

**MASTER DEVELOPMENT
DRAINAGE PLAN
FOR
BOCES CAMPUS,
EL PASO COUNTY, COLORADO**

July 2024

Prepared For:

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PCD File No.: XX-XX

Master Development Drainage Plan (MDDP) for BOCES Campus

ENGINEER'S STATEMENT:

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

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

Date

DEVELOPER'S STATEMENT:

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

Business Name: Pikes Peak Board of Cooperative Educational Services

By: _____
Patrick Bershinsky
Title: Executive Director
Address: 2883 S. Circle Drive
Colorado Springs, CO 80906

El Paso County:

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

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

Date

Conditions:



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Master Development Drainage Plan (MDDP) for BOCES Campus

PURPOSE

This document is the Master Development Drainage Plan (MDDP) for the proposed Pikes Peak Board of Cooperative Educational Services (BOCES) BOCES Campus. The purpose of this drainage plan is to:

1. Identify on-site and off-site drainage patterns.
2. Recommend preliminary stormwater facilities to collect and convey storm runoff from the proposed development to appropriate discharge and/or detention locations.
3. Recommend preliminary water quality and detention facilities to control discharge release rates to below historic rates.
4. Demonstrate compliance with drainage basin planning studies and master plans.

The drainage improvements proposed in this report are preliminary in nature to support the BOCES Campus. Future Preliminary and Final Drainage Reports will be required as development and platting progresses.

GENERAL LOCATION AND DESCRIPTION

Location

The proposed BOCES Campus development is located within the south half of Section 35, Township 12 South, Range 64 West of the Sixth Principal Meridian, El Paso County, Colorado.

The site is bound by existing single-family residence at 16360 Judge Orr Road to the east, existing Judge Orr Road to the south, existing Elbert Road to the west, and by several existing single-family homes (8995 Elbert Road, 9280 Palomino Ridge VW, and 8950 Palomino Ridge VW) to the north. A vicinity map is presented in Appendix A.

Description of Property

The proposed BOCES Campus development contains approximately 84.1 acres and will be comprised of a vocational training educational campus for teenagers, single family housing for the workforce, community open areas and detention pond areas. This report analyzes the ultimate condition with all six of the proposed phases. The proposed phases are as follows:

1. Construction Trades Building, Water Treatment Facility, Lift Station, 10 Homes
2. Pikes Peak BOCES Administration Offices, 13 Homes
3. Informational Technology, Law Enforcement Training, Firefighting Training, 24 Homes
4. Vocational Training, Sports Field/ Turf Grass Management, 26 Homes
5. Medical Training, Food Services, Culinary Arts, 25 Homes
6. Veterinary Sciences, Horticultural Sciences (Greenhouse, Aquaponics), 22 Homes

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The site is currently unoccupied and undeveloped. The existing ground cover is sparse short and mixed grass prairie vegetation and natural drainageways.

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

Floodplain Statement

Based on the FEMA FIRM numbers 08041C0558G and 08041C0559G dated December 7, 2018, the site lies within Zone X. Zone X is defined as area outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. Draft model backed BFEs for this area have been developed as part of Phase 1 for the ongoing El Paso County, CO, Risk MAP project. FEMA approved floodplain elevations will be required on the final plat. The FIRM panels are presented in Appendix A.

MAJOR DRAINAGE BASINS AND SUB-BASINS

Major Basin Descriptions

Geick Ranch

The site lies within the Geick Ranch Drainage Basin. The “Geick Ranch Drainage Basin Planning Study” by Drexel, Barrel dated October, 2007 and updated in February 2010 has not been approved by El Paso County as of the date of this report. The Geick Ranch Drainage Basin covers approximately 22 square miles beginning approximately 5 miles northeast of the Town of Falcon and extends approximately 15 miles to the southeast. The Geick Ranch Drainage Basin is tributary to Black Squirrel Creek, which drains south to its confluence with the Arkansas River near Pueblo, Colorado. In general, the Geick Ranch Drainage Basin flows from west to east across the proposed site.

As previously mentioned, the Geick Ranch drainageway does not encroach or cross the site. A portion of Geick Ranch Main Stem (MS) is located to the north and east of the site. Specifically, channel reach MS-R11a and MS-R11b run to the north and east of the site towards the MS crossing at Judge Orr Road. The proposed improvements described within that report are selective stabilization along these reaches as well as several grade control structures. Excerpts of the Geick Ranch DBPS are shown in Appendix E for information only. The proposed site will limit the flows released from the site to predevelopment levels to avoid any adverse impacts to downstream properties or infrastructure. The proposed development will not change peak flows in the existing drainageway.

BOCES CAMPUS BASINS AND SUB-BASINS

Existing Sub-basin Drainage

The existing basin delineation for BOCES Campus as shown on the map within Appendix F is as follows:

Basin OS1 is approximately 40.1 acres and is comprised of undeveloped areas to the west of the project site as well as a portion of existing Elbert Road. The existing topography has some local depressions that vary in size. For this analysis, it was assumed that those depressions would not have an impact on the runoff. Runoff will follow the historic path overland from the northwest to the southeast where it will flow across the Judge Orr Road and Elbert Road intersection at Design Point (DP) 1 ($Q_5=5.9$ cfs, $Q_{100}=32.8$ cfs). Flows will flow east and then remain in the existing north Judge Orr Road ditch to flowing east to DP2.1.

Basin OS2 is approximately 2.73 acres and is comprised of undeveloped areas to the north of the project site. Runoff ($Q_5=0.7$ cfs, $Q_{100}=5.0$ cfs) will follow the historic path overland from the northwest to the southeast where it will enter into Basin EX-A and follow the existing drainage patterns of that basin. Flows combine within the existing Judge Orr Road ditch at DP2 and continue east to DP2.1.

Existing Basin EX-A is approximately 37.0 acres and in the existing condition is comprised of undeveloped land. The existing topography has some local depressions that vary in size. For this analysis, it was assumed that those depressions would not have an impact on the runoff. Runoff ($Q_5=6.6$ cfs, $Q_{100}=44.4$ cfs) will follow the historic path overland from the northwest to the southeast where it will flow into the existing Judge Orr Road ditch and combine at DP2. DP2 runoff continues east to DP2.1.

Basin OS3 is approximately 1.11 acres and is comprised of the northern portion of existing Judge Orr Road and the roadside ditch. Runoff ($Q_5=1.8$ cfs, $Q_{100}=4.2$ cfs) will flow north from the Judge Orr Road crown to the existing roadside ditch at DP2. Flows from Basin OS2, EX-A and OS3 combine within the existing Judge Orr Road ditch at DP2 ($Q_5=8.1$ cfs, $Q_{100}=49.9$ cfs). DP2 runoff continues east and combines with Basin OS1 at DP2.1 ($Q_5=11.2$ cfs, $Q_{100}=65.3$ cfs) and then continues further east to DP3.1.

Existing Basin EX-B is approximately 14.7 acres and in the existing condition is comprised of undeveloped land. Runoff ($Q_5=3.9$ cfs, $Q_{100}=26.2$ cfs) will follow the historic path overland from the middle ridge on the site to the southeast where it will flow into the existing Judge Orr Road ditch and combine at DP3. DP3 runoff continues east to DP3.1, the southeast site boundary.

Basin OS4 is approximately 0.75 acres and is comprised of the northern portion of existing Judge Orr Road and the roadside ditch. Runoff ($Q_5=1.2$ cfs, $Q_{100}=3.1$ cfs) will flow north from the Judge Orr

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Road crown to the existing roadside ditch at DP3. Flows from Basin EX-B and OS4 combine within the existing Judge Orr Road ditch at DP3 ($Q_5=4.8$ cfs, $Q_{100}=28.4$ cfs). DP3 runoff continues east and combines with DP2.1 at DP3.1 ($Q_5=13.3$ cfs, $Q_{100}=77.7$ cfs), the southeast site boundary. Runoff leaves the site within the north side of the existing roadside ditch, eventually out falling to the existing Geick Ranch drainageway about 2,400 feet to the east.

Basin OS5 is approximately 10.8 acres and is comprised of undeveloped areas to the north of the project site. Runoff ($Q_5=1.9$ cfs, $Q_{100}=13.1$ cfs) will follow the historic path overland from the west to the east where it will enter into Basin EX-C and follow the existing drainage patterns of that basin. Flows combine within at DP4 and continue east to the existing Geick Ranch drainageway.

Existing Basin EX-C is approximately 34.8 acres and in the existing condition is comprised of undeveloped land and an existing electric transmission easement. The existing topography has some local depressions that vary in size. For this analysis, it was assumed that those depressions would not have an impact on the runoff. Runoff ($Q_5=6.9$ cfs, $Q_{100}=46.4$ cfs) will follow the historic path overland from the middle ridge on the site to the northeast. Basin OS5 and EX-C flows combine at DP4 ($Q_5=8.2$ cfs, $Q_{100}=55.2$ cfs) and continue east to the existing Geick Ranch drainageway.

See the existing condition summary tables below and Appendix B for calculations.

Table 1: Existing conditions basin summary table.

BASIN SUMMARY TABLE							
Tributary	Area	Percent			t_c	Q_5	Q_{100}
Sub-basin	(acres)	Impervious	C_5	C_{100}	(min)	(cfs)	(cfs)
EX-A	37.0	2%	0.09	0.36	41.7	6.6	44.4
EX-B	14.7	2%	0.09	0.36	21.9	3.9	26.2
EX-C	34.8	2%	0.09	0.36	36.0	6.9	46.4
OS1	40.1	5%	0.11	0.38	66.3	5.9	32.8
OS2	2.73	2%	0.09	0.36	20.5	0.7	5.0
OS3	1.11	45%	0.45	0.62	14.1	1.8	4.2
OS4	0.75	40%	0.40	0.59	10.0	1.2	3.1
OS5	10.8	2%	0.09	0.36	41.2	1.9	13.1

Table 2: Existing conditions design point summary table.

DESIGN POINT SUMMARY TABLE		
DP#	Q_5	Q_{100}
1	5.9	32.8
2	8.1	49.9
2.1	11.2	65.3
3	4.8	28.4
3.1	13.3	77.7
4	8.2	55.2

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Proposed Drainage Conveyance

In general, developed flows are collected in proposed private storm sewer, which convey water to the proposed detention area. Proposed private local roadways are used throughout the site with curb and gutter to direct flows to proposed storm inlets. Storm inlets shall be designed to fully capture all flows in the minor and major storms or bypass flows to another inlet that has sufficient capacity to fully capture the flows. Storm sewer shall be designed to meet all EPC criteria for capacity, hydraulic grade lines, energy grade lines, velocity, etc. More detailed analysis shall be provided in the future Final Drainage Report.

Proposed Sub-basin Drainage

The proposed basin delineation for BOCES Campus as shown on the map within Appendix F is as follows:

Basin OS1 is approximately 40.3 acres and is comprised of undeveloped areas to the west of the project site as well as a portion of existing Elbert Road. The existing topography has some local depressions that vary in size. For this analysis, it was assumed that those depressions would not have an impact on the runoff. Runoff ($Q_5=6.5$ cfs, $Q_{100}=34.1$ cfs) will follow the historic path overland from the northwest to the southeast where it will flow under Elbert Road via a proposed culvert at DP1. Flows will flow east and then remain in the existing north Judge Orr Road ditch to flowing east to DP3.1.

Proposed Basin A is approximately 0.30 acres and in the proposed condition is comprised of additional Elbert Road right-of-way and undeveloped land. Runoff ($Q_5=0.2$ cfs, $Q_{100}=1.0$ cfs) will follow the historic path overland from the north to the south where it will flow under Elbert Road via a proposed culvert at DP1 ($Q_5=6.6$ cfs, $Q_{100}=34.3$ cfs). Flows will flow east and then remain in the existing north Judge Orr Road ditch to flowing east to DP3.1.

Basin OS2 is approximately 2.67 acres and is comprised of undeveloped areas to the north of the project site. Runoff ($Q_5=0.7$ cfs, $Q_{100}=4.9$ cfs) will follow the historic path overland from the northwest to the southeast where it will enter into Basin B and follow the proposed drainage patterns of that basin. Flows combine at the proposed full-spectrum EDB located at DP2.

Proposed Basin B is approximately 69.9 acres and in the proposed condition is comprised of a vocational school, single-family residences, associated infrastructure (roadways, utilities, etc.), a full-spectrum EDB and open space. For this analysis, the vocational campus side was represented using the Business-Neighborhood percent impervious of 70%, and the single-family residential side was represented using the Residential-1/8 Acre percent impervious of 65%. Runoff ($Q_5=73.1$ cfs, $Q_{100}=176.3$ cfs) will be captured within the basin via proposed private storm inlets and storm sewer connected to proposed roadway curb and gutter. The private storm sewer directs flows to the proposed full-spectrum EDB where flows from Basin OS2 and B combine at DP2 ($Q_5=73.7$ cfs, $Q_{100}=180.8$ cfs). Flows will be detained within the full-spectrum EDB and released at a controlled

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rate to the existing Judge Orr Road ditch at DP2.1 ($Q_5=1.5$ cfs, $Q_{100}=20.9$ cfs). Released DP2.1 flows will combine within the existing Judge Orr Road ditch at DP3.1

Proposed Basin C is approximately 2.46 acres and in the existing condition is comprised of undeveloped land part of an existing electric transmission easement. Runoff ($Q_5=0.6$ cfs, $Q_{100}=3.7$ cfs) will follow the historic path overland from the middle ridge on the site to the southeast. Runoff combines at DP3.

Basin OS3 is approximately 1.85 acres and is comprised of the northern portion of existing Judge Orr Road and the roadside ditch. Runoff ($Q_5=2.6$ cfs, $Q_{100}=6.2$ cfs) will flow north from the Judge Orr Road crown to the existing roadside ditch at DP3. Flows from Basin C and OS3 combine within the existing Judge Orr Road ditch at DP3 ($Q_5=2.6$ cfs, $Q_{100}=8.5$ cfs). DP3 runoff continues east and combines with DP1 and DP2.1 at DP3.1 ($Q_5=9.4$ cfs, $Q_{100}=59.7$ cfs), the southeast site boundary. Runoff leaves the site within the north side of the existing roadside ditch, eventually out falling to the existing Geick Ranch drainageway about 2,400 feet to the east.

Basin OS4 is approximately 10.8 acres and is comprised of undeveloped areas to the north of the project site. Runoff ($Q_5=1.9$ cfs, $Q_{100}=13.1$ cfs) will follow the historic path overland from the west to the east where it will enter into Basin D and follow the existing drainage patterns of that basin. Flows combine within at DP4 and continue east to the existing Geick Ranch drainageway.

Proposed Basin D is approximately 13.9 acres and in the existing condition is comprised of undeveloped land. The existing topography has some local depressions that vary in size. For this analysis, it was assumed that those depressions would not have an impact on the runoff. Runoff ($Q_5=2.8$ cfs, $Q_{100}=18.5$ cfs) will follow the historic path overland from the existing electric easement to the northeast. Basin OS4 and D flows combine at DP4 ($Q_5=4.5$ cfs, $Q_{100}=29.9$ cfs) and continue east to the existing Geick Ranch drainageway.

See the proposed condition summary tables below and Appendix B for calculations.

Table 3: Proposed conditions basin summary table.

BASIN SUMMARY TABLE							
Tributary	Area	Percent			t_c	Q_5	Q_{100}
Sub-basin	(acres)	Impervious	C_5	C_{100}	(min)	(cfs)	(cfs)
A	0.30	2%	0.09	0.36	5.0	0.2	1.0
B	69.9	52%	0.38	0.55	25.2	73.1	176.3
C	2.46	2%	0.09	0.36	29.3	0.6	3.8
D	13.9	2%	0.09	0.36	36.0	2.8	18.5
OS1	40.3	6%	0.12	0.38	65.4	6.5	34.1
OS2	2.67	2%	0.09	0.36	20.5	0.7	4.9
OS3	1.85	43%	0.43	0.61	17.6	2.6	6.2
OS4	10.8	2%	0.09	0.36	41.2	1.9	13.1

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Table 4: Proposed conditions design point summary table.

DESIGN POINT SUMMARY TABLE		
DP#	Q ₅	Q ₁₀₀
1	6.6	34.3
2	73.7	180.8
2.1	1.5	20.9
3	2.6	8.5
3.1	9.4	59.7
4	4.5	29.9

Comparison of Flows

There are two locations where the site releases flows off-site in the existing and the proposed condition.

1. Runoff flows off-site at DP3.1 in both the existing and proposed condition to the east along Judge Orr Road ditch towards the existing Geick Ranch drainageway. The proposed runoff (Q₅=9.5 cfs, Q₁₀₀=59.3 cfs) is less than the existing runoff (Q₅=13.3 cfs, Q₁₀₀=77.7 cfs) discharged at the same location.
2. Runoff flows off-site at DP4 in both the existing and proposed condition and flows east to the existing Geick Ranch drainageway. The proposed runoff (Q₅=4.5 cfs, Q₁₀₀=29.9 cfs) is less than the existing runoff (Q₅=8.2 cfs, Q₁₀₀=55.2 cfs) discharged at the same location.

Based on these comparisons, there are no negative impacts anticipated to existing downstream storm infrastructure.

DRAINAGE DESIGN CRITERIA

Development Criteria Reference

Storm drainage analysis and design criteria for the project were taken from the “City of Colorado Spring/El Paso County Drainage Criteria Manual” Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the “Urban Storm Drainage Criteria Manual” Volumes 1 - 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the “Colorado Springs Drainage Criteria Manual (CCSDCM)”, dated May 2014, as adopted by El Paso County, as well as the July 2019 El Paso County Engineering Criteria Manual update.

Hydrologic Criteria

All hydrologic data was obtained from the “El Paso Drainage Criteria Manual” Volumes 1 and 2, and the “Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual” Volumes 1, 2, and 3. On-site flows were determined based on the 5-year (minor) storm event and the 100-year (major) storm event. Rainfall intensities for the 5-year and the 100-year storm return frequencies

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were obtained from Figure 6-5 of the City of Colorado Springs DCM. One-hour point rainfall data for the storm events are 1.50 inches for the 5-year and 2.52 inches for the 100-year storm. Runoff was calculated using the Rational Method. Runoff coefficients were determined based on proposed land use and from data in Table 6-6 from the CSDCM. Time of concentrations were developed using equations from EPCDCM. All runoff calculations and applicable charts and graphs are included in the Appendices.

Mile High Flood District's MHFD-Detention, Version 4.06 workbook was used for preliminary pond sizing. Required detention volumes were designed per USDCM and CCS/EPCDCM. The preliminary pond sizing spreadsheet is presented in Appendix D.

Hydraulic Criteria

For the purposes of the BOCES Campus, no hydraulic analysis was performed. In reports submitted with the development plan, proposed roadside ditches, inlets and storm sewer shall be designed to conform to requirements set in the EPC DCM.

DRAINAGE FACILITY DESIGN

General Concept

The proposed stormwater conveyance system was designed to convey the developed BOCES Campus flows to a proposed full-spectrum EDB via curb and gutter to inlets and private storm sewer. The full-spectrum EDB will outfall to the existing Judge Orr Road ditch at less than historic to minimize adverse impacts downstream. Due to this, there are no drainage problems anticipated downstream of the BOCES Campus development.

Water Quality

In accordance with Section 13.3.2.1 of the CCS/EPCDCM, full-spectrum water quality and detention are provided for all developed basins. A majority of this site will drain into a proposed full-spectrum EDB proposed with the site.

A portion of the site is an existing electric transmission easement that is undeveloped land to proposed open space with no proposed structures. In accordance with Section I.7.1.B.7 of the ECM Stormwater Quality Policy and Procedure, developed basins with land disturbance to undeveloped land that will remain undeveloped after the site shall be allowed to release runoff without a downstream permanent stormwater quality measure. A portion of this site is also additional right-of-way for the future Elbert Road expansion. The additional right-of-way located on the site will be part of the rural roadside swale and therefore will also be undeveloped land to proposed open space with no proposed structures. This area is also excluded in accordance with Section I.7.1.B.7 of the ECM Stormwater Quality Policy and Procedure. See highlighted areas in the drainage map presented in Appendix F, as well as Table 5 below.

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Table 5: Water quality summary table.

PBMP Summary Table		
Basins	Tributary Area (acres)	PBMP
A	0.30	EXCLUDED*
B	69.9	FULL-SPECTRUM EDB
C	2.46	EXCLUDED*
D	13.9	EXCLUDED*
* EXCLUDED BASED ON STREAM STABILIZATION SITE PER ECM APP. I.7.B.7		

SUMMARY

The proposed development remains consistent with pre-development drainage conditions with the construction of the recommended drainage improvements, including ditches, culverts, detention ponds and drainage channel improvements. The proposed development will not adversely affect the on-site and off-site major drainageways or surrounding development. This report meets the latest El Paso County Drainage Criteria requirements for this site.

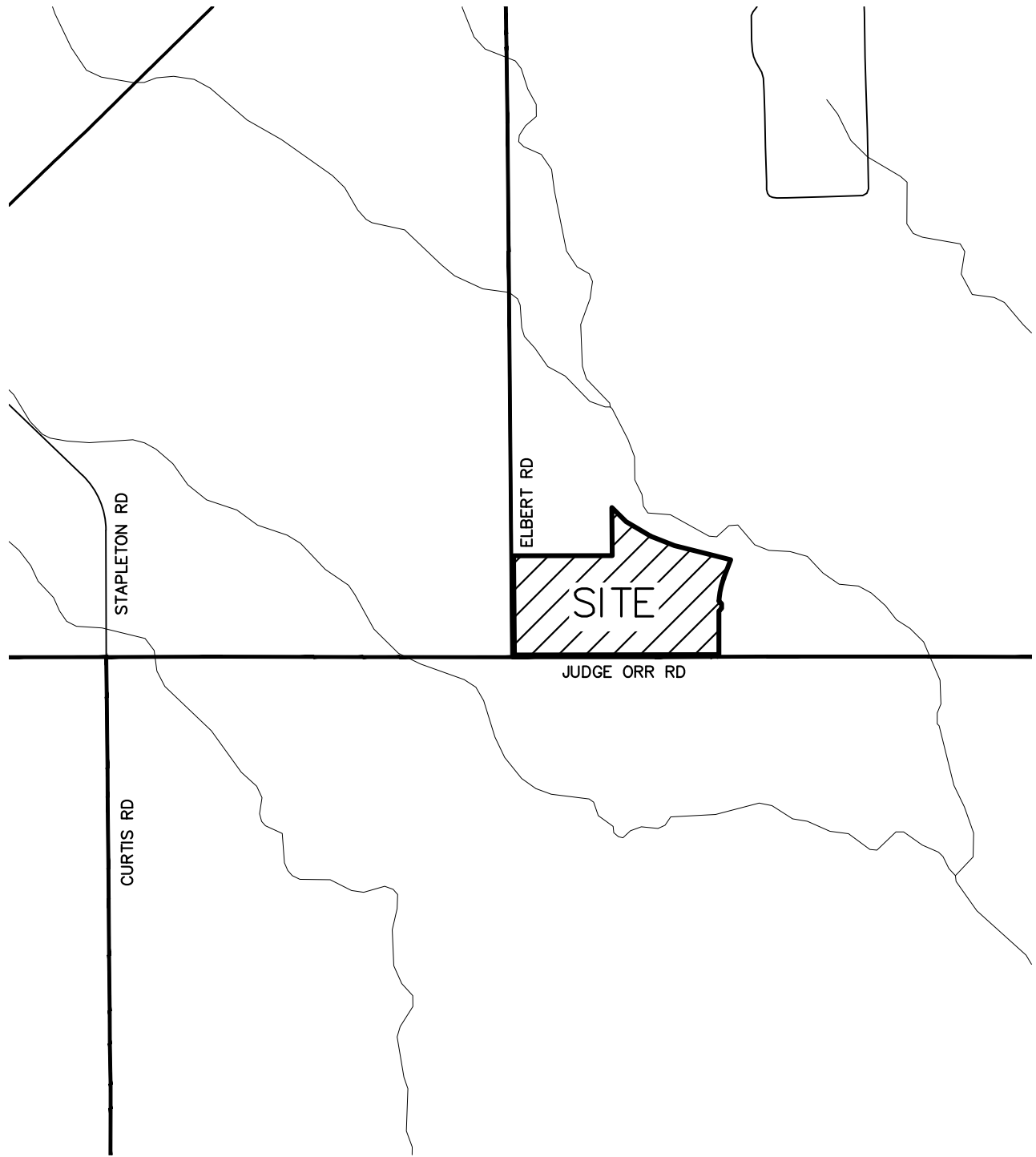
Master Development Drainage Plan (MDDP) for BOCES Campus

REFERENCES:

1. City of Colorado Springs Drainage Criteria Manual Volume 1, City of Colorado Springs, CO, May 2014.
2. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, Latest Revision.
3. Geick Ranch Drainage Basin Planning Study, Drexel, Barrell & Co., October 2007 and revised in February 2010.

APPENDIX A

FIGURES AND EXHIBITS



2000 1000 0 2000



ORIGINAL SCALE: 1" = 2000'

VICINITY MAP
BOCES CAMPUS
JOB NO. 25301.00
05/13/2024
SHEET 1 OF 1



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NOTES TO USERS

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

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

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

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

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

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

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

NGS Information Services
NOAA, NINGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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

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

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

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

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

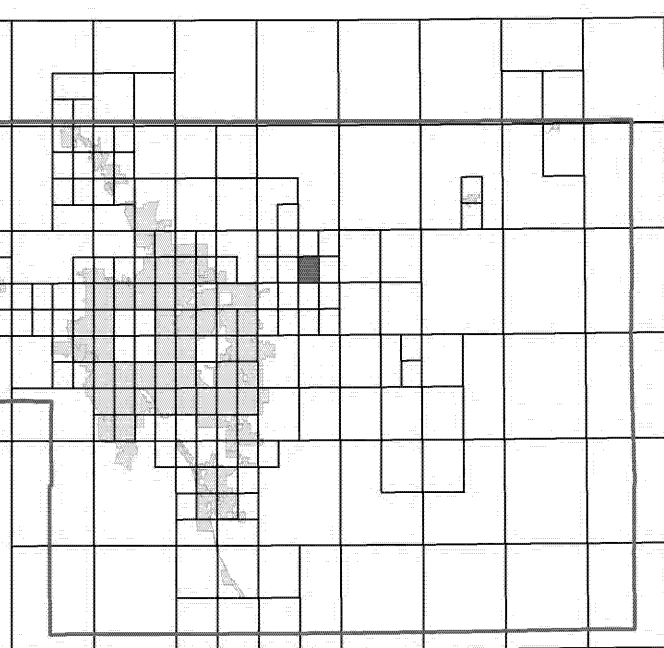
Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FIMX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

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

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

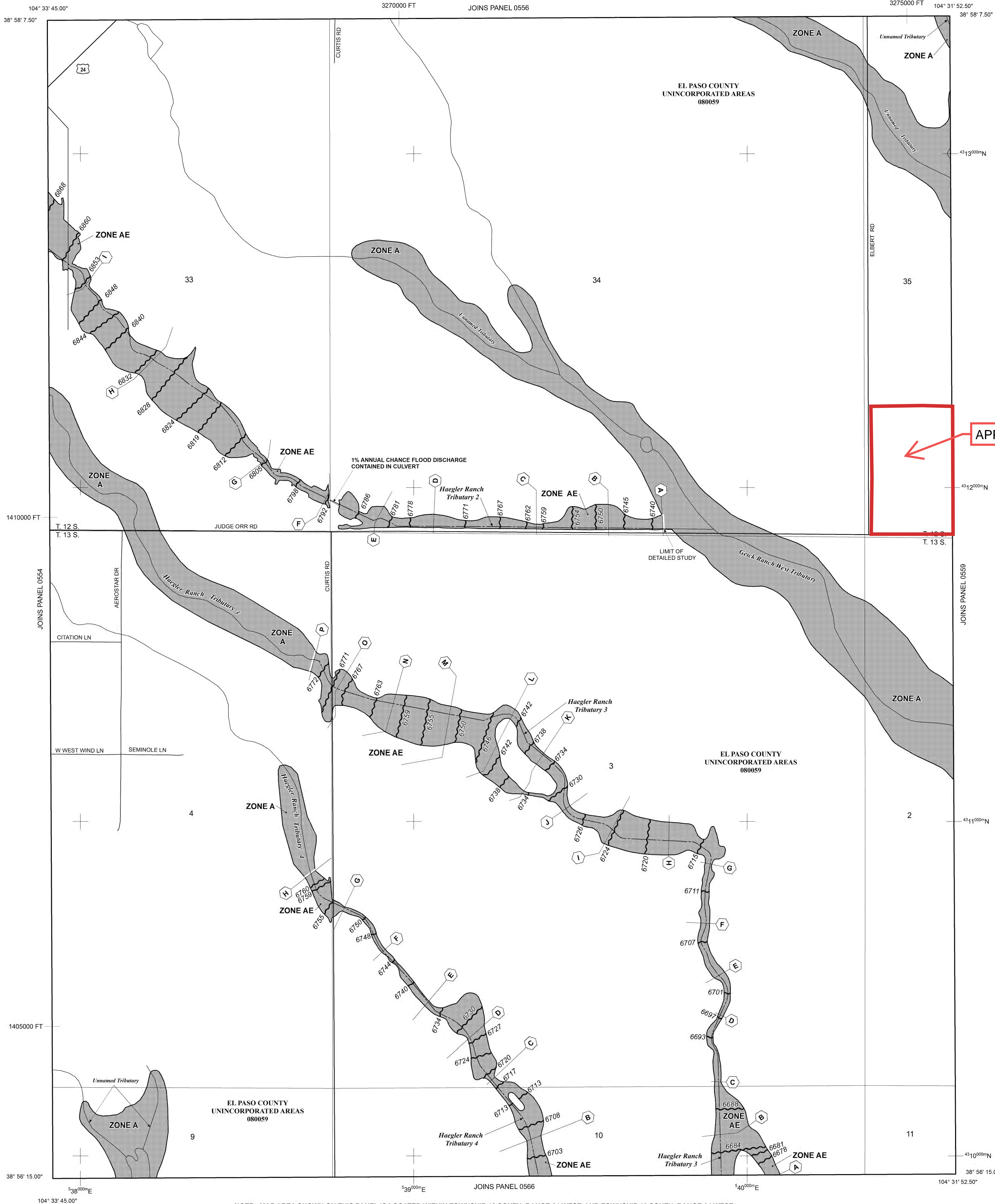
Panel Location Map



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



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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 64 WEST, AND TOWNSHIP 13 SOUTH, RANGE 64 WEST.

LEGEND

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

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decommissioned. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot, or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary

Floodway boundary

Zone D Boundary

CBRS and OPA boundary

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

(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

— A — A — Cross section line

23-23 Transsect line

97° 07' 30.00" 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

4750000N 1000-meter Universal Transverse Mercator grid ticks, zone 13

6000000 FT 5000-foot grid ticks; Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection

DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 River Mile

MAP REPOSITORIES Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

MARCH 17, 1997

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

DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

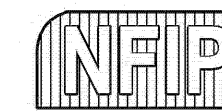
For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS



PANEL 0558G

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

PANEL 558 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0558	G

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

MAP NUMBER
08041C0558G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

NOTES TO USERS

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

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

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

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

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

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

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

NGS Information Services
NOAA, NINGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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

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

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

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

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

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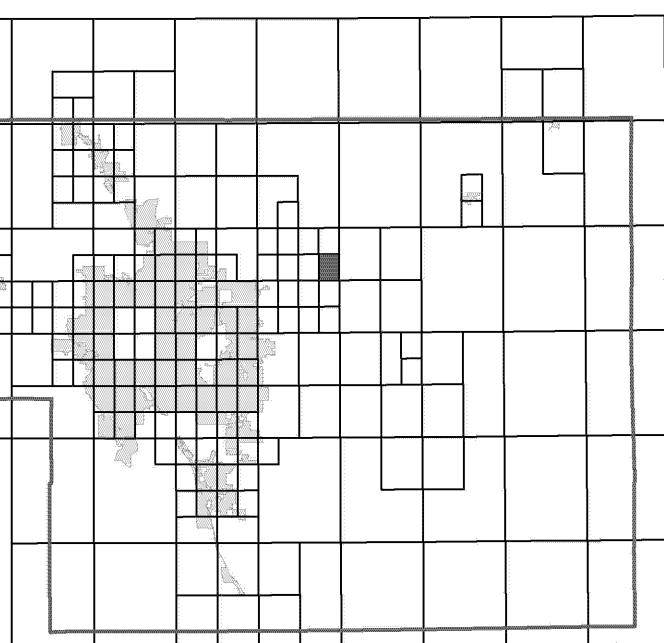
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El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

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

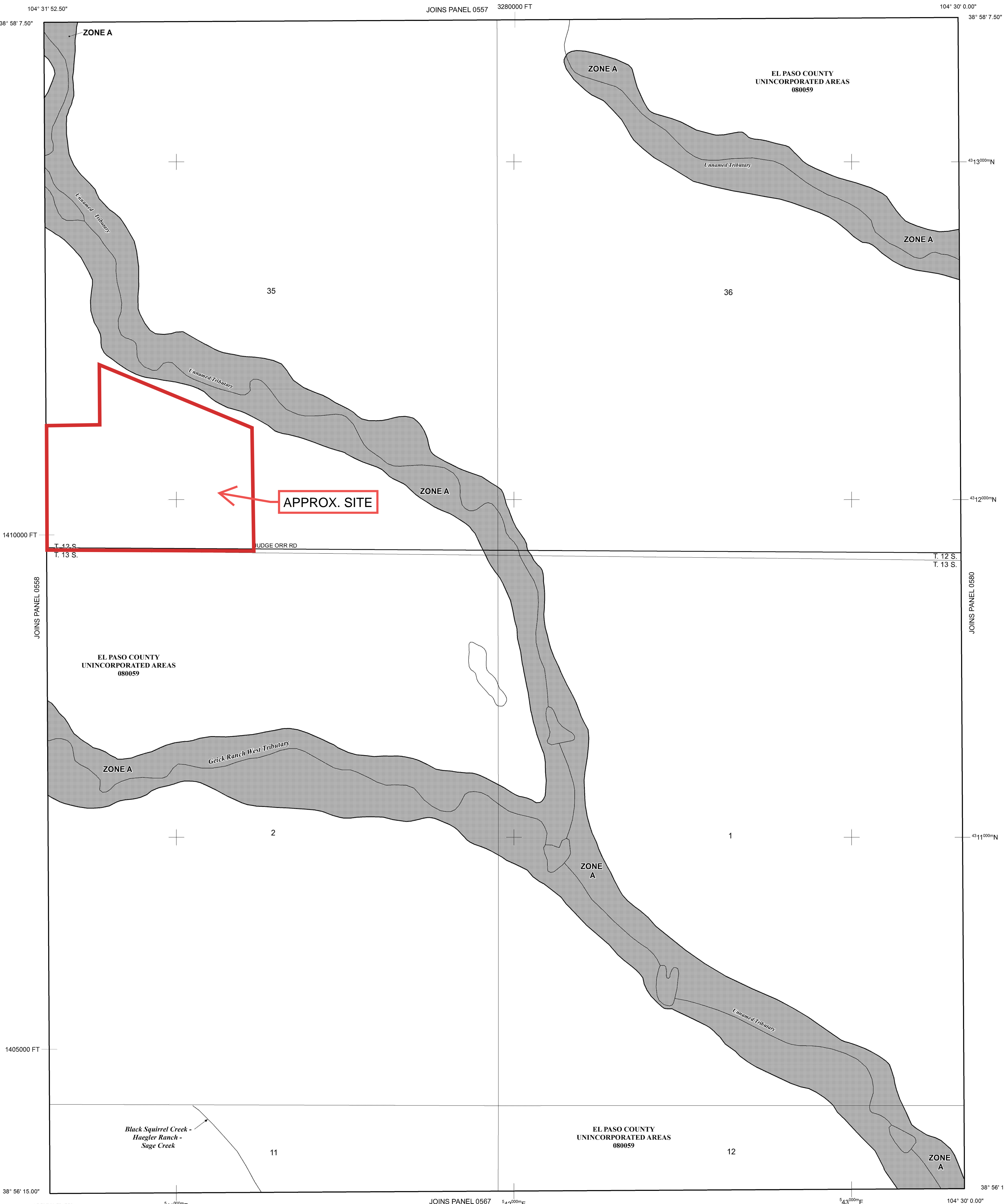
Panel Location Map



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NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 64 WEST, AND TOWNSHIP 13 SOUTH, RANGE 64 WEST.

LEGEND

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- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
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- ZONE AR** Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE D Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary

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

Base Flood Elevation line and value; elevation in feet* (EL 987)
Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

Cross section line

Transsect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

1000-meter Universal Transverse Mercator grid ticks, zone 13

5000-foot grid ticks; Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection

Bench mark (see explanation in Notes to Users section of this FIRM panel)

River Mile

MAP REPOSITORIES

Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

MARCH 17, 1997

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

DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

PANEL 0559G

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

PANEL 559 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

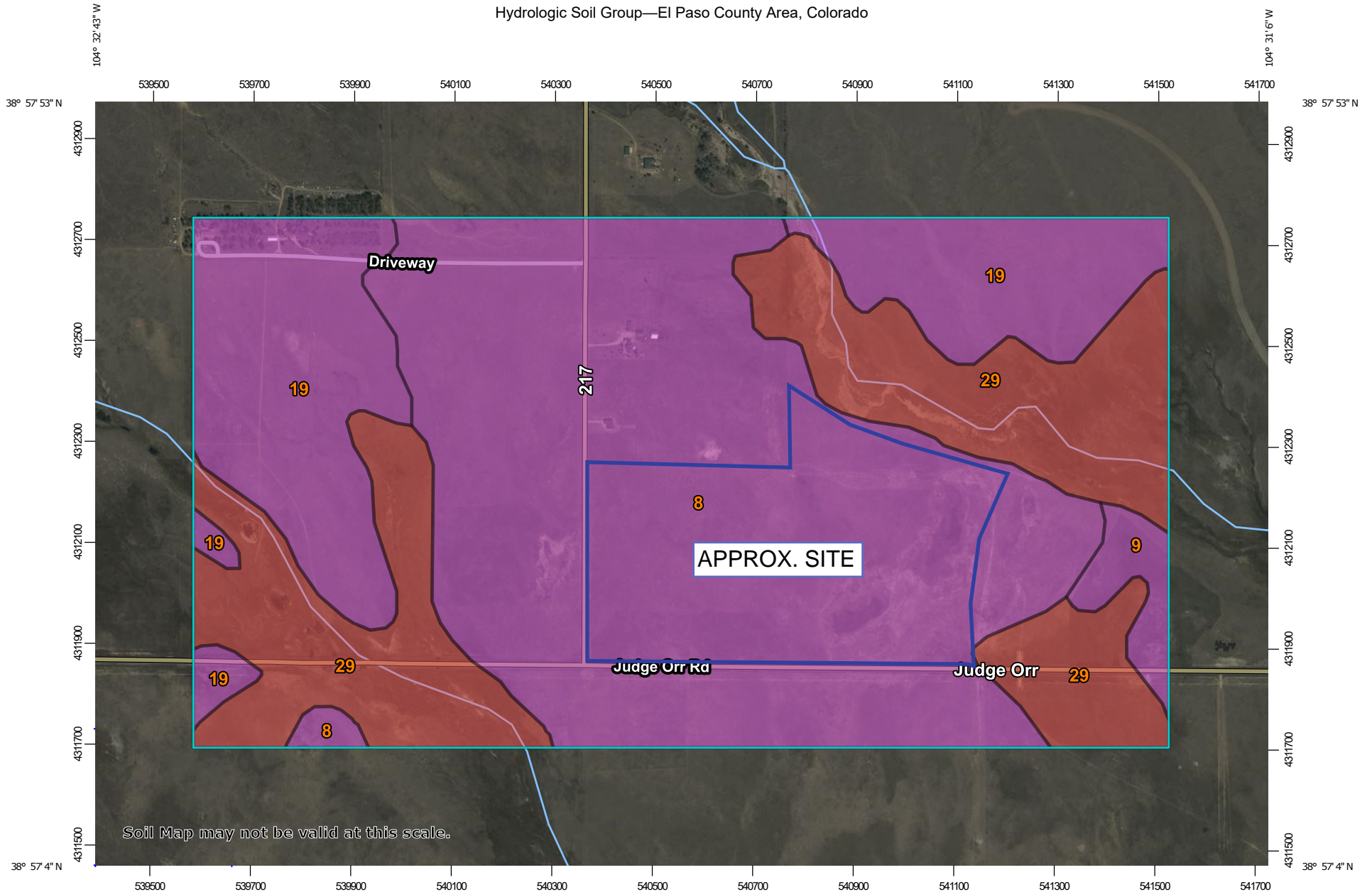
CONTAINS:	COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0559	G	

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

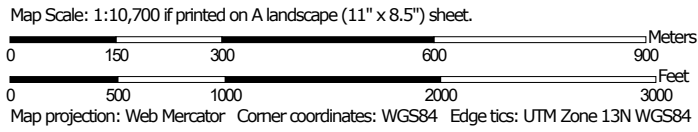
MAP NUMBER
08041C0559G

MAP REVISED
DECEMBER 7, 2018
Federal Emergency Management Agency

Hydrologic Soil Group—El Paso County Area, Colorado




Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





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

Soil Rating Lines

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

Soil Rating Points






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

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


Water Features

 Streams and Canals

Transportation

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

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	263.4	52.0%
9	Blakeland-Fluvaquentic Haplaquolls	A	9.5	1.9%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	103.9	20.5%
29	Fluvaquentic Haplaquolls, nearly level	D	129.3	25.5%
Totals for Area of Interest			506.1	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX B

HYDROLOGIC CALCULATIONS

EXISTING COMPOSITE % IMPERVIOUS/C VALUE CALCULATIONS

Subdivision: BOCES Campus
 Location: El Paso County

Project Name: BOCES Campus
 Project No.: 25301.00
 Calculated By: GAG
 Checked By: _____
 Date: 5/14/24

Basin ID	Total Area (ac)	Hardscape (100% Impervious)				Business-Neighborhood (70% Impervious)				Residential-1/8 Acre (65% Impervious)				Undeveloped (2% Impervious)				Basin Total Weighted C		Basins Total Weighted % Imp.
		C ₅	C ₁₀₀	Area (ac)	Weighted % Imp.	C ₅	C ₁₀₀	Area (ac)	Weighted % Imp.	C ₅	C ₁₀₀	Area (ac)	Weighted % Imp.	C ₅	C ₁₀₀	Area (ac)	Weighted % Imp.	C ₅	C ₁₀₀	
EX-A	37.0	0.90	0.96	0.00	0.0%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	37.0	2.0%	0.09	0.36	2.0%
EX-B	14.7	0.90	0.96	0.00	0.0%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	14.7	2.0%	0.09	0.36	2.0%
EX-C	34.8	0.90	0.96	0.00	0.0%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	34.8	2.0%	0.09	0.36	2.0%
OS1	40.1	0.90	0.96	1.19	3.0%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	38.9	1.9%	0.11	0.38	4.9%
OS2	2.73	0.90	0.96	0.00	0.0%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	2.73	2.0%	0.09	0.36	2.0%
OS3	1.11	0.90	0.96	0.49	44.1%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	0.62	1.1%	0.45	0.62	45.3%
OS4	0.75	0.90	0.96	0.29	38.7%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	0.46	1.2%	0.40	0.59	39.9%
OS5	10.8	0.90	0.96	0.00	0.0%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	10.8	2.0%	0.09	0.36	2.0%
Total On-Site	86.5																			2.0%

EXISTING STANDARD FORM SF-2 TIME OF CONCENTRATION

Subdivision: BOCES Campus
Location: El Paso County

Project Name: BOCES Campus
Project No.: 25301.00
Calculated By: GAG
Checked By: _____
Date: 5/14/24

SUB-BASIN						INITIAL/OVERLAND			TRAVEL TIME					tc CHECK			FINAL
DATA						(T _i)			(T _t)					(URBANIZED BASINS)			
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C ₅	C ₁₀₀	L (ft)	S _o (%)	t _i (min)	L _t (ft)	S _t (%)	K	VEL. (ft/s)	t _t (min)	COMP. t _c (min)	TOTAL LENGTH (ft)	Urbanized t _c (min)	t _c (min)
EX-A	37.0	A	2%	0.09	0.36	300	3.0%	22.0	1415	2.5%	7.0	1.1	21.3	43.3	1715.0	41.7	41.7
EX-B	14.7	A	2%	0.09	0.36	300	8.0%	15.9	355	2.0%	7.0	1.0	6.0	21.9	655.0	30.2	21.9
EX-C	34.8	A	2%	0.09	0.36	300	2.0%	25.1	1155	4.0%	7.0	1.4	13.8	38.9	1455.0	36.0	36.0
OS1	40.1	A	5%	0.11	0.38	300	2.0%	24.5	2390	1.0%	7.0	0.7	56.9	81.4	2690.0	66.3	66.3
OS2	2.73	A	2%	0.09	0.36	300	4.0%	20.0	40	3.0%	7.0	1.2	0.5	20.5	340.0	26.1	20.5
OS3	1.11	A	45%	0.45	0.62	30	2.0%	5.1	1520	2.0%	20.0	2.8	9.0	14.1	1550.0	30.0	14.1
OS4	0.75	A	40%	0.40	0.59	30	2.0%	5.5	1030	4.0%	20.0	4.0	4.3	9.8	1060.0	25.1	10.0
OS5	10.8	A	2%	0.09	0.36	300	2.0%	25.1	1060	1.5%	7.0	0.9	20.6	45.7	1360.0	41.2	41.2

NOTES:

$$t_c = t_i + t_t$$

Equation 6-2

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

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

Equation 6-4

Where:

t_t = channelized flow time (travel time, min)

L_t = waterway length (ft)

S_o = waterway slope (ft/ft)

V_t = travel time velocity (ft/sec) = K√S_o

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

$$t_i = \frac{0.395(1.1 - C_3)\sqrt{L_i}}{S_o^{0.33}}$$

Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)

C₃ = runoff coefficient for 5-year frequency (from Table 6-4)

L_i = length of overland flow (ft)

S_o = average slope along the overland flow path (ft/ft).

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

Equation 6-5

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.

L_t = length of channelized flow path (ft)

i = imperviousness (expressed as a decimal)

S_t = slope of the channelized flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

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

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

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

Subdivision: BOCES Campus
Location: El Paso County
Design Storm: 5-Year

Project Name: BOCES Campus
Project No.: 25301.00
Calculated By: GAG
Checked By: _____
Date: 5/14/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE			TRAVEL TIME			REMARKS	
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)		t_t (min)
	1	OS1	40.10	0.11	66.3	4.57	1.29	5.9															Off-site sheet flows to Elbert Road roadside swale Across intersection to Judge Orr roadside swale at DP2.1
		OS2	2.73	0.09	20.5	0.25	3.05	0.8															Off-site basin sheet flows to Basin EX-A Combines flow at DP2
		EX-A	37.00	0.09	41.7	3.33	1.99	6.6															Basin flows sheet flow to south basin boundary Combines flow at DP2
		OS3	1.11	0.45	14.1	0.50	3.61	1.8															Off-site basin flows of Judge Orr road to swale Combines flow at DP2
	2								41.7	4.08	1.99	8.1											Combines flow of Basins OS2, OS3, and EX-A Combines flow at swale at DP2.1
	2.1								66.3	8.65	1.29	11.2											Combines flow of DP1 and DP2 Flows within Judge Orr roadside swale to DP3.1
		EX-B	14.70	0.09	21.9	1.32	2.95	3.9															Basin flows sheet flow to south basin boundary Combines flow at DP3
		OS4	0.75	0.40	10.0	0.30	4.13	1.2															Off-site basin flows of Judge Orr road to swale Combines flow at DP3
	3								21.9	1.62	2.95	4.8											Combines flow of Basins EX-B and OS4 Combines flow at swale at DP3.1
	3.1								66.3	10.27	1.29	13.3											Combines flow of DP2 and DP3 Flows off-site to the east along Judge Orr roadway
		OS5	10.80	0.09	41.2	0.97	2.01	1.9															Off-site basin sheet flows to Basin EX-C Combines flow at DP4
		EX-C	34.80	0.09	36.0	3.13	2.21	6.9															Basin flows sheet flow to north basin boundary Combines flow at DP4
	4								41.2	4.10	2.01	8.2											Combines flow of Basins OS5 and EX-C Flows off-site to the east to existing drainageway

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

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

Subdivision: BOCES Campus
 Location: El Paso County
 Design Storm: 100-Year

Project Name: BOCES Campus
 Project No.: 25301.00
 Calculated By: GAG
 Checked By: _____
 Date: 5/14/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t _c (min)	C*A (ac)	I (in/hr)	Q (cfs)	t _c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q _{street} (cfs)	C*A (ac)	Slope (%)	Q _{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t _t (min)	
	1	OS1	40.10	0.38	66.3	15.15	2.17	32.8															Off-site sheet flows to Elbert Road roadside swale Across intersection to Judge Orr roadside swale at DP2.1
		OS2	2.73	0.36	20.5	0.98	5.12	5.0															Off-site basin sheet flows to Basin EX-A Combines flow at DP2
		EX-A	37.00	0.36	41.7	13.32	3.33	44.4															Basin flows sheet flow to south basin boundary Combines flow at DP2
		OS3	1.11	0.62	14.1	0.69	6.07	4.2															Off-site basin flows of Judge Orr road to swale Combines flow at DP2
	2								41.7	14.99	3.33	49.9											Combines flow of Basins OS2, OS3, and EX-A Combines flow at swale at DP2.1
	2.1								66.3	30.14	2.17	65.3											Combines flow of DP1 and DP2 Flows within Judge Orr roadside swale to DP3.1
		EX-B	14.70	0.36	21.9	5.29	4.96	26.2															Basin flows sheet flow to south basin boundary Combines flow at DP3
		OS4	0.75	0.59	10.0	0.44	6.93	3.1															Off-site basin flows of Judge Orr road to swale Combines flow at DP3
	3								21.9	5.73	4.96	28.4											Combines flow of Basins EX-B and OS4 Combines flow at swale at DP3.1
	3.1								66.3	35.87	2.17	77.7											Combines flow of DP2 and DP3 Flows off-site to the east along Judge Orr roadway
		OS5	10.80	0.36	41.2	3.89	3.36	13.1															Off-site basin sheet flows to Basin EX-C Combines flow at DP4
		EX-C	34.80	0.36	36.0	12.53	3.70	46.4															Basin flows sheet flow to north basin boundary Combines flow at DP4
	4								41.2	16.42	3.36	55.2											Combines flow of Basins OS5 and EX-C Flows off-site to the east to existing drainageway
Notes: Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.																							

PROPOSED COMPOSITE % IMPERVIOUS/C VALUE CALCULATIONS

Subdivision: BOCES Campus
 Location: El Paso County

Project Name: BOCES Campus
 Project No.: 25301.00
 Calculated By: GAG
 Checked By: _____
 Date: 6/25/24

Basin ID	Total Area (ac)	Hardscape (100% Impervious)				Business-Neighborhood (70% Impervious)				Residential-1/8 Acre (65% Impervious)				Undeveloped/Open Space (2% Impervious)				Basin Total Weighted C		Basins Total Weighted % Imp.
		C ₅	C ₁₀₀	Area (ac)	Weighted % Imp.	C ₅	C ₁₀₀	Area (ac)	Weighted % Imp.	C ₅	C ₁₀₀	Area (ac)	Weighted % Imp.	C ₅	C ₁₀₀	Area (ac)	Weighted % Imp.	C ₅	C ₁₀₀	
A	0.30	0.90	0.96	0.00	0.0%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	0.30	2.0%	0.09	0.36	2.0%
B	69.9	0.90	0.96	0.00	0.0%	0.49	0.62	27.6	27.6%	0.45	0.59	25.8	24.0%	0.09	0.36	16.5	0.5%	0.38	0.55	52.1%
C	2.46	0.90	0.96	0.00	0.0%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	2.46	2.0%	0.09	0.36	2.0%
D	13.9	0.90	0.96	0.00	0.0%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	13.90	2.0%	0.09	0.36	2.0%
OS1	40.3	0.90	0.96	1.66	4.1%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	38.64	1.9%	0.12	0.38	6.0%
OS2	2.67	0.90	0.96	0.00	0.0%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	2.67	2.0%	0.09	0.36	2.0%
OS3	1.85	0.90	0.96	0.78	42.2%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	1.07	1.2%	0.43	0.61	43.3%
OS4	10.8	0.90	0.96	0.00	0.0%	0.49	0.62	0.00	0.0%	0.45	0.59	0.00	0.0%	0.09	0.36	10.80	2.0%	0.09	0.36	2.0%
Total On-Site	86.6																			42.5%
Total Pond	72.6																			50.3%

PROPOSED STANDARD FORM SF-2 TIME OF CONCENTRATION

Subdivision: BOCES Campus
Location: El Paso County

Project Name: BOCES Campus
Project No.: 25301.00
Calculated By: GAG
Checked By: _____
Date: 6/25/24

SUB-BASIN						INITIAL/OVERLAND			TRAVEL TIME					t _c CHECK			FINAL
DATA						(T _i)			(T _t)					(URBANIZED BASINS)			
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C ₅	C ₁₀₀	L (ft)	S _o (%)	t _i (min)	L _t (ft)	S _t (%)	K	VEL. (ft/s)	t _t (min)	COMP. t _c (min)	TOTAL LENGTH (ft)	Urbanized t _c (min)	t _c (min)
A	0.30	A	2%	0.09	0.36	10	2.0%	4.6	0	0.0%	20.0	0.0	0.0	4.6	10.0	25.7	5.0
B	69.9	A	52%	0.38	0.55	100	3.0%	9.0	3350	3.0%	20.0	3.5	16.1	25.2	3450.0	36.9	25.2
C	2.46	A	2%	0.09	0.36	300	0.5%	39.7	355	3.0%	7.0	1.2	4.9	44.6	655.0	29.3	29.3
D	13.9	A	2%	0.09	0.36	300	2.0%	25.1	1155	4.0%	7.0	1.4	13.8	38.9	1455.0	36.0	36.0
OS1	40.3	A	6%	0.12	0.38	300	2.0%	24.3	2390	1.0%	7.0	0.7	56.9	81.2	2690.0	65.4	65.4
OS2	2.67	A	2%	0.09	0.36	300	4.0%	20.0	40	3.0%	7.0	1.2	0.5	20.5	340.0	26.1	20.5
OS3	1.85	A	43%	0.43	0.61	30	2.0%	5.3	2560	3.0%	20.0	3.5	12.3	17.6	2590.0	35.0	17.6
OS4	10.8	A	2%	0.09	0.36	300	2.0%	25.1	1060	1.5%	7.0	0.9	20.6	45.7	1360.0	41.2	41.2

NOTES:

$$t_c = t_i + t_t$$

Equation 6-2

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$

Equation 6-3

Table 6-2. NRCS Conveyance factors, K

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

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

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

Equation 6-4

Where:

t_i = overland (initial) flow time (minutes)

C₅ = runoff coefficient for 5-year frequency (from Table 6-4)

L_i = length of overland flow (ft)

S_o = average slope along the overland flow path (ft/ft).

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

Equation 6-5

Where:

t_t = channelized flow time (travel time, min)

L_t = waterway length (ft)

S_o = waterway slope (ft/ft)

V_t = travel time velocity (ft/sec) = K√S_o

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

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.

L_t = length of channelized flow path (ft)

i = imperviousness (expressed as a decimal)

S_t = slope of the channelized flow path (ft/ft).

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

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

Subdivision: BOCES Campus
Location: El Paso County
Design Storm: 5-Year

Project Name: BOCES Campus
Project No.: 25301.00
Calculated By: GAG
Checked By: _____
Date: 6/25/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE			TRAVEL TIME			REMARKS	
		Basin ID	Area (Ac)	Runoff Coeff.	t _c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t _c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q _{street} (cfs)	C*A (ac)	Slope (%)	Q _{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)		t _t (min)
		OS1	40.30	0.12	65.4	4.97	1.31	6.5															Off-site sheet flows to Elbert Road roadside swale Across intersection to Judge Orr roadside swale at DP1
		A	0.30	0.09	5.0	0.03	5.17	0.2															Flows along realigned Elbert Road road swale Across intersection to Judge Orr roadside swale at DP1
	1								65.4	5.00	1.31	6.6											Combines flow of Basin OS1 and A Combines flow at road swale at DP3.1
		OS2	2.67	0.09	20.5	0.24	3.05	0.7															Off-site basin sheet flows to Basin B Combines flow at the EDB at DP2
		B	69.90	0.38	25.2	26.62	2.75	73.1															Developed flows captured via storm sewer Directed to the EDB at DP2
	2								25.2	26.86	2.75	73.7											Combines flow of Basins OS2 and B Flows released through outlet structure at DP2.1
	2.1								-	-	-	1.5											Anticipated controlled release of the outlet structure Released flows combine at road swale at DP3.1
		C	2.46	0.09	29.3	0.22	2.51	0.6															Basin flows sheet flow to south to basin boundary Combines flow at DP3
		OS3	1.85	0.43	17.6	0.80	3.28	2.6															Off-site basin flows of Judge Orr Road to road swale Combines flow at road swale at DP3
	3								29.3	1.02	2.51	2.6											Combines flow of Basins C and OS3 Combines flow at road swale at DP3.1
	3.1								65.4	6.02	1.31	9.4											Combines flow of DP1, DP2.1 and DP3 Flows off-site to the east along Judge Orr roadway
		OS4	10.80	0.09	41.2	0.97	2.01	1.9															Off-site basin sheet flows to Basin EX-C Combines flow at DP4
		D	13.90	0.09	36.0	1.25	2.21	2.8															Basin flows sheet flow to north basin boundary Combines flow at DP4
	4								41.2	2.22	2.01	4.5											Combines flow of Basins OS4 and D Flows off-site to the east to existing drainageway
Notes: Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.																							

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

Subdivision: BOCES Campus
 Location: El Paso County
 Design Storm: 100-Year

Project Name: BOCES Campus
 Project No.: 25301.00
 Calculated By: GAG
 Checked By: _____
 Date: 6/25/24

STREET	Design Point	DIRECT RUNOFF						TOTAL RUNOFF				STREET			PIPE			TRAVEL TIME			REMARKS		
		Basin ID	Area (ac)	Runoff Coeff.	t _c (min)	C*A (ac)	I (in/hr)	Q (cfs)	t _c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q _{street} (cfs)	C*A (ac)	Slope (%)	Q _{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)		Velocity (fps)	t _t (min)
		OS1	40.30	0.38	65.4	15.50	2.20	34.1															Off-site sheet flows to Elbert Road roadside swale Across intersection to Judge Orr roadside swale at DP1
		A	0.30	0.36	5.0	0.11	8.68	1.0															Flows along realigned Elbert Road road swale Across intersection to Judge Orr roadside swale at DP1
	1								65.4	15.61	2.20	34.3											Combines flow of Basin OS1 and A Combines flow at road swale at DP3.1
		OS2	2.67	0.36	20.5	0.96	5.12	4.9															Off-site basin sheet flows to Basin B Combines flow at the EDB at DP2
		B	69.90	0.55	25.2	38.27	4.61	176.3															Developed flows captured via storm sewer Directed to the EDB at DP2
	2								25.2	39.23	4.61	180.8											Combines flow of Basins OS2 and B Flows released through outlet structure at DP2.1
	2.1								-	-	-	20.9											Anticipated controlled release of the outlet structure Released flows combine at road swale at DP3.1
		C	2.46	0.36	29.3	0.89	4.22	3.8															Basin flows sheet flow to south to basin boundary Combines flow at DP3
		OS3	1.85	0.61	17.6	1.13	5.51	6.2															Off-site basin flows of Judge Orr Road to road swale Combines flow at road swale at DP3
	3								29.3	2.02	4.22	8.5											Combines flow of Basins C and OS3 Combines flow at road swale at DP3.1
	3.1								65.4	17.63	2.20	59.7											Combines flow of DP1, DP2.1 and DP3 Flows off-site to the east along Judge Orr roadway
		OS4	10.80	0.36	41.2	3.89	3.36	13.1															Off-site basin sheet flows to Basin EX-C Combines flow at DP4
		D	13.90	0.36	36.0	5.00	3.70	18.5															Basin flows sheet flow to north basin boundary Combines flow at DP4
	4								41.2	8.89	3.36	29.9											Combines flow of Basins OS4 and D Flows off-site to the east to existing drainageway

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

APPENDIX C

HYDRAULIC CALCULATIONS

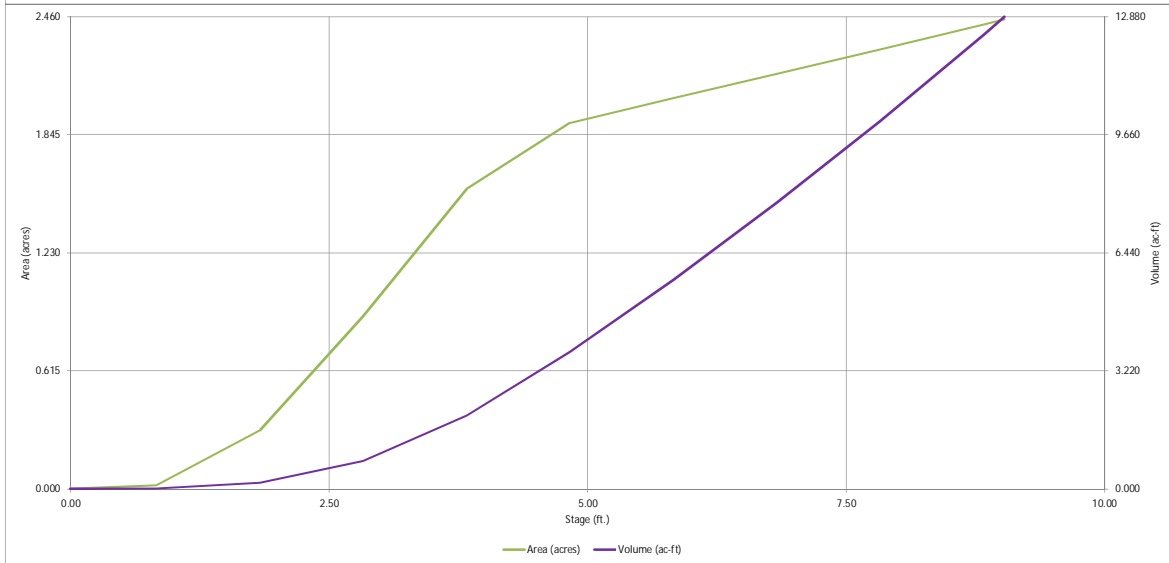
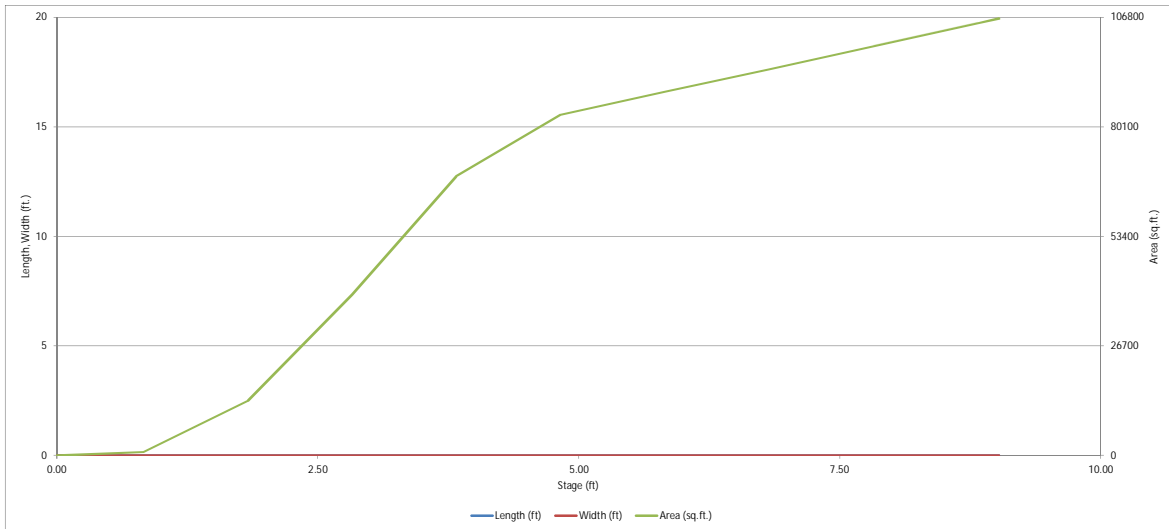
(N/A)

APPENDIX D

WATER QUALITY AND DETENTION CALCULATIONS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

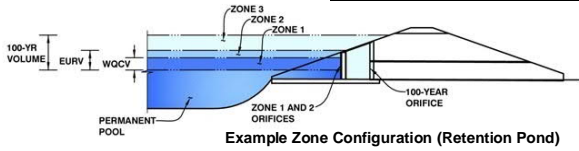
MHFD-Detention, Version 4.06 (July 2022)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: BOCES Campus
Basin ID: Full-spectrum EDB



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WOCV)	3.31	1.271	Orifice Plate
Zone 2 (EURV)	5.14	3.045	Circular Orifice
Zone 3 (100-year)	6.37	2.509	Weir&Pipe (Restrict)
Total (all zones)		6.825	

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

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

Calculated Parameters for Underdrain

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

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.32	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	13.30	inches
Orifice Plate: Orifice Area per Row =	3.76	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WO Orifice Area per Row =	2.611E-02	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.11	2.21					
Orifice Area (sq. inches)	3.76	3.76	3.76					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	3.31	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	5.14	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	4.86	N/A	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.13	N/A	ft ²
Vertical Orifice Centroid =	0.20	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.50	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Gate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Gate Type =	Close Mesh Gate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Gate Upper Edge, H ₁ =	5.50	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Gate Open Area / 100-yr Orifice Area =	7.16	N/A	
Overflow Gate Open Area w/o Debris =	12.66	N/A	ft ²
Overflow Gate Open Area w/ Debris =	6.33	N/A	ft ²

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

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

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

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	100.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.46	feet
Stage at Top of Freeboard =	8.46	feet
Basin Area at Top of Freeboard =	2.37	acres
Basin Volume at Top of Freeboard =	11.50	acre-ft

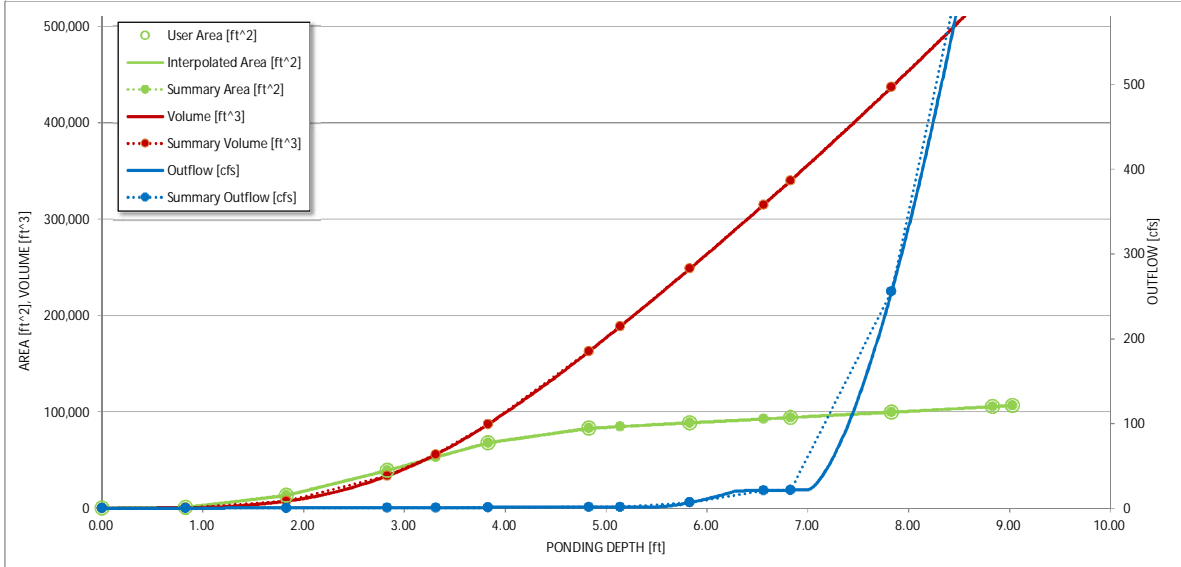
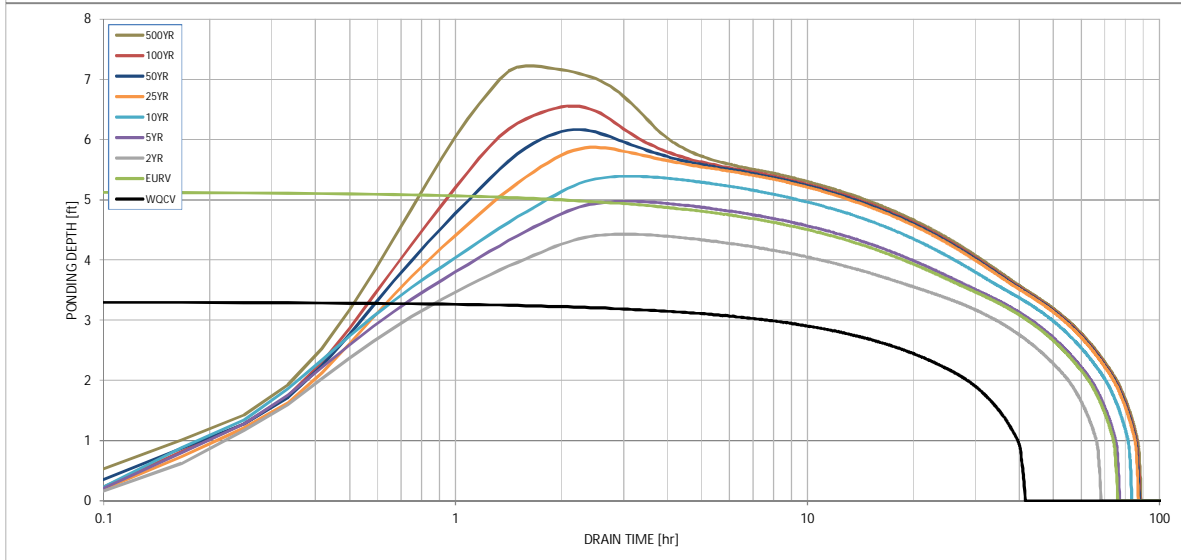
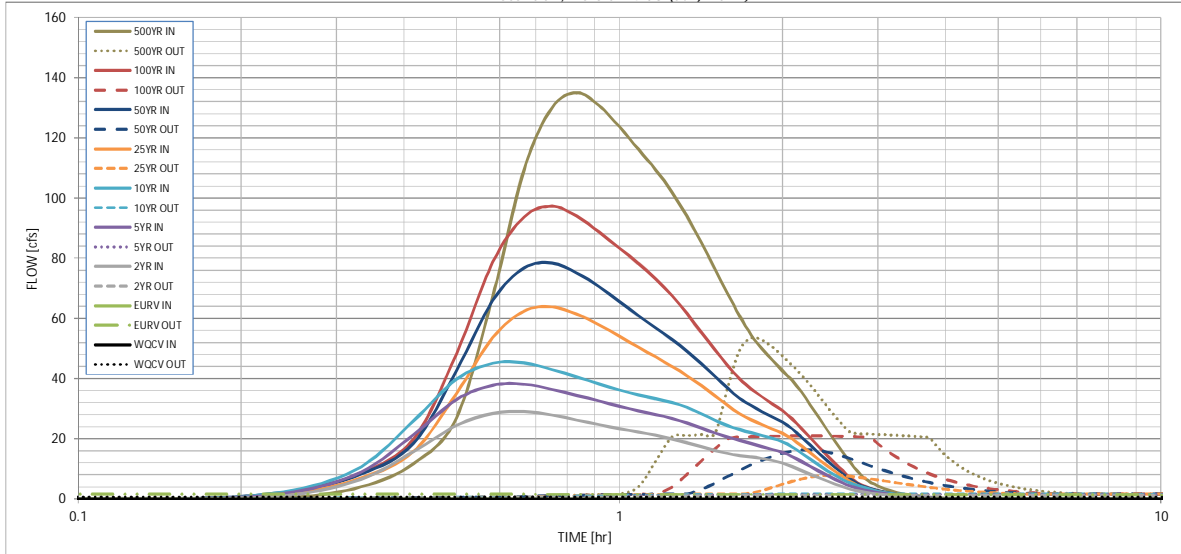
Routed Hydrograph Results

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

	WOCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	1.271	4.317	3.257	4.324	5.177	6.508	7.805	9.449	13.010
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.257	4.324	5.177	6.508	7.805	9.449	13.010
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	0.5	0.7	6.8	13.8	23.1	43.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.09	0.19	0.32	0.59
Peak Inflow Q (cfs) =	N/A	N/A	29.0	38.1	45.1	63.8	78.4	97.3	135.0
Peak Outflow Q (cfs) =	0.5	1.5	1.3	1.5	1.6	7.8	16.2	20.9	53.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.8	2.2	1.1	1.2	0.9	1.2
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.5	1.1	1.5	1.6
Max Velocity through Gate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	67	61	69	74	76	75	73	70
Time to Drain 99% of Inflow Volume (hours) =	40	72	65	73	79	82	82	81	80
Maximum Ponding Depth (ft) =	3.31	5.14	4.43	4.97	5.39	5.87	6.16	6.56	7.22
Area at Maximum Ponding Depth (acres) =	1.22	1.95	1.76	1.92	1.98	2.04	2.08	2.13	2.21
Maximum Volume Stored (acre-ft) =	1.282	4.335	2.986	4.006	4.826	5.791	6.388	7.207	8.661

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.02	0.54
	0:15:00	0.00	0.00	1.45	2.35	2.93	1.98	2.63	2.44	4.00
	0:20:00	0.00	0.00	6.49	8.93	10.69	6.89	8.26	8.60	11.74
	0:25:00	0.00	0.00	15.76	21.40	25.98	15.84	18.52	19.94	27.04
	0:30:00	0.00	0.00	24.41	32.98	39.78	35.10	42.68	48.37	67.40
	0:35:00	0.00	0.00	28.41	37.80	45.05	53.62	65.94	78.64	109.45
	0:40:00	0.00	0.00	29.03	38.10	45.15	62.40	76.75	93.75	129.99
	0:45:00	0.00	0.00	27.88	36.41	43.01	63.79	78.38	97.27	135.00
	0:50:00	0.00	0.00	26.20	34.41	40.51	61.38	75.06	93.98	130.75
	0:55:00	0.00	0.00	24.66	32.53	38.23	57.88	70.52	88.65	123.63
	1:00:00	0.00	0.00	23.31	30.73	36.18	54.03	65.54	83.30	116.16
	1:05:00	0.00	0.00	22.25	29.25	34.58	50.45	60.94	78.34	109.33
	1:10:00	0.00	0.00	21.16	28.04	33.28	47.16	56.81	73.11	102.00
	1:15:00	0.00	0.00	19.90	26.73	32.00	44.11	52.96	67.51	93.87
	1:20:00	0.00	0.00	18.60	25.17	30.41	40.94	48.99	61.56	85.27
	1:25:00	0.00	0.00	17.30	23.48	28.34	37.62	44.88	55.44	76.51
	1:30:00	0.00	0.00	16.09	21.89	26.19	34.28	40.77	49.68	68.31
	1:35:00	0.00	0.00	15.09	20.55	24.34	31.05	36.78	44.34	60.72
	1:40:00	0.00	0.00	14.40	19.45	23.04	28.29	33.42	39.88	54.48
	1:45:00	0.00	0.00	13.90	18.40	22.00	26.26	30.97	36.59	49.86
	1:50:00	0.00	0.00	13.44	17.38	21.05	24.61	28.96	33.91	46.01
	1:55:00	0.00	0.00	12.76	16.43	20.09	23.16	27.18	31.52	42.57
	2:00:00	0.00	0.00	11.89	15.47	18.97	21.79	25.52	29.30	39.39
	2:05:00	0.00	0.00	10.76	14.11	17.27	19.92	23.28	26.55	35.57
	2:10:00	0.00	0.00	9.47	12.45	15.20	17.62	20.55	23.38	31.25
	2:15:00	0.00	0.00	8.22	10.81	13.16	15.31	17.82	20.26	27.02
	2:20:00	0.00	0.00	7.05	9.25	11.23	13.10	15.21	17.29	22.98
	2:25:00	0.00	0.00	5.97	7.82	9.46	11.05	12.77	14.49	19.17
	2:30:00	0.00	0.00	4.95	6.47	7.83	9.13	10.49	11.84	15.56
	2:35:00	0.00	0.00	4.02	5.26	6.39	7.35	8.39	9.36	12.18
	2:40:00	0.00	0.00	3.24	4.24	5.21	5.78	6.52	7.14	9.16
	2:45:00	0.00	0.00	2.67	3.52	4.35	4.50	5.06	5.41	6.94
	2:50:00	0.00	0.00	2.24	2.97	3.67	3.62	4.05	4.23	5.41
	2:55:00	0.00	0.00	1.88	2.50	3.09	2.95	3.29	3.36	4.27
	3:00:00	0.00	0.00	1.58	2.09	2.59	2.42	2.69	2.68	3.37
	3:05:00	0.00	0.00	1.33	1.74	2.16	1.98	2.21	2.15	2.67
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	3:25:00	0.00	0.00	0.64	0.80	0.99	0.90	1.00	0.92	1.12
	3:30:00	0.00	0.00	0.51	0.64	0.79	0.72	0.79	0.74	0.90
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	3:55:00	0.00	0.00	0.09	0.13	0.15	0.15	0.16	0.15	0.17
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	4:05:00	0.00	0.00	0.02	0.04	0.04	0.04	0.04	0.04	0.04
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	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX E
REFERENCE MATERIALS

**GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
El Paso County, Colorado**

Volume 1 – Final Report

October 1, 2007

Revised: February 10, 2010

PREPARED FOR:

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DBC Project Number: C-7706-2

I. Project Description, Location and Drainage

A. Basin Description and Location

Figure 1.0 shows the location of the Gieck Ranch Drainage Basin. The basin covers a total area of 22.05 square miles within unincorporated El Paso County. The basin begins approximately five miles northeast of the Town of Falcon in El Paso County at an elevation of approximately 7,300 feet above mean sea level (msl). From this point, drainage from the basin travels approximately 15 miles to the southeast. An aerial photograph of the basin is included as Figure 1.1 which is located in Volume 2 of this report. The minimum elevation within the basin is approximately 6,100 feet above msl. Channel slope varies considerably across the basin with average channel slopes ranging from 0.5% to 5%. In general, steeper slopes are located at the northern reaches of the basin, while the flatter slopes are located at the southern reaches. The Gieck Ranch Drainage Basin is tributary to Black Squirrel Creek which drains south to its confluence with the Arkansas River near the city of Pueblo, Colorado. The area encompassing the basin is characterized by rolling range land typically associated with Colorado's semi-arid climates. Existing vegetative cover in undeveloped areas is considered fair for the purposes of this report.

While developing this Drainage Basin Planning Study it was determined that a portion of the adjacent Haegler Ranch Basin, approximately 1.4 square miles, is diverted into the Gieck Ranch Basin as shown in Figure 1.0. This diversion occurs just east and immediately upstream of the intersection of Judge Orr Road and Curtis Road. The diversion exists because no culvert was constructed to convey the runoff from the north side of Judge Orr Road to the south side when the road was originally built. Instead, runoff flows east along the northern edge of the road to a culvert located within the Gieck Basin. This condition has existed since the construction of Judge Orr Road. A stakeholder's meeting was held April, 2005 to discuss the impacts of maintaining the diversion or removing it and restoring historic flows. It was decided to maintain the diversion as is, Documentation and correspondence related to the diversion can be found in Section 1 of the Technical Addenda. In addition to the diversion, while delineating the drainage basins using LIDAR based topography, it was determined that there is an additional 1.35 square miles of area in the southeast section that drains into the Gieck Ranch Basin that

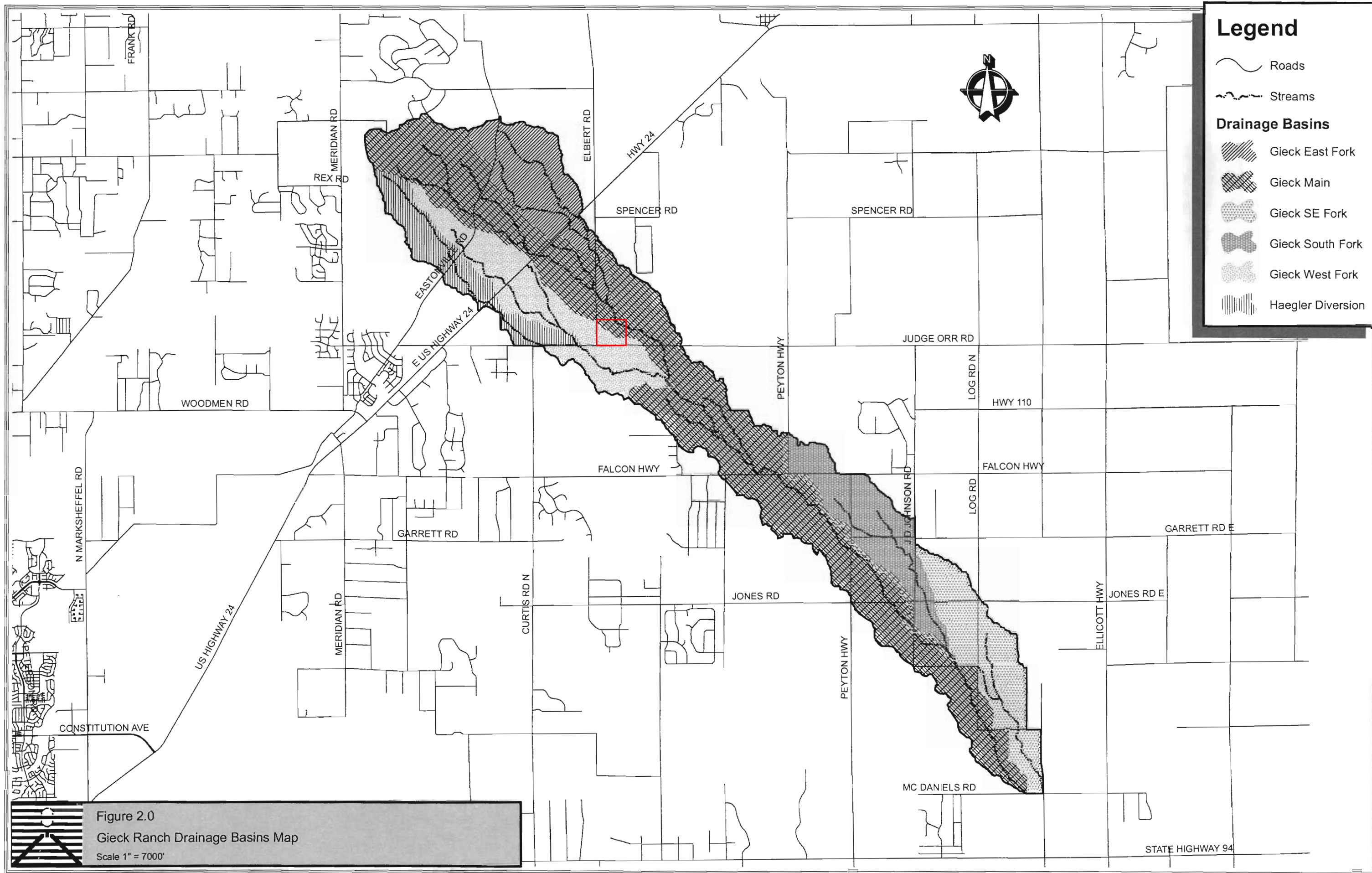
was previously thought to drain into adjacent basins. The total square miles of drainage area for the Gieck Ranch Basin (22.05) includes the 1.4 square miles of drainage area diverted from the Haegler Ranch Basin and the 1.35 square miles of additional drainage area in the southeast section of the basin.

The drainage basin has been subdivided into six major sub-watersheds or drainageways. These include the Main Stem Channel (MS) and five main tributaries, the Haegler Diversion (HD), West Fork (WF), East Fork (EF), South Fork (SF), and Southeast Fork (SE). These major drainageways were determined as those existing drainageways that carry runoff from at least 100 to 160 acres. Figure 2.0 shows the locations of the six main drainageways.

There are several open water storage areas that exist within the basin. They appear to be remnants of former irrigation structures and/or stock watering ponds. They do not appear to be constructed for the purposes of flood control. For modeling purposes they were not evaluated as effective storage. Additionally, remnants of several irrigation facilities associated with former ranch lands can be found within the drainage basin. It is not apparent whether or not these irrigation structures are still used. There do not appear to be any active irrigation ditches within the basin.

B. Climate and Flood History

The region surrounding the City of Falcon is generally classified as semi-arid, with annual precipitation in the range of 14 to 16 inches. The bulk of the precipitation is received during the spring and summer months in the form of thundershowers. Most of the flood-producing storms in El Paso County occur during the summer months when thunderstorms are most intense. Available flood history for El Paso County is almost exclusively concerned with the aspects of flooding on Fountain Creek or Monument Creek urbanized areas, so there is no history of flooding in the Gieck Ranch Basin listed in the El Paso County Flood Insurance Study. However, significant flooding events resulting in damage to roadways and drainage structures have been documented in nearby basins, such as that which occurred in the Haegler Basin in 1995. This indicates that flooding and related damage within the Gieck Ranch Drainage Basin and its tributaries is possible in the future.



Legend

- Roads
- Streams

Drainage Basins

- Gieck East Fork
- Gieck Main
- Gieck SE Fork
- Gieck South Fork
- Gieck West Fork
- Haegler Diversion

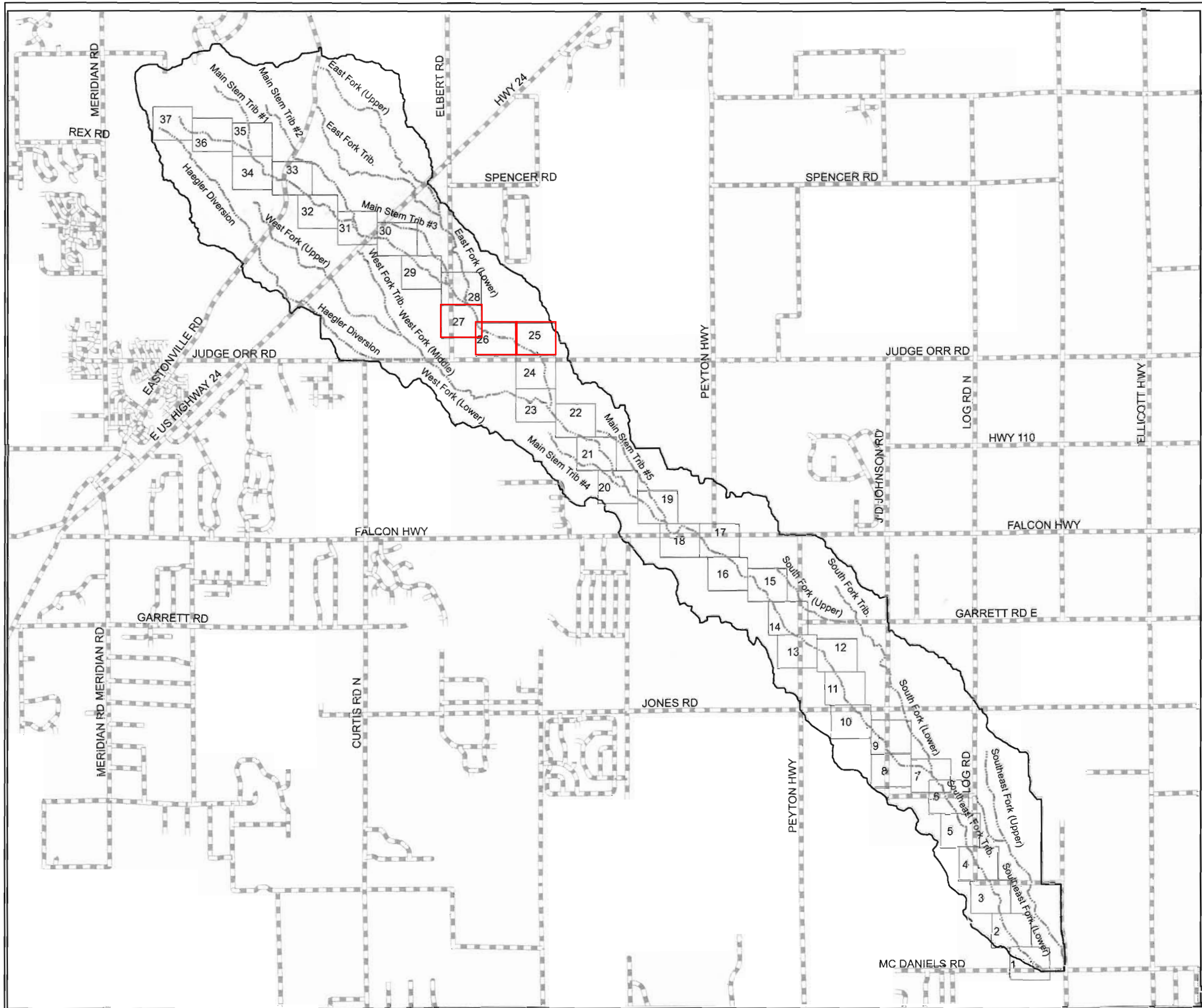
Figure 2.0
 Gieck Ranch Drainage Basins Map
 Scale 1" = 7000'

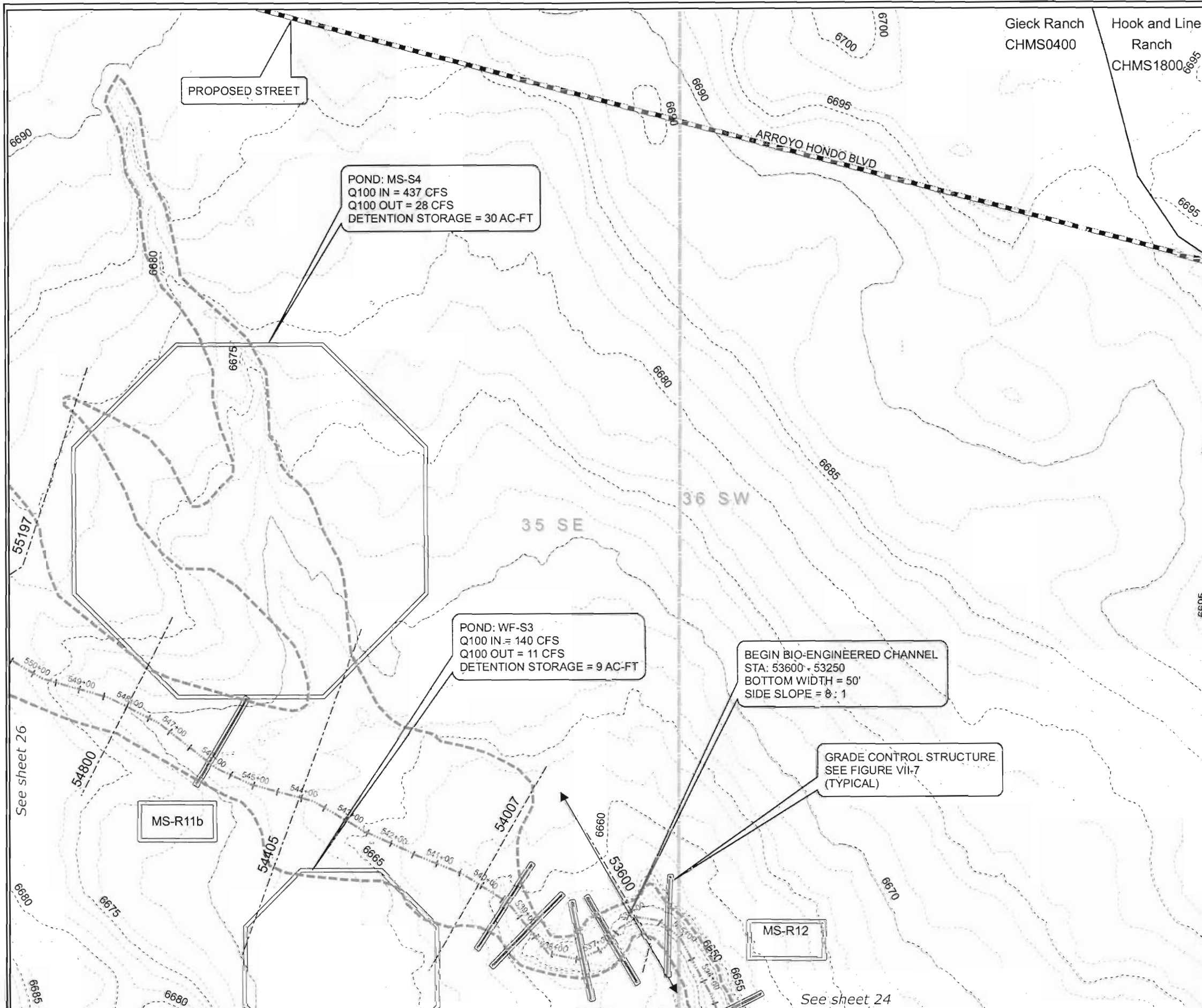


Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

THIS DRAWING IS CONCEPTUAL IN NATURE AND IS NOT TO BE USED AS THE SOLE BASIS FOR FINAL DESIGN, CONSTRUCTION, OR REMEDIAL ACTION. FURTHER STUDIES UNDER EPC DOT'S DIRECTION SHOULD BE PERFORMED PRIOR TO SUCH DECISIONS.





Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- Proposed Future Conditions 100-yr Flood Limits
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

0 100 200 Feet

Reach	Slope (%)	Q ₁₀₀ (cfs)	V ₁₀₀ (ft/s)
MS-R11b	1.74	1774	4.93
MS-R12	0.95	1896	5.60

RECOMMENDED PLAN IMPROVEMENTS

Reach	Improvement
MS-R11b	Selective Stabilization
MS-R12	Selective Stabilization

Note:
See Technical Addenda for grade control data.

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Project info: **GIECK RANCH**
 DRAINAGE BASIN PLANNING STUDY
 EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
 DRAWN BY: BLF/MLM
 CHECKED BY: RJB/TML

REVISION DESCRIPTIONS
 PER EPC/DOT COMMENTS
 PER EPC FINAL REVIEW

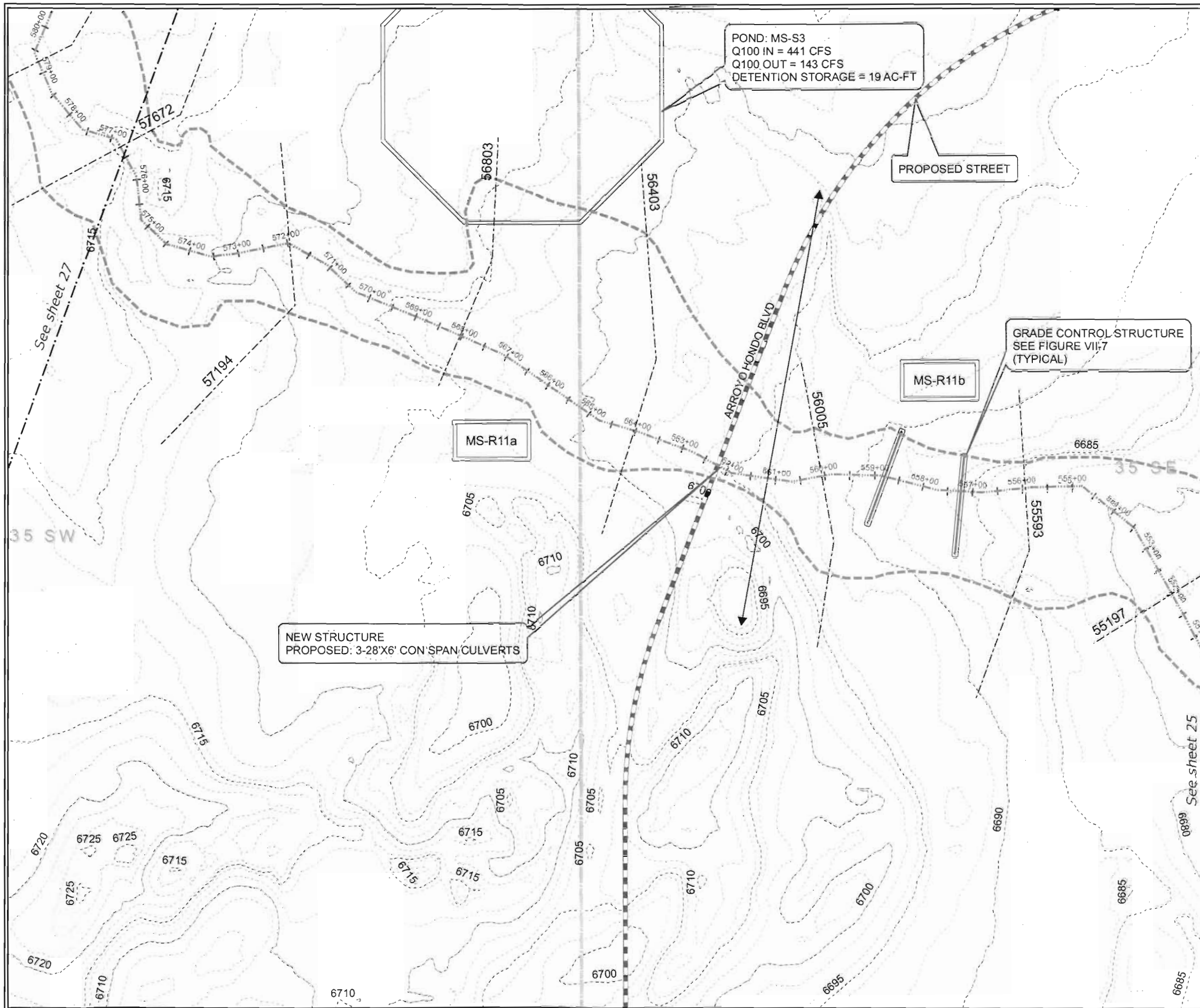
DATE
 FEBRUARY 2008
 JANUARY 2010

DRAWING INFO:
GIECK RANCH DBPS
PLAN VIEW
MAIN STEM #25

DATE: AUGUST 2007
 SCALE: 1" = 200'
 NONE

JOB NO: C7706-2
 DRAWING NO.: 6D 038

SET: PL
 SHEET: 25



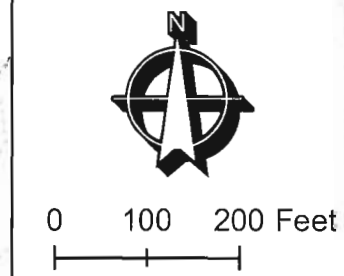
Environmental Key

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- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- Proposed Future Conditions 100-yr Flood Limits
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours



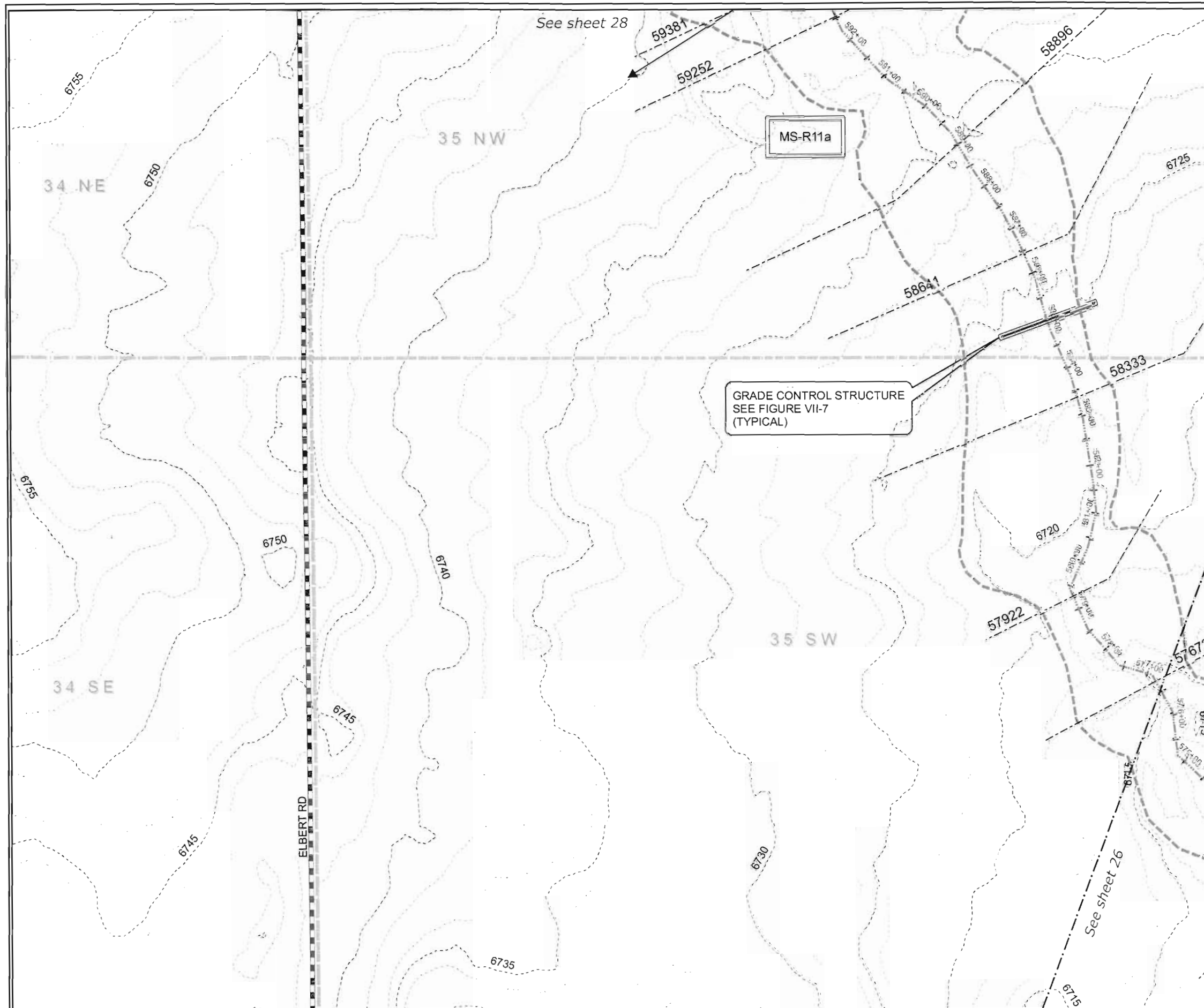
Reach	Slope (%)	Q ₁₀₀ (cfs)	V ₁₀₀ (ft/s)
MS-R11a	1.26	1774	3.80
MS-R11b	1.74	1774	4.93

RECOMMENDED PLAN IMPROVEMENTS

Reach	Improvement
MS-R11a	Selective Stabilization
MS-R11b	Selective Stabilization

Note:
See Technical Addenda for grade control data.

THIS DRAWING IS CONCEPTUAL IN NATURE AND IS NOT TO BE USED AS THE SOLE BASIS FOR FINAL DESIGN, CONSTRUCTION, OR REMEDIAL ACTION. FURTHER STUDIES UNDER EPC DOT'S DIRECTION SHOULD BE PERFORMED PRIOR TO SUCH DECISIONS.



Environmental Key

- Ponds
- Riparian: Good
- Riparian: Poor
- Potential Wetlands

The channel is considered dry unless shown as one of the above environmental categories.

Legend

- Proposed Future Conditions 100-yr Flood Limits
- Streams
- Reaches
- Reach Breaklines
- Cross-sections
- Roads
- Structures
- Section Lines
- 5-ft contours
- 2-ft contours

Reach	Slope (%)	Q ₁₀₀ (cfs)	V ₁₀₀ (ft/s)
MS-R11a	1.26	1774	3.80

RECOMMENDED PLAN IMPROVEMENTS

Reach	Improvement
MS-R11a	Selective Stabilization

THIS DRAWING IS CONCEPTUAL IN NATURE AND IS NOT TO BE USED AS THE SOLE BASIS FOR FINAL DESIGN, CONSTRUCTION, OR REMEDIAL ACTION. FURTHER STUDIES UNDER EPC DOT'S DIRECTION SHOULD BE PERFORMED PRIOR TO SUCH DECISIONS.

A. SUBDIVIDERS

OWNERS: Pikes Peak BOCES, Patrick Bershinsky, Executive Director, 2883 South Circle Drive, Colorado Springs, CO 80906, Pbershinsky@ppbores.org

B. APPLICANT

APPLICANT | PLANNER | LANDSCAPE ARCHITECT: William Guman & Associates, Ltd., Attn: Bill Guman, P.L.A., A.S.I.A., A.P.A., 731 North Weber Street, Suite 10, Colorado Springs, CO 80903, bill@guman.net

ENGINEER: JR Engineering, Attn: Bryan T. Law, PE, 5475 Tech Center Drive, Suite 235, Colorado Springs, CO 80919, blaw@jrengineering.com

ENVIRONMENTAL: Ecosystem Services, LLC, Attn: Grant Gurnee, PWS, 1455 Washburn Street, Erie, CO 80516, grant@ecologicalbenefits.com

TRANSPORTATION: JR Engineering, Attn: Bryan T. Law, PE, 5475 Tech Center Drive, Suite 235, Colorado Springs, CO 80919, blaw@jrengineering.com

WATER HYDROLOGY: GMS, Attn: Roger J. Sams, 611 N. Weber Street, Suite 300, rjsams@gmseng.com

C. TAX SCHEDULE NUMBER: 4200000362

D. LEGAL DESCRIPTION

A Tract of Land in the Southwest One-Quarter of Section 35 Township 12 South, Range 64 West of the Sixth Principal Meridian, in the County of El Paso, State of Colorado.

E. BASIS OF BEARINGS

The West line of Section 35, Township 12 South, Range 64 West, being monumented at the northerly end by a 3-1/2" aluminum cap in a vault, stamped "LS 22 103", and at the southerly end by a 3-1/2" aluminum cap in a vault, stamped "LS 17496", assumed to bear N 00 Degrees 08 Minutes 51 Seconds E a measured distance of 5273.76 feet.

Commencing at the Southwest Corner of Section 35, Township 12 South, Range 64 West; thence N 00 Degrees 08 Minutes 51 Seconds E on the West line of said Section 35 a distance of 30.00 feet; thence S 89 degrees 28 minutes 49 Seconds E and along a line being 30.00 feet north of and parallel with the South line of the Southwest One-Quarter of said Section 35 a distance of 30.00 feet to the point of beginning.

thence N 00 Degrees 08 Minutes 51 Seconds E and along a line being 30.00 feet east of and parallel with the west line of the Southwest One-Quarter of said Section 35 a distance of 268.45 feet; thence S 89 Degrees 30 Minutes 28 Seconds E and along the North line of the Southwest One-Quarter of the Southwest One-Quarter of said Section 35 a distance of 1282.36 feet to the Northeast corner of the Southwest One-Quarter of the Southwest One-Quarter of said Section 35; thence N 00 Degrees 11 Minutes 54 Seconds E and along the West line of the Northeast One-Quarter of the Southwest One-Quarter of said Section 35 a distance of 623.40 feet; thence S 44 Degrees 41 Minutes 19 Seconds a distance of 260.17 feet; thence S 58 Degrees 46 Minutes 12 Seconds E a distance of 373.98 feet; thence S 67 Degrees 57 Minutes 57 Seconds E a distance of 330.63 feet; thence S 75 Degrees 13 Minutes 13 Seconds E a distance of 753.34 feet; thence S 21 Degrees 28 Minutes 54 Seconds W a distance of 256.36 feet to a point of curve; thence along the arc of a curve to the left having a delta of 17 Degrees 49 Minutes 58 Seconds, a radius of 979.51 feet, and a length of 304.86 feet; thence S 44 Degrees 29 Minutes 49 Seconds E a Distance of 49.50 feet; thence S 00 Degrees 31 Minutes 11 Seconds W a distance of 60.00 feet; thence S 00 Degrees 31 Minutes 11 Seconds W a distance of 564.97 feet to a point on a line being 30.00 feet north of and parallel to the South line of said Section 35; thence N 89 Degrees 28 Minutes 40 Seconds W and along a line being 30.00 feet north of and parallel with the South line of said Section 35 a distance of 2659.25 feet to the point of beginning.

F. NOTES

- 1. Acreages and percentages are rounded up to equal 100%.
2. All areas designated as wetlands and drainageways, buffers, setbacks, and easements are considered as 'No-Build Areas' unless otherwise indicated.
3. The proposed Development Plan is located within the Peyton Fire Protection District.
4. After approval, this Development Plan will expire in 5 years unless a Final Plat is submitted or a letter of extension is submitted to and approved by the County.
5. Streets and access locations and configurations are conceptual and subject to change. Detailed street plans will be prepared and reviewed at the subdivision process.
6. The proposed Development Plan indicates one access location onto Judge Orr Road, and one access location onto Elbert Road.
7. Detailed plans for any proposed trails will be prepared and reviewed at the subdivision process.
8. El Paso County Regional Trails on Judge Orr Road and Elbert Road are to be coordinated with El Paso County Parks and Recreation. Trail design to be determined at a future level of submittal and will be further refined in future development plan submittals.
9. A FEMA designated 100 year floodplain does not exist on this property.
10. No known wetlands exist on the property
11. No known habitat of threatened or endangered species is on the property
12. Information pertaining to wildlife protection measures will be provided by the applicant including fencing requirements, trash and debris containment, protection and enhancement of natural vegetation, weed control and riparian and wetland protection and buffer areas, as appropriate with future zoning and development plan submittals.
13. Uses proposed on the Development Plan include:
a. Water Treatment Facility (developed and owned by PPBOCES).
b. Vocational Trades Building.
c. Construction Trades Training Facility (carpentry, plumbing, electrical).
d. Law Enforcement Training facility (in conjunction with the El Paso County Sheriff department.
e. Fire Fighting and Protection Training facility (in conjunction with the Peyton and Falcon Fire Protections Districts).
f. Medical Training facility (EMT/paramedic training).
g. Food Services (Culinary Arts).
h. Meat Processing facility.
i. Veterinary Sciences Training facility (Animal husbandry).
j. Information Technology Training facility (Computer sciences and website development).
k. Horticultural Sciences Training facility (Greenhouse management, aquaponics, and turf grass management).
l. Other vocational education training facilities based upon future needs of the community.
m. Workforce/Campus Housing for PPBOCES teachers, instructors, and member district staff.
14. The Development Plan proposed for PPBOCES to be served by an on-site Community Water System (e.g., Public Water System) to be designed, engineered, constructed, and managed by PPBOCES.
a. A Community Water System (Public Water System) is proposed to extend domestic and fire protection water to PPBOCES and potentially to the adjacent Jane Davis Ranch and Esteban Rodriguez Subdivision via a Water Services Agreement executed between the three entities.
15. A Water Resources Report is submitted with the Development Plan which supports the development of a Community Water System.
16. Wastewater service for the property will be provided by the Meridian Service Metropolitan District via a Will Serve Letter provided with this application.
17. Detention pond, open spaces, buffer areas, and no-build area will be maintained by PPBOCES.
18. Electric service is to be provided by Mountain View Electric Association (MVEA) and Black Hills Energy will provide natural gas per Will Serve Letters provided with this application. Easements for electric and gas service will be provided by PPBOCES as required.
19. PPBOCES will comply with all State and Federal laws, regulations, ordinances, review and permit requirements, and other agency requirements, if any, of applicable agencies including but not limited to: the Colorado Division of Parks and Wildlife, Colorado Department of Transportation, U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service regarding the Endangered Species Act.
20. PPBOCES may be exempt from certain agency regulatory provisions based upon a Subdivision Exemption Plat which will be submitted with the Development Plan application.

F. ZONING MAP



F. NOTES CONT'D.

- 21. The following Districts will serve the PPBOCES property:
a. PPBOCES Community Water System for all water requirements, detention ponds, drainage easements and fire protection.
b. Peyton School District No. 23
c. Peyton Fire Protection District (Fire and Emergency Services).
d. El Paso County Conservation District.
e. Pikes Peak Library District.
f. El Paso County Roads and Bridges.
g. Upper Black Squirrel Creek Ground Water.
h. Meridian Service Metropolitan District (central wastewater services).
22. Mail box kiosk locations and design will be determined at time of Final Plat in coordination with the U.S. Postal Service.
23. Perimeter buffers along existing adjacent zoning of A-35 shall be 20 feet where noted on the Development Plan. All other buffers to adjacent zoning will be 15 feet as noted on the Plan.
24. PPBOCES Subdivision Exemption status as a public educational facility exempts it from any school development fees.
G. CAMPUS HOUSING
1. In addition to Vocational Education facilities, PPBOCES proposes to develop up to 121 single-family detached residences to be used as Campus Housing for PPBOCES teachers, instructors, and staff.
2. Campus Housing is to be developed, owned, and maintained by PPBOCES; residential housing units are to serve exclusively as workforce for PPBOCES staff and its member school districts and will not be sold or leased to anyone outside the PPBOCES program.
3. Single-family housing units indicated on the Development Plan are to be constructed through PPBOCES' Construction Trades program. Housing units will be made available to teachers and instructors through a land lease (aka Ground Lease in Colorado) program where PPBOCES is the Lessor and staff is the Lessee as part of a compensation incentive between PPBOCES and staff.
a. The Development Plan indicates Campus Housing to be developed on single-family lots each satisfying County Planning Code requirements for setbacks and utility easements.
b. Campus Housing will be accessed via private local streets, with utilities provided as indicated. Central water and wastewater will be provided by PPBOCES and central waste water to be provided by the Meridian Service Metropolitan District.
3. The Development Plan is a public facility and is exempt from school development fees.

H. FLOODPLAIN NOTES

- 1. No portion of the property is located within a designated FEMA Floodplain as determined by the FEMA National Flood Insurance Program Flood Insurance Map.

I. NO-BUILD / OPEN SPACE / FEMA MAPPED FLOODPLAIN EASEMENTS

- 1. Per Section 4.2.6.F.8.c. Calculation of Residential Open Space of the El Paso County Land Development Code: "Individual, private residential or commercial lot areas shall not be included on the open space calculation unless the open space areas located on private lots are subject to open space easements and restrictions."
2. There are no known FEMA-mapped Floodplains on the property.

J. PRIVATE STREETS

- 1. All internal streets are designated as private, will be paved, and will provide for levels of vehicular circulation required by the Traffic Impact Study.
2. All private streets will be privately owned and maintained by PPBOCES.
3. Internal private streets will meet the standards of the El Paso County Engineering Criteria Manual.

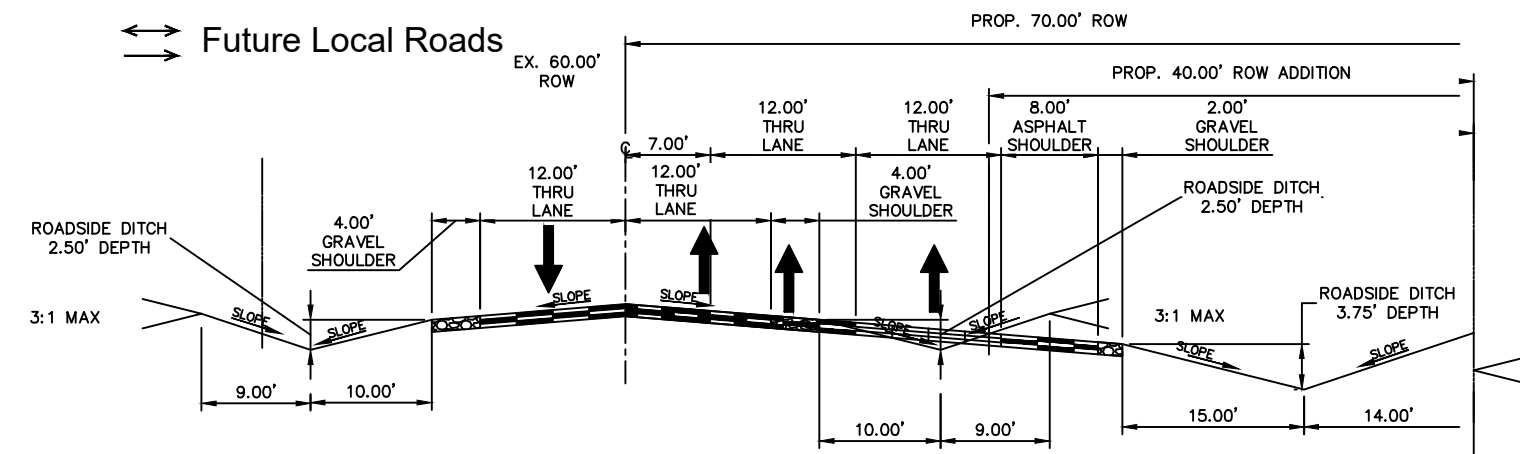
K. PUBLIC STREETS

- 1. The Development Plan does not propose for any publicly owned and maintained internal public streets.
2. Additional Right of Way to be dedicated by plat for Judge Orr Road and Elbert Road - see plan for dimensions.
3. Refer to Development Plan Sheet DP1.1 for acreage and tract data for all Public and Private Open Spaces.

PIKES PEAK BOCES DEVELOPMENT PLAN

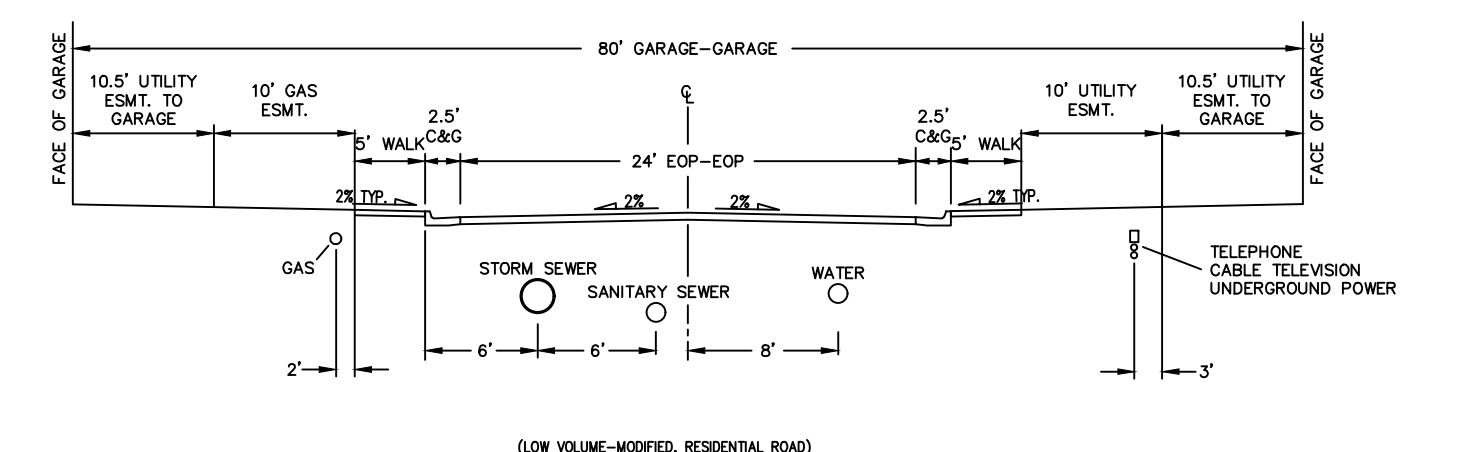
A TRACT OF LAND LOCATED IN THE SOUTHWEST ONE-QUARTER OF SECTION 35, TOWNSHIP 12 SOUTH, RANGE 64 WEST OF THE SIXTH PRINCIPAL MERIDIAN, IN THE COUNTY OF EL PASO, STATE OF COLORADO

L. STREET DETAILS



1. Existing Judge Orr Road - Typical Section

POSTED SPEED LIMIT + 45 MPH. DESIGN SPEED LIMIT = 50 MPH. NOTE: ULTIMATE SECTION HAS BEEN OVERLAID. NOTE: JUDGE ORR ROAD IS PRESENTLY A 2-LANE MINOR ARTERIAL (RURAL). FUTURE CONDITIONS = 4-LANE MINOR ARTERIAL (RURAL).

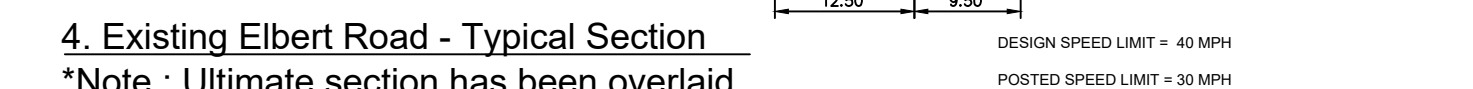


2. BOCES Residential Urban Local Road - Typical Section

POSTED SPEED LIMIT + 30 MPH. SCALE: NTS.

3. BOCES Campus Urban Local Road - Typical Section

POSTED SPEED LIMIT + 30 MPH.



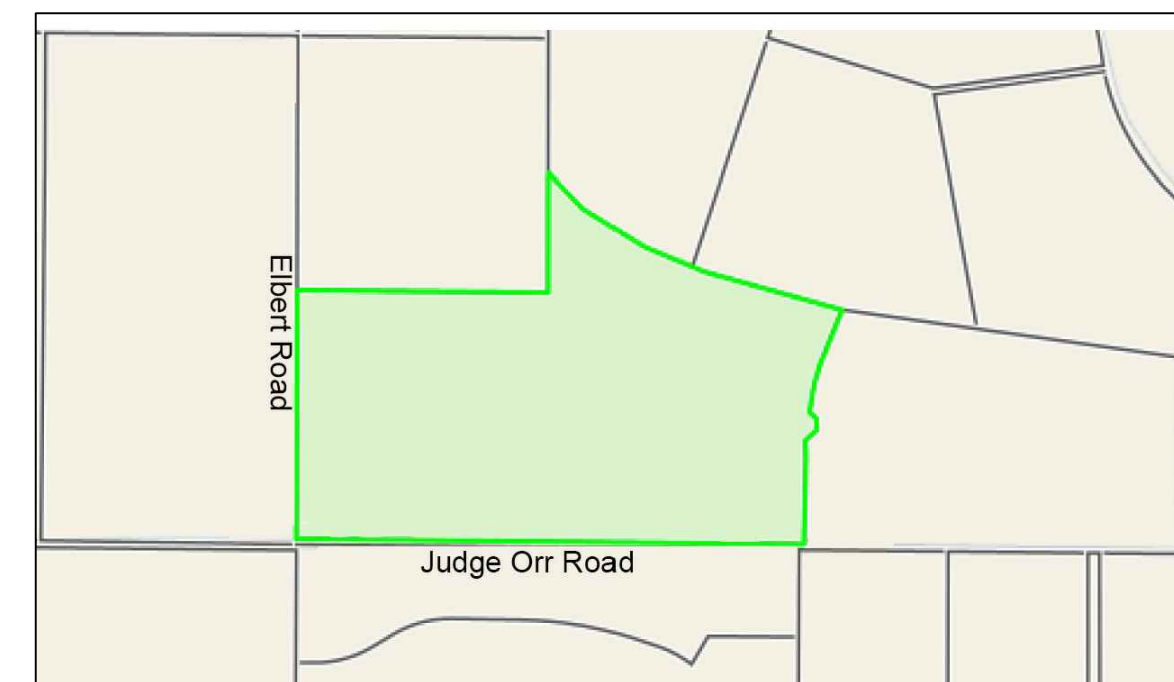
4. Existing Elbert Road - Typical Section

*Note : Ultimate section has been overlaid.

M. SOILS AND GEOLOGIC HAZARDS

- 1. Areas of proposed development that are found to be impacted by ground water, imported fill, loose and/or expansive soils, etc., will be mitigated by avoidance, re-grading, engineering design, and construction techniques. A map of any potential hazard areas of concern and recommended mitigation measures are found in the Geological Hazard Study. Further studies of these conditions that warrant additional mitigation will be provided as required.

N. VICINITY MAP



O. SITE DATA

Table with columns: Existing Land Use, Existing Zone District, Site Acreage, Total Acreage, Proposed Maximum Number of Units, PROPOSED LAND USE, GROSS AREA, ACREAGE, NET AREA, NET ACREAGE. Includes rows for Water Treatment Facility, Vocational Education Campus, Campus Residential, Open Space Tracts A-D, Electric Transmission Easement, and Street R.O.W.

P. PHASING PLAN

- 1. The PPBOCES Campus Development Plan will be constructed in multiple phases and platted in multiple filings as indicated on Sheet DP1.2. Six phases are proposed with this Development Plan. Subsequent phasing plans will be developed based upon funding availability and procurement and requirements of PPBOCES member School Districts.
2. Preliminary phasing boundaries are indicated on Sheet DP1.2 but are subject to change. Proposed development and build-out of internal streets, park and open space, and installation of utilities will be determined with each phase.

Q. AIRSPACE AVIGATION EASEMENT

A. PPBOCES for and in consideration of fulfillment of a condition of project approval and other good and valuable consideration, the receipt of which is hereby acknowledged, does hereby grant to Meadow Lake Airport, its successors and assigns, a perpetual and assignable easement in and over that certain parcel of real property as identified in this Development Plan, and a right-of-way for the free and unrestricted passage and flight of aircraft of the class, size, and category as is now or hereinafter may be operationally compatible with Meadow Lake Airport, in, through, across and about the airspace above imaginary planes, as such those planes as defined by Part 77 of the Federal Aviation Regulations; Federal Aviation Administration (FAA) Airport Design Circular (in effect as of the date of Development Plan approval); and United States Standard for Terminal Instrument Procedures (TERPS) over PPBOCES. The aforementioned easement and right-of-way includes but is not limited to:

- 1. For the use and benefit of the public, the easement and continuing right to fly, or cause by permit the flight by any and all persons or aircraft, of the class, size, and category as is now or hereinafter may be operationally compatible with Meadow Lake Airport, in, through, across or about any portion of the Airspace hereinabove described; and
2. The easement and right to cause or create, or permit or allow to be caused or created within the Airspace, such noise, dist, turbulence, vibration, illumination, air currents, fumes, exhaust, smoke and all other effects as may be inherent in the proper operation of aircraft, now known or hereinafter used for navigation of flight in air; and
3. The continuing and perpetual right to keep the Airspace clear of any portions of buildings, structures, or improvements of any and all kinds, and of trees, vegetation, or other objects, which extend into said Airspace; and
4. The right to mark and light, or cause or require to be marked or lighted, as obstructions to air navigation, and all buildings, structures, or other improvements, and trees or other objects now upon, or that in the future may be upon PPBOCES, and which extend into the Airspace may be required to mark according to FAA regulations or other regulation(s), rules, or orders; and
5. The right to ingress to, passage within, and egress from PPBOCES, solely for the above stated purposes.
B. The PPBOCES, its successors and assigns hereby covenants with Meadow Lake Airport Association, as follows:

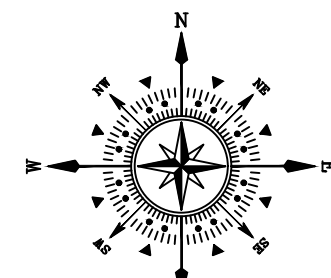
- 1. PPBOCES, its successors and assigns, will not construct, install, permit or allow any building, structure, improvement, tree, or other object on the PPBOCES Campus, to extend into the Airspace, or to constitute an obstruction to air navigation, or to obstruct or interfere with the use of the easement and right-of-way herein granted; and
2. PPBOCES, its successors and assigns, will not hereafter use or permit the use of the PPBOCES Campus in such a manner as to create electrical or electronic interference with radio communication or radar operation between any installation upon Meadow Lake Airport and any aircraft.
3. The easement and right-of-way herein granted shall be deemed both appurtenant to and for the direct benefit of that real property which now or hereinafter constitutes Meadow Lake Airport, and shall further be deemed in gross, being conveyed to and for the benefit of Meadow Lake Airport, and any and all members of the general public who may use said easement or right-of-way, taking off from, landing upon, or operating such aircraft in or about the Meadow Lake Airport or in otherwise flying through said Airspace.
4. This grant of avigation easement shall not operate to deprive PPBOCES, its successors and assigns, of any rights that it may otherwise have from time to time against any individual or private operator for negligent or unlawful operation of aircraft.
5. It is understood and agreed that these covenants and agreements run with the land and shall be binding upon the heirs, representatives, administrators, executors, successors, and assigns of PPBOCES, and that for the purposes of this instrument, the PPBOCES shall be the servient easement and Meadow Lake Airport shall be the dominant tenement.
6. The avigation easement, covenants and agreements described herein shall continue in effect until the Meadow Lake Airport shall be abandoned or shall cease to be used for public airport purpose, at which time it shall terminate.
7. PPBOCES agrees to waive all damages and claims for damages caused or alleged to be caused by the violation of any aspect of this easement agreement.

R. SHEET INDEX

Table with columns: Sheet Number, Description. Lists sheets DP 1.0 through DP 1.1.2 including Cover Page, Subdividers/Applicant, Legal Description, Notes, Zoning Map, Vicinity Map, Site Data, Internal Street Detail, Airspace Avigation Easement, Development Plan, Land Use Summary Table, Parcel Summary Table, Adjacent Owners, Phasing Plan, Landscape Development Plan, Irrigation System Plan, Landscape and Irrigation System Details and Notes, Preliminary Grading Plan, Preliminary Utility Plan.



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PLAN NORTH: N

Pikes Peak BOCES Board of Cooperative Educational Services, Judge Orr Road, Peyton, CO 80831, Development Plan Cover Page

DATE: 02/21/2024, DESIGNED: WFG, CHECKED:

Table with columns: REVISIONS, DATE, BY, DESCRIPTION.

PLAN SCALE: 1" = 100' (OR AS NOTED ON PLAN)

SHEET TITLE: COVER PAGE

SHEET NO. DP1.0, 1 of X SHEETS

FILE NO. FILE#

EXISTING LAND USE:

Vacant / grazing

CURRENT ZONING:

A-35 (Agricultural)

PROPOSED ZONING:

A-35 (Agricultural) Approval of Location and Subdivision Exemption Plat applications have been submitted concurrently with Development Plan

PLACETYPE:

Large-Lot Residential (immediately adjacent to *Employment Center* [Your El Paso County Master Plan 2021])

PROPOSED LAND USE DATA TABLE:

LAND USE:	GROSS AREA:	ACREAGE:	NET AREA:	NET ACREAGE:
Water Treatment Facility	85,813sf	1.97ac	72,838sf	1.67ac
Vocational Education Campus	1,094,227sf	25.12ac	989,066sf	22.70ac
Campus Residential	1,084,644sf	24.90ac	886,692sf	20.35ac
Open Space Tract A	316,245sf	7.26ac	316,245sf	7.26ac
Open Space Tract B	320,166sf	7.35ac	316,110sf	7.25ac
Open Space Tract C	183,823sf	4.22ac	175,412sf	4.02ac
Open Space Tract D	213,444sf	4.90ac	114,008sf	2.61ac
Electric Transmission Easement	464,350sf	10.66ac	464,350sf	10.66ac
Street R.O.W.	included	included	427,991sf	9.86ac
TOTAL:	3,762,712sf	86.38ac	3,762,712sf	86.38ac

*all numbers rounded

PROPOSED LAND USES:

- A. Water Treatment Facility (developed and owned by PPBOCES)
 - Vocational Trades Building
- B. Construction Trades Training Facility (carpentry, plumbing, electrical)
- C. Law Enforcement Training facility (in conjunction with the El Paso County Sheriff department)
- D. Fire Fighting and Protection Training facility (in conjunction with the Peyton and Falcon Fire Protection Districts)
- E. Medical Training facility (EMT/paramedic training).
- F. Food Services facility (Culinary Arts)
- G. Meat Processing facility.
- H. Veterinary Sciences Training facility (Animal husbandry).
- I. Information Technology facility (Computer Sciences and website development).
- J. Horticultural Sciences Training facilities (Greenhouse management, Aquaponics, and Turf Grass Management).
- K. Other Vocational Education training facilities based upon future needs of the community.
- L. Workforce/Campus Housing for PPBOCES teachers, instructors, and member District staff.

ADJACENT LAND OWNERS:

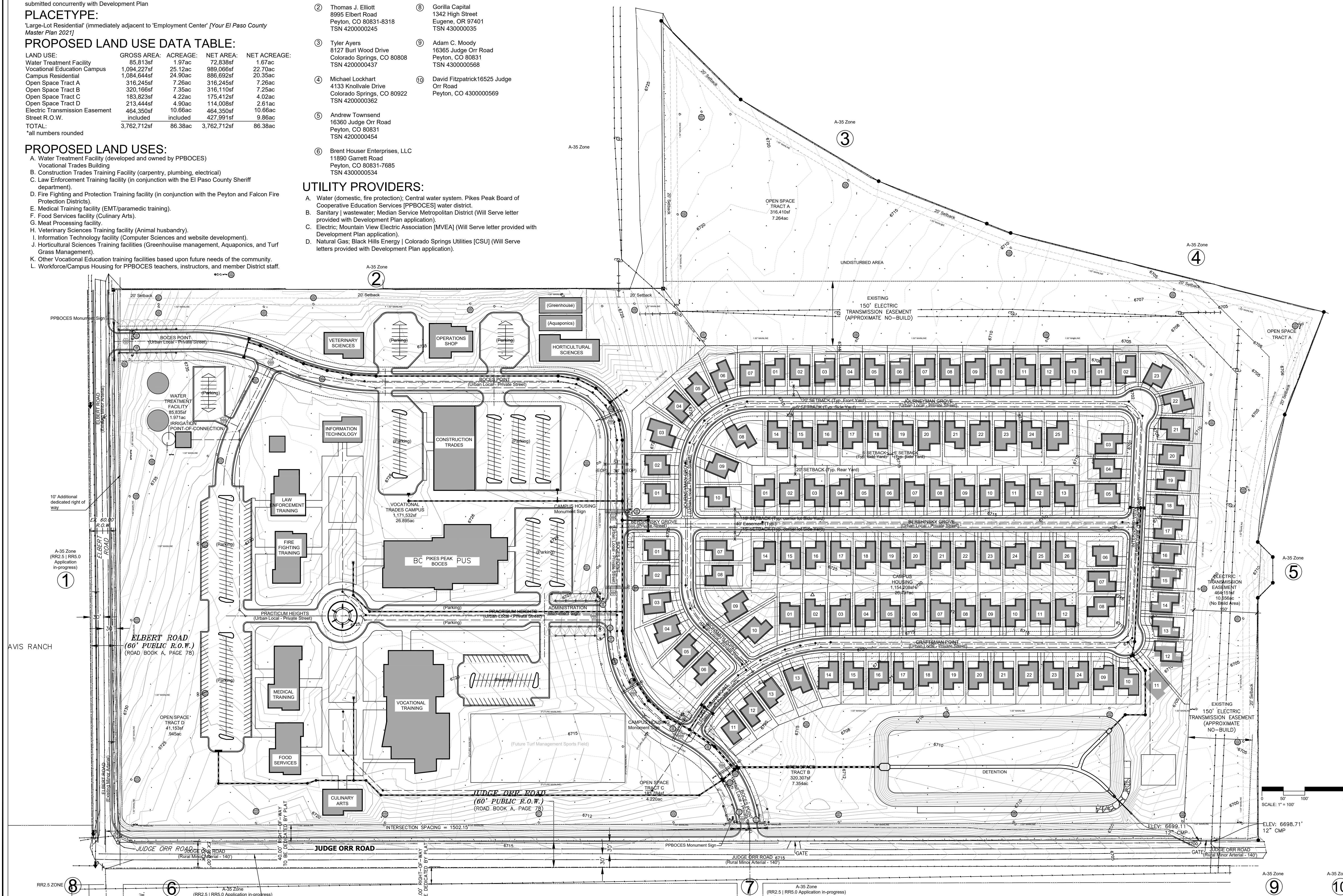
- | | | | |
|----------|--|----------|--|
| PLAN KEY | OWNER/TSN | PLAN KEY | OWNER/TSN |
| ① | Jane Davis Living Trust
9060 Elbert Road
Peyton, CO 80831-8319
TSN 4200000470 | ⑦ | Brent Houser Enterprises, LLC
11890 Garrett Road
Peyton, CO 80831-7685
TSN 4200000537 |
| ② | Thomas J. Elliott
8995 Elbert Road
Peyton, CO 80831-8318
TSN 4200000245 | ⑧ | Gorilla Capital
1342 High Street
Eugene, OR 97401
TSN 4300000305 |
| ③ | Tyler Ayers
8127 Burl Wood Drive
Colorado Springs, CO 80808
TSN 4200000437 | ⑨ | Adam C. Moody
16365 Judge Orr Road
Peyton, CO 80831
TSN 4300000568 |
| ④ | Michael Lockhart
4133 Knollvale Drive
Colorado Springs, CO 80922
TSN 4200000362 | ⑩ | David Fitzpatrick16525 Judge
Orr Road
Peyton, CO 4300000569 |
| ⑤ | Andrew Townsend
16360 Judge Orr Road
Peyton, CO 80831
TSN 4200000454 | | |
| ⑥ | Brent Houser Enterprises, LLC
11890 Garrett Road
Peyton, CO 80831-7685
TSN 4300000534 | | |

UTILITY PROVIDERS:

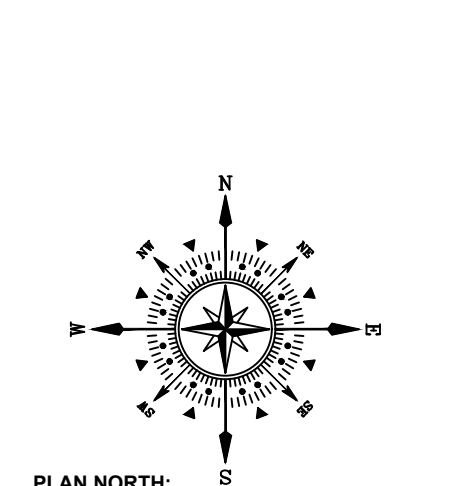
- A. Water (domestic, fire protection); Central water system: Pikes Peak Board of Cooperative Education Services [PPBOCES] water district.
- B. Sanitary | wastewater; Median Service Metropolitan District (Will Serve letter provided with Development Plan application).
- C. Electric; Mountain View Electric Association [MVEA] (Will Serve letter provided with Development Plan application).
- D. Natural Gas; Black Hills Energy | Colorado Springs Utilities [CSU] (Will Serve letters provided with Development Plan application).

PIKES PEAK BOCES

DEVELOPMENT PLAN



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Pikes Peak BOCES
Board of Cooperative Educational Services
Judge Orr Road
Peyton, CO 80831
Development Plan

PROJECT NAME:
PROJECT ADDRESS:
PROJECT DESCRIPTION:

DATE: 02/21/2024
DESIGNED: WFG
CHECKED:

REVISIONS:	DATE:	BY:	DESCRIPTION:
	03/21/2024	WFG	REVISED PHASE 2 & 3 LIMITS
	03/27/2024	WFG	REVISED PHASING AND LAYOUT PLAN

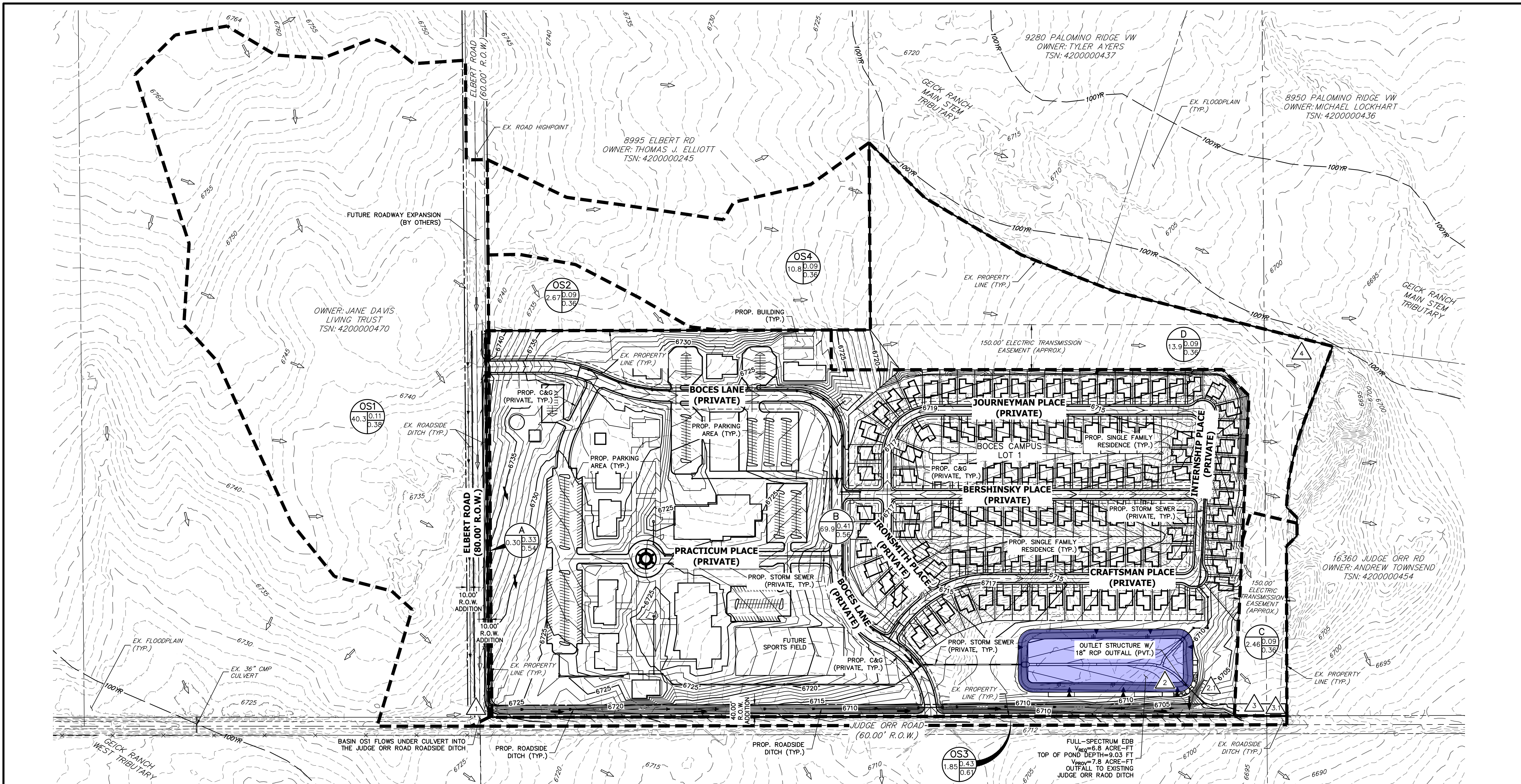
PLAN SCALE: 1" = 100' (OR AS NOTED ON PLAN)

SHEET TITLE:
DEVELOPMENT PLAN

SHEET NO.
DP1.1
2 of X SHEETS

FILE NO.
FILE#

APPENDIX F
DRAINAGE MAPS



LAYER LINETYPE LEGEND

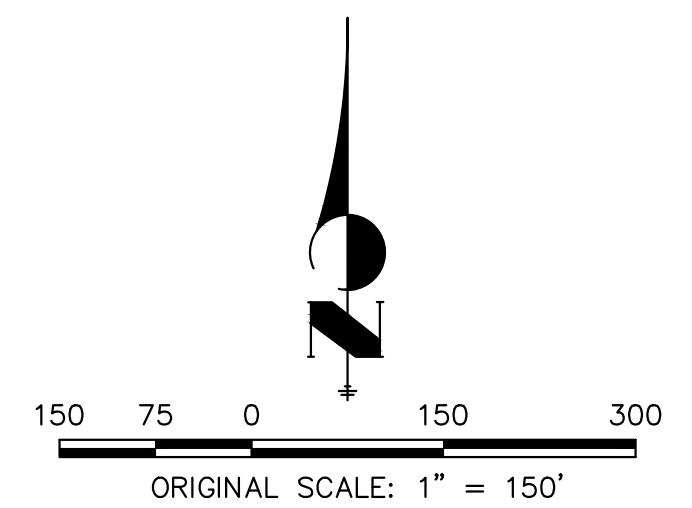
	EXISTING	PROPOSED
BOUNDARY LINE	---	---
PROPERTY LINE	---	---
EASEMENT LINE	---	---
RIGHT OF WAY	---	---
CENTERLINE	---	---
STORM SEWER	---	---
SWALE/WATERWAY FLOWLINE	---	---
INDEX CONTOUR	---	---
INTERMEDIATE CONTOUR	---	---
CURB & GUTTER	---	---
FEMA FLOODPLAIN	---	---
SUB-BASIN DRAINAGE AREA	---	---
BASIN TAG	---	---
DESIGN POINT DESIGNATION	---	---
FLOW DIRECTION (EXISTING)	---	---
FLOW DIRECTION (PROPOSED)	---	---

BASIN SUMMARY TABLE

Tributary	Area (acres)	Percent Impervious	C _s	C ₁₀₀	t _c (min)	Q _s (cfs)	Q ₁₀₀ (cfs)
A	0.30	2%	0.09	0.36	5.0	0.2	1.0
B	69.9	52%	0.38	0.55	25.2	73.1	176.3
C	2.46	2%	0.09	0.36	29.3	0.6	3.8
D	13.9	2%	0.09	0.36	36.0	2.8	18.5
OS1	40.3	6%	0.12	0.38	65.4	6.5	34.1
OS2	2.67	2%	0.09	0.36	20.5	0.7	4.9
OS3	1.85	43%	0.43	0.61	17.6	2.6	6.2
OS4	10.8	2%	0.09	0.36	41.2	1.9	13.1

DESIGN POINT SUMMARY TABLE

DP#	Q _s	Q ₁₀₀
1	6.6	34.3
2	73.7	180.8
2.1	1.5	20.9
3	2.6	8.5
3.1	9.4	59.7
4	4.5	29.9

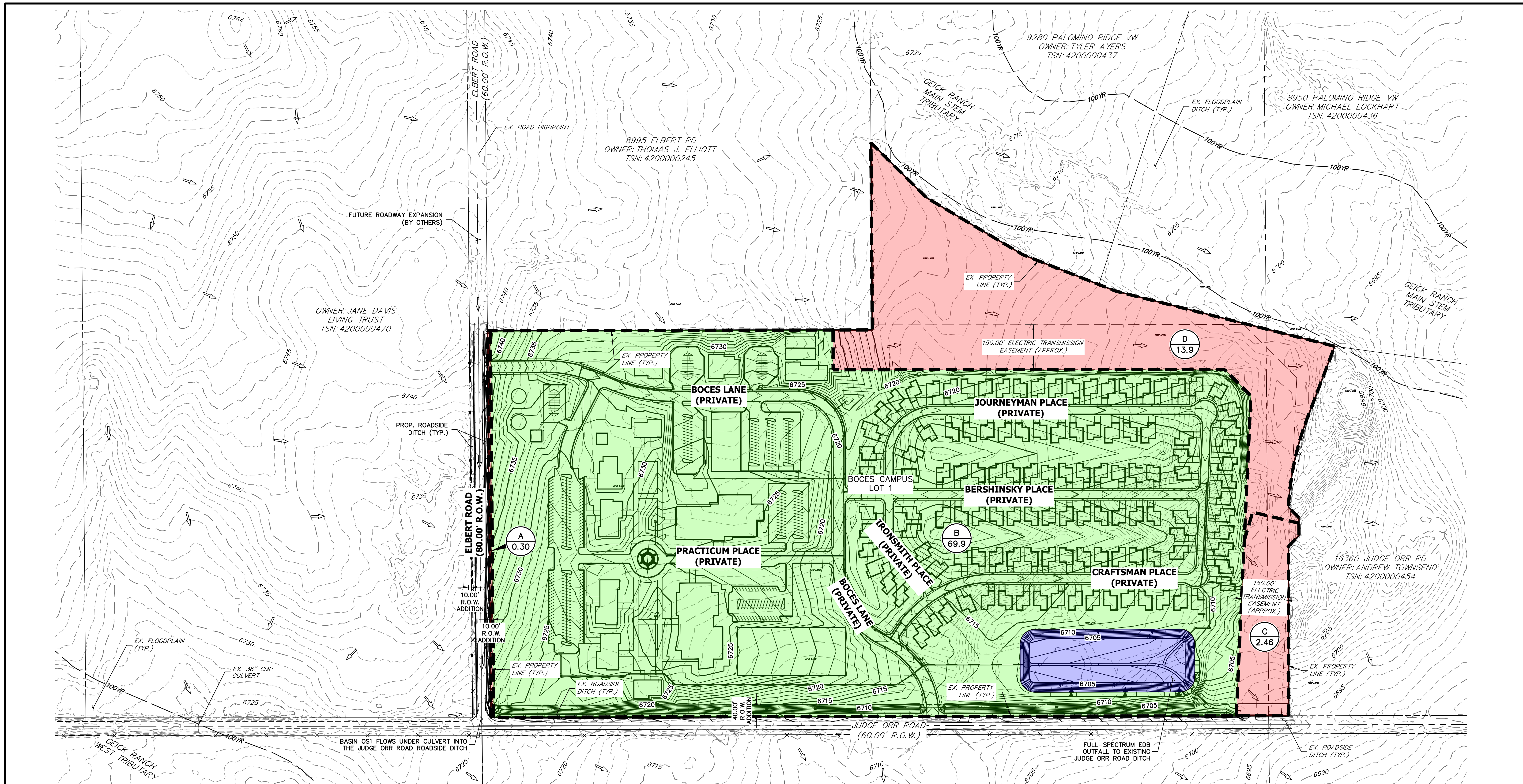


PROPOSED DRAINAGE MAP
 BOCES-CAMPUS
 JOB NO. 25301.00
 07/15/2024
 SHEET 1 OF 1

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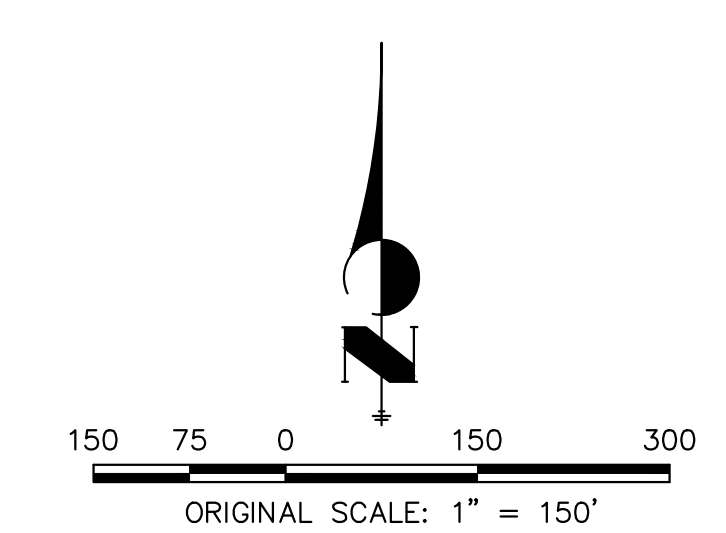
LAYER LINETYPE LEGEND

	EXISTING	PROPOSED		BASIN TAG
BOUNDARY LINE	—	—		BASIN ID:
PROPERTY LINE	—	—		AREA [AC]:
EASEMENT LINE	- - -	- - -		
RIGHT OF WAY	—	—		
CENTERLINE	—	—		
STORM SEWER	—	—		DETAINED AND TREATED AREAS WITHIN PROPOSED FULL-SPECTRUM EDB
SWALE/WATERWAY FLOWLINE	—	—		APPROXIMATE FULL-SPECTRUM EDB FOR DETENTION AND WATER QUALITY
INDEX CONTOUR	— 6100	— 6100		EXISTING UNDISTURBED LAND TO REMAIN UNDISTURBED
INTERMEDIATE CONTOUR	—	—		
CURB & GUTTER	—	—		
SUB-BASIN DRAINAGE AREA	—	—		
FLOW DIRECTION (EXISTING)	⇨	⇨		
FLOW DIRECTION (PROPOSED)		⇨		
FEMA FLOODPLAIN	100YR	100YR		

PBMP Summary Table

Basins	Tributary Area (acres)	PBMP
A	0.30	EXCLUDED*
B	69.9	FULL-SPECTRUM EDB
C	2.46	EXCLUDED*
D	13.9	EXCLUDED*

* EXCLUDED BASED ON STREAM STABILIZATION SITE PER ECM APP. I.7.B.7



PROPOSED WATER QUALITY MAP
 BOCES-CAMPUS
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