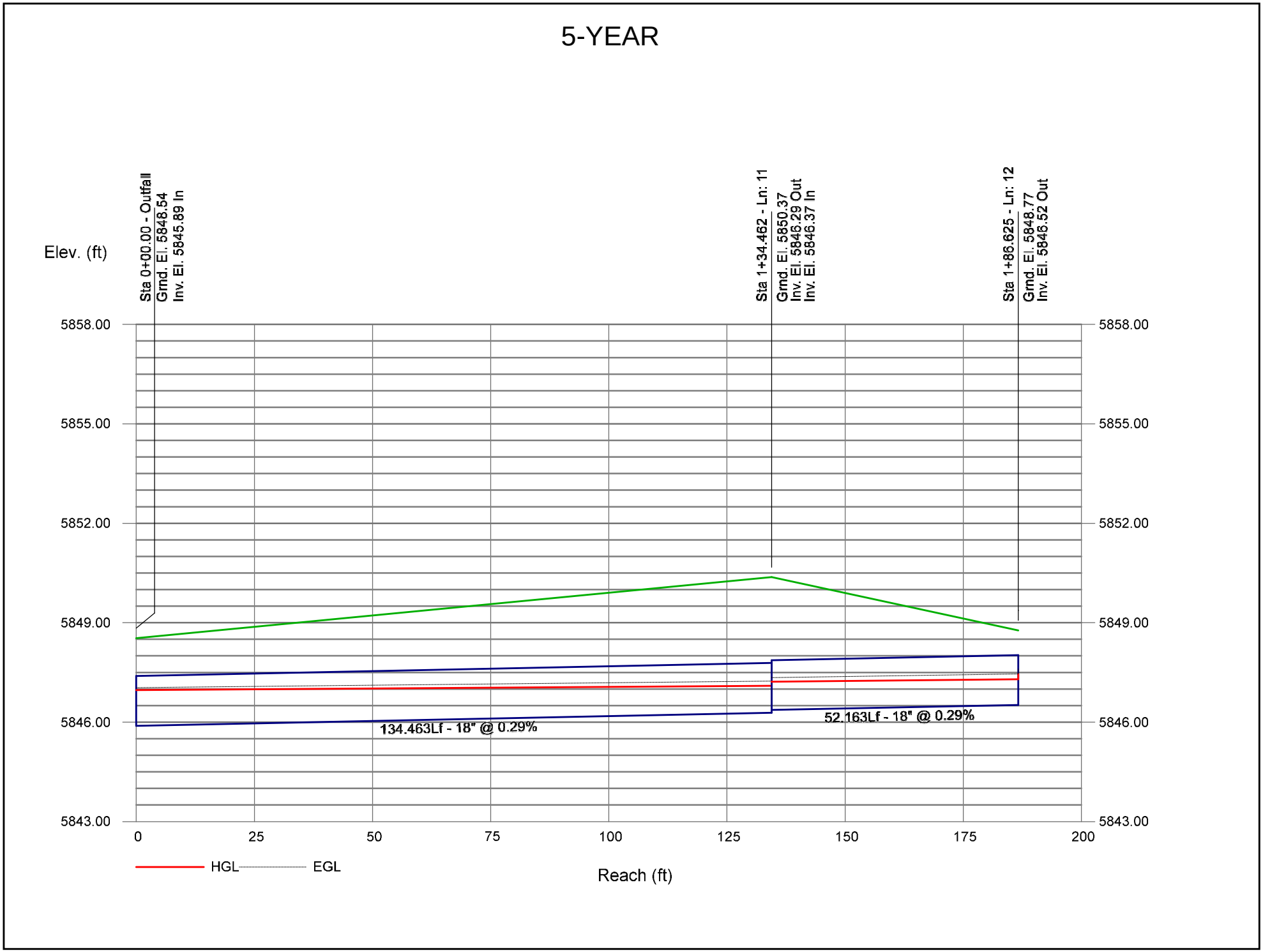
Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-5yr.stm



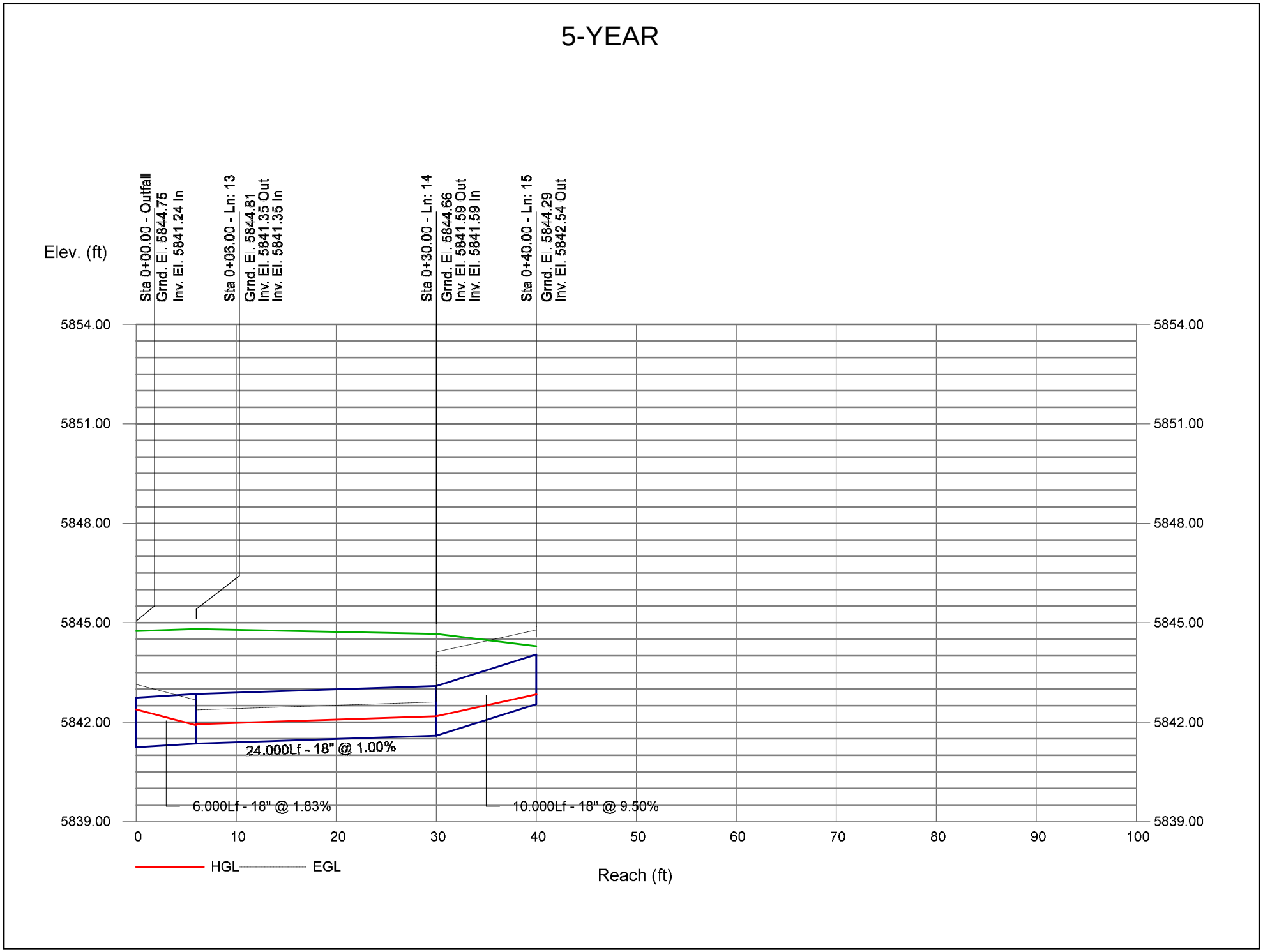
Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-5yr.stm



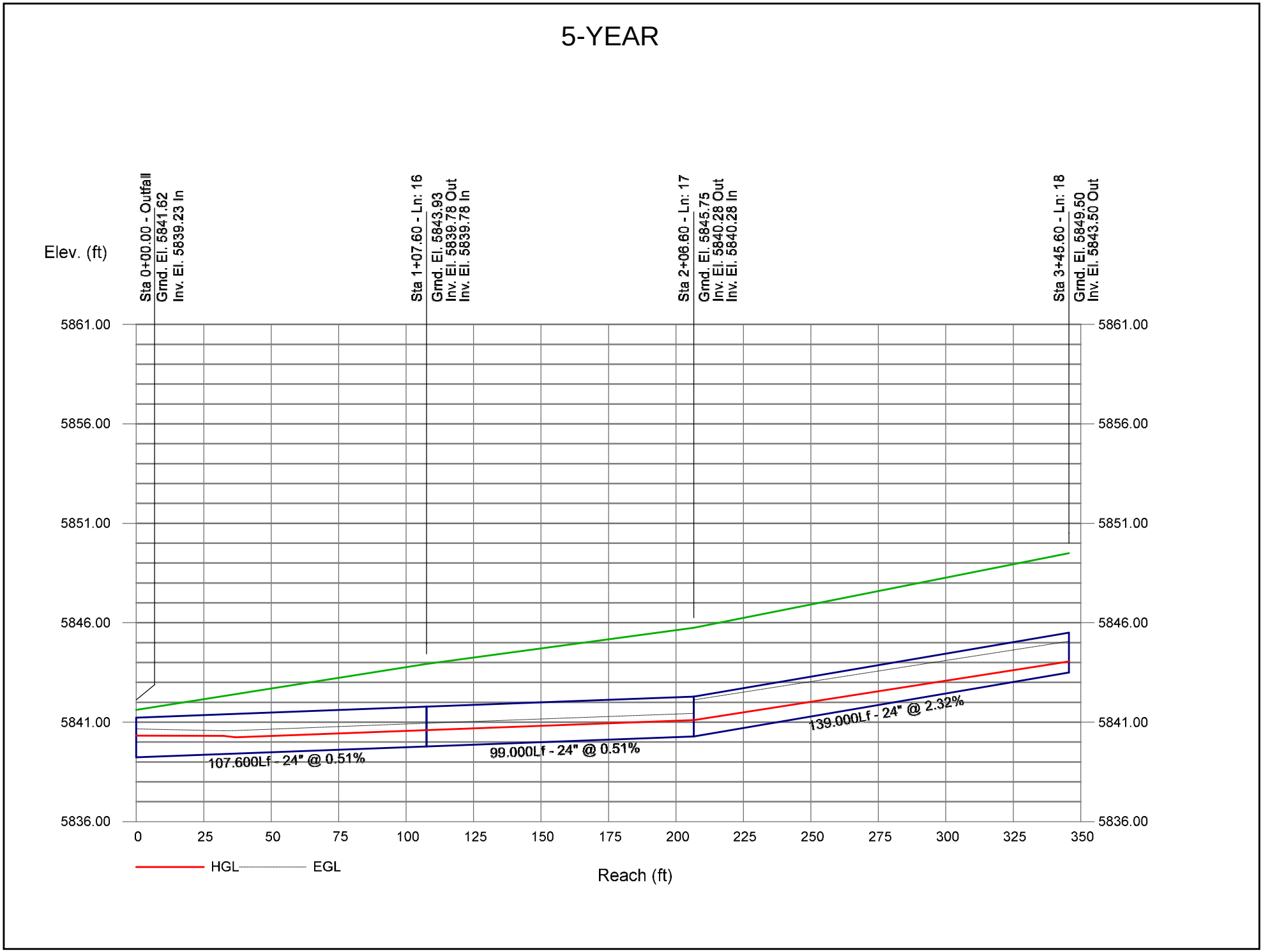
Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-5yr.stm



Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-5yr.stm

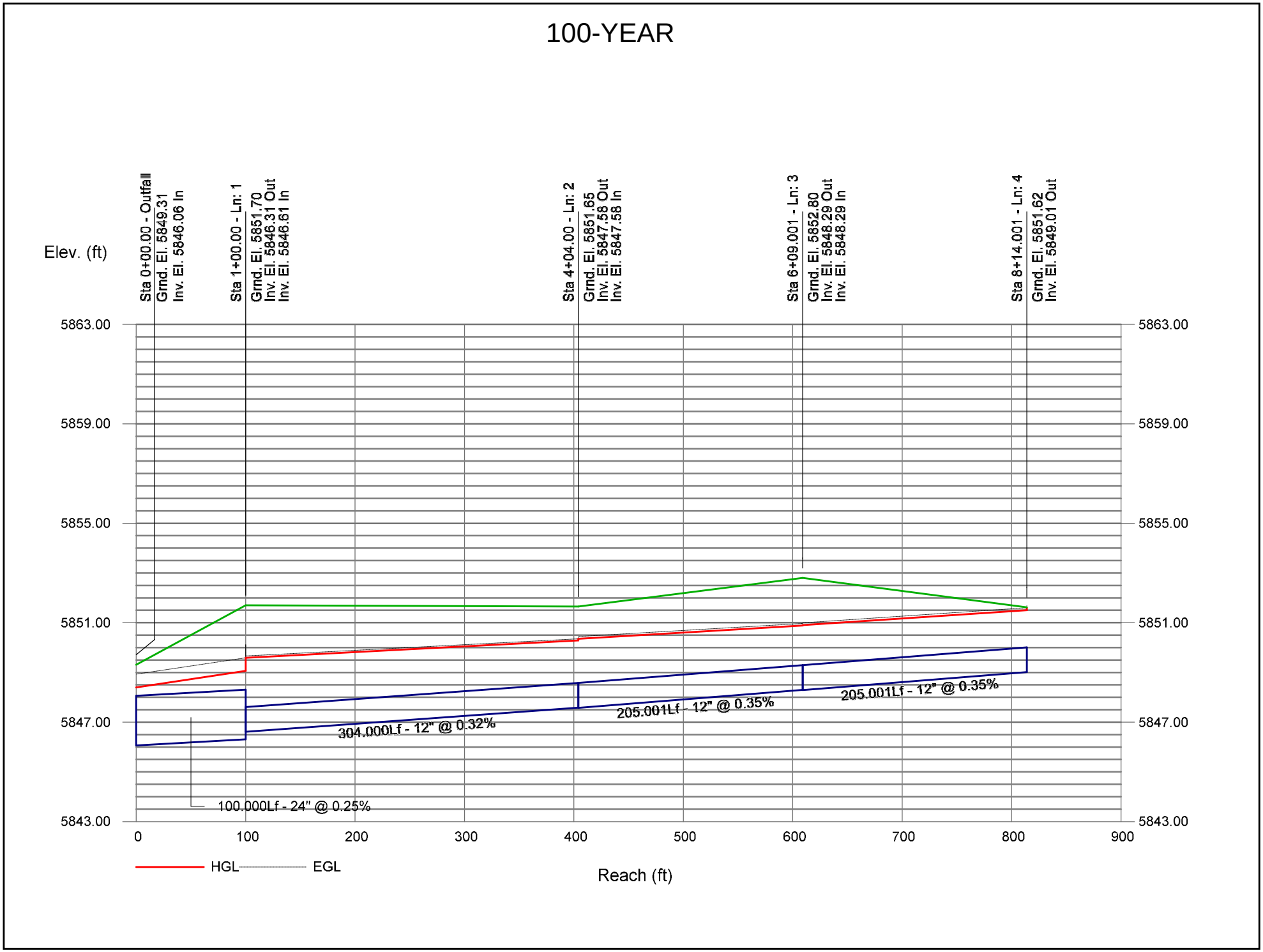


100-YEAR

Line No.	Line ID	Flow Rate	Line Size	Line Length	Invert Dn	Invert Up	Line Slope	HGL Dn	HGL Up
		(cfs)	(in)	(ft)	(ft)	(ft)	(%)	(ft)	(ft)
1	STM_phase3-P(60)	18.36	24	100.000	5846.06	5846.31	0.25	5848.40	5849.06
2	STM_phase3-P(59)	1.70	12	304.000	5846.61	5847.58	0.32	5849.59	5850.28
3	STM_phase3-P(58)	1.81	12	205.001	5847.58	5848.29	0.35	5850.36	5850.89
4	STM_phase3-P(57)	1.94	12	205.001	5848.29	5849.01	0.35	5850.90	5851.51
5	STM_phase3-P(62)	8.99	18	276.000	5846.31	5847.00	0.25	5849.59	5851.31
6	STM_phase3-P(61)	8.99	18	6.993	5847.00	5847.02	0.29	5851.72	5851.76
7	STM_phase3-P(63)	8.85	24	16.000	5846.61	5847.02	2.56	5849.59	5849.61
8	Pipe - (132)	11.90	24	104.352	5848.00	5848.54	0.51	5849.62	5849.74 j
9	Pipe - (131)	11.94	24	31.000	5848.56	5848.69	0.42	5849.86	5849.99
10	Pipe - (128) (1)	8.16	18	273.333	5848.73	5850.09	0.50	5850.06	5851.33
11	Pipe - (68)	10.95	18	134.463	5845.89	5846.29	0.29	5847.27	5848.48
12	Pipe - (68) (2)	10.95	18	52.163	5846.37	5846.52	0.29	5849.00	5849.48
13	Pipe - (11)	10.79	18	6.000	5841.24	5841.35	1.83	5842.62	5842.33
14	Pipe - (10)	9.02	18	24.000	5841.35	5841.59	1.00	5842.42	5842.66
15	Pipe - (124)	7.70	18	10.000	5841.59	5842.54	9.50	5842.66	5843.04
16	Pipe - (67) (1)	22.69	24	107.600	5839.23	5839.78	0.51	5841.00	5842.14
17	Pipe - (28)	22.69	24	99.000	5839.78	5840.28	0.51	5842.26	5843.26
18	Pipe - (67)	22.69	24	139.000	5840.28	5843.50	2.32	5843.87	5845.20 j
	Notes: j-Line contains hyd. jump								

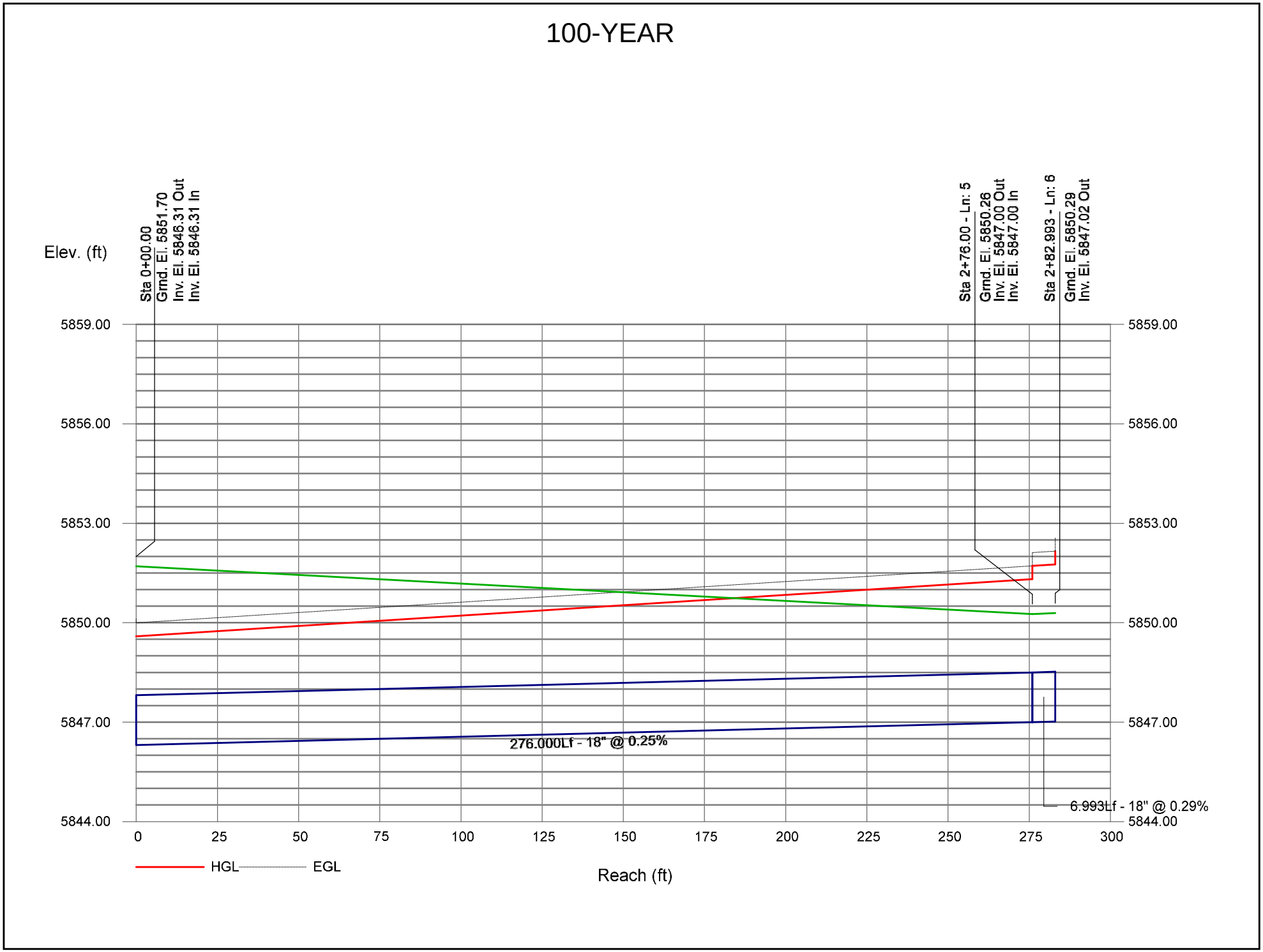
Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-100yr.stm



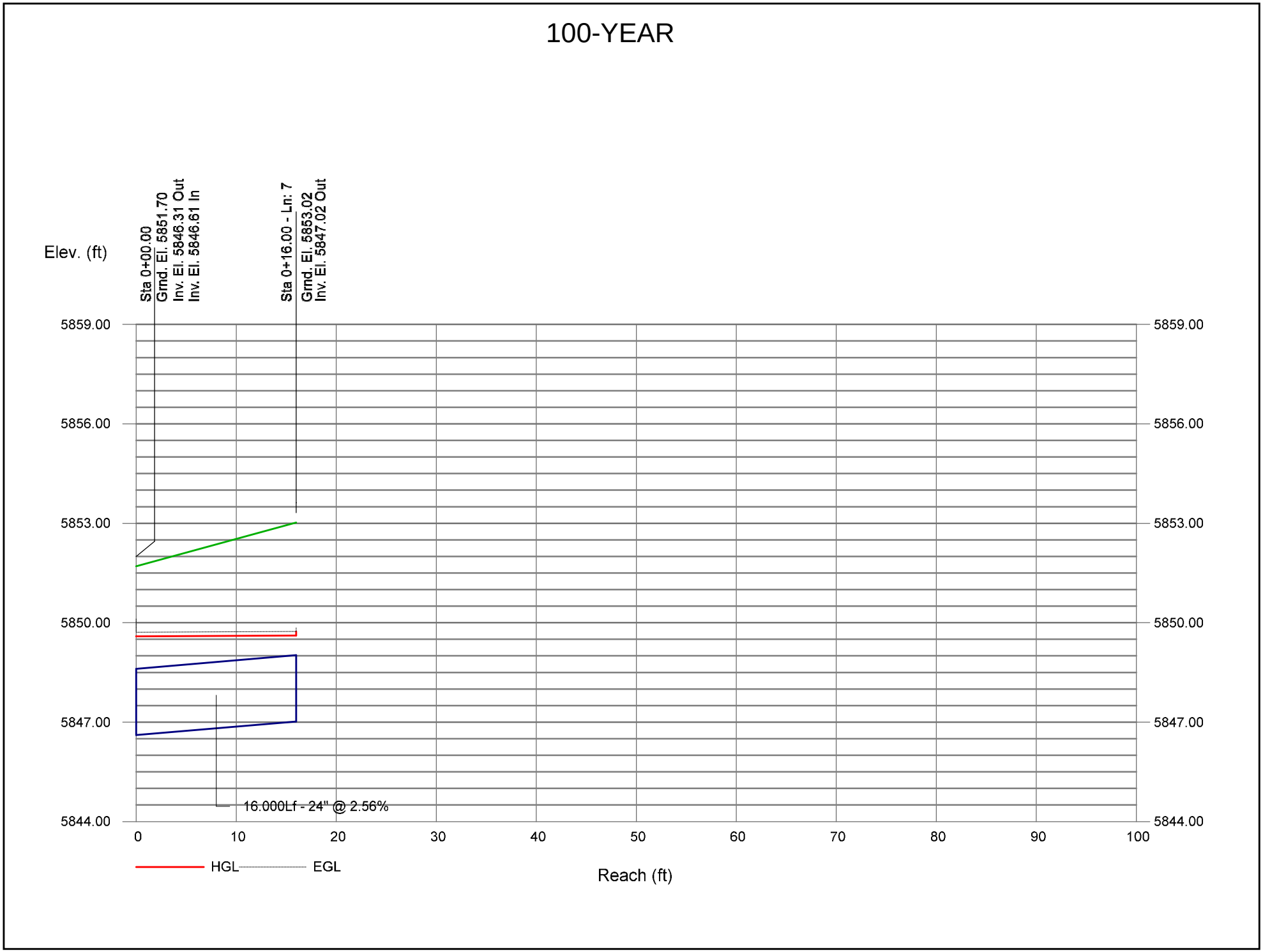
Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-100yr.stm



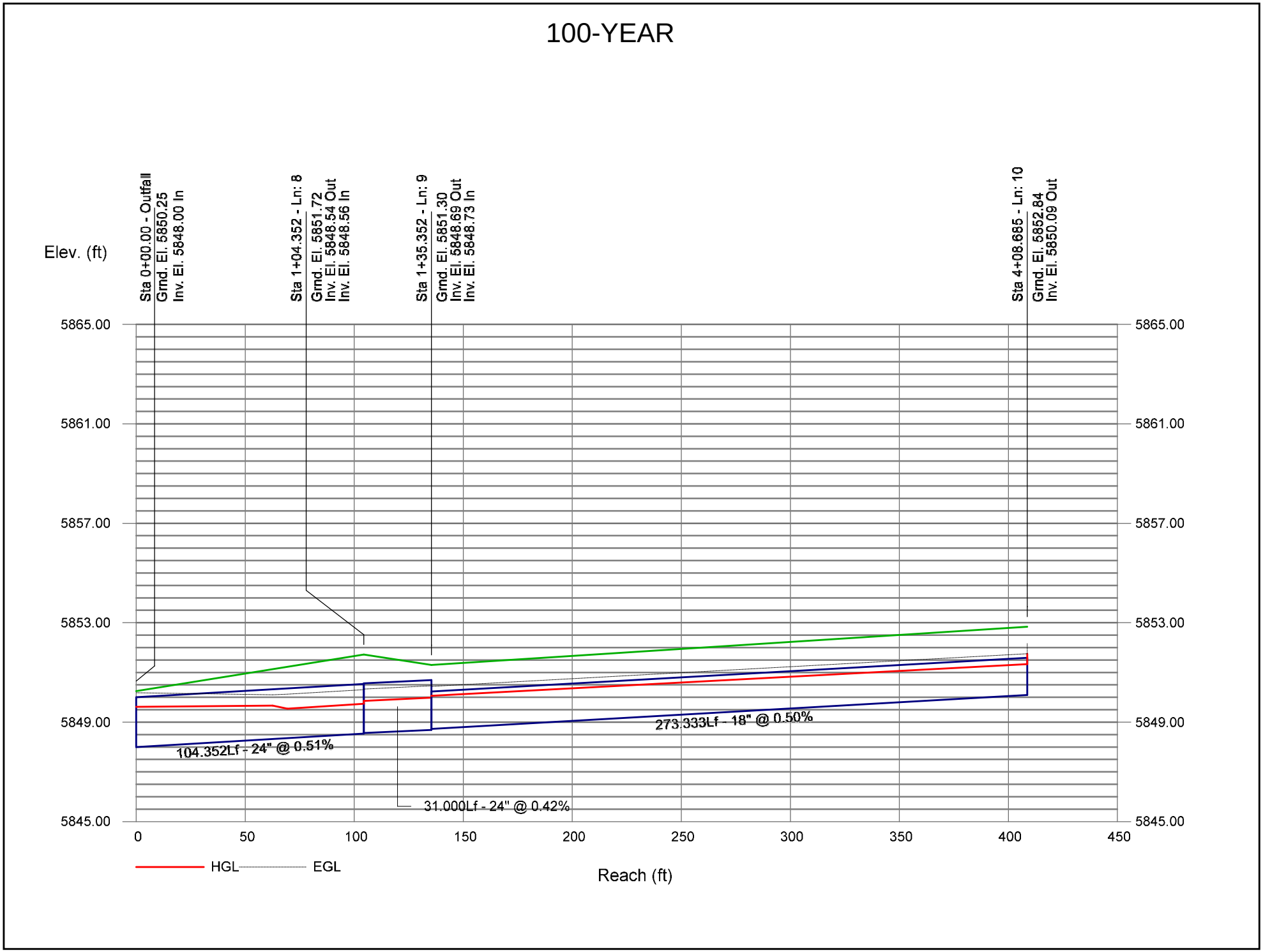
Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-100yr.stm



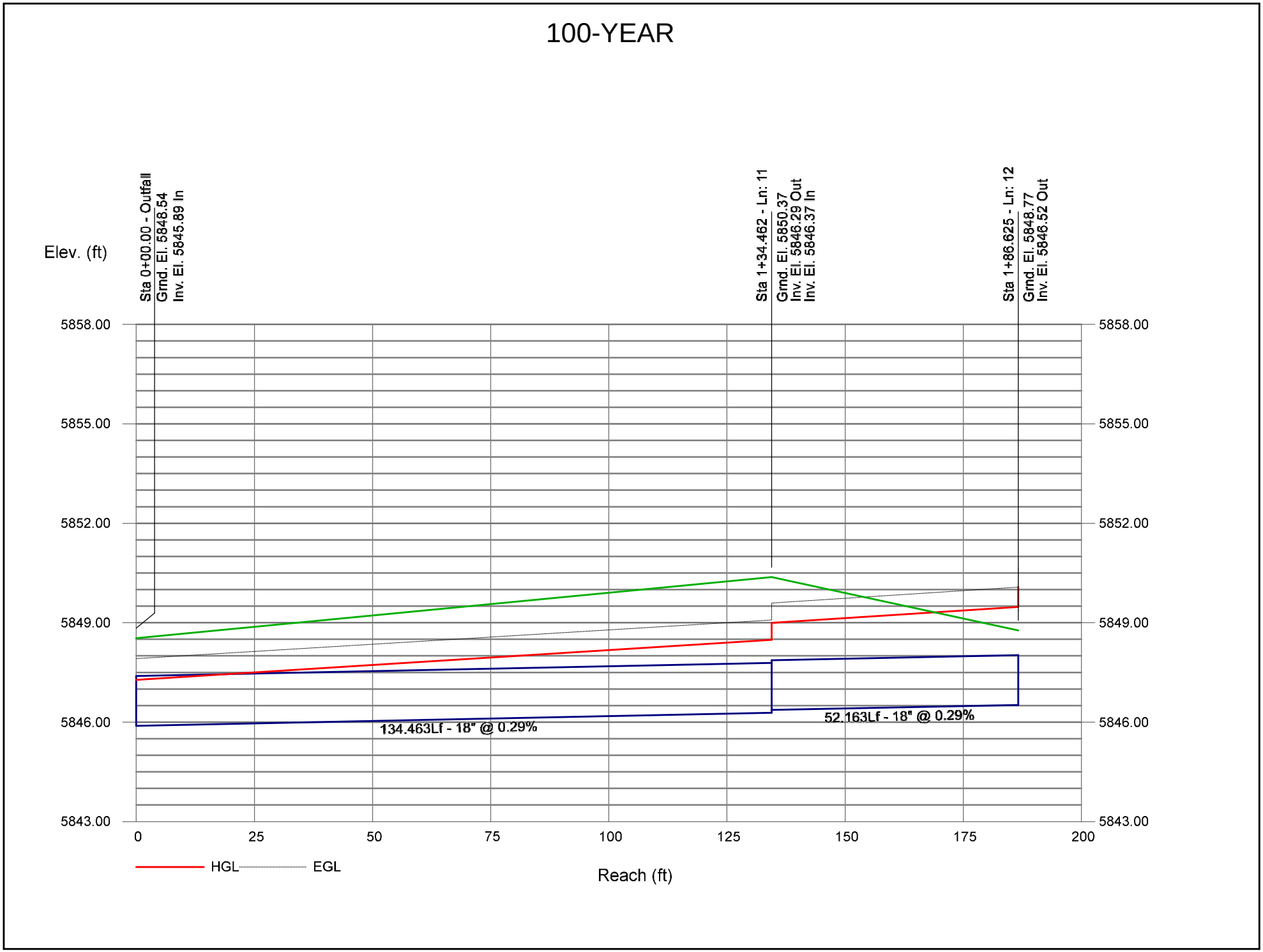
Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-100yr.stm



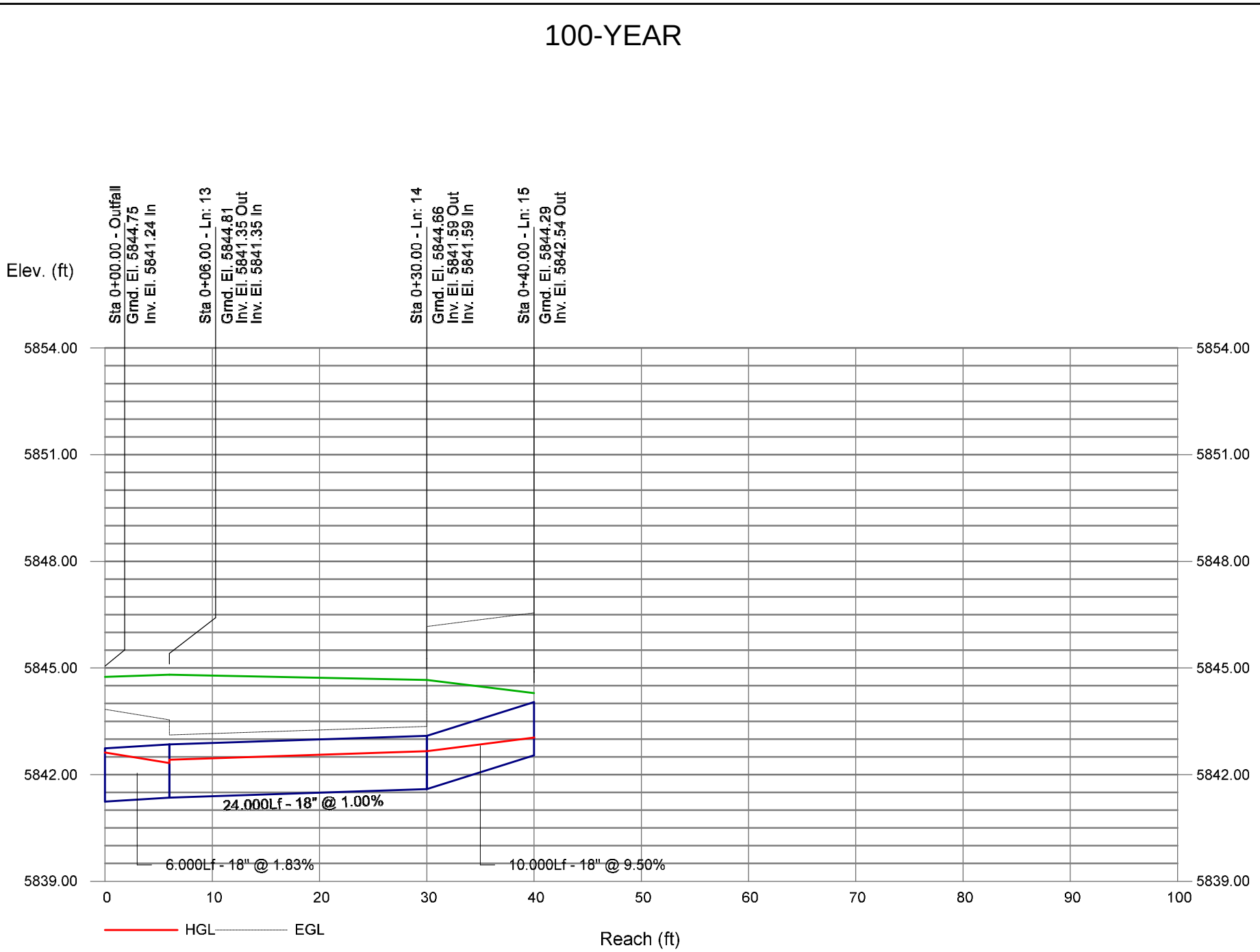
Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-100yr.stm



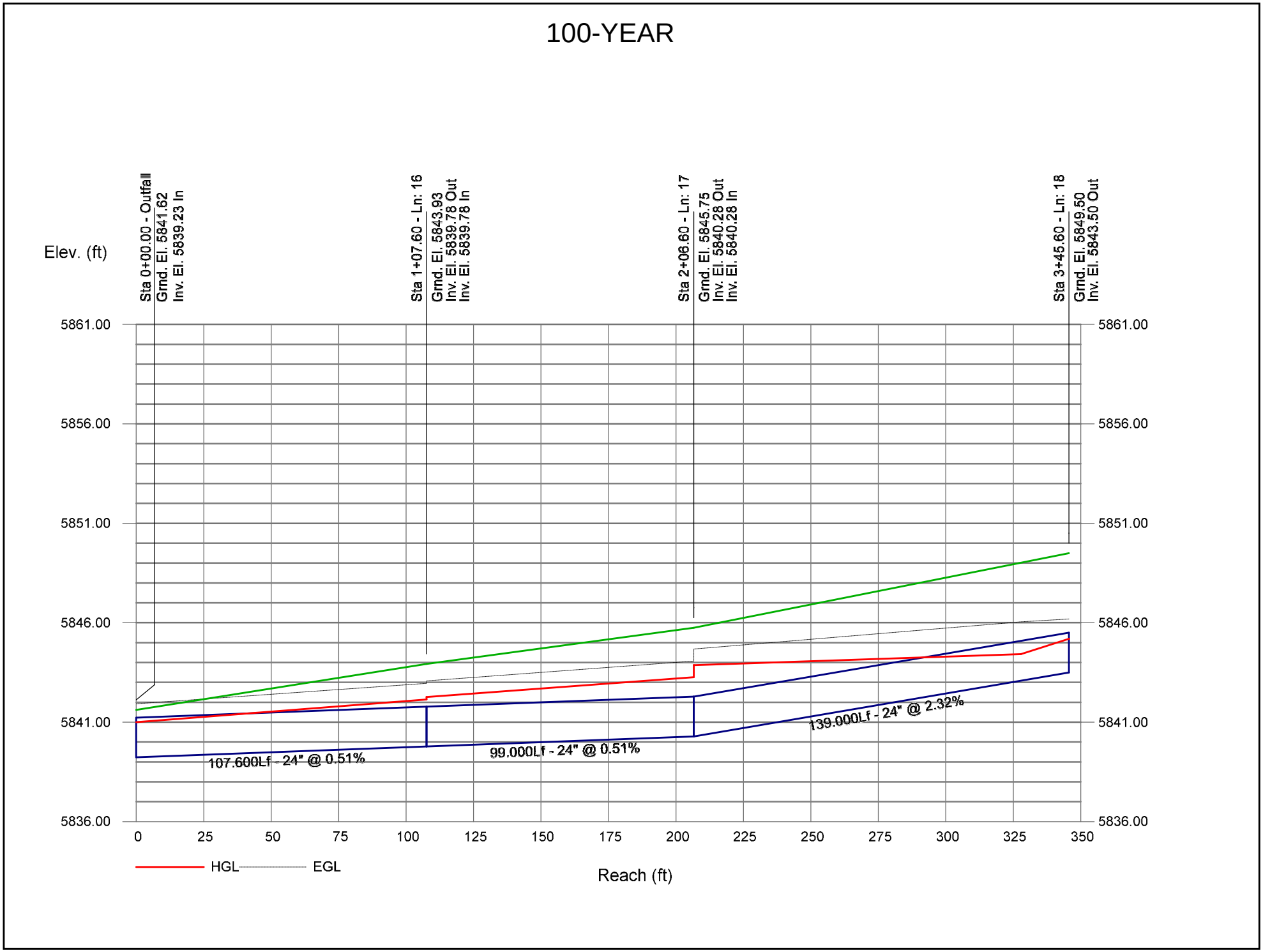
Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-100yr.stm



Storm Sewer Profile

Proj. file: Salisbury_Phase1_Storm-100yr.stm



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SALISBURY REGIONAL PARK - RIP RAP SIZING CALCS

Storm Line A01 (See HY-8 Calcs) :

Q = 2.14 cfs
D = 1.5 ft
Y_t = 0.33 ft

$Q/D^{1.5}$ = 1.16
Y_t/D = 0.22

Per MHFD Vol 2 Chapter 9 Figure 9-38: **Type L**

Storm Line A03 (See Hydraflow Calcs) :

Q = 10.95 cfs
D = 1.5 ft
Y_t = 1.38 ft

$Q/D^{1.5}$ = 5.96
Y_t/D = 0.92

Per MHFD Vol 2 Chapter 9 Figure 9-38: **Type L**

Storm Line A05 (See Hydraflow Calcs) :

Q = 10.84 cfs
D = 1.5 ft
Y_t = 1.38 ft

$Q/D^{1.5}$ = 5.90
Y_t/D = 0.92

Per MHFD Vol 2 Chapter 9 Figure 9-38: **Type L**

Storm Line C01 (See Hydraflow Calcs) :

Q = 11.87 cfs
D = 2 ft
Y_t = 1.62 ft

$Q/D^{1.5}$ = 4.20
Y_t/D = 0.81

Per MHFD Vol 2 Chapter 9 Figure 9-38: **Type L**

Storm Line C02 (See HY-8 Calcs) :

Q = 1.86 cfs
D = 1.0 ft
Y_t = 0.60 ft

$Q/D^{1.5}$ = 1.86
Y_t/D = 0.60

Per MHFD Vol 2 Chapter 9 Figure 9-38: **Type L**

Storm Line C03 (See HY-8 Calcs) :

Q = 17.13 cfs
D = 2.0 ft
Y_t = 0.38 ft

$Q/D^{1.5}$ = 6.06
Y_t/D = 0.19

Per MHFD Vol 2 Chapter 9 Figure 9-38: **Type M**

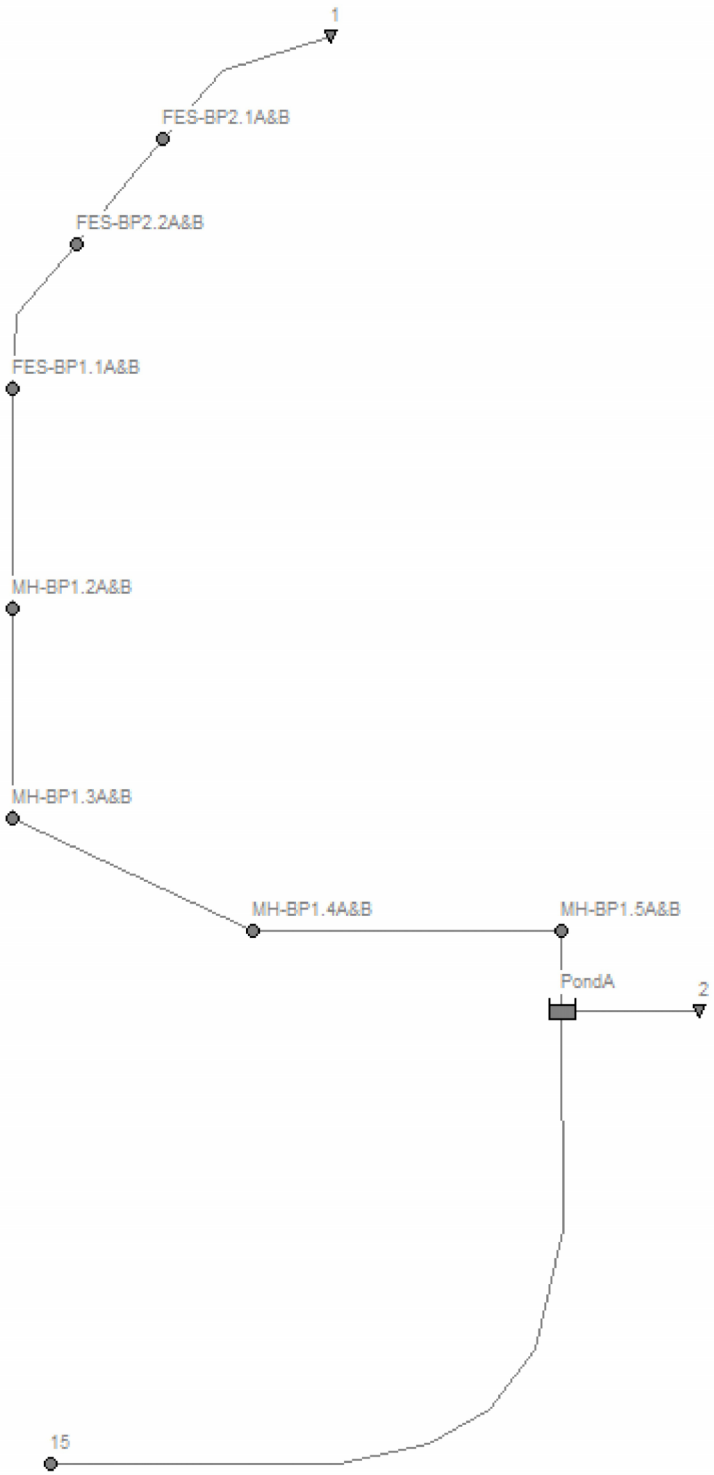
Storm Line OS01 (See HY-8 Calcs) :

Q = 6.09 cfs
D = 2.0 ft
Y_t = 0.22 ft

$Q/D^{1.5}$ = 2.15
Y_t/D = 0.11

Per MHFD Vol 2 Chapter 9 Figure 9-38: **Type L**

BYPASS PIPE SIZING SWMM CALCULATIONS


1
FES-BP2.1A&B
FES-BP2.2A&B
FES-BP1.1A&B
MH-BP1.2A&B
MH-BP1.3A&B
MH-BP1.4A&B
MH-BP1.5A&B
PondA
2
15

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)
-----------------------------------------------------------

WARNING 02: maximum depth increased for Node FES-BP2.2A&B
WARNING 02: maximum depth increased for Node FES-BP1.1A&B

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/22/2025 00:00:00
Ending Date .............. 01/23/2025 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Routing Time Step ........ 20.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.005000 ft


*************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.000         0.000
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         3.043         0.992
External Outflow .........         3.040         0.991
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.101


************************
Highest Continuity Errors
************************
Node PondA (2.99%)


**************************
Time-Step Critical Elements
**************************
Link Pipe1 (31.11%)
Link StormBypass2 (1.78%)


******************************
Highest Flow Instability Indexes
```

```
*******************************
Link StormBypass2 (2)
Link Pipe1 (2)


*******************************
Most Frequent Nonconverging Nodes
*******************************
Node 1 (0.26%)
Node 2 (0.26%)
Node MH-BP1.4A&B (0.23%)
Node MH-BP1.3A&B (0.17%)
Node MH-BP1.5A&B (0.15%)


************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.50 sec
Average Time Step           :    16.60 sec
Maximum Time Step           :    20.00 sec
% of Time in Steady State   :     0.00
Average Iterations per Step :     2.03
% of Steps Not Converging   :     0.26
Time Step Frequencies       :
   20.000 -  9.564 sec      :    82.64 %
    9.564 -  4.573 sec      :     5.40 %
    4.573 -  2.187 sec      :     5.32 %
    2.187 -  1.046 sec      :     4.78 %
    1.046 -  0.500 sec      :     1.86 %


******************
Node Depth Summary
******************

--------------------------------------------------------------------------------
                            Average  Maximum  Maximum  Time of Max    Reported
                              Depth    Depth      HGL   Occurrence   Max Depth
Node                 Type      Feet     Feet     Feet  days hr:min        Feet
--------------------------------------------------------------------------------
FES-BP2.1A&B         JUNCTION     0.21     2.07  5844.97     0  00:27        2.07
FES-BP2.2A&B         JUNCTION     0.30     3.42  5847.19     0  00:27        3.41
FES-BP1.1A&B         JUNCTION     0.22     2.24  5847.49     0  00:26        2.24
MH-BP1.2A&B          JUNCTION     0.31     3.74  5850.08     0  00:15        3.64
MH-BP1.3A&B          JUNCTION     0.31     3.55  5851.27     0  00:22        3.52
MH-BP1.4A&B          JUNCTION     0.31     3.50  5852.24     0  00:22        3.46
MH-BP1.5A&B          JUNCTION     0.26     2.85  5853.16     0  00:22        2.81
15                   JUNCTION     0.17     2.16  5872.16     0  00:16        2.13
1                    OUTFALL      0.17     1.77  5838.44     0  00:28        1.76
2                    OUTFALL      0.00     0.00  5850.00     0  00:00        0.00
PondA                STORAGE      0.26     3.11  5853.59     0  00:22        3.06


******************
Node Inflow Summary
******************

-------------------------------------------------------------------------------------------------
                            Maximum  Maximum                  Lateral       Total        Flow
                            Lateral    Total  Time of Max      Inflow      Inflow     Balance
                             Inflow   Inflow   Occurrence      Volume      Volume       Error
Node                 Type       CFS      CFS  days hr:min    10^6 gal    10^6 gal     Percent
-------------------------------------------------------------------------------------------------
```

FES-BP2.1A&B	JUNCTION	0.00	90.52	0	00:27	0	0.991	-0.007	
FES-BP2.2A&B	JUNCTION	2.94	92.54	0	00:20	0.0199	0.994	0.384	
FES-BP1.1A&B	JUNCTION	0.00	91.39	0	00:22	0	0.971	-0.315	
MH-BP1.2A&B	JUNCTION	0.00	91.37	0	00:22	0	0.971	-0.063	
MH-BP1.3A&B	JUNCTION	0.00	91.37	0	00:22	0	0.97	-0.042	
MH-BP1.4A&B	JUNCTION	0.00	91.36	0	00:22	0	0.971	0.088	
MH-BP1.5A&B	JUNCTION	0.00	91.39	0	00:21	0	0.971	-0.055	
15	JUNCTION	143.69	143.69	0	00:15	0.972	0.972	-2.880	
1	OUTFALL	0.00	90.48	0	00:28	0	0.991	0.000	
2	OUTFALL	0.00	0.00	0	00:00	0	0	0.000	gal
PondA	STORAGE	0.00	135.52	0	00:16	0	1	3.077	

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
MH-BP1.2A&B	JUNCTION	0.23	0.741	7.911
MH-BP1.3A&B	JUNCTION	0.24	0.551	5.568
MH-BP1.4A&B	JUNCTION	0.24	0.505	3.292
MH-BP1.5A&B	JUNCTION	0.25	0.437	0.899

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
PondA	0.502	1.4	0.0	0.0	11.847	34.0	0 00:22	91.39

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
1	36.68	17.14	90.48	0.991
2	0.00	0.00	0.00	0.000
System	18.34	17.14	90.48	0.991

****

Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Pipe1	CONDUIT	91.39	0	00:21	6.16	0.87	1.00
Pipe2	CONDUIT	91.36	0	00:22	6.16	0.77	1.00
Pipe3	CONDUIT	91.37	0	00:22	6.46	0.98	1.00
Pipe4	CONDUIT	91.37	0	00:22	6.46	0.96	1.00
Pipe5	CONDUIT	91.39	0	00:22	7.03	1.18	0.87
StormBypass2	CONDUIT	90.52	0	00:27	7.10	0.91	0.85
SwaleA	CONDUIT	90.70	0	00:20	2.89	0.08	0.49
SwaleB	CONDUIT	90.48	0	00:28	4.87	0.37	0.64
Overflow	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
UpSwale	CONDUIT	135.52	0	00:16	5.51	0.45	0.84

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
Pipe1	1.00	0.00	0.66	0.00	0.34	0.00	0.00	0.00	0.00	0.96
Pipe2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.99
Pipe3	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.97
Pipe4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.98
Pipe5	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.95
StormBypass2	1.00	0.00	0.10	0.00	0.90	0.00	0.00	0.00	0.00	0.96
SwaleA	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.31	0.00
SwaleB	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.50	0.00
Overflow	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UpSwale	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.17	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
Pipe1	0.24	0.27	0.24	0.01	0.24
Pipe2	0.24	0.24	0.35	0.01	0.01
Pipe3	0.23	0.23	0.23	0.01	0.01
Pipe4	0.23	0.23	0.23	0.01	0.01
Pipe5	0.01	0.23	0.01	0.23	0.01
StormBypass2	0.01	0.24	0.01	0.01	0.01
UpSwale	0.01	0.01	0.11	0.01	0.01

Analysis begun on: Thu Apr 3 14:25:59 2025
Analysis ended on: Thu Apr 3 14:25:59 2025
Total elapsed time: < 1 sec

APPENDIX E – MAPPING

DRAINAGE MAP LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- +03.3 EXISTING SPOT ELEVATION
- HISTORIC DRAINAGE BASIN BOUNDARY (MAJOR BASIN)
- HISTORIC DRAINAGE BASIN BOUNDARY (SUB BASIN)
- DIRECTION OF FLOW (HISTORIC)
- 1 BASIN DESIGN POINT
- A / .50 / 1.0 DRAINAGE BASIN IDENTIFICATION BUBBLE
  - A = HISTORIC BASIN DESIGNATION
  - .50 = 100-YR RUNOFF COEFFICIENT
  - 1.0 = AREA ACRES

HISTORIC RUNOFF SUMMARY TABLE

BASIN	DESIGN POINT	AREA (ACRES)	5-YR RUNOFF (CFS)	100-YR RUNOFF (Cfs)
H1	1	17.57	2.71	31.61
H2	2	44.80	5.97	74.37
H3	3	0.84	0.38	3.83
H4	4	12.37	2.50	22.85

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Town of Parker SALISBURY REGIONAL PARK - PHASE 1

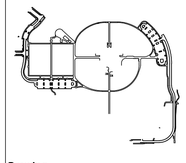
11700 MOTSENBOCKER RD
PARKER, CO 80134

ARCHITECTURE
LANDSCAPE ARCHITECTURE
PLANNING
INTERIOR DESIGN

	DATE	DESCRIPTION

Project Number:	223072.00
Sheet Issue Date:	2025-05-02
Drawn By:	AMF/KAM/MJS
Checked By:	WTP/CWK/CFG

Key Map



Drawing

HISTORIC DRAINAGE MAP

FIG. 1

SITE PLAN SUBMITTAL

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THE LINE SHOWN ABOVE IS 1" WHEN PLOTTED ON A 24"x36" SHEETS ORIGINAL PAGE SIZE
THE SQUARES ABOVE ARE COLOR WITH BLACK AND WHITE FOR A PRINTED PROPERTY

Q:\3752c - Salisbury Park North\Drawings\Exhibits-Figures\DRAINAGE MAPS\3752c-011-DPE.dwg, 4/25/2025 - 1:29 PM, KAM

THE LINE SHOWN ABOVE IS 1" WHEN PRINTED ON ARCH D SHEETS ORIGINAL PAGE SIZE

THE SQUARES ABOVE ARE COLOR, WITH BLACK AND WHITE TESTING, & PRINTED PROPERLY

C M Y K

ZONE X: AREA OF MINIMAL FLOOD HAZARD

CHERRY CREEK DRAINAGEWAY

DRANSFELDT RD
ROW VARIES

MOTSENBOCKER RD
ROW VARIES

EXISTING STORMWATER POND
(SEE FINAL ROADWAY DRAINAGE REPORT
FOR DRANSFELDT ROAD EXTENSION)

100-YEAR FLOODWAY

100-YEAR FLOODPLAIN

ZONE AE FLOODWAY

DETENTION POND A

DETENTION POND C

DETENTION POND D

DETENTION POND E

EXISTING SALISBURY
EQUESTRIAN PARK

EXISTING PWSD
FACILITY

MATCHLINE - THIS SHEET

STORM BYPASS 2

STM-FES-BP2.1A
36" CONC FES

STM-FES-BP2.1B
36" CONC FES

STM-FES-BP2.2A
36" CONC FES

STM-FES-BP2.2B
36" CONC FES

STM-HEADWALL-C04.2
6" SMALL PIPE HEADWALL

STORM LINE C04

STM-OUTLET-C04.1
OUTLET STRUCTURE

STORM LINE A04

STM-FES-A04.4
24" CONC FES

STM-MANHOLE-A04.3
4' SD MH (CON)

STM-FES-A04.1
24" CONC FES
W/ RIPRAP

STM-MANHOLE-A04.2
4' SD MH (ECC)

STORM LINE A05

STM-FES-A05.4
18" CONC FES
W/ RIPRAP

STM-INLET-A05.3
10FT TYPE-R INLET

STM-INLET-A05.2
10FT TYPE-R INLET

STM-FES-A05.1
18" CONC FES
W/ RIPRAP

STM-FES-A03.3
18" CONC FES
W/ RIPRAP

STORM LINE A03

STM-MANHOLE-A03.2
4' SD MH (ECC)

STM-FES-A03.1
18" CONC FES
W/ RIPRAP

STM-FES-A02.1
12" CONC FES
W/ RIPRAP

STM-FES-OS01.1
24" CONC FES
W/ RIPRAP

STORM LINE OS01

STM-FES-OS01.2
24" CONC FES
W/ RIPRAP

STM-FES-BP1.1B
36" CONC FES

STM-FES-BP1.1A
36" CONC FES

STORM BYPASS

STM-FES-D01.1
24" CONC FES

STORM LINE D01 (ALT 1)

STM-MANHOLE-D01.2
4' SD MH (ECC)

STM-INLET-D01.2B
15' AREA DRAIN

STM-INLET-D01.2A
24" AREA DRAIN

STM-INLET-D01.3
15' AREA DRAIN

STORM LINE D01.2 (ALT 1 EAST)

STM-INLET-D01.2C
24" AREA DRAIN

STM-FES-C03.2
24" CONC FES
W/ RIPRAP

STORM LINE D01 (ALT 1)

STM-INLET-D01.4
15' AREA DRAIN

STORM LINE C03

STM-FES-C03.1
24" CONC FES
W/ RIPRAP

STM-INLET-D01.5
15' AREA DRAIN

STM-MANHOLE-BP1.2B
5' SD MH (ECC)

STM-MANHOLE-BP1.2A
5' SD MH (ECC)

STM-FES-C01.4
24" CONC FES
W/ RIPRAP

STM-FES-C02.2
12" CONC FES
W/ RIPRAP

STM-FES-C02.1
12" CONC FES
W/ RIPRAP

STORM LINE C02

STM-MANHOLE-BP1.3B
5' SD MH (ECC)

STM-MANHOLE-BP1.3A
5' SD MH (ECC)

STORM BYPASS

STM-MANHOLE-BP1.4A
6' SD MH (ECC)

STM-MANHOLE-BP1.4B
6' SD MH (ECC)

STM-INLET-C01.1
5FT TYPE-R INLET

STM-MANHOLE-BP1.5A
6' SD MH (ECC)

STM-MANHOLE-BP1.5B
6' SD MH (ECC)

STM-FES-BP1.6A
42" CONC FES

STM-FES-BP1.6B
42" CONC FES

EXISTING DRAINAGE CHANNEL
(SEE SALISBURY HEIGHTS FLG 1 AND HORSESHOE
RIDGE SUBDIVISION FINAL DRAINAGE PLANS)

STORM LINE C01

STM-MANHOLE-C01.3
4' SD MH (CON)

STM-INLET-C01.2
5FT TYPE-R INLET

STM-FES-A01.2
18" CONC FES
W/ RIPRAP

STORM LINE A01

STM-FES-A01.1
18" CONC FES
W/ RIPRAP

EX1 | 0.51 | 6.39

EX2 | 0.52 | 12.37

BP1 | 0.67 | 1.02

BP2 | 0.51 | 17.55

A1 | 0.65 | 0.62

A2 | 0.79 | 1.00

A3 | 2.59 | 2.49

A4 | 0.62 | 5.34

A5 | 0.74 | 1.54

A6 | 0.87 | 0.33

A7 | 0.87 | 0.33

A8 | 0.68 | 2.31

C1 | 0.68 | 2.35

C2 | 0.83 | 0.98

C3 | 0.61 | 0.60

C4 | 0.60 | 3.42

C5 | 0.62 | 4.02

D1 | 0.57 | 0.46

D2 | 0.74 | 2.86

D3 | 0.73 | 3.00

D4 | 0.53 | 1.10

E1 | 0.76 | 1.65

OS1 | 0.53 | 2.87

THIS BLDG FFE=5950.4

N

100 0 100 200
SCALE IN FEET

DRAINAGE MAP LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- PROPOSED INTERMEDIATE CONTOUR
- + 03.3 EXISTING SPOT ELEVATION
- + 03.54 PROPOSED SPOT ELEVATION
- HISTORIC DRAINAGE BASIN BOUNDARY (MAJOR BASIN)
- HISTORIC DRAINAGE BASIN BOUNDARY (SUB BASIN)
- DEVELOPED DRAINAGE BASIN BOUNDARY (MAJOR BASIN)
- DEVELOPED DRAINAGE BASIN BOUNDARY (SUB BASIN)
- DIRECTION OF FLOW (HISTORIC)
- DIRECTION OF FLOW (DEVELOPED)
- OVERFLOW PATH
- 1 BASIN DESIGN POINT
- A .50 1.0 DRAINAGE BASIN IDENTIFICATION BUBBLE

A = DEVELOPED BASIN DESIGNATION
.50 = 100-YR RUNOFF COEFFICIENT
1.0 = AREA ACRES

DEVELOPED RUNOFF SUMMARY TABLE

BASIN	DESIGN POINT	AREA (ACRES)	5-YR RUNOFF (CFS)	100-YR RUNOFF (CFS)
A1	1	0.62	0.57	2.14
A2	2	1.00	2.41	6.13
A3	3	2.49	1.22	6.05
	DP3 (ROUTED)		**2.94**	**10.95**
A4	4	5.34	2.99	12.59
	DP4 (ROUTED)		**5.70**	**22.69**
A5	5	1.54	2.77	7.76
A6	6	0.33	0.82	1.83
	DP6 (ROUTED)		**3.41**	**9.09**
A7	7	0.33	0.80	1.79
	DP7 (ROUTED)		**4.19**	**10.84**
A8	8	2.31	2.25	7.52
	DP8 (ROUTED)		**5.44**	**15.76**
	DP9 (POND A RELEASE)		**1.29**	**11.14**
C1	10	2.38	2.46	8.17
C2	11	0.98	2.31	5.55
	DP11 (ROUTED)		**4.02**	**11.87**
C3	12	0.60	0.43	1.86
C4	13	3.42	1.59	7.29
	DP13 (ROUTED)		**4.79**	**17.13**
C5	14	4.02	2.14	9.20
	DP14 (ROUTED)		**6.76**	**25.66**
	DP15 (POND C RELEASE)		**0.32**	**17.07**
D1	16	0.46	0.34	1.96
D2	17	2.86	3.32	9.32
D3	18	3.00	3.30	9.48
	DP19 (ROUTED)		**6.45**	**18.85**
D4	20	1.10	0.28	2.40
	DP20 (ROUTED)		**6.67**	**21.05**
	DP21 (POND D RELEASE)		**2.24**	**2.90**
E1	22	1.65	3.09	8.37
	DP23 (POND E RELEASE)		**0.36**	**2.66**
OS1	24	2.87	0.74	6.09
BP1	25	1.02	0.50	2.96
BP2	26	17.55	3.36	38.57
	DP26 (TOTAL)		**6.28**	**61.20**
EX1	27	6.39	1.26	14.08
	DP27 (TOTAL)		**3.28**	**31.30**
EX2	28	12.37	1.98	20.13
	DP28 (TOTAL)		**11.54**	**112.63**

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	DATE	DESCRIPTION

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Drawn By: AMF/KAM/MJS
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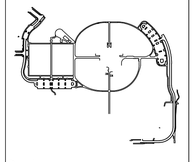
Key Map



Drawing

DEVELOPED PHASE 1
DRAINAGE MAP

FIG. 2.1

SITE PLAN SUBMITTAL

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