

**MASTER DEVELOPMENT  
DRAINAGE PLAN  
FOR  
DAVIS RANCH SKETCH PLAN,  
EL PASO COUNTY, COLORADO**

June 2023

Prepared For:

**William Guman & Associates, Ltd.**  
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Prepared By:

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Job No. 25274.00

PCD File No.: XXXX

SKP232

**JR Response: Addressed**

**ENGINEER'S STATEMENT:**

The attached drainage 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 \_\_\_\_\_ requirements specified in this drainage plan.

**JR Response: Addressed**

revise to drainage report and plan

Business Name: William Guman & Associates, Ltd.

By:

\_\_\_\_\_  
William Guman

Title:

\_\_\_\_\_  
Owner

Address:

\_\_\_\_\_  
731 North Weber Street

\_\_\_\_\_  
Colorado Springs, CO 80903

**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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Please also include in your report solutions to the drainage problems and provide alternate solutions. The ability of downstream drainage facilities to pass developed runoff from the proposed development must be thoroughly analyzed in the MDDP (see DCMV1 CH4.2)

Drainage Plan (MDDP) for Davis Ranch Sketch Plan

Drainage Plan (MDDP) for the proposed Davis Ranch

to:

ns.

ilities 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 to support the in nature to support the Davis Ranch Sketch Plan. Future Preliminary and Final Drainage Reports will be required as development and platting progresses.

## GENERAL LOCATION AND DESCRIPTION

### Location

The proposed Davis Ranch development is located within the east half of the southeast quarter of Section 33 and the majority of Section 34, Township 12 South, Range 64 West of the Sixth Principal Meridian, El Paso County, Colorado. The site is bound by existing Elbert Road to the east, the north line of Section 34, Township 12 South, Range 64 West of the Sixth Principal Meridian to the north, about 630' to the east of existing Stapleton Road to the east, and by the existing Judge Orr Road to the south. A vicinity map is presented in Appendix A.

### Description of Property

The proposed Davis Ranch development contains approximately 395 acres and per the "Davis Ranch Sketch Plan" will be comprised of 2.5-acre single-family lots, 5-acre single-family lots, commercial areas, neighborhood park areas, and detention pond areas. See Appendix E for the Davis Ranch Sketch Plan. The site is currently unoccupied and undeveloped besides some existing dirt roads and buildings. 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 and D soils. Type A soils are typically deep well-drained to excessively drained sands that have a high infiltration rate when thoroughly wet. Type D soils are typically clays and soils with a high water table that have a very slow infiltration rate. Most of the developable area of the site has Type A soils. The Type D soils are located mostly within the undevelopable floodplain area. A NRCS soil survey map is presented in Appendix A.



## Floodplain Statement

Based on the FEMA FIRM numbers 08041C0558G and 08041C0556G, both dated December 7, 2018, the site lies within Zone A, Zone AE, and Zone X. Zone A is defined as area within the Special Flood Hazard Area (SFHA) with no base flood elevations determined. Zone AE is defined as area within the SFHA with base flood elevations determined. Zone X is defined as area outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. The floodplains throughout the site shall be considered no-build areas and all proposed development within the site will occur in Zone X. The FIRM panels are presented in Appendix A.

## Environmental

The “Wetland, Wildlife and Natural Features Report for Davis Subdivision in El Paso County, Colorado” by ECOS dated June 19, 2023 describes the existing environmental features of the site. No critical habitat, wildlife refuges, or hatcheries are found in the vicinity of the site. The site does have existing wetland and riparian habitats located within the drainageways. In compliance with the environmental report, these areas will not be impacted by development and will be left intact. Road corridors that must cut through these wetland and riparian areas shall be minimized and will be analyzed farther in the Preliminary and then Final Drainage Report. See Appendix E for excerpts of the afore mentioned environmental report.

## MAJOR DRAINAGE BASINS AND SUB-BASINS

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### Major Basin Descriptions

The site lies within the Gieck Ranch Drainage Basin. The “Gieck 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 Gieck 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 Gieck 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 Gieck Ranch Drainage Basin flows from northwest to southeast across the proposed development. As this report has not been approved, there are no recommended drainage improvements, including ditches, culverts, detention ponds and drainage channel improvements. Excerpts of the Gieck Ranch DBPS are shown in Appendix E for information only.

Existing drainage infrastructure for the drainageway is located in several locations adjacent to the site. There is an existing dual 4’x8.5’ RCBC under Stapleton Road on the southwest portion of the site, which conveys flows from the Haegler Ranch Tributary 2 drainageway east. There are also existing dual 48” CMP culverts under Elbe<sup>2</sup> the site, which conveys flows from the Unnamed Tributary drainageway west. The proposed development does not

**JR Response: Addressed**

Although the Gieck Ranch DBPS was not approved, it does not preclude this development from improvements to the drainageways/channels, drainage crossings, and downstream channels/conveyance. Please address the drainageways impacting the development, downstream conveyance and identify anticipated improvements needed. The unapproved DBPS identified grade control structures within the channel, Concrete box culverts, channel stabilization etc. would be required. Per DCMV1 1.4.2 Developers in and along<sup>2</sup> a drainageway are required to implement the proper measures to maintain or create stable characteristics of the drainageway. Please address in your report.

analyze the impacts in this area. Future reports will analyze existing flowrates for the Davis Ranch development. The existing basin delineation for Davis Ranch as shown on the map within Appendix F is as follows:

**JR Response:** Addressed in a separate section.

Please also identify that a hydraulic analysis of the drainageways will be provided at the subdivision stage with the final drainage reports

## DAVIS RANCH BASINS AND SUB-BASINS

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### Existing Sub-basin Drainage

Future reports will analyze existing flowrates for the Davis Ranch development. The existing basin delineation for Davis Ranch as shown on the map within Appendix F is as follows:

Basin OS1 is approximately 26.55 acres and is comprised of undeveloped areas to the west of the project site. Flow will follow the historic path overland from the northwest to the southeast where it will enter Basin EXA and follow the drainage patterns of that basin.

Existing Basin EXA is approximately 19.37 acres and in the existing condition is comprised of undeveloped land and part of the FEMA floodplain. Historically runoff from this basin flows from northwest to southeast along Stapleton Road where the flows enter the existing drainage way at DP1. Flows then cross Stapleton Road using dual 4'x8.5' RCBC and continue flowing east within the existing drainageway.

Basin OS2 is approximately 4.89 acres and is comprised of undeveloped areas to the west of the project site. Flow will follow the historic path overland from the northwest to the southeast where it will enter Basin EXB and follow the drainage patterns of that basin.

Existing Basin EXB is approximately 5.12 acres and in the existing condition is comprised of undeveloped land, an existing dirt road, and an existing building. Historically runoff from this basin flows from northwest to southeast to dual 24" RCP culverts at DP2. The flows then cross Stapleton Road using the dual 24" RCP culverts and continue flowing east within the existing drainageway.

Basin OS3A is approximately 5.37 acres and is comprised of undeveloped areas to the west of the project site. Flow will follow the historic path overland from the northwest to the southeast where it will enter Basin EXC and follow the drainage patterns of that basin.

Existing Basin EXC is approximately 54.95 acres and in the existing condition is comprised of undeveloped land and part of the FEMA floodplain. Historically runoff from this basin flows from west to east and northwest to southeast towards the existing drainageway at DP3. The flows then continue flowing southeast within the existing drainageway.

Basin OS3B is approximately 20.89 acres and is comprised of undeveloped areas to the west of the project site. Flow will follow the historic path overland from the northwest to the southeast where it will enter Basin EXD and follow the drainage patterns of that basin.

## Master Development Drainage Plan (MDDP) for Davis Ranch Sketch Plan

Existing Basin EXD is approximately 114.1 acres and in the existing condition is comprised of undeveloped land, part of the FEMA floodplain, existing dirt roads, and existing buildings. Historically runoff from this basin flows from northwest to southeast towards the existing drainageway at DP4. The flows then continue flowing southeast within the existing drainageway, Gieck Ranch West Tributary.

Basin OS3C is approximately 21.41 acres and is comprised of undeveloped areas to the northwest of the project site. Flow will follow the historic path overland from the northwest to the southeast where it will enter Basin EXE and follow the drainage patterns of that basin.

Existing Basin EXE is approximately 105.2 acres and in the existing condition is comprised of undeveloped land and an existing dirt road. Historically runoff from this basin flows from northwest to southeast towards Elbert Road at DP5. The flows then continue flowing east towards the existing drainageway.

Basin OS4 is approximately 60.07 acres and is comprised of undeveloped areas to the northwest of the project site. The northern basin line boundary was assumed and future further evaluation shall determine if more area is tributary to the basin from the north. Flow will follow the historic path overland from the northwest to the southeast where it will enter Basin EXF and follow the drainage patterns of that basin.

Existing Basin EXF is approximately 37.91 acres and in the existing condition is comprised of undeveloped land. Historically runoff from this basin flows from west to east towards Elbert Road at DP6. The flows then continue flowing east towards the existing drainageway.

Basin OS5 is approximately 16.65 acres and is comprised of undeveloped areas to the north of the project site. Flow will follow the historic path overland from the north to the south where it will enter Basin EXG and follow the drainage patterns of that basin.

Existing Basin EXG is approximately 16.19 acres and in the existing condition is comprised of undeveloped land, part of the FEMA floodplain, an existing dirt road, and an existing building. Historically runoff from this basin flows from northwest to southeast where flows enter the exiting drainageway at DP7. Flows then cross Elbert Road using dual 48" CMP culverts and continue flowing southeast within the existing drainageway.

Existing Basin EXH is approximately 44.49 acres and in the existing condition is comprised of undeveloped land, an existing dirt road, and an existing building. Historically runoff from this basin flows from north to south towards the intersection of Judge Orr Road and Elbert Road at DP7. The flows then continue flowing southeast towards the existing drainageway.

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

Provide hydrologic analysis of the existing & proposed conditions providing the peak flows of each basin and at the design points. Be sure to include flows from the various drainageways throughout the site.

**JR Response: Addressed**

As indicated in the TIS the collectors are classified as Minor or Major Collectors due to the proposed rural development and County nomenclature. These roadways have 80 and 90' of ROW. Revise to the report.

## Proposed Drainage Conveyance

In general, developed flows are collected in proposed roadside swales, which convey water to the proposed detention areas. Proposed residential collectors with a 15' minimum depth will be used throughout the site and are per the typical El Paso County standard. All collectors will be designed per the typical county rural roadside ditch section and designed to ensure they are stable and have required capacity to satisfy criteria. A swale is considered stable with a velocity of 5 ft/s or less. To ensure capacity, swales will have a minimum of 1 ft. of freeboard over the water surface for flows anticipated in a 100-year storm event. In addition to the swales, a few proposed culverts also convey flows under proposed roadways. Culverts under paved roads will be sized to not overtop the roadways with flows from a 100-year storm event. The inlets and outlets of the proposed culverts will be protected with riprap to limit potential erosion. More details will be provided in the future Final Drainage Report.

**JR Response: Addressed**

**JR Response: Addressed**

roadside ditches shall comply with table 6-1 of DCMV1

## Proposed Sub-basin Drainage

Future reports will analyze proposed flowrates for the Davis Ranch development. The proposed basin delineation for Davis Ranch as shown on the map within Appendix F is as follows:

Basin OS1 is approximately 26.55 acres and is comprised of undeveloped areas to the west of the project site. This basin is off-site and therefore no work is proposed in this area. Flow will follow the historic path overland from the northwest to the southeast where it will enter Basin A and follow the drainage patterns of that basin.

This exclusion is for water quality only. Increase in flows for this basin will still have to be mitigated. Please discuss mitigation measures for this basin.

Basin A is approximately 17.88 acres and is comprised of Parcel A and part of Parcel B which both have a land use of large single-family lots. Runoff from this basin will be collected in a proposed swale that runs north to south along existing Stapleton Road. The proposed swale will convey the basin flows south towards the existing drainageway at DP1. Runoff from this basin does not include any proposed roadway flows and therefore follows the historic drainage pattern flowing to the existing drainageway undetained or treated. This in accordance with Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedure.

**JR Response: Addressed**

Basin B is approximately 1.48 acres and is the boundary of one of the existing floodplains that crosses the site. In the proposed condition, this basin will remain undeveloped as floodplains are no-build areas. Flows will follow the historic drainage pattern from west to east.

Basin OS2 is approximately 4.89 acres and is comprised of undeveloped areas to the west of the project site. This basin is off-site and therefore no work is proposed in this area. Flow will follow the historic path overland from the northwest to the southeast where it will enter Basin C and follow the drainage patterns of that basin.

Basin C is approximately 5.12 acres and in the proposed condition will be composed of part of Parcel B, which has a land use of large single-family lots, and Parcel A which has a land use of commercial. Runoff from this basin will be collected by a proposed swale which will direct flows to Pond 1 at

this should be 4'x8.5' RCBC as indicated  
in the drainage plan and as discussed  
previously in the narrative. Revise

**JR Response: Addressed**

DP2. The flows will be treated within Detention Basin (EDB) and then released to the existing drainageway. The flows then cross Stapleton Road using dual 24" RCP culverts and continue flowing east within the existing drainage way.

Basin D is approximately 25.91 acres and in the proposed condition will be composed of part of Parcel D, which has a land use of large single-family lots, and a proposed residential collector roadway. Runoff from this basin will be collected in a proposed roadside swale that runs along the proposed ~~residential~~ collector. Runoff from both the north and south side of this collector shall be captured by the proposed swale and culvert that leads to Pond 2 at DP3. The flows will be treated within the full-spectrum EDB and then released to the existing drainageway. The flows then continue flowing southeast within the existing drainage way.

Basin E is approximately 10.72 acres and is the boundary of one of the existing floodplains that crosses the site. In the proposed condition, this basin will remain undeveloped as floodplains are no-build areas. Flows will follow the historic drainage pattern from northwest to southeast.

Basin OS3 is approximately 47.67 acres and is comprised of undeveloped areas to the northwest of the project site. This basin is off-site and therefore no work is proposed in this area. Flow will follow the historic path overland from the northwest to the southeast where it will enter Basin F and follow the drainage patterns of that basin.

Basin F is approximately 49.43 acres and in the proposed condition will be composed of part of Parcel M, which has a land use of large single-family lots, Parcel P that has a land use of neighborhood park, Parcel Q that has a land use of detention pond, and a proposed ~~residential~~ collector roadway. Runoff from this basin will be collected in a proposed roadside swale that runs along the proposed residential collector. Runoff from both the east and west side of this collector shall be captured by the proposed swale and culvert that leads to Pond 3 at DP4. The flows will be treated within the EDB and then released to the existing drainageway. The flows then continue flowing southeast within the existing drainage way.

Basin OS4 is approximately 60.07 acres and is comprised of undeveloped areas to the northwest of the project site. This basin is off-site and therefore no work is proposed in this area. The northern basin line boundary was assumed and future further evaluation shall determine if more area is tributary to the basin from the north. Flow will follow the historic path overland from the northwest to the southeast where it will enter Basin G and follow the drainage patterns of that basin.

Basin G is approximately 53.90 acres and in the proposed condition will be composed of part of Parcel M, which has a land use of large single-family lots, part of Parcel N that has a land use of large single-family lots, Parcel S that has a land use of detention pond, and a proposed ~~residential~~ collector roadway. Runoff from this basin will be collected in a proposed roadside swale that runs along the proposed ~~residential~~ collector. Runoff from both the north and south side of this collector shall be captured by the proposed swale and culvert that leads to Pond 4 at DP5. The flows will be



treated within the EDB and then released to the existing drainageway. The flows then continue flowing southeast within the existing drainage way.

Basin H is approximately 10.99 acres and is the boundary of one of the existing floodplains that crosses the site. In the proposed condition, this basin will remain undeveloped as floodplains are no-build areas. Flows will follow the historic drainage pattern from northwest to southeast.

Basin OS5 is approximately 16.65 acres and is comprised of undeveloped areas to the north of the project site. This basin is off-site and therefore no work is proposed in this area. Flow will follow the historic path overland from the north to the south where it will enter Basin I and follow the drainage patterns of that basin.

Basin I is approximately 5.20 acres and in the proposed condition will be composed of part of Parcel N, which has a land use of large single-family lots. Runoff from this basin will flow overland towards the existing drainageway at DP6. Runoff from this basin does not include any proposed roadway flows and therefore follows the historic drainage pattern flowing to the existing drainage

**JR Response:** Addressed

This exclusion is not a quality issue. Increase in flows for this basin will still have to be mitigated. Please discuss how increased flows from this basin will be mitigated.

Basin I is approximately 5.20 acres and in the proposed condition will be composed of Parcel L, J, I, E, F, and part of N which all have a land use of large single-family lots. Also within this basin is Parcel G, which has a land use of commercial, Parcel R that has a land use of detention pond, and proposed ~~residential~~ collector roadways. Runoff from this basin will be collected in a proposed roadside swale that runs along the proposed ~~residential~~ collector. Runoff from all sides of the collectors shall be captured by the proposed swales and culverts that lead to Pond 5 at DP7. The flows will be treated within the EDB and then released to the existing drainageway. The flows then continue flowing southeast within the existing drainage way.

Basin K is approximately 12.83 acres and in the proposed condition will be composed of Parcel O which has a land use of large single-family lots. Runoff from this basin will flow overland towards the existing drainageway at DP8. Runoff from this basin does not include any proposed roadway flows and therefore follows the historic drainage pattern flowing to the existing Elbert Road site boundary undetained or treated. This in accordance with Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedure.

Basin L is approximately 29.27 acres and in the proposed condition will be composed of Parcel K and Parcel H, which both have a land use of large single-family lots. Runoff from this basin will flow overland towards the existing drainageway at DP9. Runoff from this basin does not include any proposed roadway flows and therefore follows the historic drainage pattern flowing to the existing Elbert Road site boundary undetained or treated. This in accordance with Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedure.

**JR Response:** Revised design, outfalls to floodplain.

The drainage way does not extend to DP9. Indicate how the flows are conveyed downstream.

Basin M is approximately 10.97 acres and is the boundary of one of the existing floodplains that crosses the site. In the proposed condition, this basin will remain undeveloped as floodplains are no-build areas. Flows will follow the historic drainage pattern from northwest to southeast.

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

## DRAINAGE DESIGN CRITERIA

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### 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. Future reports shall analyze the existing and proposed flows for the Davis Ranch development.

[see previous comments and revise accordingly.](#)

Mile High Flood District’s MHFD-Detention Pond Sizing Manual (MHFD-Detention Pond Sizing Manual) was used for preliminary pond sizing. Required detention volumes were designed per USDCM and CCS/EPCDCM. Preliminary pond sizing spreadsheets are presented in Appendix D.

**JR Response: Addressed**

### Hydraulic Criteria

For the purposes of the Davis Ranch Sketch Plan, no hydraulic analysis was preformed. In future Preliminary and Final Drainage Reports, proposed culverts and roadside ditches shall be designed to conform to requirements set in the EPC DCM.

## DRAINAGE FACILITY DESIGN

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### General Concept

The proposed stormwater conveyance system was designed to convey the developed Davis Ranch flows to one of five full-spectrum EDBs via roadside ditches and roadway culverts. Pond 1 is located within Parcel A, which has a commercial land use, and will detain the developed flows on-site. Pond 2 is located within Parcel D, which has a large lot single-family land use, and will detain the developed flows on-site. Pond 3 is located within Parcel Q, which has a detention pond land use, and will detain the developed flows within this parcel. Pond 4 is located in Parcel S, which has a detention pond land use, and will detain the developed flows within this parcel. Pond 5 is located

within Parcel R, which has a detention pond land use, and will detain the developed flows within this parcel. All proposed full-spectrum EDBs will be designed to release flows at less than historic to minimize adverse impacts downstream. Due to this, there are no drainage problems anticipated downstream of the Davis Ranch development. The EDBs will outfall at various points of the existing drainageway and all proposed work shall stay out of the floodplain.

In accordance with Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedure, developed basins with large lot single-family sites with a maximum of 10% impervious area shall be allowed to release runoff without a downstream water quality feature. In accordance with Section I.7.1.B.7, sites with land disturbance to undeveloped land that will remain undeveloped shall also be excluded from releasing to a downstream water quality feature. See highlighted areas in the drainage

**JR Response:** Addressed  
SUMMARY

Please include the Four-Step Process (ECM Appendix I.7.2.A.). Step 3 is discussed above as the WQCV is captured or covered under applicable discussed exclusions but none of the other steps are discussed. The LOI states that will be discussed in the MDDP.

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 offsite major drainageways or surrounding development. This report meets the latest El Paso County Drainage Criteria requirements for this site.

Refer to DCMV1 Ch4.2 for requirements of an MDDP.

-Please provide discussion and analysis of the existing and proposed downstream facilities.

-Discuss drainage problems anticipated within the development and their solutions.

**JR Response:** Per direction, level of depth will be provided at later time with different reports.

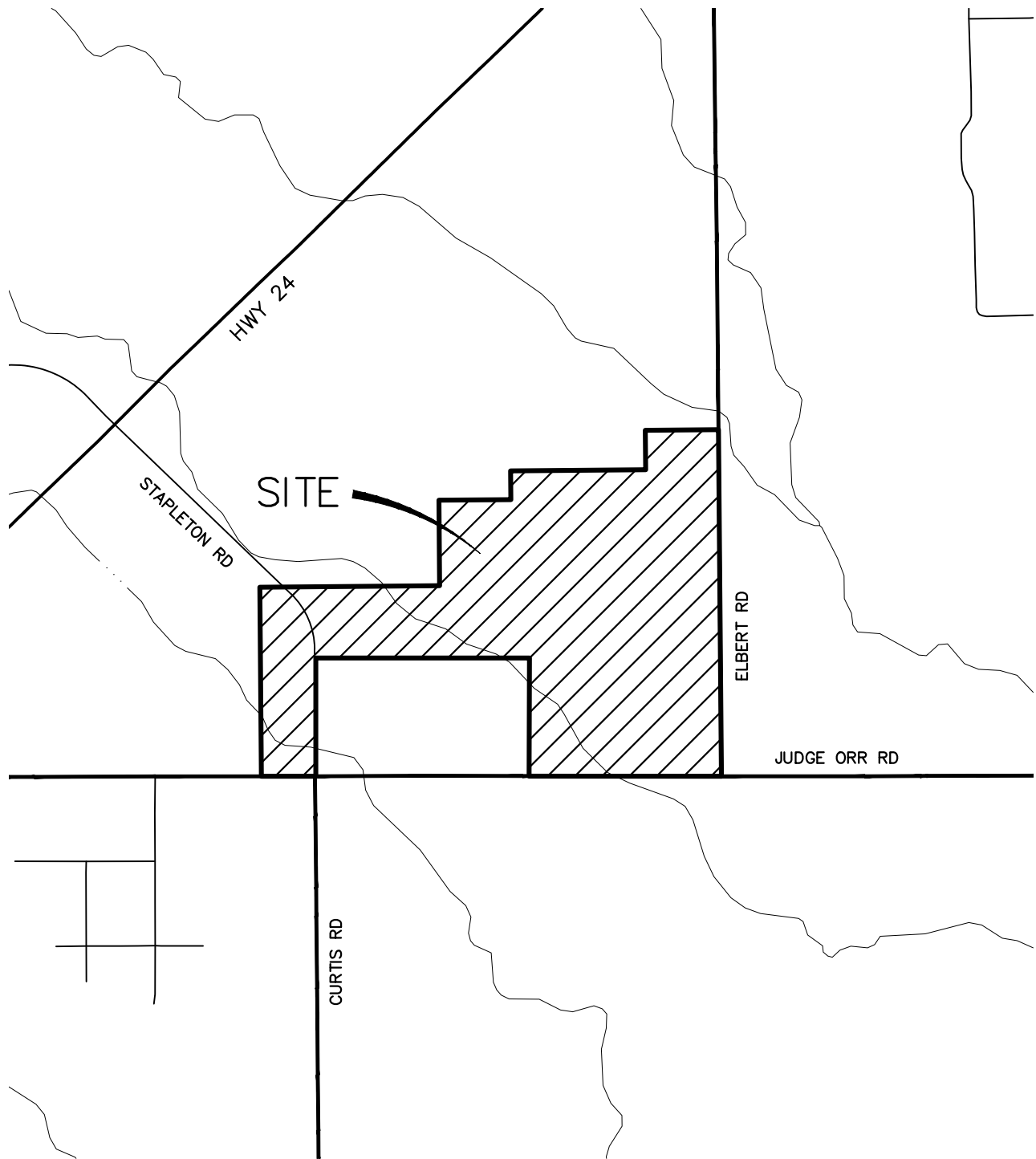


## REFERENCES:

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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. Davis Ranch Sketch Plan, William Guman & Associates, Ltd., April 2023.
4. Wetland, Wildlife and Natural Features Report for Davis Subdivision in El Paso County, Colorado, ECOS, June 2023.
5. Gieck Ranch Drainage Basin Planning Study, Drexel, Barrell & Co., October 2007 and revised in February 2010.

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



SITE

HWY 24

STAPLETON RD

ELBERT RD

JUDGE ORR RD

CURTIS RD



2000 1000 0 2000

ORIGINAL SCALE: 1" = 2000'

VICINITY MAP  
DAVIS RANCH  
JOB NO. 25274.00  
06/29/2023  
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, NNGS12  
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.

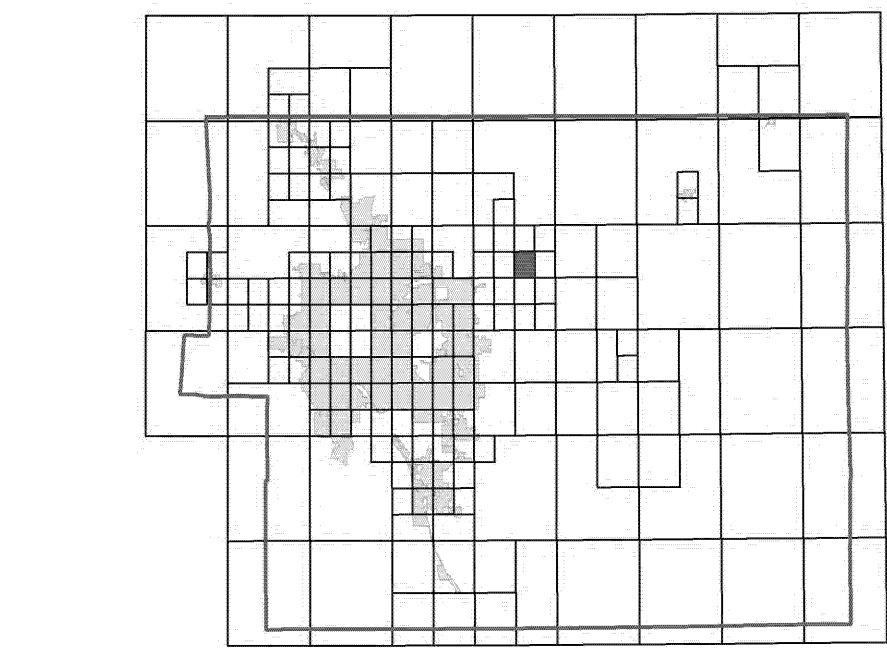
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which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

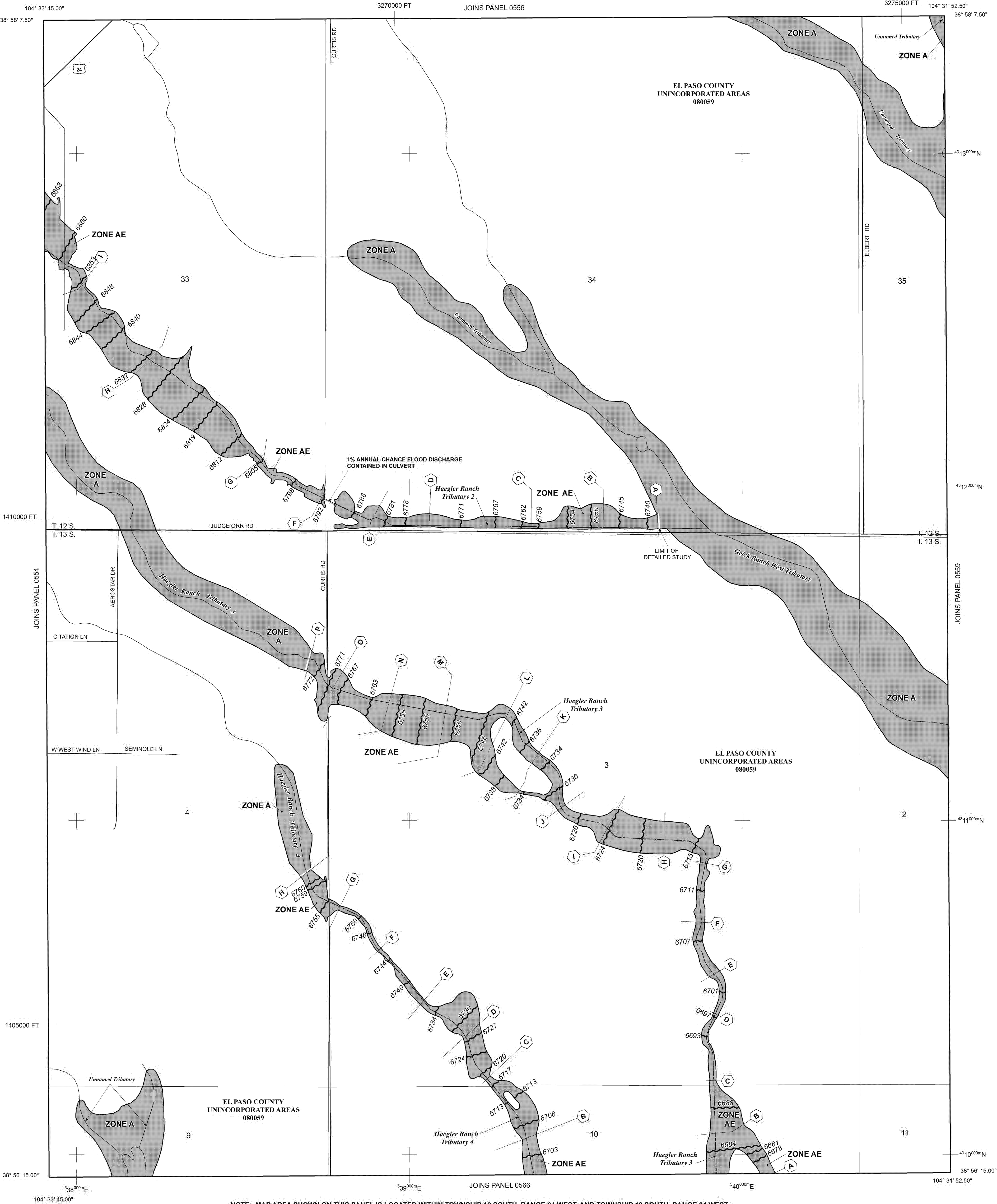
Panel Location Map



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 decremented. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**

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

**OTHER FLOOD AREAS**

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

**OTHER AREAS**

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

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

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

**OTHERWISE PROTECTED AREAS (OPAs)**

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

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Base Flood Elevation line and value; elevation in feet\* (EL 987)
- Base Flood Elevation value where uniform within zone; elevation in feet\*

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

- Cross section line
- Transect line
- 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 (TPSZONE 0502), Lambert Conformal Conic Projection
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- River Mile

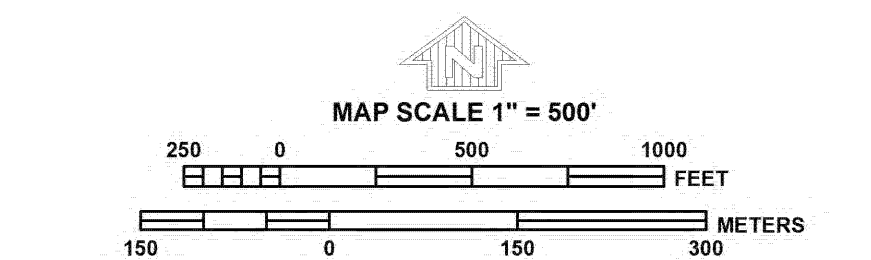
**MAP REPOSITORIES**  
Refer to Map Repositories list on Map Index

**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.



PANEL 0558G

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

PANEL 558 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	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, NIMS12  
National Geodetic Survey  
SSMC-3, #9202  
1315 East-West Highway  
Silver Spring, MD 20910-3282

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

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Panel Location Map

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

LEGEND

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

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FLOODWAY AREAS IN ZONE AE

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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)

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

A

A

Cross section line

23

23

Transect line

97° 07' 30.00"

32° 22' 30.00"

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

42°50'00"N

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

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EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

MARCH 17, 1997

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

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MAP SCALE 1" = 500'

250 0 500 1000

FEET

150 0 150 300

METERS

NFIP

PANEL 0556G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 556 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0556	G

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MAP NUMBER

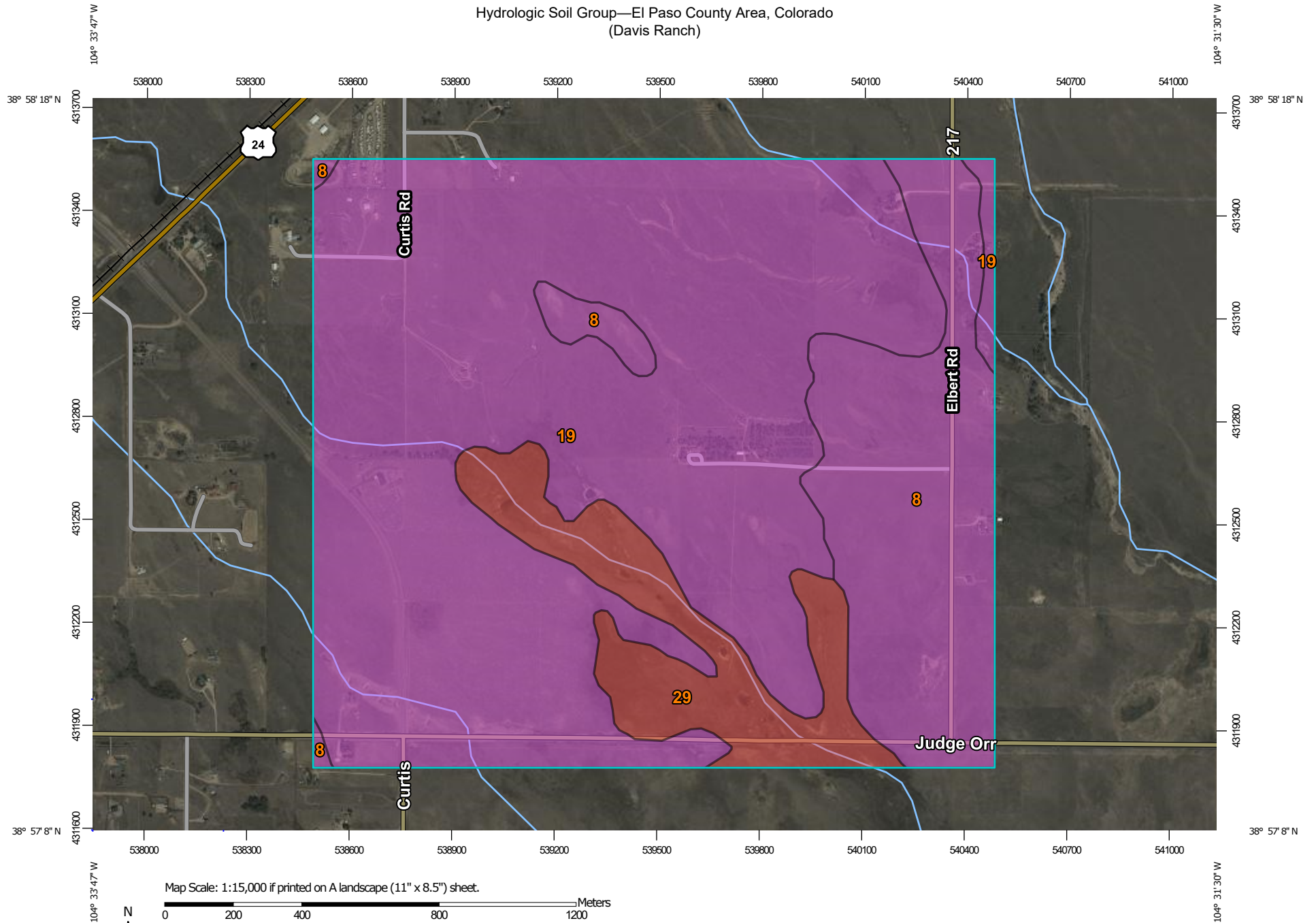
08041C0556G

MAP REVISED

DECEMBER 7, 2018

Federal Emergency Management Agency


# Hydrologic Soil Group—El Paso County Area, Colorado (Davis Ranch)



# Hydrologic Soil Group—El Paso County Area, Colorado (Davis Ranch)

## 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.

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 20, Sep 2, 2022

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	178.5	20.3%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	606.1	69.1%
29	Fluvaquentic Haplaquolls, nearly level	D	93.2	10.6%
<b>Totals for Area of Interest</b>			<b>877.8</b>	<b>100.0%</b>

## Description

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

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

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

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

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

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

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



## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher

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

## EXISTING COMPOSITE % IMPERVIOUS/C VALUE CALCULATIONS

Subdivision: Davis Ranch  
 Location: El Paso County

Project Name: \_\_\_\_\_  
 Project No.: 25274.00  
 Calculated By: GAG  
 Checked By: \_\_\_\_\_  
 Date: 6/29/23

Basin ID	Total Area (ac)	Hardscape (100% Impervious)				Undeveloped (0% Impervious)				Basin Total Weighted C		Basins Total Weighted % Imp.
		C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	
EXA	19.37	0.90	0.96	0.00	0.0%	0.08	0.35	19.37	0.0%	0.08	0.35	0.0%
EXB	5.12	0.90	0.96	0.12	2.3%	0.08	0.35	5.00	0.0%	0.10	0.36	2.3%
EXC	54.95	0.90	0.96	0.00	0.0%	0.08	0.35	54.95	0.0%	0.08	0.35	0.0%
EXD	114.12	0.90	0.96	0.17	0.1%	0.08	0.35	113.95	0.0%	0.08	0.35	0.1%
EXE	105.18	0.90	0.96	0.00	0.0%	0.08	0.35	105.18	0.0%	0.08	0.35	0.0%
EXF	37.91	0.90	0.96	0.00	0.0%	0.08	0.35	37.91	0.0%	0.08	0.35	0.0%
EXG	16.19	0.90	0.96	0.07	0.4%	0.08	0.35	16.12	0.0%	0.08	0.35	0.4%
EXH	44.49	0.90	0.96	0.16	0.4%	0.08	0.35	44.33	0.0%	0.08	0.35	0.4%
OS1	26.55	0.90	0.96	0.00	0.0%	0.08	0.35	26.55	0.0%	0.08	0.35	0.0%
OS2	4.89	0.90	0.96	0.00	0.0%	0.08	0.35	4.89	0.0%	0.08	0.35	0.0%
OS3A	5.37	0.90	0.96	0.00	0.0%	0.08	0.35	5.37	0.0%	0.08	0.35	0.0%
OS3B	20.89	0.90	0.96	0.00	0.0%	0.08	0.35	20.89	0.0%	0.08	0.35	0.0%
OS3C	21.41	0.90	0.96	0.00	0.0%	0.08	0.35	21.41	0.0%	0.08	0.35	0.0%
OS4	60.07	0.90	0.96	0.00	0.0%	0.08	0.35	60.07	0.0%	0.08	0.35	0.0%
OS5	16.65	0.90	0.96	0.00	0.0%	0.08	0.35	16.65	0.0%	0.08	0.35	0.0%
Total On-Site	397.33											0.1%

# PROPOSED COMPOSITE % IMPERVIOUS/C VALUE CALCULATIONS

Subdivision: Davis Ranch  
 Location: El Paso County

Project Name: \_\_\_\_\_  
 Project No.: 25274.00  
 Calculated By: GAG  
 Checked By: \_\_\_\_\_  
 Date: 6/28/23

Basin ID	Total Area (ac)	Hardscape (100% Impervious)				Undeveloped (0% Impervious)				Single-Family (2.5-5 acre) (0% Impervious)				Commercial (95% Impervious)				Park (7% Impervious)				Basin Total Weighted C		Basins Total Weighted % Imp.
		C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	Area (ac)	Weighted % Imp.	C <sub>5</sub>	C <sub>100</sub>	
A	17.88	0.90	0.96	0.00	0.0%	0.08	0.35	0.00	0.0%	0.16	0.41	17.88	10.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.16	0.41	10.0%
B	1.48	0.90	0.96	0.00	0.0%	0.08	0.35	1.48	0.0%	0.16	0.41	0.00	0.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.08	0.35	0.0%
C	5.12	0.90	0.96	0.00	0.0%	0.08	0.35	0.00	0.0%	0.16	0.41	1.58	3.1%	0.81	0.88	3.54	65.7%	0.12	0.39	0.00	0.0%	0.61	0.73	68.8%
D	25.91	0.90	0.96	1.58	6.1%	0.08	0.35	0.00	0.0%	0.16	0.41	24.33	9.4%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.21	0.44	15.5%
E	10.72	0.90	0.96	0.00	0.0%	0.08	0.35	10.72	0.0%	0.16	0.41	0.00	0.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.08	0.35	0.0%
F	49.43	0.90	0.96	1.81	3.7%	0.08	0.35	0.00	0.0%	0.16	0.41	41.62	8.4%	0.81	0.88	0.00	0.0%	0.12	0.39	6.00	0.8%	0.18	0.43	12.9%
G	53.90	0.90	0.96	1.48	2.7%	0.08	0.35	0.00	0.0%	0.16	0.41	52.42	9.7%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.18	0.43	12.5%
H	10.99	0.90	0.96	0.00	0.0%	0.08	0.35	10.99	0.0%	0.16	0.41	0.00	0.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.08	0.35	0.0%
I	5.20	0.90	0.96	0.00	0.0%	0.08	0.35	0.00	0.0%	0.16	0.41	5.20	10.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.16	0.41	10.0%
J	163.62	0.90	0.96	4.57	2.8%	0.08	0.35	0.00	0.0%	0.16	0.41	156.80	9.6%	0.81	0.88	2.25	1.3%	0.12	0.39	0.00	0.0%	0.19	0.43	13.7%
K	12.83	0.90	0.96	0.00	0.0%	0.08	0.35	0.00	0.0%	0.16	0.41	12.83	10.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.16	0.41	10.0%
L	29.27	0.90	0.96	0.00	0.0%	0.08	0.35	0.00	0.0%	0.16	0.41	29.27	10.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.16	0.41	10.0%
M	10.97	0.90	0.96	0.00	0.0%	0.08	0.35	10.97	0.0%	0.16	0.41	0.00	0.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.08	0.35	0.0%
OS1	26.55	0.90	0.96	0.00	0.0%	0.08	0.35	26.55	0.0%	0.16	0.41	0.00	0.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.08	0.35	0.0%
OS2	4.89	0.90	0.96	0.00	0.0%	0.08	0.35	4.89	0.0%	0.16	0.41	0.00	0.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.08	0.35	0.0%
OS3	47.67	0.90	0.96	0.00	0.0%	0.08	0.35	47.67	0.0%	0.16	0.41	0.00	0.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.08	0.35	0.0%
OS4	60.07	0.90	0.96	0.00	0.0%	0.08	0.35	60.07	0.0%	0.16	0.41	0.00	0.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.08	0.35	0.0%
OS5	16.65	0.90	0.96	0.00	0.0%	0.08	0.35	16.65	0.0%	0.16	0.41	0.00	0.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.08	0.35	0.0%
Total On-Site	397.32																							12.5%
Total Pond 1	10.01																							35.2%
Total Pond 2	25.91																							15.5%
Total Pond 3	97.10																							6.6%
Total Pond 4	113.97																							5.9%
Total Pond 5	163.62																							13.7%

Show discharge points as well and clearly show all basins that contribute to the DPs.  
 Do the ponds correspond with DPs? Please indicate which DPs the pond correspond with in the summary table

**JR Response: Addressed**

**APPENDIX C**  
**HYDRAULIC CALCULATIONS**  
**(N/A)**

## **APPENDIX D**

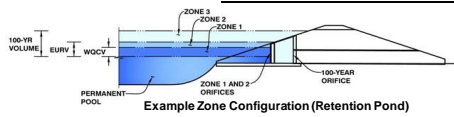
### **WATER QUALITY AND DETENTION CALCULATIONS**

## DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Davis Ranch

Basin ID: Pond 1



Example Zone Configuration (Retention Pond)

## Watershed Information

Selected BMP Type =	EDB
Watershed Area =	10.01 acres
Watershed Length =	1,455 ft
Watershed Length to Centroid =	730 ft
Watershed Slope =	0.019 ft/ft
Watershed Imperviousness =	35.20% percent
Percentage Hydrologic Soil Group A =	100.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

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

Water Quality Capture Volume (WQCV) =	0.139 acre-feet
Excess Urban Runoff Volume (EURV) =	0.368 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.269 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.366 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.444 acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	0.614 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	0.776 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	0.991 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	1.452 acre-feet
Approximate 2-yr Detention Volume =	0.233 acre-feet
Approximate 5-yr Detention Volume =	0.310 acre-feet
Approximate 10-yr Detention Volume =	0.384 acre-feet
Approximate 25-yr Detention Volume =	0.481 acre-feet
Approximate 50-yr Detention Volume =	0.549 acre-feet
Approximate 100-yr Detention Volume =	0.650 acre-feet

## Optional User Overrides

	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

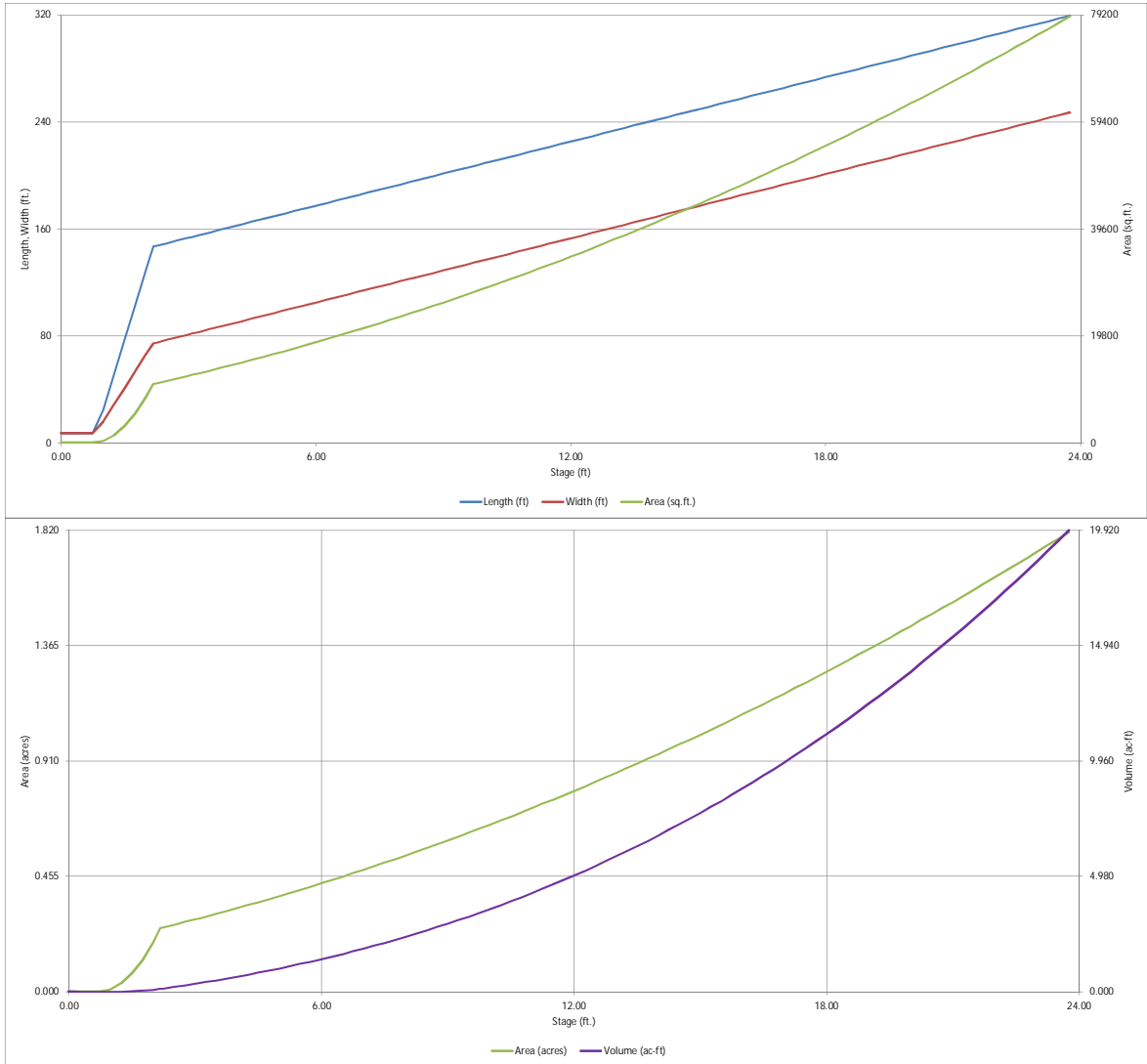
## Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.139 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.229 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.282 acre-feet
Total Detention Basin Volume =	0.650 acre-feet
Initial Surge Volume (ISV) =	18 ft <sup>3</sup>
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H <sub>total</sub> ) =	4.00 ft
Depth of Trickle Channel (H <sub>TC</sub> ) =	0.50 ft
Slope of Trickle Channel (S <sub>TC</sub> ) =	0.010 ft/ft
Slopes of Main Basin Sides (S <sub>main</sub> ) =	4 H:V
Basin Length-to-Width Ratio (R <sub>L/W</sub> ) =	2
Initial Surge Area (A <sub>ISV</sub> ) =	55 ft <sup>2</sup>
Surge Volume Length (L <sub>ISV</sub> ) =	7.4 ft
Surge Volume Width (W <sub>ISV</sub> ) =	7.4 ft
Depth of Basin Floor (H <sub>f,100yr</sub> ) =	1.34 ft
Length of Basin Floor (L <sub>f,100yr</sub> ) =	146.8 ft
Width of Basin Floor (W <sub>f,100yr</sub> ) =	74.4 ft
Area of Basin Floor (A <sub>f,100yr</sub> ) =	10,924 ft <sup>2</sup>
Volume of Basin Floor (V <sub>f,100yr</sub> ) =	5,251 ft <sup>3</sup>
Depth of Main Basin (H <sub>main</sub> ) =	1.83 ft
Length of Main Basin (L <sub>main</sub> ) =	161.4 ft
Width of Main Basin (W <sub>main</sub> ) =	89.1 ft
Area of Main Basin (A <sub>main</sub> ) =	14,377 ft <sup>2</sup>
Volume of Main Basin (V <sub>main</sub> ) =	23,078 ft <sup>3</sup>
Calculated Total Basin Volume (V <sub>total</sub> ) =	0.651 acre-feet

Depth Increment =	0.25									
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft <sup>2</sup> )	Optional Override Area (ft <sup>2</sup> )	Area (acre)	Volume (ft <sup>3</sup> )	Volume (ac-ft)	
Top of Micropool	0.00		7.4	7.4	55		0.001			
ISV	0.33		7.4	7.4	55		0.001	18	0.000	
	0.50		7.4	7.4	55		0.001	28	0.001	
	0.75		7.4	7.4	55		0.001	41	0.001	
	1.00		25.1	15.9	400		0.009	80	0.002	
	1.25		51.1	28.4	1,452		0.033	298	0.007	
	1.50		77.1	40.9	3,155		0.072	861	0.020	
	1.75		103.1	53.4	5,508		0.126	1,930	0.044	
	2.00		129.1	65.9	8,511		0.195	3,669	0.084	
	Floor	2.17		146.8	74.4	10,924		0.251	5,316	0.122
	Zone 1 (WQCV)	2.24		147.3	75.0	11,048		0.254	6,085	0.140
	2.25		147.4	75.1	11,066		0.254	6,196	0.142	
	2.50		149.4	77.1	11,515		0.264	9,019	0.207	
	2.75		151.4	79.1	11,972		0.275	11,954	0.274	
	3.00		153.4	81.1	12,437		0.286	15,005	0.344	
	Zone 2 (EURV)	3.09		154.1	81.8	12,606		0.289	16,132	0.370
	3.25		155.4	83.1	12,910		0.296	18,173	0.417	
	3.50		157.4	85.1	13,391		0.307	21,461	0.493	
	3.75		159.4	87.1	13,880		0.319	24,869	0.571	
	Zone 3 (100-year)	4.00		161.4	89.1	14,377		0.330	28,401	0.652
	4.25		163.4	91.1	14,882		0.342	32,058	0.736	
	4.50		165.4	93.1	15,395		0.353	35,843	0.823	
	4.75		167.4	95.1	15,916		0.365	39,757	0.913	
	5.00		169.4	97.1	16,445		0.378	43,801	1.006	
	5.25		171.4	99.1	16,982		0.390	47,980	1.101	
	5.50		173.4	101.1	17,527		0.402	52,293	1.200	
	5.75		175.4	103.1	18,080		0.415	56,744	1.303	
	6.00		177.4	105.1	18,641		0.428	61,333	1.408	
	6.25		179.4	107.1	19,210		0.441	66,064	1.517	
	6.50		181.4	109.1	19,787		0.454	70,939	1.629	
	6.75		183.4	111.1	20,371		0.468	75,958	1.744	
	7.00		185.4	113.1	20,964		0.481	81,125	1.862	
	7.25		187.4	115.1	21,565		0.495	86,441	1.984	
	7.50		189.4	117.1	22,174		0.509	91,909	2.110	
	7.75		191.4	119.1	22,791		0.523	97,529	2.239	
	8.00		193.4	121.1	23,416		0.538	103,305	2.372	
	8.25		195.4	123.1	24,049		0.552	109,238	2.508	
	8.50		197.4	125.1	24,690		0.567	115,330	2.648	
	8.75		199.4	127.1	25,339		0.582	121,584	2.791	
	9.00		201.4	129.1	25,996		0.597	128,001	2.938	
	9.25		203.4	131.1	26,661		0.612	134,583	3.090	
	9.50		205.4	133.1	27,334		0.628	141,332	3.245	
	9.75		207.4	135.1	28,015		0.643	148,250	3.403	
	10.00		209.4	137.1	28,704		0.659	155,340	3.566	
	10.25		211.4	139.1	29,401		0.675	162,603	3.733	
	10.50		213.4	141.1	30,106		0.691	170,041	3.904	
	10.75		215.4	143.1	30,819		0.708	177,657	4.078	
	11.00		217.4	145.1	31,540		0.724	185,452	4.257	
	11.25		219.4	147.1	32,269		0.741	193,427	4.440	
	11.50		221.4	149.1	33,006		0.758	201,587	4.628	
	11.75		223.4	151.1	33,751		0.775	209,931	4.819	
	12.00		225.4	153.1	34,504		0.792	218,463	5.015	
	12.25		227.4	155.1	35,265		0.810	227,184	5.215	
	12.50		229.4	157.1	36,034		0.827	236,096	5.420	
	12.75		231.4	159.1	36,811		0.845	245,201	5.629	
	13.00		233.4	161.1	37,596		0.863	254,502	5.843	
	13.25		235.4	163.1	38,389		0.881	264,000	6.061	
	13.50		237.4	165.1	39,190		0.900	273,697	6.283	
	13.75		239.4	167.1	39,999		0.918	283,595	6.510	
	14.00		241.4	169.1	40,816		0.937	293,697	6.742	
	14.25		243.4	171.1	41,641		0.956	304,004	6.979	
	14.50		245.4	173.1	42,474		0.975	314,518	7.220	
	14.75		247.4	175.1	43,315		0.994	325,241	7.467	
	15.00		249.4	177.1	44,164		1.014	336,176	7.718	
	15.25		251.4	179.1	45,021		1.034	347,324	7.973	
	15.50		253.4	181.1	45,886		1.053	358,687	8.234	
	15.75		255.4	183.1	46,758		1.073	370,267	8.500	
	16.00		257.4	185.1	47,639		1.094	382,067	8.771	
	16.25		259.4	187.1	48,528		1.114	394,088	9.047	
	16.50		261.4	189.1	49,425		1.135	406,332	9.328	
	16.75		263.4	191.1	50,330		1.155	418,801	9.614	
	17.00		265.4	193.1	51,243		1.176	431,498	9.906	
	17.25		267.4	195.1	52,164		1.198	444,423	10.203	
	17.50		269.4	197.1	53,093		1.219	457,580	10.505	
	17.75		271.4	199.1	54,030		1.240	470,971	10.812	
	18.00		273.4	201.1	54,975		1.262	484,596	11.125	
	18.25		275.4	203.1	55,928		1.284	498,459	11.443	
	18.50		277.4	205.1	56,889		1.306	512,561	11.767	
	18.75		279.4	207.1	57,858		1.328	526,904	12.096	
	19.00		281.4	209.1	58,835		1.351	541,491	12.431	
	19.25		283.4	211.1	59,820		1.373	556,322	12.771	
	19.50		285.4	213.1	60,813		1.396	571,401	13.118	
	19.75		287.4	215.1	61,814		1.419	586,730	13.469	
	20.00		289.4	217.1	62,823		1.442	602,309	13.827	
	20.25		291.4	219.1	63,840		1.466	618,142	14.191	
	20.50		293.4	221.1	64,865		1.489	634,230	14.560	
	20.75		295.4	223.1	65,898		1.513	650,575	14.935	
	21.00		297.4	225.1	66,939		1.537	667,179	15.316	
	21.25		299.4	227.1	67,988		1.561	684,045	15.704	
	21.50		301.4	229.1	69,045		1.585	701,174	16.097	
	21.75		303.4	231.1	70,110		1.609	718,568	16.496	
	22.00		305.4	233.1	71,183		1.634	736,229	16.902	
	22.25		307.4	235.1	72,264		1.659	754,160	17.313	
	22.50		309.4	237.1	73,353		1.684	772,362	17.731	
	22.75		311.4	239.1	74,450		1.709	790,837	18.155	
	23.00		313.4	241.1	75,555		1.734	809,588	18.586	
	23.25		315.4	243.1	76,668		1.760	828,615	19.022	
	23.50		317.4	245.1	77,789		1.786	847,922	19.466	
	23.75		319.4	247.1	78,918		1.812	867,510	19.915	

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Defention, Version 4.06 (July 2022)



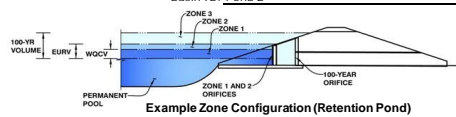


## DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Davis Ranch

Basin ID: Pond 2



Example Zone Configuration (Retention Pond)

## Watershed Information

Selected BMP Type =	EDB
Watershed Area =	25.91 acres
Watershed Length =	2,250 ft
Watershed Length to Centroid =	1,240 ft
Watershed Slope =	0.025 ft/ft
Watershed Imperviousness =	16.00% percent
Percentage Hydrologic Soil Group A =	100.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

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

Water Quality Capture Volume (WQCV) =	0.212 acre-feet
Excess Urban Runoff Volume (EURV) =	0.347 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.207 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.309 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.403 acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	0.786 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	1.155 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	1.664 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	2.781 acre-feet
Approximate 2-yr Detention Volume =	0.213 acre-feet
Approximate 5-yr Detention Volume =	0.288 acre-feet
Approximate 10-yr Detention Volume =	0.371 acre-feet
Approximate 25-yr Detention Volume =	0.488 acre-feet
Approximate 50-yr Detention Volume =	0.605 acre-feet
Approximate 100-yr Detention Volume =	0.853 acre-feet

## Optional User Overrides

	acre-feet
	acre-feet
	inches
	inches
	inches
	inches
	inches
	inches
	inches
	inches

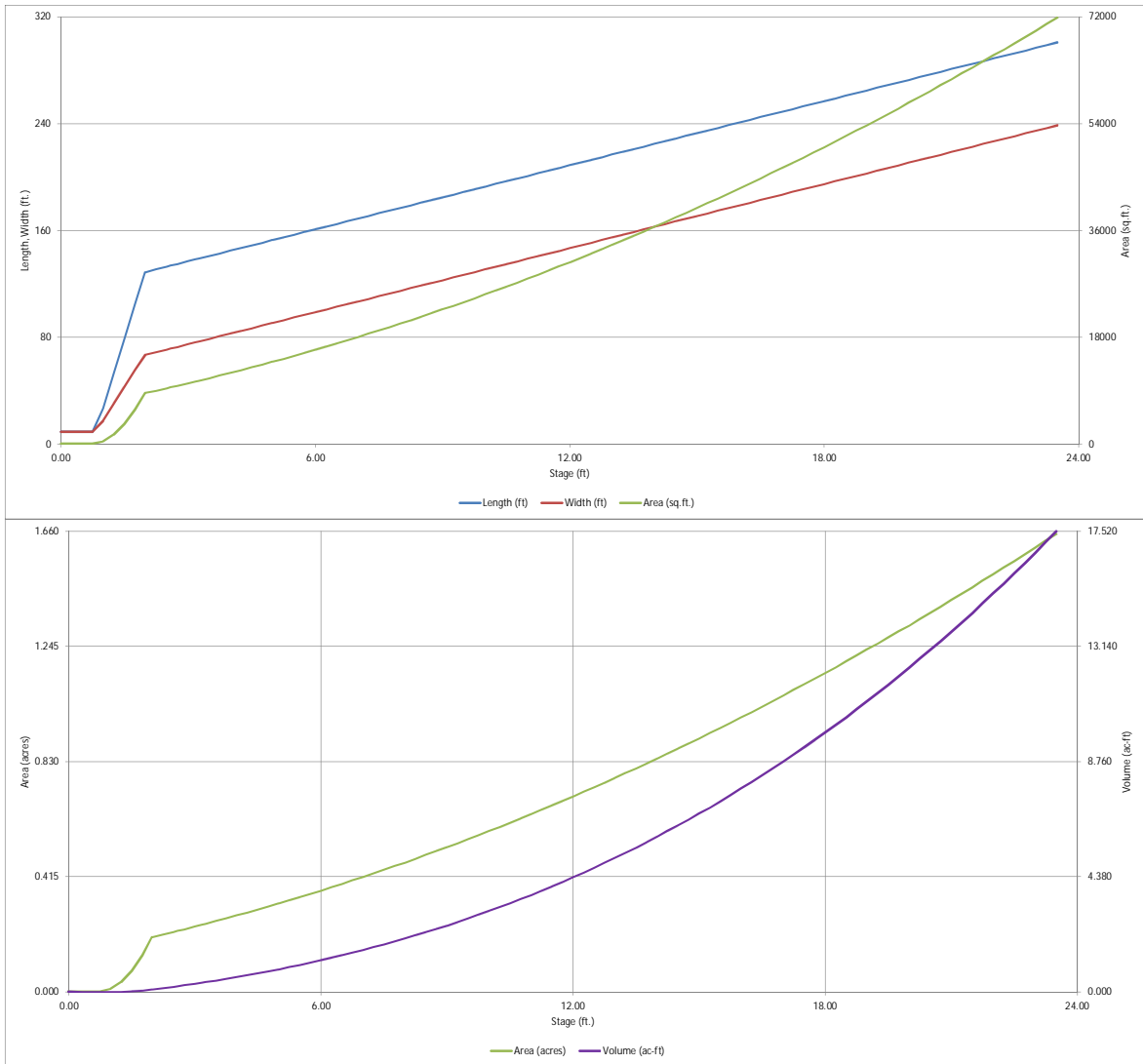
## Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.212 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.136 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.505 acre-feet
Total Detention Basin Volume =	0.853 acre-feet
Initial Surge Volume (ISV) =	28 ft <sup>3</sup>
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H <sub>total</sub> ) =	5.00 ft
Depth of Trickle Channel (H <sub>TC</sub> ) =	0.50 ft
Slope of Trickle Channel (S <sub>TC</sub> ) =	0.010 ft/ft
Slopes of Main Basin Sides (S <sub>main</sub> ) =	4 ft/V
Basin Length-to-Width Ratio (R <sub>L/W</sub> ) =	2
Initial Surge Area (A <sub>ISV</sub> ) =	84 ft <sup>2</sup>
Surge Volume Length (L <sub>ISV</sub> ) =	9.2 ft
Surge Volume Width (W <sub>ISV</sub> ) =	9.2 ft
Depth of Basin Floor (H <sub>FLOOR</sub> ) =	1.15 ft
Length of Basin Floor (L <sub>FLOOR</sub> ) =	128.8 ft
Width of Basin Floor (W <sub>FLOOR</sub> ) =	66.7 ft
Area of Basin Floor (A <sub>FLOOR</sub> ) =	8,583 ft <sup>2</sup>
Volume of Basin Floor (V <sub>FLOOR</sub> ) =	3,647 ft <sup>3</sup>
Depth of Main Basin (H <sub>MAIN</sub> ) =	3.02 ft
Length of Main Basin (L <sub>MAIN</sub> ) =	152.9 ft
Width of Main Basin (W <sub>MAIN</sub> ) =	90.8 ft
Area of Main Basin (A <sub>MAIN</sub> ) =	13,887 ft <sup>2</sup>
Volume of Main Basin (V <sub>MAIN</sub> ) =	33,610 ft <sup>3</sup>
Calculated Total Basin Volume (V <sub>total</sub> ) =	0.857 acre-feet

Depth Increment =	0.25	ft							
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft <sup>2</sup> )	Optional Override Area (ft <sup>2</sup> )	Area (acre)	Volume (ft <sup>3</sup> )	Volume (ac-ft)
Top of Micropool	0.00		9.2	9.2	84		0.002		
ISV	0.33		9.2	9.2	84		0.002	28	0.001
	0.50		9.2	9.2	84		0.002	42	0.001
	0.75		9.2	9.2	84		0.002	63	0.001
	1.00		26.8	17.7	474		0.011	113	0.003
	1.25		52.8	30.2	1,593		0.037	358	0.008
	1.50		78.8	42.7	3,363		0.077	964	0.022
	1.75		104.8	55.2	5,782		0.133	2,093	0.048
Floor	1.98		128.8	66.7	8,583		0.197	3,735	0.086
	2.00		128.9	66.8	8,614		0.198	3,907	0.090
	2.25		130.9	68.8	9,009		0.207	6,109	0.140
	2.50		132.9	70.8	9,413		0.216	8,412	0.193
Zone 1 (WQCV)	2.59		133.6	71.5	9,560		0.219	9,266	0.213
	2.75		134.9	72.8	9,824		0.226	10,816	0.248
	3.00		136.9	74.8	10,244		0.235	13,325	0.306
Zone 2 (EURV)	3.18		138.4	76.3	10,551		0.242	15,196	0.349
	3.25		138.9	76.8	10,671		0.245	15,939	0.366
	3.50		140.9	78.8	11,107		0.255	18,661	0.428
	3.75		142.9	80.8	11,550		0.265	21,493	0.493
	4.00		144.9	82.8	12,002		0.276	24,437	0.561
	4.25		146.9	84.8	12,461		0.286	27,494	0.631
	4.50		148.9	86.8	12,928		0.297	30,668	0.704
	4.75		150.9	88.8	13,404		0.308	33,959	0.780
Zone 3 (100-year)	4.99		152.8	90.7	13,868		0.318	37,232	0.855
	5.00		152.9	90.8	13,887		0.319	37,370	0.858
	5.25		154.9	92.8	14,379		0.330	40,904	0.939
	5.50		156.9	94.8	14,878		0.342	44,561	1.023
	5.75		158.9	96.8	15,386		0.353	48,343	1.110
	6.00		160.9	98.8	15,901		0.365	52,254	1.200
	6.25		162.9	100.8	16,425		0.377	56,295	1.292
	6.50		164.9	102.8	16,956		0.389	60,467	1.388
	6.75		166.9	104.8	17,496		0.402	64,774	1.487
	7.00		168.9	106.8	18,043		0.414	69,216	1.589
	7.25		170.9	108.8	18,599		0.427	73,796	1.694
	7.50		172.9	110.8	19,162		0.440	78,516	1.802
	7.75		174.9	112.8	19,734		0.453	83,377	1.914
	8.00		176.9	114.8	20,313		0.466	88,383	2.029
	8.25		178.9	116.8	20,900		0.480	93,535	2.147
	8.50		180.9	118.8	21,496		0.493	98,834	2.269
	8.75		182.9	120.8	22,099		0.507	104,283	2.394
	9.00		184.9	122.8	22,711		0.521	109,884	2.523
	9.25		186.9	124.8	23,330		0.536	115,639	2.655
	9.50		188.9	126.8	23,958		0.550	121,550	2.790
	9.75		190.9	128.8	24,593		0.565	127,619	2.930
	10.00		192.9	130.8	25,237		0.579	133,848	3.073
	10.25		194.9	132.8	25,888		0.594	140,238	3.219
	10.50		196.9	134.8	26,548		0.609	146,792	3.370
	10.75		198.9	136.8	27,215		0.625	153,513	3.524
	11.00		200.9	138.8	27,891		0.640	160,401	3.682
	11.25		202.9	140.8	28,574		0.656	167,459	3.844
	11.50		204.9	142.8	29,266		0.672	174,688	4.010
	11.75		206.9	144.8	29,965		0.688	182,092	4.180
	12.00		208.9	146.8	30,672		0.704	189,671	4.354
	12.25		210.9	148.8	31,388		0.721	197,429	4.532
	12.50		212.9	150.8	32,111		0.737	205,366	4.715
	12.75		214.9	152.8	32,843		0.754	213,485	4.901
	13.00		216.9	154.8	33,582		0.771	221,788	5.092
	13.25		218.9	156.8	34,330		0.788	230,277	5.286
	13.50		220.9	158.8	35,085		0.805	238,954	5.486
	13.75		222.9	160.8	35,849		0.823	247,820	5.689
	14.00		224.9	162.8	36,620		0.841	256,879	5.897
	14.25		226.9	164.8	37,400		0.859	266,131	6.110
	14.50		228.9	166.8	38,187		0.877	275,579	6.326
	14.75		230.9	168.8	38,983		0.895	285,225	6.548
	15.00		232.9	170.8	39,786		0.913	295,071	6.774
	15.25		234.9	172.8	40,598		0.932	305,119	7.005
	15.50		236.9	174.8	41,417		0.951	315,371	7.240
	15.75		238.9	176.8	42,245		0.970	325,828	7.480
	16.00		240.9	178.8	43,080		0.989	336,494	7.725
	16.25		242.9	180.8	43,923		1.008	347,369	7.974
	16.50		244.9	182.8	44,775		1.028	358,456	8.229
	16.75		246.9	184.8	45,634		1.048	369,757	8.488
	17.00		248.9	186.8	46,502		1.068	381,274	8.753
	17.25		250.9	188.8	47,377		1.088	393,009	9.022
	17.50		252.9	190.8	48,261		1.108	404,963	9.297
	17.75		254.9	192.8	49,152		1.128	417,140	9.576
	18.00		256.9	194.8	50,052		1.149	429,540	9.861
	18.25		258.9	196.8	50,959		1.170	442,166	10.151
	18.50		260.9	198.8	51,875		1.191	455,020	10.446
	18.75		262.9	200.8	52,798		1.212	468,104	10.746
	19.00		264.9	202.8	53,730		1.233	481,420	11.052
	19.25		266.9	204.8	54,669		1.255	494,970	11.363
	19.50		268.9	206.8	55,617		1.277	508,755	11.679
	19.75		270.9	208.8	56,572		1.299	522,779	12.001
	20.00		272.9	210.8	57,535		1.321	537,042	12.329
	20.25		274.9	212.8	58,507		1.343	551,547	12.662
	20.50		276.9	214.8	59,486		1.366	566,296	13.000
	20.75		278.9	216.8	60,474		1.388	581,291	13.345
	21.00		280.9	218.8	61,469		1.411	596,534	13.695
	21.25		282.9	220.8	62,473		1.434	612,026	14.050
	21.50		284.9	222.8	63,484		1.457	627,771	14.412
	21.75		286.9	224.8	64,504		1.481	643,769	14.779
	22.00		288.9	226.8	65,531		1.504	660,023	15.152
	22.25		290.9	228.8	66,567		1.528	676,535	15.531
	22.50		292.9	230.8	67,610		1.552	693,307	15.916
	22.75		294.9	232.8	68,662		1.576	710,341	16.307
	23.00		296.9	234.8	69,721		1.601	727,639	16.704
	23.25		298.9	236.8	70,789		1.625	745,202	17.107
	23.50		300.9	238.8	71,864		1.650	763,034	17.517

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Defention, Version 4.06 (July 2022)

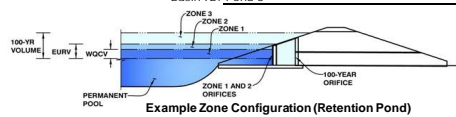


## DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Davis Ranch

Basin ID: Pond 3



Example Zone Configuration (Retention Pond)

## Watershed Information

Selected BMP Type =	EDB
Watershed Area =	97.10 acres
Watershed Length =	4.885 ft
Watershed Length to Centroid =	2.450 ft
Watershed Slope =	0.020 ft/ft
Watershed Imperviousness =	6.60% percent
Percentage Hydrologic Soil Group A =	100.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

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

Water Quality Capture Volume (WQCV) =	0.377 acre-feet
Excess Urban Runoff Volume (EURV) =	0.419 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.203 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.363 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.498 acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	1.719 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	3.004 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	4.793 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	8.835 acre-feet
Approximate 2-yr Detention Volume =	0.247 acre-feet
Approximate 5-yr Detention Volume =	0.342 acre-feet
Approximate 10-yr Detention Volume =	0.459 acre-feet
Approximate 25-yr Detention Volume =	0.638 acre-feet
Approximate 50-yr Detention Volume =	0.952 acre-feet
Approximate 100-yr Detention Volume =	1.782 acre-feet

## Optional User Overrides

	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

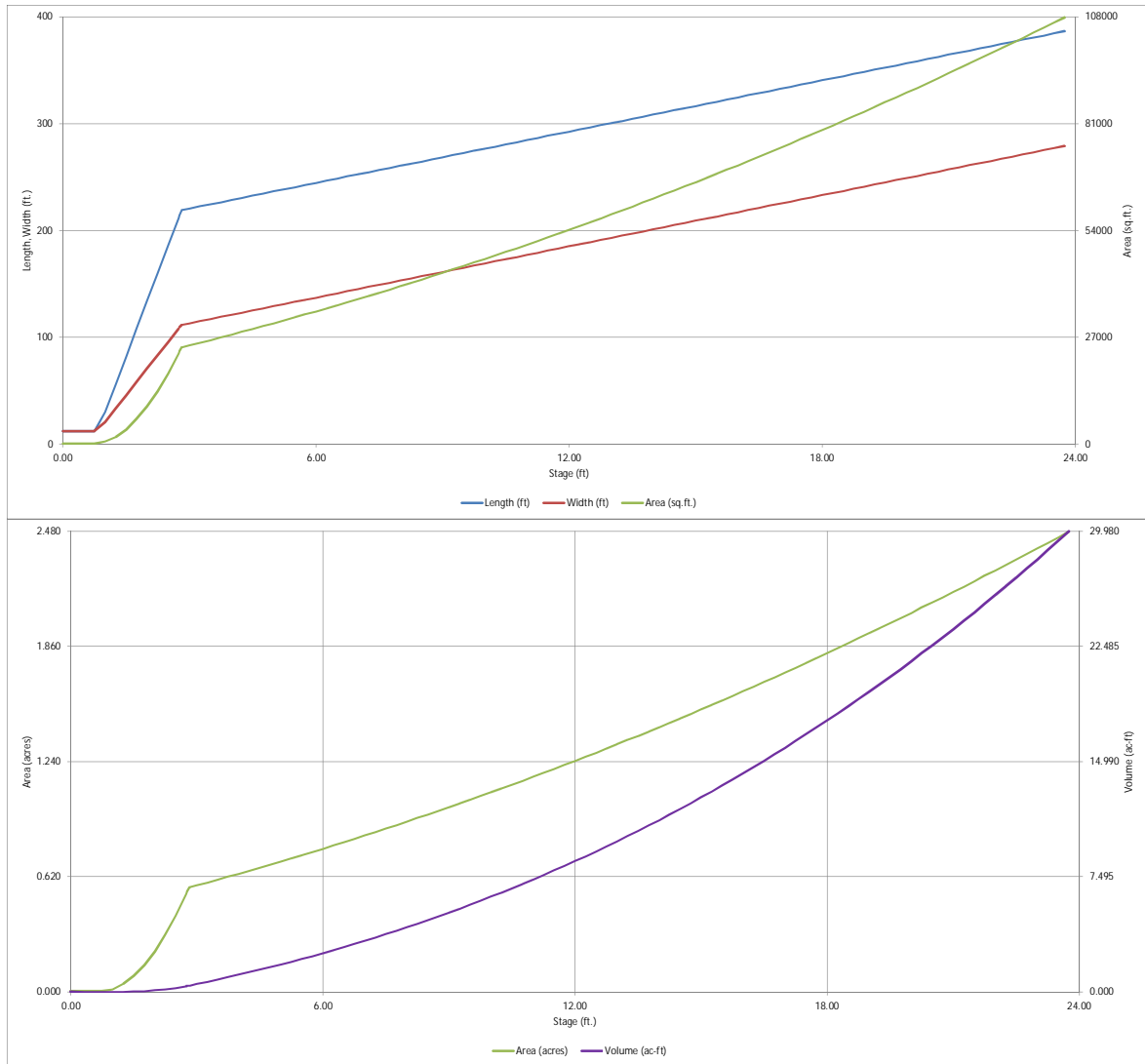
## Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.377 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.042 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.363 acre-feet
Total Detention Basin Volume =	1.782 acre-feet
Initial Surge Volume (ISV) =	49 ft <sup>3</sup>
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H <sub>total</sub> ) =	5.00 ft
Depth of Trickle Channel (H <sub>TC</sub> ) =	0.50 ft
Slope of Trickle Channel (S <sub>TC</sub> ) =	0.010 ft/ft
Slopes of Main Basin Sides (S <sub>main</sub> ) =	4 ft/V
Basin Length-to-Width Ratio (R <sub>L/W</sub> ) =	2
Initial Surge Area (A <sub>ISV</sub> ) =	149 ft <sup>2</sup>
Surge Volume Length (L <sub>ISV</sub> ) =	12.2 ft
Surge Volume Width (W <sub>ISV</sub> ) =	12.2 ft
Depth of Basin Floor (H <sub>f,100yr</sub> ) =	1.99 ft
Length of Basin Floor (L <sub>f,100yr</sub> ) =	219.2 ft
Width of Basin Floor (W <sub>f,100yr</sub> ) =	111.7 ft
Area of Basin Floor (A <sub>f,100yr</sub> ) =	24,485 ft <sup>2</sup>
Volume of Basin Floor (V <sub>f,100yr</sub> ) =	17,608 ft <sup>3</sup>
Depth of Main Basin (H <sub>main</sub> ) =	2.18 ft
Length of Main Basin (L <sub>main</sub> ) =	236.6 ft
Width of Main Basin (W <sub>main</sub> ) =	129.2 ft
Area of Main Basin (A <sub>main</sub> ) =	30,560 ft <sup>2</sup>
Volume of Main Basin (V <sub>main</sub> ) =	59,876 ft <sup>3</sup>
Calculated Total Basin Volume (V <sub>total</sub> ) =	1.782 acre-feet

Depth Increment =	0.25								
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft <sup>2</sup> )	Optional Override Area (ft <sup>2</sup> )	Area (acre)	Volume (ft <sup>3</sup> )	Volume (ac-ft)
Top of Micropool	0.00		12.2	12.2	149		0.003		
ISV	0.33		12.2	12.2	149		0.003	49	0.001
	0.50		12.2	12.2	149		0.003	75	0.002
	0.75		12.2	12.2	149		0.003	112	0.003
	1.00		29.9	20.7	619		0.014	185	0.004
	1.25		55.9	33.2	1,856		0.043	481	0.011
	1.50		81.9	45.7	3,744		0.086	1,167	0.027
	1.75		107.9	58.2	6,281		0.144	2,407	0.055
	2.00		133.9	70.7	9,468		0.217	4,362	0.100
	2.25		159.9	83.2	13,305		0.305	7,195	0.165
	2.50		185.9	95.7	17,793		0.408	11,069	0.254
	2.75		211.9	108.2	22,930		0.526	16,146	0.371
Zone 1 (WQCV)	2.77		214.0	109.2	23,369		0.536	16,609	0.381
Floor	2.82		219.2	111.7	24,485		0.562	17,805	0.409
Zone 2 (EURV)	2.84		219.3	111.9	24,538		0.563	18,295	0.420
	3.00		220.6	113.2	24,963		0.573	22,255	0.511
	3.25		222.6	115.2	25,635		0.588	28,580	0.656
	3.50		224.6	117.2	26,314		0.604	35,073	0.805
	3.75		226.6	119.2	27,002		0.620	41,738	0.958
	4.00		228.6	121.2	27,698		0.636	48,575	1.115
	4.25		230.6	123.2	28,401		0.652	55,587	1.276
	4.50		232.6	125.2	29,113		0.668	62,776	1.441
	4.75		234.6	127.2	29,832		0.685	70,144	1.610
Zone 3 (100-year)	5.00		236.6	129.2	30,560		0.702	77,693	1.784
	5.25		238.6	131.2	31,295		0.718	85,425	1.961
	5.50		240.6	133.2	32,039		0.736	93,341	2.143
	5.75		242.6	135.2	32,790		0.753	101,445	2.329
	6.00		244.6	137.2	33,550		0.770	109,737	2.519
	6.25		246.6	139.2	34,317		0.788	118,220	2.714
	6.50		248.6	141.2	35,093		0.806	126,896	2.913
	6.75		250.6	143.2	35,876		0.824	135,767	3.117
	7.00		252.6	145.2	36,668		0.842	144,835	3.325
	7.25		254.6	147.2	37,468		0.860	154,102	3.538
	7.50		256.6	149.2	38,275		0.879	163,570	3.755
	7.75		258.6	151.2	39,091		0.897	173,240	3.977
	8.00		260.6	153.2	39,914		0.916	183,116	4.204
	8.25		262.6	155.2	40,746		0.935	193,198	4.435
	8.50		264.6	157.2	41,585		0.955	203,489	4.671
	8.75		266.6	159.2	42,433		0.974	213,991	4.913
	9.00		268.6	161.2	43,288		0.994	224,706	5.159
	9.25		270.6	163.2	44,152		1.014	235,636	5.409
	9.50		272.6	165.2	45,023		1.034	246,783	5.665
	9.75		274.6	167.2	45,903		1.054	258,148	5.926
	10.00		276.6	169.2	46,790		1.074	269,735	6.192
	10.25		278.6	171.2	47,686		1.095	281,544	6.463
	10.50		280.6	173.2	48,590		1.115	293,579	6.740
	10.75		282.6	175.2	49,501		1.136	305,840	7.021
	11.00		284.6	177.2	50,421		1.157	318,330	7.308
	11.25		286.6	179.2	51,348		1.179	331,051	7.600
	11.50		288.6	181.2	52,284		1.200	344,004	7.897
	11.75		290.6	183.2	53,227		1.222	357,193	8.200
	12.00		292.6	185.2	54,179		1.244	370,619	8.508
	12.25		294.6	187.2	55,138		1.266	384,283	8.822
	12.50		296.6	189.2	56,106		1.288	398,189	9.141
	12.75		298.6	191.2	57,081		1.310	412,337	9.466
	13.00		300.6	193.2	58,065		1.333	426,730	9.796
	13.25		302.6	195.2	59,056		1.356	441,370	10.132
	13.50		304.6	197.2	60,056		1.379	456,259	10.474
	13.75		306.6	199.2	61,063		1.402	471,399	10.822
	14.00		308.6	201.2	62,079		1.425	486,791	11.175
	14.25		310.6	203.2	63,103		1.449	502,439	11.534
	14.50		312.6	205.2	64,134		1.472	518,343	11.900
	14.75		314.6	207.2	65,174		1.496	534,506	12.271
	15.00		316.6	209.2	66,221		1.520	550,931	12.648
	15.25		318.6	211.2	67,277		1.544	567,618	13.031
	15.50		320.6	213.2	68,340		1.569	584,570	13.420
	15.75		322.6	215.2	69,412		1.593	601,788	13.815
	16.00		324.6	217.2	70,491		1.618	619,276	14.217
	16.25		326.6	219.2	71,579		1.643	637,035	14.624
	16.50		328.6	221.2	72,674		1.668	655,066	15.038
	16.75		330.6	223.2	73,778		1.694	673,373	15.459
	17.00		332.6	225.2	74,889		1.719	691,956	15.885
	17.25		334.6	227.2	76,009		1.745	710,818	16.318
	17.50		336.6	229.2	77,137		1.771	729,961	16.758
	17.75		338.6	231.2	78,272		1.797	749,387	17.204
	18.00		340.6	233.2	79,416		1.823	769,098	17.656
	18.25		342.6	235.2	80,567		1.850	789,095	18.115
	18.50		344.6	237.2	81,727		1.876	809,382	18.581
	18.75		346.6	239.2	82,894		1.903	829,959	19.053
	19.00		348.6	241.2	84,070		1.930	850,830	19.532
	19.25		350.6	243.2	85,253		1.957	871,995	20.018
	19.50		352.6	245.2	86,445		1.985	893,457	20.511
	19.75		354.6	247.2	87,644		2.012	915,218	21.011
	20.00		356.6	249.2	88,852		2.040	937,280	21.517
	20.25		358.6	251.2	90,067		2.068	959,645	22.030
	20.50		360.6	253.2	91,291		2.096	982,314	22.551
	20.75		362.6	255.2	92,523		2.124	1,005,291	23.078
	21.00		364.6	257.2	93,762		2.152	1,028,576	23.613
	21.25		366.6	259.2	95,010		2.181	1,052,173	24.155
	21.50		368.6	261.2	96,265		2.210	1,076,082	24.703
	21.75		370.6	263.2	97,529		2.239	1,100,306	25.260
	22.00		372.6	265.2	98,800		2.268	1,124,847	25.823
	22.25		374.6	267.2	100,080		2.298	1,149,707	26.394
	22.50		376.6	269.2	101,367		2.327	1,174,887	26.972
	22.75		378.6	271.2	102,663		2.357	1,200,391	27.557
	23.00		380.6	273.2	103,966		2.387	1,226,219	28.150
	23.25		382.6	275.2	105,278		2.417	1,252,375	28.751
	23.50		384.6	277.2	106,597		2.447	1,278,859	29.359
	23.75		386.6	279.2	107,925		2.478	1,305,474	29.974

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Defention, Version 4.06 (July 2022)

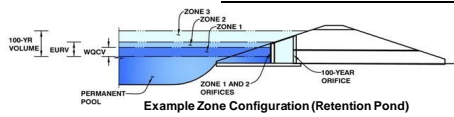


## DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD- Detention, Version 4.06 (July 2022)

Project: Davis Ranch

Basin ID: Pond 4



Example Zone Configuration (Retention Pond)

## Watershed Information

Selected BMP Type =	EDB
Watershed Area =	113.97 acres
Watershed Length =	4,575 ft
Watershed Length to Centroid =	2,300 ft
Watershed Slope =	0.025 ft/ft
Watershed Imperviousness =	5.90% percent
Percentage Hydrologic Soil Group A =	100.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

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

Water Quality Capture Volume (WQCV) =	0.400 acre-feet
Excess Urban Runoff Volume (EURV) =	0.426 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.207 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.374 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.516 acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	1.926 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	3.425 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	5.508 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	10.239 acre-feet
Approximate 2-yr Detention Volume =	0.249 acre-feet
Approximate 5-yr Detention Volume =	0.347 acre-feet
Approximate 10-yr Detention Volume =	0.468 acre-feet
Approximate 25-yr Detention Volume =	0.656 acre-feet
Approximate 50-yr Detention Volume =	1.011 acre-feet
Approximate 100-yr Detention Volume =	1.968 acre-feet

## Optional User Overrides

	acre-feet
	acre-feet
	inches
	inches
	inches
	inches
	inches
	inches
	inches

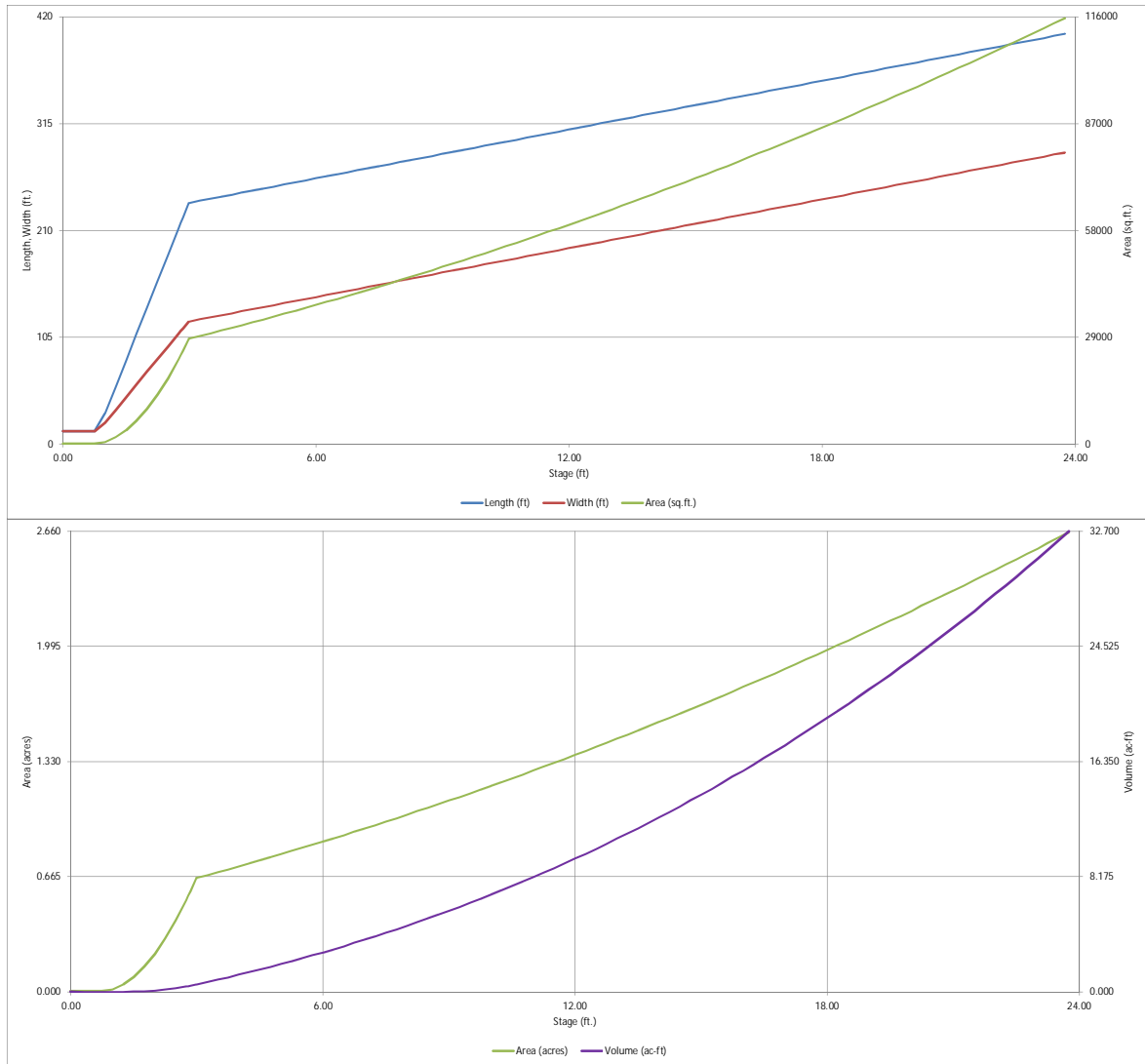
## Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.400 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.027 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.542 acre-feet
Total Detention Basin Volume =	1.968 acre-feet
Initial Surcharge Volume (ISV) =	52 ft <sup>3</sup>
Initial Surcharge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H <sub>total</sub> ) =	5.00 ft
Depth of Trickle Channel (H <sub>TC</sub> ) =	0.50 ft
Slope of Trickle Channel (S <sub>TC</sub> ) =	0.010 ft/ft
Slopes of Main Basin Sides (S <sub>main</sub> ) =	4 H:V
Basin Length-to-Width Ratio (R <sub>L/W</sub> ) =	2
Initial Surcharge Area (A <sub>ISV</sub> ) =	158 ft <sup>2</sup>
Surcharge Volume Length (L <sub>ISV</sub> ) =	12.6 ft
Surcharge Volume Width (W <sub>ISV</sub> ) =	12.6 ft
Depth of Basin Floor (H <sub>f,LOOR</sub> ) =	2.16 ft
Length of Basin Floor (L <sub>f,LOOR</sub> ) =	237.2 ft
Width of Basin Floor (W <sub>f,LOOR</sub> ) =	130.6 ft
Area of Basin Floor (A <sub>f,LOOR</sub> ) =	28,603 ft <sup>2</sup>
Volume of Basin Floor (V <sub>f,LOOR</sub> ) =	22,240 ft <sup>3</sup>
Depth of Main Basin (H <sub>MAIN</sub> ) =	2.01 ft
Length of Main Basin (L <sub>MAIN</sub> ) =	253.3 ft
Width of Main Basin (W <sub>MAIN</sub> ) =	136.7 ft
Area of Main Basin (A <sub>MAIN</sub> ) =	34,615 ft <sup>2</sup>
Volume of Main Basin (V <sub>MAIN</sub> ) =	63,439 ft <sup>3</sup>
Calculated Total Basin Volume (V <sub>total</sub> ) =	1.970 acre-feet

Depth Increment =	0.25									
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft <sup>2</sup> )	Optional Override Area (ft <sup>2</sup> )	Area (acre)	Volume (ft <sup>3</sup> )	Volume (ac-ft)	
Top of Micropool	0.00		12.6	12.6	158		0.004			
ISV	0.33		12.6	12.6	158		0.004	52	0.001	
	0.50		12.6	12.6	158		0.004	79	0.002	
	0.75		12.6	12.6	158		0.004	119	0.003	
	1.00		30.3	21.1	638		0.015	195	0.004	
	1.25		56.3	33.6	1,889		0.043	497	0.011	
Zone 1 (WQCV)	1.50		82.3	46.1	3,790		0.087	1,193	0.027	
	1.75		108.3	58.6	6,342		0.146	2,446	0.056	
	2.00		134.3	71.1	9,543		0.219	4,418	0.101	
	2.25		160.3	83.6	13,394		0.307	7,272	0.167	
	2.50		186.3	96.1	17,895		0.411	11,170	0.256	
Zone 2 (EURV)	2.75		212.3	108.6	23,047		0.529	16,274	0.374	
	2.80		217.5	111.1	24,155		0.555	17,454	0.401	
	2.85		222.7	113.6	25,289		0.581	18,690	0.429	
	Floor	2.99		237.2	120.6	28,603		0.657	22,460	0.516
	3.00		237.3	120.7	28,632		0.657	22,746	0.522	
Zone 3 (100-year)	3.25		239.3	122.7	29,352		0.674	29,994	0.689	
	3.50		241.3	124.7	30,080		0.691	37,422	0.859	
	3.75		243.3	126.7	30,816		0.707	45,034	1.034	
	4.00		245.3	128.7	31,560		0.725	52,831	1.213	
	4.25		247.3	130.7	32,311		0.742	60,815	1.396	
Zone 3 (100-year)	4.50		249.3	132.7	33,071		0.759	68,987	1.584	
	4.75		251.3	134.7	33,839		0.777	77,351	1.776	
	5.00		253.3	136.7	34,615		0.795	85,908	1.972	
	5.25		255.3	138.7	35,399		0.813	94,659	2.173	
	5.50		257.3	140.7	36,191		0.831	103,608	2.379	
Zone 3 (100-year)	5.75		259.3	142.7	36,991		0.849	112,755	2.589	
	6.00		261.3	144.7	37,799		0.868	122,104	2.803	
	6.25		263.3	146.7	38,615		0.886	131,655	3.022	
	6.50		265.3	148.7	39,439		0.905	141,412	3.246	
	6.75		267.3	150.7	40,271		0.924	151,375	3.475	
Zone 3 (100-year)	7.00		269.3	152.7	41,110		0.944	161,548	3.709	
	7.25		271.3	154.7	41,958		0.963	171,931	3.947	
	7.50		273.3	156.7	42,814		0.983	182,528	4.190	
	7.75		275.3	158.7	43,678		1.003	193,339	4.438	
	8.00		277.3	160.7	44,550		1.023	204,368	4.692	
Zone 3 (100-year)	8.25		279.3	162.7	45,430		1.043	215,615	4.950	
	8.50		281.3	164.7	46,318		1.063	227,083	5.213	
	8.75		283.3	166.7	47,214		1.084	238,775	5.482	
	9.00		285.3	168.7	48,118		1.105	250,691	5.755	
	9.25		287.3	170.7	49,030		1.126	262,834	6.034	
Zone 3 (100-year)	9.50		289.3	172.7	49,950		1.147	275,206	6.318	
	9.75		291.3	174.7	50,878		1.168	287,810	6.607	
	10.00		293.3	176.7	51,813		1.189	300,646	6.902	
	10.25		295.3	178.7	52,757		1.211	313,717	7.202	
	10.50		297.3	180.7	53,709		1.233	327,025	7.507	
Zone 3 (100-year)	10.75		299.3	182.7	54,669		1.255	340,572	7.818	
	11.00		301.3	184.7	55,637		1.277	354,360	8.135	
	11.25		303.3	186.7	56,613		1.300	368,391	8.457	
	11.50		305.3	188.7	57,597		1.322	382,667	8.785	
	11.75		307.3	190.7	58,589		1.345	397,191	9.118	
Zone 3 (100-year)	12.00		309.3	192.7	59,589		1.368	411,963	9.457	
	12.25		311.3	194.7	60,597		1.391	426,986	9.802	
	12.50		313.3	196.7	61,613		1.414	442,262	10.153	
	12.75		315.3	198.7	62,636		1.438	457,792	10.509	
	13.00		317.3	200.7	63,668		1.462	473,580	10.872	
Zone 3 (100-year)	13.25		319.3	202.7	64,708		1.485	489,627	11.240	
	13.50		321.3	204.7	65,756		1.510	505,935	11.615	
	13.75		323.3	206.7	66,812		1.534	522,506	11.995	
	14.00		325.3	208.7	67,876		1.558	539,342	12.382	
	14.25		327.3	210.7	68,948		1.583	556,445	12.774	
Zone 3 (100-year)	14.50		329.3	212.7	70,028		1.608	573,817	13.173	
	14.75		331.3	214.7	71,116		1.633	591,459	13.578	
	15.00		333.3	216.7	72,212		1.658	609,375	13.989	
	15.25		335.3	218.7	73,316		1.683	627,566	14.407	
	15.50		337.3	220.7	74,427		1.709	646,034	14.831	
Zone 3 (100-year)	15.75		339.3	222.7	75,547		1.734	664,780	15.261	
	16.00		341.3	224.7	76,675		1.760	683,808	15.698	
	16.25		343.3	226.7	77,811		1.786	703,119	16.141	
	16.50		345.3	228.7	78,955		1.813	722,714	16.591	
	16.75		347.3	230.7	80,107		1.839	742,597	17.048	
Zone 3 (100-year)	17.00		349.3	232.7	81,267		1.866	762,768	17.511	
	17.25		351.3	234.7	82,435		1.892	783,231	17.981	
	17.50		353.3	236.7	83,611		1.919	803,986	18.457	
	17.75		355.3	238.7	84,795		1.947	825,037	18.940	
	18.00		357.3	240.7	85,987		1.974	846,384	19.430	
Zone 3 (100-year)	18.25		359.3	242.7	87,187		2.002	868,031	19.927	
	18.50		361.3	244.7	88,394		2.029	889,978	20.431	
	18.75		363.3	246.7	89,610		2.057	912,229	20.942	
	19.00		365.3	248.7	90,834		2.085	934,784	21.460	
	19.25		367.3	250.7	92,066		2.114	957,647	21.985	
Zone 3 (100-year)	19.50		369.3	252.7	93,306		2.142	980,818	22.516	
	19.75		371.3	254.7	94,554		2.171	1,004,300	23.056	
	20.00		373.3	256.7	95,810		2.199	1,028,096	23.602	
	20.25		375.3	258.7	97,074		2.229	1,052,206	24.155	
	20.50		377.3	260.7	98,346		2.258	1,076,633	24.716	
Zone 3 (100-year)	20.75		379.3	262.7	99,626		2.287	1,101,379	25.284	
	21.00		381.3	264.7	100,914		2.317	1,126,447	25.860	
	21.25		383.3	266.7	102,209		2.346	1,151,837	26.443	
	21.50		385.3	268.7	103,513		2.376	1,177,552	27.033	
	21.75		387.3	270.7	104,825		2.406	1,203,594	27.631	
Zone 3 (100-year)	22.00		389.3	272.7	106,145		2.437	1,229,965	28.236	
	22.25		391.3	274.7	107,473		2.467	1,256,668	28.849	
	22.50		393.3	276.7	108,809		2.498	1,283,703	29.470	
	22.75		395.3	278.7	110,153		2.529	1,311,073	30.098	
	23.00		397.3	280.7	111,505		2.560	1,338,780	30.734	
Zone 3 (100-year)	23.25		399.3	282.7	112,865		2.591	1,366,826	31.378	
	23.50		401.3	284.7	114,233		2.622	1,395,213	32.030	
	23.75		403.3	286.7	115,609		2.654	1,423,943	32.689	

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Defention, Version 4.06 (July 2022)

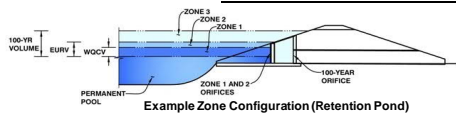


# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Davis Ranch

Basin ID: Pond 5



Example Zone Configuration (Retention Pond)

## Watershed Information

Selected BMP Type =	EDB
Watershed Area =	163.62 acres
Watershed Length =	3,600 ft
Watershed Length to Centroid =	1,935 ft
Watershed Slope =	0.020 ft/ft
Watershed Imperviousness =	14.00% percent
Percentage Hydrologic Soil Group A =	100.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	0.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

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

Water Quality Capture Volume (WQCV) =	1.205 acre-feet
Excess Urban Runoff Volume (EURV) =	1.849 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.053 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	1.621 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	2.125 acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	4.489 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	6.789 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	9.978 acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	16.987 acre-feet
Approximate 2-yr Detention Volume =	1.124 acre-feet
Approximate 5-yr Detention Volume =	1.530 acre-feet
Approximate 10-yr Detention Volume =	1.982 acre-feet
Approximate 25-yr Detention Volume =	2.628 acre-feet
Approximate 50-yr Detention Volume =	3.326 acre-feet
Approximate 100-yr Detention Volume =	4.869 acre-feet

## Optional User Overrides

	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

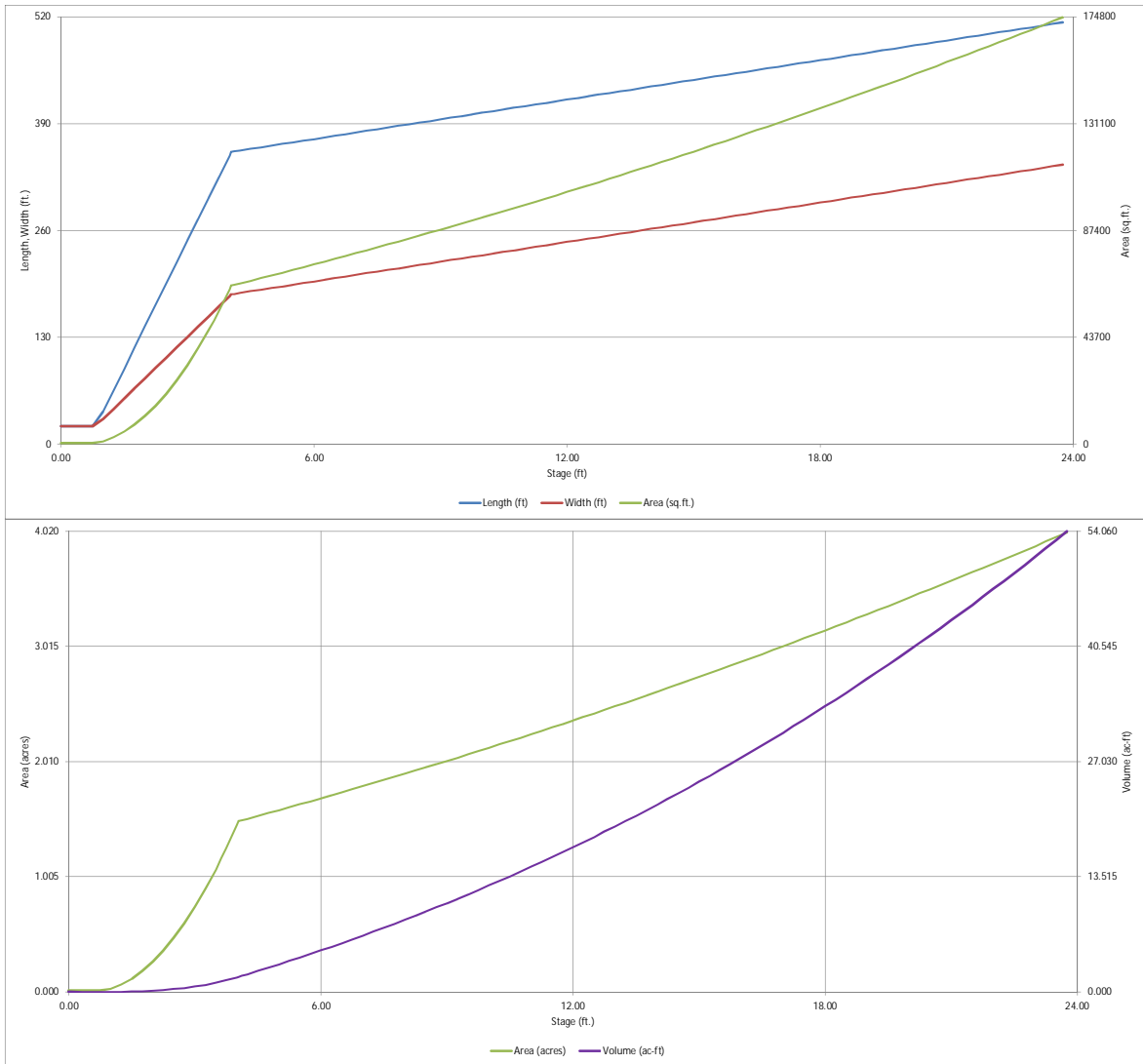
## Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.205 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.644 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.020 acre-feet
Total Detention Basin Volume =	4.869 acre-feet
Initial Surge Volume (ISV) =	157 ft <sup>3</sup>
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H <sub>total</sub> ) =	6.00 ft
Depth of Trickle Channel (H <sub>TC</sub> ) =	0.50 ft
Slope of Trickle Channel (S <sub>TC</sub> ) =	0.010 ft/ft
Slopes of Main Basin Sides (S <sub>main</sub> ) =	4 ft/V
Basin Length-to-Width Ratio (R <sub>L/W</sub> ) =	2
Initial Surge Area (A <sub>ISV</sub> ) =	477 ft <sup>2</sup>
Surge Volume Length (L <sub>ISV</sub> ) =	21.8 ft
Surge Volume Width (W <sub>ISV</sub> ) =	21.8 ft
Depth of Basin Floor (H <sub>floor</sub> ) =	3.21 ft
Length of Basin Floor (L <sub>floor</sub> ) =	355.7 ft
Width of Basin Floor (W <sub>floor</sub> ) =	182.3 ft
Area of Basin Floor (A <sub>floor</sub> ) =	64,857 ft <sup>2</sup>
Volume of Basin Floor (V <sub>floor</sub> ) =	75,860 ft <sup>3</sup>
Depth of Main Basin (H <sub>main</sub> ) =	1.96 ft
Length of Main Basin (L <sub>main</sub> ) =	371.4 ft
Width of Main Basin (W <sub>main</sub> ) =	198.0 ft
Area of Main Basin (A <sub>main</sub> ) =	73,539 ft <sup>2</sup>
Volume of Main Basin (V <sub>main</sub> ) =	135,539 ft <sup>3</sup>
Calculated Total Basin Volume (V <sub>total</sub> ) =	4.862 acre-feet

Depth Increment =	0.25								
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft <sup>2</sup> )	Optional Override Area (ft <sup>2</sup> )	Area (acre)	Volume (ft <sup>3</sup> )	Volume (ac-ft)
Top of Micropool	0.00		21.8	21.8	477		0.011		
ISV	0.33		21.8	21.8	477		0.011	157	0.004
	0.50		21.8	21.8	477		0.011	239	0.005
	0.75		21.8	21.8	477		0.011	358	0.008
	1.00		39.5	30.3	1,199		0.028	534	0.012
	1.25		65.5	42.8	2,807		0.064	1,022	0.023
1.50		91.5	55.3	5,065		0.116	1,992	0.046	
1.75		117.5	67.8	7,973		0.183	3,608	0.083	
2.00		143.5	80.3	11,531		0.265	6,033	0.138	
2.25		169.5	92.8	15,739		0.361	9,428	0.216	
2.50		195.5	105.3	20,597		0.473	13,957	0.320	
2.75		221.5	117.8	26,105		0.599	19,781	0.454	
3.00		247.5	130.3	32,263		0.741	27,064	0.621	
3.25		273.5	142.8	39,071		0.897	35,967	0.826	
3.50		299.5	155.3	46,529		1.068	46,653	1.071	
Zone 1 (WQCV)	3.63		313.0	161.8	50,664		1.163	52,969	1.216
3.75		325.5	167.8	54,637		1.254	59,286	1.361	
4.00		351.5	180.3	63,395		1.455	74,026	1.699	
Floor	4.04		355.7	182.3	64,857		1.489	76,591	1.758
Zone 2 (EURV)	4.11		356.2	182.9	65,159		1.496	81,142	1.863
4.25		357.4	184.0	65,764		1.510	90,306	2.073	
4.50		359.4	186.0	66,850		1.535	106,883	2.454	
4.75		361.4	188.0	67,945		1.560	123,732	2.841	
5.00		363.4	190.0	69,048		1.585	140,856	3.234	
5.25		365.4	192.0	70,159		1.611	158,257	3.633	
5.50		367.4	194.0	71,278		1.636	175,936	4.039	
5.75		369.4	196.0	72,404		1.662	193,896	4.451	
Zone 3 (100-year)	6.00		371.4	198.0	73,539		1.688	212,139	4.870
6.25		373.4	200.0	74,682		1.714	230,666	5.295	
6.50		375.4	202.0	75,833		1.741	249,481	5.727	
6.75		377.4	204.0	76,991		1.767	268,583	6.166	
7.00		379.4	206.0	78,158		1.794	287,977	6.611	
7.25		381.4	208.0	79,333		1.821	307,663	7.063	
7.50		383.4	210.0	80,516		1.848	327,644	7.522	
7.75		385.4	212.0	81,707		1.876	347,922	7.987	
8.00		387.4	214.0	82,905		1.903	368,498	8.460	
8.25		389.4	216.0	84,112		1.931	389,375	8.939	
8.50		391.4	218.0	85,327		1.959	410,555	9.425	
8.75		393.4	220.0	86,550		1.987	432,039	9.918	
9.00		395.4	222.0	87,780		2.015	453,830	10.419	
9.25		397.4	224.0	89,019		2.044	475,930	10.926	
9.50		399.4	226.0	90,266		2.072	498,340	11.440	
9.75		401.4	228.0	91,521		2.101	521,064	11.962	
10.00		403.4	230.0	92,783		2.130	544,101	12.491	
10.25		405.4	232.0	94,054		2.159	567,456	13.027	
10.50		407.4	234.0	95,333		2.189	591,129	13.570	
10.75		409.4	236.0	96,620		2.218	615,123	14.121	
11.00		411.4	238.0	97,915		2.248	639,440	14.680	
11.25		413.4	240.0	99,217		2.278	664,081	15.245	
11.50		415.4	242.0	100,528		2.308	689,049	15.818	
11.75		417.4	244.0	101,847		2.338	714,346	16.399	
12.00		419.4	246.0	103,174		2.369	739,973	16.987	
12.25		421.4	248.0	104,508		2.399	765,933	17.583	
12.50		423.4	250.0	105,851		2.430	792,228	18.187	
12.75		425.4	252.0	107,202		2.461	818,860	18.798	
13.00		427.4	254.0	108,561		2.492	845,830	19.418	
13.25		429.4	256.0	109,928		2.524	873,141	20.045	
13.50		431.4	258.0	111,302		2.555	900,794	20.679	
13.75		433.4	260.0	112,685		2.587	928,793	21.322	
14.00		435.4	262.0	114,076		2.619	957,138	21.973	
14.25		437.4	264.0	115,475		2.651	985,831	22.632	
14.50		439.4	266.0	116,881		2.683	1,014,876	23.298	
14.75		441.4	268.0	118,296		2.716	1,044,273	23.973	
15.00		443.4	270.0	119,719		2.748	1,074,024	24.656	
15.25		445.4	272.0	121,150		2.781	1,104,133	25.347	
15.50		447.4	274.0	122,589		2.814	1,134,600	26.047	
15.75		449.4	276.0	124,035		2.847	1,165,428	26.755	
16.00		451.4	278.0	125,490		2.881	1,196,618	27.471	
16.25		453.4	280.0	126,953		2.914	1,228,174	28.195	
16.50		455.4	282.0	128,424		2.948	1,260,095	28.928	
16.75		457.4	284.0	129,902		2.982	1,292,386	29.669	
17.00		459.4	286.0	131,389		3.016	1,325,047	30.419	
17.25		461.4	288.0	132,884		3.051	1,358,081	31.177	
17.50		463.4	290.0	134,387		3.085	1,391,490	31.944	
17.75		465.4	292.0	135,898		3.120	1,425,275	32.720	
18.00		467.4	294.0	137,416		3.155	1,459,439	33.504	
18.25		469.4	296.0	138,943		3.190	1,493,984	34.297	
18.50		471.4	298.0	140,478		3.225	1,528,912	35.099	
18.75		473.4	300.0	142,021		3.260	1,564,224	35.910	
19.00		475.4	302.0	143,571		3.296	1,599,923	36.729	
19.25		477.4	304.0	145,130		3.332	1,636,010	37.558	
19.50		479.4	306.0	146,697		3.368	1,672,488	38.395	
19.75		481.4	308.0	148,272		3.404	1,709,359	39.241	
20.00		483.4	310.0	149,855		3.440	1,746,625	40.097	
20.25		485.4	312.0	151,445		3.477	1,784,287	40.962	
20.50		487.4	314.0	153,044		3.513	1,822,348	41.835	
20.75		489.4	316.0	154,651		3.550	1,860,810	42.718	
21.00		491.4	318.0	156,266		3.587	1,899,674	43.611	
21.25		493.4	320.0	157,888		3.625	1,938,944	44.512	
21.50		495.4	322.0	159,519		3.662	1,978,619	45.423	
21.75		497.4	324.0	161,158		3.700	2,018,704	46.343	
22.00		499.4	326.0	162,805		3.737	2,059,199	47.273	
22.25		501.4	328.0	164,460		3.775	2,100,107	48.212	
22.50		503.4	330.0	166,122		3.814	2,141,429	49.160	
22.75		505.4	332.0	167,793		3.852	2,183,169	50.119	
23.00		507.4	334.0	169,472		3.891	2,225,327	51.086	
23.25		509.4	336.0	171,159		3.929	2,267,905	52.064	
23.50		511.4	338.0	172,853		3.968	2,310,907	53.051	
23.75		513.4	340.0	174,556		4.007	2,354,333	54.048	

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Defention, Version 4.06 (July 2022)





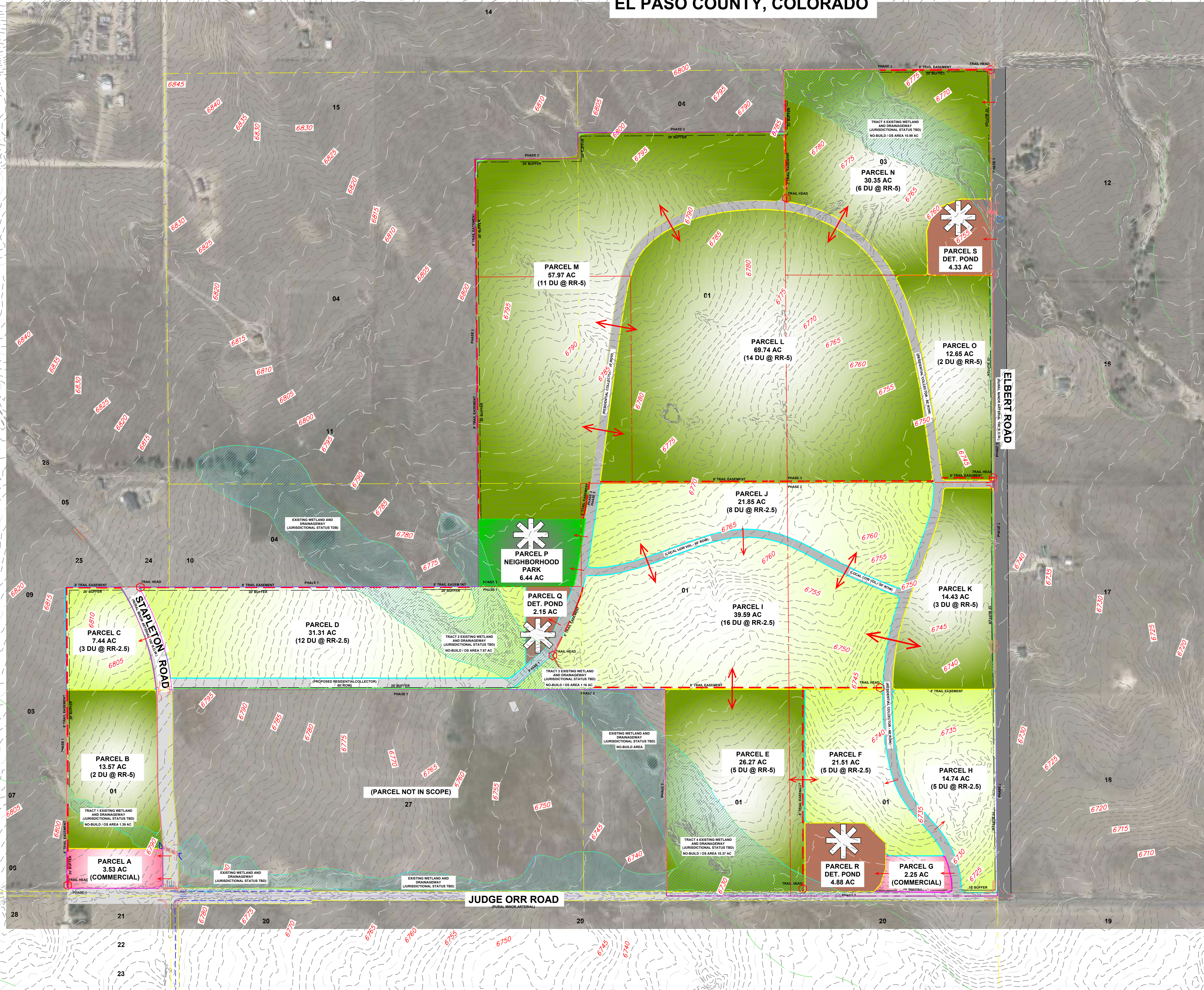
**APPENDIX E**  
**REFERENCE MATERIALS**



# DAVIS RANCH SKETCH PLAN

TOWNSHIP 12S, SE  $\frac{1}{4}$  of SE  $\frac{1}{4}$  OF SEC. 34, T. 12S, R. 64W (661 SSL, 660 ESL)

EL PASO COUNTY, COLORADO



LAND USE SUMMARY TABLE:			
LAND USE CATEGORY	ACREAGE	% OF SITE	MAXIMUM UNITS
LOW DENSITY RR-2.5 ZONING	127.44 ac	32%	49
LOW DENSITY RR-5 ZONING	226.30 ac	57%	43
COMMERCIAL CS ZONING	5.78 ac	1.5%	n.a.
OPEN SPACE PARK ZONING	6.44 ac	1.7%	n.a.
FLOODPLAIN NO-BUILD / OS	31.89 ac	n.a.	n.a.
DETENTION NO-BUILD	11.35 ac	2.9%	n.a.
TRAIL AND TRAIL HEAD	2.69 ac	1.0%	n.a.
15-20' BUFFER	n.a.	n.a.	n.a.
PROPOSED R.O.W.	20.68 ac	4.4%	n.a.
TOTAL:	398.91 ac	100%	92

PARCEL SUMMARY			
PARCEL	ACREAGE	PROPOSED USE/ZONE	MAXIMUM UNITS
A	3.53	COMMERCIAL	n.a.
B	13.57	RR-5.0	2 DU
C	7.44	RR-2.5	3 DU
D	31.31	RR-2.5	12 DU
E	26.27	RR-5.0	5 DU
F	12.51	RR-2.5	5 DU
G	2.25	COMMERCIAL	n.a.
H	14.74	RR-2.5	5 DU
I	39.59	RR-2.5	16 DU
J	21.85	RR-2.5	9 DU
K	28.40	RR-5.0	3 DU
L	69.79	RR-5.0	14 DU
M	57.97	RR-5.0	11 DU
N	30.35	RR-5.0	6 DU
O	12.65	RR-5.0	2 DU
P	6.44	PARK	n.a.
Q	2.14	DETENTION	n.a.
R	4.88	DETENTION	n.a.
S	4.33	DETENTION	n.a.

ADJACENT PROPERTY OWNERS:			
KEY	NAME AND ADDRESS	KEY	NAME AND ADDRESS
01	Jane Davis Living Trust 9060 Elbert Road Peyton, CO 80831 - 8319 TSN 4200000377	15	Jerry F. Ager 9365 N. Curtis Road Peyton, CO 80831 - 8226 TSN 4234001001
02	Junior J. Davis 9050 Elbert Road Peyton, CO 80831 - 8319 TSN 4200000218	16	Joseph A. Stenstrom 9055 Elbert Road Peyton, CO 80831 TSN 4200000244
03	Junior J. Davis 9350 Elbert Road Peyton, CO 80831 - 8319 TSN 4200000241	17	Thomas J. Elliott 8995 Elbert Road Peyton, CO 80831 - 8318 TSN 4200000245
04	Robert D. Gieck Trust 8349 S. Allison Street Littleton, CO 80128- 6101 TSN 4200000209	18	Charlotte A. Howard 3232 Muirfield Drive Colo. Spgs., CO 80907 TSN 4200000362
05	Mabel L. Brown 9555 Curtis Road Peyton, CO 80831 - 7759 TSN 4200000047	19	Brent Houser Ent., LLC 11890 Garrett Road Peyton, CO 80831 - 7685 TSN 4300000539
06	Jennings Family Trust 2030 Tabor Court Colorado Springs, CO 80919 - 4843 TSN 4233002007	20	Gorilla Capital Co. 1342 High Street Eugene, OR 97401 TSN 4300000599
07	FFR7, LLC 1220 Valley Street Colorado Springs, CO 80915 TSN 4233002006	21	J.D. Enghaus 14775 Judge Orr Road Peyton, CO 80831 - 8424 TSN 4304003001
08	Jennings Family Trust 2030 Tabor Court Colorado Springs, CO 80919 - 4843 TSN 4233002004	22	Rodolfo Escobedo 10075 Burgess Road Colorado Springs, CO 80908 TSN 4304003002
09	Albert Omar Lopez 7220 Rinn Bluff Lane Colorado Springs, CO 80927 TSN 4233002003	23	Daniel Duane Combss 8410 N. Curtis Road Peyton, CO 80831 - 7927 TSN 4304003003
10	Roberto S. Torres 9464 Winged Foot Road Peyton, CO 80831 TSN 4233002002	24	Jennifer Renzelman 14990 Stapleton Road Peyton, CO 80831 - 6202 TSN 4233000034
11	Julia B. Morgan Living Trust 4825 Old Farm Drive #314 Colorado Springs, CO 80917 - 1089 TSN 4220000015	25	George Tasoulis 227 W. Sylvester Place Littleton, CO 80129 - 6202 TSN 4233000034
12	Maria O. Skaggs P.O. Box 219 Lake Hopatcong, NJ 07849 - 0219 TSN 4200000103	26	Peter J. Hagen 704 Silver Oak Grove Colorado Springs, CO 80906 TSN 4200000377
13	Coronado Ranch Partners, LLC 1083 Prickly Pear Place Colorado Springs, CO 80921 TSN 4200000021	27	Pete Lien & Sons, Inc. P.O. Box 440 Rapid City, SD 57709 - 0440 TSN 4200000405
14	Julia B. Morgan Living Trust 4825 Old Farm Drive #314 Colorado Springs, CO 80917 - 1089 TSN 4220000015	28	William R. Bunn 28531 Saratoga Ave. Big Pine Key, FL 33043 - 3207 TSN 4304005019

**DRAFT**  
MAY 5, 2023

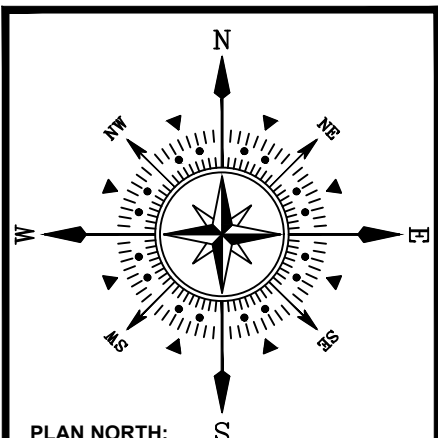
Actual North

0' 300' 600' 900'

SCALE: 1" = 300' - 0"

**William Guman & Associates, Ltd.**  
LANDSCAPE ARCHITECTURE  
731 North Weber Street  
Colorado Springs, CO 80903  
(719) 633-9700  
www.GumanLtd.com  
bill@guman.net

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**DAVIS RANCH**  
**9350 ELBERT ROAD**  
**PEYTON, CO 80831**  
**SKETCH PLAN**

DATE:	04/12/2023
DESIGNED:	WFG
CHECKED:	GEM

REVISIONS:		
DATE:	BY:	DESCRIPTION:

PLAN SCALE: 1" = 300' (OR AS NOTED ON PLAN)

SHEET TITLE:  
**SKETCH PLAN**

SHEET NO.  
**SKP1.2**

2 of 3 SHEETS

FILE NO.  
FILE#





**Wetland, Wildlife and Natural Features Report  
for  
Davis Subdivision in El Paso County, Colorado**

June 19, 2023

**Prepared for:**

Bill Guman, PLA, ASLA, APA  
William Guman & Associates, Ltd.  
731 North Weber Street  
Colorado Springs, CO 80903

**Prepared by:**



1455 Washburn Street  
Erie, Colorado 80516  
(p): 970-812-3267

Project Number: 2022-22-1



drainages flow from the area and can form wide wet meadows of up to 40 acres in size. These many drainages and wet meadows support a mosaic of wetland plants and communities including Baltic rush (*Juncus balticus* var. *montanus*), Nebraska sedge (*Carex nebrascensis*), clustered sedge (*C. praegracilis*), woolly sedge (*C. pellita*), Crawe sedge (*C. crawei*), three-square bulrush (*Scirpus pungens*), saltgrass (*Distichlis spicata*) and the European pasture grass redtop (*Agrostis gigantea*). These communities can form monotypic stands or intermingle with adjacent types.

No Critical Habitat, Wildlife Refuges, or Hatcheries are present in the vicinity of the Site according to the USFWS IPaC Trust Resources Report in Appendix B (USFWS, 2023a).

### 3.1 Topography / Natural Landform

The topography of the Site trends from the northwest to the southeast and is formed by three gentle ridges along the southwest, central and northeast portions of the Site, which form natural drainage depressions in the southwest, south-central and northeast portions of the Site. It ranges from a high elevation of approximately 6,818 feet above mean sea level (AMSL) along the northwest edge of the Site to a low elevation of approximately 6,720 feet AMSL in the southeastern corner of the Site.

### 3.2 Soils

ECOS utilized the USDA, Natural Resource Conservation Service (NRCS) Web Soil Survey (USDA, NRCS, 2023) to determine the types of soils present and if hydric soils are present within the Site, as this data assist in informing the presence/absence of potential wetland habitat regulated under the Clean Water Act. The soil data were also utilized to supplement the field observations of vegetation, as the USDA provides a correlation of native vegetation species by soil types. Please refer to the Custom Soil Resource Report for the Site in Appendix A.

The Site is comprised of the following soil types:

#### Map Unit Symbol & Name

- 8 – Blakeland loamy sand, 1 to 9 percent slopes;
- 19 - Columbine gravelly sandy loam, 0 to 3 percent slopes; and
- 29 - Fluvaquentic Haploquolls, nearly level.

Pursuant to the Custom Soil Resource Report:

- The Blakeland loamy sand is not hydric; however, the 1% inclusion of Pleasant soil is hydric;
- The Columbine gravelly sandy loam is not hydric; however, the 1% inclusion of Fluvaquentic Haploquolls and 1% inclusion of Pleasant soils are both hydric; and
- The Fluvaquentic Haploquolls is hydric and the 1% inclusion of Haploquolls soil is hydric as well.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS, 1994) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in *Field Indicators of Hydric Soils in the United States* (USDA, NRCS, 2010).

### 3.3 Vegetation Communities

#### 3.3.1 Short- and Mixed-grass Prairie

The vegetation within the Site is primarily comprised of herbaceous short-grass prairie species with herbaceous wetland vegetation in the drainages and ephemeral swales flowing through the Site. Given the limited presence of certain mid-grass prairie species mixed throughout the shortgrass prairie, we have referred to the vegetation community as “short and mixed grass prairie”. Refer to Figure 4, Vegetation Community Map. The dominant prairie grass species is blue grama (*Bouteloua gracilis*), with occasional little bluestem (*Schizachyrium scoparium*) and western wheatgrass (*Pascopyrum smithii*). The other most common associative prairie species are prairie aster (*Machaeranthera tenacetifolia*), smooth brome (*Bromus inermis*), fringed sage (*Artemisia frigida*), yucca (*Yucca spp.*) and prickly pear cactus (*Opuntia sp.*). Other species include Wood’s rose (*Rosa woodsii*), false indigo bush (*Amorpha fruticosa*), sticky geranium (*Geranium viscosissimum*), and yarrow (*Achillea millefolium*). The Site is moderately grazed and there are scattered weeds, including Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), Scotch thistle (*Onopordum acanthium*), common mullein (*Verbascum thapsus*), horseweed (*Conyza canadensis*) and field bindweed (*Convolvulus arvensis*).

#### 3.3.2 Wetland

Hydrophytic vegetation (wetland vegetation) is present within the northeastern, south-central, and southwest ephemeral drainages where saturated (hydric) soils are present. Dominant wetland vegetation includes Baltic rush (*Juncus balticus*), Nebraska sedge (*Carex nebrascensis*), clustered field sedge (*C. praegracilis*), saltgrass (*Distichlis spicata*), and spikerush (*Eleocharis palustris*). Dispersed sandbar willow (*Salix exigua*) is present in the northeastern ephemeral drainages. Other hydrophytic species present include water mint (*Mentha aquatica*), narrowleaf cattail (*Typha angustifolia*), and Rocky Mountain iris (*Iris missouriensis*). Refer to Figure 4, Vegetation Community Map and Figure 5, NWI Map.

### **3.3.2 Riparian**

Riparian habitat within the Site is comprised of more robust short-grass prairie where moist, mesic soils are present adjacent to wetlands (described above) and small pockets of open water that were excavated for stock ponds (refer to

Figures 4 and 6). Trees and shrubs are primarily absent, with the exception of narrowleaf and Plains cottonwood (*Populus angustifolia* and *deltoides*) and sandbar willow dispersed throughout the Site but mostly in the northeastern drainages. Refer to Figure 4, Vegetation Community Map and Figure 6. CNHP Riparian Habitat Map.

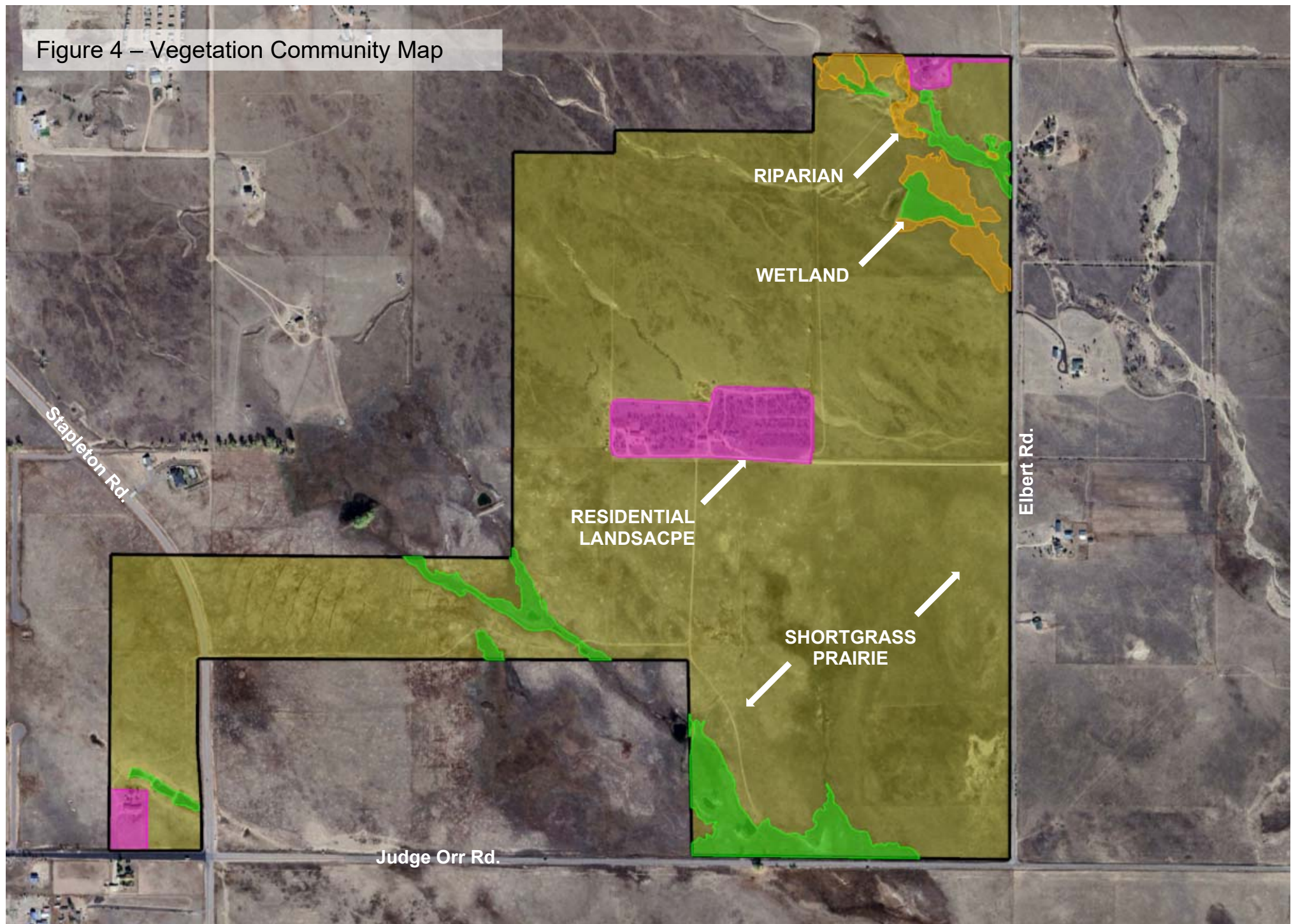
### **3.3.2 Residential Landscape**

A large grove of Chinese elm (*Ulmus parvifolia*) was planted around the Davis Ranch (Gieck Ranch on USGS mapping) in the central portion of Section 34. This stand of elm serves as an excellent wind break, as well as good habitat for wildlife, including numerous bird cavities. Other common “landscape” trees such as pine, oak, and fruit trees are present in the residential areas. Refer to Figure 4, Vegetation Community Map.

Refer to Appendix B – Photo Location Map and Representative Photos of the vegetation communities found on the Site.



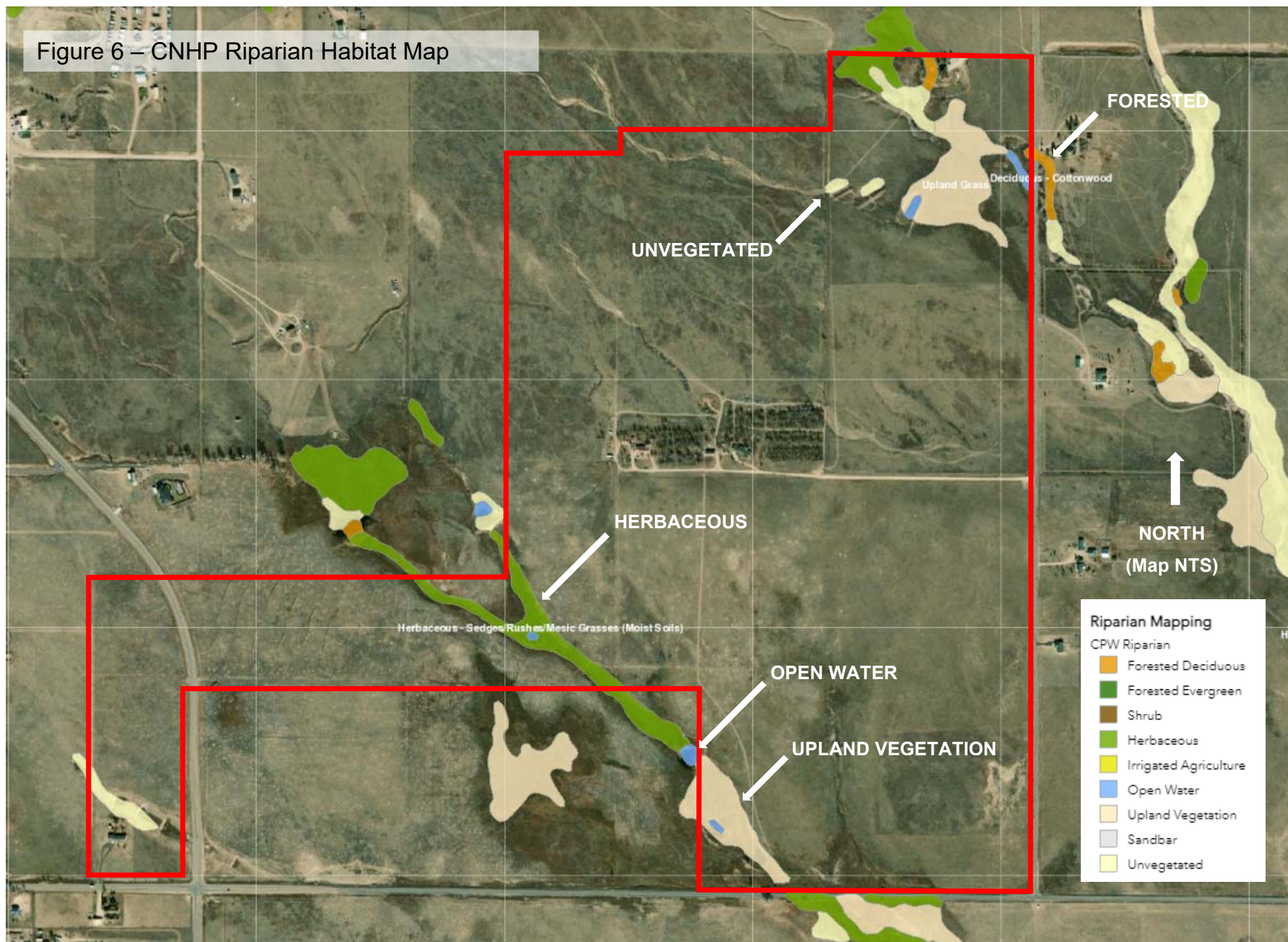
Figure 4 – Vegetation Community Map



Source: Google Earth Aerial Image, 10/31/2022 & Ecosystem Services, LLC Site Assessment, 5/23/2023



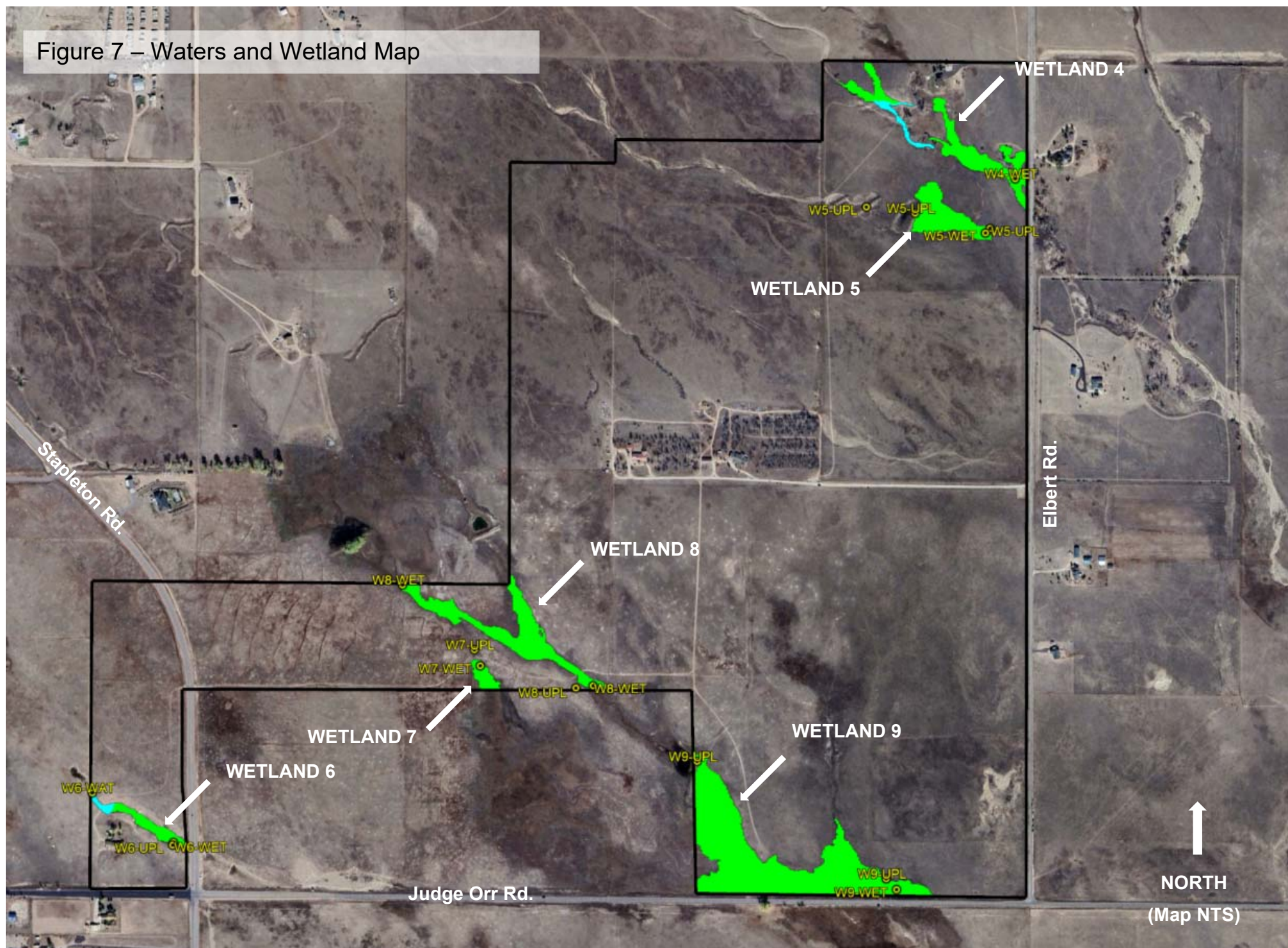
Figure 6 – CNHP Riparian Habitat Map



Source: Colorado Natural Heritage Program (CNHP) Wetland Mapper



Figure 7 – Waters and Wetland Map



Source: Google Earth Aerial Image, 10/31/2023 & Ecosystem Services, LLC Wetland Delineation, 5/23/2023

### 3.7 Wildlife

The stated purpose and intent of the “El Paso County Development Standards” wildlife section is to ensure that proposed development is reviewed with consideration of the impacts to wildlife and wildlife habitat, and to implement the provisions of the Master Plan (El Paso County, 2021). The two primary vegetation types within the Site are herbaceous prairie and wetlands. ECOS has determined that the wildlife impact potential for development of this singular Site is expected to be moderate to low, as the Site currently provides poor to moderate habitat for wildlife. Taken in a regional watershed or larger landscape context, as more and more prairie is developed over time impacts to wildlife are expected to be moderate to high as wildlife run out of space and habitat.

The Site provides habitat for prairie species such as pronghorn (*Antilocapra americana*), black-tailed prairie dog (*Cynomys ludovicianus*), thirteen-lined ground squirrel (*Ictidomys tridecemlineatus*), voles (*Microtus spp.*) and jackrabbit (*Lepus townsendii*). The Site also provides foraging and breeding habitat for predators such as coyote (*Canis latrans*), fox (*Vulpes vulpes*), badger (*Meles meles*), and occasional bobcat (*Lynx rufus*). The Site also provides good habitat for reptiles and moderate habitat for amphibians such as Woodhouse toad (*Anaxyrus woodhousii*), leopard frog (*Lithobates pipiens*), and garter snake (*Thamnophis spp.*).

The USFWS IPaC Trust Resources Report (USFWS, 2023a) (Appendix C) reports that bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), and ferruginous hawk (*Buteo regalis*) may utilize the area. The Site provides limited tree nesting habitat for raptors; however, ferruginous hawks may also use ground nests.

The Site contains no Critical Habitat, Wildlife Refuges, or Hatcheries according to the USFWS IPaC Trust Resources Report (USFWS, 2023a) (Appendix C).

The project proposes to develop most of the prairie, however, the drainages and grassland immediately adjacent to them within the floodplain would be preserved as Open Space. A noxious weed management plan will be implemented per State and County requirements to improve wildlife habitat, and a native plant re-vegetation plan for the Open Space is recommended to provide additional benefit to wildlife habitat.

### 4.0 FEDERAL LISTED SPECIES

A number of species that occur in El Paso County are listed as threatened and endangered (T&E) by the USFWS under the Endangered Species Act (ESA) (USFWS 2023). ECOS compiled the data regarding T&E species for the Site in Table 3 based on the Site-specific, USFWS IPaC Trust Resources Report we ran for the Project (Appendix C) and our onsite assessment. ECOS has provided our professional opinion regarding the probability that these species may occur within the Site and their probability of being impacted by the Project.

The likelihood that the Project would impact any of the species listed below is insignificant to none. Most are not expected to occur in the project area and no downstream impacts are expected. The USFWS also states that there is no Critical Habitat for T&E species in the Site locations.

<b>TABLE 3 - FEDERAL LISTED SPECIES POTENTIALLY IMPACTED BY THE PROJECT</b>			
<b>Species</b>	<b>Status</b>	<b>Habitat Requirements and Presence</b>	<b>Probability of Impact by Project</b>
<b>FISH</b>			
Greenback cutthroat trout ( <i>Oncorhynchus clarki stomias</i> )	Threatened	Cold, clear, gravely headwater streams and mountain lakes that provide an abundant food supply of insects.	None. Suitable habitat does not exist on the Site.
Pallid sturgeon ( <i>Scaphirhynchus albus</i> )	Endangered	Water-related activities/use in the N. Platte, S. Platte and Laramie River Basins may affect listed species in Nebraska.	None. The proposed project will not affect any of the listed river basins.
<b>BIRDS</b>			
Eastern Black Rail ( <i>Laterallus jamaicensis ssp. Jamaicensis</i> )	Threatened	Habitat includes tidally or non-tidally influenced marshes which range in salinity from salt to brackish to fresh. It requires dense overhead perennial herbaceous cover with underlying soils that are moist to saturated (occasionally dry) interspersed with or adjacent to very shallow water (typically $\leq 3$ cm). Eastern black rails depend on this dense cover throughout their life cycle and it is their primary strategy to avoid predation.	Insignificant. Suitable, dense, overhead, perennial, herbaceous cover and shallow water are minimal and dispersed in the discontinuous wetland habitat on the Site.



## 5.0 RAPTORS AND MIGRATORY BIRDS

Raptors and most birds are protected by the Colorado Nongame Wildlife Regulations, as well as by the federal Migratory Bird Treaty Act. Additionally, eagles are protected by the Bald and Golden Eagle Protection Act (BGEPA).

### 5.1 COGCC Database

ECOS utilized the Colorado Oil and Gas Conservation Commissions (COGCC) GIS Online data ([https://cogccmap.state.co.us/cogcc\\_gis\\_online/](https://cogccmap.state.co.us/cogcc_gis_online/)) (COGCC, 2023) to screen the Site for potential raptor nests. No raptor nests have been mapped within one mile of the Site (COGCC, 202). The closest raptor nests to the Site are Golden Eagle and Ferruginous hawk active nests located 3.22 miles east of the eastern edge of the Site and a Golden Eagle active nest located 7.02 miles southwest of the southwest corner of the Site.

### 5.2 USFWS IPaC Data

The USFWS IPaC data for the Site indicates the probability of the presence of five bird species (refer to Appendix C) in the vicinity of the Site. The birds listed by IPaC are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in the Project location. The 1988 amendment to the Fish and Wildlife Conservation Act mandates the USFWS to “identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the ESA. “Birds of Conservation Concern 2021 (BCC 2021)” is the most recent effort to carry out this mandate. The birds listed by IPaC include:

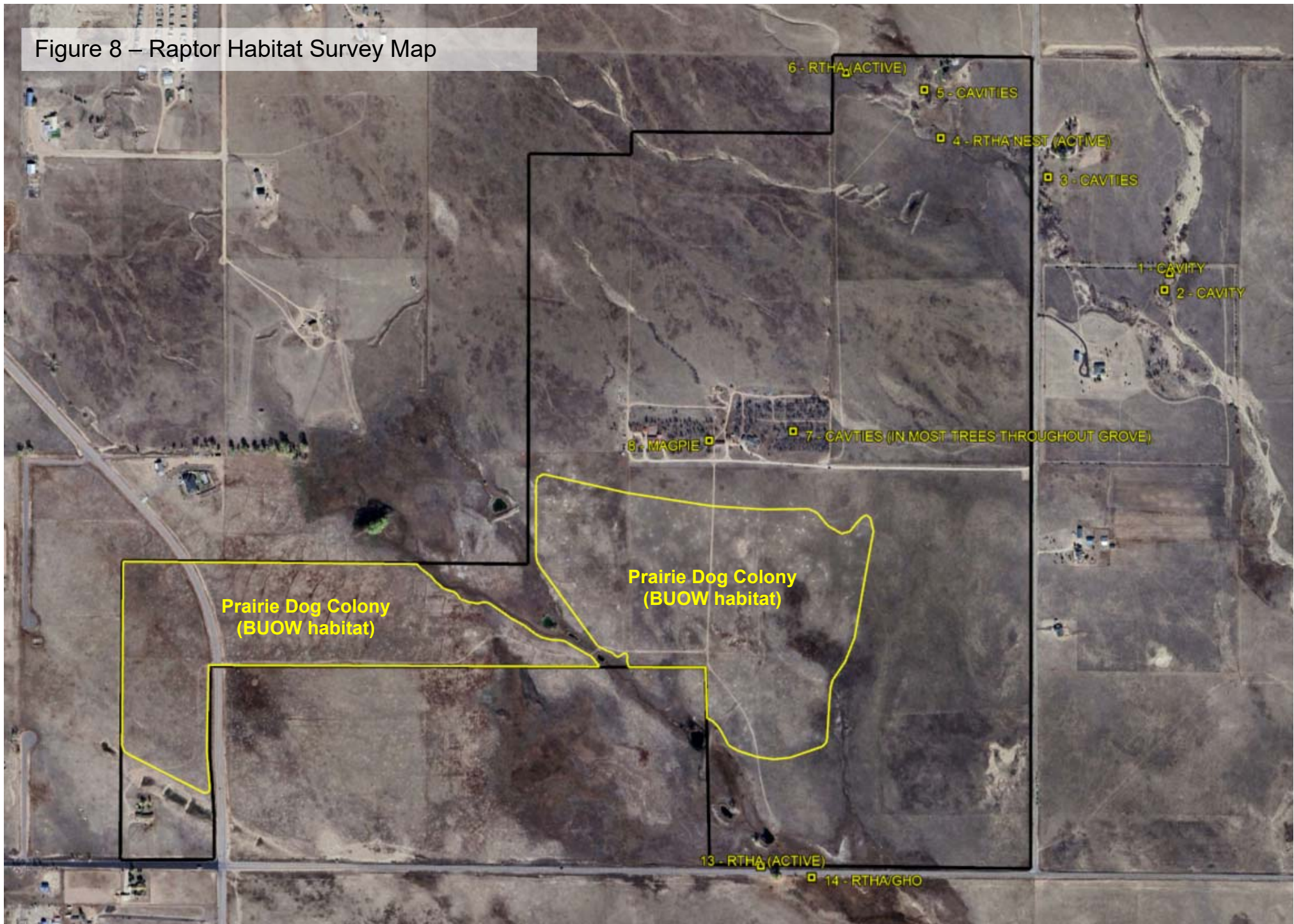
- Bald Eagle (*Haliaeetus leucocephalus*) - This is not a BCC in this area but warrants attention because of the BGEPA.
- Ferruginous Hawk (*Buteo regalis*) - This is a BCC only in particular Bird Conservation Regions (BCRs) including Colorado. Per the USFWS Environmental Conservation Online System data (USFWS 2023b) (<https://ecos.fws.gov/ecp/species/6038>), ideal habitat for Ferruginous Hawks is grassland and shrub-steppe habitat including pastures, hayland, and cropland. Their nests can be found in trees and large shrubs and on roofs, utility structures, and artificial platforms, or near the ground on river cutbanks, or less frequently other ground locations such as rockpiles and riverbed mounds. ECOS has observed their nests open prairie habitat in this vicinity.
- Golden Eagle (*Aquila chrysaetos*) - This is not a BCC but warrants attention because of the BGEPA
- Lesser Yellowlegs (*Tringa flavipes*) - This is a BCC throughout its range in the continental USA and Alaska. Per the USFWS Per the USFWS Environmental Conservation Online System data (USFWS 2023b) (<https://ecos.fws.gov/ecp/species/9679>) the Site does not comprise suitable habitat for this species. However, they may pass through the Project vicinity in the 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> week of April.

- Pinyon Jay (*Gymnorhinus cyanocephalus*) - This is a BCC throughout its range in the continental USA and Alaska. Per the USFWS Environmental Conservation Online System data (USFWS 2023b) (<https://ecos.fws.gov/ecp/species/9420>) the Site does not comprise suitable habitat for this species. As their name implies, they can be found in pinyon-juniper woodland, sagebrush, scrub oak, and chaparral communities, and sometimes in pine forests. Given that Colorado is within its large Western U.S. range, this broad-brush range includes the Project vicinity, but the probability of its presence in said vicinity is limited to the 1<sup>st</sup> week in October.

### 5.3 Field Assessment

Two occupied Redtail hawk nests were identified in the northeastern corner of the Site. One occupied magpie nest was identified in the central portion of the Site. Two large prairie dog colonies that provide potential habitat for Burrowing owl (*Athene cunicularia*) are present in the south-central and southwestern portions of the Site. Numerous tree cavities were identified in live and dead trees throughout the Site, especially in the forested area around the Davis ranch. One nest was being used by a redtail hawk and one unoccupied raptor nest (likely Redtail hawk or Great Horned owl) was identified immediately south of the south Site boundary near Judge Orr Road. Numerous songbirds were detected using the Cornell Lab Merlin bird identification application, including yellow oriole (*Icterus nigrogularis*), red-wing blackbird (*Agelaius phoeniceus*), grackle (*Quiscalus spp.*), flicker (*Colaptes spp.*), meadowlark (*Sturnella neglecta*), Say's phoebe (*Sayornis saya*), western kingbird (*Tyrannus verticalis*), eastern kingbird (*Tyrannus tyrannus*), northern mocking bird (*Mimus polyglottos*), western wood-pewee (*Contopus sordidulus*), house wren (*Troglodytes aedon*) and house sparrow (*Passer domesticus*). The prairie, riparian corridors, and wetland habitat may also provide nesting and foraging habitat for many other migratory birds. Please refer to Figure 8, Raptor Habitat Survey Map.

Figure 8 – Raptor Habitat Survey Map



Source: Google Earth Aerial Image, 10/31/2023 & Ecosystem Services, LLC MBTA Survey, 5/23/2023



## 6.0 SUMMARY OF IMPACTS & RECOMMENDATIONS

### 6.1 Vegetation

The vegetation within the Site is primarily comprised of herbaceous shortgrass prairie species. Given the presence of certain midgrass and tallgrass prairie and non-native species mixed throughout the shortgrass prairie, we have referred to the vegetation community as “short and mixed grass prairie”. Wetland vegetation is comprised primarily of emergent, herbaceous, hydrophytic species in the ephemeral drainages and swales. Riparian habitat within the Site is comprised of upland grassland, herbaceous wetland, and small pockets of shallow open water (refer to Figure 6). Trees and shrubs are primarily absent, with the exception of dispersed individual narrowleaf and Plains cottonwood (*Populus angustifolia* and *deltoides*) and small patches of sandbar willow (*Salix exigua*) in the northeastern drainages. Refer to Figure 4, Vegetation Map.

The short and mixed grass prairie will be the primary vegetation/habitat type impacted by the proposed development. The proposed residential parcels are all planned to be low-density so that could provide ample opportunity to preserve high quality, native habitat within private lots if building envelopes/disturbance footprints are limited. Small neighborhood parks developed for tot-lots, field sports, etc. are not valuable open space for wildlife. If however they are designed to preserve some native habitat they can provide limited natural open space functions for smaller wildlife and birds. The two Commercial parcels and the internal road system are anticipated to have maximum impact on short and mixed grass prairie (e.g., 100% of the area beneath their footprint). The three Detention Ponds will result in the loss/impact primarily of short and mixed grass prairie, with minor impacts to wetland habitat resulting from stormwater outfalls into the creek systems. These impacts could be temporary and mitigated if prairie, riparian, and wetland habitat are restored after construction.

In addition to preserving the highest value existing native vegetation on public and private open space, in order to reduce overall direct impacts from the development, proposed landscaping (private and public) should consist of native prairie species from the same ecosystem that provide food and cover for wildlife. High, solid fences if proposed are a major impediment and impact wildlife movement through the landscape. Short, permeable and unbarbed wildlife-friendly fences that allow large and small species to move freely are recommended wherever fences are desired which will allow future residents to enjoy wildlife experiences in their everyday lives.

Over 80 percent of all wildlife species use riparian areas during some part of their life cycle. As such, floodplains, riparian areas including wetlands that together form linear natural corridors (i.e., greenways) should not be impacted by development and left intact. If necessary, road, trail, and utility corridors (i.e., crossings) that must cut through riparian areas should be avoided or minimized to only a few locations where the riparian corridors (and wetlands) are the narrowest or absent. Any proposed crossings should be designed perpendicular

to greenways. Greenways are ideal locations for trails that run parallel with the floodplain/riparian corridor to provide future neighborhood residents with positive natural outdoor and wildlife experiences such as bird watching (i.e., ecological benefits). The layout of the development at a sketch plan level is nebulous regarding the avoidance and minimization of impacts to greenways. During more detailed preliminary and final design, all man-made structures, including detention ponds should avoid impacting riparian areas and wetlands. Detention/water quality ponds, where required should be located adjacent to riparian areas and vegetated to the maximum extent possible utilizing native riparian and wetland vegetation in the pond bottoms; upland grasses, shrubs, and trees along side-slopes, spillways, and run-downs to expand riparian habitat for wildlife. Outfall structures from detention ponds with scour aprons are typically designed to extend into and impact wetlands and stream beds. These impacts can be mitigated by locating the outfall outside of riparian and/or wetland habitat and then creating a riparian/wetland swale that extends to the receiving stream.

Ground disturbance/removal of vegetation and exposure of soil instigates the invasion and colonization of common and noxious weeds, one of the most detrimental processes to the quality of any kind of habitat if left unchecked. As such, minimization of ground-disturbing activities that compact or remove native vegetation during construction is recommended. Thereafter, control of common, noxious weeds and non-native species in all areas (existing or landscaped) should be a priority during and after construction and as part of the long-term private residence and HOA maintenance of the Site. If native vegetation is preserved and weeds are managed, the loss of the existing habitat is minimized.

Overall impacts to vegetation communities that provide habitat for wildlife can be offset/mitigated by the thoughtful design; restrictions that minimize impacts to prairie through the employment of building envelopes; implementation of native planting and seeding requirements on private and public land; ongoing weed management; and long-term preservation of large, contiguous open space and greenways that limit crossings and fragmentation.

### **6.3 Wetland Habitat and Waters of the U.S.**

There are five WOTUS features on the Site including the Northeast drainage (North and South branches); South-central drainage (North and South branches) and the Southwest drainage. The downstream end of the South-Central drainage collects water from the Southwest drainage and combines to form a very significant expanse of wetland along the entire north edge of Judge Orr Road. ECOS delineated the boundaries of these WOTUS features pursuant to the current USACE methodology to assist the planning and design Team in Site planning. The Sketch Plan does not reflect the locations of these delineated WOTUS features as it was prepared prior to the delineation. Therefore, during the final Site Plan design, the Project Team will incorporate avoidance and minimization of WOTUS impacts to the extent possible to meet the Least Environmentally Damaging and Practicable Alternative (LEDPA) requirements of Section 404(b)(1) of the Clean Water Act (CWA).



## **Gieck Ranch DBPS**

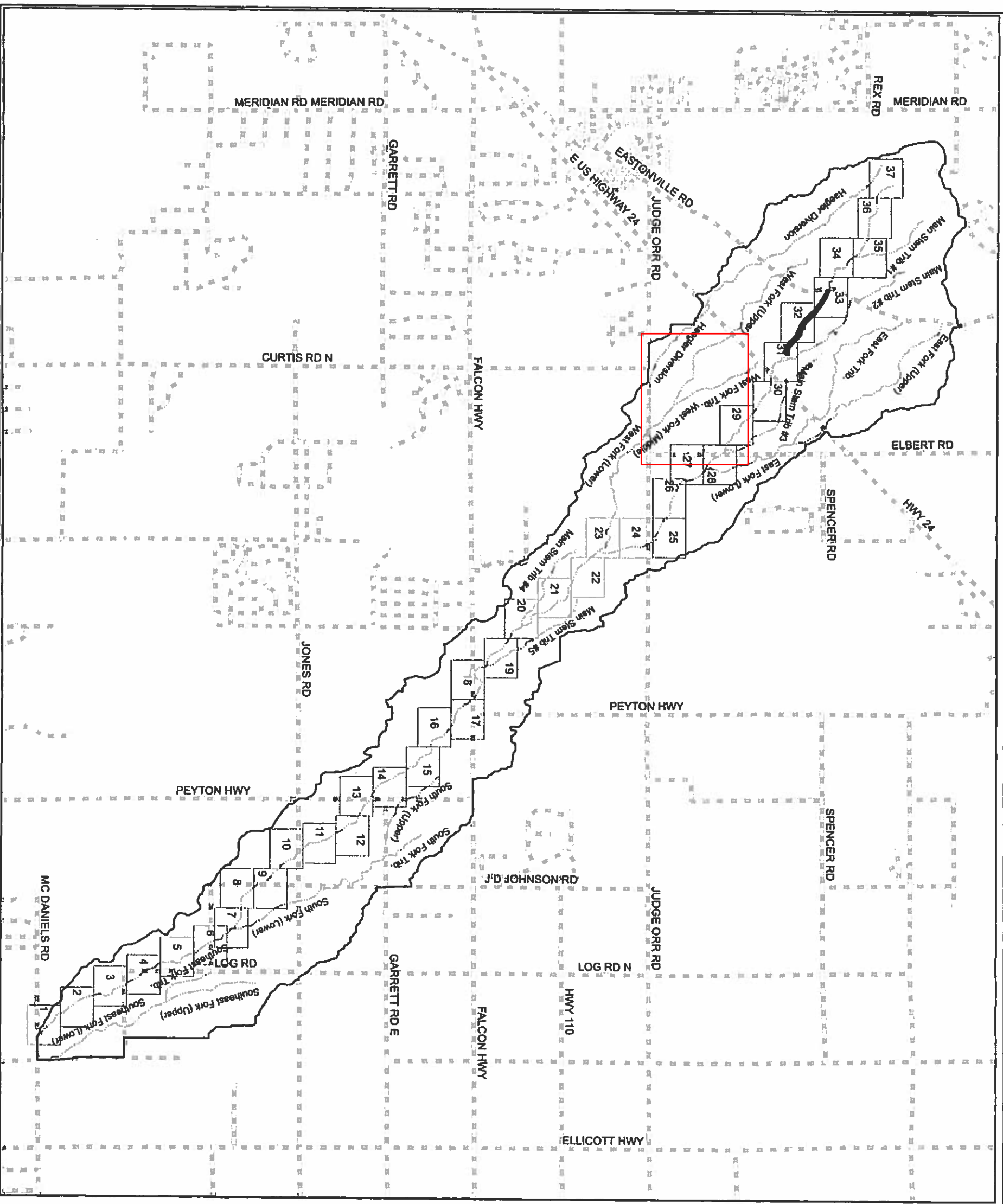


**Legend**

- 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 DOTS DIRECTION SHOULD BE PERFORMED PRIOR TO SUCH DECISIONS.

0 1 2 Miles



**Drexel, Batrell & Co.** Engineers, Surveyors  
1900 20TH STREET  
13.5 TH STREET  
BATH CO, COLO 81001  
CONTACT: ROBERT BENNETT  
BOULDER, COLO 80501 303 443-4335  
COLORADO SPRINGS, COLO 709 264-4487  
DENVER, COLO 303 733-1444

PROJECT FOR:

**REALTY DEVELOPMENT SERVICES**  
25 NORTH TULSA STREET, SUITE 200  
COLORADO SPRINGS, COLO 709 264-4487  
CONTACT: NAY C SULLIVAN (719) 277-1622

PROJECT NAME:

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

DESIGNED BY:

RJB

CHECKED BY:

RJB

DATE:

DESIGNED BY:

RJB

CHECKED BY:

RJB

DATE:

DATE:

AUGUST 2007

PROJECT NO.:

C7706-1

PLANT:

PL

SCALE:

1" = 5000'

PROJECT NO.:

6D 038

PLANT:

K1

**APPENDIX F**  
**DRAINAGE MAPS**



account for all offsite  
flow entering the site

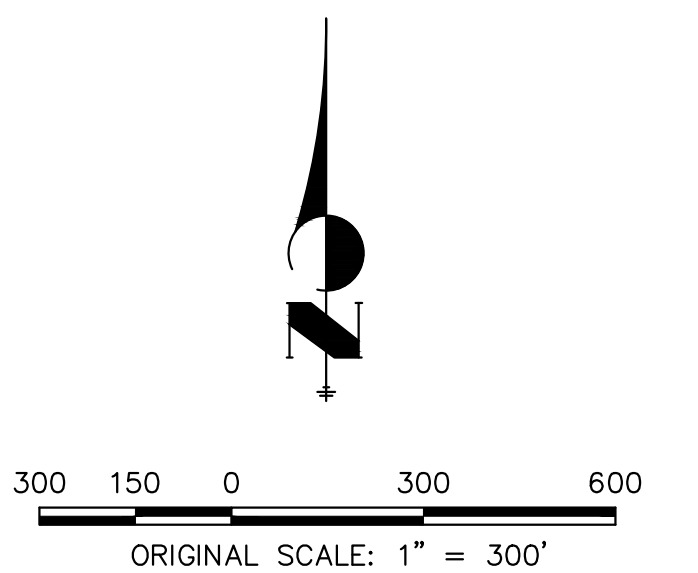
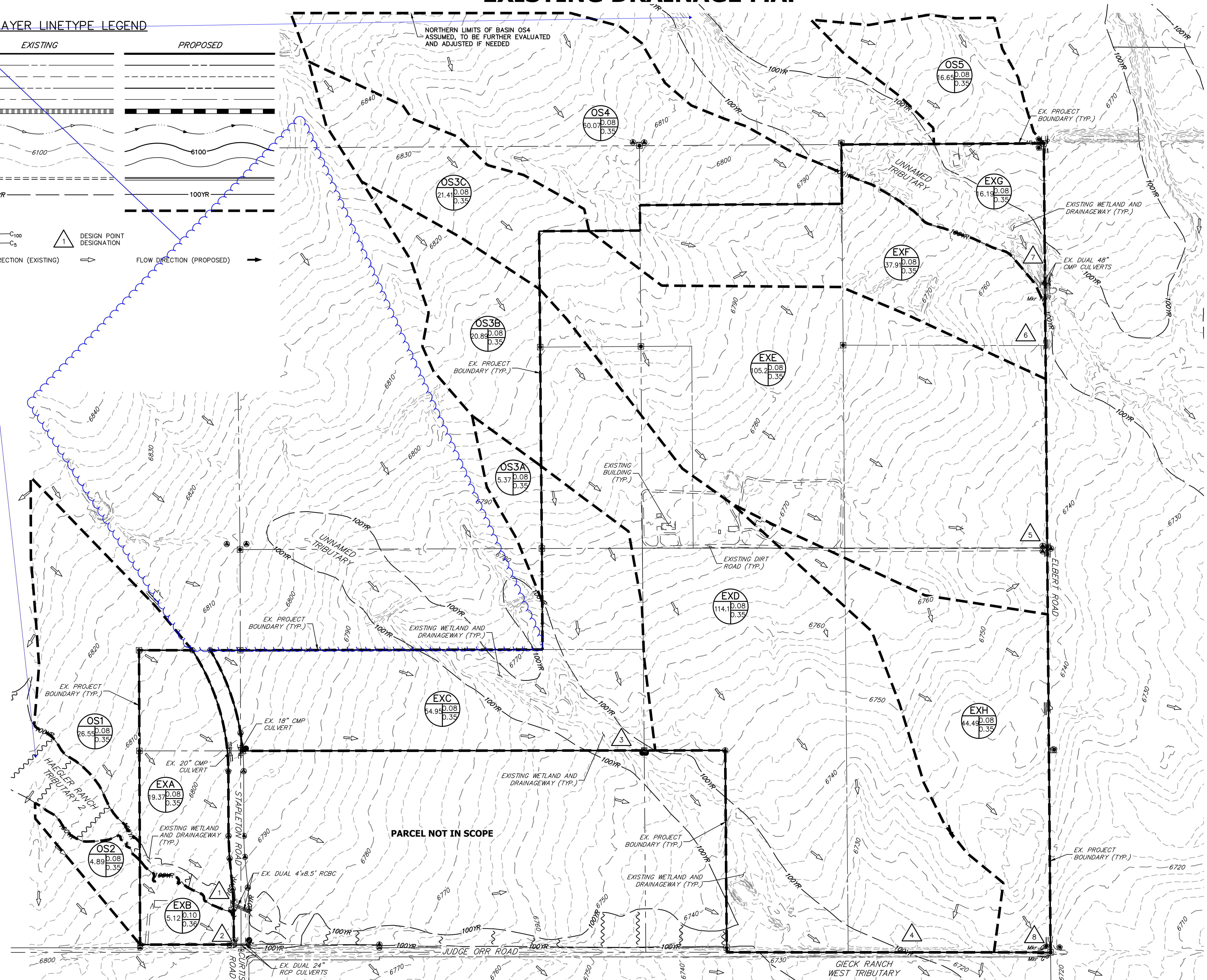
### LAYER LINETYPE LEGEND

Figure 1: Typical cross-section of a drainage basin. The diagram illustrates the layout of a drainage basin, showing the relationship between various lines and features. The diagram is divided into two main sections: EXISTING and PROPOSED. Key features include:

- BOUNDARY LINE**: The outermost line defining the basin.
- PROPERTY LINE**: The line separating the basin from adjacent properties.
- EASEMENT LINE**: The line indicating the extent of the easement.
- RIGHT OF WAY**: The line indicating the boundary of the right of way.
- CENTERLINE**: The line indicating the center of the road or waterway.
- STORM SEWER**: The line indicating the location of the storm sewer.
- SWALE/WATERWAY FLOWLINE**: The line indicating the flow direction of the swale or waterway.
- INDEX CONTOUR**: The line indicating the elevation of the terrain (e.g., 6100).
- INTERMEDIATE CONTOUR**: The line indicating the elevation of the terrain (e.g., 6100).
- CURB & GUTTER**: The line indicating the location of the curb and gutter.
- FEMA FLOODPLAIN**: The line indicating the 100-year floodplain.
- SUB-BASIN DRAINAGE AREA**: The area of the basin that drains into the design point.
- DESIGN POINT DESIGNATION**: A triangle symbol indicating the location of the design point.
- FLOW DIRECTION (EXISTING)**: Indicated by a blue arrow pointing towards the design point.
- FLOW DIRECTION (PROPOSED)**: Indicated by a black arrow pointing towards the design point.

The diagram also includes a legend for the basin tag, which includes:

- Basin ID**: A number inside a circle.
- Area [AC]**: A number inside a circle.
- C<sub>100</sub>**: The elevation of the 100-year floodplain.
- C<sub>5</sub>**: The elevation of the 5-year floodplain.



EXISTING DRAINAGE MAP  
DAVIS RANCH  
JOB NO. 25274.00  
06/29/23  
SHEET 1 OF 1



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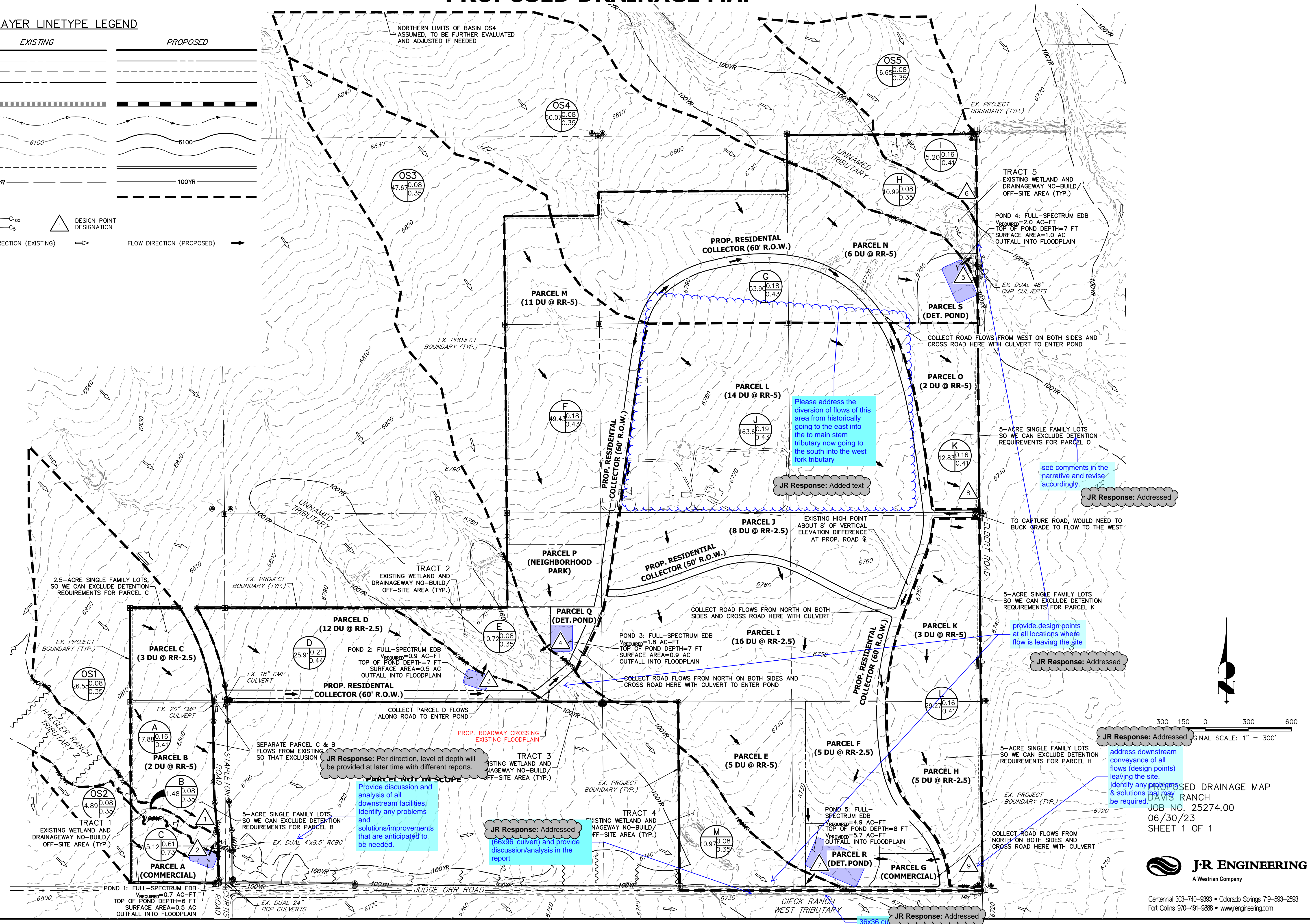


# DAVIS RANCH

## PROPOSED DRAINAGE MAP

### 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)		





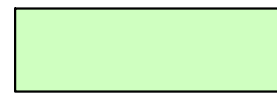



# DAVIS RANCH

## PROPOSED WATER QUALITY MAP

### 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	---	---
SUB-BASIN DRAINAGE AREA	---	---
FLOW DIRECTION (EXISTING)	---	---
FLOW DIRECTION (PROPOSED)	---	---
FEMA FLOODPLAIN	---	---

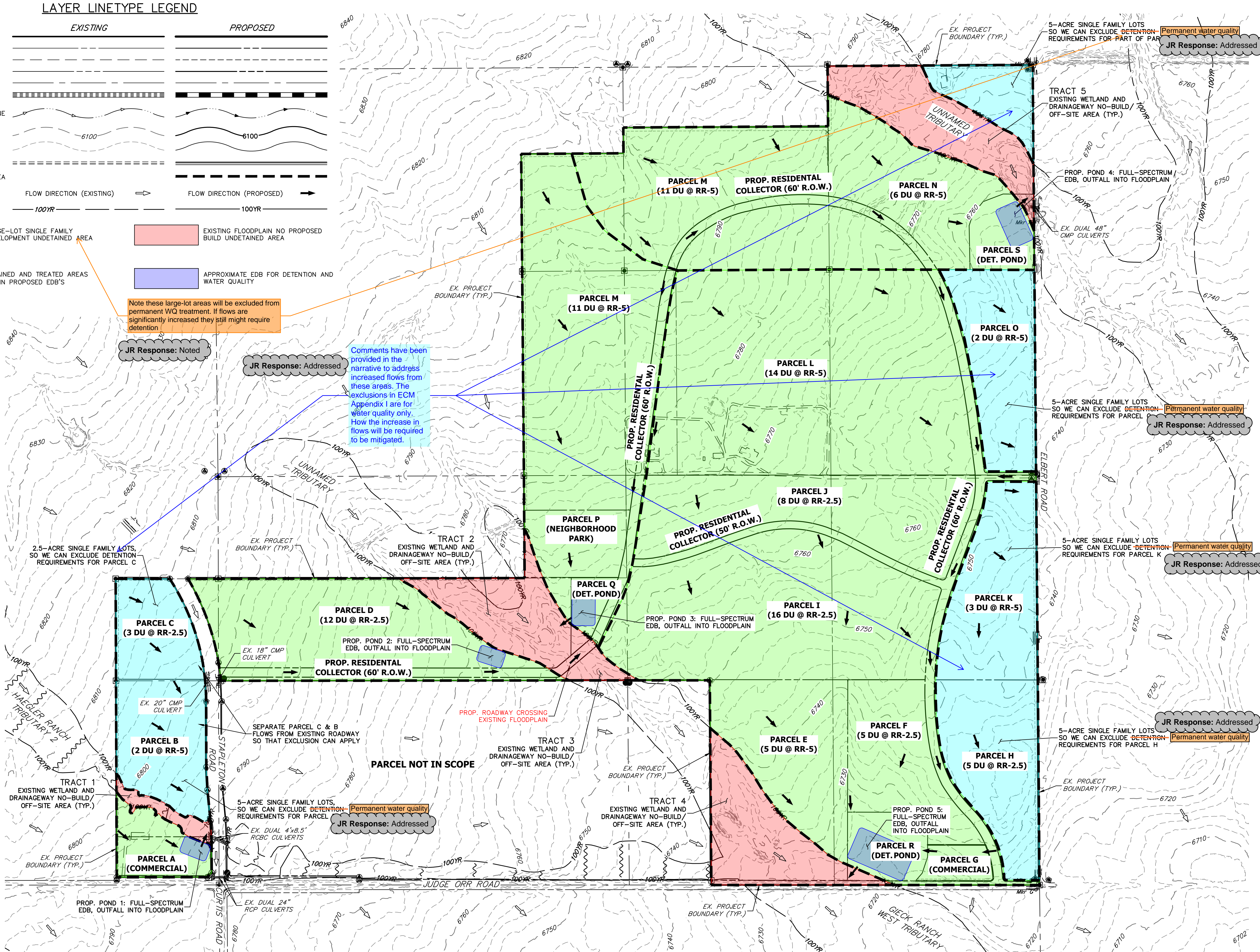
 LARGE-LOT SINGLE FAMILY DEVELOPMENT UNDETAINED AREA	 EXISTING FLOODPLAIN NO PROPOSED BUILD UNDETAINED AREA
 DETAINED AND TREATED AREAS WITHIN PROPOSED EDB'S	 APPROXIMATE EDB FOR DETENTION AND WATER QUALITY

Note these large-lot areas will be excluded from permanent WQ treatment. If flows are significantly increased they still might require detention

JR Response: Noted

JR Response: Addressed

Comments have been provided in the narrative to address increased flows from these areas. The exclusions in ECM Appendix I are for water quality only. How the increase in flows will be required to be mitigated.



PROPOSED WATER QUALITY MAP  
DAVIS RANCH  
JOB NO. 25274.00  
06/30/23  
SHEET 1 OF 1



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