Final Drainage Report

El Paso County

Package 1 - Pedestrian Crossings Project

El Paso County
August 14, 2025

Design Engineer's Statement:

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

Registered Professional Engineer
State of Colorado
No.

Date

EL PASO COUNTY:

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

County Engineer

Date

Conditions:

Table of Contents

Introduction

Purpose

The purpose of the overall project is to improve pedestrian safety for 24 intersections throughout El Paso County (county) and includes updates to sidewalks and crosswalks. This report focuses on Package 1 of the intersections where drainage patterns will be changed due to bump outs, raised cross walks, addition of curb and gutter, etc. Therefore Tri-Lakes Fire station and Stratmoor Hills Fire station are not needed in this analysis. The analysis for all the other intersections checks whether proposed design still meets county criteria or if further changes need to be made.

General Location

The project locations included in the Package 1 spread and depth analysis are:

- Sunrise Elementary at Grand Valley Drive mid-block crossing (Basin 1)
- King Elementary at Defoe Avenue mid-block crossing (Basin 2)
- Jersey Lane at Bickley Street at Webster Elementary (Basin 3)
- Widefield Elementary at Widefield Drive mid-block crossing (Basin 4)
- Hallam Avenue at Leta Dive (Basin 7)
- Cody Drive at Spur Drive (Basin 8)

The project locations included in Package 1 that did not require spread and depth analysis are:

- Tri-Lakes Fire Station at Woodmoor Drive
- Stratmoor Hills Fire Station at B Street

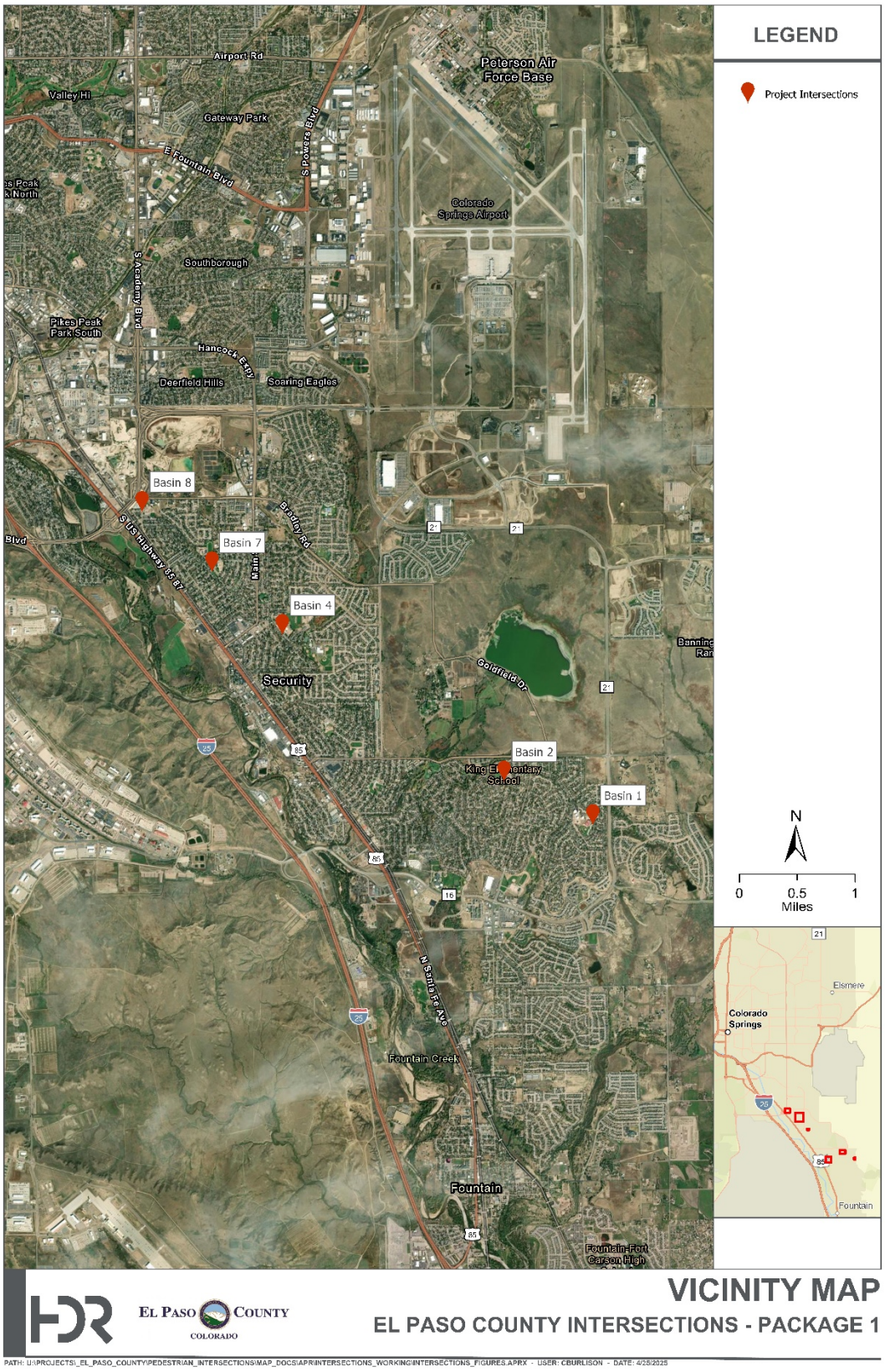

Figure 1: South Vicinity Map

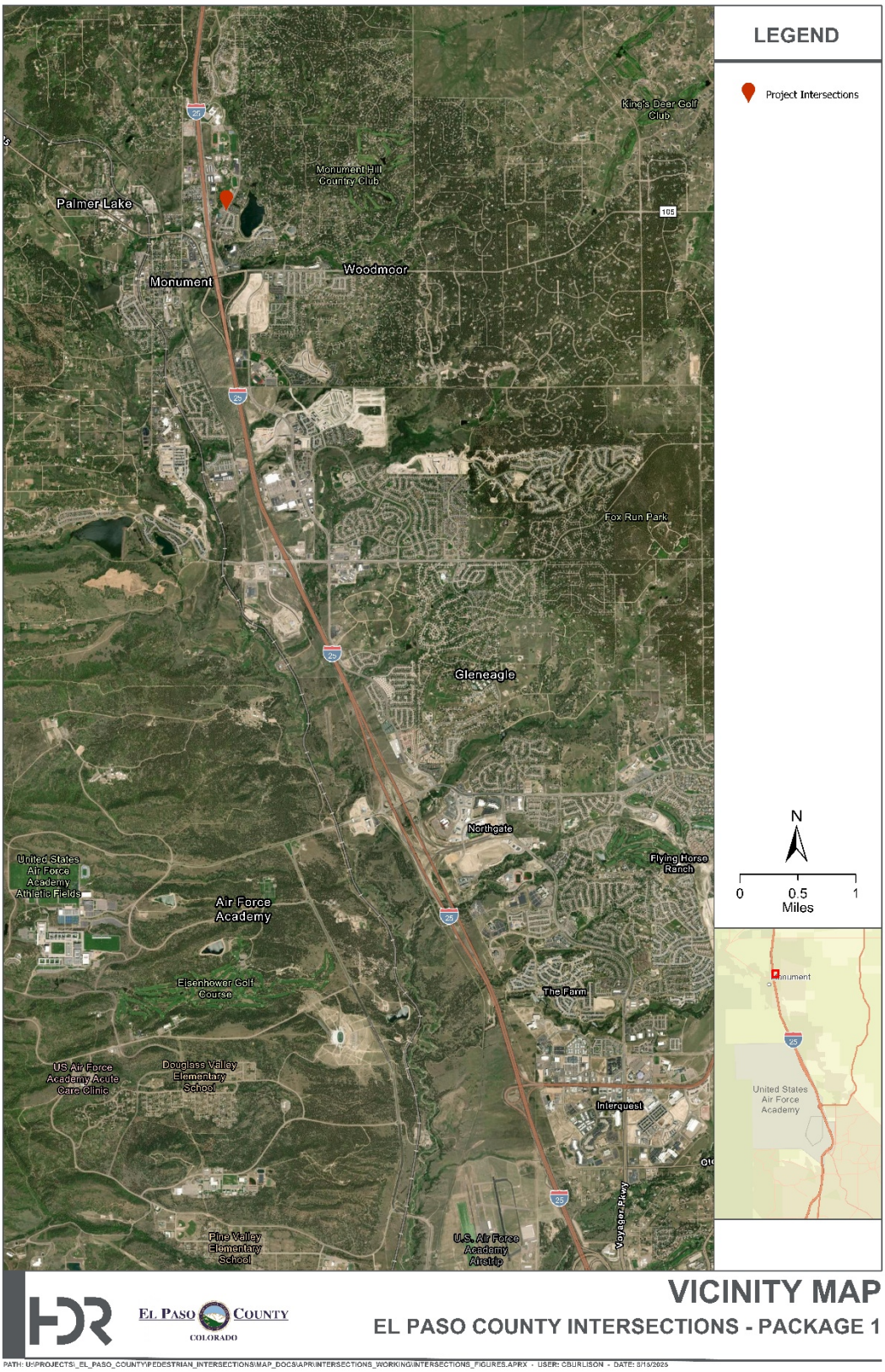

Figure 2: North Vicinity Map

Drainage Design Criteria

Pedestrian improvements resulting in potential changes to existing flow patterns for this project will be analyzed against and designed to meet criteria from the El Paso County (EPC) Drainage Criteria Manual (DCM) and Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (USDCM). The references used for the on-site drainage, off-site drainage, and water quality are listed below.

- Drainage Criteria Manual, Volume I and Volume II, El Paso County, October 31, 2018.
- Urban Storm Drainage Criteria Manual Volume 2, revised January 2016 and Volume 3, March 2024.
- Drainage Criteria Manual, Volume II, City of Colorado Springs, December 2020.

Hydrologic Criteria

Hydrology will be developed at each site using the rational method. This method is accepted by El Paso County for sites less than 100 acres (Section 5.1 EPC-DCM). Soil information will be obtained from the National Resource Conservation Service (NRCS) Websoil Survey. Rainfall data will be determined by using NOAA Atlas-14 since it is more recent than the Intensity-Frequency Curves (Figure 5-1 EPC-DCM). Hydrologic criteria has been summarized below in Table 6-2.

TABLE 1: HYDROLOGIC CRITERIA SUMMARY TABLE

Hydrology	El Paso County Drainage Criteria Manual
Acceptable Methods	Rational Method for Basins <100acres
Precipitation Data	NOAA Atlas-14
Design Storms	Major: 100-Year Minor: 10-Year
C-Value	Table 5-1

Hydraulic Criteria

A summary of the hydraulic criteria in accordance with the EPC DCM has been outlined below in Table 6-1.

TABLE 2: HYDRAULIC CRITERIA SUMMARY TABLE

Roadway Classification	El Paso County Drainage Criteria
Residential/Local	Minor: No curb overtopping, flow may spread to crown of street or top of curb (whichever is most limiting) Major: Depth of water at gutter flow line shall not exceed 12”. Residential dwellings, public, commercial, or industrial shall not be inundated at the ground line. (Ch.6, Table 6-1)
Collector or Minor Arterial	Minor: No curb overtopping. Flow spread must be limited to a maximum 20 foot spread from each curb face. Major: Depth of water at gutter flow line shall not exceed 12”. Residential dwellings, public, commercial, or industrial shall not be inundated at the ground line. (Ch.6, Table 6-1)

Water Quality Criteria

Water quality treatment is not anticipated to be needed due to the following exemptions, according to El Paso County Engineering Criteria Manual Appendix I.7. Post-Construction Stormwater Management:

- Each intersection site will involve well below the 1 acre of soil disturbance that is the threshold for water quality treatment. Furthermore, each site is >1/4mi away from each other such that they will not constitute as a "larger common plan of development" LCPD) (ie: their respective disturbances would not be additive towards the 1 acre threshold). Each intersection's anticipated area of disturbance is listed below.

Location	Total Proposed Disturbed Area (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.B.# (ac)	Non-Excluded Disturbances (ac)	Applicable WQ Exclusions (App I.7.1.B.#)	Distance from Nearest Intersection Included with this Project (mi)	Notes
Cody Drive at Spur Drive (Pinello Elem.)	0.042	0.043	-0.001	3,2	0.95	
Hallam Avenue at Leta Drive (Dist. 3 North Pre-school)	0.043	0.04	0.003	3,2	0.51	
Stratmoor Hills Fire station at B Street	0	0	0.000	-	0.12	<0.25 miles a Package 3 Project
Jersey Lane at Bickley Street (Webster Elem.)	0.127	0.092	0.035	3,2	0.85	
King Elementary at Defoe Avenue mid-block crossing	0.097	0.071	0.026	3,2	0.17	<0.25 miles from a Package 3 Project
Sunrise Elementary at Grand Valley Drive mid-block crossing	0.063	0.051	0.012	3,2	0.70	
Tri-Lakes Fire station at Woodmoor Drive	0.025	0.014	0.011	-	10.47	
Widefield Elementary at Widefield Drive mid-block crossing	0.062	0.032	0.030	3,2	0.43	

Furthermore, each site is applicable to the following PCM exclusions:

- Site adds less than 1 acre of paved area per mile
- Site adds 8.35 ft or less of paved width at any location throughout the project
- Project increases the width of the existing roadway by less than two times the existing width

In the case that the soil disturbance at a site or sites part of a LCPD exceeds 1 acre and no PCM exclusions apply then none of these exemptions apply at a location, post-construction stormwater management may be required per the El Paso County Post Construction Stormwater Management Applicability Evaluation Form.

Erosion and Stormwater Quality Control Permit (ESQCP) will not be necessary due to disturbance being less than one acre.

Floodplain

Each site will be compared with Flood Insurance Rate Maps found in the FEMA Flood Map Service Center to ensure floodplains are noted and considered in design. No Floodplain impacts are anticipated with this project.

Roadway Drainage Analysis

Project Description

The project consists of various sites located throughout El Paso County. The project scope focuses on pedestrian safety improvements for multiple intersections throughout the county. This analysis focuses on how the pedestrian safety improvements affect drainage patterns and examines whether spread and/or depth have improved or worsened. This project will not address existing drainage issues, but checks that conditions are not worsened.

Sub- Basin Delineation

The sub-basins for project were delineated using El Palso County LiDAR set to a horizontal projection of NAD (1983 2011) State Plane Colorado Central FIPS 0502 Ft US and vertical projection of North American Datum 1988.

Drainage Basin Descriptions

The 10-Year and 100-Year peak discharge events (Minor and Major storm events) were analyzed for each intersection where the proposed designed reduced the travel width of the existing roadway. It is assumed that the longitudinal slope, transverse slope, and gutter pan are the same the existing and proposed conditions with the only alteration coming from a bump out in the sidewalk curb thus reducing the travel lane width.

Basin 1 - Sunrise Elementary at Grand Valley Drive Mid-block Crossing
The intersection includes the following basins:

- 1a
    - Subbasin 1A drains to the east side of Grand Valley Drive and made up primarily of residential homes. The basin slope is approximately 1.6% with an approximate width of 71 feet and length of 750 feet. The soil type in this subbasin is hydrologic soil group B.
- 1b
    - Subbasin 1B drains to the east side of Grand Valley Drive and is made up primarily of the street. The basin slope is approximately 1.5% with an approximate width of 12 feet and length of 70 feet. The soil type in this subbasin is hydrologic soil group B.
- 1c
    - Subbasin 1C drains to the west side of Grand Valley Drive and is made up primarily of the street. The basin slope is approximately 1.0% with an approximate width of 20 feet and length of 90 feet. The soil type in this subbasin is hydrologic soil group B.
- 1d
    - Subbasin D drains to the west side of Grand Valley Drive and made up primarily of parking lot and yard area. The basin is approximately 2.5% with an approximate width of 275 feet and length of 405 feet. The soil type in this subbasin is hydrologic soil group B.

Basin 2 - King Elementary at Defoe Avenue Mid-block Crossing
This intersection includes the following basins:

- 2a
    - Subbasin 2A drains to the north side of Defoe Avenue and made up primarily of street and yard area. The basin slope is approximately 2.0% with an approximate width of 99 feet and length of 1,500 feet. The soil type in this subbasin is hydrologic soil group B.
- 2b
    - Subbasin 2B drains to the east side of Fielding Terrace and made up primarily of residential homes. The basin slope is approximately 2.0% with an approximate width of 600 feet and length of 3,600 feet. The soil type in this subbasin is hydrologic soil group B.
- 2c
    - Subbasin 2C drains to the south side of Defoe Avenue and made up primarily of residential homes. The basin slope is approximately 2.5% with an approximate width of 80 feet and length of 670 feet. The soil type in this subbasin is hydrologic soil group B.
- 2d
    - Subbasin 2D drains to the south side of Defoe Avenue and made up primarily of residential homes. The basin slope is approximately 2.0% with an approximate

width of 90 feet and length of 240 feet. The soil type in this subbasin is hydrologic soil group B.

- 2e
    - Subbasin 2E drains to the north side of Defoe Avenue and made up primarily of parking lot. The basin slope is approximately 2.0% with an approximate width of 50 feet and length of 250 feet. The soil type in this subbasin is hydrologic soil group B.
- 2f
    - Subbasin 2F drains to the north side of Defoe Avenue and made up primarily of parking lot and yard area. The basin slope is approximately 4% with an approximate width of 70 feet and length of 300 feet. The soil type in this subbasin is hydrologic soil group B.
- 2g
    - Subbasin 2G drains to the north side of Defoe Avenue and made up primarily of parking lot. The basin slope is approximately 5% with an approximate width of 30 feet land length of 135 feet. The soil type in this subbasin is hydrologic soil group B.

Basin 3 – Jersey Lane at Bickley Street

This intersection includes the following basins:

- 3a
    - Subbasin 3a drains to the westbound lane on the northeast corner of Jersey Lane and Bickley Street and made up primarily of residential homes. The basin slope is approximately 1.2% with an approximate width of feet and feet. The soil type in this subbasin is hydrologic soil group C.
- 3b
    - Subbasin 3b drains to the west bound lane on the south side of Jersey Lane at Bickley Street and made up primarily of residential homes. The basin slope is approximately 1.7% with an approximate width of feet and feet. The soil type in this subbasin is hydrologic soil group C.
- 3c
    - Subbasin 3c drains to the northwest corner of Jersey Lane at Bickley and made up primarily of residential homes. The basin slope is approximately 1.3% with an approximate width of feet and feet. The soil type in this subbasin is hydrologic soil group C.
- 3d
    - Subbasin 3d drains to the southbound lane at the northwest corner of Jersey Lane at Bickley Street and made up primarily of residential homes. The basin slope is approximately 1.3% with an approximate width of feet and feet. The soil type in this subbasin is hydrologic soil group C.

Basin 4 - Widefield Elementary at Widefield Drive Mid-block Crossing
This intersection includes the following basins:

- 4a
    - Subbasin 4a drains to the southeast lane of Widefield Drive at Widefield Elementary and made up primarily of residential homes. The basin slope is approximately 1% with an approximate width of feet and feet. The soil type in this subbasin is hydrologic soil group A.
- 4b
    - Subbasin 4b drains to the southeast lane of Widefield Drive at Widefield Elementary and made up primarily of parks. The basin slope is approximately 1% with an approximate width of feet and feet. The soil type in this subbasin is hydrologic soil group A.

Basin 7 - Hallam Ave at Leta Drive
This intersection includes the following basins:

- 7a
    - Subbasin 7a drains to the south corner of Hallam Ave at Leta Drive (Dist. 3 North Pre-school) and made up primarily of residential homes. The basin slope is approximately 1.6% with an approximate width of feet and feet. The soil type in this subbasin is hydrologic soil group A.
- 7b
    - Subbasin 7b drains to the north bulbout corner of Hallam Ave at Leta Drive (Dist. 3 North Pre-School) and made up primarily of parks. The basin slope is approximately 2.9% with an approximate width of feet and feet. The soil type in this subbasin is hydrologic soil group A.

Basin 8 – Cody Drive at Spur Drive
This intersection includes the following basins:

- 8a
    - Subbasin 8a drains to the west bulbout corner of Cody Drive at Spur Drive (Pinello Elementary) and made up primarily of parks. The basin slope is approximately 1.3% with an approximate width of feet and feet. The soil type in this subbasin is hydrologic soil group A.
- 8b
    - Subbasin 8b drains to the east bulbout corner of Cody Drive at Spur Drive (Pinello Elementary and made up primarily of parks. The basin slope is approximately 3.2% with an approximate width of feet and feet. The soil type in this subbasin is hydrologic soil group A.

Intersection Analysis

Proposed pedestrian improvements were analyzed at locations where bump outs and/or medians resulted in reduction of roadway width. The proposed design's spread and depth results were initially checked against El Paso County Criteria using Bentley FlowMaster by modeling a standard gutter channel. Spread was measured from the edge of pavement to the crown and depth was measured at the gutter flowline.

For proposed design, curb and gutter dimensions were assumed to be Type A standard dimensions from El Paso County's Roadway Criteria.

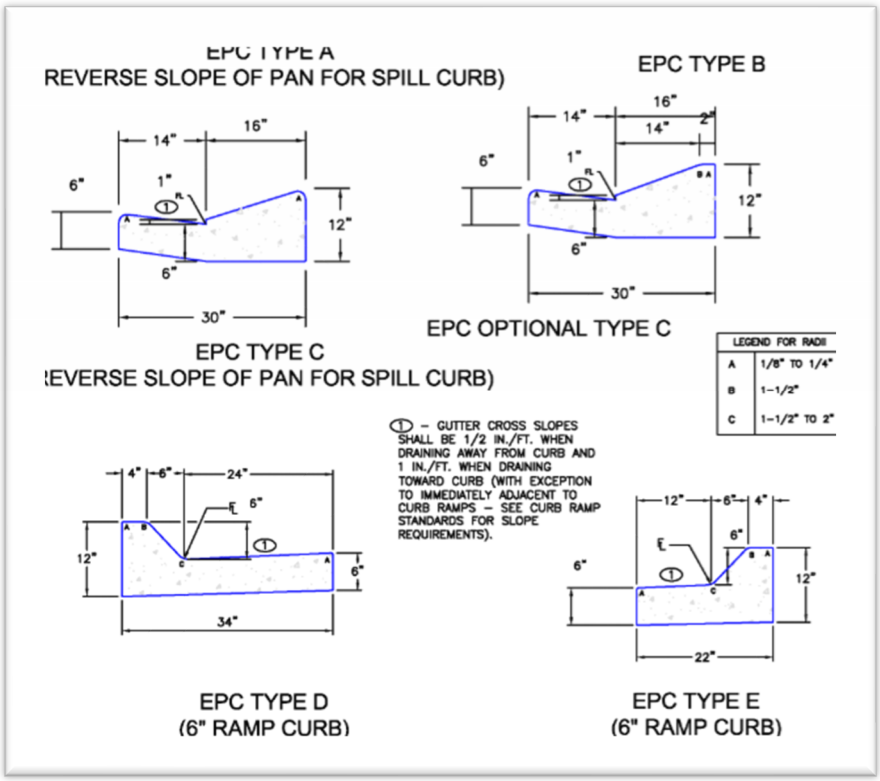

FIGURE 2: STANDARD EL PASO COUNTY CURB AND GUTTER

Any locations where the proposed spread and depth met the criteria were considered acceptable. In situations where the criteria was not met, a secondary analysis that utilized a more detailed model of the roadway cross section was created in FlowMaster to verify the initial result and to compare the existing conditions versus proposed conditions. The results evaluated whether the proposed design improved or worsened the spread and depth or if conditions remained the same.

Proposed Conditions Results

21 design points over 6 intersections were examined where spread and depth were analyzed by a curb and gutter analysis and checked against El Paso County's Drainage Criteria. A detailed analysis of all design points can be seen in Appendix D and Appendix E.

In the minor, 10-year storm event, 4 design points did not pass the initial curb and gutter analysis and were further evaluated in more detail. In the major, 100-year storm event, 1 design point did not pass the initial curb and gutter analysis and were further evaluated in more detail. Spread and Depth results for the secondary analysis can be found in Tables 3 through 6 below.

Once the proposed design for these design points were modeled in more detail, they were compared to the existing conditions. Some results show that spread and depth do not meet criteria, however they do show either improved conditions or conditions that remained the same, therefore the results are acceptable.

TABLE 3: 10-YEAR SPREAD RESULTS FOR PROPOSED LOCATIONS NOT MEETING CRITERIA STANDARDS

Intersection and Proposed Structure	Basin ID	Discharge (cfs)	Existing Distance from Edge of Road to Crown (ft)	Existing Spread (ft)	Proposed Distance from Edge of Road to Crown (ft)	Proposed Spread (ft)	Spread Criteria Overage (ft)	Street Type and Spread Criteria
Jersey Lane at Bickley St Bump out	3c	14.2	15.5	10.6	11.1	7.3	No	Collector/Minor Arterial Max 20' from each curb face
Hallam Ave at Leta Drive Median	7b	64.28	16	13⁺	13	13*⁺	Yes*	Residential/Local to crown
Cody Dr and Spur Dr Median	8a	19.6	19	15.5	13.3	13.3*	Yes*⁺	Residential/Local to crown
Cody Dr and Spur Dr Median	8b	16.8	19	13.2	12.8	12.1	No⁺	Residential/Local to crown

**Spread exceeds criteria, but matches or improves existing conditions.*
⁺Spread overtops crown or spreads to median

TABLE 4: 10-YEAR DEPTH RESULTS FOR PROPOSED LOCATIONS NOT MEETING CRITERIA STANDARDS

Intersection and Proposed Structure	Basin ID	Discharge (cfs)	Existing Depth at Flowline (in)	Proposed Depth at Flowline (in)	Depth Criteria Overage (in)	Street Type and Depth Criteria
Jersey Lane at Bickley St Bump out	3c	14.2	7.8⁺	7.6*⁺	Yes*⁺	Collector/Minor Arterial Max 6"
Hallam Ave at Leta Drive Median	7b	64.28	8.4⁺	8.4*⁺	Yes*⁺	Residential/Local Max 6"
Cody Dr and Spur Dr Median	8a	19.6	8.1⁺	7.8*⁺	Yes*⁺	Residential/Local Max 6"
Cody Dr and Spur Dr Median	8b	16.8	7.9⁺	7.4*⁺	Yes*⁺	Residential/Local Max 6"

** Depth exceeds criteria, but matches or improves existing conditions.*
⁺ Depth overtops back of curb

TABLE 5: 100-YEAR SPREAD RESULTS FOR PROPOSED LOCATIONS NOT MEETING CRITERIA STANDARDS

Intersection and Proposed Structure	Basin ID	Discharge (cfs)	Existing Distance from Edge of Road to Crown (ft)	Existing Spread (ft)	Proposed Distance from Edge of Road to Crown (ft)	Proposed Spread (ft)	Spread Criteria Overage (ft)	Street Type and Spread Criteria
Hallam Ave at Leta Drive Median	7b	152.4	16	16	13	13	No+	Property shall not be inundated at ground line

** Spread exceeds criteria, but matches or improves existing conditions.*
+ Spread overtops crown

TABLE 6: 100-YEAR DEPTH RESULTS FOR PROPOSED LOCATIONS NOT MEETING CRITERIA STANDARDS

Intersection and Proposed Structure	Basin ID	Discharge (cfs)	Existing Depth at Flowline (in)	Proposed Depth at Flowline (in)	Depth Criteria Overage (in)	Street Type and Depth Criteria
Hallam Ave at Leta Drive Median	7b	152.4	10.9+	10.9*+	Yes*+	Residential/Local Max 6.3”

** Depth exceeds criteria, but matches or improves existing conditions.*
+ Depth overtops back of curb

Conclusion

This project is focused on the improvements to existing pedestrian facilities including work such as sidewalks, cross walks, curb ramps, and medians that generally have minimal stormwater impacts. Due to concrete bump out structures and medians, roadway travel lanes were reduced at multiple locations which were the major focuses for this analysis.

In proposed conditions, runoff will drain around the bump outs via standard curb and gutter. In most locations, the proposed results meet criteria for the 10-year and 100-year storm events. Locations which do not meet criteria in proposed conditions show improved or unchanged results for depth and spread, therefore the proposed improvements are acceptable.

References

1. Colorado Department of Transportation, 2019 Drainage Design Manual, https://www.codot.gov/business/hydraulics/drainage-design-manual

2. El Paso County, Drainage Criteria Manual, Version: Oct. 31, 2018 (Current), https://publicworks.elpasoco.com/stormwater/

3. El Paso County, Engineering Criteria Manual, Version: Oct. 14, 2020 (Current), https://publicworks.elpasoco.com/stormwater/

4. Mile High Flood District, Detention Design – MHFD-Detention v4.04, Feb. 2021, https://mhfd.org/resources/software

Appendices

Appendix A: Drainage Basin Maps

Appendix B: Soil Survey

Appendix C: Precipitation Information

Appendix D: Rational Method Calculations

Appendix E: Flow Master Results

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Appendix D: Rational Method Calculations

Appendix E: Hydraulic Results

References

1. Colorado Department of Transportation, 2019 Drainage Design Manual, https://www.codot.gov/business/hydraulics/drainage-design-manual

2. El Paso County, Drainage Criteria Manual, Version: Oct. 31, 2018 (Current), https://publicworks.elpasoco.com/stormwater/

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Appendices

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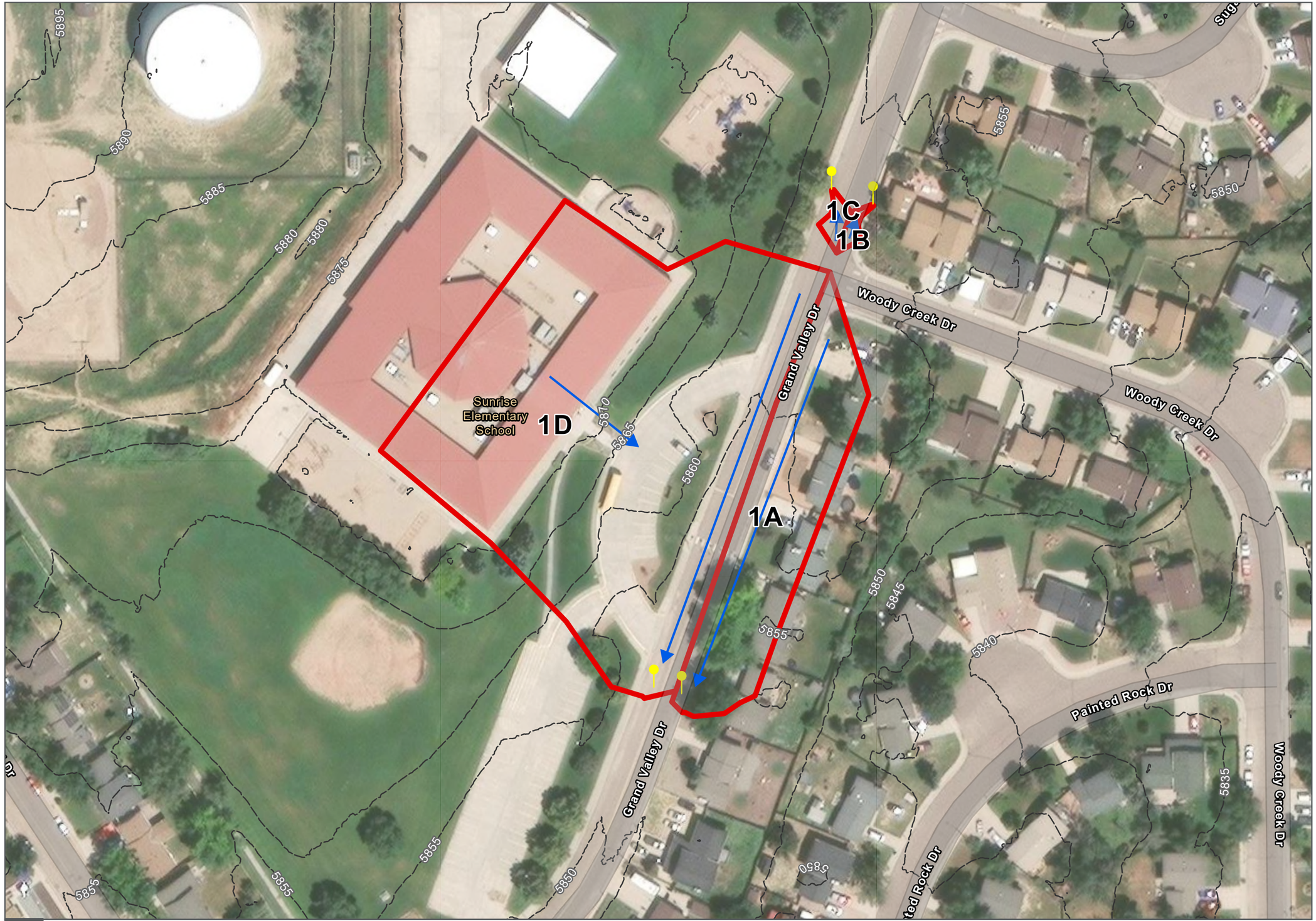
Appendix A: Drainage Basin Maps



LEGEND

- SUBBASIN
- EXISTING CONTOUR 5FT
- FLOW ARROW
- DesignPoints
- DesignLinework
- Existing Inlet

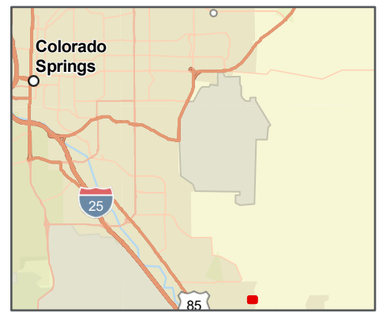
Intersection Description

Sunrise Elementary at Grand Valley Drive mid-block crossing

N

0 65 130

Feet

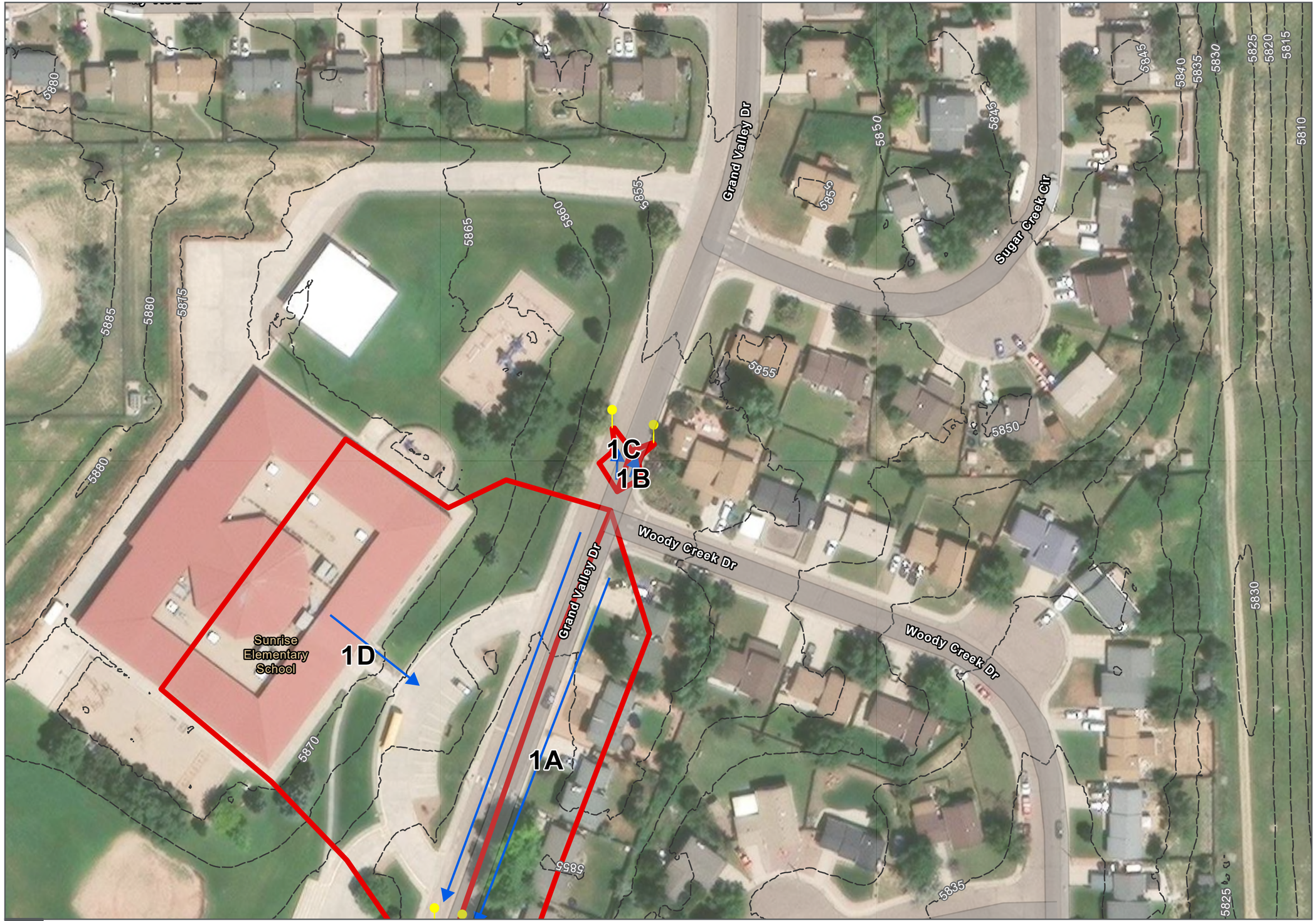


DATA SOURCE:

EL PASO COUNTY COLORADO

BASIN MAP 1A,1D

EL PASO COUNTY INTERSECTIONS



LEGEND

- SUBBASIN
- EXISTING CONTOUR 5FT
- FLOW ARROW
- DesignPoints
- DesignLinework
- Existing Inlet

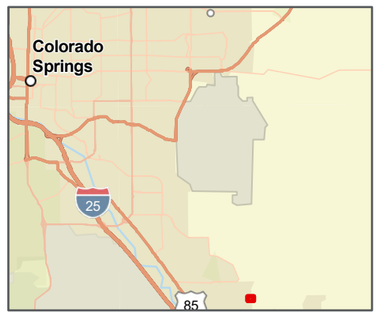
Intersection Description

Sunrise Elementary at Grand Valley Drive mid-block crossing

N

0 65 130

Feet

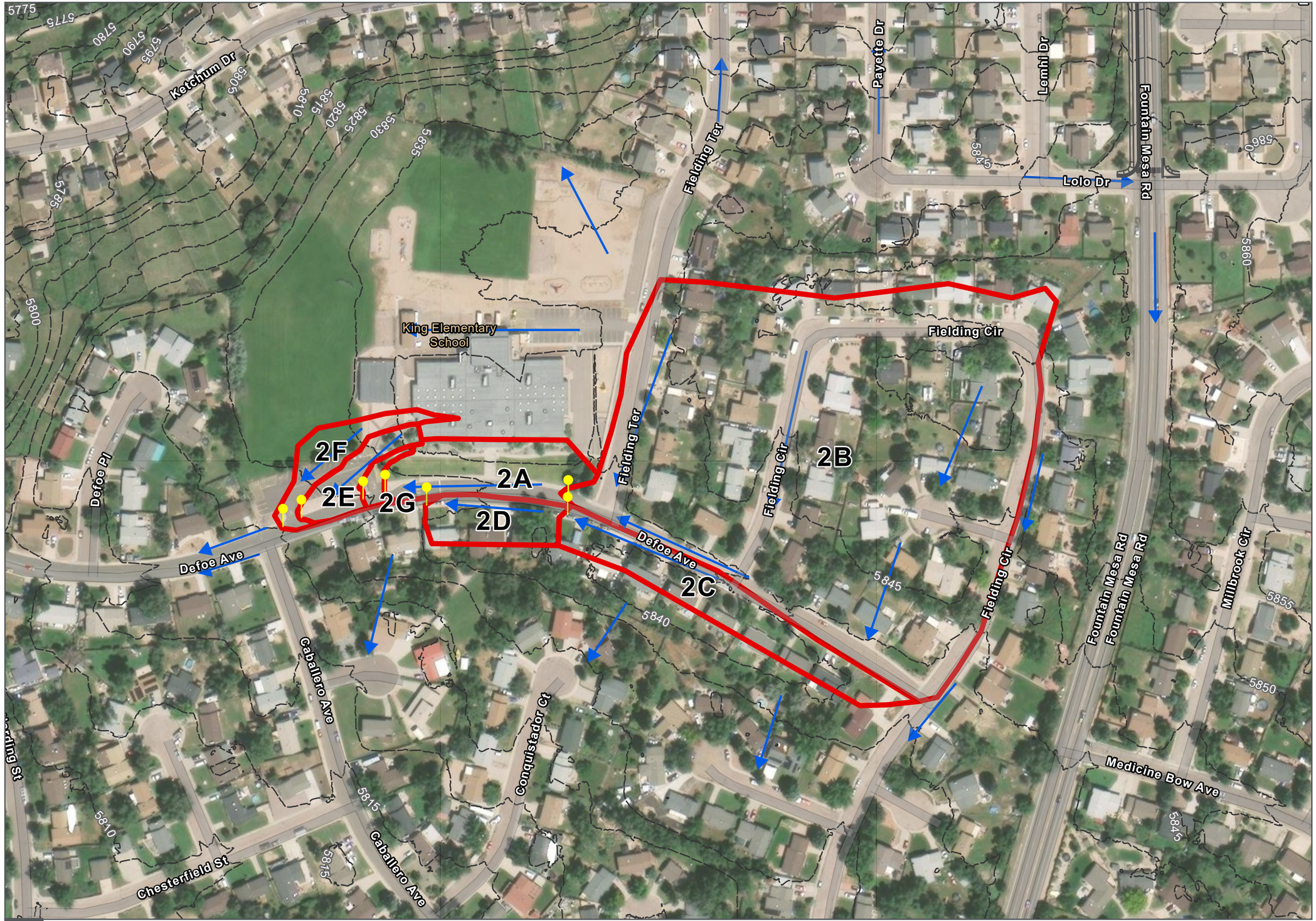


DATA SOURCE:

EL PASO COUNTY COLORADO

BASIN MAP 1B,1C

EL PASO COUNTY INTERSECTIONS



LEGEND

- SUBBASIN
- EXISTING CONTOUR 5FT
- FLOW ARROW
- DesignPoints
- DesignLinework
- Existing Inlet

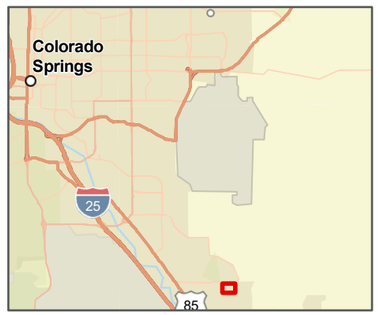
Intersection Description

King Elem. at Defoe Ave mid-block crossing

N

0 130 260

Feet

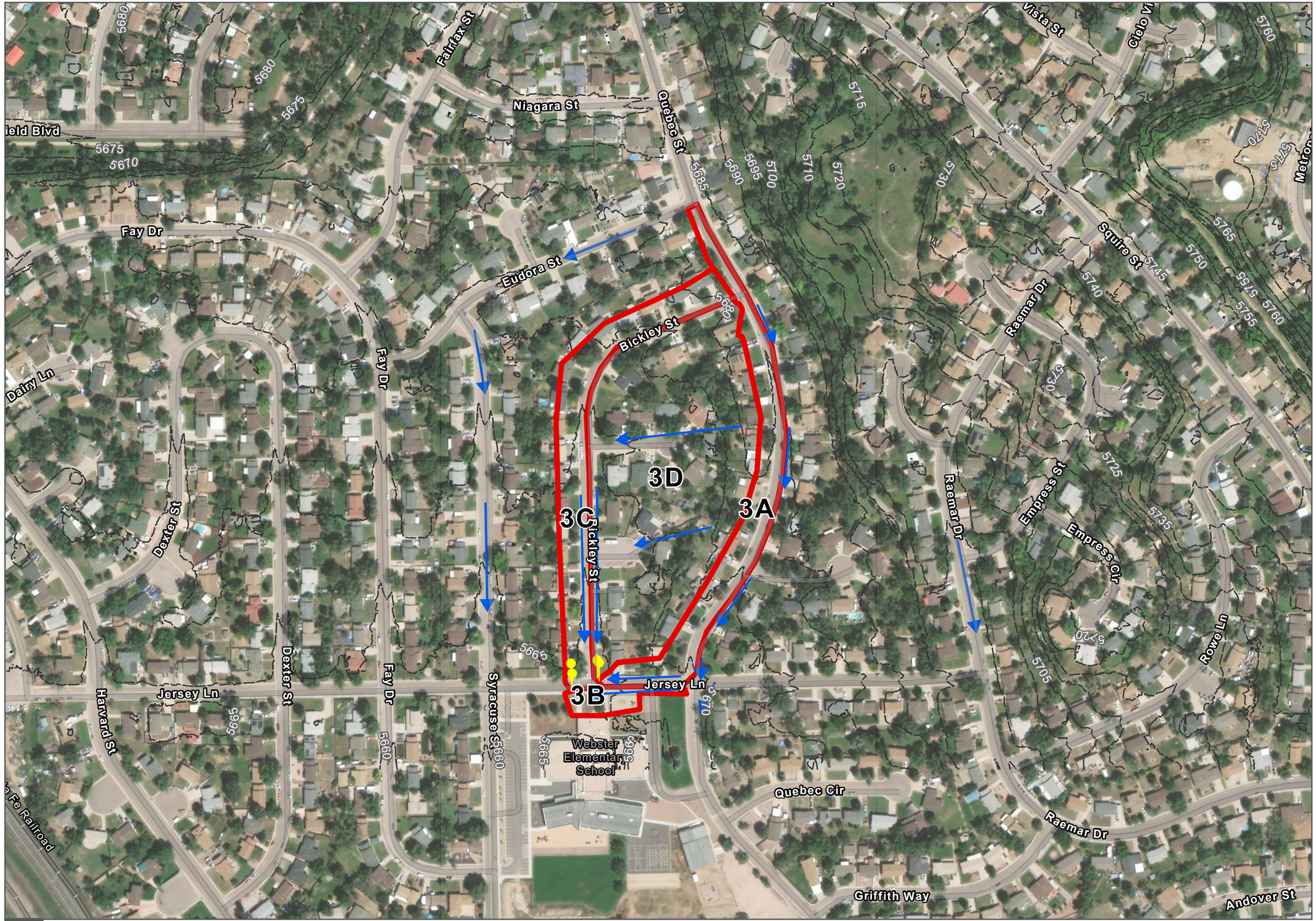


DATA SOURCE:

EL PASO COUNTY COLORADO

BASIN MAP 2

EL PASO COUNTY INTERSECTIONS



LEGEND

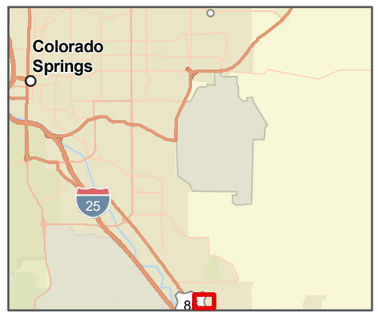
- SUBBASIN
- EXISTING CONTOUR 5FT
- FLOW ARROW
- DesignPoints
- DesignLinework
- Existing Inlet

Intersection Description

Jersey Lane at Bickley Street (Webster Elem.)

N

0 200 400
Feet



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BASIN MAP 3

EL PASO COUNTY INTERSECTIONS

EL PASO COUNTY
COLORADO

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LEGEND

- SUBBASIN
- EXISTING CONTOUR 5FT
- FLOW ARROW
- DesignPoints
- DesignLinework
- Existing Inlet

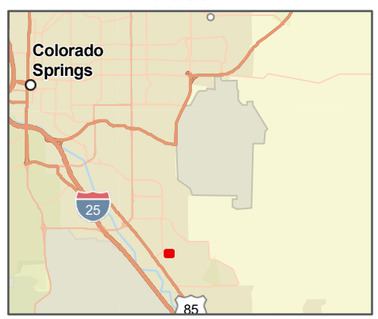
Intersection Description

Widefield Elementary at Widefield Drive mid-block crossing

N

0 65 130

Feet



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BASIN MAP 4

EL PASO COUNTY INTERSECTIONS

EL PASO COUNTY COLORADO

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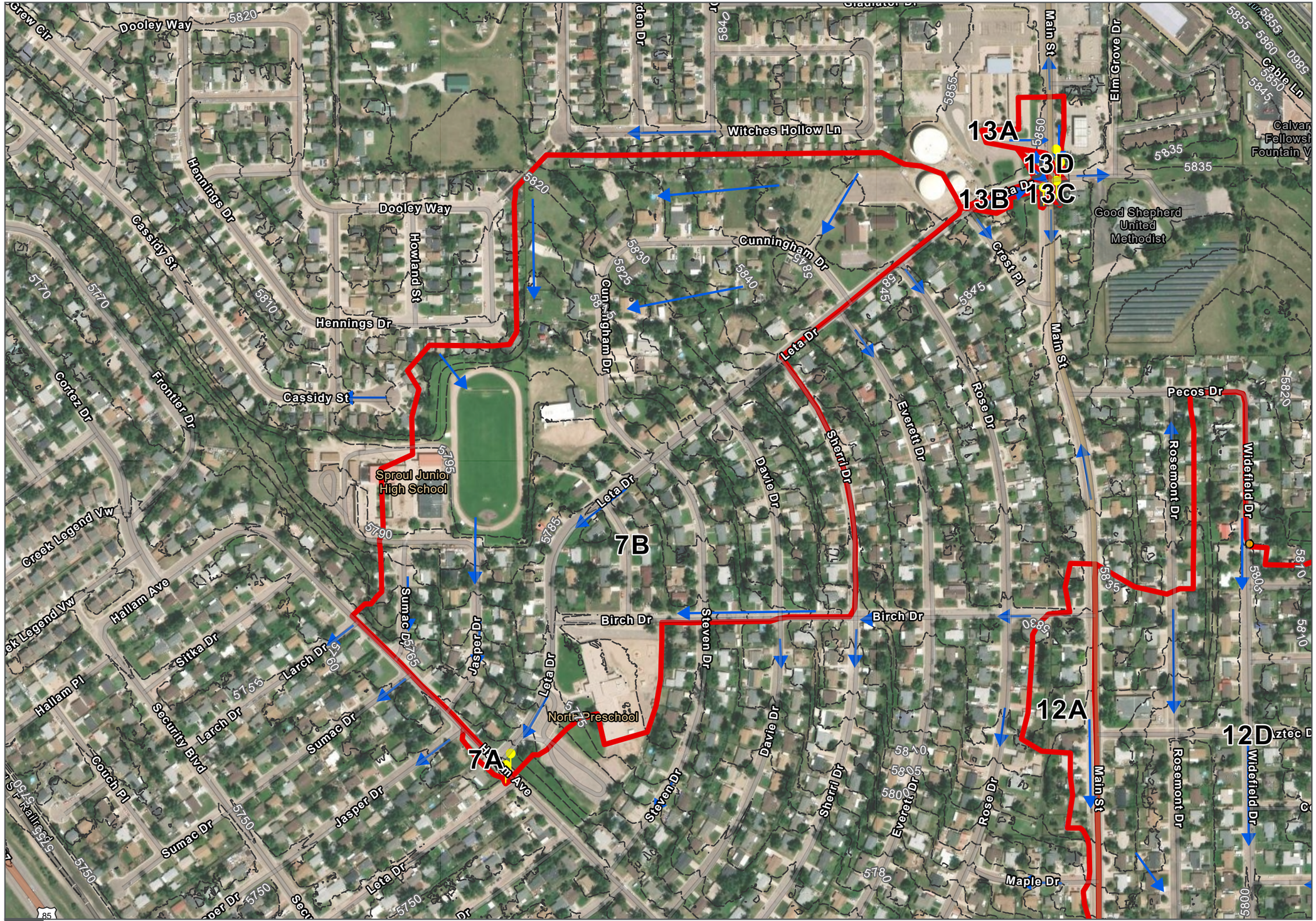


LEGEND

- SUBBASIN
- EXISTING CONTOUR 5FT
- FLOW ARROW
- DesignPoints
- DesignLinework
- Existing Inlet

Intersection Description

Hallam Ave at Leta Drive (Dist. 3 North Pre-School)

N

0 265 530

Feet

DATA SOURCE:

BASIN MAP 7

EL PASO COUNTY INTERSECTIONS

EL PASO COUNTY
COLORADO

LEGEND

- SUBBASIN
- EXISTING CONTOUR 5FT
- FLOW ARROW
- DesignPoints
- DesignLinework
- Existing Inlet

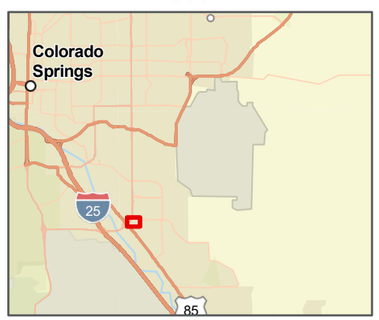
Intersection Description

Cody Drive at Spur Drive (Pinello Elementary)

N

0 130 260

Feet



DATA SOURCE:

BASIN MAP 8

EL PASO COUNTY INTERSECTIONS

EL PASO COUNTY COLORADO

PATH: U:\PROJECTS_EL_PASO_COUNTY\PEDESTRIAN_INTERSECTIONS\MAP_DOCS\APR\INTERSECTIONS_WORKING\INTERSECTIONS_FIGURES.APRX - USER: CBURLISON - DATE: 12/19/2024

Appendix B: Soil Survey

LEGEND

Project Intersections

Project Intersections

Hydrologic Soil Group

Soil Type

- Water
- A
- B
- C
- D

Basin 8
Basin 7
Basin 4
Basin 2
Basin 1
Basin 3

N

0 0.5 1
Miles

SOILS MAP

EL PASO COUNTY INTERSECTIONS - PACKAGE 1

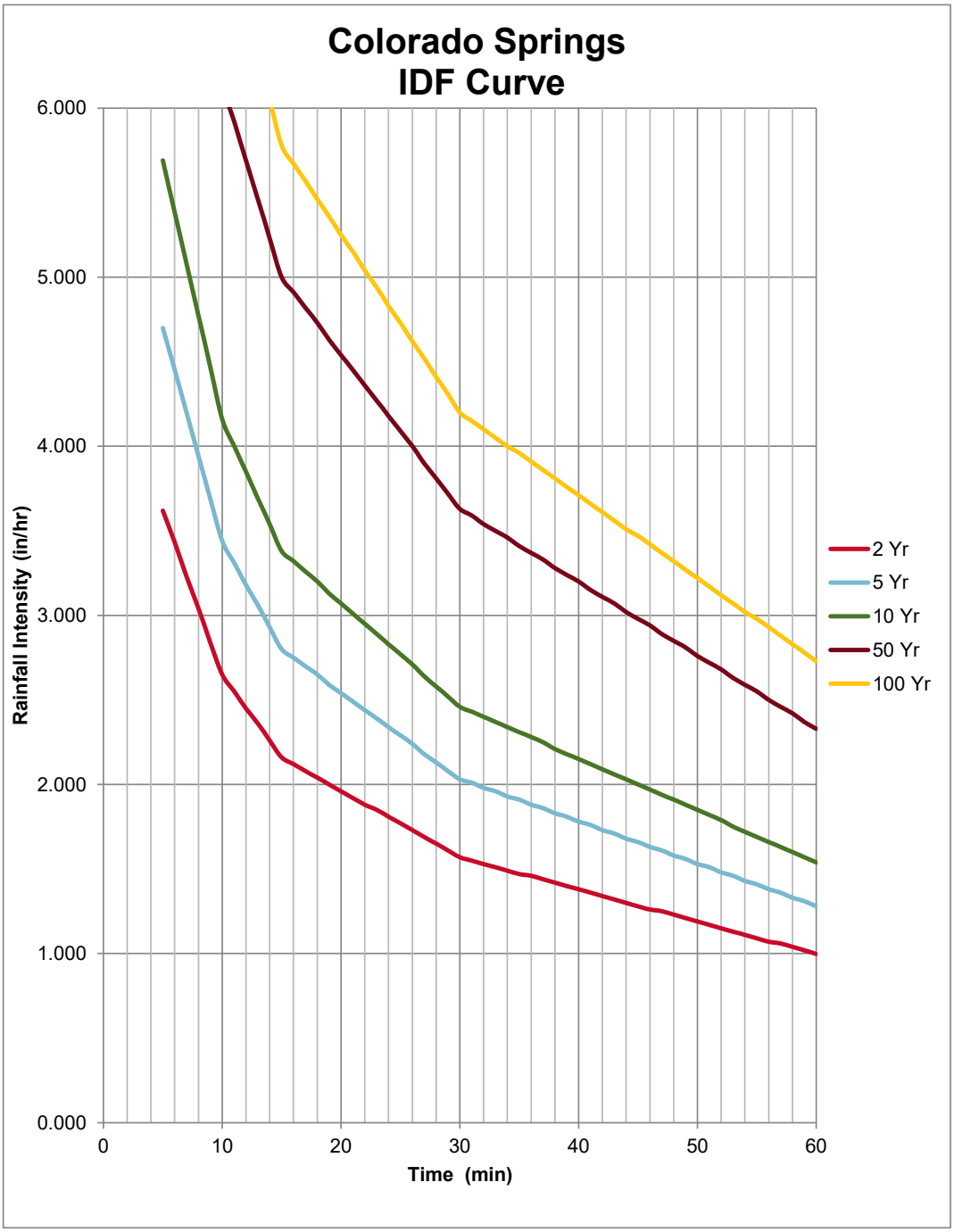
EL PASO COUNTY
COLORADO

Appendix C: Precipitation Information

Colorado SpringsIDF Computed: CB Date: 10/30/2024

Checked: Date:

Time (min)	(in/hr)				
	2 Yr	5 Yr	10 Yr	50 Yr	100 Yr
5	3.620	4.700	5.690	8.400	9.720
6	3.430	4.450	5.380	7.950	9.200
7	3.230	4.200	5.080	7.500	8.680
8	3.040	3.940	4.770	7.050	8.160
9	2.840	3.690	4.470	6.600	7.640
10	2.650	3.440	4.160	6.150	7.120
11	2.550	3.310	4.000	5.920	6.850
12	2.450	3.180	3.850	5.690	6.580
13	2.360	3.060	3.690	5.460	6.320
14	2.260	2.930	3.540	5.230	6.050
15	2.160	2.800	3.380	5.000	5.780
16	2.120	2.750	3.320	4.910	5.670
17	2.080	2.700	3.260	4.820	5.570
18	2.040	2.650	3.200	4.730	5.460
19	2.000	2.590	3.130	4.630	5.360
20	1.960	2.540	3.070	4.540	5.250
21	1.920	2.490	3.010	4.450	5.150
22	1.880	2.440	2.950	4.360	5.040
23	1.850	2.390	2.890	4.270	4.940
24	1.810	2.340	2.830	4.180	4.830
25	1.770	2.290	2.770	4.090	4.730
26	1.730	2.240	2.710	4.000	4.620
27	1.690	2.180	2.640	3.900	4.520
28	1.650	2.130	2.580	3.810	4.410
29	1.610	2.080	2.520	3.720	4.310
30	1.570	2.030	2.460	3.630	4.200
31	1.550	2.010	2.430	3.590	4.150
32	1.530	1.980	2.400	3.540	4.100
33	1.510	1.960	2.370	3.500	4.050
34	1.490	1.930	2.340	3.460	4.000
35	1.470	1.910	2.310	3.410	3.960
36	1.460	1.880	2.280	3.370	3.910
37	1.440	1.860	2.250	3.330	3.860
38	1.420	1.830	2.210	3.280	3.810
39	1.400	1.810	2.180	3.240	3.760
40	1.380	1.780	2.150	3.200	3.710
41	1.360	1.760	2.120	3.150	3.660
42	1.340	1.730	2.090	3.110	3.610
43	1.320	1.710	2.060	3.070	3.560
44	1.300	1.680	2.030	3.020	3.510
45	1.280	1.660	2.000	2.980	3.470
46	1.260	1.630	1.970	2.940	3.420
47	1.250	1.610	1.940	2.890	3.370
48	1.230	1.580	1.910	2.850	3.320
49	1.210	1.560	1.880	2.810	3.270
50	1.190	1.530	1.850	2.760	3.220
51	1.170	1.510	1.820	2.720	3.170
52	1.150	1.480	1.790	2.680	3.120
53	1.130	1.460	1.750	2.630	3.070
54	1.110	1.430	1.720	2.590	3.020
55	1.090	1.410	1.690	2.550	2.980
56	1.070	1.380	1.660	2.500	2.930
57	1.060	1.360	1.630	2.460	2.880
58	1.040	1.330	1.600	2.420	2.830
59	1.020	1.310	1.570	2.370	2.780
60	0.998	1.280	1.540	2.330	2.730


Colorado Springs
IDF Curve
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Rainfall Intensity (in/hr)
0
10
20
30
40
50
60
Time (min)
2 Yr
5 Yr
10 Yr
50 Yr
100 Yr

NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 38.7345°, Longitude: -104.6996°
Elevation: 5843 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/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	3.01 (2.48-3.72)	3.62 (2.98-4.46)	4.70 (3.85-5.82)	5.69 (4.63-7.07)	7.16 (5.66-9.38)	8.40 (6.44-11.1)	9.72 (7.16-13.2)	11.1 (7.84-15.6)	13.2 (8.86-19.0)	14.8 (9.62-21.5)
10-min	2.21 (1.82-2.72)	2.65 (2.18-3.27)	3.44 (2.83-4.26)	4.16 (3.39-5.18)	5.24 (4.15-6.87)	6.15 (4.72-8.15)	7.12 (5.24-9.68)	8.16 (5.74-11.4)	9.64 (6.48-13.9)	10.8 (7.04-15.8)
15-min	1.80 (1.48-2.21)	2.16 (1.78-2.66)	2.80 (2.30-3.46)	3.38 (2.76-4.21)	4.26 (3.37-5.58)	5.00 (3.84-6.62)	5.78 (4.26-7.87)	6.63 (4.66-9.29)	7.84 (5.27-11.3)	8.81 (5.73-12.8)
30-min	1.31 (1.08-1.61)	1.57 (1.29-1.94)	2.03 (1.67-2.52)	2.46 (2.00-3.06)	3.09 (2.45-4.05)	3.63 (2.78-4.81)	4.20 (3.10-5.72)	4.82 (3.39-6.75)	5.70 (3.83-8.22)	6.40 (4.16-9.32)
60-min	0.851 (0.701-1.05)	0.998 (0.821-1.23)	1.28 (1.05-1.58)	1.54 (1.26-1.92)	1.96 (1.56-2.60)	2.33 (1.80-3.11)	2.73 (2.02-3.74)	3.18 (2.24-4.48)	3.83 (2.58-5.54)	4.36 (2.84-6.35)
2-hr	0.524 (0.434-0.641)	0.605 (0.501-0.742)	0.767 (0.633-0.943)	0.928 (0.761-1.15)	1.19 (0.958-1.57)	1.42 (1.11-1.89)	1.68 (1.26-2.30)	1.97 (1.41-2.77)	2.40 (1.64-3.47)	2.76 (1.81-3.99)
3-hr	0.383 (0.319-0.467)	0.436 (0.362-0.532)	0.547 (0.452-0.669)	0.662 (0.545-0.815)	0.855 (0.695-1.13)	1.03 (0.809-1.38)	1.23 (0.927-1.68)	1.46 (1.05-2.05)	1.80 (1.23-2.59)	2.08 (1.37-3.00)
6-hr	0.219 (0.184-0.266)	0.247 (0.206-0.299)	0.308 (0.256-0.374)	0.373 (0.309-0.456)	0.484 (0.397-0.640)	0.587 (0.464-0.780)	0.705 (0.536-0.960)	0.841 (0.609-1.18)	1.04 (0.722-1.50)	1.21 (0.807-1.74)
12-hr	0.121 (0.102-0.146)	0.139 (0.117-0.167)	0.174 (0.146-0.210)	0.211 (0.176-0.256)	0.272 (0.223-0.355)	0.327 (0.260-0.430)	0.389 (0.297-0.524)	0.460 (0.335-0.637)	0.565 (0.394-0.803)	0.653 (0.438-0.929)
24-hr	0.068 (0.057-0.081)	0.079 (0.067-0.095)	0.101 (0.085-0.121)	0.121 (0.102-0.147)	0.154 (0.127-0.199)	0.183 (0.146-0.238)	0.215 (0.165-0.286)	0.251 (0.183-0.343)	0.302 (0.212-0.425)	0.345 (0.233-0.487)
2-day	0.038 (0.032-0.045)	0.045 (0.038-0.054)	0.058 (0.049-0.069)	0.069 (0.059-0.083)	0.087 (0.072-0.110)	0.102 (0.082-0.131)	0.119 (0.091-0.156)	0.136 (0.100-0.185)	0.162 (0.114-0.225)	0.182 (0.124-0.256)
3-day	0.027 (0.023-0.032)	0.032 (0.028-0.038)	0.041 (0.035-0.049)	0.049 (0.042-0.059)	0.062 (0.051-0.078)	0.072 (0.058-0.092)	0.083 (0.064-0.109)	0.095 (0.070-0.129)	0.113 (0.080-0.157)	0.127 (0.087-0.178)
4-day	0.022 (0.019-0.026)	0.026 (0.022-0.030)	0.032 (0.028-0.038)	0.039 (0.033-0.046)	0.048 (0.040-0.061)	0.056 (0.045-0.071)	0.065 (0.050-0.085)	0.074 (0.055-0.100)	0.088 (0.062-0.121)	0.099 (0.068-0.138)
7-day	0.015 (0.013-0.017)	0.017 (0.015-0.020)	0.021 (0.018-0.025)	0.025 (0.021-0.030)	0.031 (0.025-0.038)	0.035 (0.029-0.045)	0.041 (0.032-0.053)	0.046 (0.035-0.062)	0.054 (0.039-0.075)	0.061 (0.042-0.085)
10-day	0.012 (0.010-0.014)	0.013 (0.012-0.016)	0.016 (0.014-0.019)	0.019 (0.017-0.023)	0.024 (0.020-0.029)	0.027 (0.022-0.034)	0.031 (0.024-0.040)	0.035 (0.026-0.047)	0.041 (0.029-0.056)	0.046 (0.032-0.063)
20-day	0.007 (0.006-0.009)	0.009 (0.008-0.010)	0.011 (0.009-0.013)	0.012 (0.011-0.015)	0.015 (0.012-0.018)	0.017 (0.014-0.021)	0.019 (0.015-0.024)	0.021 (0.016-0.028)	0.024 (0.017-0.033)	0.027 (0.019-0.037)
30-day	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.008 (0.007-0.010)	0.010 (0.008-0.012)	0.012 (0.010-0.014)	0.013 (0.011-0.016)	0.015 (0.011-0.019)	0.016 (0.012-0.021)	0.018 (0.013-0.025)	0.020 (0.014-0.027)
45-day	0.005 (0.004-0.005)	0.005 (0.005-0.006)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.009 (0.008-0.011)	0.010 (0.008-0.013)	0.011 (0.009-0.014)	0.012 (0.009-0.016)	0.014 (0.010-0.019)	0.015 (0.010-0.020)
60-day	0.004 (0.003-0.005)	0.005 (0.004-0.005)	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.008 (0.006-0.009)	0.009 (0.007-0.011)	0.009 (0.007-0.012)	0.010 (0.008-0.013)	0.011 (0.008-0.015)	0.012 (0.009-0.017)

[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.

Appendix D: Rational Method Calculations

El Paso County Intersection Improvements
Priority Intersections

Computed: CMB Date: 3/3/2025
Checked: LVS Date: 11/22/2024

Basin ID	Description	Hydr Soils Group	Total Area (ac)	Composite C		Streets (paved)			Industrial (Light areas)			Business (Neighborhood Area)			Undeveloped Areas or Parks			1/4 acre		
				C_{10}	C_{100}	C_{10}	C_{100}	Area (ac)	C_{10}	C_{100}	Area (ac)	C_{10}	C_{100}	Area (ac)	C_{10}	C_{100}	Area (ac)	C_{10}	C_{100}	Area (ac)
1a	Sunrise ELementary at Grand Valley Drive mid-block crossing SE pinch point	B	0.57	0.36	0.50	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	0.57
1b	Sunrise Elementary at Grand Valley Drive mid-block crossing NE pinch point	B	0.01	0.90	0.95	0.90	0.95	0.01	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	0.00
1c	Sunrise Elementary at Grand Valley Drive mid-block crossing NW pinch point	B	0.02	0.90	0.95	0.90	0.95	0.02	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	0.00
1d	Sunrise Elementary at Grand Valley Drive mid-block crossing SW pinch point	B	2.12	0.75	0.80	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	2.12	0.30	0.55	0.00	0.36	0.50	0.00
2a	King Elem. at Defoe Ave mid-block crossing NW curb	B	0.78	0.30	0.55	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.78	0.36	0.50	0.00
2b	King Elem. at Defoe Ave mid-block crossing NE curb	B	9.57	0.36	0.50	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	9.57
2c	King Elem. at Defoe Ave mid-block crossing SE curb	B	1.04	0.36	0.50	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	1.04
2d	King Elem. at Defoe Ave mid-block crossing SW curb	B	0.44	0.36	0.50	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	0.44
2e	King Elem. at Defoe Ave mid-block crossing parking entrance, E curb	B	0.30	0.90	0.95	0.90	0.95	0.30	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	0.00
2f	King Elem. at Defoe Ave mid-block crossing parking entrance W curb	B	0.36	0.30	0.55	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.36	0.36	0.50	0.00
2g	King Elem. at Defoe Ave mid-block crossing parking exit W curb	B	0.08	0.90	0.95	0.90	0.95	0.08	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	0.00
3a	Jersey Lane at Bickley Street (Webster Elem.) NE corner, WB	B	2.22	0.36	0.50	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	2.22
3b	Jersey Lane at Bickley Street (Webster Elem.) S curb	C	0.35	0.36	0.50	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	0.35
3c	Jersey Lane at Bickley Street (Webster Elem.) NW corner	B	2.36	0.36	0.50	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	2.36
3d	Jersey Lane at Bickley Street (Webster Elem.) NE corner, NB	B	7.44	0.36	0.50	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	7.44
4a	Widefield Elementary at Widefield Drive mid-block crossing SB	A	0.58	0.36	0.50	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	0.58
4b	Widefield Elementary at Widefield Drive mid-block crossing NB	A	1.42	0.75	0.80	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	1.42	0.30	0.55	0.00	0.36	0.50	0.00
7a	Hallam Ave at Leta Drive (Dist. 3 North Pre-School) S corner	A	0.20	0.75	0.80	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.20	0.30	0.55	0.00	0.36	0.50	0.00
7b	Hallam Ave at Leta Drive (Dist. 3 North Pre-School) N Bulbout	A	62.98	0.36	0.50	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	0.00	0.30	0.55	0.00	0.36	0.50	62.98
8a	Cody Drive at Spur Drive (Pinello Elementary) West Bulbout	A	6.48	0.75	0.80	0.90	0.95	0.00	0.70	0.80	0.00	0.75	0.80	6.48	0.30	0.55	0.00	0.36	0.50	0.00
8b	Cody Drive at Spur Drive (Pinello Elementary East Bulbout	A	8.88	0.50	0.68	0.90	0.95	0.00	0.70	0.80	4.44	0.75	0.80	0.00	0.30	0.55	4.44	0.36	0.50	0.00

El Paso County Intersection Improvements
Priority Intersections

Minimum Tc of 5 minutes used for roadway basins 0.50 acres or smaller

Computed: WS Date: 3/3/2025
Checked: EVS Date: 11/25/2024

				INITIAL/OVERLAND FLOW (t_i)					TRAVEL TIME (t_t)									Total	Tc CHECK (Urbanized basins)				FINAL Tc (min)
													Type of Land Surface									
Basin ID	Description	C_{10}	Area (ac)	Length (ft)	Start Elevation (ft)	End Elevation (ft)	Slope (%)	t_i (min)	Length (ft)	Start Elevation (ft)	End Elevation (ft)	S_w (ft/ft)	Code	Description	Convey Coef (C_v)	Velocity (ft/s)	Travel Time (min)	$t_c = t_i + t_t$ (min)	Urban (Yes /No)	Total Length	Regional $T_{c\,max}$ (min)	$T_{c\,max} > t_c$	
1a	Sunrise ELementary at Grand Valley Drive mid-block crossing SE pinch point	0.36	0.57	85	5858.2	5856.7	1.738	10.63	380	5856.7	5850.5	0.016	6	Paved areas and swales	20.00	2.55	2.48	13.11	Yes	465	12.58	Regional Tc	12.58
1b	Sunrise Elementary at Grand Valley Drive mid-block crossing NE pinch point	0.90	0.01	18	5857.5	5857.3	1.114	1.53	36	5857.3	5856.8	0.015	6	Paved areas and swales	20.00	2.41	0.25	1.78	Yes	54	10.30	Check	5.00
1c	Sunrise Elementary at Grand Valley Drive mid-block crossing NW pinch point	0.90	0.02	30	5857.6	5857.1	1.535	1.78	37	5857.1	5856.9	0.007	6	Paved areas and swales	20.00	1.65	0.37	2.15	Yes	67	10.37	Check	5.00
1d	Sunrise Elementary at Grand Valley Drive mid-block crossing SW pinch point	0.75	2.12	180	5871.1	5863.0	4.486	5.35	495	5863.0	5850.6	0.025	6	Paved areas and swales	20.00	3.16	2.61	7.96	Yes	675	13.75	Check	7.96
2a	King Elem. at Defoe Ave mid-block crossing NW curb	0.30	0.78	110	5843.2	5837.1	5.533	8.92	315	5837.1	5831.0	0.019	6	Paved areas and swales	20.00	2.78	1.89	10.81	Yes	425	12.36	Check	10.81
2b	King Elem. at Defoe Ave mid-block crossing NE curb	0.36	9.57	145	5853.3	5849.9	2.299	12.66	1080	5849.9	5837.6	0.011	6	Paved areas and swales	20.00	2.14	8.43	21.09	Yes	1225	16.81	Regional Tc	16.81
2c	King Elem. at Defoe Ave mid-block crossing SE curb	0.36	1.04	50	5838.1	5836.8	2.623	7.12	660	5836.8	5836.8	0.000	6	Paved areas and swales	20.00	0.19	57.51	64.63	Yes	710	13.94	Regional Tc	13.94
2d	King Elem. at Defoe Ave mid-block crossing SW curb	0.36	0.44	60	5840.1	5837.7	3.932	6.82	245	5837.7	5832.5	0.021	6	Paved areas and swales	20.00	2.90	1.41	8.23	Yes	305	11.69	Check	8.23
2e	King Elem. at Defoe Ave mid-block crossing parking entrance, E curb	0.90	0.30	195	5843.3	5831.0	6.290	2.85	90	5831.0	5826.5	0.050	6	Paved areas and swales	20.00	4.45	0.34	3.18	Yes	285	11.58	Check	5.00
2f	King Elem. at Defoe Ave mid-block crossing parking entrance W curb	0.30	0.36	105	5842.8	5840.0	2.708	11.03	355	5840.0	5825.9	0.040	6	Paved areas and swales	20.00	3.98	1.49	12.52	Yes	460	12.56	Check	12.52
2g	King Elem. at Defoe Ave mid-block crossing parking exit W curb	0.90	0.08	60	5843.2	5836.2	11.685	1.29	105	5836.2	5829.3	0.065	6	Paved areas and swales	20.00	5.10	0.34	1.63	Yes	165	10.92	Check	5.00
3a	Jersey Lane at Bickley Street (Webster Elem.) NE corner, WB	0.36	2.22	20	5683.6	5682.8	3.791	3.99	1580	5682.8	5663.6	0.012	6	Paved areas and swales	20.00	2.21	11.94	15.92	Yes	1600	18.89	Check	15.92
3b	Jersey Lane at Bickley Street (Webster Elem.) S curb	0.36	0.35	30	5668.9	5668.0	2.931	5.32	295	5668.0	5662.9	0.017	6	Paved areas and swales	20.00	2.63	1.87	7.19	Yes	325	11.81	Check	7.19
3c	Jersey Lane at Bickley Street (Webster Elem.) NW corner	0.36	2.36	85	5682.4	5679.0	4.035	8.05	1255	5679.0	5662.8	0.013	6	Paved areas and swales	20.00	2.27	9.21	17.26	Yes	1340	17.44	Check	17.26
3d	Jersey Lane at Bickley Street (Webster Elem.) NE corner, NB	0.36	7.44	100	5681.0	5677.7	3.322	9.31	1135	5677.7	5663.3	0.013	6	Paved areas and swales	20.00	2.25	8.39	17.71	Yes	1235	16.86	Regional Tc	16.86
4a	Widefield Elementary at Widefield Drive mid-block crossing SB	0.36	0.58	39	5777.1	5776.8	0.673	9.85	325	5776.8	5773.6	0.010	6	Paved areas and swales	20.00	2.01	2.69	12.54	Yes	364	12.02	Regional Tc	12.02
4b	Widefield Elementary at Widefield Drive mid-block crossing NB	0.75	1.42	105	5779.1	5776.7	2.227	5.15	345	5776.7	5773.5	0.009	6	Paved areas and swales	20.00	1.94	2.97	8.12	Yes	450	12.50	Check	8.12
7a	Hallam Ave at Leta Drive (Dist. 3 North Pre-School) S corner	0.75	0.20	31	5758.2	5757.2	3.266	2.47	245	5757.2	5753.4	0.016	6	Paved areas and swales	20.00	2.51	1.63	4.09	Yes	276	11.53	Check	5.00
7b	Hallam Ave at Leta Drive (Dist. 3 North Pre-School) N Bulbout	0.36	62.98	55	5852.7	5851.5	2.305	7.79	3315	5851.5	5754.2	0.029	6	Paved areas and swales	20.00	3.43	16.12	23.92	Yes	3370	28.72	Check	23.92
8a	Cody Drive at Spur Drive (Pinello Elementary) West Bulbout	0.75	6.48	235	5812.0	5779.6	13.794	4.22	740	5779.6	5772.9	0.009	6	Paved areas and swales	20.00	1.90	6.50	10.72	Yes	975	15.42	Check	10.72
8b	Cody Drive at Spur Drive (Pinello Elementary East Bulbout	0.50	8.88	110	5817.1	5811.5	5.019	6.91	1200	5811.5	5772.8	0.032	6	Paved areas and swales	20.00	3.60	5.56	12.47	Yes	1310	17.28	Check	12.47

El Paso County Intersection Improvements
Priority Intersections

Computed: CB Date: 3/3/2025
Checked: EVS Date: 11/25/2024

Design Storm: 10-yr

Basin Description	DIRECT RUNOFF							REMARKS
	AREA DESIGN (name)	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C.A. (AC)	I IN / HR	Q (CFS)	
(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Sunrise ELementary at Grand Valley Drive mid-block crossing SE pinch point	1a	0.567	0.360	12.58	0.20	3.76	**0.77**	
Sunrise Elementary at Grand Valley Drive mid-block crossing NE pinch point	1b	0.010	0.900	5.00	0.01	5.69	**0.05**	
Sunrise Elementary at Grand Valley Drive mid-block crossing NW pinch point	1c	0.016	0.900	5.00	0.01	5.69	**0.08**	
Sunrise Elementary at Grand Valley Drive mid-block crossing SW pinch point	1d	2.121	0.750	7.96	1.59	4.78	**7.61**	
King Elem. at Defoe Ave mid-block crossing NW curb	2a	0.777	0.300	10.81	0.23	4.03	**0.94**	Basin 2a = 2a+2b = 12.21 cfs
King Elem. at Defoe Ave mid-block crossing NE curb	2b	9.572	0.360	16.81	3.45	3.27	**11.27**	
King Elem. at Defoe Ave mid-block crossing SE curb	2c	1.038	0.360	13.94	0.37	3.55	**1.33**	
King Elem. at Defoe Ave mid-block crossing SW curb	2d	0.436	0.360	8.23	0.16	4.70	**0.74**	Basin 2d = 2d+2c = 2.06 cfs
King Elem. at Defoe Ave mid-block crossing parking entrance, E curb	2e	0.299	0.900	5.00	0.27	5.69	**1.53**	Basin 2e = 2e+2g+2a+2b = 14.18 cfs
King Elem. at Defoe Ave mid-block crossing parking entrance W curb	2f	0.365	0.300	12.52	0.11	3.77	**0.41**	Basin 2f = 2f+2e+2g+2a+2b = 14.59 cfs
King Elem. at Defoe Ave mid-block crossing parking exit W curb	2g	0.085	0.900	5.00	0.08	5.69	**0.43**	Basin 2g = 2g+2a+2b = 12.65 cfs
Jersey Lane at Bickley Street (Webster Elem.) NE corner, WB	3a	2.215	0.360	15.92	0.80	3.32	**2.65**	
Jersey Lane at Bickley Street (Webster Elem.) S curb	3b	0.355	0.360	7.19	0.13	5.02	**0.64**	
Jersey Lane at Bickley Street (Webster Elem.) NW corner	3c	2.363	0.360	17.26	0.85	3.24	**2.76**	Basin 3c = 3c+3a+3d = 14.17 cfs
Jersey Lane at Bickley Street (Webster Elem.) NE corner, NB	3d	7.441	0.360	16.86	2.68	3.27	**8.75**	
Widefield Elementary at Widefield Drive mid-block crossing SB	4a	0.575	0.360	12.02	0.21	3.85	**0.80**	
Widefield Elementary at Widefield Drive mid-block crossing NB	4b	1.417	0.750	8.12	1.06	4.73	**5.03**	
Hallam Ave at Leta Drive (Dist. 3 North Pre-School) S corner	7a	0.199	0.750	5.00	0.15	5.69	**0.85**	
Hallam Ave at Leta Drive (Dist. 3 North Pre-School) N Bulbout	7b	62.978	0.360	23.92	22.67	2.84	**64.28**	
Cody Drive at Spur Drive (Pinello Elementary) West Bulbout	8a	6.475	0.750	10.72	4.86	4.04	**19.64**	
Cody Drive at Spur Drive (Pinello Elementary East Bulbout	8b	8.876	0.500	12.47	4.44	3.77	**16.76**	

El Paso County Intersection Improvements
Priority Intersections

Computed: CB Date: 3/3/2025
Checked: EVS Date: 11/25/2024

Design Storm: 100-yr

Basin Description	DIRECT RUNOFF							REMARKS
	Basin ID	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C.A. (AC)	I IN / HR	Q (CFS)	
(1)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Sunrise ELementary at Grand Valley Drive mid-block crossing SE pinch point	1a	0.567	0.500	12.58	0.28	6.43	**1.82**	
Sunrise Elementary at Grand Valley Drive mid-block crossing NE pinch point	1b	0.010	0.950	5.00	0.01	9.72	**0.10**	
Sunrise Elementary at Grand Valley Drive mid-block crossing NW pinch point	1c	0.016	0.950	5.00	0.02	9.72	**0.15**	
Sunrise Elementary at Grand Valley Drive mid-block crossing SW pinch point	1d	2.121	0.800	7.96	1.70	8.18	**13.88**	
King Elem. at Defoe Ave mid-block crossing NW curb	2a	0.777	0.550	10.81	0.43	6.90	**2.95**	Basin 2a = 2a+2b = 29.70 cfs
King Elem. at Defoe Ave mid-block crossing NE curb	2b	9.572	0.500	16.81	4.79	5.59	**26.75**	
King Elem. at Defoe Ave mid-block crossing SE curb	2c	1.038	0.500	13.94	0.52	6.07	**3.15**	
King Elem. at Defoe Ave mid-block crossing SW curb	2d	0.436	0.500	8.23	0.22	8.04	**1.75**	Basin 2d = 2d+2c = 4.90 cfs
King Elem. at Defoe Ave mid-block crossing parking entrance, E curb	2e	0.299	0.950	5.00	0.28	9.72	**2.76**	Basin 2e = 2e+2g+2a+2b = 33.24 cfs
King Elem. at Defoe Ave mid-block crossing parking entrance W curb	2f	0.365	0.550	12.52	0.20	6.44	**1.29**	Basin 2f = 2f+2e+2g+2a+2b = 34.54 cfs
King Elem. at Defoe Ave mid-block crossing parking exit W curb	2g	0.085	0.950	5.00	0.08	9.72	**0.78**	Basin 2g = 2g+2a+2b = 30.48 cfs
Jersey Lane at Bickley Street (Webster Elem.) NE corner, WB	3a	2.215	0.500	15.92	1.11	5.68	**6.29**	
Jersey Lane at Bickley Street (Webster Elem.) S curb	3b	0.355	0.500	7.19	0.18	8.58	**1.52**	
Jersey Lane at Bickley Street (Webster Elem.) NW corner	3c	2.363	0.500	17.26	1.18	5.54	**6.55**	Basin 3c = 3c+3a+3d = 33.61 cfs
Jersey Lane at Bickley Street (Webster Elem.) NE corner, NB	3d	7.441	0.500	16.86	3.72	5.58	**20.77**	
Widefield Elementary at Widefield Drive mid-block crossing SB	4a	0.575	0.500	12.02	0.29	6.57	**1.89**	
Widefield Elementary at Widefield Drive mid-block crossing NB	4b	1.417	0.800	8.12	1.13	8.10	**9.18**	
Hallam Ave at Leta Drive (Dist. 3 North Pre-School) S corner	7a	0.199	0.800	5.00	0.16	9.72	**1.54**	
Hallam Ave at Leta Drive (Dist. 3 North Pre-School) N Bulbout	7b	62.978	0.500	23.92	31.49	4.84	**152.39**	
Cody Drive at Spur Drive (Pinello Elementary) West Bulbout	8a	6.475	0.800	10.72	5.18	6.93	**35.87**	
Cody Drive at Spur Drive (Pinello Elementary East Bulbout	8b	8.876	0.675	12.47	5.99	6.46	**38.71**	

Appendix E: Hydraulic Results

Project: El Paso County Intersections
Calculations by: Will Simmons
Date: 11/20/2024
Flow Master Results - Proposed Minor Storm, EPC Intersections
Design Event: Minor, 10-year storm
Solve For: Spread
Manning Coefficient: 0.016

Design assumptions:
Gutter Width: 1.2 feet
Guttter Cross Slope: 0.083 ft/ft
Curb Height: 6 inches

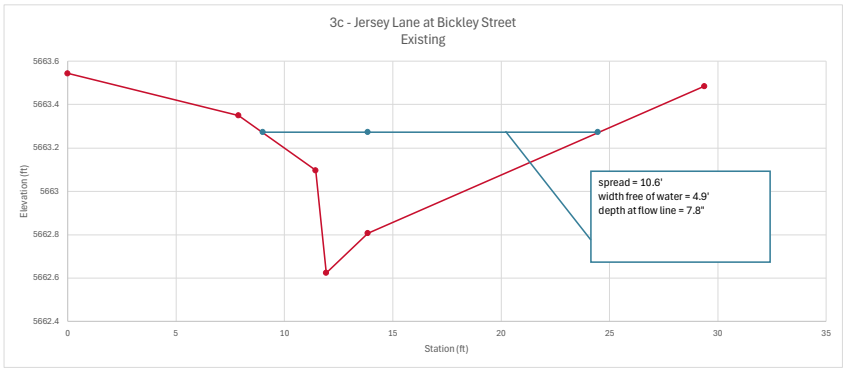
Basin ID	Description	Road Long. Slope	Discharge (cfs)	Road Cross Slope (ft/ft)	Depth Above Curb (in)	Depth (in)	Spread (ft)	Total Lane Width (ft)	Lane Free of Water Width (ft)	Street Type	Meets Criteria per Street Type
8b	Colby Drive and Spur Driver	0.01	16.8	0.04	1.0	7.0	13.4	13	-0.4	Residential/Local	FAIL
8a	Colby Drive and Spur Driver	0.01	19.6	0.04	1.4	7.4	14.2	13	-1.2	Residential/Local	FAIL
7b	Hallam Ave at Leta Drive (Dist. 3 North Pre-School)	0.01	64.3	0.03	4.3	10.3	26.6	12	-14.6	Residential/Local	FAIL
7a	Hallam Ave at Leta Drive (Dist. 3 North Pre-School)	0.01	0.9	0.03	-3.5	2.5	4.9	12	7.1	Residential/Local	YES
4b	Widefield Elementary at Widefield Drive mid-block crossing	0.01	5.0	0.03	-1.6	4.4	10.1	13	2.9	Residential/Local	YES
4a	Widefield Elementary at Widefield Drive mid-block crossing	0.01	0.8	0.03	-3.5	2.5	4.7	13	8.3	Residential/Local	YES
3d	Jersey Lane at Bickley Street (Webster Elem.)	0.01	8.8	0.02	-1.2	4.8	16.0	12	-4	Residential/Local	YES
3c	Jersey Lane at Bickley Street (Webster Elem.)	0.01	14.2	0.01	-1.4	4.6	29.8	12	-17.8	Collector or Minor Arterial	FAIL
3b	Jersey Lane at Bickley Street (Webster Elem.)	0.005	0.6	0.01	-3.8	2.2	9.8	18	8.2	Collector or Minor Arterial	YES
3a	Jersey Lane at Bickley Street (Webster Elem.)	0.02	2.7	0.01	-3.3	2.7	13.4	18	4.6	Collector or Minor Arterial	YES
2a	King Elem. at Defoe Ave mid-block crossing	0.02	12.2	0.02	-1.3	4.7	16.0	20	4	Residential/Local	YES
2b	King Elem. at Defoe Ave mid-block crossing	0.02	11.3	0.03	-0.9	5.1	12.0	20	8	Residential/Local	YES
2c	King Elem. at Defoe Ave mid-block crossing	0.02	1.3	0.06	-3.2	2.8	3.4	11	7.6	Residential/Local	YES
2d	King Elem. at Defoe Ave mid-block crossing	0.02	2.1	0.03	-3.0	3.0	6.1	12	5.9	Residential/Local	YES
2e	King Elem. at Defoe Ave mid-block crossing	0.03	14.2	0.02	-1.3	4.7	15.6	16	0.4	Residential/Local	YES
2f	King Elem. at Defoe Ave mid-block crossing	0.04	14.6	0.02	-1.5	4.5	15.0	16	1	Residential/Local	YES
2g	Widefield Elementary at Widefield Drive mid-block crossing	0.04	12.7	0.05	-0.7	5.3	8.0	18	10	Residential/Local	YES
1d	Sunrise Elementary at Grand Valley Drive mid-block crossing	0.06	7.6	0.01	-0.9	5.1	17.4	19	1.6	Residential/Local	YES
1c	Sunrise Elementary at Grand Valley Drive mid-block crossing	0.01	0.1	0.02	-4.9	1.1	1.2	14	12.8	Residential/Local	YES
1b	Sunrise Elementary at Grand Valley Drive mid-block crossing	0.01	0.1	0.01	-5.0	1.0	1.0	14	13	Residential/Local	YES
1a	Sunrise Elementary at Grand Valley Drive mid-block crossing	0.005	0.8	0.02	-3.4	2.6	6.9	14	7.1	Residential/Local	YES

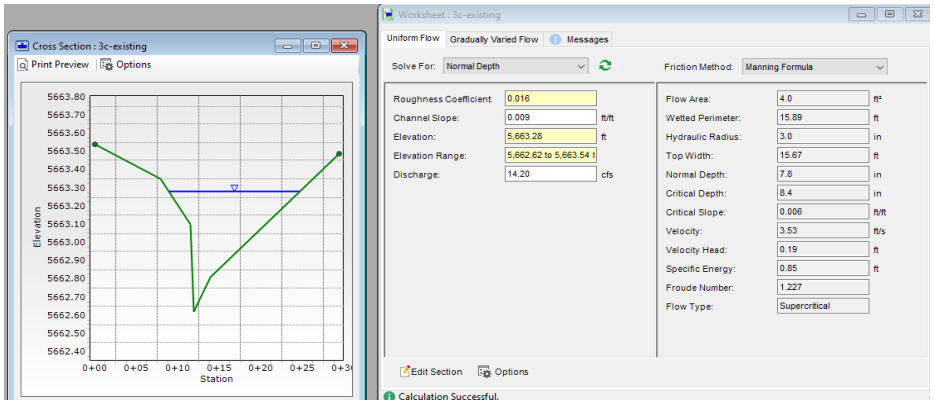
Project: El Paso County Intersections
Calculations by: Will Simmons
Date: 11/20/2024
Flow Master Results - Proposed Major Storm, EPC Intersections
Design Event: Major, 100-year storm
Solve For: Spread
Manning Coefficient: 0.016

Design assumptions:
Gutter Width: 1.2 feet
Guttter Cross Slope: 0.083 ft/ft
Curb Height: 6 inches

Checked: EVS 11/25/2024

Basin ID	Description	Road Long. Slope (ft/ft)	Discharge (cfs)	Road Cross Slope (ft/ft)	Depth Above Curb (in)	Depth (in)	Spread (ft)	Total Lane Width (ft)	Lane Free of Water Width (ft)	Street Type	Meets Criteria per Street Type
8b	Colby Drive and Spur Driver	0.01	38.7	0.04	3.4	9.4	18.3	13	-5.3	Residential/Local	YES
8a	Colby Drive and Spur Driver	0.01	35.9	0.04	3.2	9.2	17.8	13	-4.8	Residential/Local	YES
7b	Hallam Ave at Leta Drive (Dist. 3 North Pre-School)	0.01	152.4	0.03	8.0	14.0	36.8	12	-24.8	Residential/Local	FAIL
7a	Hallam Ave at Leta Drive (Dist. 3 North Pre-School)	0.01	1.5	0.03	-3.0	3.0	6.3	12	5.7	Residential/Local	YES
4b	Widefield Elementary at Widefield Drive mid-block crossing	0.01	9.2	0.03	-0.7	5.3	12.7	13	0.3	Residential/Local	YES
4a	Widefield Elementary at Widefield Drive mid-block crossing	0.01	1.9	0.03	-2.8	3.2	6.8	13	6.2	Residential/Local	YES
3d	Jersey Lane at Bickley Street (Webster Elem.)	0.01	20.8	0.02	0.3	6.3	22.3	12	-10.3	Residential/Local	YES
3c	Jersey Lane at Bickley Street (Webster Elem.)	0.01	33.6	0.01	0.0	6.0	41.4	12	-29.4	Collector or Minor Arterial	YES
3b	Jersey Lane at Bickley Street (Webster Elem.)	0.005	1.5	0.01	-3.2	2.8	14.2	18	3.8	Collector or Minor Arterial	YES
3a	Jersey Lane at Bickley Street (Webster Elem.)	0.02	6.3	0.01	-2.7	3.3	19	18	-1	Collector or Minor Arterial	YES
2g	Widefield Elementary at Widefield Drive mid-block crossing	0.04	30.5	0.05	1.2	7.2	11.2	18	6.8	Residential/Local	YES
2f	King Elem. at Defoe Ave mid-block crossing	0.04	34.5	0.02	-0.1	5.9	20.8	16	-4.8	Residential/Local	YES
2e	King Elem. at Defoe Ave mid-block crossing	0.03	33.2	0.02	0.1	6.1	21.7	16	-5.7	Residential/Local	YES
2d	King Elem. at Defoe Ave mid-block crossing	0.02	4.9	0.03	-2.1	3.9	8.7	12	3.3	Residential/Local	YES
2c	King Elem. at Defoe Ave mid-block crossing	0.02	3.2	0.06	-2.2	3.8	4.8	11	6.2	Residential/Local	YES
2b	King Elem. at Defoe Ave mid-block crossing	0.02	26.8	0.03	0.8	6.8	16.7	20	3.3	Residential/Local	YES
2a	King Elem. at Defoe Ave mid-block crossing	0.02	29.7	0.02	0.3	6.3	22.4	20	-2.4	Residential/Local	YES
1d	Sunrise Elementary at Grand Valley Drive mid-block crossing	0.06	13.9	0.01	0.2	6.2	21.9	19	-2.9	Residential/Local	YES
1c	Sunrise Elementary at Grand Valley Drive mid-block crossing	0.01	0.2	0.02	-4.6	1.4	3.1	14	10.9	Residential/Local	YES
1b	Sunrise Elementary at Grand Valley Drive mid-block crossing	0.01	0.1	0.01	-4.8	1.2	1.4	14	12.6	Residential/Local	YES
1a	Sunrise Elementary at Grand Valley Drive mid-block crossing	0.005	1.8	0.02	-3.9	2.1	8.9	14	5.1	Residential/Local	YES


3c - Jersey Lane at Bickley Street
Existing
Elevation (ft)
Station (ft)
spread = 10.6'
width free of water = 4.9'
depth at flow line = 7.8"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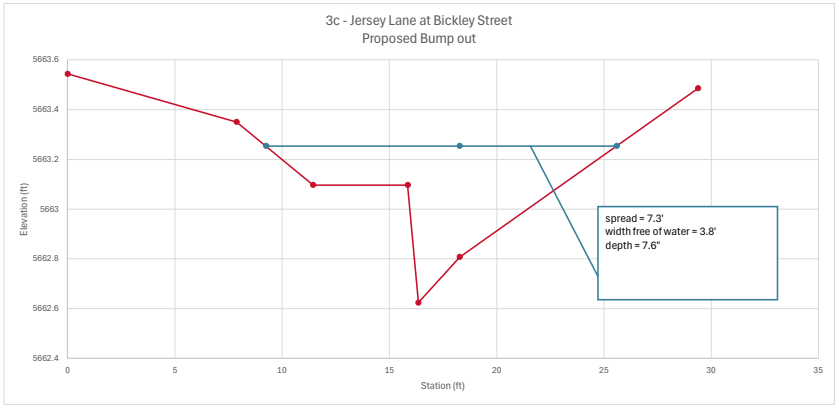
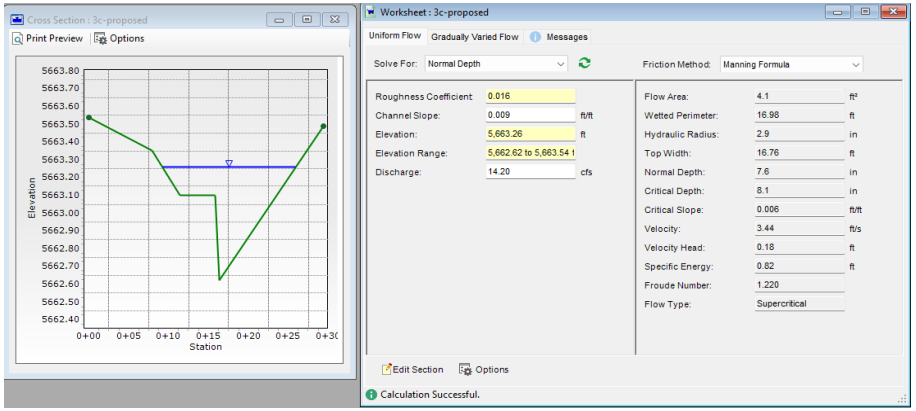
Options
Elevation
Station
Worksheet : 3c-existing
Uniform Flow
Gradually Varied Flow
Messages
Solve For: Normal Depth
Friction Method: Manning Formula
Roughness Coefficient 0.016
Channel Slope: 0.009 ft/ft
Elevation: 5,663.28 ft
Elevation Range: 5,662.62 to 5,663.54 f
Discharge: 14.20 cfs
Flow Area: 4.0 ft²
Wetted Perimeter: 15.89 ft
Hydraulic Radius: 3.0 in
Top Width: 15.67 ft
Normal Depth: 7.8 in
Critical Depth: 8.4 in
Critical Slope: 0.006 ft/ft
Velocity: 3.53 ft/s
Velocity Head: 0.19 ft
Specific Energy: 0.85 ft
Froude Number: 1.227
Flow Type: Supercritical
Edit Section
Options
Calculation Successful.


3c - Jersey Lane at Bickley Street
Proposed Bump out
Elevation (ft)
Station (ft)
spread = 7.3'
width free of water = 3.8'
depth = 7.6"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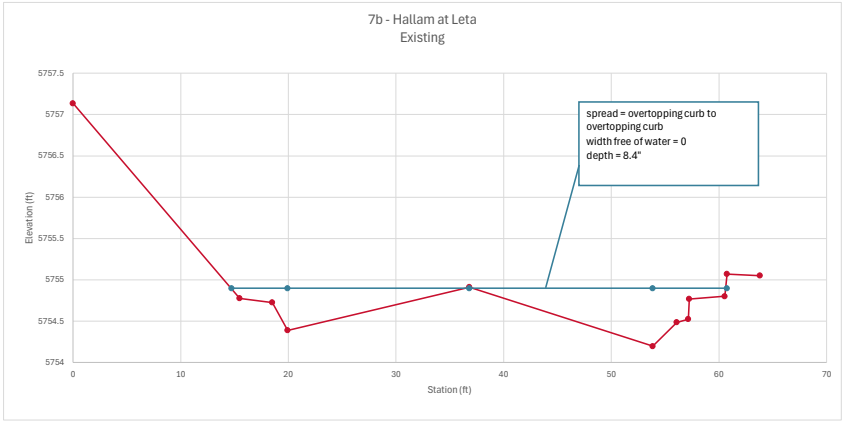
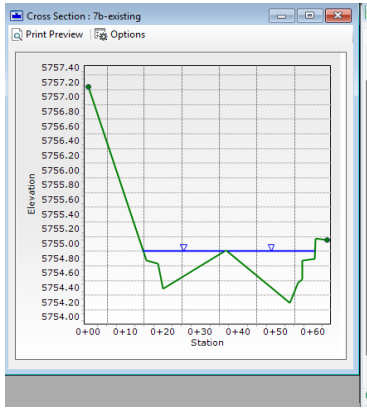
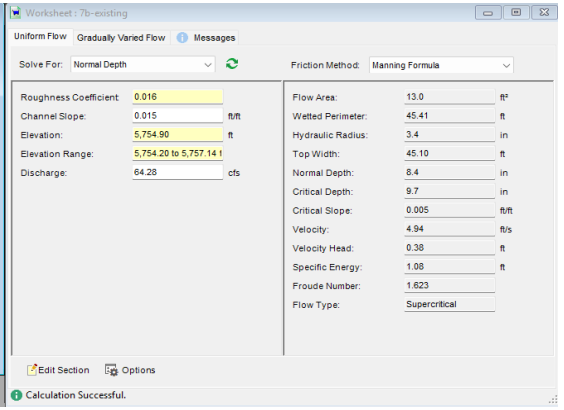
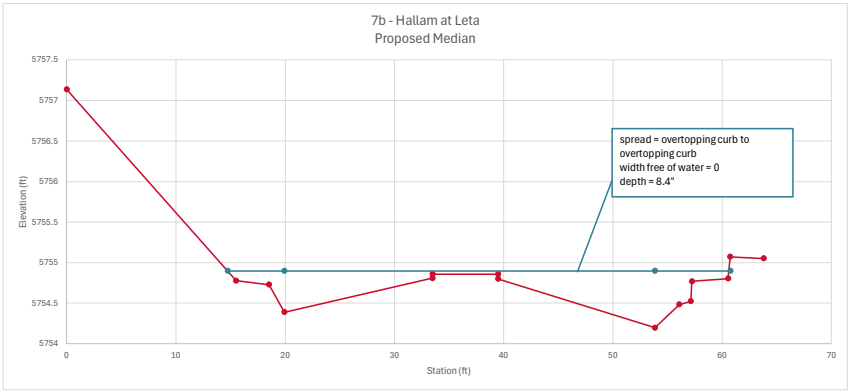
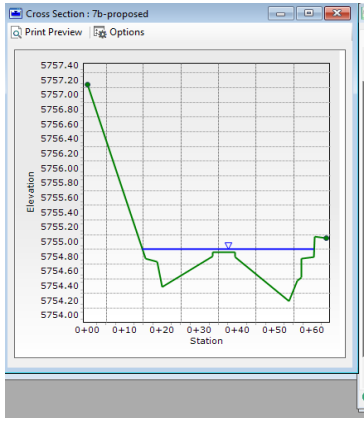
Elevation
Station
Worksheet : 3c-proposed
Uniform Flow
Gradually Varied Flow
Messages
Solve For: Normal Depth
Friction Method: Manning Formula
Roughness Coefficient 0.016
Channel Slope: 0.009 ft/ft
Elevation: 5,663.26 ft
Elevation Range: 5,662.62 to 5,663.54 f
Discharge: 14.20 cfs
Flow Area: 4.1 ft²
Wetted Perimeter: 16.98 ft
Hydraulic Radius: 2.9 in
Top Width: 16.76 ft
Normal Depth: 7.6 in
Critical Depth: 8.1 in
Critical Slope: 0.006 ft/ft
Velocity: 3.44 ft/s
Velocity Head: 0.18 ft
Specific Energy: 0.82 ft
Froude Number: 1.220
Flow Type: Supercritical
Edit Section
Options
Calculation Successful.

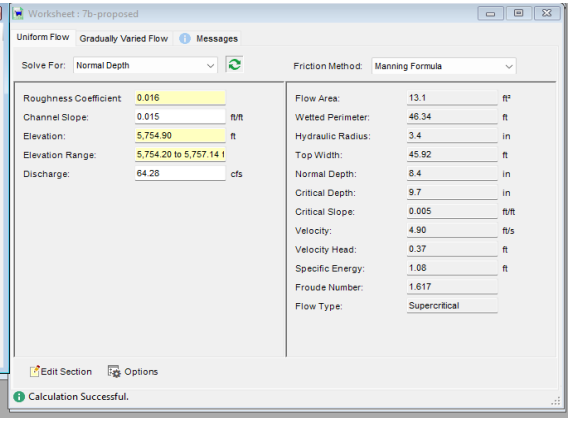

7b - Hallam at Leta
Existing
spread = overtopping curb to overtopping curb
width free of water = 0
depth = 8.4"
Elevation (ft)
Station (ft)

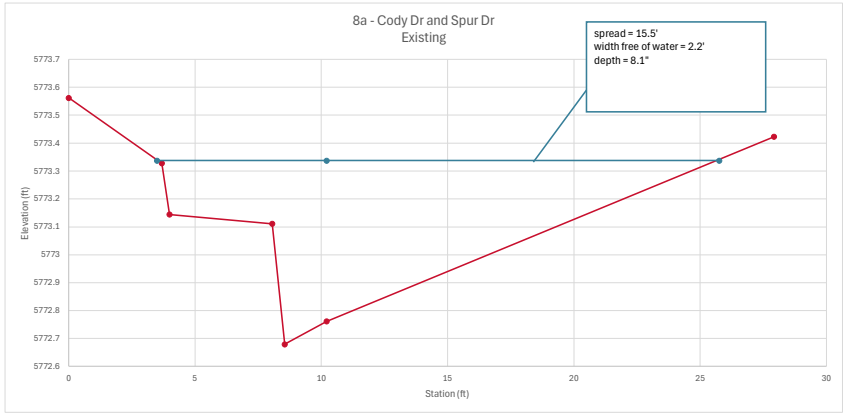

Cross Section : 7b-existing
Print Preview
Options
Elevation
Station

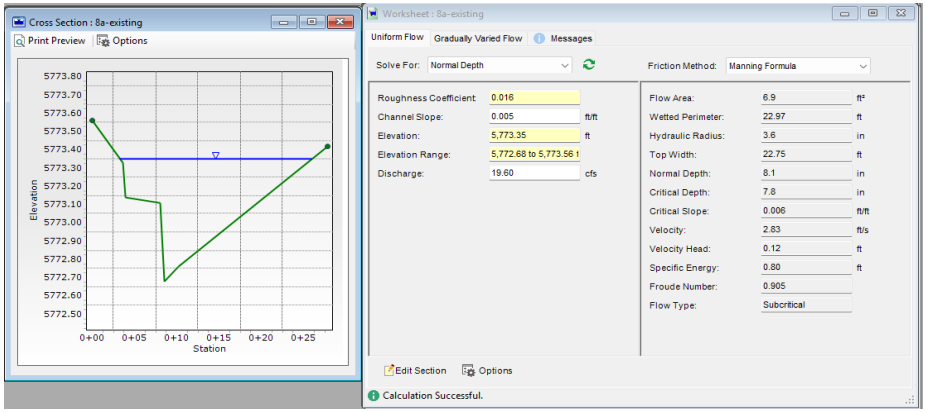

Worksheet : 7b-existing
Uniform Flow
Gradually Varied Flow
Messages
Solve For: Normal Depth
Friction Method: Manning Formula
Roughness Coefficient 0.016
Channel Slope: 0.015 ft/ft
Elevation: 5,754.90 ft
Elevation Range: 5,754.20 to 5,757.14 f
Discharge: 64.28 cfs
Flow Area: 13.0 ft²
Wetted Perimeter: 45.41 ft
Hydraulic Radius: 3.4 in
Top Width: 45.10 ft
Normal Depth: 8.4 in
Critical Depth: 9.7 in
Critical Slope: 0.005 ft/ft
Velocity: 4.94 ft/s
Velocity Head: 0.38 ft
Specific Energy: 1.08 ft
Froude Number: 1.623
Flow Type: Supercritical
Edit Section
Options
Calculation Successful.

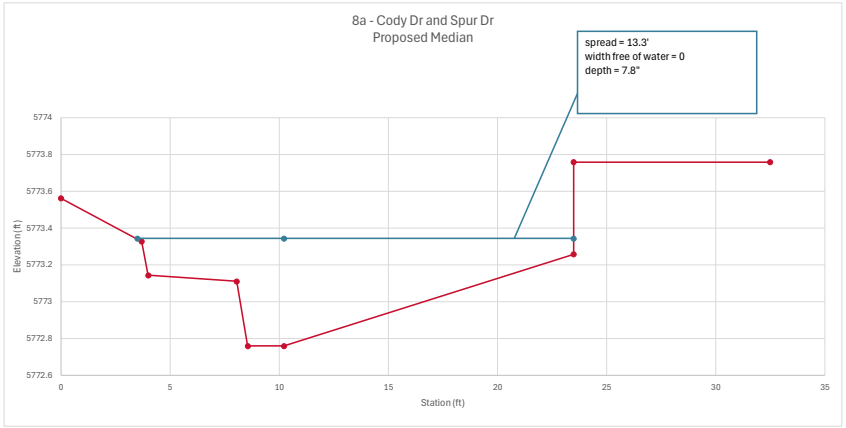

7b - Hallam at Leta
Proposed Median
spread = overtopping curb to overtopping curb
width free of water = 0
depth = 8.4"
Elevation (ft)
Station (ft)

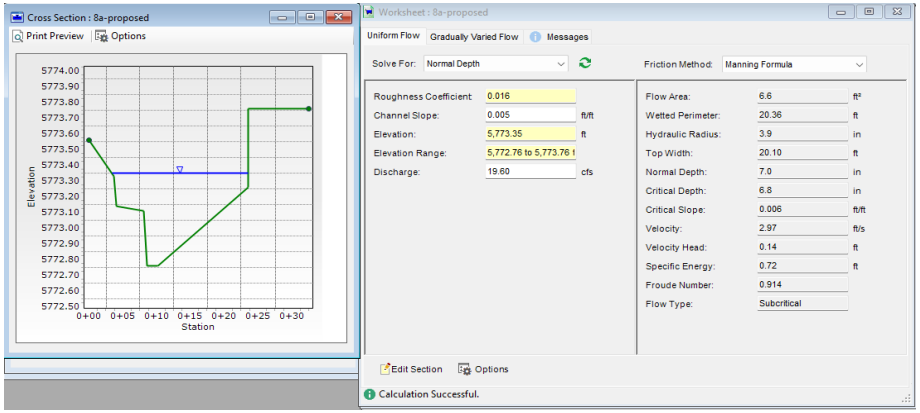

Cross Section : 7b-proposed
Print Preview
Options
Elevation
Station

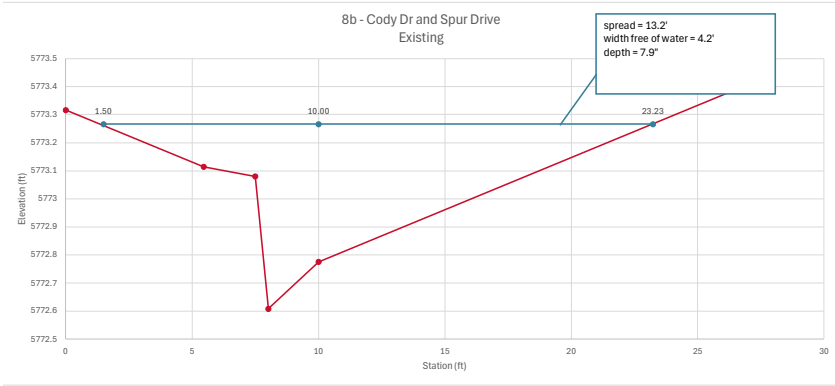

Worksheet : 7b-proposed
Uniform Flow
Gradually Varied Flow
Messages
Solve For: Normal Depth
Friction Method: Manning Formula
Roughness Coefficient 0.016
Channel Slope: 0.015 ft/ft
Elevation: 5,754.90 ft
Elevation Range: 5,754.20 to 5,757.14 f
Discharge: 64.28 cfs
Flow Area: 13.1 ft²
Wetted Perimeter: 46.34 ft
Hydraulic Radius: 3.4 in
Top Width: 45.92 ft
Normal Depth: 8.4 in
Critical Depth: 9.7 in
Critical Slope: 0.005 ft/ft
Velocity: 4.90 ft/s
Velocity Head: 0.37 ft
Specific Energy: 1.08 ft
Froude Number: 1.617
Flow Type: Supercritical
Edit Section
Options
Calculation Successful.

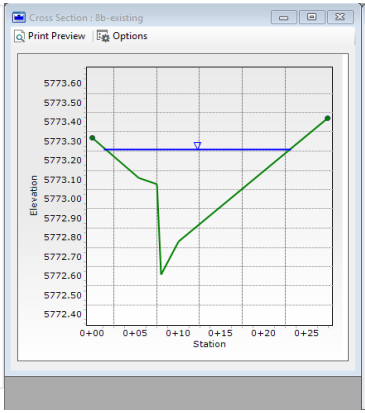

8a - Cody Dr and Spur Dr
Existing
spread = 15.5'
width free of water = 2.2'
depth = 8.1"
Elevation (ft)
Station (ft)

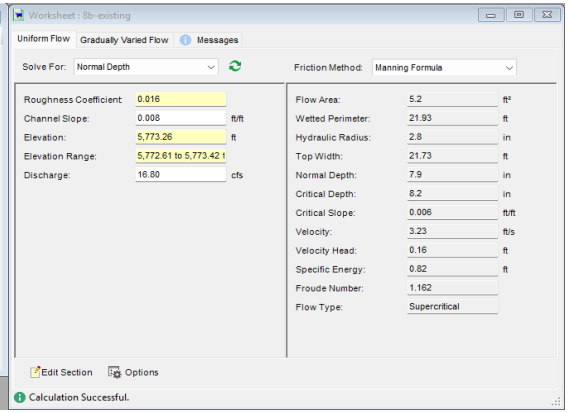

Cross Section : 8a-existing
Print Preview
Options
Elevation
Station
Worksheet : 8a-existing
Uniform Flow
Gradually Varied Flow
Messages
Solve For: Normal Depth
Friction Method: Manning Formula
Roughness Coefficient 0.016
Channel Slope: 0.005 ft/ft
Elevation: 5,773.35 ft
Elevation Range: 5,772.68 to 5,773.56 f
Discharge: 19.60 cfs
Flow Area: 6.9 ft²
Wetted Perimeter: 22.97 ft
Hydraulic Radius: 3.6 in
Top Width: 22.75 ft
Normal Depth: 8.1 in
Critical Depth: 7.8 in
Critical Slope: 0.006 ft/ft
Velocity: 2.83 ft/s
Velocity Head: 0.12 ft
Specific Energy: 0.80 ft
Froude Number: 0.905
Flow Type: Subcritical
Edit Section
Options
Calculation Successful.

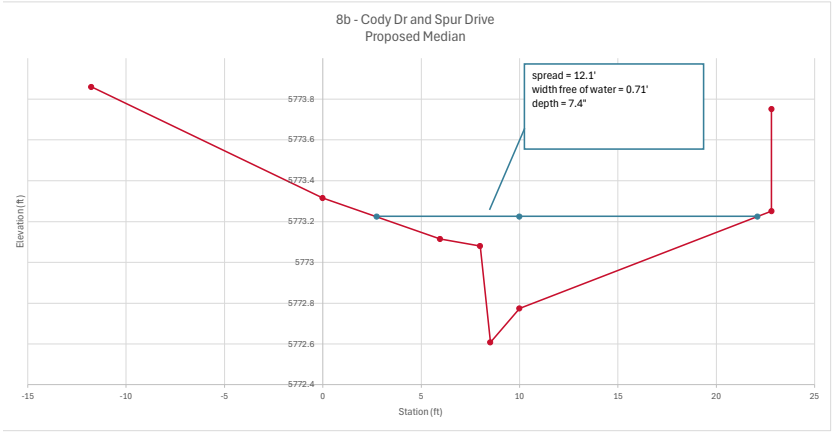

8a - Cody Dr and Spur Dr
Proposed Median
spread = 13.3'
width free of water = 0
depth = 7.8"
Elevation (ft)
Station (ft)

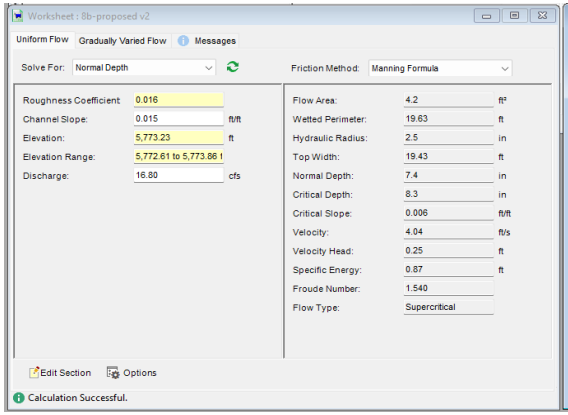

Cross Section : 8a-proposed
Print Preview
Options
Elevation
Station
Worksheet : 8a-proposed
Uniform Flow
Gradually Varied Flow
Messages
Solve For: Normal Depth
Friction Method: Manning Formula
Roughness Coefficient 0.016
Channel Slope: 0.005 ft/ft
Elevation: 5,773.35 ft
Elevation Range: 5,772.76 to 5,773.76 f
Discharge: 19.60 cfs
Flow Area: 6.6 ft²
Wetted Perimeter: 20.36 ft
Hydraulic Radius: 3.9 in
Top Width: 20.10 ft
Normal Depth: 7.0 in
Critical Depth: 6.8 in
Critical Slope: 0.006 ft/ft
Velocity: 2.97 ft/s
Velocity Head: 0.14 ft
Specific Energy: 0.72 ft
Froude Number: 0.914
Flow Type: Subcritical
Edit Section
Options
Calculation Successful.

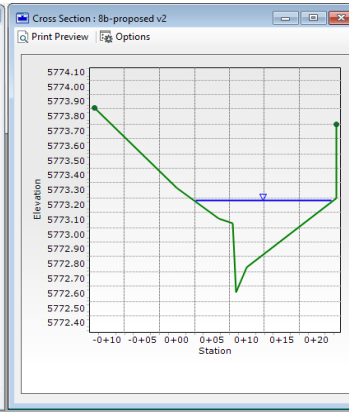

8b - Cody Dr and Spur Drive
Existing
spread = 13.2'
width free of water = 4.2'
depth = 7.9"
1.50
10.00
23.23
Elevation (ft)
Station (ft)

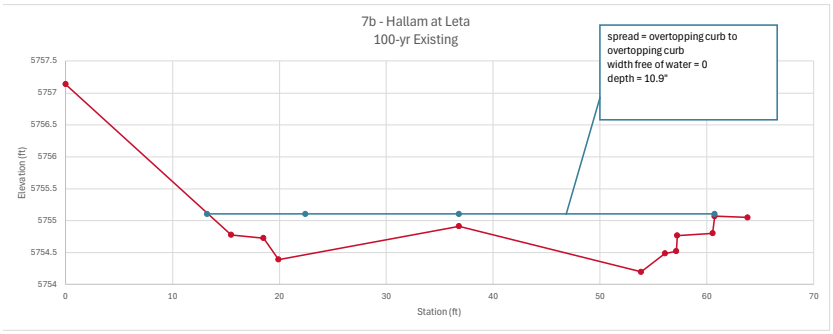

Cross Section : 8b-existing
Print Preview
Options
Elevation
Station

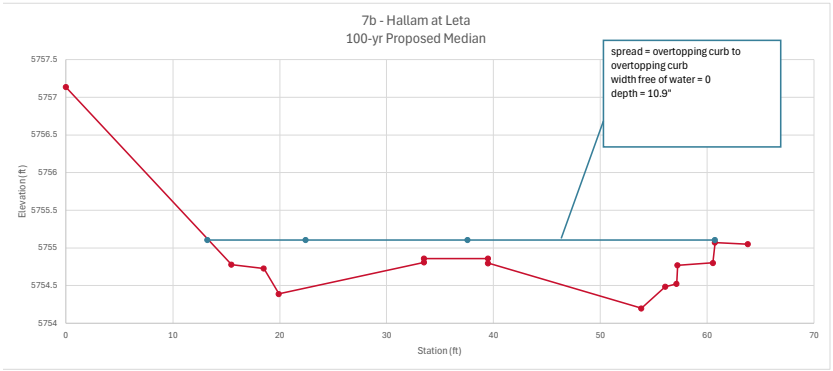

Worksheet : 8b-existing
Uniform Flow
Gradually Varied Flow
Messages
Solve For: Normal Depth
Friction Method: Manning Formula
Roughness Coefficient: 0.016
Channel Slope: 0.008 ft/ft
Elevation: 5,773.26 ft
Elevation Range: 5,772.61 to 5,773.42 f
Discharge: 16.80 cfs
Flow Area: 5.2 ft²
Wetted Perimeter: 21.93 ft
Hydraulic Radius: 2.8 in
Top Width: 21.73 ft
Normal Depth: 7.9 in
Critical Depth: 8.2 in
Critical Slope: 0.006 ft/ft
Velocity: 3.23 ft/s
Velocity Head: 0.16 ft
Specific Energy: 0.82 ft
Froude Number: 1.162
Flow Type: Supercritical
Edit Section
Options
Calculation Successful.

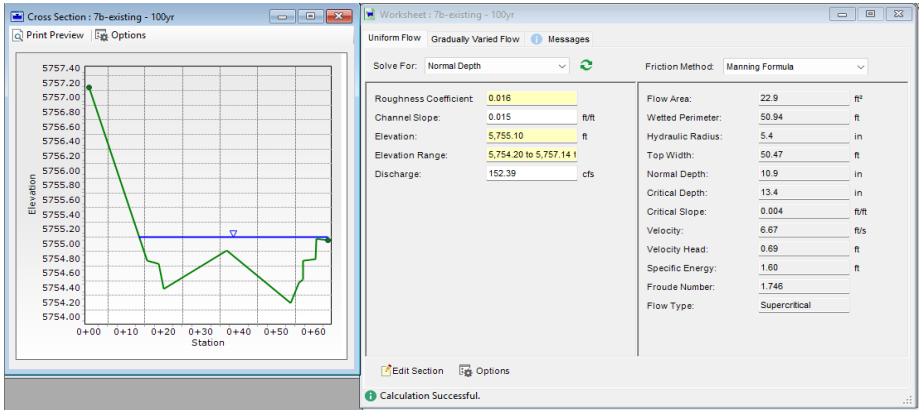

8b - Cody Dr and Spur Drive
Proposed Median
spread = 12.1'
width free of water = 0.71'
depth = 7.4"
Elevation (ft)
Station (ft)

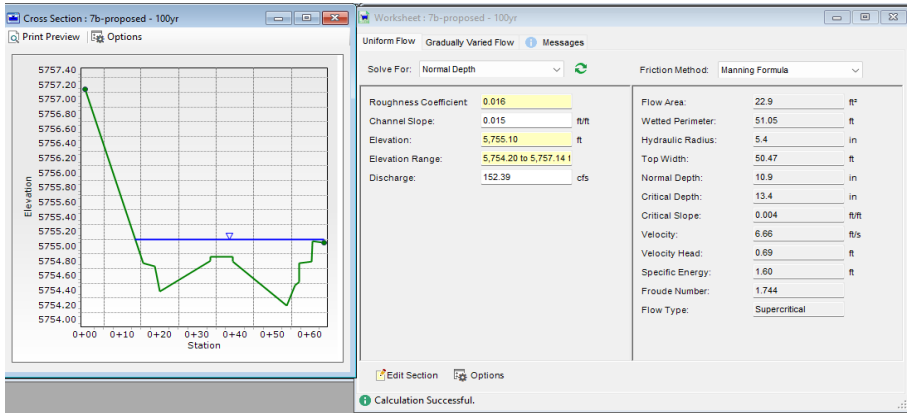

Worksheet : 8b-proposed v2
Uniform Flow
Gradually Varied Flow
Messages
Solve For: Normal Depth
Friction Method: Manning Formula
Roughness Coefficient: 0.016
Channel Slope: 0.015 ft/ft
Elevation: 5,773.23 ft
Elevation Range: 5,772.61 to 5,773.86 f
Discharge: 16.80 cfs
Flow Area: 4.2 ft²
Wetted Perimeter: 19.63 ft
Hydraulic Radius: 2.5 in
Top Width: 19.43 ft
Normal Depth: 7.4 in
Critical Depth: 8.3 in
Critical Slope: 0.006 ft/ft
Velocity: 4.04 ft/s
Velocity Head: 0.25 ft
Specific Energy: 0.87 ft
Froude Number: 1.540
Flow Type: Supercritical
Edit Section
Options
Calculation Successful.


Cross Section : 8b-proposed v2
Print Preview
Options
Elevation
Station


7b - Hallam at Leta
100-yr Existing
spread = overtopping curb to overtopping curb
width free of water = 0
depth = 10.9"
Elevation (ft)
Station (ft)


7b - Hallam at Leta
100-yr Proposed Median
spread = overtopping curb to overtopping curb
width free of water = 0
depth = 10.9"
Elevation (ft)
Station (ft)


Cross Section : 7b-existing - 100yr
Print Preview
Options
Elevation
Station
Worksheet : 7b-existing - 100yr
Uniform Flow
Gradually Varied Flow
Messages
Solve For: Normal Depth
Friction Method: Manning Formula
Roughness Coefficient: 0.016
Channel Slope: 0.015 ft/ft
Elevation: 5,755.10 ft
Elevation Range: 5,754.20 to 5,757.14 ft
Discharge: 152.39 cfs
Flow Area: 22.9 ft²
Wetted Perimeter: 50.94 ft
Hydraulic Radius: 5.4 in
Top Width: 50.47 ft
Normal Depth: 10.9 in
Critical Depth: 13.4 in
Critical Slope: 0.004 ft/ft
Velocity: 6.67 ft/s
Velocity Head: 0.69 ft
Specific Energy: 1.60 ft
Froude Number: 1.746
Flow Type: Supercritical
Edit Section
Options
Calculation Successful.


Cross Section : 7b-proposed - 100yr
Print Preview
Options
Elevation
Station
Worksheet : 7b-proposed - 100yr
Uniform Flow
Gradually Varied Flow
Messages
Solve For: Normal Depth
Friction Method: Manning Formula
Roughness Coefficient: 0.016
Channel Slope: 0.015 ft/ft
Elevation: 5,755.10 ft
Elevation Range: 5,754.20 to 5,757.14 ft
Discharge: 152.39 cfs
Flow Area: 22.9 ft²
Wetted Perimeter: 51.05 ft
Hydraulic Radius: 5.4 in
Top Width: 50.47 ft
Normal Depth: 10.9 in
Critical Depth: 13.4 in
Critical Slope: 0.004 ft/ft
Velocity: 6.66 ft/s
Velocity Head: 0.69 ft
Specific Energy: 1.60 ft
Froude Number: 1.744
Flow Type: Supercritical
Edit Section
Options
Calculation Successful.