



FINAL DRAINAGE REPORT FOR NORTHERN DELIVERY SYSTEM BOOSTER PUMP STATION



PREPARED BY

Richard Gallegos, P.E.
RESPEC
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PREPARED FOR

Triview Metropolitan District
16055 Old Forest Point STE 300
Monument, CO 80132

April 2023

Project 224.29

El Paso County PD File No. PPR2262





ENGINEER'S STATEMENT

This report and plan for the drainage design of Northern Delivery System Booster Pump Station, was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan of the drainage basin. I understand that El Paso County does not, and will not, assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Richard Gallegos, P.E.

Registered Professional Engineer State of Colorado No. 36247

Date

05.26.2023



DEVELOPER'S STATEMENT

The Triview Metropolitan District hereby certifies that the drainage facilities for the Northern Delivery System Booster Pump Station shall be constructed according to the design presented in this report. I understand that El Paso County does not, and will not, assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to El Paso County; and cannot, on behalf of the Northern Delivery System Booster Pump Station guarantee that final drainage design review will absolve the Triview Metropolitan District and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

James M. Grady
Authorized Signature
James M. Grady
Printed Name

Date

5-26-23

District Manager
Title

Address:

16055 OLD FOREST POINT
SUITE 302
MONUMENT, CO 80132

EL PASO COUNTY STATEMENT

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

For the County Engineer

Date



TABLE OF CONTENTS

1.0 PURPOSE.....	1
2.0 SOIL CONDITIONS.....	1
3.0 HYDROLOGIC CRITERIA.....	2
4.0 EXISTING DRAINAGE CONDITIONS.....	2
5.0 DEVELOPED DRAINAGE CONDITIONS.....	4
6.0 WATER QUALITY.....	5
7.0 FOUR STEP PROCESS.....	6
8.0 EROSION CONTROL PLAN.....	7
9.0 FLOODPLAIN STATEMENT.....	7
10.0 DRAINAGE BASIN FEES.....	7
10.0 CONSTRUCTION COST OPINION.....	7
11.0 CONCLUSIONS.....	7
12.0 REFERENCES.....	8

APPENDIX

APPENDIX A MAPS

APPENDIX B CALCULATIONS

APPENDIX C DESIGN CHARTS

BACK POCKET





1.0 PURPOSE

This drainage report is for the design of the Northern Delivery System Booster Pump Station. The site is located along Highway 83, Colorado Springs, Colorado in central El Paso County. See Vicinity Map in the Appendix below for reference. It is further described as the Southwest One-Quarter of the Northwest One-Quarter of Section 3, Township 12 South, Range 66 West of the 6th P.M. This 9.75-acre site is located within the Black Squirrel Creek – FOMO3600 basin.

One Drainage Basin Planning Study for Black Squirrel Creek was found within the County's files that included the project site:

- *Black Squirrel Creek Drainage Basin Planning Study Final Report*, City of Colorado Springs and El Paso County, January of 1989

The site is bounded to the west by Highway 83. Work will include the construction of a 1500 square foot (sf) pump station and asphalt driveway. No portion of the site is located within a FEMA designated 100-year floodplain per Map No. 08041C0295G that was effective on December 7th, 2018.

2.0 SOIL CONDITIONS

According to the El Paso County Area Soil Survey, the soil on the site is classified as follows:

SOIL #	SOIL TYPE	HYDROLOGIC CLASSIFICATION	PERCENT OF SITE
41	Kettle Gravelly Loamy Sand, 8 to 40 Percent Slopes	B	10.8%
69	Peyton-Pring Complex, 8 to 15 Percent Slopes	B	0.0%
71	Pring Coarse Sandy Loam, 3 to 8 Percent Slopes	B	89.2%

The Kettle Gravelly soil can be described as having a high permeability, low surface runoff, and slight hazard of erosion. The Pring Coarse Sandy soils is described, similarly, as having high permeability and low surface runoff. The hydrologic soil classification used for this study is 'B'. See Soils Map in the Appendix for reference.



3.0 HYDROLOGIC CRITERIA

The methodology utilized for this report is in accordance with the *El Paso County Drainage Criteria Manual*. All references from the *El Paso County Drainage Criteria Manual* can be found in Appendix C. The Rational Method for computation of runoff was used.

$Q = c ia$ Where
 Q = maximum rate of runoff in cubic feet per second
 c = runoff coefficient representing drainage area characteristics
 i = average rainfall intensity, in inches per hour, for the duration required for the runoff to become established
 a = drainage basin size in acres

The storm recurrence intervals, used to determine swale capacity, for this study were the 10-year storm and the 100-year storm. ManningSolver Version 1.019 was used in this analysis to calculate the Manning's normal depth.

4.0 EXISTING DRAINAGE CONDITIONS

The overall site consists of 9.75 acres. The site includes an existing water storage tank and gravel driveway. The areas of the site not covered by the potable water tank or gravel driveway are covered with scrub oak, grass, willows and pine trees. These undeveloped areas include slopes that range from 4.9% to 34.1%. The overall existing site is 3.5% impervious. See Existing Drainage Map in the Back Pocket for reference.

Flows from Sub-basin OS1, Sub-basin OS2, and Sub-basin Aex through Sub-basin Gex are tributary to the Black Squirrel Creek – FOMO3600 drainage basin.

Sub-basin OS1 contains 3.85 acres and drains southeast towards a stream that is tributary to Black Squirrel Creek. This sub-basin produces existing flows of 3.5 cfs for the 10-year storm and 9.2 cfs for the 100-year storm. These flows sheetflow to the southeast over nearly bare ground.

Sub-basin OS2 consists of 3.69 acres and drains southeast towards a stream that is tributary to Black Squirrel Creek. This sub-basin produces existing flows of 2.8 cfs for the 10-year storm and 8.5 cfs for the 100-year storm. These flows sheetflow to the southeast. Flows from Sub-basin OS2 combine with flows from Sub-basin Eex, Sub-basin Fex, and Sub-basin Gex to produce total flows of 7.5 cfs for the 10-year storm and 20.8 cfs for the 100-year storm at Design Point 1 (DP1). These flows proceed into the stream tributary to Black Squirrel Creek that is located southeast of the site.

Sub-basin Aex contains 3.89 acres and drains south towards a private access road. This sub-basin produces existing flows of 2.4 cfs for the 10-year storm and 7.8 cfs for the 100-year storm. These flows sheetflow to the south.



Sub-basin Bex consists of 2.37 acres and drains south along a private access road. This sub-basin produces existing flows of 2.1 cfs for the 10-year storm and 5.9 cfs for the 100-year storm. These flows sheetflow in the southerly direction.

Sub-basin Cex contains 7.96 acres and drains south towards a private access road. This sub-basin produces existing flows of 5.4 cfs for the 10-year storm and 17.4 cfs for the 100-year storm. These flows sheetflow to the south.

Sub-basin Dex consists of 3.98 acres and drains southeast towards a stream that is tributary to Black Squirrel Creek. It produces flows of 2.7 cfs for the 10-year storm and 9.2 cfs for the 100-year storm. These flows sheetflow to the southeast, ultimately ending up in the stream noted on the Existing Drainage Plan in the Back Pocket. Flows from Sub-basin Dex combine with flows from Sub-basin Cex, Sub-basin OS1, and Design Point 1 (DP1) to produce total flows of 15.8 cfs for the 10-year storm and 46.9 cfs for the 100-year storm at Design Point 2 (DP2). These flows continue along the stream towards Black Squirrel Creek.

Sub-basin Eex contains 2.79 acres and drains east towards Sub-basin OS2. It produces flows of 3.3 cfs for the 10-year storm and 8.3 cfs for the 100-year storm. These flows sheetflow to the east, ultimately ending up in the stream that is tributary to Black Squirrel Creek.

Sub-basin Fex contains 1.15 acres and drains southeast towards Sub-basin OS2. It produces flows of 1.4 cfs for the 10-year storm and 3.4 cfs for the 100-year storm. These flows sheetflow to the southeast, ultimately ending up in the stream that is tributary to Black Squirrel Creek.

Sub-basin Gex consists of 0.96 acres and drains southeast towards Sub-basin OS1. It produces flows of 0.7 cfs for the 10-year storm and 2.5 cfs for the 100-year storm. These flows sheetflow to the southeast into the stream that is tributary to Black Squirrel Creek.

The estimated runoff amounts produced for the project under Existing Conditions are shown in Table 1 below.

TABLE 1 – EXISTING CONDITIONS		
Sub-basin	Q ₁₀ (CFS)	Q ₁₀₀ (CFS)
OS1	3.5	9.2
OS2	2.8	8.5
Aex	2.4	7.8
Bex	2.1	5.9
Cex	5.4	17.4
Dex	2.7	9.2
Eex	3.3	8.3
Fex	1.4	3.4
Gex	0.7	2.5
DP1 (Eex + Fex + Gex + OS2)	7.5	20.8
DP2 (DP1 + Cex + Dex + OS1)	15.8	46.9



5.0 DEVELOPED DRAINAGE CONDITIONS

The overall site consists of 9.75 acres, of which 0.9 acres will be disturbed for permanent improvements as part of this project. A booster pump station building and 15' wide asphalt access road is proposed on the east side of the site. A secondary gate access road is also proposed on the south end of the site along that connects the site to the existing private asphalt driveway. Proposed Conditions Map is located below in the Back Pocket for reference.

Proposed site imperviousness is 5.4%, versus 3.5% in the existing conditions. Proposed flows are tributary to the Black Squirrel Creek – FOMO3600 drainage basin.

Sub-basin OS1 contains 3.85 acres and drains southeast towards a stream that is tributary to Black Squirrel Creek. This sub-basin produces existing flows of 3.5 cfs for the 10-year storm and 9.2 cfs for the 100-year storm. These flows sheetflow to the southeast over nearly bare ground.

Sub-basin OS2 contains 3.68 acres and drains southeast towards a stream that is tributary to Black Squirrel Creek. This sub-basin produces existing flows of 2.8 cfs for the 10-year storm and 8.5 cfs for the 100-year storm. These flows sheetflow to the southeast. Flows from Sub-basin OS2 combine with flows from Sub-basin E, Sub-basin F, and Sub-basin G to produce total flows of 8.2 cfs for the 10-year storm and 22.0 cfs for the 100-year storm at Design Point 1 (DP1). These flows proceed into the stream tributary to Black Squirrel Creek that is located southeast of the site.

Sub-basin A consists of 3.89 acres and drains south towards a private access road. This sub-basin produces existing flows of 2.4 cfs for the 10-year storm and 7.8 cfs for the 100-year storm. These flows sheetflow to the south.

Sub-basin B contains 2.37 acres and drains south along a private access road. This sub-basin produces existing flows of 2.3 cfs for the 10-year storm and 6.1 cfs for the 100-year storm. These flows sheetflow in the southerly direction.

Sub-basin C consists of 7.96 acres and drains south towards a private access road. This sub-basin produces existing flows of 5.4 cfs for the 10-year storm and 17.4 cfs for the 100-year storm. These flows sheetflow to the south over all roads (existing and proposed).

Sub-basin D contains 3.98 acres and drains southeast towards a stream that is tributary to Black Squirrel Creek. It produces flows of 3.1 cfs for the 10-year storm and 9.8 cfs for the 100-year storm. These flows sheetflow to the southeast over the proposed access road, ultimately ending up in the stream noted on the Existing Drainage Plan in the Back Pocket. Flows from Sub-basin D combine with flows from Sub-basin C, Sub-basin OS1, and Design Point 1 (DP1) to produce total flows of 16.8 cfs for the 10-year storm and 48.3 cfs for the 100-year storm at Design Point 2 (DP2). These flows continue along the stream towards Black Squirrel Creek.

Sub-basin E contains 2.83 acres and drains east towards the proposed pump station. It produces flows of 3.8 cfs for the 10-year storm and 9.1 cfs for the 100-year storm. Two 1.25' deep triangular swales



with 4:1 side slopes route these flows around the proposed pump station. These flows sheetflow to the east, ultimately ending up in the stream that is tributary to Black Squirrel Creek.

Sub-basin F consists of 1.15 acres and drains southeast towards Sub-basin OS2. It produces flows of 1.4 cfs for the 10-year storm and 3.4 cfs for the 100-year storm. These flows sheetflow to the southeast, ultimately ending up in the stream that is tributary to Black Squirrel Creek.

Sub-basin G contains 0.96 acres and drains southeast towards Sub-basin OS1. It produces flows of 1.1 cfs for the 10-year storm and 3.0 cfs for the 100-year storm. These flows sheetflow to the southeast over the proposed access road and into the stream that is tributary to Black Squirrel Creek.

The estimated runoff amounts produced for the project under Proposed Conditions are shown in Table 2 below.

TABLE 2 – PROPOSED CONDITIONS		
Sub-basin	Q ₁₀ (CFS)	Q ₁₀₀ (CFS)
OS1	3.5	9.2
OS2	2.8	8.5
A	2.4	7.8
B	2.3	6.1
C	5.4	17.4
D	3.1	9.8
E	3.8	9.1
F	1.4	3.4
G	1.1	3.0
DP1 (E + F + G + OS2)	8.3	22.1
DP2 (DP1 + C + D + OS1)	16.8	48.3

6.0 WATER QUALITY

The total disturbance for this development will be 0.98 acres. Due to the proximity of an environmentally sensitive area located west of the project site and as part of the El Paso County regulations, an Erosion and Stormwater Quality Control Permit (ESQCP) will be prepared and submitted separately from this Final Drainage Report. The site is also less than one-acre of disturbance area, and therefore does not require additional water quality features.



7.0 FOUR STEP PROCESS

El Paso County utilizes a “Four Step Process” for receiving water protection, which focuses on reducing runoff volumes and implementing long-term source controls and is intended to help manage more frequently occurring storm events. A summary of the Four Step Process for this project is as follows.

- Step 1: Reduce runoff by disconnecting impervious area, eliminating “unnecessary impervious area and encouraging infiltration into soils that are suitable. For this project, the following elements will be implemented:
 - Use of gravel parking areas adjacent to the building rather than use of asphalt, allowing additional area of infiltration
 - Runoff from the pump station rooftop will discharge onto landscaped areas and reseeded areas adjacent to the building
 - The proposed asphalt road is sloped to the southeast to encourage sheet flow patterns across the driveway and onto areas with native grasses prior
 - Use of curb and gutter and a crowned section was avoided for the asphalt drive to avoid point discharges
- Step 2: Treat and slowly release the Water Quality Capture Volume
 - The site is less than one-acre in size and does not require formal Water Quality treatment
 - Where possible, sheet flow patterns are maintained to help enhance water quality
- Step 3: Stabilize stream channels
 - There are no major drainageways within the project boundary
 - A tributary to Black Squirrel Creek exists to the east
 - An environmentally sensitive area exists to the east of the site. Proposed improvements have been offset as much as reasonably from the area to provide a buffer, including allowing sheet flow patterns to filter through native grasses.
 - Grass swales will direct flows around the proposed building, allowing for additional infiltration
- Step 4: Implement Source Controls
 - Erosion control measures will be installed during prior to, and during the initial construction activities at the site to provide source control of sediment
 - Landscaping will be placed within the proposed development and permanent seeding of all disturbed areas will be completed per the Grading and Erosion Control Plan requirements
 - No other potential pollutants are anticipated from the site, post construction

The development of this site will have no adverse impacts on downstream properties.



8.0 EROSION CONTROL PLAN

The site construction consists of constructing a new pump station and an asphalt access road, disturbing 0.98 acres of area. This does not require an Erosion and Stormwater Quality Control Permit. However, a Grading and Erosion Control Plan will be submitted in separate Construction Plans.

9.0 FLOODPLAIN STATEMENT

No portion of the developed site is located within a designated FEMA 100-year floodplain according to the information published in the Federal Emergency Management Agency Flood Plain Map No. 08041C0295G dated December 7th, 2018. No portion of the site lies within the Zone 'A' of Black Squirrel Creek as noted on Map No. 08041C0295G.

10.0 DRAINAGE BASIN FEES

The proposed development is located within the Black Squirrel Drainage Basin, which assesses drainage and bridge fees at the time of platting. A plat is not proposed as part of this project, so do drainage or bridge fees are due.

10.0 CONSTRUCTION COST OPINION

Flows will either sheet flow or be directed to outfall points via ditch. No culverts, storm sewers, or other drainage structures are needed for this project, and no Construction Cost Opinion is required for this report.

11.0 CONCLUSIONS

For this 9.75-acre site, work will include constructing a booster pump station and 15' wide asphalt access road. Additionally, a secondary gate access road will be constructed that will allow access from the site from the private driveway south of the property. The total anticipated disturbance of the site will be 0.9 acres. The development increases total routed flows exiting the site at Design Point 2 (DP2) from 15.9 cfs to 16.8 cfs for the 10-year storm, while the 100-year storm flow increases from 46.9 cfs to 48.4 cfs. These increases do not warrant the need for detention. All developed flows will continue to flow along existing drainage patterns.

Disturbed areas shall be permanently stabilized as soon as construction activities are completed. Areas to be re-vegetated shall be treated with soil amendments to provide an adequate growth medium to sustain vegetation and shall match the pre-existing, pre-disturbed vegetation cover. Erosion control



measures will be installed during construction of the proposed site per the approved Grading and Erosion Control Plan to be submitted separately for review and approval. Site runoff, storm drains, and appurtenances associated with the development of the Triview Metropolitan District Northern Delivery System Booster Pump Station will not adversely affect the downstream and surrounding developments.

12.0 REFERENCES

Black Squirrel Creek Drainage Basin Planning Study Final Report, City of Colorado Springs and El Paso County, January of 1989

Flood Insurance Rate Map Number 08041C0295G, Federal Emergency Management Agency Floodplain Data, revised December 7, 2018

Municipal Code Corporation (2018). *Drainage Criteria Manual of El Paso County, Colorado (DPM)*

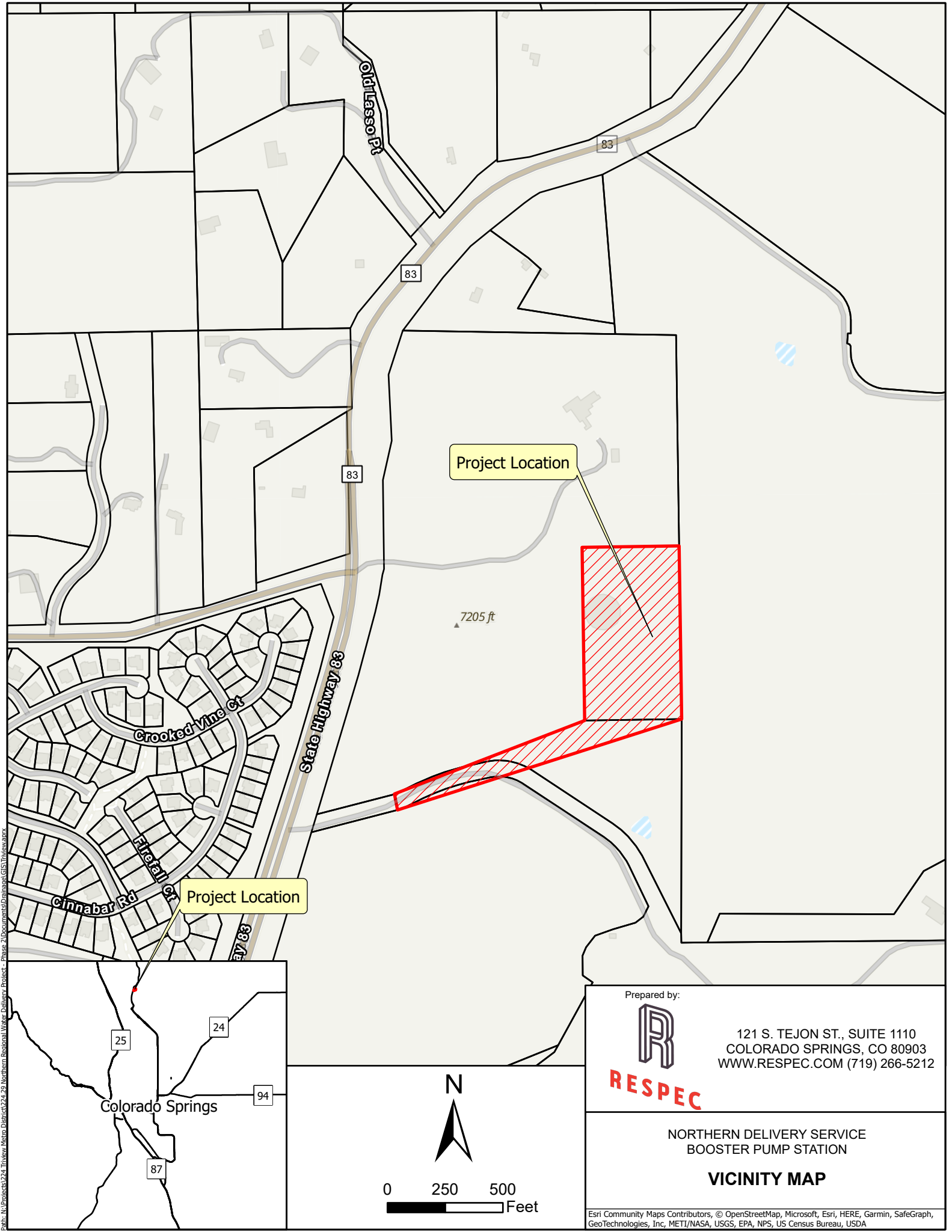
Urban Drainage and Flood Control District (June 2017). *Urban Storm Drainage Criteria Manual, Volume 1-3.*

USDA, NRCS. Soil Survey of El Paso County Area, Colorado.



APPENDIX A

MAPS

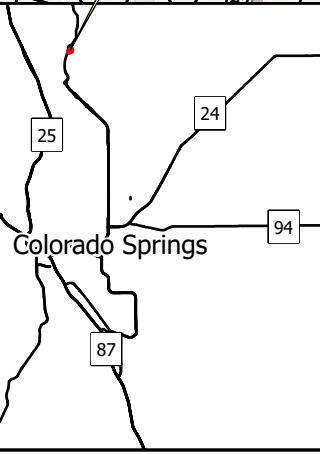


Project Location

Project Location

7205 ft

Path: N:\Projects\244 Tiview Metro District\244_23 Northern Regional Water Delivery Project - Phase 2\Documents\Drawings\GIS\Tiview\vicinity



Colorado Springs



0 250 500 Feet

Prepared by:



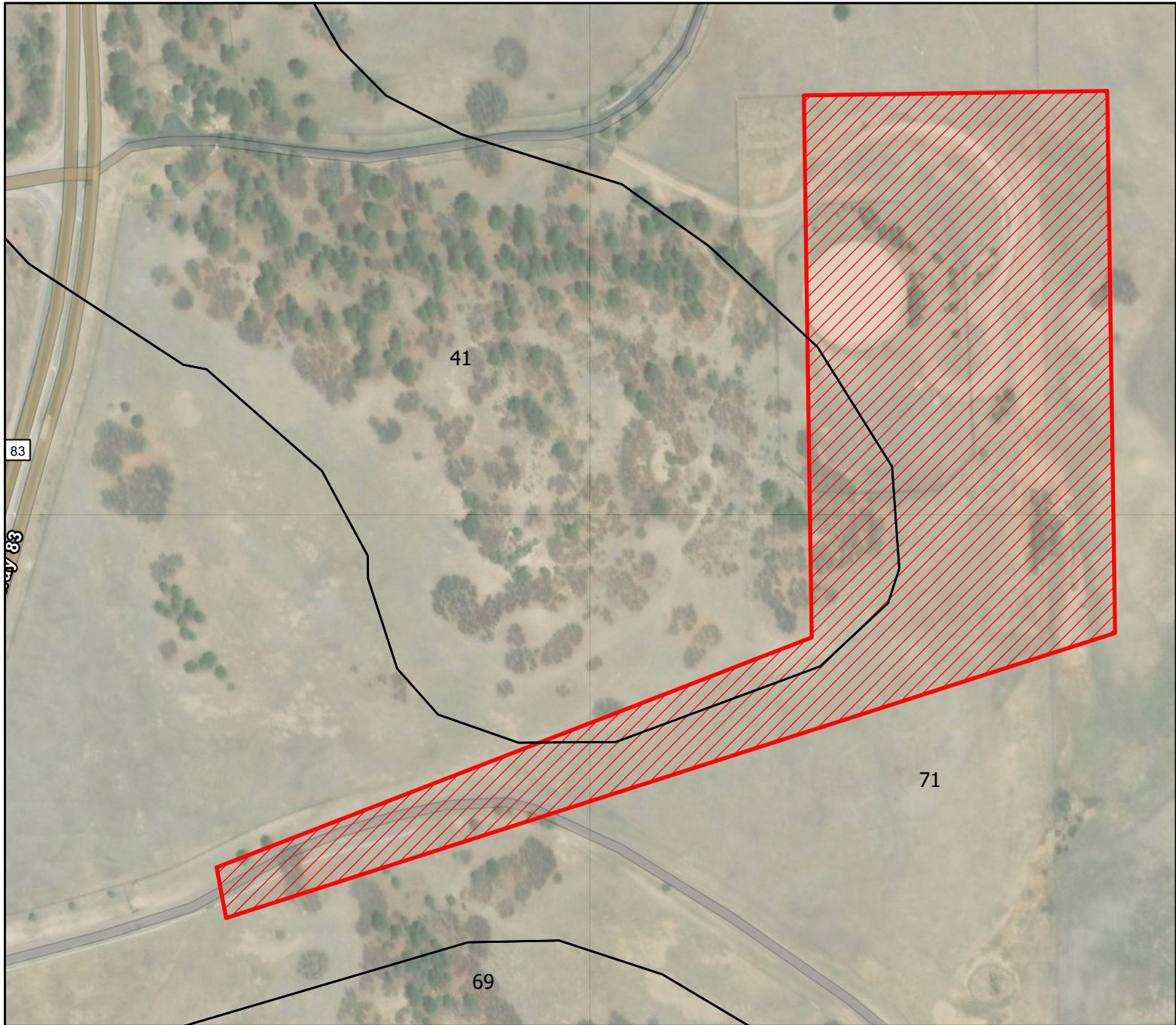
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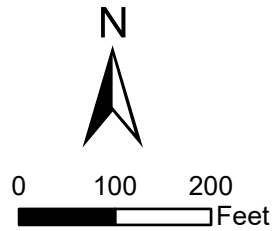
NORTHERN DELIVERY SERVICE
BOOSTER PUMP STATION

VICINITY MAP

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Map Unit Symbol	Map Unit Name	Rating	Percent of Site, %
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	10.8
69	Peyton-Pring complex, 8 to 15 percent slopes	B	0.0
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	89.2

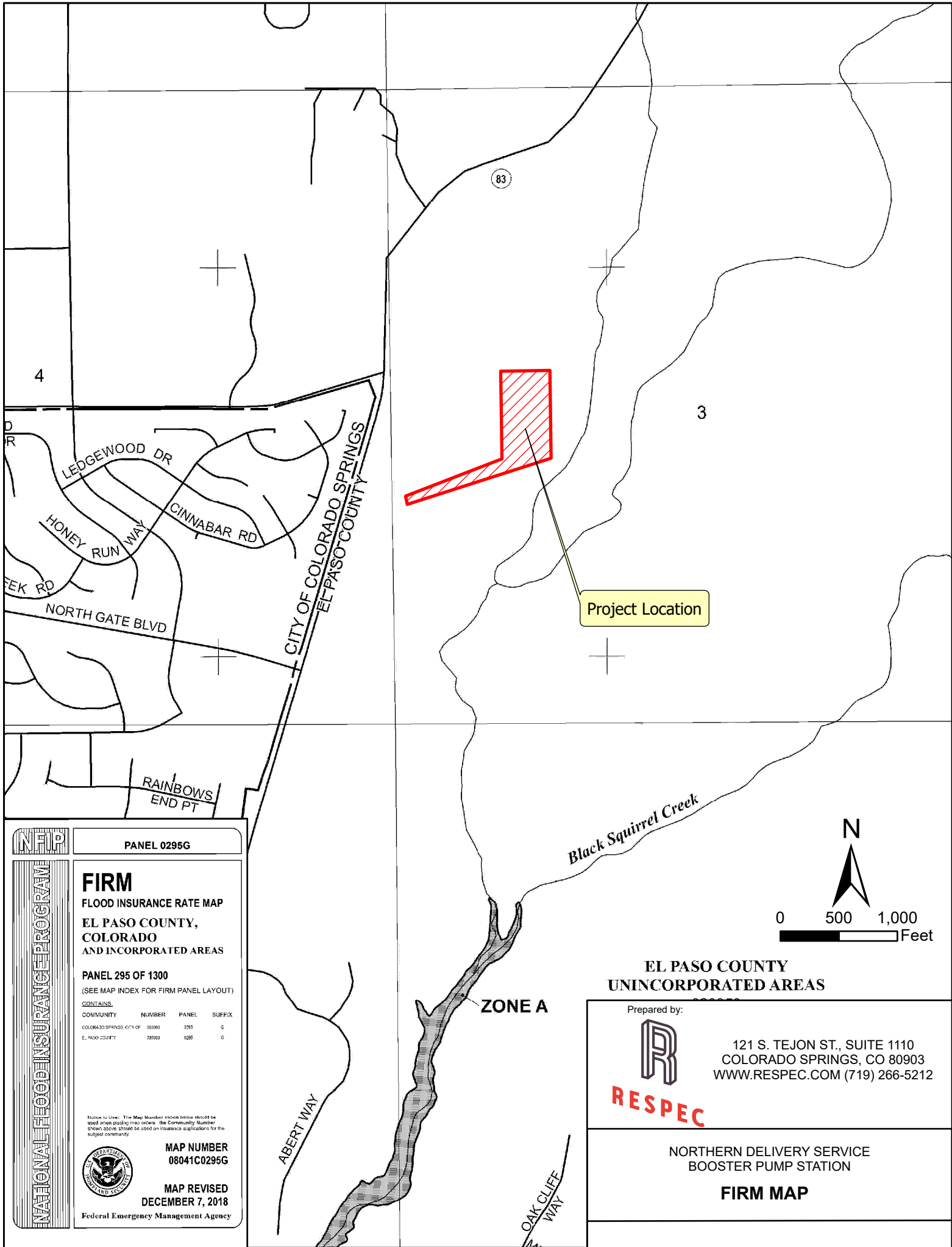


Prepared by:



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NORTHERN DELIVERY SERVICE
 BOOSTER PUMP STATION
SOILS MAP



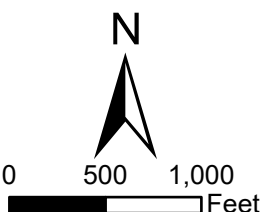
83

4

3

Project Location

ZONE A



NIP

PANEL 0295G

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

PANEL 295 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS CITY OF	30300	3295	G
E. PASO COUNTY	30303	0295	G

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

MAP NUMBER
08041C0295G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

**EL PASO COUNTY
UNINCORPORATED AREAS**

Prepared by:

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**NORTHERN DELIVERY SERVICE
BOOSTER PUMP STATION**

FIRM MAP



APPENDIX B

CALCULATIONS

Northern Delivery Service Booster Pump Station									
PROJ.224.29									
C FACTOR CALCULATION SHEET									
EXISTING CONDITIONS									
RUNOFF COEFICIENT									
TYPE A/B SOILS									
LAND USE		Imperv %	10 YR	100 YR					
UNDEV		0	0.15	0.35					
GRAVEL ROAD		80	0.63	0.7					
ASPHALT ROAD		100	0.92	0.96					
ROOFS		90	0.75	0.81					
EXISTING CONDITIONS									
	TOTAL	SURFACE CONDITION AREAS				CALCULATED C			
AREA	AREA	UNDEV	GRAVEL	ASPHALT	ROOFS	10	100	% IMPERVIOUS	
DESIG.	(acre)		ROAD	ROAD		YR	YR		
OS1	3.85	3.27	0.58	0.00	0.00	0.22	0.40		12.05
OS2	3.68	3.54	0.14	0.00	0.00	0.17	0.36		3.04
Aex	3.89	3.79	0.10	0.00	0.00	0.16	0.36		2.06
Bex	2.37	2.15	0.22	0.00	0.00	0.19	0.38		7.43
Cex	7.96	7.75	0.21	0.00	0.00	0.16	0.36		2.11
Dex	3.98	3.98	0.00	0.00	0.00	0.15	0.35		0.00
Eex	2.79	2.52	0.02	0.00	0.25	0.22	0.39		8.64
Fex	1.15	0.99	0.03	0.00	0.13	0.25	0.41		12.26
Gex	0.96	0.96	0.00	0.00	0.00	0.15	0.35		0.00
Site Percent Impervious, %		3.49							

PROPOSED CONDITIONS									
RUNOFF COEFICIENT									
TYPE A/B SOILS									
LAND USE		Imperv %	10 YR	100 YR					
UNDEV		0	0.15	0.35					
GRAVEL ROAD		80	0.63	0.7					
ASPHALT ROAD		100	0.92	0.96					
ROOFS		90	0.75	0.81					
PROPOSED CONDITIONS									
	TOTAL	SURFACE CONDITION AREAS				CALCULATED C			
AREA	AREA	UNDEV	GRAVEL	ASPHALT	ROOFS	10	100	% IMPERVIOUS	
DESIG.	(acre)		ROAD	ROAD		YR	YR		
OS1	3.85	3.27	0.58	0.00	0.00	0.22	0.40	12.05	
OS2	3.72	3.58	0.14	0.00	0.00	0.17	0.36	3.01	
A	3.89	3.79	0.10	0.00	0.00	0.16	0.36	2.06	
B	2.37	2.12	0.21	0.04	0.00	0.21	0.39	8.78	
C	7.96	7.72	0.21	0.03	0.00	0.16	0.36	2.49	
D	3.98	3.83	0.00	0.15	0.00	0.17	0.37	3.77	
E	2.83	2.45	0.00	0.10	0.28	0.25	0.42	12.44	
F	1.15	0.99	0.03	0.00	0.13	0.25	0.41	12.26	
G	0.96	0.85	0.00	0.11	0.00	0.22	0.42	11.46	
Site Percent Impervious, %		5.35							

Manning Formula: Proposed Swale 10-Year Flows

Irregular Section

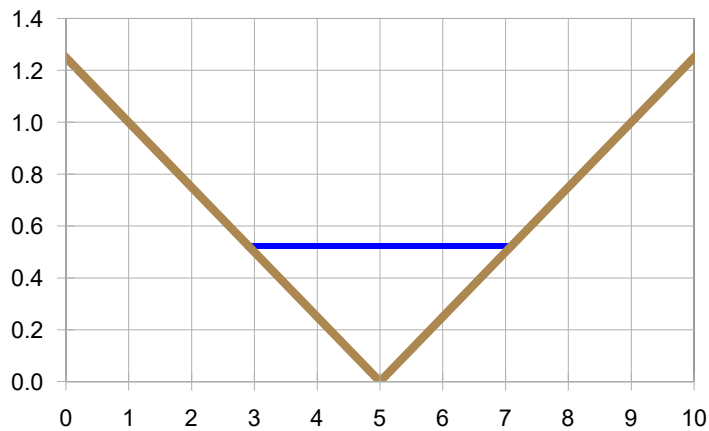
Input

Flow 3.8 cfs
Slope 0.085 ft/ft

Sta	Elev	n	Sta	Elev	n	Sta	Elev	n	Sta	Elev	n
0	1.25	0.05	5	0	0.05	10	1.25	0.05			

Output

WSElev 0.523 ft
Flow Area 1.09 sf
Velocity 3.47 fps
Velocity Head 0.187 ft
Top Width 4.18 ft
Froude Number 1.20
Critical WSElev 0.562 ft
Critical Slope ft/ft



Manning Formula:

Proposed Swale 100-Year Flows

Irregular Section

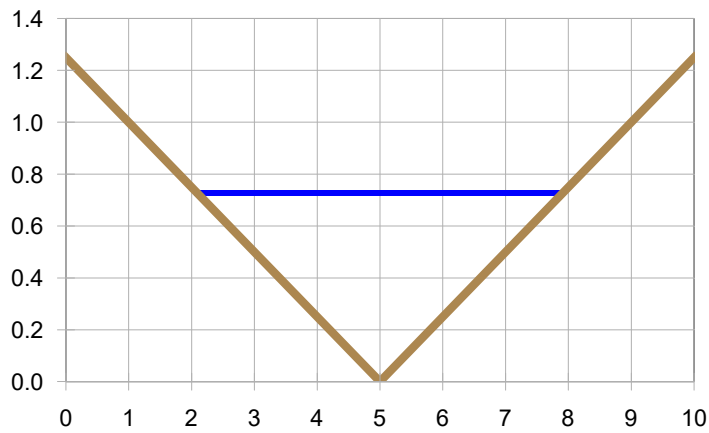
Input

Flow 9.1 cfs
Slope 0.085 ft/ft

Sta	Elev	n	Sta	Elev	n	Sta	Elev	n	Sta	Elev	n
0	1.25	0.05	5	0	0.05	10	1.25	0.05			

Output

WSElev 0.726 ft
Flow Area 2.11 sf
Velocity 4.32 fps
Velocity Head 0.290 ft
Top Width 5.81 ft
Froude Number 1.26
Critical WSElev 0.797 ft
Critical Slope ft/ft

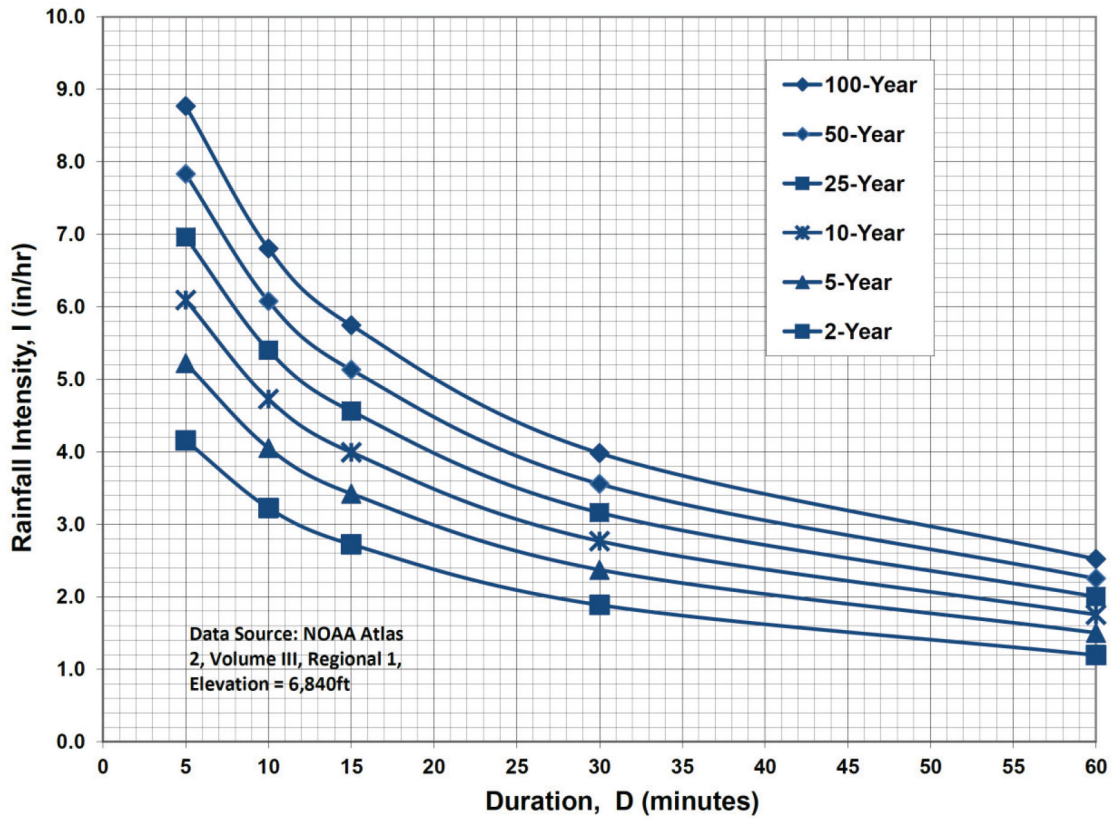




APPENDIX C
DESIGN CHARTS

Historic Flow Analysis— Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$$I_{100} = -2.52 \ln(D) + 12.735$$

$$I_{50} = -2.25 \ln(D) + 11.375$$

$$I_{25} = -2.00 \ln(D) + 10.111$$

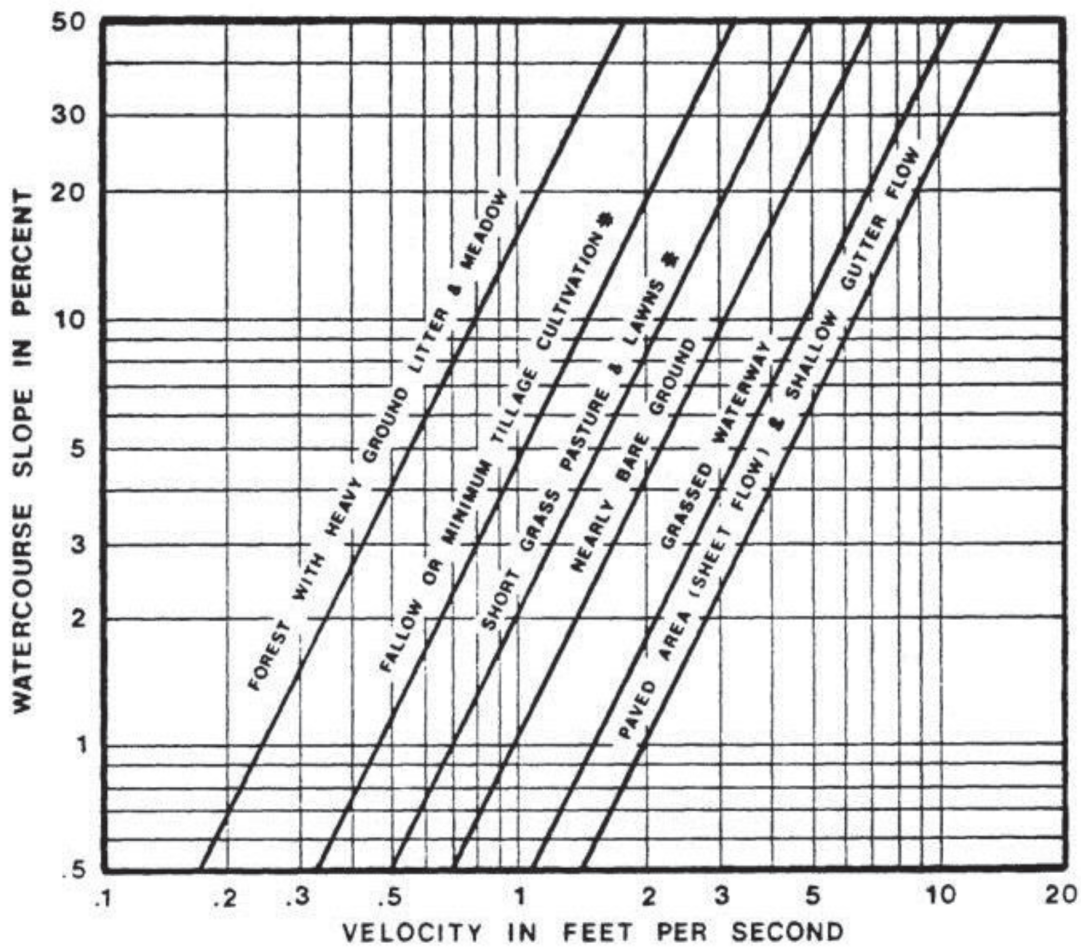
$$I_{10} = -1.75 \ln(D) + 8.847$$

$$I_5 = -1.50 \ln(D) + 7.583$$

$$I_2 = -1.19 \ln(D) + 6.035$$

Note: Values calculated by equations may not precisely duplicate values read from figure.

Figure 6-25. Estimate of Average Concentrated Shallow Flow





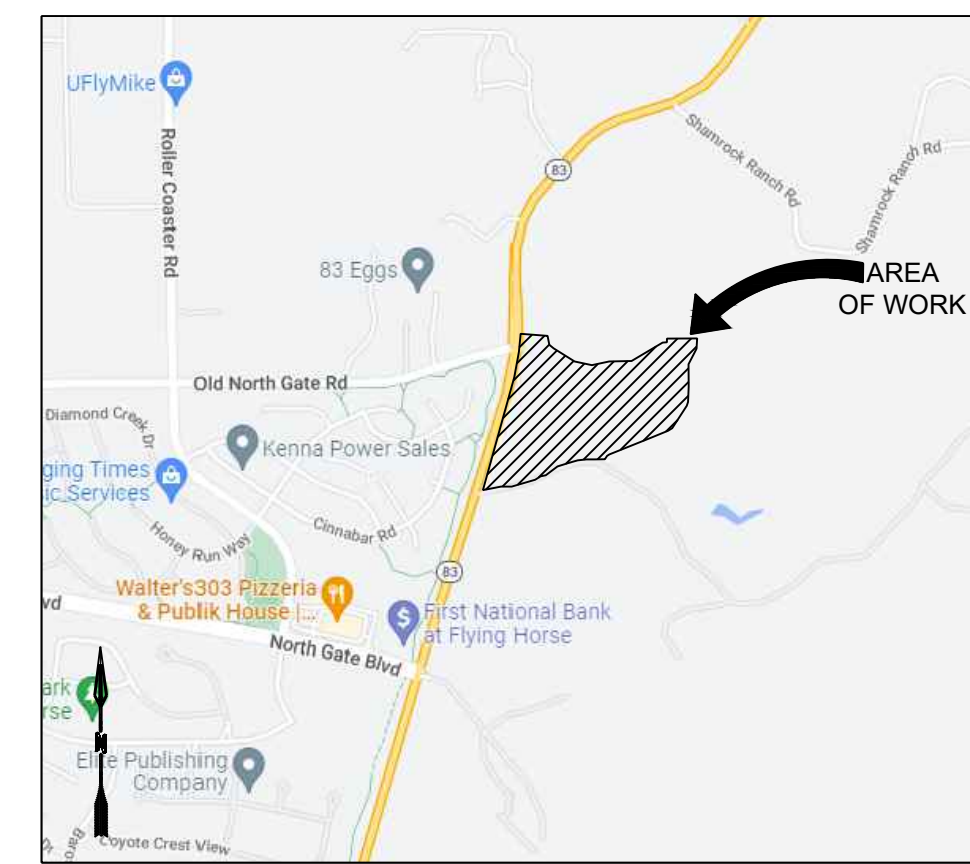
BACK POCKET

M:\Projects\224 Triview Metro District\224-29 Northern Regional Water Delivery Project - Phase 2\Documents\Drawings\DWG\1 Existing Drainage Planning



NOTES:

1. THERE IS NO FEMA FLOODPLAIN WITHIN THE PROPOSED SITE. FEMA MAP: 08041C0295G EFFECTIVE: 12/7/2018
2. MIN CONTOUR INTERVAL IS 5' AND MAX CONTOUR INTERVAL IS 10'. COUNTY CRITERIA STATES, "FOR SUBDIVISIONS INVOLVING RURAL LOTS GREATER THAN 1 ACRE, THE MAXIMUM INTERVAL MAY BE 5 FEET WHERE APPROVED, IN TERRAIN GREATER THAN 10% - 10 FEET."



BENCHMARKS

TOPOGRAPHY SURVEY CENTENAL LAND SURVEYING, LLC. SEE SURVEY FOR ESTABLISHED CONTROL. THE FOLLOWING COORDINATE SYSTEM AND DATUM RECORD IS AS FOLLOWS:

HORIZONTAL DATUM: HORIZONTAL COORDINATES ARE MODIFIED COLORADO STATE PLANE CENTRAL BASED UPON THE FOLLOWING: COORDINATES ARE SCALED FROM CONTROL POINT 5052 BEING A 2-INCH ALUMINUM CAP STAMPED AZTEC CP 52 SET AT THE TOP OF A DIRT BANK ALONG THE EAST SIDE OF GLEN EAGLE DR. APPROXIMATELY 380+ FEET NORTHERLY OF ST. LAWRENCE HWY. VALUES ARE BASED UPON A STATIC SURVEY SESSION WITH THE FOLLOWING RESULTS:

LATITUDE: 39-04-05916N; LONGITUDE: 104-49-24.82486 W

STATE PLANE NORTHING: 1,450,401.759; STATE PLANE EASTING: 3,192,049.712

SCALE FACTOR: 1.0004063250

TRUNCATE NORTHING: 1,000,000.00; TRUNCATE EASTING: 3,000,000.00

PROJECT NORTHING: 450,401.759; PROJECT EASTING: 192,049.712

VERTICAL DATUM: NAVD 88 WITH GEOID G18US; BENCHMARK: CP 5052 EL: 7213.70

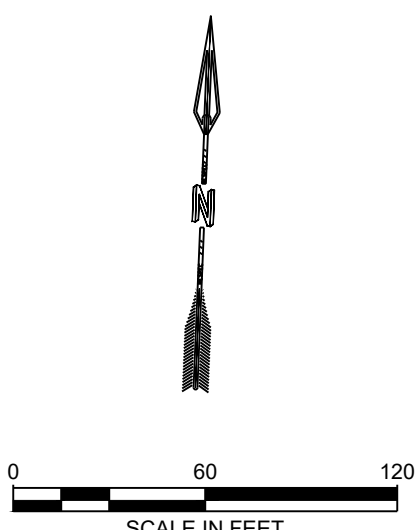
BENCHMARK: NGS CS110/DM0842 EL: 6843.25; BENCHMARK: NGS 5294/KX0272 EL: 7116.72

LEGEND

	EXIST BASIN DESIGNATION		EXIST BASIN CALLOUT
	EXIST BASIN AREA, ACRES		EXIST BASIN INFORMATION
	EXIST 10 YEAR STORM, CFS		EXIST 10 YEAR ACCUMULATED FLOW, CFS
	EXIST 100 YEAR STORM, CFS		EXIST 100 YEAR ACCUMULATED FLOW, CFS
	EXIST DESIGN POINT		EXISTING DIRECTION OF DRAINAGE FLOW
	EXISTING EASEMENT LINE		EXISTING SUB-BASIN BOUNDARY
	EXISTING MAJOR CONTOUR		EXISTING MINOR CONTOUR
	EXISTING TIME OF CONCENTRATION PATH		EXISTING PROPERTY BOUNDARY
	EXISTING PROPERTY BOUNDARY		EXISTING FENCE
	EXISTING STREAM CENTERLINE		EXISTING PROPERTY BOUNDARY
	EXISTING MOUSE HABITAT		

EXISTING CONDITIONS			
SUB-BASIN	AREA (AC)	Q10 (CFS)	Q100 (CFS)
OS1	3.85	3.5	9.2
OS2	3.69	2.8	8.5
Aex	3.89	2.4	7.8
Bex	2.37	2.1	5.9
Cex	7.96	5.4	17.4
Dex	3.98	2.7	9.2
Eex	2.79	3.3	8.3
Fex	1.15	1.4	3.4
Gex	0.96	0.7	2.5

DESIGN POINT	AREA (AC)	Q10 (CFS)	Q100 (CFS)
DP1 (Eex + Fex + Gex + OS2)	8.59	7.5	20.8
DP2 (DP1 + Cex + Dex + OS1)	24.38	15.8	46.9



JDS-HYDRO a Division of **RESPEC**
 5540 TECH CENTER DR., SUITE 100
 COLORADO SPRINGS, COLORADO 80919
 (719) 227-0072

ISSUANCES OF CONTRACTOR SHALL VERIFY ALL DIMENSIONS, SURFACE, AND VOLUMES SHALL BE REPORTED TO JDS-HYDRO, A DIVISION OF RESPEC. JDS-HYDRO ASSUMES NO LIABILITY FOR UNAUTHORIZED CHANGES AND/OR REVISIONS MADE TO PLANS.

TRIVIEW METROPOLITAN DISTRICT
 NORTHERN DELIVERY SYSTEM BOOSTER PUMP STATION
 EXISTING DRAINAGE PLAN

NO.	DESCRIPTION	BY	APP.	DATE
1				
2				
3				
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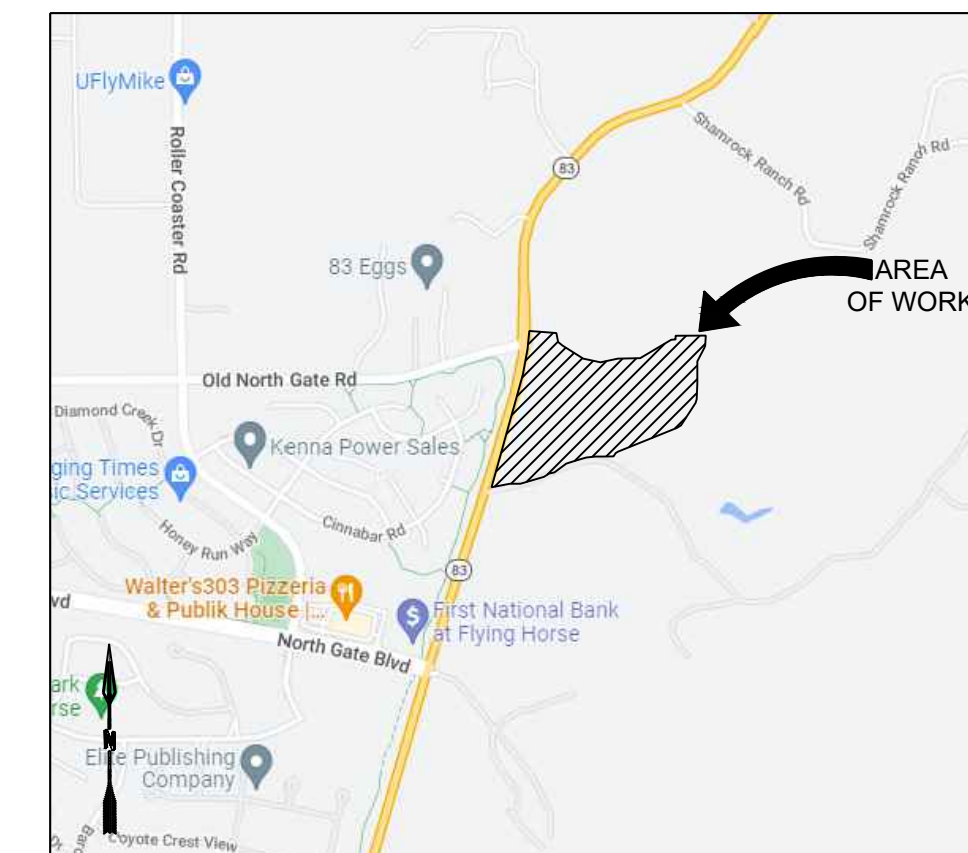
Project No.: 224-29
 Date: 04/2023
 Design: CTD
 Drawn: CTD
 Check: RGG

DR1
 SHEET 1 OF 2

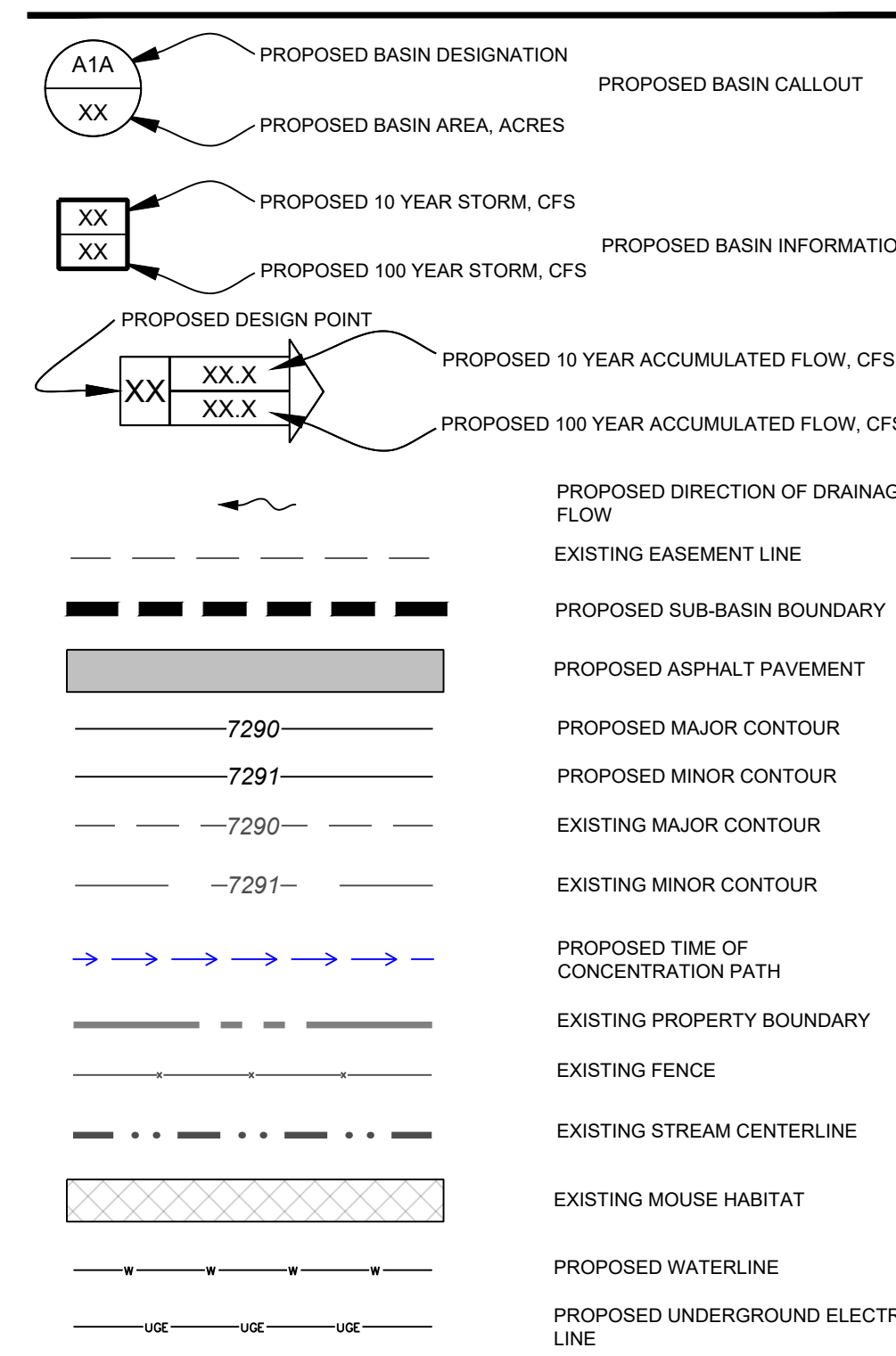
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 2023/04/14 10:01 AM By: Dawn White



NOTES:
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 EFFECTIVE: 12/7/2018
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 BENCHMARK: NCS CS110/DW8842 EL: 6943.25; BENCHMARK: NCS S294/KK2272 EL: 7116.72

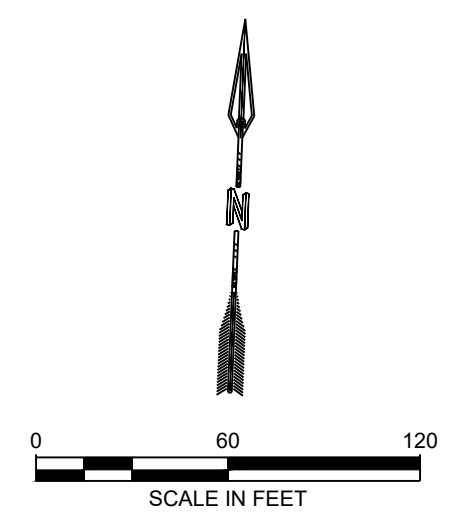


PROPOSED CONDITIONS

SUB-BASIN	AREA (AC)	Q10 (CFS)	Q100 (CFS)
OS1	3.85	3.5	9.2
OS2	3.68	2.8	8.5
A	3.89	2.4	7.8
B	2.37	2.3	6.1
C	7.96	5.4	17.4
D	3.98	3.1	9.8
E	2.83	3.8	9.1
F	1.15	1.4	3.4
G	0.96	1.1	3.0

DESIGN POINT

DESIGN POINT	AREA (AC)	Q10 (CFS)	Q100 (CFS)
DP1 (E + F + G + OS2)	8.66	8.3	22.1
DP2 (DP1 + C + D + OS1)	24.45	16.8	48.3



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TRIVIEW METROPOLITAN DISTRICT
 NORTHERN DELIVERY SYSTEM BOOSTER PUMP STATION
 PROPOSED DRAINAGE PLAN

REVISIONS

NO.	DESCRIPTION	BY	APP.	DATE
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2				
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Project No.: 224-29
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