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

March 2024

Prepared For:

William Guman & Associates, Ltd.
731 North Weber Street
Colorado Springs, CO 80903
(719) 633-9700

Prepared By:

JR ENGINEERING
5475 Tech Center Drive
Colorado Springs, CO 80919
(719) 593-2593

Job No. 25274.00

PCD File No.: SKP232

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 Date
For and On Behalf of JR Engineering, LLC

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

Business Name: 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. Date
County Engineer/ ECM Administrator

Conditions:

CONTENTS

PURPOSE **1**

GENERAL LOCATION AND DESCRIPTION **1**

LOCATION 1
DESCRIPTION OF PROPERTY 1
FLOODPLAIN STATEMENT 2
ENVIRONMENTAL 2

MAJOR DRAINAGE BASINS AND SUB-BASINS **2**

MAJOR BASIN DESCRIPTIONS 2

JANE DAVIS RANCH BASINS AND SUB-BASINS **5**

EXISTING SUB-BASIN DRAINAGE 5
PROPOSED DRAINAGE CONVEYANCE 7
PROPOSED SUB-BASIN DRAINAGE 7

DRAINAGE DESIGN CRITERIA **12**

DEVELOPMENT CRITERIA REFERENCE 12
HYDROLOGIC CRITERIA 13
HYDRAULIC CRITERIA 13

DRAINAGE FACILITY DESIGN **13**

GENERAL CONCEPT 13
FOUR STEP PROCESS TO MINIMIZE ADVERSE IMPACTS OF URBANIZATION 14
CHANNEL ANALYSIS AND DESIGN 15

SUMMARY **15**

REFERENCES: **16**

APPENDICES

A. Figures and Exhibits
B. Hydrologic Calculations
C. Hydraulic Calculations (N/A)
D. Detention and Water Quality Calculations
E. Reference Materials
F. Drainage Maps

PURPOSE

This document is the Master Development Drainage Plan (MDDP) for the proposed Jane Davis Ranch Sketch Plan. The purpose of this drainage plan is to:

1. Identify on-site and off-site drainage patterns.
2. Recommend preliminary stormwater facilities to collect and convey storm runoff from the proposed development to appropriate discharge and/or detention locations.
3. Recommend preliminary water quality and detention facilities to control discharge release rates to below historic rates.
4. Analyze drainage problems and alternate solutions. Analyze the ability of downstream drainage facilities to pass developed runoff from the proposed development.
5. 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 Jane Davis Ranch Sketch Plan. Final Drainage Report with the development plan will be required as development and platting progresses.

GENERAL LOCATION AND DESCRIPTION

Location

The proposed Jane 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 Jane Davis Ranch development contains approximately 395 acres and per the “Jane 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 Jane 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 A 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 Final Drainage Report with the development plan. See Appendix E for excerpts of the afore mentioned environmental report.

MAJOR DRAINAGE BASINS AND SUB-BASINS

Major Basin Descriptions

The site lies within the Gieck Ranch Drainage Basin. As part of its drainage research, JR Engineering reviewed the following drainage studies, reports, and LOMRs:

- Gieck Ranch Drainage Basin Planning Study prepared by Drexel, Barrell & Co. in October, 2007 and revised in February 2010. (Not adopted by El Paso County as of July 2019)
- Santa Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision prepared by Tri-Core Engineering in June 2004

Gieck Ranch Drainage Basin

The "Gieck Ranch Drainage Basin Planning Study" 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 Bain 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. Within the Gieck Ranch DBPS, there are recommended drainage improvements including culverts, detention

ponds and drainage channel improvements. Excerpts of the Gieck Ranch DBPS are shown in Appendix E for information only.

As described within the Gieck Ranch DBPS, the drainage basin has been subdivided into six major drainage ways. The site is located adjacent to or within reaches of the Main Stem Channel (MS), Haegler Diversion (HD) tributary, and West Fork (WF) tributary. Approximately 1.4 square miles of the adjacent Haegler Ranch Basin is diverted into the Gieck Ranch Basin immediately upstream of the intersection of Judge Orr Road and Curtis Road. When Judge Orr Road was built, no culvert was constructed to convey the runoff from the north side of Judge Orr Road to the south. The runoff thus flows east along Judge Orr Road to the existing culvert (Structure #38) within the Gieck Ranch Basin. It was determined that this diversion will be maintained. The Gieck Ranch DBPS has recommended structures, detention ponds and drainage channel improvements. The drainage channel improvements are described as either vegetation augmentation or selective stabilization. With vegetation augmentation, native hydric species are used to augment the existing vegetation when stormwater runoff is first introduced. This allows the dry channel to transform to a wet channel without the loss of soils. Selective channel stabilization involves armoring the channel banks with riprap or other bioengineered stabilization measures. Additionally, grade control structures to prevent headcutting of the channel invert are required with selective stabilization. Developments in or around the drainageways are required to implement proper measures to maintain or create stable characteristics of the drainageway.

To the west of the Judge Orr Road and Stapleton Road intersection, the Haegler Diversion of Gieck Ranch Basin crosses onto the western side of the site. The reach upstream of the site is defined as HD-R4 and has a developed 100-year flow of 429 cfs. The DBPS recommends that the HD-R4 reach be improved by vegetation augmentation. The Haegler Diversion then continues flowing east within a parcel outside of this development scope until it once again crosses onto the site boundary at the reach defined as HD-R5. At this location, a 100-year flow of 468 cfs is anticipated in the developed condition. The DBPS recommends that the HD-R5 reach be improved by selective stabilization as well as several 4’ non-grouted riprap drop structures. The Haegler Diversion tributary then converges with the West Fork tributary of the Gieck Ranch Basin.

In the central area of the site, the West Fork of Gieck Ranch Basin crosses onto the site. The reach is defined as WF-R4d upstream of the site and has a developed 100-year flow of 242 cfs. The West Fork then continues flowing southeast along the WF-R5 reach with developed 100-year flow of 394 cfs and then the WF-R6 reach with developed 100-year flow of 698 cfs. Both the West Fork WF-R6 reach the Haegler Diversion reach DH-R5 converge to the north of the Judge Orr Road crossing. The DBPS recommends that the WF-R4d, WF-R5, and WF-R6 reaches all be improved by selective stabilization as well as several grade control structures. The DBPS also recommends that the WF-R6 reach be improved using a trapezoidal channel with a 50’ bottom width and 10:1 side slopes. The West Fork tributary then crosses Judge Orr Road via Structure #38. Structure #38 is an existing 67” x 95” CMP in good condition located at the Judge Orr Road at West Fork crossing. Per the DBPS the existing structure size is not adequate to pass the anticipated developed flow and the DBPS proposes

that 4 - 12’ x 5’ RCBC be installed. The DBPS also recommended a regional detention facility WF-SR1 be located to the north of Judge Orr Road. The pond characteristics are developed 100-year inflow of 951 cfs to the pond and 100-year flow of 753 cfs flowing out of the pond with a detention storage volume of 29 acre-feet. The DBPS states that the pond exceeds the contributing size area limitation for full-spectrum design and therefore, the water quality control volume will be provided. Flows from the proposed pond will then use either Structure #38 or Structure #39 to cross Judge Orr Road. Structure #39 is an existing 36” CMP in good condition located at Judge Orr Road to the east of Structure #38. Per the DBPS the existing structure size is adequate to pass the anticipated flow and the DBPS proposes that structure remains. The Gieck Ranch West Fork tributary is then off-site within the reach to the south of Judge Orr Road. This reach is defined as WF-R7a and has a developed 100-year flow of 753 cfs.

To the west of the existing Elbert Road, the Main Stem of Gieck Ranch Basin crosses onto the eastern side of the site. The reach upstream of the site is defined as MS-R7c and has a developed 100-year flow of 877 cfs. The DBPS recommends that the MS-R7c reach be improved by vegetation augmentation as well as several grade control structures. The Main Stem continues flowing southeast along the MS-R8a reach with developed 100-year flow of 896 cfs. The DBPS recommends that the MS-R8a reach be improved using a trapezoidal channel with a 50’ bottom width and 10:1 side slopes with vegetation augmentation. Also to the west of the existing Elbert Road the Main Stem Tributary #3 also crosses onto the site. The reach upstream of the site is defined as MST3-R1 and has a developed 100-year flow of 19 cfs. The DBPS recommends that the MST3-R1 reach be improved as needed. Downstream of this reach, the Main Stem Tributary #3 reach MST3-R1 and the Main Stem reach MS-R8a converge to the west of Structure #36. Structure #36 is an existing dual 48” CMP in good condition located at Elbert Road and Main Stem crossing. Per the DBPS the existing structure size is not adequate to pass the anticipated developed flow and the DBPS proposes that 3 – 12’ x 4’ RCBC be installed. Structure #37 is an existing 24” CMP in poor condition located along Elbert Road to the south of Structure #36. Per the DBPS the existing structure size is adequate to pass the anticipated flow and the DBPS proposes that the structure remains. The Gieck Ranch Main Stem channel is then off-site within the reach to the east of Elbert Road. This reach is defined as MS-R8b and has a developed 100-year flow of 896 cfs.

Haegler Ranch Drainage Basin

“The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR” was executed on Haegler Ranch Tributary 2, 3, and 4. The LOMR revised the on-site effective flood zones from Zone A to Zone AE for the three drainageways. Upstream stretches of Tributary 3 are classified Zone A located on-site. See FIRM Panel 080059-0575G for limits of LOMR study and revised flood zones, presented in Appendix E.

The proposed development does not intend to change peak flows in the existing drainageways. Due to a proposed residential collector crossing the existing drainageway, it is anticipated that a LOMR will be required in the future to analyze the impacts in this area. Future reports will analyze the proposed Jane Davis Ranch drainage infrastructure and determine what is needed for the

development. Additionally, a hydraulic analysis of the drainageway will be provided at the subdivision stage of development with the Final Drainage Reports.

JANE DAVIS RANCH BASINS AND SUB-BASINS

Existing Sub-basin Drainage

The existing basin delineation for Jane 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. Basin flow (Q_5=0 cfs, Q_{100}=13 cfs) 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. The basin flows will combine at DP1.

Existing Basin EXA is approximately 19.37 acres and in the existing condition is comprised of undeveloped land and part of the FEMA floodplain. Basin flow (Q_5=0 cfs, Q_{100}=13 cfs) from this basin flows from northwest to southeast along Stapleton Road where the flows enter the existing drainage way at DP1 (Q_5= N/A, Q_{100}=429 cfs). These flows are from the reach HD-R4 within the "Gieck Ranch Drainage Basin Planning Study" by Drexel, Barrell & Co. dated October 2007. Flows then cross Stapleton Road using dual 4'x8.5' RCBC and continue flowing east within the existing drainageway.

Basin OS2 is approximately 11.56 acres and is comprised of undeveloped areas to the west of the project site. Basin flow (Q_5=0 cfs, Q_{100}=6 cfs) 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. The basin flows will combine at DP2.

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. Basin flow (Q_5=0 cfs, Q_{100}=3 cfs) from this basin flows from northwest to southeast to dual 24" RCP culverts at DP2 (Q_5=0 cfs, Q_{100}=9 cfs). The DP2 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. Basin flow (Q_5=0 cfs, Q_{100}=2 cfs) 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. The basin flows will combine at DP3.

Existing Basin EXC is approximately 54.95 acres and in the existing condition is comprised of undeveloped land and part of the FEMA floodplain. Basin flow (Q_5=1 cfs, Q_{100}=34 cfs) from this basin flows from west to east and northwest to southeast towards the existing drainageway at DP3

(Q_5=N/A, Q_{100}=394 cfs). These flows are from the reach WF-R5 within the "Gieck Ranch Drainage Basin Planning Study" by Drexel, Barrell & Co. dated October 2007. 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. Basin flow (Q_5=0 cfs, Q_{100}=12 cfs) 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. The basin flows will combine at DP4.

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. Basin flow (Q_5=1 cfs, Q_{100}=44 cfs) from this basin flows from northwest to southeast towards the existing drainageway at DP4 (Q_5=N/A, Q_{100}=753 cfs). These flows are from the reach WF-R7a within the "Gieck Ranch Drainage Basin Planning Study" by Drexel, Barrell & Co. dated October 2007. 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. Basin flow (Q_5=0 cfs, Q_{100}=9 cfs) 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. The basin flows will combine at DP5.

Existing Basin EXE is approximately 105.2 acres and in the existing condition is comprised of undeveloped land and an existing dirt road. Basin flow (Q_5=1 cfs, Q_{100}=53 cfs) from this basin flows from northwest to southeast towards Elbert Road at DP5 (Q_5=1 cfs, Q_{100}=62 cfs). The flows then continue flowing east off-site across another property 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. Basin flow (Q_5=1 cfs, Q_{100}=33 cfs) 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. The basin flows will combine at DP6.

Existing Basin EXF is approximately 37.91 acres and in the existing condition is comprised of undeveloped land. Basin flow (Q_5=0 cfs, Q_{100}=14 cfs) from this basin flows from west to east towards Elbert Road at DP6 (Q_5=1 cfs, Q_{100}=48 cfs). 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. Basin flow (Q_5=0 cfs, Q_{100}=9 cfs) 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. The basin flows will combine at DP7.

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. Basin flow (Q_5=0 cfs, Q_{100}=11 cfs) from this basin flows from northwest to southeast where flows enter the exiting drainageway at DP7 (Q_5=N/A, Q_{100}=896 cfs). These flows are from the reach MS-R8a within the "Gieck Ranch Drainage Basin Planning Study" by Drexel, Barrell & Co. dated October 2007. 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. Basin flow (Q_5=0 cfs, Q_{100}=16 cfs) from this basin flows from north to south towards the intersection of Judge Orr Road and Elbert Road at DP8. The flows then continue flowing southeast towards the existing drainageway.

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

Proposed Drainage Conveyance

In general, developed flows are collected in proposed roadside swales, which convey water to the proposed detention areas. Proposed rural minor collector roadways with 80' right-of-ways as well as rural local roadways with 60' right-of-ways are used throughout the site and are per the typical El Paso County section. Proposed swales 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. The roadside swales shall comply with Table 6-1 of the EPC DCM Volume 1. 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 detailed analysis shall be provided in the future Final Drainage Report with the development plan.

Proposed Sub-basin Drainage

The proposed basin delineation for Jane Davis Ranch as shown on the map within Appendix F is as follows:

Basin OS1B is approximately 7.86 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 follows the rural local roadway to the south outfalling to the Haegler Ranch Tributary 2 floodplain at DP1 (Q_5=0 cfs, Q_{100}=4 cfs). Roadway flows will be excluded and treated in Basin A.

Basin OS1A is approximately 18.68 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. The basin flows will combine at DP2.

Basin A is approximately 17.96 acres and in the proposed condition will be composed of a proposed rural local roadway, Parcel C, and part of Parcel B which both have a land use of large single-family lots. Runoff (Q_5=2 cfs, Q_{100}=14 cfs) from this basin will be collected in a proposed swale that runs north to south along existing Stapleton Road. Runoff from the local roadway will be captured and piped to the proposed swale and direct flows to Pond 1 at DP2 (Q_5=2 cfs, Q_{100}=27 cfs). The flows will be treated within the full-spectrum Extended Detention Basin (EDB) and then released to the existing drainageway within Basin B at DP3.

Basin B is approximately 1.48 acres and is the boundary of one of the existing floodplains that crosses the site. A proposed rural local roadway crosses the floodplain and is also the boundary of the basin. In the proposed condition, this basin will remain undeveloped as floodplains are no-build areas. The only proposed disturbances within this basin are channel improvements and drainage infrastructure to cross the roadways which will be further analyzed in detail with drainage reports submitted with the development plan. This in accordance with Section I.7.1.B.8 of the ECM Stormwater Quality Policy and Procedure. Basin flows (Q_5=0 cfs, Q_{100}=1 cfs) will follow the historic drainage pattern from west to east and flow to DP3 (Q_5=N/A, Q_{100}=429 cfs). These flows are from the reach HD-R4 within the “Gieck Ranch Drainage Basin Planning Study” by Drexel, Barrell & Co. dated October 2007. The flows then cross Stapleton Road using 4’x8.5’ box culvert and continue flowing east within the existing drainage way. The flows then continue flowing east within the existing drainageway.

Basin OS2 is approximately 11.56 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. Runoff (Q_5=0 cfs, Q_{100}=6 cfs) 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. The basin flows will combine at DP4.

Basin C is approximately 5.20 acres and in the proposed condition will be composed of a proposed rural local roadway, 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 (Q_5=5 cfs, Q_{100}=11 cfs) from this basin will be collected by a proposed swale running along Judge Orr Road. Runoff from the local roadway will be captured and piped to the proposed swale and direct flows to Pond 2 at DP4 (Q_5=5 cfs, Q_{100}=17 cfs). The flows will be treated within the full-spectrum EDB and then released to the existing drainageway within Basin B at DP3.

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 rural minor collector roadway. Runoff (Q_5=3 cfs, Q_{100}=15 cfs) from this basin will be collected in a proposed roadside swale that runs along the proposed minor 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 3 at DP5 (Q_5=3 cfs,

Q_{100}=15 cfs). 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 to DP6 within Basin E2.

Basin E1 is approximately 9.11 acres and is the boundary of one of the existing floodplains that crosses the site. A proposed rural minor collector crosses the floodplain and is also the boundary of the basin. In the proposed condition, this basin will remain undeveloped as floodplains are no-build areas. The only proposed disturbances within this basin are channel improvements and drainage infrastructure to cross the roadways which will be further analyzed in detail with drainage reports submitted with the development plan. This in accordance with Section I.7.1.B.8 of the ECM Stormwater Quality Policy and Procedure. Basin flows (Q_5=3 cfs, Q_{100}=11 cfs) will follow the historic drainage pattern from northwest to southeast and flow to DP6 within Basin E2.

Basin E2 is approximately 1.17 acres and is the boundary of one of the existing floodplains that crosses the site. A proposed rural minor collector crosses the floodplain and is also the boundary of the basin. In the proposed condition, this basin will remain undeveloped as floodplains are no-build areas. The only proposed disturbances within this basin are channel improvements and drainage infrastructure to cross the roadways which will be further analyzed in detail with drainage reports submitted with the development plan. This in accordance with Section I.7.1.B.8 of the ECM Stormwater Quality Policy and Procedure. Basin flows (Q_5=1 cfs, Q_{100}=2 cfs) will follow the historic drainage pattern from northwest to southeast and flow to DP6 (Q_5=N/A, Q_{100}=394 cfs). These flows are from the reach WF-R5 within the “Gieck Ranch Drainage Basin Planning Study” by Drexel, Barrell & Co. dated October 2007. The flows then continue flowing southeast within the existing drainageway.

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. Runoff (Q_5=1 cfs, Q_{100}=33 cfs) 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. The basin flows will combine at DP7.

Basin F is approximately 49.33 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 rural minor collector roadway. Runoff from this basin will be collected in a proposed roadside swale that runs along the proposed minor 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 4 at DP7 (Q_5=4 cfs, Q_{100}=57 cfs). 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 to DP6 within Basin E2.

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. Runoff (Q_5=1 cfs, Q_{100}=33 cfs) 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. The basin flows will combine at DP8.

Basin G is approximately 53.91 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 rural minor collector roadway. Runoff (Q_5=4 cfs, Q_{100}=32 cfs) from this basin will be collected in a proposed roadside swale that runs along the proposed minor 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 5 at DP8 (Q_5=5 cfs, Q_{100}=65 cfs). 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 to DP9 within Basin H.

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. The only proposed disturbances within this basin are channel improvements which will be further analyzed in detail with drainage reports submitted with the development plan. This in accordance with Section I.7.1.B.8 of the ECM Stormwater Quality Policy and Procedure. Basin flows (Q_5=0 cfs, Q_{100}=4 cfs) will follow the historic drainage pattern from northwest to southeast and flow to DP9 (Q_5=N/A, Q_{100}=896 cfs). These flows are from the reach MS-R8a within the “Gieck Ranch Drainage Basin Planning Study” by Drexel, Barrell & Co. dated October 2007. The flows then continue flowing southeast within the existing drainageway and will cross the proposed triple 12’x4’ box culvert under Elbert Road.

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. Runoff (Q_5=0 cfs, Q_{100}=9 cfs) 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. The basin flows will combine at DP10.

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 (Q_5=0 cfs, Q_{100}=4 cfs) from this basin will flow overland towards the existing drainageway at DP10. Runoff from this basin is comprised of only large single-family lots and does not include any proposed roadway flows. Flows will therefore follow the historic path to the existing Unnamed Tributary drainageway without a permanent stormwater quality measure and are excluded from water quality treatment. This in accordance with Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedure. The flows then continue flowing southeast within the existing drainage way to DP9 within Basin H.

Basin J is approximately 119.8 acres and in the proposed condition will be composed of Parcel L, J, F, H, 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, proposed rural minor collector roadways, and proposed rural local roadway. Runoff (Q_5=10 cfs, Q_{100}=60 cfs) 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 6 at DP11. 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. The flows then continue flowing southeast within the existing drainage way to DP14 within Basin M1. A portion of this basin diverts flow from going east into the Main Stem tributary and goes south into the West Fork tributary, but since the two drainageways meet about a mile downstream, not large scale impacts are anticipated.

Basin K is approximately 29.86 acres and in the proposed condition will be composed of Parcel O and Parcel K which has a land use of large single-family lots. Runoff (Q_5=3 cfs, Q_{100}=24 cfs) from this basin will flow overland towards the existing drainageway at DP12. Runoff from this basin is comprised of only large single-family lots and does not include any proposed roadway flows. Flows will therefore follow the historic path to the existing Unnamed Tributary drainageway without a permanent stormwater quality measure and are excluded from water quality treatment. This in accordance with Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedure. The flows then continue flowing the historic drainage pattern to the Elbert Road site boundary.

Basin L is approximately 56.53 acres and in the proposed condition will be composed of Parcel I and Parcel E, which both have a land use of large single-family lots. Runoff (Q_5=4 cfs, Q_{100}=36 cfs) from this basin will flow overland towards the existing drainageway at DP13. Runoff from this basin is comprised of only large single-family lots and does not include any proposed roadway flows. Flows will therefore follow the historic path to the existing drainageway without a permanent stormwater quality measure and are excluded from water quality treatment. This in accordance with Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedure. The flows then continue flowing southeast within the existing drainage way to DP14 within Basin M1.

Basin M1 is approximately 10.55 acres and is the boundary of one of the existing floodplains that crosses the site. A proposed rural minor collector roadway crosses the floodplain and is also the boundary of the basin. In the proposed condition, this basin will remain undeveloped as floodplains are no-build areas. The only proposed disturbances within this basin are channel improvements and drainage infrastructure to cross the roadways which will be further analyzed in detail with drainage reports submitted with the development plan. This in accordance with Section I.7.1.B.8 of the ECM Stormwater Quality Policy and Procedure. Basin flows (Q_5=3 cfs, Q_{100}=10 cfs) will follow the historic drainage pattern from northwest to southeast to DP14 (Q_5=N/A, Q_{100}=753 cfs). These flows are from the reach WF-R5 within the “Gieck Ranch Drainage Basin Planning Study” by Drexel, Barrell & Co. dated October 2007. The flows then continue flowing southeast within the existing drainageway.

Basin M2 is approximately 0.26 acres and is the boundary of one of the existing floodplains that crosses the site. A proposed rural minor collector roadway crosses the floodplain and is also the boundary of the basin. In the proposed condition, this basin will remain undeveloped as floodplains are no-build areas. The only proposed disturbances within this basin are channel improvements and drainage infrastructure to cross the roadways which will be further analyzed in detail with drainage reports submitted with the development plan. This in accordance with Section I.7.1.B.8 of the ECM Stormwater Quality Policy and Procedure. Basin flows (Q_5=0 cfs, Q_{100}=0 cfs) will follow the historic drainage pattern from northwest to southeast to DP14 within Basin M1.

A summary of proposed basin parameters is presented in Appendix B. See the table below for the water quality treatment summary table indicating which basins are treated and which are excluded.

Table 1 – Water Quality Treatment Summary Table

PBMP Summary Table		
Basins	Tributary Area (acres)	PBMP
A	17.96	POND 1
B	1.33	EXCLUDED**
C	5.20	POND 2
D	26.15	POND 3
E1-E2	10.28	EXCLUDED**
F	49.33	POND 4
G	53.91	POND 5
H	10.99	EXCLUDED**
I	5.20	EXCLUDED*
J	119.80	POND 6
K	29.86	EXCLUDED*
L	56.53	EXCLUDED*
M1-M2	10.81	EXCLUDED**
*EXCLUDED BASED ON LARGE-LOT SINGLE FAMILY SITE PER ECM APP. I.7.B.5 ** EXCLUDED BASED ON STREAM STABILIZATION SITE PER ECM APP. I.7.B.8		

DRAINAGE DESIGN CRITERIA

Development Criteria Reference

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

Hydrologic Criteria

All hydrologic data was obtained from the “El Paso Drainage Criteria Manual" Volumes 1 and 2, and the “Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual” Volumes 1, 2, and 3. On-site flows were determined based on the 5-year (minor) storm event and the 100-year (major) storm event. Rainfall intensities for the 5-year and the 100-year storm return frequencies were obtained from Figure 6-5 of the City of Colorado Springs DCM. Runoff was calculated using CUHP Version 2.0.0, developed by Urban Drainage and Flood Control District. The model utilizes the raingage classified as “a design storm by temporal distribution of one-hour rain depths with area correction factors”. The following Colorado Springs rainfall depths were utilized in the model: 1.50 inches for 1-hour 5-year depth and 2.52 inches for 1-hour 100-year depth. The CUHP calculations and SWMM model are presented in Appendix B.

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

Hydraulic Criteria

For the purposes of the Jane Davis Ranch Sketch Plan, no hydraulic analysis was performed. In reports submitted with the development plan, proposed culverts and roadside ditches shall be designed to conform to requirements set in the EPC DCM.

DRAINAGE FACILITY DESIGN

General Concept

The proposed stormwater conveyance system was designed to convey the developed Jane Davis Ranch flows to one of six full-spectrum EDBs via roadside ditches and roadway culverts. Pond 1 is located within Parcel B, which has a large lot single-family land use, and will detain the developed flows on-site. Pond 2 is located within Parcel A, which has a commercial land use, and will detain the developed flows on-site. Pond 3 is located within Parcel D, which has a large lot single-family land use, and will detain the developed flows on-site. Pond 4 is located within Parcel Q, which has a detention pond land use, and will detain the developed flows within this parcel. Pond 5 is located in Parcel S, which has a detention pond land use, and will detain the developed flows within this parcel. Pond 6 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 Jane Davis Ranch development. The EDBs will outfall at various points of the existing drainageway and all proposed work shall stay out of the floodplain. Only stream stabilization activities shall occur in the floodplain.

The “Soil and Geology Study: Davis Subdivision” prepared by Rocky Mountain Group showed some bore test results with groundwater located within 10 feet of the surface. The test borings taken were

not located in the immediate vicinity of the proposed full-spectrum EDBs, but final pond locations may have some risk for shallow groundwater. When the final pond locations are determined with future analysis within the drainage reports submitted for development plans, additional test bore holes may be required. If shallow groundwater is an issue for any of the full-spectrum EDBs, mitigation options such as clay or geomembrane layers shall be defined in the future drainage reports.

Four Step Process to Minimize Adverse Impacts of Urbanization

In accordance with the El Paso County Drainage Criteria Manual, Volume 2 this site has implemented the four step process to minimize adverse impacts of urbanization. The four step process includes reducing runoff volumes; stabilizing drainageways, treating the water quality capture volume (WQCV), and consider the need for Industrial Commercial BMP's.

Step 1, Reducing Runoff Volumes: The development of the project site is proposed as mixed commercial and large-lot single family residential (2.5 ac. min.) with open spaces and lawn areas interspersed within the development which helps disconnect impervious areas and reduce runoff volumes. Roadways will utilize roadside ditches further disconnecting impervious areas. These practices will also allow for increased infiltration and reduce runoff volume.

Step 2, Stabilize Drainageways: This site will utilize roadside ditches with culvert crossings throughout the site. These roadside ditches will then direct the on-site development flows to the multiple detention ponds within the project that will be designed to release at or below historic rates in the natural channels. The natural channels will be stabilized in reaches with high velocity by the use of drop structures incorporated at each roadway culvert crossing and isolated grade control structures where warranted per the Gieck Ranch DBPS. Based upon the proposed reduction in released flows compared to the pre-developed flows, no impact to downstream drainageways is anticipated.

Step 3, Provide WQCV: Runoff from this development will be treated through capture and slow release of the WQCV in multiple permanent detention basins that will be designed per current El Paso County drainage criteria. 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 permanent stormwater quality measure. In accordance with Section I.7.1.B.8, sites with constructing activity that is for the purpose of stream stabilization are also excluded from having a downstream permanent stormwater quality measure. See highlighted areas in the drainage map presented in Appendix F. Outlet structure release rates will be limited to less than historic rates to minimize adverse impacts to downstream stormwater facilities. Complete pond and outlet structure designs will be provided with the Final Drainage Report. Preliminary pond design parameters are presented in Appendix D.

Step 4, Consider the need for Industrial and Commercial BMP's: Some areas within the development propose commercial uses. A site specific storm water quality and erosion control plan

and narrative will be prepared for each future Filing. Site specific temporary source control BMPs as well as permanent BMP's will be detailed in this plan and narrative to protect receiving waters.

Channel Analysis and Design

Detailed channel analysis and design will be provided with the development plan. Due to proposed rural local roadways crossing the existing Gieck Ranch Tributary drainageway in three locations, it is anticipated that a LOMR will be required in the future to analyze the impacts in this area. The design of the required drainage infrastructure will be defined at that time. Additionally, improvements to the existing drainageway include but are not limited to adjacent reach selective stabilization as stated in the environmental study and the Gieck Ranch DBPS.

SUMMARY

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

REFERENCES:

1. City of Colorado Springs Drainage Criteria Manual Volume 1, City of Colorado Springs, CO, May 2014.

2. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, Latest Revision.

3. Jane 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.

6. Letter of Map Revision Determination Document, Federal Emergency Management Agency, Febuary 16, 2005.

7. Soil and Geology Study: Davis Subdivision, Rocky Mountain Group, April 2023.

APPENDIX A

FIGURES AND EXHIBITS

N

2000 1000 0 2000

ORIGINAL SCALE: 1" = 2000'

VICINITY MAP
DAVIS RANCH
JOB NO. 25274.00
06/29/2023
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

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, N/NGS12
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 (FMIX) 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 equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

* Referenced to the North American Vertical Datum of 1988 (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)
^{4275000m}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
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

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, N/NGS12
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 (FMIX) 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.

LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

* Referenced to the North American Vertical Datum of 1988 (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)
$^{42}75^{000m}$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
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

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

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
08041C0556G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

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

Map Scale: 1:15,000 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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%
Totals for Area of Interest			**877.8**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX B

HYDROLOGIC CALCULATIONS

EXISTING COMPOSITE % IMPERVIOUS/C VALUE CALCULATIONS

Subdivision: Jane Davis Ranch-Sketch Plan
Location: El Paso County

Project Name: Jane Davis Ranch
Project No.: 25274.00
Calculated By: GAG
Checked By:
Date: 3/13/24

Basin ID	Total Area (ac)	Hardscape (100% Impervious)				Undeveloped (2% Impervious)				Basin Total Weighted C		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
EXA	19.37	0.90	0.96	0.00	0.0%	0.08	0.35	19.37	2.0%	0.08	0.35	2.0%
EXB	5.12	0.90	0.96	0.12	2.3%	0.08	0.35	5.00	2.0%	0.10	0.36	4.3%
EXC	54.95	0.90	0.96	0.00	0.0%	0.08	0.35	54.95	2.0%	0.08	0.35	2.0%
EXD	114.1	0.90	0.96	0.17	0.1%	0.08	0.35	113.95	2.0%	0.08	0.35	2.1%
EXE	105.2	0.90	0.96	0.00	0.0%	0.08	0.35	105.18	2.0%	0.08	0.35	2.0%
EXF	37.91	0.90	0.96	0.00	0.0%	0.08	0.35	37.91	2.0%	0.08	0.35	2.0%
EXG	16.19	0.90	0.96	0.07	0.4%	0.08	0.35	16.12	2.0%	0.08	0.35	2.4%
EXH	44.49	0.90	0.96	0.16	0.4%	0.08	0.35	44.33	2.0%	0.08	0.35	2.4%
OS1	26.55	0.90	0.96	0.00	0.0%	0.08	0.35	26.55	2.0%	0.08	0.35	2.0%
OS2	11.56	0.90	0.96	0.00	0.0%	0.08	0.35	11.56	2.0%	0.08	0.35	2.0%
OS3A	5.37	0.90	0.96	0.00	0.0%	0.08	0.35	5.37	2.0%	0.08	0.35	2.0%
OS3B	20.89	0.90	0.96	0.00	0.0%	0.08	0.35	20.89	2.0%	0.08	0.35	2.0%
OS3C	21.41	0.90	0.96	0.00	0.0%	0.08	0.35	21.41	2.0%	0.08	0.35	2.0%
OS4	60.07	0.90	0.96	0.00	0.0%	0.08	0.35	60.07	2.0%	0.08	0.35	2.0%
OS5	16.65	0.90	0.96	0.00	0.0%	0.08	0.35	16.65	2.0%	0.08	0.35	2.0%
Total On-Site	397.33											2.1%

Summary of CUHP Input Parameters (Version 2.0.1)

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
EXA		5 YR DESIGN STORM	0.041	0.171	0.292	0.019	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
EXB		5 YR DESIGN STORM	0.008	0.088	0.130	0.023	4.3	0.40	0.10	5.00	1.00	0.0007	0.00	0.09	0.04	2.73
EXC		5 YR DESIGN STORM	0.086	0.186	0.359	0.024	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
EXD		5 YR DESIGN STORM	0.178	0.455	0.848	0.021	2.1	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.30
EXE		5 YR DESIGN STORM	0.164	0.273	0.680	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
EXF		5 YR DESIGN STORM	0.059	0.287	0.476	0.021	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
EXG		5 YR DESIGN STORM	0.025	0.091	0.182	0.023	2.4	0.40	0.10	5.00	1.00	0.0007	0.00	0.05	0.02	1.49
EXH		5 YR DESIGN STORM	0.070	0.301	0.615	0.023	2.4	0.40	0.10	5.00	1.00	0.0007	0.00	0.05	0.02	1.49
OS1		5 YR DESIGN STORM	0.030	0.077	0.260	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
OS2		5 YR DESIGN STORM	0.018	0.116	0.198	0.028	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
OS3A		5 YR DESIGN STORM	0.008	0.072	0.197	0.023	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.00	0.02	1.22
OS3B		5 YR DESIGN STORM	0.033	0.085	0.304	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
OS3C		5 YR DESIGN STORM	0.033	0.171	0.363	0.021	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
OS4		5 YR DESIGN STORM	0.094	0.236	0.420	0.027	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
OS5		5 YR DESIGN STORM	0.026	0.098	0.246	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
EXA	5-year	0.158	0.113	40.3	3.80	21.0	2.69	6.3	31	96,377	0.01	1,065	35.0	0	1,065	0.01
EXB	5-year	0.153	0.052	39.7	1.89	20.7	1.34	3.2	6	18,586	0.03	474	32.0	0	474	0.03
EXC	5-year	0.158	0.157	31.5	4.10	16.4	2.90	6.8	82	199,469	0.01	2,203	34.0	1	2,203	0.02
EXD	5-year	0.158	0.218	54.5	9.42	28.4	6.66	15.7	98	414,183	0.01	4,820	43.0	1	4,820	0.01
EXE	5-year	0.158	0.210	40.2	6.79	20.9	4.80	11.3	123	381,876	0.01	4,218	39.0	1	4,219	0.01
EXF	5-year	0.158	0.133	54.4	5.84	28.3	4.13	9.7	33	137,613	0.01	1,520	38.0	0	1,520	0.01
EXG	5-year	0.157	0.090	28.3	2.26	14.7	1.59	3.8	27	58,770	0.01	789	32.0	0	789	0.02
EXH	5-year	0.157	0.142	57.2	6.54	29.8	4.62	10.9	36	161,499	0.01	2,169	39.0	0	2,169	0.01
OS1	5-year	0.158	0.098	29.6	2.53	15.4	1.79	4.2	31	70,313	0.01	777	32.0	0	777	0.02
OS2	5-year	0.158	0.078	36.8	2.50	19.2	1.77	4.2	15	41,963	0.01	464	33.0	0	464	0.01
OS3A	5-year	0.158	0.055	43.2	2.13	22.5	1.50	3.5	6	19,493	0.01	204	32.0	0	204	0.01
OS3B	5-year	0.158	0.102	32.4	2.83	16.8	2.00	4.7	30	75,831	0.01	838	33.0	0	838	0.01
OS3C	5-year	0.158	0.103	48.2	4.10	25.0	2.90	6.8	21	77,718	0.01	859	35.0	0	858	0.01
OS4	5-year	0.158	0.163	35.7	4.77	18.5	3.37	8.0	79	218,054	0.01	2,409	36.0	1	2,409	0.01
OS5	5-year	0.158	0.092	34.6	2.73	18.0	1.93	4.6	23	60,440	0.01	668	33.0	0	668	0.01

Summary of CUHP Input Parameters (Version 2.0.1)

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
EXA		100 YR DESIGN STORM	0.041	0.171	0.292	0.019	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
EXB		100 YR DESIGN STORM	0.008	0.088	0.130	0.023	4.3	0.40	0.10	5.00	1.00	0.0007	0.00	0.09	0.04	3.30
EXC		100 YR DESIGN STORM	0.086	0.186	0.359	0.024	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
EXD		100 YR DESIGN STORM	0.178	0.455	0.848	0.021	2.1	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.59
EXE		100 YR DESIGN STORM	0.164	0.273	0.680	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
EXF		100 YR DESIGN STORM	0.059	0.287	0.476	0.021	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
EXG		100 YR DESIGN STORM	0.025	0.091	0.182	0.023	2.4	0.40	0.10	5.00	1.00	0.0007	0.00	0.05	0.02	1.82
EXH		100 YR DESIGN STORM	0.070	0.301	0.615	0.023	2.4	0.40	0.10	5.00	1.00	0.0007	0.00	0.05	0.02	1.82
OS1		100 YR DESIGN STORM	0.030	0.077	0.260	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
OS2		100 YR DESIGN STORM	0.018	0.116	0.198	0.028	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
OS3A		100 YR DESIGN STORM	0.008	0.072	0.197	0.023	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.00	0.02	1.50
OS3B		100 YR DESIGN STORM	0.033	0.085	0.304	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
OS3C		100 YR DESIGN STORM	0.033	0.171	0.363	0.021	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
OS4		100 YR DESIGN STORM	0.094	0.236	0.420	0.027	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
OS5		100 YR DESIGN STORM	0.026	0.098	0.246	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
EXA	100-year	0.157	0.112	40.3	3.78	21.0	2.67	6.3	31	96,377	0.47	44,883	44.0	13	44,883	0.49
EXB	100-year	0.151	0.051	39.7	1.87	20.6	1.32	3.1	6	18,586	0.51	9,406	42.0	3	9,406	0.53
EXC	100-year	0.157	0.156	31.5	4.08	16.4	2.88	6.8	82	199,469	0.47	92,892	43.0	34	92,887	0.62
EXD	100-year	0.157	0.216	54.5	9.36	28.3	6.61	15.6	98	414,183	0.47	193,603	52.0	44	193,601	0.38
EXE	100-year	0.157	0.209	40.2	6.75	20.9	4.77	11.3	123	381,876	0.47	177,840	47.0	53	177,842	0.50
EXF	100-year	0.157	0.132	54.3	5.81	28.3	4.10	9.7	33	137,613	0.47	64,086	48.0	14	64,086	0.38
EXG	100-year	0.156	0.089	28.3	2.24	14.7	1.58	3.7	27	58,770	0.47	27,777	41.0	11	27,775	0.67
EXH	100-year	0.156	0.141	57.2	6.49	29.7	4.59	10.8	36	161,499	0.47	76,332	49.0	16	76,331	0.37
OS1	100-year	0.157	0.098	29.6	2.51	15.4	1.78	4.2	31	70,313	0.47	32,745	41.0	13	32,746	0.65
OS2	100-year	0.157	0.077	36.8	2.49	19.2	1.76	4.1	15	41,963	0.47	19,542	42.0	6	19,543	0.53
OS3A	100-year	0.157	0.055	43.2	2.12	22.5	1.50	3.5	6	19,493	0.47	9,071	42.0	2	9,070	0.46
OS3B	100-year	0.157	0.101	32.4	2.81	16.8	1.98	4.7	30	75,831	0.47	35,314	42.0	12	35,312	0.60
OS3C	100-year	0.157	0.102	48.1	4.07	25.0	2.88	6.8	21	77,718	0.47	36,193	46.0	9	36,191	0.42
OS4	100-year	0.157	0.162	35.7	4.75	18.5	3.35	7.9	79	218,054	0.47	101,548	44.0	33	101,543	0.56
OS5	100-year	0.157	0.091	34.6	2.72	18.0	1.92	4.5	23	60,440	0.47	28,147	42.0	9	28,146	0.56

PROPOSED COMPOSITE % IMPERVIOUS/C VALUE CALCULATIONS

Subdivision: Jane Davis Ranch-Sketch Plan
Location: El Paso County

Project Name: Jane Davis Ranch
Project No.: 25274.00
Calculated By: GAG
Checked By:
Date: 3/13/24

Basin ID	Total Area (ac)	Hardscape (100% Impervious)				Undeveloped (2% Impervious)				Single-Family (2.5-5 acre) (0% Impervious)				Commercial (95% Impervious)				Park (7% Impervious)				Basin Total Weighted C		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
A	17.96	0.90	0.96	0.58	3.2%	0.08	0.35	0.51	0.1%	0.16	0.41	16.87	9.4%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.18	0.43	12.7%
B	1.33	0.90	0.96	0.00	0.0%	0.08	0.35	1.33	2.0%	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	2.0%
C	5.20	0.90	0.96	0.41	7.9%	0.08	0.35	0.36	0.1%	0.16	0.41	1.30	2.5%	0.81	0.88	3.13	57.2%	0.12	0.39	0.00	0.0%	0.60	0.73	67.7%
D	26.15	0.90	0.96	1.93	7.4%	0.08	0.35	2.36	0.2%	0.16	0.41	21.86	8.4%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.21	0.45	15.9%
E1	9.11	0.90	0.96	0.00	0.0%	0.08	0.35	9.11	2.0%	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	2.0%
E2	1.17	0.90	0.96	0.00	0.0%	0.08	0.35	1.17	2.0%	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	2.0%
F	49.33	0.90	0.96	2.16	4.4%	0.08	0.35	2.64	0.1%	0.16	0.41	38.09	7.7%	0.81	0.88	0.00	0.0%	0.12	0.39	6.44	0.9%	0.18	0.43	13.1%
G	53.91	0.90	0.96	1.67	3.1%	0.08	0.35	2.04	0.1%	0.16	0.41	50.20	9.3%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.18	0.42	12.5%
H	10.99	0.90	0.96	0.00	0.0%	0.08	0.35	10.99	2.0%	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	2.0%
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	119.8	0.90	0.96	5.70	4.8%	0.08	0.35	6.42	0.1%	0.16	0.41	105.63	8.8%	0.81	0.88	2.05	1.6%	0.12	0.39	0.00	0.0%	0.20	0.44	15.3%
K	29.86	0.90	0.96	0.00	0.0%	0.08	0.35	0.00	0.0%	0.16	0.41	29.86	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	56.53	0.90	0.96	0.00	0.0%	0.08	0.35	0.00	0.0%	0.16	0.41	56.53	10.0%	0.81	0.88	0.00	0.0%	0.12	0.39	0.00	0.0%	0.16	0.41	10.0%
M1	10.55	0.90	0.96	0.00	0.0%	0.08	0.35	10.55	2.0%	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	2.0%
M2	0.26	0.90	0.96	0.00	0.0%	0.08	0.35	0.26	2.0%	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	2.0%
OS1A	18.68	0.90	0.96	0.00	0.0%	0.08	0.35	18.68	2.0%	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	2.0%
OS1B	7.86	0.90	0.96	0.00	0.0%	0.08	0.35	7.86	2.0%	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	2.0%
OS2	11.56	0.90	0.96	0.00	0.0%	0.08	0.35	11.56	2.0%	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	2.0%
OS3	47.67	0.90	0.96	0.00	0.0%	0.08	0.35	47.67	2.0%	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	2.0%
OS4	60.07	0.90	0.96	0.00	0.0%	0.08	0.35	60.07	2.0%	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	2.0%
OS5	16.65	0.90	0.96	0.00	0.0%	0.08	0.35	16.65	2.0%	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	2.0%
Total On-Site	397.4																							12.9%
Total Pond 1 (Basin OS1B & A)	36.64																							7.2%
Total Pond 2 (Basin OS2 & B)	16.76																							22.4%
Total Pond 3 (Basin D)	26.15																							15.9%
Total Pond 4 (Basin OS3 & F)	97.00																							7.7%
Total Pond 5 (Basin OS4 & G)	114.0																							7.0%
Total Pond 6 (Basin J)	119.8																							15.3%

Summary of CUHP Input Parameters (Version 2.0.1)

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
A		5 YR DESIGN STORM	0.028	0.066	0.313	0.020	12.7	0.40	0.10	5.00	1.00	0.0007	0.00	0.25	0.11	8.97
B		5 YR DESIGN STORM	0.002	0.043	0.114	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.00	0.02	1.22
C		5 YR DESIGN STORM	0.008	0.114	0.210	0.020	67.7	0.40	0.10	5.00	1.00	0.0007	0.00	0.92	0.29	65.04
D		5 YR DESIGN STORM	0.041	0.214	0.373	0.020	15.9	0.40	0.10	5.00	1.00	0.0007	0.00	0.32	0.12	11.77
E1		5 YR DESIGN STORM	0.014	0.117	0.197	0.020	2.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.66
E2		5 YR DESIGN STORM	0.002	0.031	0.046	0.020	2.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.00	0.02	1.66
F		5 YR DESIGN STORM	0.077	0.277	0.639	0.020	13.1	0.40	0.10	5.00	1.00	0.0007	0.00	0.26	0.11	9.31
G		5 YR DESIGN STORM	0.084	0.265	0.486	0.020	12.5	0.40	0.10	5.00	1.00	0.0007	0.00	0.25	0.11	8.80
H		5 YR DESIGN STORM	0.017	0.116	0.319	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
I		5 YR DESIGN STORM	0.008	0.051	0.132	0.020	10.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.20	0.10	6.71
J		5 YR DESIGN STORM	0.187	0.466	1.057	0.020	15.3	0.40	0.10	5.00	1.00	0.0007	0.00	0.31	0.12	11.23
K		5 YR DESIGN STORM	0.047	0.120	0.235	0.020	10.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.20	0.10	6.71
L		5 YR DESIGN STORM	0.088	0.226	0.424	0.020	10.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.20	0.10	6.71
M1		5 YR DESIGN STORM	0.016	0.168	0.259	0.020	2.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.66
M2		5 YR DESIGN STORM	0.000	0.027	0.036	0.020	0.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.00	0.02	0.00
OS1A		5 YR DESIGN STORM	0.029	0.096	0.190	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
OS1B		5 YR DESIGN STORM	0.012	0.072	0.160	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.00	0.02	1.22
OS2		5 YR DESIGN STORM	0.018	0.116	0.198	0.028	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
OS3		5 YR DESIGN STORM	0.074	0.107	0.385	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
OS4		5 YR DESIGN STORM	0.094	0.236	0.420	0.027	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24
OS5		5 YR DESIGN STORM	0.026	0.098	0.246	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.24

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A	5-year	0.130	0.079	30.5	2.16	15.9	1.52	3.6	28	65,195	0.10	6,466	32.0	2	6,465	0.11
B	5-year	0.158	0.029	50.0	1.43	26.0	1.01	2.4	1	4,828	0.01	50	31.0	0	50	0.01
C	5-year	0.082	0.069	23.5	1.56	12.2	1.10	2.6	10	18,876	0.98	18,557	31.0	5	18,555	0.96
D	5-year	0.123	0.090	48.5	3.66	25.2	2.59	6.1	25	94,925	0.14	13,054	37.0	3	13,054	0.10
E1	5-year	0.157	0.069	44.5	2.67	23.1	1.88	4.4	10	33,069	0.36	11,961	41.0	3	11,961	0.32
E2	5-year	0.157	0.028	29.7	0.93	15.4	0.65	1.5	2	4,247	0.36	1,536	35.0	1	1,535	0.44
F	5-year	0.128	0.124	54.2	5.45	28.2	3.85	9.1	43	179,068	0.10	18,581	40.0	3	18,581	0.07
G	5-year	0.130	0.131	44.7	4.79	23.3	3.38	8.0	56	195,693	0.10	18,962	37.0	4	18,961	0.08
H	5-year	0.158	0.076	51.2	3.29	26.6	2.33	5.5	10	39,894	0.01	441	34.0	0	441	0.01
I	5-year	0.138	0.048	31.3	1.45	16.3	1.03	2.4	8	18,876	0.07	1,316	31.0	0	1,316	0.08
J	5-year	0.124	0.180	58.7	8.41	30.5	5.94	14.0	96	434,874	0.13	56,548	44.0	10	56,548	0.08
K	5-year	0.138	0.105	28.4	2.59	14.8	1.83	4.3	49	108,392	0.07	7,557	33.0	3	7,557	0.09
L	5-year	0.138	0.140	38.3	4.43	19.9	3.13	7.4	69	205,204	0.07	14,308	36.0	4	14,307	0.07
M1	5-year	0.157	0.074	56.4	3.51	29.3	2.48	5.8	9	38,297	0.36	13,852	44.0	3	13,852	0.26
M2	5-year	0.163	0.015	48.6	0.84	25.3	0.59	1.4	0	944	0.33	315	40.0	0	314	0.27
OS1A	5-year	0.158	0.097	28.7	2.43	14.9	1.72	4.1	30	67,808	0.01	749	32.0	0	749	0.02
OS1B	5-year	0.158	0.065	34.1	2.01	17.7	1.42	3.4	11	28,532	0.01	298	32.0	0	298	0.01
OS2	5-year	0.158	0.078	36.8	2.50	19.2	1.77	4.2	15	41,963	0.01	464	33.0	0	464	0.01
OS3	5-year	0.158	0.147	27.9	3.46	14.5	2.44	5.8	80	173,042	0.01	1,912	33.0	1	1,911	0.02
OS4	5-year	0.158	0.163	35.7	4.77	18.5	3.37	8.0	79	218,054	0.01	2,409	36.0	1	2,409	0.01
OS5	5-year	0.158	0.092	34.6	2.73	18.0	1.93	4.6	23	60,440	0.01	668	33.0	0	668	0.01

Summary of CUHP Input Parameters (Version 2.0.1)

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
A		100 YR DESIGN STORM	0.028	0.066	0.313	0.020	12.7	0.40	0.10	5.00	1.00	0.0007	0.00	0.25	0.11	10.32
B		100 YR DESIGN STORM	0.002	0.043	0.114	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.00	0.02	1.50
C		100 YR DESIGN STORM	0.008	0.114	0.210	0.020	67.7	0.40	0.10	5.00	1.00	0.0007	0.00	0.92	0.29	66.04
D		100 YR DESIGN STORM	0.041	0.214	0.373	0.020	15.9	0.40	0.10	5.00	1.00	0.0007	0.00	0.32	0.12	13.25
E1		100 YR DESIGN STORM	0.014	0.117	0.197	0.020	2.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.79
E2		100 YR DESIGN STORM	0.002	0.031	0.046	0.020	2.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.00	0.02	1.79
F		100 YR DESIGN STORM	0.077	0.277	0.639	0.020	13.1	0.40	0.10	5.00	1.00	0.0007	0.00	0.26	0.11	10.68
G		100 YR DESIGN STORM	0.084	0.265	0.486	0.020	12.5	0.40	0.10	5.00	1.00	0.0007	0.00	0.25	0.11	10.14
H		100 YR DESIGN STORM	0.017	0.116	0.319	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
I		100 YR DESIGN STORM	0.008	0.051	0.132	0.020	10.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.20	0.10	7.92
J		100 YR DESIGN STORM	0.187	0.466	1.057	0.020	15.3	0.40	0.10	5.00	1.00	0.0007	0.00	0.31	0.12	12.70
K		100 YR DESIGN STORM	0.047	0.120	0.235	0.020	10.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.20	0.10	7.92
L		100 YR DESIGN STORM	0.088	0.226	0.424	0.020	10.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.20	0.10	7.92
M1		100 YR DESIGN STORM	0.016	0.168	0.259	0.020	2.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.04	0.02	1.79
M2		100 YR DESIGN STORM	0.000	0.027	0.036	0.020	0.0	0.40	0.10	3.00	0.50	0.0018	0.00	0.00	0.02	0.00
OS1A		100 YR DESIGN STORM	0.029	0.096	0.190	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
OS1B		100 YR DESIGN STORM	0.012	0.072	0.160	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.00	0.02	1.50
OS2		100 YR DESIGN STORM	0.018	0.116	0.198	0.028	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
OS3		100 YR DESIGN STORM	0.074	0.107	0.385	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
OS4		100 YR DESIGN STORM	0.094	0.236	0.420	0.027	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51
OS5		100 YR DESIGN STORM	0.026	0.098	0.246	0.020	2.0	0.40	0.10	5.00	1.00	0.0007	0.00	0.04	0.02	1.51

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A	100-year	0.125	0.077	30.3	2.09	15.7	1.48	3.5	28	65,195	0.66	43,298	41.0	14	43,292	0.80
B	100-year	0.157	0.029	50.0	1.42	26.0	1.00	2.4	1	4,828	0.47	2,247	45.0	1	2,247	0.40
C	100-year	0.081	0.070	23.3	1.55	12.1	1.09	2.6	10	18,876	1.91	36,130	38.0	11	36,126	2.03
D	100-year	0.120	0.089	48.0	3.59	25.0	2.54	6.0	26	94,925	0.73	69,245	46.0	15	69,246	0.59
E1	100-year	0.156	0.069	44.5	2.66	23.1	1.88	4.4	10	33,069	1.49	49,258	48.0	11	49,258	1.16
E2	100-year	0.156	0.027	29.7	0.92	15.4	0.65	1.5	2	4,247	1.49	6,326	41.0	2	6,323	1.53
F	100-year	0.125	0.121	53.8	5.30	28.0	3.75	8.8	43	179,068	0.67	120,363	49.0	25	120,360	0.51
G	100-year	0.126	0.127	44.4	4.62	23.1	3.27	7.7	57	195,693	0.66	129,182	46.0	32	129,182	0.59
H	100-year	0.157	0.076	51.2	3.27	26.6	2.31	5.5	10	39,894	0.47	18,578	46.0	4	18,578	0.40
I	100-year	0.134	0.047	31.2	1.42	16.2	1.00	2.4	8	18,876	0.61	11,530	41.0	4	11,531	0.74
J	100-year	0.121	0.178	58.2	8.25	30.3	5.83	13.7	96	434,874	0.72	311,829	52.0	60	311,822	0.50
K	100-year	0.134	0.102	28.3	2.52	14.7	1.78	4.2	50	108,392	0.61	66,209	41.0	24	66,209	0.80
L	100-year	0.134	0.136	38.2	4.29	19.9	3.03	7.2	69	205,204	0.61	125,345	45.0	36	125,339	0.63
M1	100-year	0.156	0.074	56.4	3.50	29.3	2.47	5.8	9	38,297	1.49	57,044	53.0	10	57,044	0.98
M2	100-year	0.163	0.015	48.6	0.84	25.3	0.59	1.4	0	944	1.44	1,357	49.0	0	1,357	1.05
OS1A	100-year	0.157	0.096	28.7	2.42	14.9	1.71	4.0	30	67,808	0.47	31,578	41.0	12	31,579	0.66
OS1B	100-year	0.157	0.065	34.0	2.00	17.7	1.41	3.3	11	28,532	0.47	13,277	41.0	4	13,276	0.57
OS2	100-year	0.157	0.077	36.8	2.49	19.2	1.76	4.1	15	41,963	0.47	19,542	42.0	6	19,543	0.53
OS3	100-year	0.157	0.146	27.9	3.44	14.5	2.43	5.7	80	173,042	0.47	80,586	42.0	33	80,583	0.68
OS4	100-year	0.157	0.162	35.7	4.75	18.5	3.35	7.9	79	218,054	0.47	101,548	44.0	33	101,543	0.56
OS5	100-year	0.157	0.091	34.6	2.72	18.0	1.92	4.5	23	60,440	0.47	28,147	42.0	9	28,146	0.56

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: Jane Davis Ranch

Basin ID: Pond 1

Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	37.00	acres
Watershed Length =	2,920	ft
Watershed Length to Centroid =	1,460	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	7.50%	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.161	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.188	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.091	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.161	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.220	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.695	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.188	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.877	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	3.423	acre-feet		inches
Approximate 2-yr Detention Volume =	0.111	acre-feet		
Approximate 5-yr Detention Volume =	0.154	acre-feet		
Approximate 10-yr Detention Volume =	0.205	acre-feet		
Approximate 25-yr Detention Volume =	0.283	acre-feet		
Approximate 50-yr Detention Volume =	0.408	acre-feet		
Approximate 100-yr Detention Volume =	0.730	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.161	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.027	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.542	acre-feet
Total Detention Basin Volume =	0.730	acre-feet
Initial Surcharge Volume (ISV) =	21	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	4.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	64	ft^2
Surcharge Volume Length (L_{ISV}) =	8.0	ft
Surcharge Volume Width (W_{ISV}) =	8.0	ft
Depth of Basin Floor (H_{FLOOR}) =	1.46	ft
Length of Basin Floor (L_{FLOOR}) =	159.8	ft
Width of Basin Floor (W_{FLOOR}) =	81.0	ft
Area of Basin Floor (A_{FLOOR}) =	12,943	ft^2
Volume of Basin Floor (V_{FLOOR}) =	6,772	ft^3
Depth of Main Basin (H_{MAIN}) =	1.71	ft
Length of Main Basin (L_{MAIN}) =	173.5	ft
Width of Main Basin (W_{MAIN}) =	94.7	ft
Area of Main Basin (A_{MAIN}) =	16,424	ft^2
Volume of Main Basin (V_{MAIN}) =	25,050	ft^3
Calculated Total Basin Volume (V_{total}) =	0.732	acre-feet

Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		8.0	8.0	64		0.001		
ISV	0.33		8.0	8.0	64		0.001	21	0.000
	0.50		8.0	8.0	64		0.001	32	0.001
	0.75		8.0	8.0	64		0.001	48	0.001
	1.00		25.7	16.5	423		0.010	90	0.002
	1.25		51.7	29.0	1,497		0.034	317	0.007
	1.50		77.7	41.5	3,222		0.074	893	0.020
	1.75		103.7	54.0	5,596		0.128	1,981	0.045
	2.00		129.7	66.5	8,620		0.198	3,745	0.086
	2.25		155.7	79.0	12,295		0.282	6,346	0.146
Floor	2.29		159.8	81.0	12,943		0.297	6,851	0.157
Zone 1 (WQCV)	2.31		160.0	81.1	12,981		0.298	7,110	0.163
Zone 2 (EURV)	2.40		160.7	81.9	13,156		0.302	8,286	0.190
	2.50		161.5	82.7	13,350		0.306	9,611	0.221
	2.75		163.5	84.7	13,843		0.318	13,010	0.299
	3.00		165.5	86.7	14,343		0.329	16,533	0.380
	3.25		167.5	88.7	14,851		0.341	20,182	0.463
	3.50		169.5	90.7	15,368		0.353	23,959	0.550
	3.75		171.5	92.7	15,892		0.365	27,867	0.640
Zone 3 (100-year)	4.00		173.5	94.7	16,424		0.377	31,906	0.732
	4.25		175.5	96.7	16,965		0.389	36,080	0.828
	4.50		177.5	98.7	17,513		0.402	40,389	0.927
	4.75		179.5	100.7	18,069		0.415	44,837	1.029
	5.00		181.5	102.7	18,634		0.428	49,424	1.135
	5.25		183.5	104.7	19,206		0.441	54,154	1.243
	5.50		185.5	106.7	19,786		0.454	59,028	1.355
	5.75		187.5	108.7	20,375		0.468	64,048	1.470
	6.00		189.5	110.7	20,971		0.481	69,216	1.589

340
255
170
85
0
Length, Width (ft.)
84000
63000
42000
21000
0
Area (sq.ft.)
0.00
6.00
12.00
18.00
24.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

1.940
1.455
0.970
0.485
0.000
Area (acres)
21.560
16.170
10.780
5.390
0.000
Volume (ac-ft)
0.00
6.00
12.00
18.00
24.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Jane Davis Ranch

Basin ID: Pond 2

Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	17.00	acres
Watershed Length =	1,455	ft
Watershed Length to Centroid =	730	ft
Watershed Slope =	0.019	ft/ft
Watershed Imperviousness =	22.50%	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.178	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.353	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.230	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.327	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.415	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.683	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.937	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.281	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	2.031	acre-feet		inches
Approximate 2-yr Detention Volume =	0.219	acre-feet		
Approximate 5-yr Detention Volume =	0.294	acre-feet		
Approximate 10-yr Detention Volume =	0.373	acre-feet		
Approximate 25-yr Detention Volume =	0.480	acre-feet		
Approximate 50-yr Detention Volume =	0.570	acre-feet		
Approximate 100-yr Detention Volume =	0.737	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.178	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.175	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.385	acre-feet
Total Detention Basin Volume =	0.737	acre-feet
Initial Surcharge Volume (ISV) =	23	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	4.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	70	ft^2
Surcharge Volume Length (L_{ISV}) =	8.4	ft
Surcharge Volume Width (W_{ISV}) =	8.4	ft
Depth of Basin Floor (H_{FLOOR}) =	1.46	ft
Length of Basin Floor (L_{FLOOR}) =	160.2	ft
Width of Basin Floor (W_{FLOOR}) =	81.4	ft
Area of Basin Floor (A_{FLOOR}) =	13,042	ft^2
Volume of Basin Floor (V_{FLOOR}) =	6,848	ft^3
Depth of Main Basin (H_{MAIN}) =	1.71	ft
Length of Main Basin (L_{MAIN}) =	173.9	ft
Width of Main Basin (W_{MAIN}) =	95.1	ft
Area of Main Basin (A_{MAIN}) =	16,535	ft^2
Volume of Main Basin (V_{MAIN}) =	25,230	ft^3
Calculated Total Basin Volume (V_{total}) =	0.738	acre-feet

Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		8.4	8.4	70		0.002		
ISV	0.33		8.4	8.4	70		0.002	23	0.001
	0.50		8.4	8.4	70		0.002	35	0.001
	0.75		8.4	8.4	70		0.002	53	0.001
	1.00		26.1	16.9	441		0.010	98	0.002
	1.25		52.1	29.4	1,531		0.035	331	0.008
	1.50		78.1	41.9	3,271		0.075	917	0.021
	1.75		104.1	54.4	5,661		0.130	2,020	0.046
	2.00		130.1	66.9	8,701		0.200	3,802	0.087
	2.25		156.1	79.4	12,392		0.284	6,425	0.147
Floor	2.29		160.2	81.4	13,042		0.299	6,934	0.159
Zone 1 (WQCV)	2.36		160.8	82.0	13,178		0.303	7,851	0.180
	2.50		161.9	83.1	13,451		0.309	9,715	0.223
	2.75		163.9	85.1	13,945		0.320	13,140	0.302
Zone 2 (EURV)	2.91		165.2	86.4	14,265		0.327	15,396	0.353
	3.00		165.9	87.1	14,447		0.332	16,689	0.383
	3.25		167.9	89.1	14,957		0.343	20,364	0.467
	3.50		169.9	91.1	15,475		0.355	24,168	0.555
	3.75		171.9	93.1	16,001		0.367	28,102	0.645
Zone 3 (100-year)	4.00		173.9	95.1	16,535		0.380	32,169	0.738
	4.25		175.9	97.1	17,077		0.392	36,370	0.835
	4.50		177.9	99.1	17,627		0.405	40,708	0.935
	4.75		179.9	101.1	18,185		0.417	45,184	1.037
	5.00		181.9	103.1	18,751		0.430	49,801	1.143
	5.25		183.9	105.1	19,325		0.444	54,560	1.253
	5.50		185.9	107.1	19,907		0.457	59,464	1.365
	5.75		187.9	109.1	20,497		0.471	64,514	1.481
	6.00		189.9	111.1	21,095		0.484	69,713	1.600

340
255
170
85
0
Length, Width (ft.)
84000
63000
42000
21000
0
Area (sq.ft.)
0.00
6.00
12.00
18.00
24.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

1.940
1.455
0.970
0.485
0.000
Area (acres)
21.660
16.245
10.830
5.415
0.000
Volume (ac-ft)
0.00
6.00
12.00
18.00
24.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Jane Davis Ranch

Basin ID: Pond 3

Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	26.50	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.217	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.355	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.211	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.316	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.412	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.803	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.181	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.702	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	2.844	acre-feet		inches
Approximate 2-yr Detention Volume =	0.217	acre-feet		
Approximate 5-yr Detention Volume =	0.295	acre-feet		
Approximate 10-yr Detention Volume =	0.379	acre-feet		
Approximate 25-yr Detention Volume =	0.499	acre-feet		
Approximate 50-yr Detention Volume =	0.619	acre-feet		
Approximate 100-yr Detention Volume =	0.872	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.217	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.139	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.517	acre-feet
Total Detention Basin Volume =	0.872	acre-feet
Initial Surcharge Volume (ISV) =	28	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	5.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	86	ft^2
Surcharge Volume Length (L_{ISV}) =	9.3	ft
Surcharge Volume Width (W_{ISV}) =	9.3	ft
Depth of Basin Floor (H_{FLOOR}) =	1.16	ft
Length of Basin Floor (L_{FLOOR}) =	129.9	ft
Width of Basin Floor (W_{FLOOR}) =	67.3	ft
Area of Basin Floor (A_{FLOOR}) =	8,737	ft^2
Volume of Basin Floor (V_{FLOOR}) =	3,746	ft^3
Depth of Main Basin (H_{MAIN}) =	3.01	ft
Length of Main Basin (L_{MAIN}) =	154.0	ft
Width of Main Basin (W_{MAIN}) =	91.3	ft
Area of Main Basin (A_{MAIN}) =	14,065	ft^2
Volume of Main Basin (V_{MAIN}) =	34,000	ft^3
Calculated Total Basin Volume (V_{total}) =	0.868	acre-feet

Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		9.3	9.3	86		0.002		
ISV	0.33		9.3	9.3	86		0.002	28	0.001
	0.50		9.3	9.3	86		0.002	43	0.001
	0.75		9.3	9.3	86		0.002	64	0.001
	1.00		26.9	17.8	478		0.011	115	0.003
	1.25		52.9	30.3	1,602		0.037	361	0.008
	1.50		78.9	42.8	3,376		0.077	970	0.022
	1.75		104.9	55.3	5,799		0.133	2,103	0.048
Floor	1.99		129.9	67.3	8,737		0.201	3,836	0.088
	2.00		130.0	67.3	8,753		0.201	3,923	0.090
	2.25		132.0	69.3	9,152		0.210	6,161	0.141
	2.50		134.0	71.3	9,558		0.219	8,500	0.195
Zone 1 (WQCV)	2.60		134.8	72.1	9,723		0.223	9,464	0.217
	2.75		136.0	73.3	9,973		0.229	10,941	0.251
	3.00		138.0	75.3	10,396		0.239	13,487	0.310
Zone 2 (EURV)	3.19		139.5	76.9	10,722		0.246	15,493	0.356
	3.25		140.0	77.3	10,826		0.249	16,139	0.371
	3.50		142.0	79.3	11,265		0.259	18,900	0.434
	3.75		144.0	81.3	11,711		0.269	21,772	0.500
	4.00		146.0	83.3	12,166		0.279	24,757	0.568
	4.25		148.0	85.3	12,629		0.290	27,856	0.639
	4.50		150.0	87.3	13,099		0.301	31,072	0.713
	4.75		152.0	89.3	13,578		0.312	34,406	0.790
	5.00		154.0	91.3	14,065		0.323	37,862	0.869
Zone 3 (100-year)	5.01		154.1	91.4	14,084		0.323	38,002	0.872
	5.25		156.0	93.3	14,559		0.334	41,439	0.951
	5.50		158.0	95.3	15,062		0.346	45,142	1.036
	5.75		160.0	97.3	15,573		0.357	48,971	1.124
	6.00		162.0	99.3	16,091		0.369	52,929	1.215
	6.25		164.0	101.3	16,618		0.381	57,017	1.309
	6.50		166.0	103.3	17,153		0.394	61,238	1.406
	6.75		168.0	105.3	17,695		0.406	65,594	1.506
	7.00		170.0	107.3	18,246		0.419	70,087	1.609

320
240
160
80
0
Length, Width (ft.)
72400
54300
36200
18100
0
Area (sq.ft.)
0.00
6.00
12.00
18.00
24.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

1.660
1.245
0.830
0.415
0.000
Area (acres)
17.660
13.245
8.830
4.415
0.000
Volume (ac-ft)
0.00
6.00
12.00
18.00
24.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Jane Davis Ranch

Basin ID: Pond 4

Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	97.50	acres
Watershed Length =	4,885	ft
Watershed Length to Centroid =	2,450	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	8.00%	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.449	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.538	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.261	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.458	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.623	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.887	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.192	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	5.017	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	9.098	acre-feet		inches
Approximate 2-yr Detention Volume =	0.319	acre-feet		
Approximate 5-yr Detention Volume =	0.441	acre-feet		
Approximate 10-yr Detention Volume =	0.587	acre-feet		
Approximate 25-yr Detention Volume =	0.805	acre-feet		
Approximate 50-yr Detention Volume =	1.142	acre-feet		
Approximate 100-yr Detention Volume =	1.999	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.449	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.089	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.460	acre-feet
Total Detention Basin Volume =	1.999	acre-feet
Initial Surcharge Volume (ISV) =	59	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	5.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	178	ft^2
Surcharge Volume Length (L_{ISV}) =	13.3	ft
Surcharge Volume Width (W_{ISV}) =	13.3	ft
Depth of Basin Floor (H_{FLOOR}) =	2.17	ft
Length of Basin Floor (L_{FLOOR}) =	239.0	ft
Width of Basin Floor (W_{FLOOR}) =	121.8	ft
Area of Basin Floor (A_{FLOOR}) =	29,120	ft^2
Volume of Basin Floor (V_{FLOOR}) =	22,838	ft^3
Depth of Main Basin (H_{MAIN}) =	2.00	ft
Length of Main Basin (L_{MAIN}) =	255.0	ft
Width of Main Basin (W_{MAIN}) =	137.8	ft
Area of Main Basin (A_{MAIN}) =	35,149	ft^2
Volume of Main Basin (V_{MAIN}) =	64,174	ft^3
Calculated Total Basin Volume (V_{total}) =	2.001	acre-feet

Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		13.3	13.3	178		0.004		
ISV	0.33		13.3	13.3	178		0.004	59	0.001
	0.50		13.3	13.3	178		0.004	89	0.002
	0.75		13.3	13.3	178		0.004	133	0.003
	1.00		31.0	21.8	677		0.016	216	0.005
	1.25		57.0	34.3	1,957		0.045	532	0.012
	1.50		83.0	46.8	3,888		0.089	1,249	0.029
	1.75		109.0	59.3	6,468		0.148	2,530	0.058
	2.00		135.0	71.8	9,698		0.223	4,537	0.104
	2.25		161.0	84.3	13,579		0.312	7,433	0.171
	2.50		187.0	96.8	18,109		0.416	11,381	0.261
	2.75		213.0	109.3	23,289		0.535	16,542	0.380
Zone 1 (WQCV)	2.88		226.5	115.8	26,240		0.602	19,759	0.454
Floor	3.00		239.0	121.8	29,120		0.668	23,079	0.530
Zone 2 (EURV)	3.02		239.2	122.0	29,177		0.670	23,662	0.543
	3.25		241.0	123.8	29,845		0.685	30,450	0.699
	3.50		243.0	125.8	30,579		0.702	38,003	0.872
	3.75		245.0	127.8	31,321		0.719	45,740	1.050
	4.00		247.0	129.8	32,070		0.736	53,664	1.232
	4.25		249.0	131.8	32,828		0.754	61,776	1.418
	4.50		251.0	133.8	33,594		0.771	70,078	1.609
	4.75		253.0	135.8	34,367		0.789	78,573	1.804
Zone 3 (100-year)	5.00		255.0	137.8	35,149		0.807	87,263	2.003
	5.25		257.0	139.8	35,939		0.825	96,149	2.207
	5.50		259.0	141.8	36,737		0.843	105,233	2.416
	5.75		261.0	143.8	37,542		0.862	114,518	2.629
	6.00		263.0	145.8	38,356		0.881	124,005	2.847
	6.25		265.0	147.8	39,178		0.899	133,696	3.069
	6.50		267.0	149.8	40,007		0.918	143,594	3.296
	6.75		269.0	151.8	40,845		0.938	153,701	3.528
	7.00		271.0	153.8	41,691		0.957	164,017	3.765

420
315
210
105
0
Length, Width (ft.)
118000
88500
59000
29500
0
Area (sq.ft.)
0.00
6.00
12.00
18.00
24.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

2.720
2.040
1.360
0.680
0.000
Area (acres)
33.720
25.290
16.860
8.430
0.000
Volume (ac-ft)
0.00
6.00
12.00
18.00
24.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Jane Davis Ranch

Basin ID: Pond 5

Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	114.00	acres
Watershed Length =	4,575	ft
Watershed Length to Centroid =	2,300	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	7.00%	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.466	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.531	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.257	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.457	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.625	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.072	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.585	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	5.694	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	10.445	acre-feet		inches
Approximate 2-yr Detention Volume =	0.313	acre-feet		
Approximate 5-yr Detention Volume =	0.434	acre-feet		
Approximate 10-yr Detention Volume =	0.580	acre-feet		
Approximate 25-yr Detention Volume =	0.804	acre-feet		
Approximate 50-yr Detention Volume =	1.179	acre-feet		
Approximate 100-yr Detention Volume =	2.162	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.466	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.064	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.631	acre-feet
Total Detention Basin Volume =	2.162	acre-feet
Initial Surcharge Volume (ISV) =	61	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	5.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	185	ft^2
Surcharge Volume Length (L_{ISV}) =	13.6	ft
Surcharge Volume Width (W_{ISV}) =	13.6	ft
Depth of Basin Floor (H_{FLOOR}) =	2.32	ft
Length of Basin Floor (L_{FLOOR}) =	254.9	ft
Width of Basin Floor (W_{FLOOR}) =	129.6	ft
Area of Basin Floor (A_{FLOOR}) =	33,028	ft^2
Volume of Basin Floor (V_{FLOOR}) =	27,594	ft^3
Depth of Main Basin (H_{MAIN}) =	1.85	ft
Length of Main Basin (L_{MAIN}) =	269.7	ft
Width of Main Basin (W_{MAIN}) =	144.4	ft
Area of Main Basin (A_{MAIN}) =	38,937	ft^2
Volume of Main Basin (V_{MAIN}) =	66,493	ft^3
Calculated Total Basin Volume (V_{total}) =	2.163	acre-feet

Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		13.6	13.6	185		0.004		
ISV	0.33		13.6	13.6	185		0.004	61	0.001
	0.50		13.6	13.6	185		0.004	92	0.002
	0.75		13.6	13.6	185		0.004	138	0.003
	1.00		31.3	22.1	691		0.016	223	0.005
	1.25		57.3	34.6	1,981		0.045	544	0.012
	1.50		83.3	47.1	3,921		0.090	1,268	0.029
	1.75		109.3	59.6	6,511		0.149	2,558	0.059
	2.00		135.3	72.1	9,751		0.224	4,578	0.105
	2.25		161.3	84.6	13,641		0.313	7,488	0.172
	2.50		187.3	97.1	18,182		0.417	11,453	0.263
	2.75		213.3	109.6	23,372		0.537	16,633	0.382
Zone 1 (WQCV)	2.90		228.9	117.1	26,798		0.615	20,393	0.468
Zone 2 (EURV)	3.00		239.3	122.1	29,212		0.671	23,193	0.532
Floor	3.15		254.9	129.6	33,028		0.758	27,858	0.640
	3.25		255.7	130.4	33,336		0.765	31,176	0.716
	3.50		257.7	132.4	34,112		0.783	39,607	0.909
	3.75		259.7	134.4	34,896		0.801	48,233	1.107
	4.00		261.7	136.4	35,689		0.819	57,056	1.310
	4.25		263.7	138.4	36,489		0.838	66,078	1.517
	4.50		265.7	140.4	37,297		0.856	75,301	1.729
	4.75		267.7	142.4	38,113		0.875	84,727	1.945
Zone 3 (100-year)	5.00		269.7	144.4	38,937		0.894	94,358	2.166
	5.25		271.7	146.4	39,769		0.913	104,196	2.392
	5.50		273.7	148.4	40,609		0.932	114,243	2.623
	5.75		275.7	150.4	41,457		0.952	124,501	2.858
	6.00		277.7	152.4	42,313		0.971	134,972	3.099
	6.25		279.7	154.4	43,178		0.991	145,658	3.344
	6.50		281.7	156.4	44,050		1.011	156,562	3.594
	6.75		283.7	158.4	44,930		1.031	167,684	3.849
	7.00		285.7	160.4	45,818		1.052	179,027	4.110

440
330
220
110
0
Length, Width (ft.)
125200
93900
62600
31300
0
Area (sq.ft.)
0.00
6.00
12.00
18.00
24.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

2.880
2.160
1.440
0.720
0.000
Area (acres)
36.240
27.180
18.120
9.060
0.000
Volume (ac-ft)
0.00
6.00
12.00
18.00
24.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Jane Davis Ranch

Basin ID: Pond 6

Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	120.00	acres
Watershed Length =	5,580	ft
Watershed Length to Centroid =	2,460	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	15.50%	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.957	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.545	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.911	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.372	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.788	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	3.554	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	5.260	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	7.614	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	12.783	acre-feet		inches
Approximate 2-yr Detention Volume =	0.944	acre-feet		
Approximate 5-yr Detention Volume =	1.281	acre-feet		
Approximate 10-yr Detention Volume =	1.651	acre-feet		
Approximate 25-yr Detention Volume =	2.175	acre-feet		
Approximate 50-yr Detention Volume =	2.710	acre-feet		
Approximate 100-yr Detention Volume =	3.854	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.957	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.588	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.309	acre-feet
Total Detention Basin Volume =	3.854	acre-feet
Initial Surcharge Volume (ISV) =	125	ft^3
Initial Surcharge Depth (ISD) =	0.33	ft
Total Available Detention Depth (H_{total}) =	6.00	ft
Depth of Trickle Channel (H_{TC}) =	0.50	ft
Slope of Trickle Channel (S_{TC}) =	0.010	ft/ft
Slopes of Main Basin Sides (S_{main}) =	4	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	2	
Initial Surcharge Area (A_{ISV}) =	379	ft^2
Surcharge Volume Length (L_{ISV}) =	19.5	ft
Surcharge Volume Width (W_{ISV}) =	19.5	ft
Depth of Basin Floor (H_{FLOOR}) =	2.64	ft
Length of Basin Floor (L_{FLOOR}) =	294.0	ft
Width of Basin Floor (W_{FLOOR}) =	151.5	ft
Area of Basin Floor (A_{FLOOR}) =	44,535	ft^2
Volume of Basin Floor (V_{FLOOR}) =	43,140	ft^3
Depth of Main Basin (H_{MAIN}) =	2.53	ft
Length of Main Basin (L_{MAIN}) =	314.3	ft
Width of Main Basin (W_{MAIN}) =	171.7	ft
Area of Main Basin (A_{MAIN}) =	53,962	ft^2
Volume of Main Basin (V_{MAIN}) =	124,408	ft^3
Calculated Total Basin Volume (V_{total}) =	3.854	acre-feet

Depth Increment = 0.25 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		19.5	19.5	379		0.009		
ISV	0.33		19.5	19.5	379		0.009	125	0.003
	0.50		19.5	19.5	379		0.009	189	0.004
	0.75		19.5	19.5	379		0.009	284	0.007
	1.00		37.1	28.0	1,039		0.024	431	0.010
	1.25		63.1	40.5	2,555		0.059	867	0.020
	1.50		89.1	53.0	4,722		0.108	1,763	0.040
	1.75		115.1	65.5	7,538		0.173	3,282	0.075
	2.00		141.1	78.0	11,005		0.253	5,586	0.128
	2.25		167.1	90.5	15,121		0.347	8,838	0.203
	2.50		193.1	103.0	19,888		0.457	13,201	0.303
	2.75		219.1	115.5	25,304		0.581	18,836	0.432
	3.00		245.1	128.0	31,371		0.720	25,907	0.595
	3.25		271.1	140.5	38,087		0.874	34,576	0.794
Zone 1 (WQCV)	3.43		289.9	149.5	43,326		0.995	41,898	0.962
Floor	3.47		294.0	151.5	44,535		1.022	43,655	1.002
	3.50		294.3	151.7	44,642		1.025	44,993	1.033
	3.75		296.3	153.7	45,538		1.045	56,265	1.292
Zone 2 (EURV)	4.00		298.3	155.7	46,442		1.066	67,763	1.556
	4.25		300.3	157.7	47,354		1.087	79,487	1.825
	4.50		302.3	159.7	48,274		1.108	91,440	2.099
	4.75		304.3	161.7	49,202		1.130	103,625	2.379
	5.00		306.3	163.7	50,138		1.151	116,042	2.664
	5.25		308.3	165.7	51,082		1.173	128,695	2.954
	5.50		310.3	167.7	52,034		1.195	141,584	3.250
	5.75		312.3	169.7	52,994		1.217	154,712	3.552
Zone 3 (100-year)	6.00		314.3	171.7	53,962		1.239	168,081	3.859
	6.25		316.3	173.7	54,938		1.261	181,694	4.171
	6.50		318.3	175.7	55,922		1.284	195,551	4.489
	6.75		320.3	177.7	56,914		1.307	209,655	4.813
	7.00		322.3	179.7	57,914		1.330	224,009	5.143
	7.25		324.3	181.7	58,922		1.353	238,613	5.478
	7.50		326.3	183.7	59,938		1.376	253,470	5.819
	7.75		328.3	185.7	60,962		1.399	268,582	6.166
	8.00		330.3	187.7	61,993		1.423	283,952	6.519

460
345
230
115
0
Length, Width (ft.)
144800
108600
72400
36200
0
Area (sq.ft.)
0.00
6.00
12.00
18.00
24.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

3.340
2.505
1.670
0.835
0.000
Area (acres)
43.480
32.610
21.740
10.870
0.000
Volume (ac-ft)
0.00
6.00
12.00
18.00
24.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

APPENDIX E

REFERENCE MATERIALS

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

June 19, 2023

Prepared for:

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

Prepared by:

ecos ecosystem services LLC

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:

<u>Map Unit Symbol & Name</u>

- 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 Haplaquolls and 1% inclusion of Pleasant soils are both hydric; and
- The Fluvaquentic Haplaquolls is hydric and the 1% inclusion of Haplaquolls 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 sedged (*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.

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

Source: Colorado Natural Heritage Program (CNHP) Wetland Mapper

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.

TABLE 3 - FEDERAL LISTED SPECIES POTENTIALLY IMPACTED BY THE PROJECT			
Species	**Status**	**Habitat Requirements and Presence**	**Probability of Impact by Project**
FISH			
Greenback cutthroat trout (*Oncorhynchus clarki stomias*)	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 (*Scaphirhynchus albus*)	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.
BIRDS			
Eastern Black Rail (*Laterallus jamaicensis ssp. Jamaicensis*)	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 ≤ 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/) (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 2nd, 3rd, and 4th 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 1st 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.

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
DRAINAGE BASIN PLANNING STUDY
El Paso County, Colorado

Volume 1 – Final Report

October 1, 2007
Revised: February 10, 2010

PREPARED FOR:
975 Ford LP, LLP
118 North Tejon Street, Suite 213
Colorado Springs, CO 80903
(719) 491-4169
Contact: Neil McLeod

PREPARED BY:
Drexel, Barrell & Co.
3 S. 7th Street
Colorado Springs, CO 80905
(719) 260-0887
Contact: James A. Brzostowicz , P.E.
DBC Project Number: C-7706-2

I. Project Description, Location and Drainage

A. Basin Description and Location

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

While developing this Drainage Basin Planning Study it was determined that a portion of the adjacent Haegler Ranch Basin, approximately 1.4 square miles, is diverted into the Gieck Ranch Basin as shown in Figure 1.0. This diversion occurs just east and immediately upstream of the intersection of Judge Orr Road and Curtis Road. The diversion exists because no culvert was constructed to convey the runoff from the north side of Judge Orr Road to the south side when the road was originally built. Instead, runoff flows east along the northern edge of the road to a culvert located within the Gieck Basin. This condition has existed since the construction of Judge Orr Road. A stakeholder's meeting was held April, 2005 to discuss the impacts of maintaining the diversion or removing it and restoring historic flows. It was decided to maintain the diversion as is, Documentation and correspondence related to the diversion can be found in Section 1 of the Technical Addenda. In addition to the diversion, while delineating the drainage basins using LIDAR based topography, it was determined that there is an additional 1.35 square miles of area in the southeast section that drains into the Gieck Ranch Basin that was previously thought to drain into adjacent basins. The total square miles of drainage area for the Gieck Ranch Basin (22.05) includes the 1.4 square miles of drainage area diverted from the Haegler Ranch Basin and the 1.35 square miles of additional drainage area in the southeast section of the basin.

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

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

B. Climate and Flood History

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

III. Hydrology

A. Introduction

This section summarizes the hydrologic analysis of the Gieck Ranch Drainage Basin. Both existing conditions and future development were considered in the development of peak discharge rates and runoff volumes for the 2-, 5-, 10- and 100-year storm events. The following sections describe the data, methodologies, assumptions, and calculation methods used.

B. Hydrologic Modeling

A hydrologic model was utilized to simulate stormwater runoff in the Gieck Ranch Basin. The model was developed using the U. S. Army Corps of Engineers' HEC-HMS hydrologic modeling program, version 3.3. The use of this model is made in compliance with the El Paso County Drainage Criteria Manual (DCM).

Delineation of the Gieck Ranch Basin and its sub-basins was performed using the El Paso County 2002 LIDAR Terrain Points data set. This data set shows the bare earth and canopy LIDAR points that were flown for a set section during April and May of 2002. The horizontal datum used for the data set is the North American Datum of 1983 and the vertical datum used is NAVD 88. The grid coordinate system used is the Colorado State Plane Coordinate System, Zone 502. The geographic locations have an absolute horizontal accuracy of 15 cm (approximately 0.5 feet) and an absolute vertical accuracy of 30 cm (approximately 1.0 feet). Additional metadata information for the data set is provided in Section 2 of the Technical Addenda.

The LIDAR data was processed using ArcGIS 9.1 computer software to create 2-foot contour intervals over the entire basin. The LIDAR data is considered by the El Paso County IT Department to be limited in it's accuracy for creating 5 foot contours. The 2 foot contours used throughout this study were accepted because significant 2 foot contour mapping had been done from another source and was available to confirm the reliability of the LIDAR based 2-foot contours. The topographic mapping was supplemented with field observations and measurements to assist in delineating sub-basins. The Gieck Ranch Basin was initially subdivided into six major watersheds or drainageways associated with the main stem channel and its' five major tributaries. Minor tributaries to these major drainageways were also identified to further delineate sub-basins. A total of 91 sub-basins ranging in size from 19 to 365 acres were delineated. The sub-basins are labeled in reference to its' associated drainageway or tributary as follows:

Drainageway/Tributary	Basins
Main Stem	MS-B1 through MS-B35
Main Stem Tributary #1	MST1-B1
Main Stem Tributary #2	MST2-B1 through MST2-B3
Main Stem Tributary #3	MST3-B1 through MST3-B2
Main Stem Tributary #4	MST4-B1 through MST4-B2
Main Stem Tributary #5	MST5-B1 through MST5-B2
Haegler Diversion	HD-B1 through HD-B6
West Fork	WF-B1 through WF-B11
West Fork Tributary #1	WFT1-B1 through WFT1-B2
East Fork	EF-B1 through EF-B8
East Fork Tributary #1	EFT1-B1 through EFT1-B4
South Fork	SF-B1 through SF-B7
South Fork Tributary #1	SFT1-B1
Southeast Fork	SE-B1 through SE-B7

Figures 6.1, 6.2 and 6.3, located in Volume 2 of this report, show the contour intervals and the sub-basin delineations for the existing and future conditions models.

C. Time of Concentration Calculations

The topographic mapping was also used to determine the longest flow path within each basin, establish elevations at the beginning and end of flow paths, and determine channel geometry within reaches. This information was used to assist in computing the time of concentration of each sub-basin and ultimately the lag time used in the hydrology model. The time of concentration was determined using the methods presented in the SCS procedure in the Technical Release Manual titled Urban Hydrology for Small Watersheds, 2nd Edition, revised June 1986 (herein referred to as TR-55) and is calculated as the sum of the sheet flow, shallow concentrated flow, and open channel flow. For the existing conditions

Table 2.0: Summary of Existing Conditions Basin Data

Basin ID	Basin Area (acres)	Basin Area (sq. miles)	Basin CCN	tlag (mins)	Average % Imp. Area	Impervious Acres
MS-B1	174.5	0.2727	74	20	1.3%	2.3
MS-B2	52.6	0.0821	73	34	0.0%	0.0
MS-B3	121.5	0.1898	72	32	0.2%	0.3
MS-B4	114.7	0.1792	69	91	0.1%	0.2
MS-B5	205.7	0.3214	64	43	0.0%	0.0
MS-B6	110.0	0.1720	59	103	0.2%	0.2
MS-B7	29.2	0.0456	58	51	0.5%	0.1
MS-B8	100.6	0.1571	58	129	0.6%	0.6
MS-B9	139.7	0.2183	58	179	0.2%	0.3
MS-B10	115.0	0.1797	58	157	0.5%	0.5
MS-B11	316.1	0.4939	66	69	1.1%	3.4
MS-B12	291.1	0.4548	59	285	0.3%	0.8
MS-B13	90.6	0.1415	60	72	0.1%	0.1
MS-B14	61.9	0.0966	60	38	0.1%	0.0
MS-B15	140.0	0.2187	70	81	0.3%	0.5
MS-B16	150.7	0.2354	59	76	0.1%	0.2
MS-B17	202.0	0.3156	58	185	0.1%	0.2
MS-B18	132.7	0.2073	60	79	0.0%	0.0
MS-B19	54.1	0.0845	62	65	0.1%	0.1
MS-B20	82.7	0.1292	64	61	0.5%	0.4
MS-B21	246.4	0.3850	63	164	0.8%	1.9
MS-B22	212.0	0.3312	62	81	0.7%	1.4
MS-B23	207.2	0.3237	58	167	0.0%	0.1
MS-B24	292.8	0.4576	58	72	0.1%	0.2
MS-B25	331.3	0.5176	65	73	0.1%	0.3
MS-B26	118.4	0.1850	61	83	0.1%	0.2
MS-B27	344.8	0.5388	65	128	0.0%	0.1
MS-B28	59.1	0.0924	68	52	0.3%	0.2
MS-B29	198.9	0.3108	62	83	1.1%	2.1
MS-B30	48.3	0.0754	69	78	1.8%	0.9
MS-B31	192.0	0.2999	61	240	1.4%	2.6
MS-B32	87.7	0.1371	64	81	0.3%	0.2
MS-B33	93.6	0.1462	68	57	1.3%	1.2
MS-B34	44.5	0.0696	74	61	1.9%	0.9
MS-B35	75.6	0.1181	67	48	1.1%	0.9
MST1-B1	156.3	0.2442	70	58	0.6%	1.0
MST2-B1	132.8	0.2076	73	43	0.2%	0.3
MST2-B2	262.9	0.4108	70	44	0.0%	0.1
MST2-B3	213.1	0.3329	58	118	0.1%	0.2
MST3-B1	75.7	0.1183	58	124	0.0%	0.0
MST3-B2	178.2	0.2784	59	179	1.3%	2.2
MST4-B1	274.0	0.4281	64	70	0.5%	1.3
MST4-B2	116.9	0.1827	69	53	0.0%	0.0
MST5-B1	165.0	0.2578	64	51	0.0%	0.0
MST5-B2	225.4	0.3522	61	138	0.0%	0.1
HD-B1	264.3	0.4129	73	50	0.0%	0.1

Table 2.0: Summary of Existing Conditions Basin Data (continued):

Basin ID	Basin Area (acres)	Basin Area (sq. miles)	Basin CCN	tlag (mins)	Average % Imp. Area	Impervious Acres
HD-B2	261.3	0.4082	70	48	0.1%	0.1
HD-B3	101.0	0.1578	64	48	0.3%	0.3
HD-B4	117.9	0.1843	61	65	1.5%	1.7
HD-B5	100.7	0.1573	62	165	10.8%	10.9
HD-B6	165.1	0.2580	64	71	0.5%	0.9
WF-B1	115.1	0.1799	72	54	0.0%	0.0
WF-B2	77.6	0.1212	67	38	0.0%	0.0
WF-B3	18.6	0.0291	73	24	0.0%	0.0
WF-B4	61.7	0.0964	66	32	1.1%	0.7
WF-B5	101.8	0.1590	68	37	2.0%	2.0
WF-B6	188.8	0.2950	63	81	3.8%	7.2
WF-B7	59.9	0.0935	61	142	1.3%	0.8
WF-B8	116.5	0.1820	61	71	0.0%	0.0
WF-B9	209.2	0.3268	68	66	0.1%	0.2
WF-B10	74.0	0.1156	62	200	1.5%	1.1
WF-B11	365.2	0.5707	64	56	0.1%	0.3
WFT1-B1	196.5	0.3071	65	87	1.2%	2.4
WFT1-B2	167.1	0.2610	66	86	16.1%	26.9
EF-B1	68.8	0.1076	73	20	0.0%	0.0
EF-B2	79.9	0.1248	73	26	0.0%	0.0
EF-B3	210.5	0.3289	73	26	0.0%	0.0
EF-B4	351.9	0.5498	73	34	0.0%	0.2
EF-B5	85.1	0.1329	73	42	0.1%	0.1
EF-B6	25.5	0.0398	58	61	0.3%	0.1
EF-B7	70.9	0.1107	58	66	0.3%	0.2
EF-B8	115.7	0.1807	58	119	0.7%	0.8
EFT1-B1	64.2	0.1004	73	27	0.0%	0.0
EFT1-B2	80.7	0.1261	68	28	0.0%	0.0
EFT1-B3	253.0	0.3953	67	70	0.1%	0.2
EFT1-B4	30.0	0.0470	59	74	0.3%	0.1
SF-B1	127.7	0.1995	64	55	0.5%	0.7
SF-B2	223.9	0.3498	70	61	0.0%	0.0
SF-B3	76.9	0.1202	70	60	0.0%	0.0
SF-B4	181.4	0.2835	67	109	0.1%	0.2
SF-B5	241.1	0.3767	67	101	0.0%	0.1
SF-B6	89.8	0.1403	72	48	0.1%	0.1
SF-B7	140.7	0.2199	69	67	0.1%	0.2
SFT1-B1	233.4	0.3647	69	74	0.0%	0.0
SE-B1	297.5	0.4649	73	39	0.8%	2.5
SE-B2	325.5	0.5087	72	94	0.0%	0.1
SE-B3	47.4	0.0741	72	102	2.0%	0.9
SE-B4	152.3	0.2380	73	68	0.1%	0.2
SE-B5	317.7	0.4964	71	204	0.4%	1.2
SE-B6	167.3	0.2614	73	99	3.6%	6.0
SE-B7	252.2	0.3940	63	83	0.8%	2.0
Totals	14111	22.05	66		0.7%	100

Table 3.0: Summary of Future Conditions Basin Data

Basin ID	Basin Area (acres)	Basin Area (sq. miles)	Basin CCN	tlag (mins)	Average % Imp. Area	Impervious Acres
MS-B1	174.5	0.2727	75	16	6.7%	11.7
MS-B2	52.6	0.0821	78	25	19.4%	10.2
MS-B3	121.5	0.1898	76	27	15.3%	18.6
MS-B4	114.7	0.1792	74	37	15.1%	17.3
MS-B5	207.4	0.3240	72	19	24.1%	50.1
MS-B6	110.0	0.1720	61	82	5.7%	6.2
MS-B7	29.2	0.0456	60	38	5.3%	1.6
MS-B8	100.6	0.1571	58	129	0.6%	0.6
MS-B9	139.7	0.2183	58	179	0.2%	0.3
MS-B10	115.0	0.1797	58	157	0.5%	0.5
MS-B11	316.1	0.4939	72	27	16.1%	51.0
MS-B12	291.2	0.4550	68	52	21.8%	63.5
MS-B13	90.6	0.1415	71	27	28.5%	25.8
MS-B14	61.9	0.0967	80	14	49.9%	30.9
MS-B15	140.0	0.2187	74	60	12.6%	17.6
MS-B16	150.7	0.2354	60	63	0.9%	1.3
MS-B17	202.0	0.3156	63	56	10.6%	21.4
MS-B18	132.7	0.2073	70	24	21.4%	28.4
MS-B19	54.1	0.0845	75	22	25.4%	13.7
MS-B20	82.7	0.1292	64	61	1.4%	1.2
MS-B21	246.4	0.3850	63	164	0.8%	1.9
MS-B22	212.0	0.3312	62	81	0.7%	1.4
MS-B23	207.2	0.3237	58	167	0.0%	0.1
MS-B24	292.8	0.4576	58	72	0.1%	0.2
MS-B25	331.3	0.5176	65	73	0.1%	0.3
MS-B26	118.4	0.1850	61	79	0.1%	0.2
MS-B27	344.8	0.5388	65	128	0.0%	0.1
MS-B28	59.1	0.0924	68	52	0.3%	0.2
MS-B29	198.9	0.3108	63	78	1.7%	3.5
MS-B30	48.3	0.0754	69	78	1.8%	0.9
MS-B31	192.0	0.2999	61	240	1.4%	2.6
MS-B32	87.7	0.1371	64	81	0.3%	0.2
MS-B33	93.6	0.1462	68	57	1.3%	1.2
MS-B34	44.5	0.0696	74	61	1.9%	0.9
MS-B35	75.6	0.1181	67	48	1.1%	0.9
MST1-B1	156.3	0.2442	73	37	11.9%	18.6
MST2-B1	132.8	0.2076	76	22	11.7%	15.6
MST2-B2	261.3	0.4082	73	27	11.9%	31.0
MST2-B3	213.1	0.3329	58	97	1.0%	2.0
MST3-B1	80.0	0.1249	59	79	1.6%	1.3
MST3-B2	173.9	0.2718	59	179	1.3%	2.2
MST4-B1	274.0	0.4281	75	23	28.3%	77.5
MST4-B2	116.9	0.1827	73	29	13.2%	15.4
MST5-B1	165.0	0.2578	77	22	37.6%	62.1
MST5-B2	225.4	0.3522	69	60	17.5%	39.5
HD-B1	264.3	0.4129	75	23	29.6%	78.2

Table 3.0: Summary of Future Conditions Basin Data (continued):

Basin ID	Basin Area (acres)	Basin Area (sq. miles)	Basin CCN	tlag (mins)	Average % Imp. Area	Impervious Acres
HD-B2	261.3	0.4082	79	17	45.6%	119.1
HD-B3	101.0	0.1578	68	27	12.0%	12.1
HD-B4	117.9	0.1843	64	41	11.0%	12.9
HD-B5	100.7	0.1573	64	73	14.2%	14.3
HD-B6	165.1	0.2580	66	41	6.1%	10.1
WF-B1	115.1	0.1799	74	26	26.7%	30.7
WF-B2	77.6	0.1212	81	16	47.2%	36.6
WF-B3	14.4	0.0224	82	13	36.6%	5.3
WF-B4	61.7	0.0964	69	20	12.0%	7.4
WF-B5	101.8	0.1590	71	29	11.8%	12.0
WF-B6	188.8	0.2950	63	76	3.8%	7.2
WF-B7	59.9	0.0935	61	122	1.3%	0.8
WF-B8	116.5	0.1820	62	67	2.7%	3.1
WF-B9	209.2	0.3268	82	27	40.8%	85.3
WF-B10	74.0	0.1156	79	28	48.7%	36.0
WF-B11	365.2	0.5707	78	27	37.6%	137.4
WFT1-B1	200.8	0.3137	69	36	11.8%	23.7
WFT1-B2	167.1	0.2610	66	48	16.1%	26.9
EF-B1	70.5	0.1102	76	15	11.3%	8.0
EF-B2	79.9	0.1248	73	26	0.0%	0.0
EF-B3	210.5	0.3289	73	26	0.0%	0.0
EF-B4	351.9	0.5498	73	34	0.0%	0.2
EF-B5	85.1	0.1329	73	42	0.1%	0.1
EF-B6	25.5	0.0398	58	61	0.3%	0.1
EF-B7	70.9	0.1107	58	66	0.3%	0.2
EF-B8	115.7	0.1807	58	119	0.7%	0.8
EFT1-B1	62.6	0.0978	76	20	11.9%	7.5
EFT1-B2	80.7	0.1261	68	28	0.0%	0.0
EFT1-B3	253.0	0.3953	67	70	0.1%	0.2
EFT1-B4	30.0	0.0470	59	74	0.3%	0.1
SF-B1	127.7	0.1995	64	53	1.4%	1.8
SF-B2	223.9	0.3498	70	61	0.0%	0.0
SF-B3	76.9	0.1202	70	60	0.0%	0.0
SF-B4	181.4	0.2835	67	109	0.1%	0.2
SF-B5	241.1	0.3767	67	101	0.0%	0.1
SF-B6	89.8	0.1403	72	55	0.1%	0.1
SF-B7	140.7	0.2199	69	67	0.1%	0.2
SFT1-B1	233.4	0.3647	69	73	0.0%	0.0
SE-B1	297.5	0.4649	73	39	0.8%	2.5
SE-B2	325.5	0.5087	72	94	0.0%	0.1
SE-B3	47.4	0.0741	72	102	2.0%	0.9
SE-B4	152.3	0.2380	73	68	0.1%	0.2
SE-B5	317.7	0.4964	71	204	0.4%	1.2
SE-B6	167.3	0.2614	73	99	3.6%	6.0
SE-B7	252.2	0.3940	63	85	0.8%	2.0
Totals	14111	22.05	69		9.5%	1343

Table 4.0: Existing Conditions Channel Reach Data

Reach ID	Reach Length R (ft)	Reach Slope (%)	Mannings n value	Reach Side Slope (h/v)	Bottom Width B (ft)
MS-R1	2400	1.67%	0.05	7	20
MS-R2	1800	2.22%	0.05	5	15
MS-R3	1270	2.05%	0.07	10	50
MS-R4	2900	1.79%	0.07	10	25
MS-R5	6040	1.79%	0.05	8	20
MS-R6	1050	1.24%	0.07	15	20
MS-R7	6190	1.86%	0.05	6	25
MS-R8	1870	1.60%	0.07	15	20
MS-R9	450	2.67%	0.07	20	40
MS-R10	1580	1.71%	0.07	50	65
MS-R11	5400	1.48%	0.07	15	45
MS-R12	570	1.05%	0.05	4	30
MS-R13	3110	1.09%	0.05	6	40
MS-R14	7160	1.12%	0.05	7	25
MS-R15	3400	1.03%	0.05	6	45
MS-R16	2400	1.13%	0.05	6	30
MS-R17	630	0.79%	0.05	7	25
MS-R18	5140	0.88%	0.05	5	25
MS-R18A	3456	1.59%	0.07	60	80
MS-R19	1640	0.91%	0.05	8	30
MS-R20	2670	1.01%	0.07	15	50
MS-R21	5760	1.04%	0.05	8	40
MS-R22	3410	1.17%	0.07	10	25
MS-R23	3240	0.93%	0.05	8	15
MS-R24	1660	1.02%	0.07	40	30
MS-R25	3930	1.07%	0.07	10	15
MS-R26	760	0.66%	0.07	12	25
MS-R27	1570	1.59%	0.07	12	25
MS-R28	3730	0.88%	0.07	15	60
MS-R29	580	0.86%	0.07	25	40
MS-R30	2220	1.13%	0.07	100	80
MST2-R1	4010	2.00%	0.07	12	25
MST2-R2	6450	1.94%	0.07	10	25
MST3-R1	5970	1.76%	0.07	60	70
MST4-R1	3390	1.30%	0.07	25	45
MST5-R1	7230	1.08%	0.05	6	30
HD-R1	2900	2.07%	0.07	40	60
HD-R2	2650	2.08%	0.07	20	30
HD-R3	2460	1.22%	0.05	8	20
HD-R4	5920	1.52%	0.07	50	80
HD-R5	3730	1.61%	0.05	9	10
WF-R1	2210	1.72%	0.07	15	25
WF-R2	2200	2.27%	0.07	40	50
WF-R3	3200	1.69%	0.05	6	15
WF-R4	6270	1.82%	0.07	15	30
WF-R5	1130	1.24%	0.07	10	30
WF-R6	1060	1.42%	0.07	20	25

Table 4.0: Existing Conditions Channel Reach Data (continued):

Reach ID	Reach Length R (ft)	Reach Slope (%)	Mannings n value	Reach Side Slope (h/v)	Bottom Width B (ft)
WF-R7	3600	1.19%	0.07	15	35
WF-R8	5900	1.24%	0.05	8	25
WFT1-R1	6040	1.84%	0.07	15	45
EF-R1	2660	2.26%	0.05	8	20
EF-R2	2510	2.19%	0.05	7	30
EF-R3	4770	1.47%	0.05	7	20
EF-R4	1130	1.42%	0.05	7	30
EF-R5	2160	1.76%	0.05	4	10
EF-R6	1440	1.25%	0.05	7	15
EF-R7	5330	1.31%	0.05	6	15
EFT1-R1	3230	2.11%	0.07	15	30
EFT1-R2	6820	1.64%	0.07	25	35
EFT1-R3	2260	1.99%	0.07	10	25
SF-R1	6120	1.27%	0.07	70	50
SF-R2	3840	1.17%	0.07	30	35
SF-R3	2740	0.95%	0.05	7	60
SF-R4	1560	0.51%	0.07	10	40
SF-R5	2720	0.81%	0.07	12	30
SF-R6	4450	0.94%	0.07	20	30
SE-R1	5690	1.05%	0.07	60	60
SE-R2	3010	1.10%	0.07	50	120
SE-R3	6750	0.81%	0.07	75	100
SET1-R1	5580	0.99%	0.07	80	80
SET1-R2	3650	0.96%	0.07	100	30

Table 5.0: Future Conditions Channel Reach Data

Reach ID	Reach Length R (ft)	Reach Slope (%)	Mannings n value	Reach Side Slope (h/v)	Bottom Width B (ft)
MS-R1	2400	1.67%	0.05	8	20
MS-R2	1800	2.22%	0.05	8	20
MS-R3	1270	2.05%	0.05	8	20
MS-R4	2900	1.79%	0.05	4	15
MS-R5	6040	1.79%	0.05	8	20
MS-R6	1050	1.24%	0.05	8	20
MS-R7	6190	1.86%	0.05	6	25
MS-R8	1870	1.60%	0.07	15	20
MS-R9	450	2.67%	0.07	20	40
MS-R10	1580	1.71%	0.07	50	65
MS-R11	5400	1.48%	0.05	4	15
MS-R12	570	1.05%	0.05	4	15
MS-R13	3110	1.09%	0.05	4	15
MS-R14	7160	1.12%	0.05	8	20
MS-R15	3400	1.03%	0.05	8	20
MS-R16	2400	1.13%	0.05	4	15
MS-R17	630	0.79%	0.05	4	15
MS-R18	5140	0.88%	0.05	5	25
MS-R18A	3456	1.59%	0.07	80	60
MS-R19	1640	0.91%	0.05	8	30
MS-R20	2670	1.01%	0.07	15	50
MS-R21	5760	1.04%	0.05	8	40
MS-R22	3410	1.17%	0.07	10	25
MS-R23	3240	0.93%	0.05	8	15
MS-R24	1660	1.02%	0.07	40	30
MS-R25	3930	1.07%	0.07	10	15
MS-R26	760	0.66%	0.07	12	25
MS-R27	1570	1.59%	0.07	12	25
MS-R28	3730	0.88%	0.07	15	60
MS-R29	580	0.86%	0.07	25	40
MS-R30	2220	1.13%	0.05	8	20
MST2-R1	4010	2.00%	0.05	8	20
MST2-R2	6450	1.94%	0.05	8	20
MST3-R1	5970	1.76%	0.07	60	70
MST4-R1	3390	1.30%	0.05	8	20
MST5-R1	7230	1.08%	0.05	4	15
HD-R1	2900	2.07%	0.05	4	15
HD-R2	2650	2.08%	0.05	8	20
HD-R3	2460	1.22%	0.05	8	20
HD-R4	5920	1.52%	0.05	8	20
HD-R5	3730	1.61%	0.05	4	15
WF-R1	2210	1.72%	0.05	4	15
WF-R2	2200	2.27%	0.05	8	20
WF-R3	3200	1.69%	0.05	8	20
WF-R4	6270	1.82%	0.07	15	30
WF-R5	1130	1.24%	0.07	10	30
WF-R6	1060	1.42%	0.05	8	20

Table 5.0: Future Conditions Channel Reach Data (continued):

Reach ID	Reach Length R (ft)	Reach Slope (%)	Mannings n value	Reach Side Slope (h/v)	Bottom Width B (ft)
WF-R7	3600	1.19%	0.05	4	15
WF-R8	5900	1.24%	0.05	4	15
WFT1-R1	6040	1.84%	0.05	8	20
EF-R1	2660	2.26%	0.05	8	20
EF-R2	2510	2.19%	0.05	7	30
EF-R3	4770	1.47%	0.05	7	20
EF-R4	1130	1.42%	0.05	7	30
EF-R5	2160	1.76%	0.05	4	10
EF-R6	1440	1.25%	0.05	7	15
EF-R7	5330	1.31%	0.05	6	15
EFT1-R1	3230	2.11%	0.07	15	30
EFT1-R2	6820	1.64%	0.07	25	35
EFT1-R3	2260	1.99%	0.07	10	25
SF-R1	6120	1.27%	0.07	70	50
SF-R2	3840	1.17%	0.07	30	35
SF-R3	2740	0.95%	0.05	7	60
SF-R4	1560	0.51%	0.07	10	40
SF-R5	2720	0.81%	0.07	12	30
SF-R6	4450	0.94%	0.07	20	30
SE-R1	5690	1.05%	0.07	60	60
SE-R2	3010	1.10%	0.07	50	120
SE-R3	6750	0.81%	0.07	75	100
SET1-R1	5580	0.99%	0.07	80	80
SET1-R2	3650	0.96%	0.07	100	30

Table 6.2: Summary of Flows at Selected Design Points – 5-year Storm Event

Design Point ID	Design Point Location	Hydrologic Element	Accumulative Area (mi^2)	Existing Peak Flow (cfs)	Future Peak Flow (cfs)	% Difference Peak Flow	Existing Volume (ac-ft)	Future Volume (ac-ft)	% Difference Volume
1	Haegler Diversion at Eastonville Road	HD-J2	0.8	122	359	195%	26	38	43%
2	West Fork at Eastonville Road	WF-J1	0.3	39	130	235%	10	16	59%
3	Main Channel at Eastonville Road	MS-J4	1.3	214	389	82%	37	50	33%
4	Haegler Diversion at Highway 24	HD-J4	1.3	137	396	189%	31	45	43%
5	West Fork at Highway 24	WF-J3	0.4	52	186	258%	16	23	47%
6	Main Channel at Highway 24	MS-J6	2.5	262	591	126%	62	78	27%
7	East Fork at Highway 24	EF-J4	1.2	292	334	14%	44	45	2%
8	Main Channel at Elbert Road	MS-J7	3.0	262	590	126%	68	84	25%
9	East Fork at Elbert Road	EF-J6	2.1	307	344	12%	62	64	4%
10	West Fork at Judge Orr Road	WF-J6	1.5	241	634	163%	72	101	40%
11	Confluence of East Fork and Main Channel	MS-J9	5.7	456	934	105%	134	153	14%
12	Main Channel at Judge Orr Road	MS-J11	6.7	482	997	107%	150	187	25%
13	Confluence of West Fork and Main Channel	MS-J12	11.2	615	1780	189%	240	346	44%
14	Main Channel at Falcon Highway	MS-J16	13.4	662	1907	188%	271	412	52%
15	Main Channel at Peyton Highway	MS-J19	15.1	683	1906	179%	285	428	50%
16	Main Channel at Jones Road	MS-J20	15.6	688	1913	178%	291	440	51%
17	South Fork at Jones Road	SF-J4	1.3	117	117	0%	41	41	0%
18	Confluence of South Fork and Main Channel	MS-J22	17.9	764	1989	161%	341	494	45%
19	Southeast Fork at McDaniels Road	SE-J3	2.4	157	153	-2%	69	69	0%
20	Main Channel at McDaniels Road	MS-J29	19.6	790	1985	151%	355	521	47%
21	Total Combined Outfall	SE-J3 plus MS-J29	22.0	909	2071	128%	424	590	39%

The 5-year storm event future undetained peak flow is estimated to increase by 128% over the existing peak flow while the future volume of runoff is estimated to increase by 39%.

Table 6.4: Summary of Flows at Selected Design Points – 100-year Storm Event

Design Point ID	Design Point Location	Hydrologic Element	Accumulative Area (mi^2)	Existing Peak Flow (cfs)	Future Peak Flow (cfs)	% Difference Peak Flow	Existing Volume (ac-ft)	Future Volume (ac-ft)	% Difference Volume
1	Haegler Diversion at Eastonville Road	HD-J2	0.8	431	1060	146%	77	96	25%
2	West Fork at Eastonville Road	WF-J1	0.3	146	389	166%	29	39	33%
3	Main Channel at Eastonville Road	MS-J4	1.3	730	1233	69%	112	135	20%
4	Haegler Diversion at Highway 24	HD-J4	1.3	521	1223	135%	97	121	24%
5	West Fork at Highway 24	WF-J3	0.4	224	605	170%	49	62	26%
6	Main Channel at Highway 24	MS-J6	2.5	997	1896	90%	194	225	16%
7	East Fork at Highway 24	EF-J4	1.2	1054	1113	6%	124	126	1%
8	Main Channel at Elbert Road	MS-J7	3.0	1010	1896	88%	220	253	15%
9	East Fork at Elbert Road	EF-J6	2.1	1120	1172	5%	183	187	2%
10	West Fork at Judge Orr Road	WF-J6	1.5	1017	2213	117%	244	291	19%
11	Confluence of East Fork and Main Channel	MS-J9	5.7	1817	3068	69%	429	467	9%
12	Main Channel at Judge Orr Road	MS-J11	6.7	1968	3383	72%	487	564	16%
13	Confluence of West Fork and Main Channel	MS-J12	11.2	2732	6104	123%	805	993	23%
14	Main Channel at Falcon Highway	MS-J16	13.4	3045	6784	123%	936	1191	27%
15	Main Channel at Peyton Highway	MS-J19	15.1	3200	6946	117%	1012	1269	25%
16	Main Channel at Jones Road	MS-J20	15.6	3250	7056	117%	1040	1308	26%
17	South Fork at Jones Road	SF-J4	1.3	454	454	0%	133	133	0%
18	Confluence of South Fork and Main Channel	MS-J22	17.9	3650	7392	103%	1210	1489	23%
19	Southeast Fork at McDaniels Road	SE-J3	2.4	547	546	0%	210	210	0%
20	Main Channel at McDaniels Road	MS-J29	19.6	3791	7525	99%	1293	1597	23%
21	Total Combined Outfall	SE-J3 plus MS-J29	22.0	4326	7687	78%	1503	1807	20%

The 100-year storm event future undetained peak flow is estimated to increase by 78% over the existing peak flow while the future volume of runoff is estimated to increase by 20%.

During the hydrologic analysis it was observed that the Black Squirrel Creek lies very close to the eastern boundary of the Gieck Ranch Basin from Falcon Highway downstream to Log Road. It is possible that flow from Black Squirrel Creek could spill into the Gieck Ranch Basin during extreme storm events. The flows in Black Squirrel Creek in this area are expected to be more than 5,000 cfs for the 100-year event. If the Black Squirrel Creek were to overflow its' banks and flow into the Gieck Ranch Basin it could increase the flows shown in the above tables. Possible improvements to address this potential problem include channel improvements to increase the Black Squirrel Creek conveyance in this area or constructing berms on the east bank to prevent overflow.

IV. Hydraulic Analysis

A. Introduction

This section summarizes the hydraulic analysis of the Gieck Ranch Drainage Basin. Included in this section are an inventory of existing drainageway structures and a summary of structure deficiencies, a description of the USACE HEC-RAS model, the 100-year existing conditions floodplain delineation with comparison to regulatory floodplains and a discussion of the 100-year future conditions floodplain. The floodplain information contained in this report is intended for the identification and mitigation of flood prone areas within the studied reach. It should only be used as a planning tool, and is not intended to replace the information presented in the El Paso County Flood Insurance Studies.

B. Hydraulic Structure Inventory and Evaluation

All of the existing drainage structures within the basin were identified and evaluated based on size, type, and general condition. The locations of the existing structures are identified in Figures 6.1, 6.2 and 6.3 which are located in Volume 2 of this report. The hydraulic capacity of existing culverts and bridges was estimated using either the CulvertMaster computer program by Haested Methods or the USACE HEC-RAS model. The hydraulic capacity of road crossings was based on the allowable cross flow defined in Table 6.1 of the Colorado Springs/El Paso County DCM for the functional classifications of the existing roadways identified in the El Paso County DOT 2030 Major Transportation Corridors Plan. A summary of the inventory and hydraulic capacity analysis is presented in Table 8.0 and the detailed analysis is provided in Section 12 of the Technical Addenda. During evaluation of the structures it was determined that El Paso County is not responsible for the maintenance and/or replacement for some structures, such as bridges and culverts under Highway 24. While these structures are included in the inventory tables, they were not evaluated for hydraulic capacity as indicated in Table 8.0.

In general, culverts inventoried for this study were found to have little capacity during the 100-year storm event before flood flows would overtop the road. Many were partially clogged with debris and/or sediment. A few were completely buried, possibly from roadside maintenance grading, and were not found. In general, most of the existing bridge crossings were found to have adequate capacity during the 100-year storm event.

The diversion channel that conveys water from the Haegler Diversion drainageway to the West Fork drainageway north of Judge Orr Road was also evaluated for capacity. It was found to be inadequate to convey the existing 100-year flow.

C. Irrigation Structures

There are no irrigation canals located within the basin. The basin does have a number of stock watering ponds that have been constructed over time by local ranchers. These structures are meant to detain water during the spring runoff and during infrequent thunderstorms that occur over the basin. It is assumed that the structures will be removed as the basin develops or will be overwhelmed during a major storm event. Therefore, they were not evaluated as effective storage areas in the hydraulic analysis.

D. Hydraulic Model

Water surface elevations for the Gieck Ranch Drainage Basin were modeled using the U.S. Army Corps of Engineers direct-step-backwater computer model HEC-RAS version 4.0, dated May 2005. Water surface elevations were determined for the major stream reaches of the Gieck Ranch Drainage Basin identified in Figure 8.1 located in Volume 2 of this report. These stream reaches were first defined based on the ARC Hydro 1.1 GIS extension applied to the surface grid generated from the LIDAR terrain points within the ARCVIEW GIS 9.1 environment. Adjustments were made to stream reaches based on structure locations, El Paso County DOT review comments, and field investigations. The final stream delineations used in the HEC-RAS model closely match the reach delineations used in the HEC-HMS hydrologic model and follow the same naming convention with the one exception that some of the major drainageways have been further sub-divided within the HEC-RAS model as upper/middle/lower or North 1 (N1), North 2 (N2), South 1 (S1), South 2 (S2), etc., as shown on Figure 8.1.

Table 8.0: Structure Inventory and Evaluation Summary

Structure ID	Location	Type	Existing Condition	Percent of 100-year Flow Passing*	Adequate** Y/N?	Proposed Structure
1	Eastonville Road southeast of structure 2	18" CMP	Good	13%	N	2 - 6' x 3' CBC
2	Eastonville Road at Haegler Diversion	18" CMP	Good	3%	N	1 - 12' x 5' CBC
3	Eastonville Road northeast of structure 2	18" CMP	Good	67%	N	2 - 24" RCP
4	Eastonville Road at West Fork	36" CMP	Good	24%	N	48" x 76" ERCP
5	Eastonville Road northeast of structure 4	30" CMP	Fair	81%	N	2 - 30" CMP
6	Eastonville Road northeast of structure 5	18" CMP	Poor	100%	Y	---
7	Eastonville Road northeast of structure 6	18" CMP	Good	100%	Y	---
8	Eastonville Road northeast of structure 7	18" CMP	Good	93%	N	19" x 30" ERCP
9	Eastonville Road at Main Channel	24" CMP	Fair	2%	N	2 - 10' x 5' CBC
10	Eastonville Road at Main Channel - East Tributary	19" x 28" CMP	Good	4%	N	1 - 12' x 5' CBC
11	Eastonville Road northeast of structure 10	18" CMP	Good	100%	Y	---
12	Eastonville Road northeast of structure 11	24" x 35" CMP	Good	89%	Y	---
13	Eastonville Road at headwaters of East Fork	30" CMP	Good	24%	N	43" x 68" ERCP
14	Upstream of Hwy 24 at Haegler Diversion	2 - 36" CMP	Good	22%	N	2 - 8' x 4' CBC
15	Hwy 24 at Haegler Diversion	4' x 4' CBC	Good	34%	N.E.	---
16	Upstream of Hwy 24 northeast of structure 14	18" CI	Good	100%	N	24" CMP
17	Hwy 24 northeast of structure 15	24" RCP	Good	100%	N.E.	---
18	Upstream of Hwy 24 at West Fork	Bridge	Good	100%	Y	---
19	Hwy 24 at West Fork	Bridge	Good	100%	N.E.	---
20	Upstream of Hwy 24 northeast of structure 18	36" CMP	Good	72%	Y	---
21	Hwy 24 northeast of structure 19	24" CMP	Poor	34%	N.E.	---
22	Upstream of Hwy 24 at Main Channel	Bridge	Good	100%	Y	---
23	Hwy 24 at Main Channel	Bridge	Good	100%	N.E.	---
24	Upstream of Hwy 24 northeast of structure 22	24" CMP	Unknown	100%	Y	---
25	Hwy 24 northeast of structure 23	24" CMP	Unknown	100%	N.E.	---
26	Upstream of Hwy 24 northeast of structure 24	24" CMP	Unknown	100%	Y	---
27	Hwy 24 northeast of structure 25	24" CMP	Fair	100%	N.E.	---
28	Hwy 24 northeast of structure 27	24" CMP	Poor	99%	N.E.	---
29	Upstream of Hwy 24 at East Fork - West Tributary	24" CMP	Fair	6%	N	1 - 12' x 4' CBC
30	Hwy 24 at East Fork - West Tributary	24" CMP	Good	9%	N.E.	---
31	Upstream of Hwy 24 at East Fork - East Tributary	Bridge	Good	100%	Y	---
32	Hwy 24 at East Fork - East Tributary	Bridge	Good	100%	N.E.	---
33	Curtis Road south of Hwy 24	15" CMP	Good	6%	N	36" CMP
34	Elbert Road at East Fork	Bridge	Good	39%	N	50' Span

Table 8.0: Structure Inventory and Evaluation Summary (Cont.)

35	Elbert Road south of structure 34	24" CMP	Good	100%	Y	---
36	Elbert Road at Main Channel	2 - 48" CMP	Good	19%	N	3 - 12' x 4' CBC
37	Elbert Road south of structure 36	24" CMP	Poor	55%	Y	---
38	Judge Orr Road at West Fork	67" x 95" CMP	Good	20%	N	4 - 12' x 5' CBC
39	Judge Orr Road east of structure 38	36" CMP	Good	100%	Y	---
40	Judge Orr Road west of structure 41	24" CMP	Poor	90%	Y	---
41	Judge Orr Road at Main Channel	Bridge	Good	100%	Y	---
42	Falcon Hwy at Main Channel	Bridge	Good	57%	N	85' Span
43	Peyton Road at headwaters of South Fork	24" CMP	Fair	75%	Y	---
44	Peyton Road at Main Channel	4 - 24" RCP	Good	2%	N	5 - 12' x 7' CBC
45	Peyton Road south of structure 44	36" CMP	Poor	100%	Y	---
46	Peyton Road south of structure 45	24" CMP	Good	100%	Y	---
47	East Garrett Road west of structure 48	24" CMP	Poor	100%	Y	---
48	East Garrett Road at South Fork	48" CMP	Good	14%	N	2 - 5' x 4' CBC
49	J.D. Johnson Road at South Fork	4 - 42" RCP	Good	63%	N	2 - 12' x 4' CBC
50	J.D. Johnson Road south of structure 49	30" CMP	Fair	56%	N	36" CMP
51	J.D. Johnson Road south of structure 50	30" CMP	Fair	100%	Y	---
52	Jones Road at Main Channel	60" CMP	Fair	4%	N	6 - 12' x 7' CBC
53	J.D. Johnson Road at Jones Road	30" CMP	Fair	55%	Y	---
54	Jones Road east of J.D. Johnson Road	30" CMP	Good	73%	Y	---
55	Jones Road at South Fork	36" CMP	Good	6%	N	2 - 7' x 5' CBC
56	Jones Road east of structure 55	30" CMP	Fair	67%	Y	---
57	J.D. Johnson Road at Main Channel US of structure 58	3 - 60" RCP	Good	14%	N	85' Span
58	J.D. Johnson Road at Main Channel	30" CMP	Good	1%	N	120' Span
59	J.D. Johnson Road and Log Road	24" CMP	Fair	23%	N	2 - 6' x 3' CBC
60	Main Channel at private driveway	48" CMP (est.)	Unknown	2%	N.E.	---
61	Log Road at Main Channel	Bridge	Good	36%	N	120' Span
62	McDaniel Road at Main Channel	30" x 48" Oval CMP	Good	1%	N	120' Span
63	Log Road and McDaniels Road	24" CMP	Good	2%	N	5 - 6' x 3' CBC

* Road over-topping not included

** Allowable road over-topping included in adequacy analysis

*** Based on proposed (with selected drainage basin plan) flows

N.E. Not Evaluated, not EPCDOT responsibility

minimize impacts to wetlands and waters from the project to the maximum extent practicable. Individual permit applications are advertised for public comment and are reviewed by federal, state and local agencies. The processing of individual permits requires a minimum of 60-90 days, and wetland mitigation is required for impacts to jurisdictional wetlands and waters at a 1:1 mitigation replacement ratio.

Wetlands, streams and riparian areas along the Gieck Ranch Basin should be preserved and protected to the maximum extent practicable. Impacts to wetlands and waters should be avoided and minimized by the project design. All impacts to wetlands and waters will need to be mitigated following a mitigation plan approved by the U.S. Army Corps of Engineers.

G. Mitigation Guidelines and Recommendations

The U.S. Army Corps of Engineers would like to see project design plans for the Gieck Ranch Basin that minimize hard-lining the channel, with an emphasis on vegetative restoration measures. The existing floodway channel should be maintained to allow for overbank flooding that promotes the use of the floodway and adjacent floodplain during storm events. Water storage facilities should avoid impacts to wetlands and the Gieck Ranch riparian corridor. A wetlands and riparian buffer zone should be established and preserved along the Gieck Ranch drainageways to protect aquatic resources.

Mitigation opportunities include wetlands restoration and creation along the wetter sections of Gieck Ranch tributaries, and restoration of riparian habitats. Wetlands creation and restoration work generally involves site grading, planting wetland plant species, and seeding with native wetlands seed. Mitigation bank credits could potentially be purchased to offset wetlands impacts that result from the drainage basin project in order to meet wetlands mitigation requirements, if mitigation bank credits are available. Section 404 permit authorization must be obtained from the U.S. Army Corps of Engineers prior to initiating work in jurisdictional wetlands. It is recommended that the Corps be contacted in advance of all proposed work activities that could impact wetlands or waters to insure compliance with current Section 404 wetlands regulations. Best Management Practices (BMP's) for erosion and sediment control should be followed during all project activities.

VI. Evaluation of Alternatives

A. Introduction

This section describes the process for the development of alternative plans for drainageway improvements within the Gieck Ranch Drainage Basin. If not mitigated, future development would cause 100-year return period peak runoff rates within the basin to increase from 4,326 cfs to 7,687 cfs, an increase of 78%. Total runoff volume from the basin would increase by 20% for the 100-year event. This would increase flood flows and thereby increase the size and elevation of the 100-year floodplain, increasing the number of buildings that could be potentially flooded. Many of the existing drainage structures would have insufficient capacity to pass the increased flood flows and could potentially be damaged as well. In addition, smaller rainfall events would produce more runoff volume due to the increase in impervious surface areas. The estimated increase in runoff volume from 2-year event is 56%. As a result, channel erosion could be expected. Feasible alternatives were identified to address these long-term affects of urbanization on the basin.

The development of alternatives was accomplished in a two-step process. In the first step, several possible alternatives were evaluated for feasibility using parameters compared on qualitative and relative quantitative bases. Based on the results of the first step, feasible alternatives were selected by the Sponsors for further evaluation and screening in the second step.

B. Planning Goals and Evaluation Parameters

During the planning study process several planning goals were developed as a basis for alternative evaluation. These were refined into 5 general planning goals that are identified as the following:

- Identify existing facilities that are impacted by the 100-year storm event and improvements that will be required to control flooding as a result of new development.
- Provide stormwater management within developing areas of the basin that reduce the affects of runoff and sedimentation and maintain channel stability in order to minimize improvements required on reaches downstream of developments.

the number of storms that create runoff, and increases the overall volume of runoff discharged from a site. In a newly developed area, this increased volume of runoff leads to elevated soil moisture in the drainageways. Native vegetation that is adapted to periodically moist soils begins to "drown" and die off in the wet channel conditions. Erosion of the channel begins as the roots that used to hold soils in place disappear. In-stream measures are needed to keep the receiving waterways form undergoing undesirable geomorphic changes. Measures to be considered for use in combination with any of the detention methods described above include vegetation augmentation and selective channel stabilization using structural methods and/or bio-engineered channels.

With vegetation augmentation, better adapted native hydric species are used to augment the existing vegetation early in the process when stormwater runoff is first introduced. This allows the dry channel to transform to a wet channel while not permitting the loss of soils.

Selective channel stabilization includes a number of structural methods to reduce erosion of channel banks where needed at selected sites. Stabilization usually involves armoring of the channel banks with riprap or a combination of riprap with other bioengineered stabilization measures. Bioengineered channels emphasize the use of vegetative components in combination with structural measures to stabilize and protect stream banks from erosion. Selective channel stabilization is particularly effective in areas where channel erosion is already occurring and protection of property and improvements is required. Grade control structures to prevent head-cutting of the channel invert may be required with this approach.

5. Channelization

Channelization involves the use of constructed, lined channels to control flood flows around or through urbanized areas. They are generally lined with riprap and are the most expensive of the alternatives considered. This alternative has a high potential for impacts to environmental resources also. Grade control structures would also be required with this approach, adding to the infrastructure costs.

D. Evaluation Matrix

An evaluation matrix was developed to assist in the initial development of the possible alternatives. The matrix is presented in Table 9.0 where alternatives are ranked relative to each other for each of the evaluation parameters.

Table 9.0: Alternatives Evaluation Matrix

	Alternative						
Parameter	Do - nothing	Prudent Line	On-Site Detention	Regional Detention	Small Regional Full Spectrum Detention	Channel Stabilization	Channel -ization
Infrastructure costs	Good	Good	Fair	Poor	Fair	Fair	Poor
Maintenance	Poor	Good	Fair	Fair	Fair	Good	Fair
Flood damage reduction	Poor	Fair	Good*	Good	Good*	Poor	Poor
Channel stability	Poor	Poor	Fair	Fair	Fair	Good	Good
Environmental impacts	Good	Fair	Fair	Fair	Fair	Fair	Poor
Impacts on roads	Poor	Poor	Good	Good	Good	Good	Good
R-O-W/property	Good	Poor	Good	Fair	Fair	Good	Good
Trails and open space	Fair	Good	Poor	Good	Good	Poor	Poor
Stormwater quality	Poor	Poor	Good	Fair	Good	Fair	Fair

*Good rating applies only if properly maintained. Studies have shown that this is not typical when the facilities are privately owned.

E. Feasible Alternatives - Conclusions and Recommendations

Based on the hydrologic and hydraulic analyses and the initial evaluation of alternatives, the following conclusions are made and strategies are recommended for further evaluation in Step 2 of the process:

1. Different areas of the basin will be subjected to differing levels of development. The majority of the high density development is expected to occur in the northwest and central sections, whereas the northeast and southern sections are expected to remain less developed. Different alternative approaches should be used for the different areas.

2. The do-nothing approach is not suitable for use in developed areas. It can be applied to specific reaches that are stable and do not expect to see any significant impacts from development, such as

VII. Drainage Basin Plan Development

A. Selected Plan

The selected plan consists of integrating the selected alternative outlined in the previous section. This includes the construction of the small regional full spectrum detention basins and the recommended channel improvements shown on the plan and profile sheets located in the Appendices. The future conditions hydrologic and hydraulic models were updated to determine the affect of the full spectrum regional ponds on peak flows, volumes and channel velocities. Revised hydrologic and hydraulic modeling results are provided in Sections 17 and 18 of the Technical Addenda. Table 11 presents a summary of discharge rates for the selected plan incorporating the full spectrum regional detention facilities.

Table 11: Summary of Flows at Selected Design Points – Selected Plan Developed Conditions

Design Point ID	Design Point Location	Hydrologic Element	Q2 (cfs)	Q5 (cfs)	Q10 (cfs)	Q100 (cfs)
1	Haegler Diversion at Eastonville Road	POND HD-S1	5	25	32	338
2	West Fork at Eastonville Road	WF-J2	2	17	45	114
3	Main Channel at Eastonville Road	POND MS-S1	28	119	253	573
4	Main Channel Tributary 2 at Eastonville Road	POND MST2-S1	21	65	126	271
5	East Fork Tributary at Eastonville Road	EFT1-B1	25	46	73	134
6	East Fork at Eastonville Road	EF-B1	33	59	92	168
7	Haegler Diversion at Highway 24	HD-J4	7	33	138	429
8	West Fork at Highway 24	WF-J3	6	38	97	242
9	West Fork Tributary at Highway 24	POND WFT1-S1	1	8	24	66
10	Main Channel at Highway 24	MS-J6	49	190	391	877
11	Main Channel Tributary 3 at Highway 24	MST3-B1	1	3	7	19
12	East Fork Tributary at Highway 24	EFT1-J2	43	95	164	337
13	East Fork at Highway 24	EF-J4	160	334	564	1102
14	Main Channel at Elbert Road (Further South of)	MS-B10	1	2	6	16
15	Main Channel at Elbert Road (South of)	MS-J8	1	3	6	18
16	Main Channel at Elbert Road	MS-J7	50	193	399	896
17	East Fork at Elbert Road	EF-J6	162	344	588	1169
18	Confluence of East Fork and Main Channel	MS-J9	160	390	775	1774
19	West Fork at Judge Orr Road	POND WF-SR1	18	86	273	753
20	Main Channel at Judge Orr Road (West of)	POND WF-S3	1	2	4	11
21	Main Channel at Judge Orr Road	MS-J11	154	407	828	1920
22	Confluence of West Fork and Main Channel	MS-J12	160	500	1085	2679
23	Main Channel at Falcon Highway	MS-J16	141	494	1103	2842
24	Main Channel at Falcon Highway (East of)	MS-B20	2	7	15	38
25	South Fork at Falcon Highway	SF-B1	4	13	27	65
26	Main Channel at Peyton Highway	MS-J19	150	520	1163	3003
27	South Fork at Peyton Highway	SF-J1	18	40	70	148
28	South Fork at J.D. Johnson Road	SF-J4	51	117	212	455
29	Main Channel at Jones Road	MS-J20	154	528	1179	3054
30	South Fork at Jones Road	SF-J5	54	124	226	484
31	South Fork Tributary at Jones Road	SET1-B1	24	47	78	152
32	Main Channel at J.D. Johnson Road (North)	MS-J21	154	529	1184	3068
33	Confluence of South Fork and Main Channel	MS-J22	188	602	1341	3449
34	Main Channel at J.D. Johnson Road (South)	MS-J23	193	612	1367	3520
35	South Fork Tributary at J.D. Johnson Road	SET1-J1	38	77	131	272
36	Main Channel at Log Road (North)	MS-J25	195	616	1375	3546
37	Main Channel at Log Road (South)	MS-J26	196	618	1378	3557
38	Southeast Fork at Log Road	SE-J2	70	145	247	498
39	Main Channel at McDaniels Road	MS-J29	199	626	1395	3594
40	Southeast Fork at McDaniels Road	SE-J3	73	153	263	537
41	Total Combined Outfall	MS-J29 and SE-J3	272	779	1657	4131

Comparison to the existing conditions flows presented in Tables 6.1 through 6.4 shows that implementation of the selected plan will result in developed peak discharge rates that are slightly lower than existing discharge rates. This should reduce potential for flood damage within the basin.

B. Small Regional Detention Basins

The recommended plan includes the construction of 17 small regional detention storage basins, 15 of which would incorporate full spectrum detention. Ponds WF-SR1 and MS-SR1 exceed the contributing area size limitation for full spectrum detention. For these two ponds, the water quality

control volume should be provided. Pond WFT1-S1 will only provide detention for the property located in Basin WFT1-B1 and the pond should be constructed when this property is developed. The locations of the basins shown on the plan sheets are conceptual. The final location and sizes of the basins are to be determined during final design of proposed development projects. It is possible that the location and basin size may vary from the conceptual design as long as sufficient detention storage is provided to meet required discharge rates and the excess urban runoff volumes are provided as outlined in the Urban Drainage and Flood Control District Criteria for full spectrum detention. Table 12 lists the detention basin data for the selected plan. Some areas of the drainage basin may encounter seasonal high ground water tables. Final sizing of the detention basins should be done in such a way as to minimize the need for underdrains.

C. Channel Improvements

Recommended channel improvements consist of vegetation augmentation, selective channel stabilization such as selectively armoring existing channel banks with riprap at outside channel bends and at bridge and culvert outlets, bio-engineered stabilization treatment, and low flow linings, some channelization, and construction of grade control structures. The recommended channel improvements have been selected to minimize environmental impacts and retain natural channel characteristics as much as possible since the basin is mostly undeveloped and the majority of the existing drainageways have not been disturbed at this time. There are large areas of the basin that are to remain as vacant or agricultural land based on the El Paso County 2030 Land Use Codes. Specific channel improvements to the drainageways in these areas were not recommended. It is assumed that these channels will remain in private ownership which lowers the feasibility of channel improvements that require permanent right-of-way or easements for construction and maintenance. The recommended approach for these areas is to provide as-needed improvements.

Table 12: Detention Basin Data

Basin ID	Excess Urban Runoff Volume (ac-ft)	Detention Storage Volume (ac-ft)	Discharge Rate (cfs)
HD-S1	21.4	41.0	345
HD-S2	2.4	7.0	92
WF-S1	7.3	17.0	115
WF-S2	2.7	13.8	134
WF-S3	4.3	9.0	11
WF-S4	29.7	52.0	359
WFT1-S1	2.2	9.0	70
WF-SR1	WQCV*	30.0	802
MS-S1	12.2	42.0	583
MS-S2	0.6	5.2	58
MS-S3	4.8	19.0	147
MS-S4	11.8	30.0	29
MS-S5	2.9	6.1	26
MS-SR1	WQCV*	50.0	2,900
MST2-S1	3.9	21.5	275
MST4-S1	6.4	20.0	137
MST5-S1	11.6	30.0	90

* Use Water Quality Control Volume

Table 13 lists the recommended approach to channel improvements on a reach by reach basis. As land development projects proceed within the drainage basin the location and specific type of selective channel improvements will need to be identified during the project design phase based on site specific conditions. There may be some overlapping of approaches between reaches. For example, some selective stabilization may be needed in reaches designated for vegetation augmentation and vice-versa. The methods outlined in the City/County Drainage Criteria Manual and the El Paso County Engineering Manual should be applied during final design analysis. Some specific channel improvements have been identified for several areas such as the Haegler Diversion channel upsizing and realignment at Judge Orr Road. These improvements are called out on the selected plan drawings.

Table 13: Channel Improvements By Reach

Drainageway	Reach ID	Reach Length (ft)	Channel Approach
Haegler Diversion	HD-R1a	3875	Selective Stabilization
Haegler Diversion	HD-R1b	5737	Channelization
Haegler Diversion	HD-R2	2826	Vegetation Augmentation
Haegler Diversion	HD-R3	2207	Selective Stabilization
Haegler Diversion	HD-R4	5161	Vegetation Augmentation
Haegler Diversion	HD-R5	3784	Selective Stabilization
West Fork	WF-R1	1775	Channelization
West Fork	WF-R2	2281	Vegetation Augmentation
West Fork	WF-R3	3029	Selective Stabilization
West Fork	WF-R4a	1717	Vegetation Augmentation
West Fork	WF-R4b	2001	Vegetation Augmentation
West Fork	WF-R4c	1601	Selective Stabilization
West Fork	WF-R4d	1198	Selective Stabilization
West Fork	WF-R5	1200	Selective Stabilization
West Fork	WF-R6	863	Selective Stabilization
West Fork	WF-R7a	2341	Vegetation Augmentation
West Fork	WF-R7b	1594	Vegetation Augmentation
West Fork	WF-R8a	4002	Selective Stabilization
West Fork	WF-R8b	1600	Selective Stabilization
West Fork - Trib. WF1	WFT1-RI	5601	Vegetation Augmentation
Gieck Main	MS-R1	2400	Vegetation Augmentation
Gieck Main	MS-R2	2000	Selective Stabilization
Gieck Main	MS-R3	1200	Selective Stabilization
Gieck Main	MS-R4a	1278	Channelization
Gieck Main	MS-R4b	1341	Channelization
Gieck Main	MS-R5	6181	Vegetation Augmentation
Gieck Main	MS-R6	804	Selective Stabilization
Gieck Main	MS-R7a	1554	Vegetation Augmentation
Gieck Main	MS-R7b	3191	Vegetation Augmentation
Gieck Main	MS-R7c	1354	Vegetation Augmentation
Gieck Main	MS-R8a	314	Vegetation Augmentation
Gieck Main	MS-R8b	783	Selective Stabilization
Gieck Main	MS-R8c	568	Selective Stabilization
Gieck Main	MS-R11a	3376	Selective Stabilization
Gieck Main	MS-R11b	2405	Selective Stabilization
Gieck Main	MS-R12	620	Selective Stabilization
Gieck Main	MS-R13	3158	Vegetation Augmentation
Gieck Main	MS-R14	7422	Selective Stabilization
Gieck Main	MS-R15	3306	Selective Stabilization
Gieck Main	MS-R16	2294	As-needed Improvements
Gieck Main	MS-R17	542	As-needed Improvements
Gieck Main	MS-R18	5457	As-needed Improvements
Gieck Main	MS-R19	1604	As-needed Improvements
Gieck Main	MS-R20a	1197	As-needed Improvements

Table 13: Channel Improvements By Reach, cont.

Drainageway	Reach ID	Reach Length (ft)	Channel Approach
Gieck Main	MS-R20b	1227	As-needed Improvements
Gieck Main	MS-R21a	1990	As-needed Improvements
Gieck Main	MS-R21b	1584	As-needed Improvements
Gieck Main	MS-R21c	2242	As-needed Improvements
Gieck Main	MS-R22	3360	As-needed Improvements
Gieck Main	MS-R23	3268	As-needed Improvements
Gieck Main	MS-R24	1927	As-needed Improvements
Gieck Main	MS-R25a	1603	As-needed Improvements
Gieck Main	MS-R25b	1615	As-needed Improvements
Gieck Main	MS-R25c	384	As-needed Improvements
Gieck Main	MS-R26	803	As-needed Improvements
Gieck Main	MS-R27	1597	As-needed Improvements
Gieck Main	MS-R28	3599	As-needed Improvements
Gieck Main	MS-R29	797	As-needed Improvements
Gieck Main	MS-R30	2004	As-needed Improvements
Gieck Main - Sub Trib M1	MST1-R1	4799	Selective Stabilization
Gieck Main - Sub Trib M2	MST2-R1	3896	Selective Stabilization
Gieck Main - Sub Trib M2	MST2-R2	6504	Vegetation Augmentation
Gieck Main - Sub Trib M3	MST3-R1	5599	As-needed Improvements
Gieck Main - Sub Trib M4	MST4-R1	6000	Selective Stabilization
Gieck Main - Trib. M5	MST5-R1	7200	Selective Stabilization
East Fork	EF-R1	2659	As-needed Improvements
East Fork	EF-R2	2400	As-needed Improvements
East Fork	EF-R3	4800	As-needed Improvements
East Fork	EF-R4	1122	As-needed Improvements
East Fork	EF-R5	2161	As-needed Improvements
East Fork	EF-R6	1410	As-needed Improvements
East Fork	EF-R7	4876	As-needed Improvements
East Fork - Trib. EF1	EFT1-R1	3200	As-needed Improvements
East Fork - Trib. EF1	EFT1-R2a	2400	As-needed Improvements
East Fork - Trib. EF1	EFT1-R2b	4041	As-needed Improvements
East Fork - Trib. EF1	EFT1-R3	2394	As-needed Improvements
South Fork	SF-R1	2017	As-needed Improvements
South Fork	SF-R2	4120	As-needed Improvements
South Fork	SF-R3	3063	As-needed Improvements
South Fork	SF-R4	1167	As-needed Improvements
South Fork	SF-R5	2434	As-needed Improvements
South Fork	SF-R6	4799	As-needed Improvements
South Fork - Trib. SF1	SFT1-R1	2400	As-needed Improvements
Southeast Fork	SE-R1	5596	As-needed Improvements
Southeast Fork	SE-R2	2786	As-needed Improvements
Southeast Fork	SE-R3a	3209	As-needed Improvements
Southeast Fork	SE-R3b	2940	As-needed Improvements
Southeast Fork - Trib. SEF1	SET1-R1	3301	As-needed Improvements

The criterion used for sizing proposed channel sections and determining channel armoring has been average channel velocity. A maximum permissible velocity of 5 feet per second was used in areas to be developed. This corresponds to EPC DCM Table 10-4 values for earth lined channels with 0% to 5% slopes for prairie type grasses. In order to minimize the need for hard-lining of channels, check or drop structures have been recommended to reduce the channel slope and to prevent head-cutting of the channel. For this report, drop structures have been designed for a maximum drop of 5 feet and check structures have been designed for a maximum of 2.5 feet. The grade control structures should extend to the channel banks to prevent head cutting at the ends of the structure. Extensive use of grade control structures has eliminated the need for the hard-lining of channels with riprap in almost all locations, allowing for the use of soft-lined channels instead. Low flow linings can be utilized to protect the channel from increased frequency and volume of runoff from minor storm events where native channels will be altered. Recommended design methodologies for grade control structures and low flow linings are presented in Chapter 10 of the City/County DCM and in Volume 2 of the Urban Storm Drainage Criteria Manual. The 100-year velocities shown on the plan sheets have been adjusted to account for recommended channel improvements. Supporting calculations are provided by reach cross-sections in Section 19 of the Technical Addenda.

D. Roadway Bridge and Culvert Replacements

Many of the roadway culverts and a few of the bridges were found to be deficient for the 100-year storm event. Recommended replacements are shown on the plan view sheets in Appendix C. The replacement structures were sized in accordance with the City/County Drainage Criteria Manual. Because of erosive soils, riprap armor protection of the channel and abutments at bridges is recommended. The riprap protection should extend on either side of the bridge and should be accompanied with a cutoff wall at the downstream end to prevent undercutting of the armor protection.

E. Impacts on Environmental Resources

The overall approach of the selected plan is to minimize environmental impacts and retain natural channel characteristics as much as possible. Still, there will be some potential impacts due to channelization in areas where it cannot be avoided, construction of detention basins, construction of grade control structures and improvements made to culverts and bridges. Many of these impacts will be temporary in nature. Environmental impacts may be mitigated by the utilization of vegetation augmentation and bio-engineered channel stabilization where wetland vegetation is introduced.

F. Right-of-Way Acquisition

The drainageways that pass through areas to be developed should be in dedicated drainage tracts, easements or rights-of-way to provide access to maintain or improve the channels as needed. This is an issue that should be addressed through the development review and approval process. It is assumed that all of the small regional detention basins will be owned and maintained by private entities; therefore county access will not be required. One area where additional right-of-way may be required is at the Haegler Diversion channel on the north side of Judge Orr Road. The El Paso County Major Transportation Corridors Plan calls for widening of Judge Orr Road. The selected plan calls for the channel to be realigned so that it is not using the road embankment as one of the channel side slopes. Additional room will be needed to separate the channel from the roadway when this work is done. There are several deficient roadway structures where the adjacent channel invert will need to lowered to accommodate a larger structure. Temporary construction easements may be required to do this work. No cost has been included in the fee estimates for temporary easements.

G. Stormwater Quality

In January 2006 the County adopted the El Paso County Addendum to the City of Colorado Springs Drainage Criteria Manual Volume 2: Stormwater Quality Policies, Procedures and Best Management Practices (BMPs) which has been incorporated into the El Paso County Engineering Criteria Manual as Appendix 1. The goal of the Addendum is to provide engineering criteria for water quality protection measures. In addition to establishing permitting, inspection, and enforcement policies, the addendum provides guidance and requirements for the selection of structural BMP's for new development. It is the responsibility of the entity conducting any land disturbance activity to submit a Stormwater Management Plan for temporary erosion control prior to the start of construction and to properly control surface runoff, erosion, and sedimentation during construction activities. It is important that the erosion control plan be adhered to and maintained as specified in the Addendum.

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

Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

0 1 2 Miles

PREPARED BY:
Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET
3 S 7TH STREET
6513 W 4TH STREET
CONTACT: ROBERT BENNETT
BOULDER, COLORADO 80301 (303) 442-4338
COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
GREELEY, COLORADO 80634 (970) 351-0645

PREPARED FOR:
REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO:
GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY:	RJB
DRAWN BY:	BLF
CHECKED BY:	RJB

REVISION DESCRIPTIONS | DATE

DRAWING INFO:
GIECK RANCH
KEY MAP
MAIN STEM

DATE:	JOB NO:	SET
AUGUST 2007	C7706-1	PL
SCALE: H: 1" = 6000' V:	DRAWING NO.: 6D 038	SHEET K1

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

Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

0 1 2 Miles

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
6513 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: ROBERT BENNETT

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF
CHECKED BY: RJB

REVISION DESCRIPTIONS | DATE

DRAWING INFO: GIECK RANCH
KEY MAP
MAIN STEM TRIBUTARY #3

DATE: AUGUST 2007
SCALE: H: 1" = 6000' V:
JOB NO: C7706-1
DRAWING NO.: 6D 038
SET PL
SHEET K4

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

Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

0 1 2 Miles

PREPARED BY: Drexel, Barrell & Co. Engineers Surveyors
1800 38TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
6513 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: ROBERT BENNETT

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB
DRAWN BY: BLF
CHECKED BY: RJB

REVISION DESCRIPTIONS | DATE

DRAWING INFO: GIECK RANCH
KEY MAP
HAEGLER DIVERSION

DATE: AUGUST 2007
SCALE: H: 1" = 6000' V:
JOB NO: C7706-1
DRAWING NO.: 6D 038
SET: PL
SHEET: K7

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

Legend

- Streams
- Roads
- Basin Boundary
- Matchlines

0 1 2 Miles

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET — BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET — COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
6513 W 4TH STREET — GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: ROBERT BENNETT

PREPARED FOR: **REALTY DEVELOPMENT SERVICES**
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

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

DESIGNED BY:	RJB
DRAWN BY:	BLF
CHECKED BY:	RJB

REVISION DESCRIPTIONS — DATE

DRAWING INFO: GIECK RANCH KEY MAP WEST FORK

DATE: AUGUST 2007	JOB NO: C7706-1	SET PL	
SCALE: H: 1" = 6000' V:	DRAWING NO.: 6D 038	SHEET K8	

Environmental Key

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

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

Legend

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

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
MS-R7c	2.62	877	4.82
MS-R8a	0.66	896	2.71
MS-R8b	1.79	896	5.21
MS-R8c	1.00	896	4.63
MS-R11a	1.26	1774	3.80

RECOMMENDED PLAN IMPROVEMENTS

Reach	
MS-R7c	Vegetation Augmentation
MS-R8a	Vegetation Augmentation
MS-R8b	Selective Stabilization
MS-R8c	Selective Stabilization
MS-R11a	Selective Stabilization

Note:
See Technical Addenda for grade control data.

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

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
6513 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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

REVISION DESCRIPTIONS	DATE
PER EPCDOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
MAIN STEM #28

DATE: AUGUST 2007
SCALE: H: 1" = 200' V: NONE
JOB NO: C7706-2
DRAWING NO.: 6D 038
SET: PL
SHEET: 28

Environmental Key

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

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

Legend

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

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
MS-R7b	1.85	877	5.10
MS-R7c	2.62	877	4.82

RECOMMENDED PLAN IMPROVEMENTS

Reach	
MS-R7b	Vegetation Augmentation
MS-R7c	Vegetation Augmentation

Note:
See Technical Addenda for grade control data.

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

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
6513 W 4TH STREET GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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

REVISION DESCRIPTIONS	DATE
PER EPCDOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
MAIN STEM #29

DATE: AUGUST 2007
SCALE: H 1" = 200' V NONE
JOB NO: C7706-2
DRAWING NO.: 6D 038
SET PL
SHEET 29

Environmental Key

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

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

Legend

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

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
MST3-R1	1.80	19	1.61

RECOMMENDED PLAN IMPROVEMENTS

Reach	
MST3-R1	As-needed Improvements

Note:
See Technical Addenda for grade control data.

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

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
6513 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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

REVISION DESCRIPTIONS	DATE
PER EPCDOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
MAIN STEM TRIBUTARY-3 #1

DATE: AUGUST 2007
SCALE: H: 1" = 200' V: NONE
JOB NO: C7706-2
DRAWING NO.: 6D 038
SET: PL
SHEET: 44

Environmental Key

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

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

Legend

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

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
HD-R5	1.67	468	2.87

RECOMMENDED PLAN IMPROVEMENTS

Reach	
HD-R5	Selective Stabilization

Note:
See Technical Addenda for grade control data.

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

Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET — BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET — COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
6513 W 4TH STREET — GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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

REVISION DESCRIPTIONS	DATE
PER EPCDOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
HAEGLER DIVERSION #1

DATE:	JOB NO:	SET
AUGUST 2007	C7706-2	PL
SCALE: H: 1" = 200' V: NONE	DRAWING NO.: 6D 038	SHEET 55

Environmental Key

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

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

Legend

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

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
HD-R4	1.75	429	2.71
HD-R5	1.67	468	2.87

RECOMMENDED PLAN IMPROVEMENTS

Reach	
HD-R4	Vegetation Augmentation
HD-R5	Selective Stabilization

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

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
6513 W 4TH STREET GREELEY, COLORADO 80634 (970) 351-0545
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB	REVISION DESCRIPTIONS: PER EPC FINAL REVIEW	DATE: JANUARY 2010
DRAWN BY: BLF/MLM		
CHECKED BY: RJB/TML		

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
HAEGLER DIVERSION #3

DATE: AUGUST 2007	JOB NO.: C7706-2	SET: PL
SCALE: H: 1" = 200' V: NONE	DRAWING NO.: 6D 038	SHEET: 57

Environmental Key

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

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

Legend

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

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
WF-R6	1.04	698	3.45
WF-R7a	1.18	753	2.19

RECOMMENDED PLAN IMPROVEMENTS

Reach	
WF-R6	Selective Stabilization
WF-R7a	Vegetation Augmentation

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

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
551 3 W 4TH STREET GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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

REVISION DESCRIPTIONS	DATE
PER EPCDOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
WEST FORK #4

DATE:	JOB NO:	SET
AUGUST 2007	C7706-2	PL
SCALE: H: 1" = 200' V: NONE	DRAWING NO.: 6D 038	SHEET 68

Environmental Key

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

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

Legend

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

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
WF-R4d	1.45	242	3.60
WF-R5	1.52	394	4.32

RECOMMENDED PLAN IMPROVEMENTS

Reach	
WF-R4d	Selective Stabilization
WF-R5	Selective Stabilization

Note:
See Technical Addenda for grade control data.

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

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
3 W 4TH STREET GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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

REVISION DESCRIPTIONS	DATE
PER EPC/DOT COMMENTS	FEBRUARY 2008
PER EPC FINAL REVIEW	JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
WEST FORK #5

DATE: AUGUST 2007
SCALE: H: 1" = 200' V: NONE
JOB NO: C7706-2
DRAWING NO.: 6D 038
SET: PL
SHEET: 69

Environmental Key

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

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

Legend

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

N

0 100 200 Feet

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
WF-R4b	1.60	242	3.36
WF-R4c	2.44	242	2.91
WF-R4d	1.45	242	3.60

RECOMMENDED PLAN IMPROVEMENTS

Reach	
WF-R4b	Vegetation Augmentation
WF-R4c	Selective Stabilization
WF-R4d	Selective Stabilization

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

PREPARED BY: Drexel, Barrell & Co. Engineers · Surveyors
1800 38TH STREET, BOULDER, COLORADO 80301 (303) 442-4338
3 S 7TH STREET, COLORADO SPRINGS, COLORADO 80905 (719) 260-0887
6513 W 4TH STREET, GREELEY, COLORADO 80634 (970) 351-0645
CONTACT: ROBERT BENNETT, P.E., CFM

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
CONTACT: RAY O' SULLIVAN (719) 227-1022

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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

REVISION DESCRIPTIONS: PER EPC FINAL REVIEW — DATE: JANUARY 2010

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
WEST FORK #6

DATE: AUGUST 2007
SCALE: H: 1" = 200' V: NONE
JOB NO: C7706-2
DRAWING NO.: 6D 038
SET: PL
SHEET: 70

NOTE: SEE TECHNICAL ADDENDA FOR GRADE CONTROL STRUCTURES AND PROPOSED ROADWAY STRUCTURE DATA.

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

PREPARED BY: Drexel, Barrell & Co. Engineers • Surveyors 3 SOUTH 7th STREET COLORADO SPRINGS, COLORADO 80905 (719)260-0887 BOULDER (303)442-4338 • DENVER (720)214-0955 • GREELEY (970)351-0645 • GRAND JUNCTION (970)257-1350 • STEAMBOAT SPRINGS (970)879-1523 CONTACT: SCOTT STEVENS, P.E.	PREPARED FOR: REALTY DEVELOPMENT SERVICES 25 NORTH TEJON STREET, SUITE 300 COLORADO SPRINGS, COLORADO 80903 (719) 227-1022 CONTACT: RAY O'SULLIVAN	PROJECT INFO: GIECK RANCH DRAINAGE BASIN PLANNING STUDY EL PASO COUNTY, COLORADO	DESIGNED BY: RJB DRAWN BY: BLF/MLM CHECKED BY: RJB/TML	REVISION DESCRIPTIONS PER EPC FINAL REVIEW	DATE JANUARY 2010	DRAWING INFO. GIECK RANCH MAIN NORTH 4 FLOOD PROFILES (REACH: MS-R8a TO MS-R8c)	DATE: AUGUST 2007 SCALE: H: 1" = 200' V: 1" = 20' JOB NO: C7706-2 DRAWING NO.: 6D 038 SET: PR SHEET: 14

PREPARED BY: Drexel, Barrell & Co. Engineers • Surveyors
3 SOUTH 7th STREET COLORADO SPRINGS, COLORADO 80905 (719)260-0887
BOULDER (303)442-4338 • DENVER (720)214-0955 • GREELEY (970)351-0645 • GRAND JUNCTION (970)257-1350 • STEAMBOAT SPRINGS (970)879-1523
CONTACT: SCOTT STEVENS, P.E.

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
(719) 227-1022
CONTACT: RAY O'SULLIVAN

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB	REVISION DESCRIPTIONS	DATE
DRAWN BY: BLF/MLM	PER EPC FINAL REVIEW	JANUARY 2010
CHECKED BY: RJB/TML		

DRAWING INFO: GIECK RANCH MAIN NORTH 3 FLOOD PROFILES (REACH: MS-R7a TO MS-R7c)

DATE:	JOB NO:	SET
AUGUST 2007	C7706-2	PR
SCALE: H: 1" = 200' V: 1" = 20'	DRAWING NO.: 6D 038	SHEET 15

PREPARED BY: Drexel, Barrell & Co. Engineers • Surveyors 3 SOUTH 7th STREET COLORADO SPRINGS, COLORADO 80905 (719)260-0887 BOULDER (303)442-4338 • DENVER (720)214-0955 • GREELEY (970)351-0645 • GRAND JUNCTION (970)257-1350 • STEAMBOAT SPRINGS (970)879-1523 CONTACT: SCOTT STEVENS, P.E.	PREPARED FOR: REALTY DEVELOPMENT SERVICES 25 NORTH TEJON STREET, SUITE 300 COLORADO SPRINGS, COLORADO 80903 (719) 227-1022 CONTACT: RAY O'SULLIVAN	PROJECT INFO: GIECK RANCH DRAINAGE BASIN PLANNING STUDY EL PASO COUNTY, COLORADO	DESIGNED BY: RJB DRAWN BY: BLF/MLM CHECKED BY: RJB/TML	REVISION DESCRIPTIONS: PER EPC FINAL REVIEW DATE: JANUARY 2010	DRAWING INFO. GIECK RANCH SUB-TRIBUTARY M3 FLOOD PROFILES (REACH: MST3-R1)	DATE: AUGUST 2007 SCALE: H: 1" = 200' V: 1" = 20' JOB NO: C7706-2 DRAWING NO.: 6D 038 SET: PR SHEET: 24

PREPARED BY: Drexel, Barrell & Co. Engineers • Surveyors
3 SOUTH 7th STREET COLORADO SPRINGS, COLORADO 80905 (719)260-0887
BOULDER (303)442-4338 • DENVER (720)214-0955 • GREELEY (970)351-0845 • GRAND JUNCTION (970)257-1350 • STEAMBOAT SPRINGS (970)879-1523
CONTACT: SCOTT STEVENS, P.E.

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
(719) 227-1022
CONTACT: RAY O'SULLIVAN

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB	REVISION DESCRIPTIONS	DATE
DRAWN BY: BLF/MLM	PER EPC FINAL REVIEW	JANUARY 2010
CHECKED BY: RJB/TML		

DRAWING INFO: GIECK RANCH HAEGLER DIVERSION FLOOD PROFILES (REACH: HD-R4 & HD-R5)

DATE:	JOB NO:	SET
AUGUST 2007	C7706-2	PR
SCALE: H: 1" = 200' V: 1" = 20'	DRAWING NO.: 6D 038	SHEET 28

PREPARED BY: Drexel, Barrell & Co. Engineers • Surveyors
3 SOUTH 7th STREET COLORADO SPRINGS, COLORADO 80905 (719)280-0887
BOULDER (303)442-4338 • DENVER (720)214-0955 • GREELEY (970)351-0645 • GRAND JUNCTION (970)257-1350 • STEAMBOAT SPRINGS (970)879-1523
CONTACT: SCOTT STEVENS, P.E.

PREPARED FOR: REALTY DEVELOPMENT SERVICES
25 NORTH TEJON STREET, SUITE 300
COLORADO SPRINGS, COLORADO 80903
(719) 227-1022
CONTACT: RAY O'SULLIVAN

PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

DESIGNED BY: RJB	REVISION DESCRIPTIONS	DATE
DRAWN BY: BLF/MLM	PER EPC FINAL REVIEW	JANUARY 2010
CHECKED BY: RJB/TML		

DRAWING INFO. GIECK RANCH HAEGLER DIVERSION FLOOD PROFILES (REACH: HD-R2 & HD-R4)

DATE:	JOB NO:	SET
AUGUST 2007	C7706-2	PR
SCALE: H: 1" = 200' V: 1" = 20'	DRAWING NO.: 6D 038	SHEET 29

NOTE: SEE TECHNICAL ADDENDA FOR GRADE CONTROL STRUCTURES AND PROPOSED ROADWAY STRUCTURE DATA.

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

PREPARED BY: Drexel, Barrell & Co. Engineers • Surveyors 3 SOUTH 7th STREET COLORADO SPRINGS, COLORADO 80905 (719)260-0887 BOULDER (303)442-4338 • DENVER (720)214-0955 • GREELEY (970)351-0645 • GRAND JUNCTION (970)257-1350 • STEAMBOAT SPRINGS (970)879-1523 CONTACT: SCOTT STEVENS, P.E.	PREPARED FOR: REALTY DEVELOPMENT SERVICES 25 NORTH TEJON STREET, SUITE 300 COLORADO SPRINGS, COLORADO 80903 (719) 227-1022 CONTACT: RAY O'SULLIVAN	PROJECT INFO: GIECK RANCH DRAINAGE BASIN PLANNING STUDY EL PASO COUNTY, COLORADO	DESIGNED BY: RJB DRAWN BY: BLF/MLM CHECKED BY: RJB/TML	REVISION DESCRIPTIONS: PER EPC FINAL REVIEW DATE: JANUARY 2010	DRAWING INFO. GIECK RANCH WEST FORK (LOWER) FLOOD PROFILES (REACH: WF-R7a TO WF-R8a)	DATE: AUGUST 2007 SCALE: H: 1" = 200' V: 1" = 20'	JOB NO: C7706-2 DRAWING NO.: 6D 038	SET PR SHEET 34

NOTE: SEE TECHNICAL ADDENDA FOR GRADE CONTROL STRUCTURES AND PROPOSED ROADWAY STRUCTURE DATA.

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

PREPARED BY: Drexel, Barrell & Co. Engineers • Surveyors 3 SOUTH 7th STREET COLORADO SPRINGS, COLORADO 80905 (719)260-0887 BOULDER (303)442-4338 • DENVER (720)214-0955 • GREELEY (970)351-0645 • GRAND JUNCTION (970)257-1350 • STEAMBOAT SPRINGS (970)879-1523 CONTACT: SCOTT STEVENS, P.E.	PREPARED FOR: REALTY DEVELOPMENT SERVICES 25 NORTH TEJON STREET, SUITE 300 COLORADO SPRINGS, COLORADO 80903 (719) 227-1022 CONTACT: RAY O'SULLIVAN	PROJECT INFO: GIECK RANCH DRAINAGE BASIN PLANNING STUDY EL PASO COUNTY, COLORADO	DESIGNED BY: RJB DRAWN BY: BLF/MLM CHECKED BY: RJB/TML	REVISION DESCRIPTIONS: PER EPC FINAL REVIEW DATE: JANUARY 2010	DRAWING INFO. GIECK RANCH WEST FORK (MIDDLE) FLOOD PROFILES (REACH: WF-R5 & WF-R6)	DATE: AUGUST 2007 SCALE: H: 1" = 200' V: 1" = 20'	JOB NO: C7706-2 DRAWING NO.: 6D 038	SET PR SHEET 35

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

Within 90 days of the second publication in the local newspaper, a citizen may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised BFEs presented in this LOMR may be changed.

A notice of changes will be published in the *Federal Register*. This information also will be published in your local newspaper on or about the dates listed below.

LOCAL NEWSPAPER Name: *El Paso County News*
Dates: 11/10/2004 11/17/2004

PUBLIC NOTIFICATION

FLOODING SOURCE	LOCATION OF REFERENCED ELEVATION	BFE (FEET NGVD) EFFECTIVE	BFE (FEET NGVD) REVISED	MAP PANEL NUMBER(S)
Haegler Ranch Tributary 2	Approximately 310 feet upstream of confluence with Geick Ranch West Tributary	None	6,735	08041C0575 F
	Approximately 3,140 feet upstream of confluence with Geick Ranch West Tributary	None	6,779	08041C0575 F
Haegler Ranch Tributary 3	Approximately 8,100 feet downstream of Curtis Road	None	6,672	08041C0575 F
	Approximately 300 feet upstream of Curtis Road	None	6,769	08041C0575 F
Haegler Ranch Tributary 4	Approximately 4,000 feet downstream of Curtis Road	None	6,688	08041C0575 F
	Approximately 300 feet upstream of Curtis Road	None	6,758	08041C0575 F

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2677 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Kevin C. Long

Kevin C. Long, CFM, Project Engineer
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate 102929 101104080587 102IAC

CHANGES ARE MADE IN DETERMINATIONS OF BASE FLOOD ELEVATIONS FOR THE UNINCORPORATED AREAS OF EL PASO COUNTY, COLORADO, UNDER THE NATIONAL FLOOD INSURANCE PROGRAM

On March 17, 1997, the Department of Homeland Security's Federal Emergency Management Agency identified Special Flood Hazard Areas (SFHAs) in the unincorporated areas of El Paso County, Colorado, through issuance of a Flood Insurance Rate Map (FIRM). The Mitigation Division has determined that modification of the elevations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) for certain locations in this community is appropriate. The modified Base Flood Elevations (BFEs) revise the FIRM for the community.

The changes are being made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65.

A hydraulic analysis was performed to incorporate new hydrologic, hydraulic, and topographic data for Haegler Ranch Tributary 2 from approximately 310 feet upstream to approximately 3,140 feet upstream of the confluence with Geick Ranch West Tributary; for Haegler Ranch Tributary 3 from approximately 8,100 feet downstream to approximately 400 feet upstream of Curtis Road; and for Haegler Ranch Tributary 4 from approximately 4,100 feet downstream to approximately 400 feet upstream of Curtis Road. This has resulted in increases and decreases in SFHA width and increased BFEs for the above-mentioned tributaries. The table below indicates existing and modified BFEs for selected locations along the affected lengths of the flooding source(s) cited above.

Location	Existing BFE (feet)*	Modified BFE (feet)*
Haegler Ranch Tributary 2:		
Approximately 310 feet upstream of confluence with Geick Ranch West Tributary	None	6,735
Approximately 3,140 feet upstream of confluence with Geick Ranch West Tributary	None	6,779
Haegler Ranch Tributary 3:		
Approximately 8,100 feet downstream of Curtis Road	None	6,672
Approximately 300 feet upstream of Curtis Road	None	6,769
Haegler Ranch Tributary 4:		
Approximately 4,000 feet downstream of Curtis Road	None	6,688
Approximately 300 feet upstream of Curtis Road	None	6,758

*National Geodetic Vertical Datum, rounded to nearest whole foot

Under the above-mentioned Acts of 1968 and 1973, the Mitigation Division must develop criteria for floodplain management. To participate in the National Flood Insurance Program (NFIP), the community must use the modified BFEs to administer the floodplain management measures of the NFIP. These modified BFEs will also be used to calculate the appropriate flood insurance premium rates for new buildings and their contents and for the second layer of insurance on existing buildings and contents.

ZONE X
ZONE A
AREA REVISED BY LOMR DATED MARCH 9, 2004
33
34
32
ZONE A
ZONE A
ZONE A
Haegler Ranch Tributary 2
Geick Ranch West Tributary
ZONE A
JUDGE ORR ROAD
LIMIT OF DETAILED STUDY
6770
6775
6765
6750
6736
LIMIT OF DETAILED STUDY
ZONE AE
ZONE AE
LIMIT OF DETAILED STUDY
6760
6740
6768
ZONE X
ZONE A
4
LIMIT OF DETAILED STUDY
6740
6711
3
6720
6750
6758
6735
ZONE AE
6700
REVISED AREA
6720
6689
Haegler Ranch Tributary 3
6705
6675
ZONE A
6690
6675
LIMIT OF DETAILED STUDY
LIMIT OF DETAILED STUDY
9
10
Haegler Ranch Tributary 4
ZONE X
CURTIS ROAD
ZONE A
EL PASO COUNTY UNINCORPORATED AREAS 080059
16
15
APPROXIMATE SCALE IN FEET
2,000
0
2,000
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS
PANEL 575 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
EL PASO COUNTY, UNINCORPORATED AREAS 080059 0575 F
COLORADO SPRINGS, CITY OF 080060 0575 F
REVISED TO REFLECT LOMR DATED FEB 16 2005
MAP NUMBER
08041C0575 F
EFFECTIVE DATE:
March 17, 1997
Federal Emergency Management Agency

Table 3. Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Year	50-Year	100-Year	500-Year
Haegler Ranch Tributary 2 At the confluence with Geick Ranch West Tributary	1.47	__1	__1	592	__1
Haegler Ranch Tributary 3 At approximately 2,300 feet upstream of the confluence with Haegler Ranch Tributary 4	1.09	__1	__1	505	__1
Haegler Ranch Tributary 4 At approximately 3,700 feet upstream of the confluence with Haegler Ranch Tributary 3	0.60	__1	__1	130	__1

1 Data Not Available

REVISED TO REFLECT LOMR DATED FEB 16 2005

TRI-CORE ENGINEERING

PROJECT NAME: Santa Fe Springs - Haegler Ranch Drainage Basin LOMR
PROJECT NUMBER: 6005
ENGINEER: RLS
DATE: 6/4/2004

EXISITING HYDROLOGY CONDITIONS

TIME OF CONCENTRATION CALCULATIONS

BASIN	HA	HA1	HA2	HA3	HA4	HA5	HA6	HA7	HA8	HB	OS1	OS2
AREA, A [ACRE]	238.7	200.3	66.9	187.9	115.7	329.6	196.5	125.1	11.8	498.0	218.5	59.4
SUB-BASIN LENGTH [MI]	0.79	1.20	0.59	1.03	0.79	1.63	0.94	0.62	0.20	1.99	0.96	0.55
CHANNEL ELEVATION CHANGE [FT]	55	117	65	65	60	110	125	90	27	152	145	50
H[1]	28	59	33	33	30	55	63	45	14	76	73	25
SUB-BASIN SLOPE [FT/FT]	0.0132	0.0185	0.0209	0.0120	0.0144	0.0128	0.0252	0.0275	0.0256	0.0145	0.0286	0.0172
TIME OF CONCENTRATION (MIN)[2]	33	40	22	42	32	59	29	21	9	65	29	23
LAG-TIME OF CONCENTRATION (MIN)[3]	20	24	13	25	19	35	18	12	5	39	17	14

[1] *Elevation difference between divide and outlet*
[2] $Tc=60(11.9L^3/H)^{0.385}$
[3] $Tc=60(11.9L^3/H)^{0.385} * 0.6$

FLOW DATA

Flow Title: ex-100yr
Flow File : P:\6005\0001\LOMR\6005_0001.f01

Flow Data (cfs)

River	Reach	RS	PF 1
Trib.3 to Black	Reach No. H9	8015	130
Trib.2 to Black	Reach No. H8	12669	452
Trib.2 to Black	Reach No. H8	10137	505
Trib.1 to Black	Reach No. H7	3326	592

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Trib.1 to Black	Reach No. H7	PF 1	Normal S = 0.014
Normal S = 0.017			
Trib.2 to Black	Reach No. H8	PF 1	Normal S = 0.013
Normal S = 0.005			
Trib.3 to Black	Reach No. H9	PF 1	Normal S = 0.014
Normal S = 0.016			

GEOMETRY DATA

Geometry Title: 6005_0001
Geometry File : P:\6005\0001\LOMR\6005_0001.g01

CROSS SECTION

RIVER: Trib.1 to Black
REACH: Reach No. H7 RS: 3326

INPUT
Description: Cross Section 45
Station Elevation Data num= 78

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6780	1.28	6780	2.96	6780	7.4	6780	38.31	6779.82
39.48	6779.82	40.1	6779.82	51.98	6779.76	57.71	6779.74	69.8	6779.72
71	6779.71	74.2	6779.7	79.75	6779.68	83.44	6779.66	87.22	6779.64
88.7	6779.63	98.89	6779.58	105.05	6779.55	110.99	6779.52	117.52	6779.5
121.66	6779.48	124.01	6779.47	132.61	6779.39	138.38	6779.36	144.59	6779.34
145.36	6779.33	150	6779.307	151.43	6779.3	152.25	6779.3	181.96	6779.19
191.41	6779.13	204.1	6779.03	208.83	6779	214.91	6778.98	220.66	6778.96
221.22	6778.95	227.64	6778.93	228.19	6778.93	231.42	6778.9	234.52	6778.88
235.57	6778.89	261.4	6778.89	266.03	6778.92	305.11	6778.96	317.9	6778.82
322.45	6778.76	323.5	6778.76	337	6778.53	337.86	6778.53	341.71	6778.53
342.24	6778.54	342.8	6778.54	343.36	6778.54	353.8	6778.27	363.1	6778
369.86	6777.01	371.7	6776.84	372.82	6776.78	373.06	6776.73	373.37	6776.69
373.61	6776.68	374.24	6776.67	374.53	6776.66	375.81	6776.66	377.23	6776.66

377.84	6776.67	378.06	6776.67	380.06	6776.68	380.18	6776.75	380.78	6776.86
388.45	6778	391.86	6778	393.07	6778.26	3986779.351		400.93	6780
401.56	6780	404.07	6780.97	419.34	6780.95				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	150	.03	398	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
150	398	340	260	265	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	6779.55	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.30	Wt. n-Val.		0.030
W.S. Elev (ft)	6779.25	Reach Len. (ft)	340.00	260.00
265.00				
Crit W.S. (ft)	6779.25	Flow Area (sq ft)		134.99
E.G. Slope (ft/ft)	0.016054	Area (sq ft)		134.99
Q Total (cfs)	592.00	Flow (cfs)		592.00
Top Width (ft)	230.75	Top Width (ft)		230.75
Vel Total (ft/s)	4.39	Avg. Vel. (ft/s)		4.39
Max Chl Dpth (ft)	2.59	Hydr. Depth (ft)		0.59
Conv. Total (cfs)	4672.3	Conv. (cfs)		4672.3
Length Wtd. (ft)	260.00	Wetted Per. (ft)		231.10
Min Ch El (ft)	6776.66	Shear (lb/sq ft)		0.59
Alpha	1.00	Stream Power (lb/ft s)		2.57
Frctn Loss (ft)	3.71	Cum Volume (acre-ft)		8.28
C & E Loss (ft)	0.03	Cum SA (acres)		10.07

Warning: The energy equation could not be balanced within the specified number of iterations. The
program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
depth, the calculated water surface came back below critical depth. This indicates that there is
not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

Vel Total (ft/s)	3.55	Avg. Vel. (ft/s)	3.55
Max Chl Dpth (ft)	1.60	Hydr. Depth (ft)	0.80
Conv. Total (cfs)	7083.9	Conv. (cfs)	7083.9
Length Wtd. (ft)	160.00	Wetted Per. (ft)	209.61
Min Ch El (ft)	6731.16	Shear (lb/sq ft)	0.35
Alpha	1.00	Stream Power (lb/ft s)	1.23
Frctn Loss (ft)	1.54	Cum Volume (acre-ft)	0.50
C & E Loss (ft)	0.03	Cum SA (acres)	0.60

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Trib.1 to Black
REACH: Reach No. H7 RS: 169

INPUT
Description: Cross Section 56
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6731.42	26	6731.124	9.59	6730	9.66	6730	10.52	6730
11.83	6730	15.82	6730	19.15	6730	31.27	6730	32.83	6730
33.35	6729.98	34.91	6730	38.49	6730	39.18	6730	39.85	6730
47.53	6729.94	53.19	6730	55.55	6730	63.61	6730	68.75	6730
73.47	6730	74.71	6730	76.08	6730	76.55	6730	76.56	6730
79.35	6729.96	80.59	6730	89.02	6730	101.07	6730	111.83	6730
120.61	6730	123	6731.075	123.41	6731.26	125.01	6731.75	125.79	6732
133.05	6733.73	134.13	6734	135.73	6734	136.06	6734	137.31	6734.3
148.78	6734.285								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	2	.03	123	.03

Bank Sta: Left	Right	Coeff Contr.	Expan.
2	123	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	6731.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.47	Wt. n-Val.		0.030
W.S. Elev (ft)	6730.93	Reach Len. (ft)		

Crit W.S. (ft)	6730.93	Flow Area (sq ft)	108.00
E.G. Slope (ft/ft)	0.014041	Area (sq ft)	108.00
Q Total (cfs)	592.00	Flow (cfs)	592.00
Top Width (ft)	119.40	Top Width (ft)	119.40
Vel Total (ft/s)	5.48	Avg. Vel. (ft/s)	5.48
Max Chl Dpth (ft)	0.99	Hydr. Depth (ft)	0.90
Conv. Total (cfs)	4996.0	Conv. (cfs)	4996.0
Length Wtd. (ft)		Wetted Per. (ft)	119.67
Min Ch El (ft)	6729.94	Shear (lb/sq ft)	0.79
Alpha	1.00	Stream Power (lb/ft s)	4.34
Frctn Loss (ft)		Cum Volume (acre-ft)	
C & E Loss (ft)		Cum SA (acres)	

Warning: Slope too steep for slope area to converge during supercritical flow calculations (normal depth is
below critical depth). Water surface set to critical depth.

CROSS SECTION

RIVER: Trib.2 to Black
REACH: Reach No. H8 RS: 12669

INPUT
Description: Station 122+55 Cross Section No. 1
Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6772.61	22.61	6772	22.96	6772	26.44	6772	27.42	6772
27.67	6772	28.16	6771.99	137.98	6770	138.68	6770	141.19	6770
142.24	6770	148.75	6770	150.91	6770	154.98	6770	173	6769.082
174.21	6769.02	187.82	6768.37	189.46	6768.29	195.66	6768	195.79	6768
196.13	6768	196.16	6768	197.88	6768	203.26	6768	203.71	6768
204.17	6768	204.72	6768	205.14	6768	212.3	6767.85	250.99	6767.81
251.81	6767.56	256.23	6767.63	261.25	6767.67	300.27	6768	300.76	6768
301.82	6768	304.85	6768	305.36	6768	307.13	6768	323.3	6768
327.49	6768	332.35	6768.13	333.33	6768.16	334.19	6768.18	357.17	6768.82
360.59	6768.89	365.66	6769.02	369.03	6769.1	370	6769.123	375.54	6769.25
388.56	6769.48	392.13	6769.55	413.18	6770	414.19	6770	414.74	6770
414.79	6770	422.64	6770.24	423.36	6770.24	438.11	6770	452.87	6770

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	173	.03	370	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
173	370	110	183	470	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

VICINTY MAP

1"=5000'

LEGEND

- EX. MAJOR CONTOUR 6420
- DRAINAGE BASIN BOUNDARY
- OVERLAND FLOW DIRECTION
- CHANNELIZED FLOW DIRECTION
- HAEGLER/GIECK BASIN BOUNDARY
- DESIGN POINT 1
- 100-YEAR FLOODPLAIN PER FIRM MAPS
- BASIN I.D. — HA3
- BASIN AREA (Acres) — 187.9

RUNOFF SUMMARY TABLE

BASIN	DRAINAGE AREA (ACRES)	RUNOFF 100 YR (cfs)
HA	238.7	191.4
HA1	200.3	139.6
HA2	66.9	64.7
HA3	187.9	126.8
HA4	115.7	94.4
HA5	329.6	178.5
HA6	196.5	167.5
HA7	125.1	138.8
HA8	11.8	20.1
HB	498.0	245.8
OS1	218.5	195.2
OS2	59.4	57.6

DESIGN POINT SUMMARY TABLE

DESIGN POINT	RUNOFF 100 YR (cfs)	COMMENTS
*HG2	465.2	FLOW TO HWY 24- H1,H2,H4,H6
*HG3	286.1	FLOW TO HWY 24- H3,H5
*HG8	236.5	FLOW TO HWY 24- H7,H8
1	417.3	FLOW TO JUDGE ORR- HA,HG8
2	591.3	FLOW JUDGE ORR - HA1,HG2
3	1058.6	FLOW TO JUDGE ORR- HB,HG3,DP2
4	451.4	FLOW TO CURTIS RD- HA2,DP1
5	506.2	FLOW FROM HA4,DP4
6	676.0	FLOW TO SITE BNDY- HA5,DP5
7	126.8	FLOW TO CURTIS RD- HA3
8	287.1	FLOW TO SITE BNDY- DP7,HA6
9	1055.8	FLOW FROM SITE BNDY- DP6,8;HA7,8;OS1-2

* DENOTES LIMITS OF FEMA CASE #04-08-0012P FOURWAY RANCH STUDY

GRAPHIC SCALE
1000 0 500 1000
1 inch = 1000 ft.

NO.	DESCRIPTION	REV BY	CKD BY	DATE

REVISION

TRI-CORE ENGINEERING
5526 N. ACADEMY BLVD., SUITE 204
COLORADO SPRINGS, CO 80918
PHONE (719) 264-1560
FAX (719) 264-1193

SCALE (H): 1"=1000'
SCALE (V): N/A
DRAWN BY: DMM
DESIGNED BY: RLS
CHECKED BY: RLS
DATE: 05/21/04

SANTA FE SPRINGS
HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO, COUNTY
REALTY DEVELOPMENT SERVICES
25 NORTH TEJON
SUITE 300

EXHIBIT 1
HYDROLOGIC SUBBASIN MAP

PROJECT NO. 6005-0001
FILENAME 01DR_HIST.DWG
DRAWING NO. EXH. 1

EFFECTIVE CONDITION

MAP PANEL NO. 0575F

REVISED EFFECTIVE CONDITION

APPROXIMATE SCALE IN FEET
2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 575 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY NAME	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0575	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0575	F

MAP NUMBER
08041C0575 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

GRAPHIC SCALE
2000 0 1000 2000
1 inch = 2000 ft

NO.	DESCRIPTION	REV BY	CKD BY	DATE

REVISION

TRI-CORE ENGINEERING
5526 N. ACADEMY BLVD., SUITE 204
COLORADO SPRINGS, CO 80918
PHONE (719) 264-1560
FAX (719) 264-1193

SCALE (H): 1"=2000'
SCALE (V): N/A

DRAWN BY: DMM
DESIGNED BY: RLS
CHECKED BY: RLS

DATE: 05/21/04

SANTA FE SPRINGS
HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO, COUNTY

REALTY DEVELOPMENT SERVICES
25 NORTH TEJON
SUITE 300

EXHIBIT 2
REVISED FLOOD INSURANCE RATE MAP

PROJECT NO.
6005-0001

FILENAME
RATE_MAP_LOMR.DWG

DRAWING NO.
EXH. 2

NO.	DESCRIPTION	REV BY	CKD BY	DATE

REVISION

TRI-CORE ENGINEERING
5526 N. ACADEMY BLVD., SUITE 204
COLORADO SPRINGS, CO 80918
PHONE (719) 264-1560
FAX (719) 264-1193

SCALE (H): 1"=200'
SCALE (V): 1"=10'

DRAWN BY: KMV
DESIGNED BY: RLS
CHECKED BY: RLS

DATE: 06/04/04

SANTA FE SPRINGS
HAEGLER RANCH DRAINAGE BASIN LOMR
EL PASO COUNTY

REALTY DEVELOPMENT SERVICES
25 NORTH TEJON, SUITE 300
COLORADO SPRINGS, CO 80903

EXHIBIT 3 100-YEAR FLOODPLAIN BOUNDARY & PROFILE WORKMAP

PROJECT NO. 6005.0001

FILENAME PP-LOMR.DWG

DRAWING NO. EXH. 3

Architectural
Structural
Geotechnical

RMG
Engineers / Architects

Materials Testing
Forensic
Civil/Planning

SOIL AND GEOLOGY STUDY

Davis Subdivsion
6 parcels totaling 398.91 acres
EL Paso County, Colorado

PREPARED FOR:

William Guman & Associates, Ltd
731 North Weber Street, Ste 10
Colorado Springs, CO 80903

JOB NO. 190392

April 27, 2023

Respectfully Submitted,
RMG – Rocky Mountain Group

Kelli Zigler

Kelli Zigler
Project Geologist

Reviewed by,
RMG – Rocky Mountain Group

COLORADO REGISTERED
ANTHONY P. MUNGER
4/27/23
39818
PROFESSIONAL ENGINEER

Tony Munger, P.E.
Sr. Geotechnical Project Manager

DENOTES APPROXIMATE LOCATION OF TEST BORINGS

DENOTES APPROXIMATE LOCATION OF TEST PITS

NOT TO SCALE

JOB No. 190392

RMG
Materials Testing
Forensics
Civil / Planning
Architecture
Structural
Geotechnical

Engineers / Architects
SOUTHERN COLORADO OFFICE
2910 AUSTIN BLUFFS PKWY, SUITE 100,
COLORADO SPRINGS, CO 80918
(719) 548-0600 ~ WWW.RMGENGINEERS.COM
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

JUDGE ORR RD
DAVIS SUBDIVISION
EL PASO COUNTY, COLORADO
WILLIAM GUMAN AND ASSOCIATES

ENGINEER:	TM
DRAWN BY:	NM
CHECKED BY:	TM
ISSUED:	4-27-2023

TEST PIT/TEST BORING LAYOUT PLAN

SHEET No.
FIG-3

APPENDIX F

DRAINAGE MAPS

JANE DAVIS RANCH

EXISTING DRAINAGE MAP

LAYER LINETYPE LEGEND

	EXISTING	PROPOSED
BOUNDARY LINE		
PROPERTY LINE		
EASEMENT LINE		
RIGHT OF WAY		
CENTERLINE		
STORM SEWER		
SWALE/WATERWAY FLOWLINE		
INDEX CONTOUR	6100	6100
INTERMEDIATE CONTOUR		
CURB & GUTTER		
FEMA FLOODPLAIN	100YR	100YR
SUB-BASIN DRAINAGE AREA		

BASIN TAG — BASIN ID #; AREA [AC] #.#; C_{100}; C_5

DESIGN POINT DESIGNATION

FLOW DIRECTION (EXISTING) FLOW DIRECTION (PROPOSED)

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	$t_{c,5}$ (min)	$t_{c,100}$ (min)	Q_5 (cfs)	Q_{100} (cfs)
EXA	19.37	2.0%	0.08	0.35	35.0	44.0	0	13
EXB	5.12	4.3%	0.10	0.36	32.0	42.0	0	3
EXC	54.95	2.0%	0.08	0.35	34.0	43.0	1	34
EXD	114.1	2.1%	0.08	0.35	43.0	52.0	1	44
EXE	105.2	2.0%	0.08	0.35	39.0	47.0	1	53
EXF	37.91	2.0%	0.08	0.35	38.0	48.0	0	14
EXG	16.19	2.4%	0.08	0.35	32.0	41.0	0	11
EXH	44.49	2.4%	0.08	0.35	39.0	49.0	0	16
OS1	26.55	2.0%	0.08	0.35	32.0	41.0	0	13
OS2	11.56	2.0%	0.08	0.35	33.0	42.0	0	6
OS3A	5.37	2.0%	0.08	0.35	32.0	42.0	0	2
OS3B	20.89	2.0%	0.08	0.35	33.0	42.0	0	12
OS3C	21.41	2.0%	0.08	0.35	35.0	46.0	0	9
OS4	60.07	2.0%	0.08	0.35	36.0	44.0	1	33
OS5	16.65	2.0%	0.08	0.35	33.0	42.0	0	9

Values in BLUE are from the CUHP methodology, see separate calculations.

DESIGN POINT SUMMARY TABLE

DP#	Q_5	Q_{100}
1	-	429
2	0	9
3	-	394
4	-	753
5	1	62
6	1	48
7	-	896
8	0	16

For values in RED, used reach flow from Giech Ranch DBPS by Drexel, Barrel & Co.

EXISTING DRAINAGE MAP
JANE DAVIS RANCH
JOB NO. 25274.00
03/14/2024
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

JANE 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	6100	6100
INTERMEDIATE CONTOUR		
CURB & GUTTER		
FEMA FLOODPLAIN	100YR	100YR
SUB-BASIN DRAINAGE AREA		

BASIN TAG — BASIN ID #; AREA [AC] #.#; C_{100}; C_5

1 DESIGN POINT DESIGNATION

FLOW DIRECTION (EXISTING) ⇨ FLOW DIRECTION (PROPOSED) →

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	$t_{c,5}$ (min)	$t_{c,100}$ (min)	Q_5 (cfs)	Q_{100} (cfs)
A	17.96	12.7%	0.18	0.43	32.0	41.0	2	14
B	1.33	2.0%	0.08	0.35	31.0	45.0	0	1
C	5.20	67.7%	0.60	0.73	31.0	38.0	5	11
D	26.15	15.9%	0.21	0.45	37.0	46.0	3	15
E1	9.11	2.0%	0.08	0.35	41.0	48.0	3	11
E2	1.17	2.0%	0.08	0.35	35.0	41.0	1	2
F	49.33	13.1%	0.18	0.43	40.0	49.0	3	25
G	53.91	12.5%	0.18	0.42	37.0	46.0	4	32
H	10.99	2.0%	0.08	0.35	34.0	46.0	0	4
I	5.20	10.0%	0.16	0.41	31.0	41.0	0	4
J	119.8	15.3%	0.20	0.44	44.0	52.0	10	60
K	29.86	10.0%	0.16	0.41	33.0	41.0	3	24
L	56.53	10.0%	0.16	0.41	36.0	45.0	4	36
M1	10.55	2.0%	0.08	0.35	44.0	53.0	3	10
M2	0.26	2.0%	0.08	0.35	40.0	49.0	0	0
OS1A	18.68	2.0%	0.08	0.35	32.0	41.0	0	12
OS1B	7.86	2.0%	0.08	0.35	32.0	41.0	0	4
OS2	11.56	2.0%	0.08	0.35	33.0	42.0	0	6
OS3	47.67	2.0%	0.08	0.35	33.0	42.0	1	33
OS4	60.07	2.0%	0.08	0.35	36.0	44.0	1	33
OS5	16.65	2.0%	0.08	0.35	33.0	42.0	0	9

Values in BLUE are from the CUHP methodology, see separate calculations.

DESIGN POINT SUMMARY TABLE

DP#	Q_5	Q_{100}
1	0	4
2	2	27
3	-	429
4	5	17
5	3	15
6	-	394
7	4	57
8	5	65
9	-	896
10	1	13
11	10	60
12	3	24
13	10	60
14	-	753

For values in RED, used reach flow from Giech Ranch DBPS by Drexel, Barrel & Co.

300 150 0 300 600

ORIGINAL SCALE: 1" = 300'

PROPOSED DRAINAGE MAP
JANE DAVIS RANCH
JOB NO. 25274.00
03/15/2024
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

DAVIS RANCH

PROPOSED WATER QUALITY MAP

PBMP Summary Table

Basins	Tributary Area (acres)	PBMP
A	17.96	POND 1
B	1.33	EXCLUDED**
C	5.20	POND 2
D	26.15	POND 3
E1-E2	10.28	EXCLUDED**
F	49.33	POND 4
G	53.91	POND 5
H	10.99	EXCLUDED**
I	5.20	EXCLUDED*
J	119.80	POND 6
K	29.86	EXCLUDED*
L	56.53	EXCLUDED*
M1-M2	10.81	EXCLUDED**

*EXCLUDED BASED ON LARGE-LOT SINGLE FAMILY SITE PER ECM APP. I.7.B.5

** EXCLUDED BASED ON STREAM STABILIZATION SITE PER ECM APP. I.7.B.8

PROPOSED WATER QUALITY MAP
DAVIS RANCH
JOB NO. 25274.00
03/18/2024
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com