GIECK RANCH TRIBUTARY
WEST FORK REACH 7A
CHANNEL ANALYSIS REPORT
FOR
SADDLEHORN RANCH FILING NO. 4

Prepared For:
ROI Property Group, LLC.
2495 Rigdon Street
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(707) 633-9700

Update with CWCB information

May 4, 2023
Project No. 25142.06

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive
Colorado Springs, CO 80919
719-593-2593

El Paso county PCD File No:
SF-XX-XXX ← SF236

(following comments are from first submittal)

CONTENTS

OVERVIEW

This report was prepared to provide hydraulic information for the existing West Fork Reach 7A Drainageway as part of the Saddlehorn Ranch Filing No. 4 development. This document is the Existing Channel Analysis report for the Gieck Ranch Tributary West Fork Reach 7A, it will only discuss the analysis of the drainageway located on the Saddlehorn Filing No. 4 site. The West Fork Reach 7A Drainageway was studied as part of the "Gieck Ranch Drainage Basin Planning Study" which presented existing and future drainage conditions for the drainageway. Note that this study has not been approved and adopted by the county; however, for the sake of consistency the boundary conditions used in this report were followed in this existing conditions analysis. Existing flow rates from the Gieck Ranch Study were used as the basis for the design of the existing channel condition, with a flow of 1,017 cfs present within the drainageway.

GENERAL LOCATION AND DESCRIPTION

Location

Saddlehorn Ranch Filing No. 4, known as "Filing 4" from herein, is a parcel of land located in Section 3, Township 13 South, Range 64 West of the 6th Principal Meridian in El Paso County, Colorado. Filing 4 is a 179 acre, rural, single family-development, and is comprised of 42 single-family lots, and associated infrastructure. Filing 4 is bound to the north by Judge Orr Road & to the east by the East section line of Section 3 Township 13 south, Range 64 west of the 6th Principal Meridian. The existing West Fork Reach 7A Drainageway, known as "Reach 7A" from herein, is contained within Tract A of Filing 4 and is located in the northeast corner of the site. A vicinity map of the area is presented in Appendix A.

Description of Property

Filing 4 is currently unoccupied and undeveloped. The existing ground cover is sparse vegetation and open space, typical of a Colorado rolling rangeland condition. Existing topography of Filing 4 show a ridge running northwest to southeast, with the northeast section of Filing 4, draining to Reach 7A in existing conditions. Reach 7A is comprised of jurisdictional wetlands and is contained within Tract A & B of Filing 4.

Per an NRCS web soil survey of the area, the Filing 4 site is made up of Type A soils and Type D, with the vast majority of Reach 7A being comprised of Type D. Type A soils have a high infiltration rate when thoroughly wet. Type D soils have a very slow infiltration when thoroughly wet. A NRCS soil survey map has been presented in Appendix A.

Floodplain Statement

Based on the FEMA FIRM Map number 08041C0558G, dated December 7, 2018, Filing 4 lies within Zone A and Zone X. Zone A is defined as areas where no base flood elevation has been determined. Zone X is defined as area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. All proposed residential

development within Filing 4 will occur in Zone X. Reach 7A is located within zone A and has not been subject to study by FEMA, therefore, there is no established flood plain extents or elevations. The FIRM Map has been presented in Appendix A.

PREVIOUS GIECK RANCH STUDIES

Reach 7A is part of the Gieck Ranch Drainage Basin, which was analyzed as part of the "*Gieck Ranch Drainage Basin Planning Study*" prepared by Drexel, Barrell & Co, initially dated October 1 2007 and revised February 10, 2010.

The Gieck Ranch Drainage Basin covers approximately 22 square miles in unincorporated El Paso County, CO. The Gieck Ranch Drainage Basin is tributary to Black Squirrel Creek. In its existing condition, the basin is primarily comprised of undeveloped land with the exception Meridian Ranch Development located at the top of the basin. The Gieck Ranch Drainage Basin is comprised of rolling rangeland with fair vegetative cover associated with Colorado's semi-arid climate. The natural Drainageway within the site limits is typically shallow with gently sloping sides, with an undefined flow path just south of the Judge Orr crossing, but eventually forms a defined and deep section just before going offsite to the east. Flows generated from the development of Filing 4 will drain into Reach 7A after treatment in proposed water quality pond D, ensuring that runoff from Filing 4 does not exceed existing conditions.

Reach 7A of the Gieck Ranch West Fork Drainageway was also discussed in the Master Development Plan & Preliminary Drainage Report for Saddlehorn Ranch, prepared by JR Engineering.

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, October 2007 (Not adopted by El Paso County as of July 2019).
- Master Development Drainage Plan and Preliminary Drainage Report for Saddle Horn Ranch by JR Engineering, May 2020.

Based upon provided drainage maps and analysis, Gieck Ranch discharges a total of 1,017 cfs onto the site within Reach 7A. An existing 66" CMP and 36" CMP culverts convey the offsite flow across Judge Orr Road onto the site. The existing culverts at Judge Orr Road are undersized for existing and future flows, resulting in localized overtopping. The DBPS recommends the culvert be upsized to four –12' x 5' box culverts. The culvert will not be upsized within the context of this report and development. The culvert is owned by El Paso County and the County will control timing of the recommended improvements. The overtopping at the intersection of Reach 7A is not contained within the 100-year floodplain and extends further east then the anticipated crossing over Elbert Road. The limits of overtopping are presented in the Floodplain Map included in Appendix A

West of the Reach 7A & Judge Orr crossing is an additional drainageway that conveys a portion the flows developed within the adjacent Haegler Ranch Basin east into the Gieck Ranch Basin and to the Judge Orr Crossing. The 1,017 cfs flow presented in the DBPS accounts for these additional flows coming from the west.

Existing Crossing & Channel Analysis

Using the hydraulic data presented in the Gieck Ranch Drainage Basin Planning study, and existing site survey data and topography, JR Engineering performed a hydraulic analysis of Reach 7A and Judge Orr Crossing and the extent of Reach 7A located within the Filing 4 boundary. The findings of this analysis are presented below.

The GeoHecRas Model completed with this report yields results similar to what is presented in the Gieck Ranch DBPS. As stated in the Gieck Ranch DBPS the existing culvert crossings at Judge Orr Road are undersized and lead to significant overtopping of Judge Orr Road that then flows south onto the Filing 4 site. Based upon existing topography of the culverts and road crossing, the majority of flows present in Reach 7A are concentrated within the 36" culvert and overtop Judge Orr Road at this location. This differs from the flow path anticipated within the Gieck Ranch DBPS, which assumed flow concentration at the 66" culvert crossing, existing topographic shows this to be incorrect. According to existing site topography, flows are initial directed to the 66" culvert; however, this culvert is only able to pond to a depth of 1.10', after which water overflows east to the 36" culvert. Due to this limited ponding depth, the capacity of the 66" culvert is restricted to 1.70 cfs per GeoHecRas analysis. Due to the limitations of the 66" culvert, the majority of flows present in Reach 7A are conveyed through the 36" culvert located to the east. Water will pond for a depth of 4.75' before overtopping Judge Orr Road at its existing lowpoint elevation of 6725.20'. The 36" culvert conveys 70.07 cfs, with the remaining 945.23 cfs being conveyed via overtopping of Judge Orr Road, with an overtopping elevation of 6726.36'.

After overtopping Judge Orr Road, the flow present within Reach 7A flow south and are contained within the 100 year floodplain on the Filing 4 site. As this area was never subject to a hydraulic analysis, the assumed 100 yr floodplain are conservative and extends beyond resultant floodplain from the GeoHecRas model completed with this report. The reduction of the 100-year floodplain is shown in the Floodplain map included in Appendix A

DRAINAGE DESIGN CRITERIA

Development Criteria Reference

Storm drainage analysis techniques 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.

Hydrologic Criteria

The hydrologic analysis for this project is based on the *Gieck Ranch Drainage Basin Planning Study*. The flow rates for the 100-yr storm event were taken from Table 6.4 and Sheets 67 & 68 of this study. The Baseline Flows from the *Gieck Ranch Drainage Basin Planning Study* are included in Appendix C.

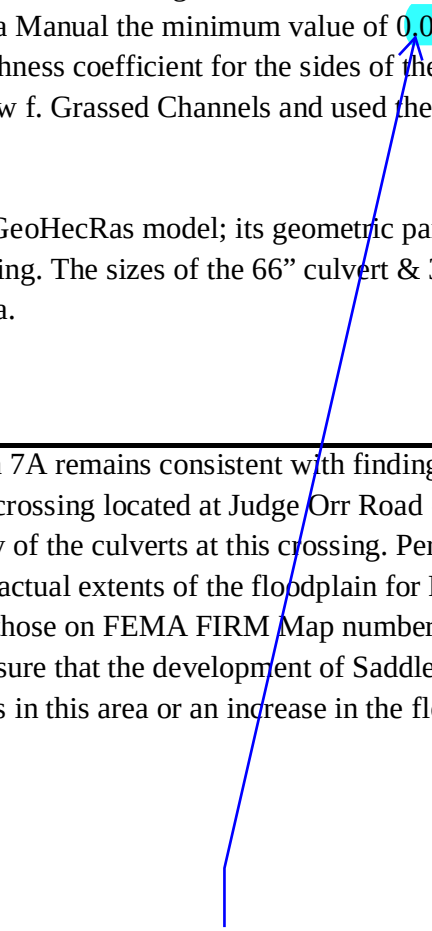
Hydraulic Criteria

GeoHecRas was used as the primary analysis method for the site. GeoHecRas was used to model the flows within the Reach 7A Drainageway. This model was used to verify flood plains and analyze the overtopping of Judge Orr Road. The 100-year water surface profiles for the model were analyzed from just north of Judge Orr Road to the eastern most property line of Tract A and the Filing 4 site. Hydraulic computations for the models are contained in Appendix B. In the model the value for the roughness coefficient (n) were based upon those shown in Table 10-2 of the El Paso County Drainage Criteria Manual, Volume 1. The manning's roughness coefficient for the bottom of the channel was categorized as a winding and sluggish channel with grass and some weeds present. Per Table 10-2 of the El Paso County Drainage Criteria Manual the minimum value of 0.025 was used for the bottom of the channel. The manning's roughness coefficient for the sides of the channel was categorized as a grassed channel per Table 10-2 row f. Grassed Channels and used the normal value of 0.040

The Judge Orr Road crossing was modeled in the GeoHecRas model; its geometric parameters were determined using survey obtained data to the crossing. The sizes of the 66" culvert & 36" culvert in the crossing were also determined from survey data.

SUMMARY

This analysis of the Gieck Ranch West Fork Reach 7A remains consistent with finding of the Gieck Ranch Drainage Basin Planning Study, in that the crossing located at Judge Orr Road overtops during a 100 year event due to insufficient capacity of the culverts at this crossing. Per the GeoHecRas model completed with this report, the actual extents of the floodplain for Reach 7A located on the Filing 4 site reduce as compared to those on FEMA FIRM Map number 08041C0558G. This reduced floodplain extents ensure that the development of Saddlehorn Filing 4 will result in no rise to the existing flood elevations in this area or an increase in the floodplain extents.

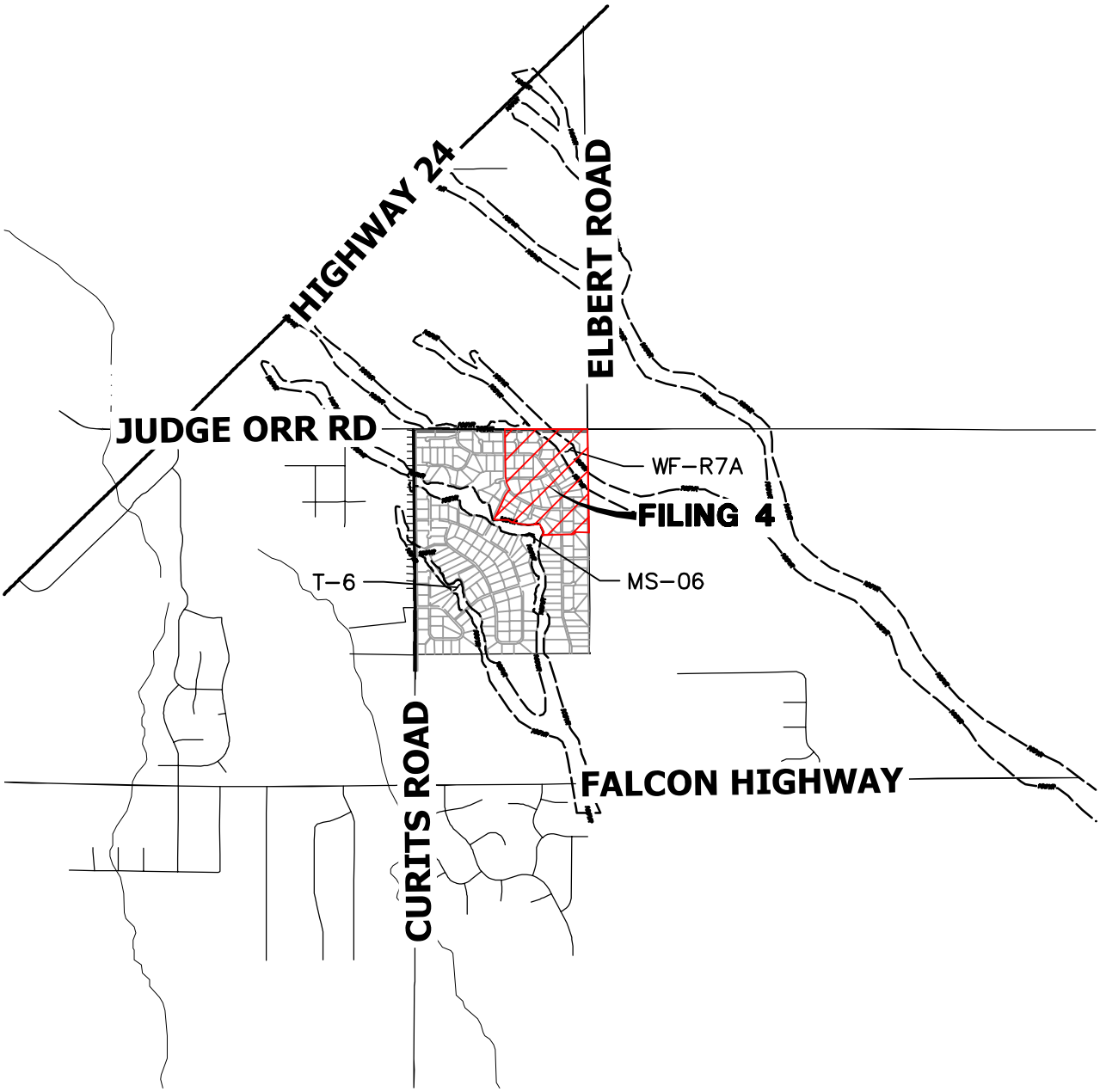


REFERENCES:

1. El Paso County Drainage Criteria Manual Volume 1, El Paso County, CO, 1994.
2. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, Latest Revision.
3. Gieck Ranch Drainage Basin Planning Study prepared by Drexel, Barrell & Co, 2007
4. Master Development Drainage Plan and Preliminary Drainage Report for Saddlehorn Ranch by JR Engineering, 2020.
5. FEMA FIRM Map number 08041C0558G, Federal Emergency Management Agency , 2018

APPENDIX A

FIGURES AND EXHIBITS



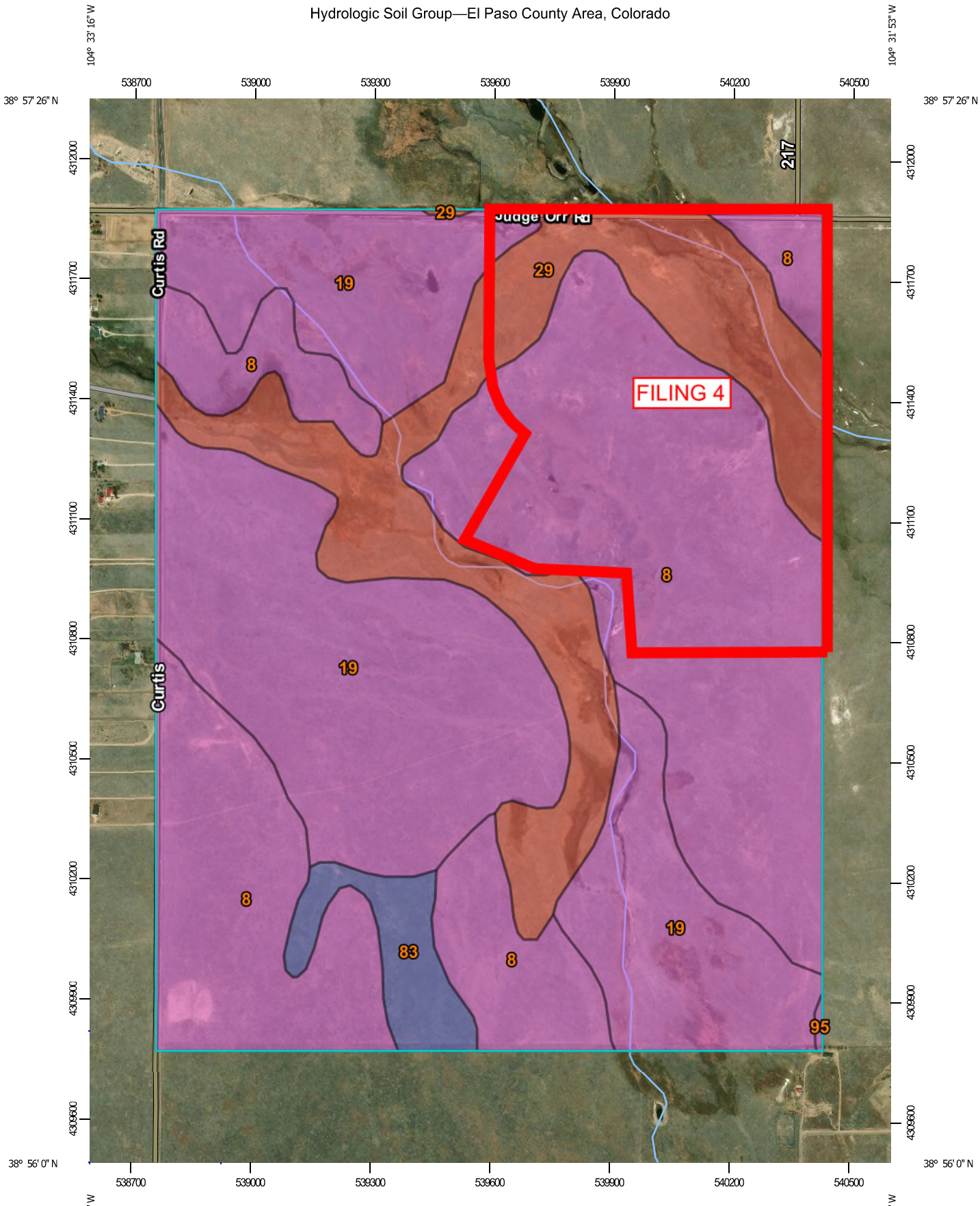
5000 2500 0 5000 10000

ORIGINAL SCALE: 1" = 5000'

VICINITY MAP
SADDLEHORN RANCH FILING 4
25142.06
2/11/22
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



Map Scale: 1:13,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 150 300 600 900

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 16, Sep 10, 2018

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

Date(s) aerial images were photographed: May 22, 2016—Aug 17, 2017

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	388.3	44.6%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	307.3	35.3%
29	Fluvaquentic Haplaquolls, nearly level	D	150.0	17.2%
83	Stapleton sandy loam, 3 to 8 percent slopes	B	24.6	2.8%
95	Truckton loamy sand, 1 to 9 percent slopes	A	0.6	0.1%
Totals for Area of Interest			**870.8**	**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

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 used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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

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

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

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

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

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

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

Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (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/.

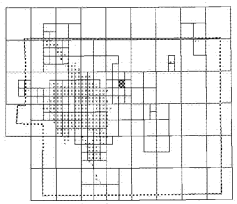
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

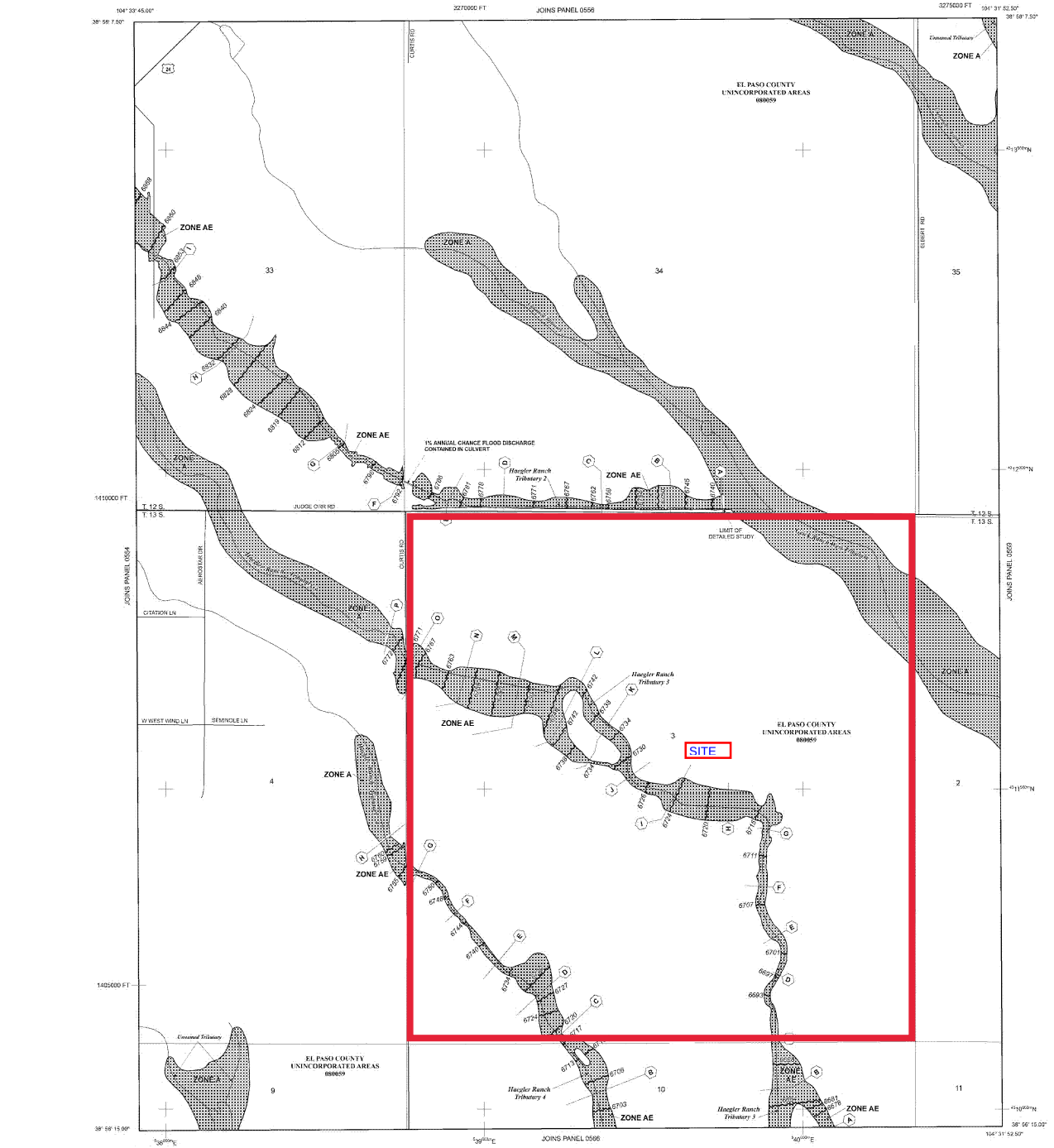
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

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)
4779000mN — 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

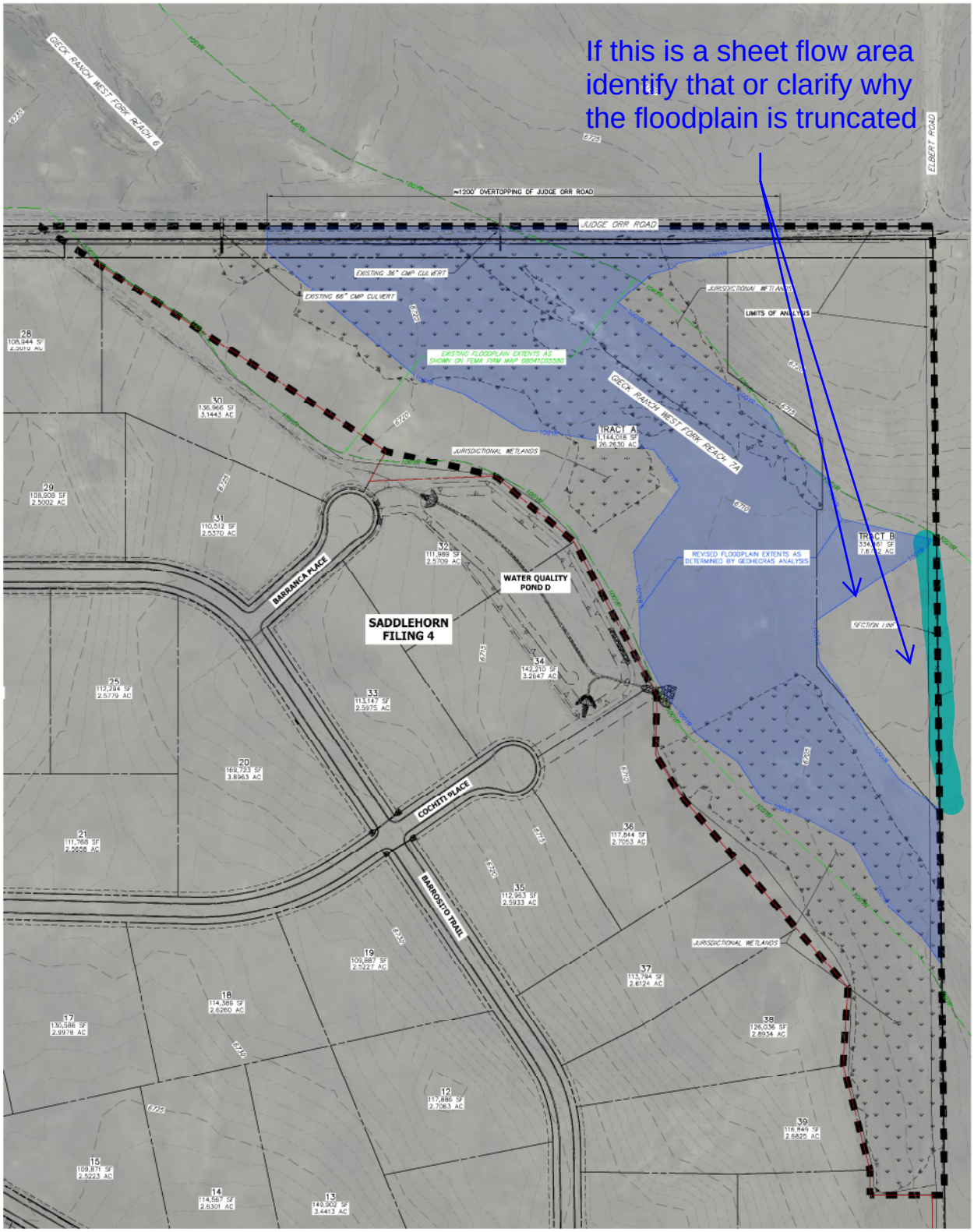
MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

SADDLEHORN RANCH - FILING 4

LOCATED IN SECTION 3
TOWNSHIP 13 SOUTH, RANGE 64 WEST OF THE 6TH P.M.,
EL PASO COUNTY, STATE OF COLORADO

FLOODPLAIN MAP



LEGEND

FEMA FLOODPLAIN BOUNDARY
MODEL FLOODPLAIN BOUNDARY
PROPERTY/TRACT LINES
LIMITS OF ANALYSIS

These are reversed

Also provide a working map and plan and profile

100 50 0 100 200
ORIGINAL SCALE: 1" = 100'

FLOODPLAIN MAP
SADDLEHORN RANCH – FILING 4
JOB NO. 25142.06
3/3/22
SHEET 1 OF 1

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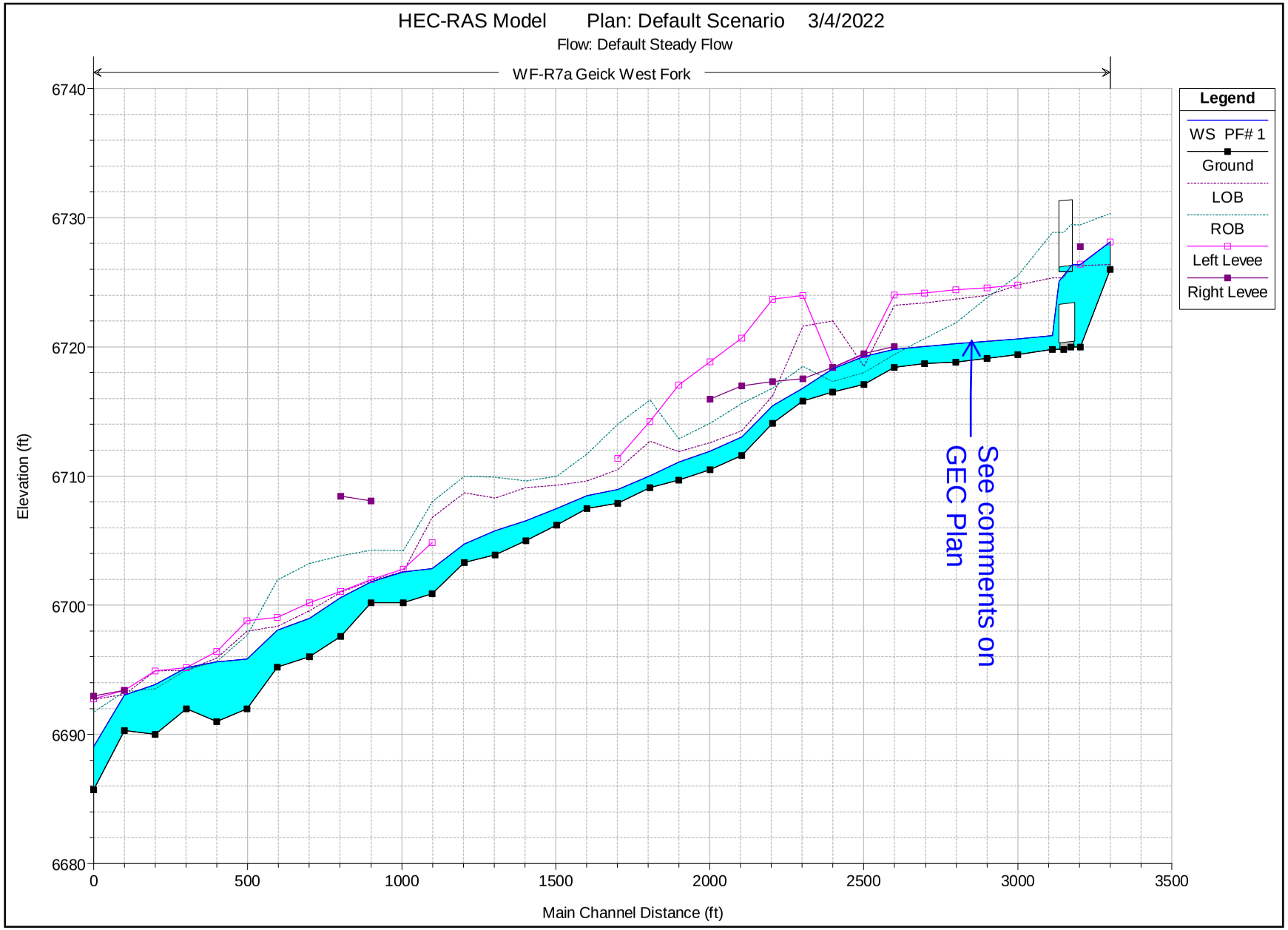
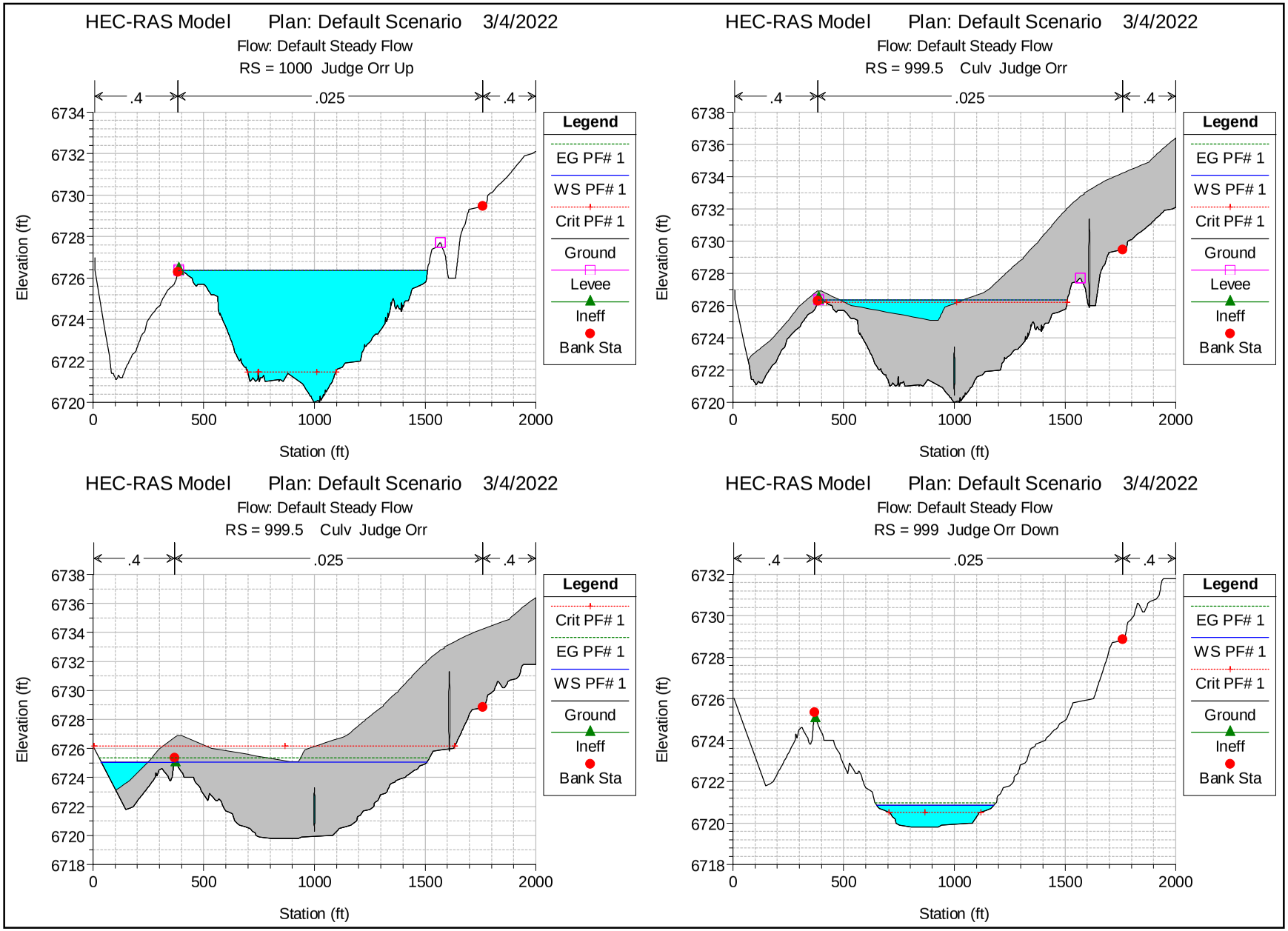
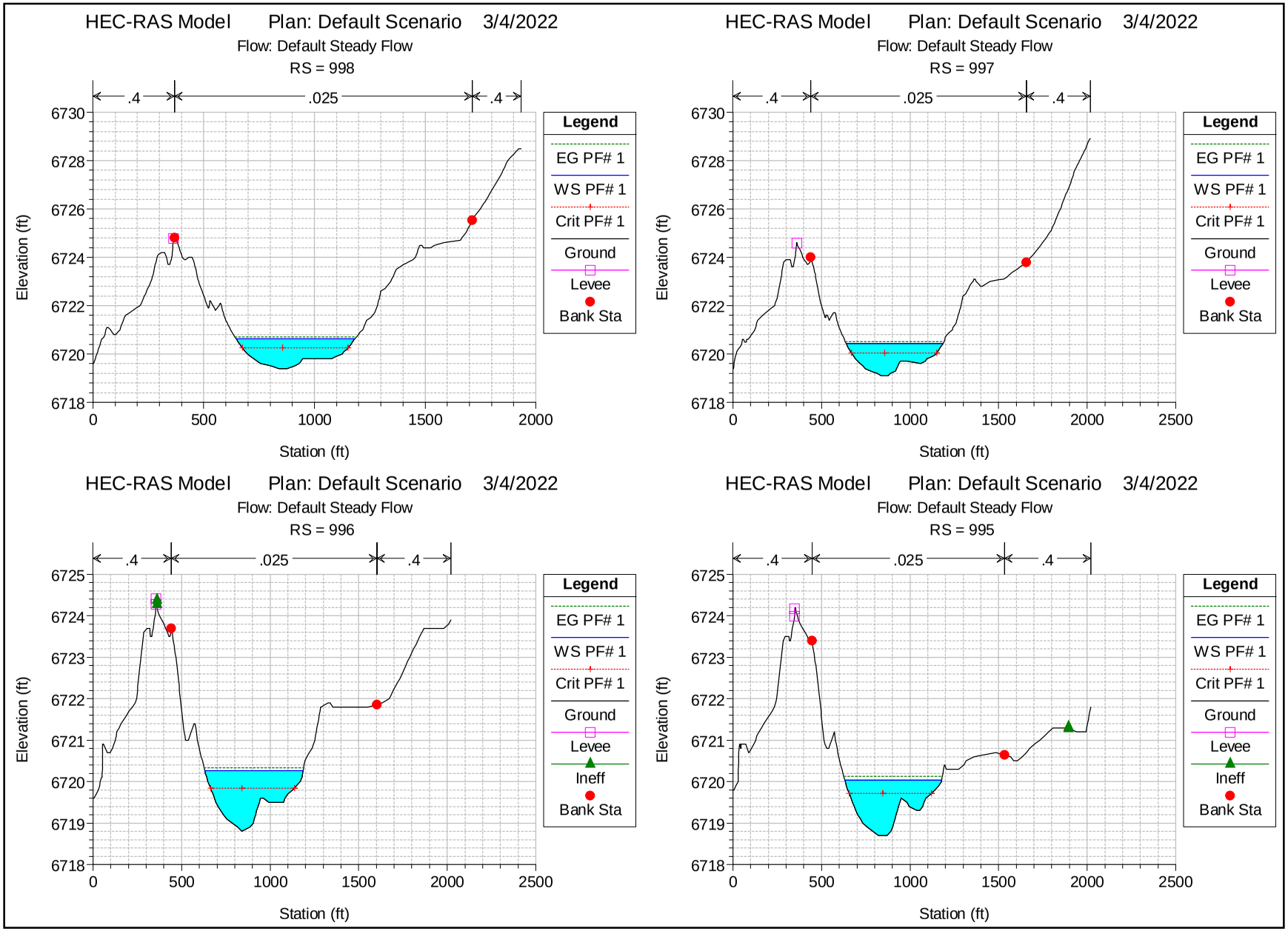
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

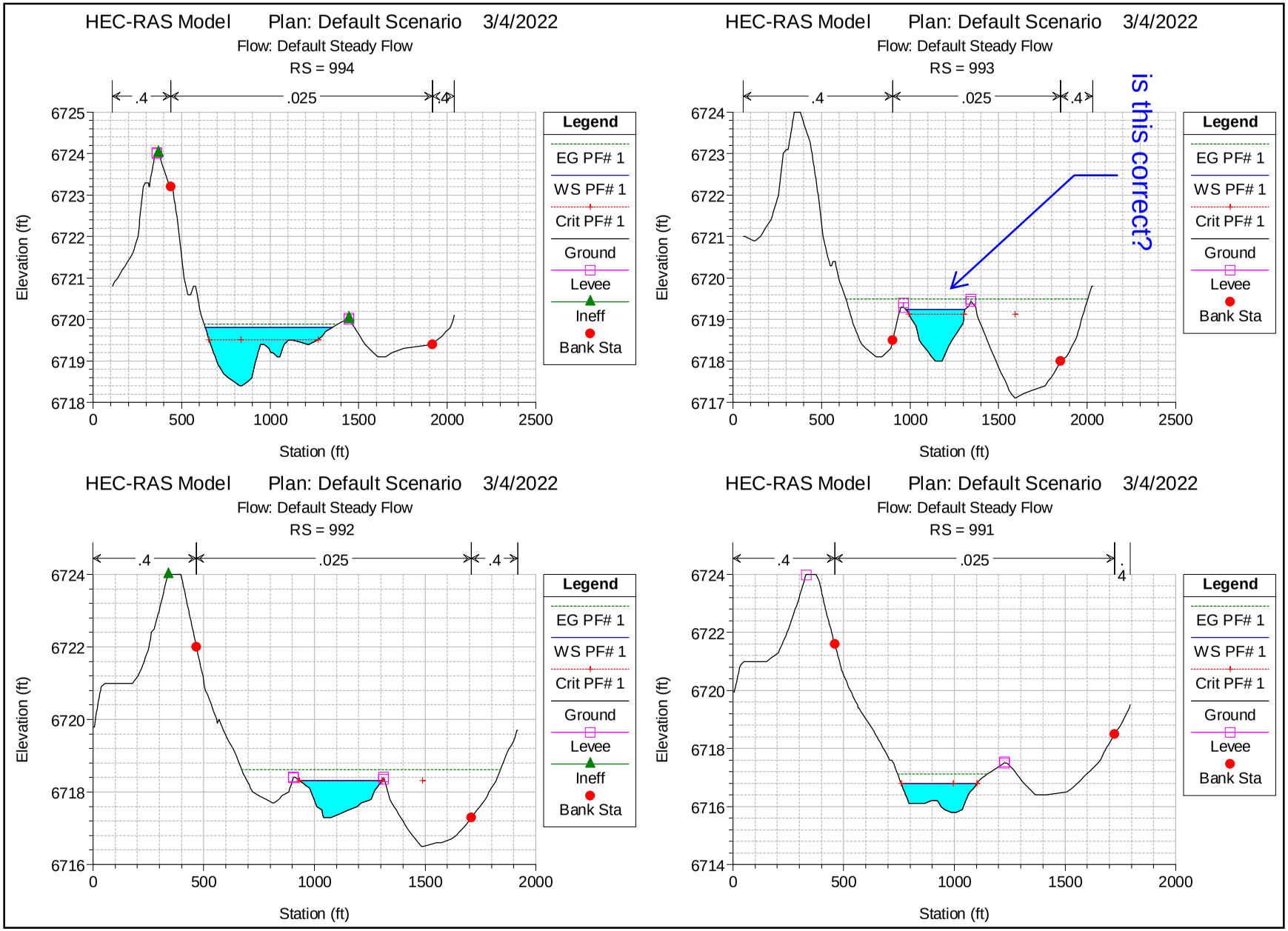
APPENDIX B

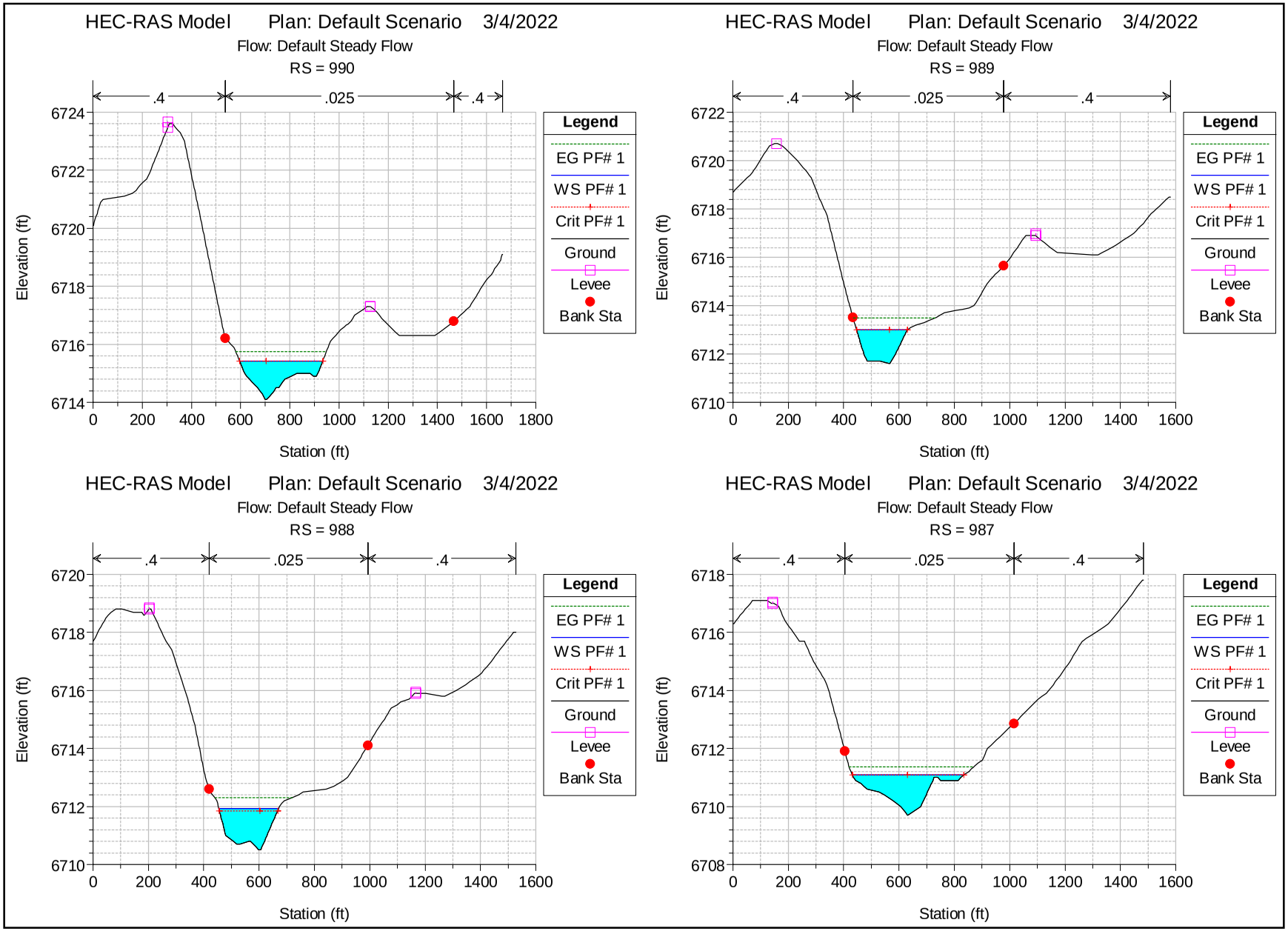
HYDRAULIC CALCULATIONS

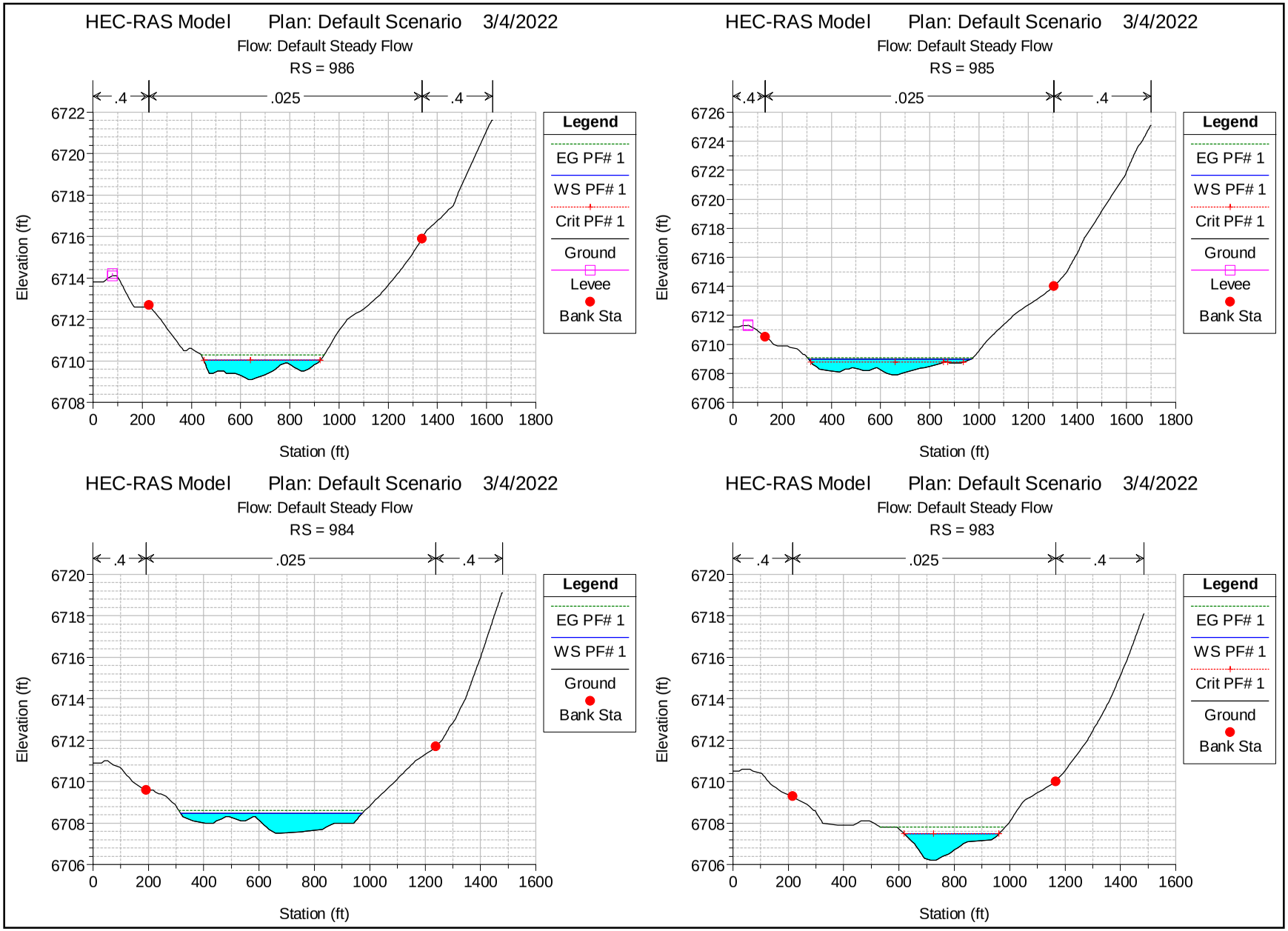

HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
WF-R7a Geick West Fork
Legend
WS PF# 1
Ground
LOB
ROB
Left Levee
Right Levee
See comments on GEC Plan
Elevation (ft)
Main Channel Distance (ft)
6740
6730
6720
6710
6700
6690
6680
0
500
1000
1500
2000
2500
3000
3500

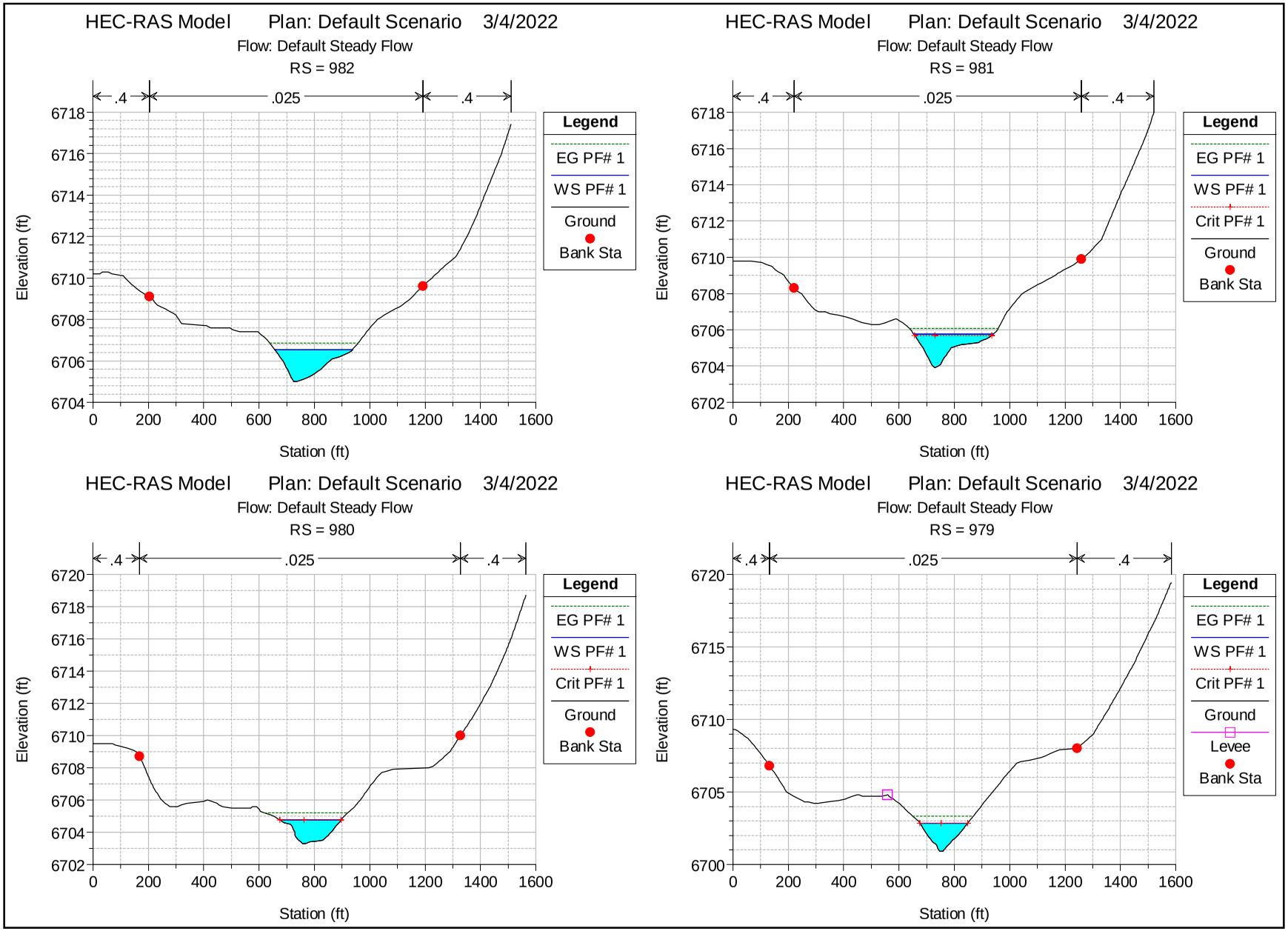

HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 1000 Judge Orr Up
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Ineff
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 999.5 Culv Judge Orr
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 999.5 Culv Judge Orr
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 999 Judge Orr Down

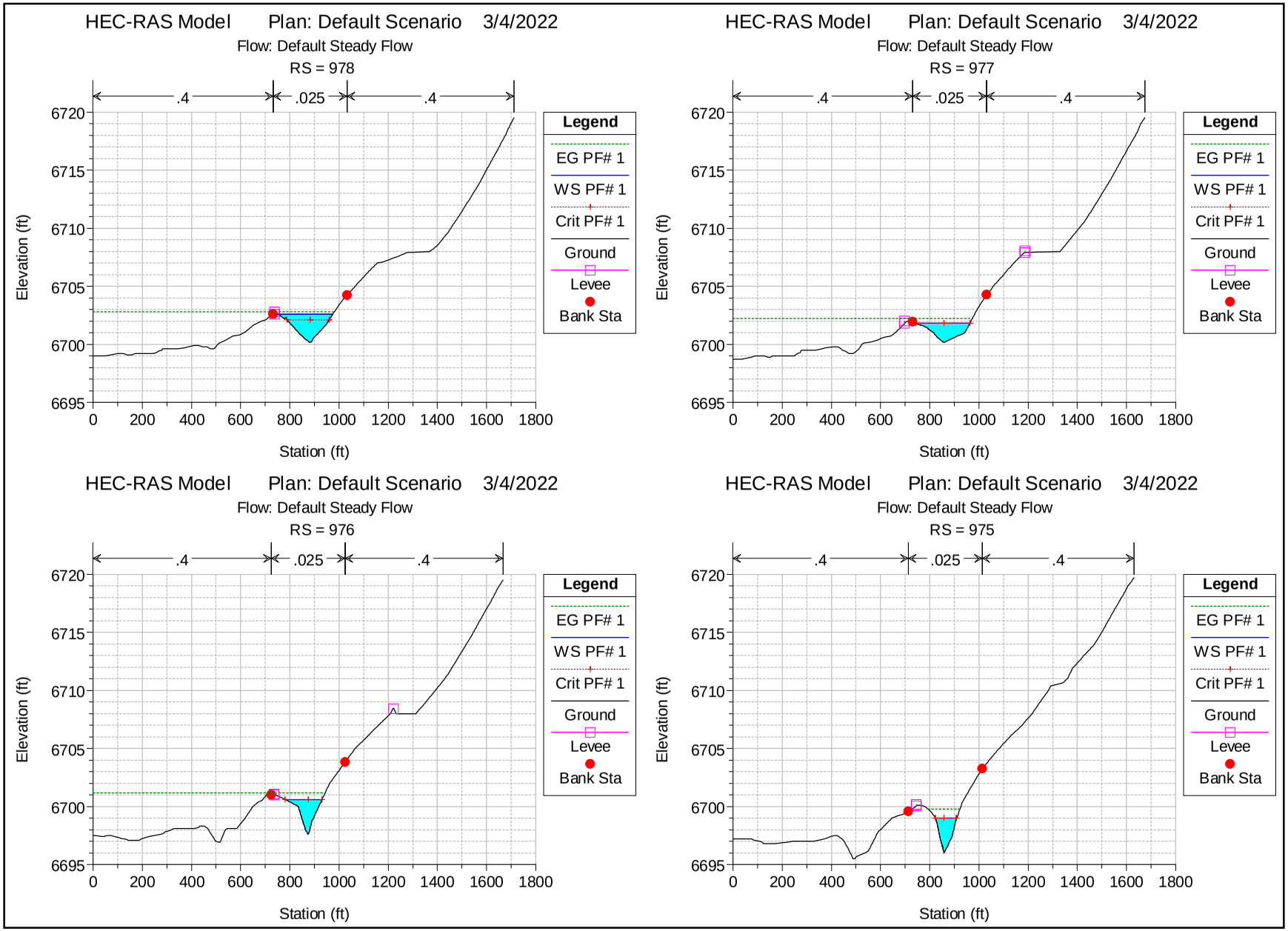

HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 998
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 997
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 996
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Ineff
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 995
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Ineff
Bank Sta


HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 994
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Ineff
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 993
is this correct?
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 992
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 991


HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 990
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 989
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 988
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 987
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Bank Sta


HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 986
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 985
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 984
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 983
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Bank Sta


HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 982
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 981
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 980
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 979
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Bank Sta


HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 978
.4
.025
.4
Elevation (ft)
Station (ft)
Legend
EG PF# 1
WS PF# 1
Crit PF# 1
Ground
Levee
Bank Sta
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 977
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 976
HEC-RAS Model Plan: Default Scenario 3/4/2022
Flow: Default Steady Flow
RS = 975

HEC-RAS Plan: Default Scenario River: WF-R7a Reach: Geick West Fork Profile: PF# 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Geick West Fork	1001	PF# 1	1017.00	6726.00	6728.13	6728.13	6728.60	0.012973	5.96	438.12	397.94	1.16
Geick West Fork	1000 Judge Orr Up	PF# 1	1017.00	6720.00	6726.37	6721.47	6726.37	0.000004	0.26	3889.42	1111.97	0.02
Geick West Fork	999.5 Judge Orr		Culvert									
Geick West Fork	999 Judge Orr Down	PF# 1	1017.00	6719.80	6720.87	6720.52	6720.96	0.002576	2.52	403.97	529.88	0.51
Geick West Fork	998	PF# 1	1017.00	6719.40	6720.63	6720.25	6720.71	0.001945	2.30	441.84	536.92	0.45
Geick West Fork	997	PF# 1	1017.00	6719.10	6720.44	6720.04	6720.52	0.001859	2.26	450.68	545.49	0.44
Geick West Fork	996	PF# 1	1017.00	6718.80	6720.26	6719.85	6720.33	0.001676	2.17	467.93	554.33	0.42
Geick West Fork	995	PF# 1	1017.00	6718.70	6720.04	6719.72	6720.13	0.002459	2.45	414.93	547.12	0.50
Geick West Fork	994	PF# 1	1017.00	6718.40	6719.81	6719.52	6719.89	0.002406	2.18	465.67	718.13	0.48
Geick West Fork	993	PF# 1	1017.00	6717.10	6719.24	6719.13	6719.50	0.006808	4.05	251.34	335.22	0.82
Geick West Fork	992	PF# 1	1017.00	6716.50	6718.31	6718.31	6718.62	0.010988	4.47	227.47	374.18	1.01
Geick West Fork	991	PF# 1	1017.00	6715.80	6716.80	6716.80	6717.11	0.009872	4.48	227.07	343.78	0.97
Geick West Fork	990	PF# 1	1017.00	6714.10	6715.43	6715.43	6715.75	0.010075	4.54	224.20	338.15	0.98
Geick West Fork	989	PF# 1	1017.00	6711.60	6713.01	6713.01	6713.49	0.008936	5.58	182.30	184.22	0.99
Geick West Fork	988	PF# 1	1017.00	6710.50	6711.92	6711.85	6712.30	0.007314	4.93	206.25	215.85	0.89
Geick West Fork	987	PF# 1	1017.00	6709.70	6711.08	6711.08	6711.37	0.011058	4.35	233.78	402.60	1.01
Geick West Fork	986	PF# 1	1017.00	6709.10	6710.03	6710.03	6710.29	0.011722	4.15	245.02	473.01	1.02
Geick West Fork	985	PF# 1	1017.00	6707.90	6708.96	6708.77	6709.06	0.003673	2.57	396.30	659.07	0.58
Geick West Fork	984	PF# 1	1017.00	6707.50	6708.46		6708.60	0.006037	2.99	340.66	655.36	0.73
Geick West Fork	983	PF# 1	1017.00	6706.20	6707.48	6707.48	6707.81	0.010728	4.60	221.33	343.22	1.01
Geick West Fork	982	PF# 1	1017.00	6705.00	6706.55		6706.86	0.007584	4.48	226.93	281.65	0.88
Geick West Fork	981	PF# 1	1017.00	6703.90	6705.78	6705.69	6706.09	0.007768	4.47	227.46	288.41	0.89
Geick West Fork	980	PF# 1	1017.00	6703.30	6704.76	6704.76	6705.20	0.009771	5.33	190.89	221.02	1.01
Geick West Fork	979	PF# 1	1017.00	6700.90	6702.85	6702.83	6703.33	0.008365	5.60	181.64	173.74	0.97
Geick West Fork	978	PF# 1	1017.00	6700.20	6702.59	6702.12	6702.81	0.003102	3.74	271.90	226.33	0.60
Geick West Fork	977	PF# 1	1017.00	6700.20	6701.81	6701.81	6702.25	0.009728	5.35	190.07	217.93	1.01
Geick West Fork	976	PF# 1	1017.00	6697.60	6700.61	6700.61	6701.16	0.008512	5.96	170.59	150.32	0.99
Geick West Fork	975	PF# 1	1017.00	6696.00	6698.99	6698.99	6699.80	0.007457	7.21	141.14	84.57	0.98
Geick West Fork	974	PF# 1	1017.00	6695.20	6698.07	6698.07	6698.78	0.007976	6.74	150.91	105.32	0.99
Geick West Fork	973	PF# 1	1017.00	6692.00	6695.85	6695.85	6696.94	0.006901	8.40	121.05	53.73	0.99
Geick West Fork	972	PF# 1	1017.00	6691.00	6695.63	6694.53	6695.92	0.002960	4.30	236.97	163.36	0.61
Geick West Fork	971	PF# 1	1017.00	6692.00	6695.17	6695.17	6695.46	0.008554	4.44	381.90	519.60	0.92
Geick West Fork	970	PF# 1	1017.00	6690.00	6693.86	6693.58	6694.08	0.003757	3.80	413.50	498.11	0.65
Geick West Fork	969	PF# 1	1017.00	6690.30	6693.04	6693.04	6693.50	0.009005	5.45	186.44	195.90	0.99
Geick West Fork	968	PF# 1	1017.00	6685.70	6689.07	6689.07	6690.21	0.006986	8.59	118.37	51.34	1.00

Many of these sections show supercritical flows. Detailed analysis and need for stabilization needs to be addressed.

Plan: Default Scenario WF-R7a Geick West Fork RS: 1000 Profile: PF# 1

E.G. Elev (ft)	6726.37	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.025	
W.S. Elev (ft)	6726.37	Reach Len. (ft)	90.00	90.00	90.00
Crit W.S. (ft)	6721.47	Flow Area (sq ft)		3889.42	
E.G. Slope (ft/ft)	0.000004	Area (sq ft)		3889.42	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	1111.97	Top Width (ft)		1111.97	
Vel Total (ft/s)	0.26	Avg. Vel. (ft/s)		0.26	
Max Chl Dpth (ft)	6.37	Hydr. Depth (ft)		3.50	
Conv. Total (cfs)	532333.1	Conv. (cfs)		532333.1	
Length Wtd. (ft)	90.00	Wetted Per. (ft)		1113.07	
Min Ch El (ft)	6720.00	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.37	21.52	0.36
C & E Loss (ft)		Cum SA (acres)	0.45	25.28	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 999 Profile: PF# 1

E.G. Elev (ft)	6720.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.		0.025	
W.S. Elev (ft)	6720.87	Reach Len. (ft)	112.62	112.62	112.62
Crit W.S. (ft)	6720.52	Flow Area (sq ft)		403.97	
E.G. Slope (ft/ft)	0.002576	Area (sq ft)		403.97	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	529.88	Top Width (ft)		529.88	
Vel Total (ft/s)	2.52	Avg. Vel. (ft/s)		2.52	
Max Chl Dpth (ft)	1.07	Hydr. Depth (ft)		0.76	
Conv. Total (cfs)	20037.4	Conv. (cfs)		20037.4	
Length Wtd. (ft)	112.62	Wetted Per. (ft)		529.89	
Min Ch El (ft)	6719.80	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)		0.31	
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	0.37	18.56	0.36
C & E Loss (ft)	0.00	Cum SA (acres)	0.45	23.58	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 998 Profile: PF# 1

E.G. Elev (ft)	6720.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.		0.025	
W.S. Elev (ft)	6720.63	Reach Len. (ft)	100.48	100.48	100.48
Crit W.S. (ft)	6720.25	Flow Area (sq ft)		441.84	
E.G. Slope (ft/ft)	0.001945	Area (sq ft)		441.84	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	536.92	Top Width (ft)		536.92	
Vel Total (ft/s)	2.30	Avg. Vel. (ft/s)		2.30	
Max Chl Dpth (ft)	1.23	Hydr. Depth (ft)		0.82	
Conv. Total (cfs)	23061.2	Conv. (cfs)		23061.2	
Length Wtd. (ft)	100.48	Wetted Per. (ft)		536.93	
Min Ch El (ft)	6719.40	Shear (lb/sq ft)		0.10	
Alpha	1.00	Stream Power (lb/ft s)		0.23	
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.37	17.47	0.36
C & E Loss (ft)	0.00	Cum SA (acres)	0.45	22.20	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 997 Profile: PF# 1

E.G. Elev (ft)	6720.52	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.		0.025	
W.S. Elev (ft)	6720.44	Reach Len. (ft)	101.19	101.19	101.19
Crit W.S. (ft)	6720.04	Flow Area (sq ft)		450.68	
E.G. Slope (ft/ft)	0.001859	Area (sq ft)		450.68	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	545.49	Top Width (ft)		545.49	
Vel Total (ft/s)	2.26	Avg. Vel. (ft/s)		2.26	
Max Chl Dpth (ft)	1.34	Hydr. Depth (ft)		0.83	
Conv. Total (cfs)	23585.0	Conv. (cfs)		23585.0	
Length Wtd. (ft)	101.19	Wetted Per. (ft)		545.50	
Min Ch El (ft)	6719.10	Shear (lb/sq ft)		0.10	
Alpha	1.00	Stream Power (lb/ft s)		0.22	
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	0.37	16.44	0.36
C & E Loss (ft)	0.00	Cum SA (acres)	0.45	20.95	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 996 Profile: PF# 1

E.G. Elev (ft)	6720.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.025	
W.S. Elev (ft)	6720.26	Reach Len. (ft)	102.08	102.08	102.08
Crit W.S. (ft)	6719.85	Flow Area (sq ft)		467.93	
E.G. Slope (ft/ft)	0.001676	Area (sq ft)		467.93	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	554.33	Top Width (ft)		554.33	
Vel Total (ft/s)	2.17	Avg. Vel. (ft/s)		2.17	
Max Chl Dpth (ft)	1.46	Hydr. Depth (ft)		0.84	
Conv. Total (cfs)	24841.2	Conv. (cfs)		24841.2	
Length Wtd. (ft)	102.08	Wetted Per. (ft)		554.35	
Min Ch El (ft)	6718.80	Shear (lb/sq ft)		0.09	
Alpha	1.00	Stream Power (lb/ft s)		0.19	
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.37	15.37	0.36
C & E Loss (ft)	0.00	Cum SA (acres)	0.45	19.68	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 995 Profile: PF# 1

E.G. Elev (ft)	6720.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.		0.025	
W.S. Elev (ft)	6720.04	Reach Len. (ft)	97.18	97.18	97.18
Crit W.S. (ft)	6719.72	Flow Area (sq ft)		414.93	
E.G. Slope (ft/ft)	0.002459	Area (sq ft)		414.93	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	547.12	Top Width (ft)		547.12	
Vel Total (ft/s)	2.45	Avg. Vel. (ft/s)		2.45	
Max Chl Dpth (ft)	1.33	Hydr. Depth (ft)		0.76	
Conv. Total (cfs)	20509.2	Conv. (cfs)		20509.2	
Length Wtd. (ft)	97.18	Wetted Per. (ft)		547.13	
Min Ch El (ft)	6718.70	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)		0.29	
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.37	14.34	0.36
C & E Loss (ft)	0.01	Cum SA (acres)	0.45	18.38	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 994 Profile: PF# 1

E.G. Elev (ft)	6719.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.025	
W.S. Elev (ft)	6719.81	Reach Len. (ft)	98.17	98.17	98.17
Crit W.S. (ft)	6719.52	Flow Area (sq ft)		465.67	
E.G. Slope (ft/ft)	0.002406	Area (sq ft)		465.67	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	718.13	Top Width (ft)		718.13	
Vel Total (ft/s)	2.18	Avg. Vel. (ft/s)		2.18	
Max Chl Dpth (ft)	1.41	Hydr. Depth (ft)		0.65	
Conv. Total (cfs)	20735.0	Conv. (cfs)		20735.0	
Length Wtd. (ft)	98.17	Wetted Per. (ft)		718.15	
Min Ch El (ft)	6718.40	Shear (lb/sq ft)		0.10	
Alpha	1.00	Stream Power (lb/ft s)		0.21	
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	0.37	13.36	0.36
C & E Loss (ft)	0.02	Cum SA (acres)	0.45	16.97	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 993 Profile: PF# 1

E.G. Elev (ft)	6719.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.		0.025	
W.S. Elev (ft)	6719.24	Reach Len. (ft)	102.47	102.47	102.47
Crit W.S. (ft)	6719.13	Flow Area (sq ft)		251.34	
E.G. Slope (ft/ft)	0.006808	Area (sq ft)		251.34	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	335.22	Top Width (ft)		335.22	
Vel Total (ft/s)	4.05	Avg. Vel. (ft/s)		4.05	
Max Chl Dpth (ft)	2.14	Hydr. Depth (ft)		0.75	
Conv. Total (cfs)	12325.8	Conv. (cfs)		12325.8	
Length Wtd. (ft)	102.47	Wetted Per. (ft)		335.35	
Min Ch El (ft)	6717.10	Shear (lb/sq ft)		0.32	
Alpha	1.00	Stream Power (lb/ft s)		1.29	
Frctn Loss (ft)	0.87	Cum Volume (acre-ft)	0.37	12.55	0.36
C & E Loss (ft)	0.01	Cum SA (acres)	0.45	15.79	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 992 Profile: PF# 1

E.G. Elev (ft)	6718.62	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.31	Wt. n-Val.		0.025	
W.S. Elev (ft)	6718.31	Reach Len. (ft)	96.67	96.67	96.67
Crit W.S. (ft)	6718.31	Flow Area (sq ft)		227.47	
E.G. Slope (ft/ft)	0.010988	Area (sq ft)		227.47	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	374.18	Top Width (ft)		374.18	
Vel Total (ft/s)	4.47	Avg. Vel. (ft/s)		4.47	
Max Chl Dpth (ft)	1.81	Hydr. Depth (ft)		0.61	
Conv. Total (cfs)	9702.1	Conv. (cfs)		9702.1	
Length Wtd. (ft)	96.67	Wetted Per. (ft)		374.19	
Min Ch El (ft)	6716.50	Shear (lb/sq ft)		0.42	
Alpha	1.00	Stream Power (lb/ft s)		1.86	
Frctn Loss (ft)	1.01	Cum Volume (acre-ft)	0.37	11.99	0.36
C & E Loss (ft)	0.00	Cum SA (acres)	0.45	14.95	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 991 Profile: PF# 1

E.G. Elev (ft)	6717.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.31	Wt. n-Val.		0.025	
W.S. Elev (ft)	6716.80	Reach Len. (ft)	98.00	98.00	98.00
Crit W.S. (ft)	6716.80	Flow Area (sq ft)		227.07	
E.G. Slope (ft/ft)	0.009872	Area (sq ft)		227.07	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	343.78	Top Width (ft)		343.78	
Vel Total (ft/s)	4.48	Avg. Vel. (ft/s)		4.48	
Max Chl Dpth (ft)	1.00	Hydr. Depth (ft)		0.66	
Conv. Total (cfs)	10235.9	Conv. (cfs)		10235.9	
Length Wtd. (ft)	98.00	Wetted Per. (ft)		343.79	
Min Ch El (ft)	6715.80	Shear (lb/sq ft)		0.41	
Alpha	1.00	Stream Power (lb/ft s)		1.82	
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)	0.37	11.48	0.36
C & E Loss (ft)	0.00	Cum SA (acres)	0.45	14.16	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 990 Profile: PF# 1

E.G. Elev (ft)	6715.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.32	Wt. n-Val.		0.025	
W.S. Elev (ft)	6715.43	Reach Len. (ft)	100.30	100.30	100.30
Crit W.S. (ft)	6715.43	Flow Area (sq ft)		224.20	
E.G. Slope (ft/ft)	0.010075	Area (sq ft)		224.20	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	338.15	Top Width (ft)		338.15	
Vel Total (ft/s)	4.54	Avg. Vel. (ft/s)		4.54	
Max Chl Dpth (ft)	1.33	Hydr. Depth (ft)		0.66	
Conv. Total (cfs)	10132.1	Conv. (cfs)		10132.1	
Length Wtd. (ft)	100.30	Wetted Per. (ft)		338.17	
Min Ch El (ft)	6714.10	Shear (lb/sq ft)		0.42	
Alpha	1.00	Stream Power (lb/ft s)		1.89	
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)	0.37	10.97	0.36
C & E Loss (ft)	0.02	Cum SA (acres)	0.45	13.39	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 989 Profile: PF# 1

E.G. Elev (ft)	6713.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.48	Wt. n-Val.		0.025	
W.S. Elev (ft)	6713.01	Reach Len. (ft)	102.23	102.23	102.23
Crit W.S. (ft)	6713.01	Flow Area (sq ft)		182.30	
E.G. Slope (ft/ft)	0.008936	Area (sq ft)		182.30	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	184.22	Top Width (ft)		184.22	
Vel Total (ft/s)	5.58	Avg. Vel. (ft/s)		5.58	
Max Chl Dpth (ft)	1.41	Hydr. Depth (ft)		0.99	
Conv. Total (cfs)	10758.7	Conv. (cfs)		10758.7	
Length Wtd. (ft)	102.23	Wetted Per. (ft)		184.26	
Min Ch El (ft)	6711.60	Shear (lb/sq ft)		0.55	
Alpha	1.00	Stream Power (lb/ft s)		3.08	
Frctn Loss (ft)	0.82	Cum Volume (acre-ft)	0.37	10.51	0.36
C & E Loss (ft)	0.03	Cum SA (acres)	0.45	12.79	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 988 Profile: PF# 1

E.G. Elev (ft)	6712.30	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.38	Wt. n-Val.		0.025	
W.S. Elev (ft)	6711.92	Reach Len. (ft)	101.87	101.87	101.87
Crit W.S. (ft)	6711.85	Flow Area (sq ft)		206.25	
E.G. Slope (ft/ft)	0.007314	Area (sq ft)		206.25	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	215.85	Top Width (ft)		215.85	
Vel Total (ft/s)	4.93	Avg. Vel. (ft/s)		4.93	
Max Chl Dpth (ft)	1.42	Hydr. Depth (ft)		0.96	
Conv. Total (cfs)	11891.9	Conv. (cfs)		11891.9	
Length Wtd. (ft)	101.87	Wetted Per. (ft)		215.88	
Min Ch El (ft)	6710.50	Shear (lb/sq ft)		0.44	
Alpha	1.00	Stream Power (lb/ft s)		2.15	
Frctn Loss (ft)	0.91	Cum Volume (acre-ft)	0.37	10.05	0.36
C & E Loss (ft)	0.03	Cum SA (acres)	0.45	12.32	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 987 Profile: PF# 1

E.G. Elev (ft)	6711.37	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.		0.025	
W.S. Elev (ft)	6711.08	Reach Len. (ft)	93.65	93.65	93.65
Crit W.S. (ft)	6711.08	Flow Area (sq ft)		233.78	
E.G. Slope (ft/ft)	0.011058	Area (sq ft)		233.78	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	402.60	Top Width (ft)		402.60	
Vel Total (ft/s)	4.35	Avg. Vel. (ft/s)		4.35	
Max Chl Dpth (ft)	1.38	Hydr. Depth (ft)		0.58	
Conv. Total (cfs)	9671.1	Conv. (cfs)		9671.1	
Length Wtd. (ft)		Wetted Per. (ft)		402.62	
Min Ch El (ft)	6709.70	Shear (lb/sq ft)		0.40	
Alpha	1.00	Stream Power (lb/ft s)		1.74	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.37	9.54	0.36
C & E Loss (ft)		Cum SA (acres)	0.45	11.59	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 986 Profile: PF# 1

E.G. Elev (ft)	6710.29	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.27	Wt. n-Val.		0.025	
W.S. Elev (ft)	6710.03	Reach Len. (ft)	105.38	105.38	105.38
Crit W.S. (ft)	6710.03	Flow Area (sq ft)		245.02	
E.G. Slope (ft/ft)	0.011722	Area (sq ft)		245.02	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	473.01	Top Width (ft)		473.01	
Vel Total (ft/s)	4.15	Avg. Vel. (ft/s)		4.15	
Max Chl Dpth (ft)	0.93	Hydr. Depth (ft)		0.52	
Conv. Total (cfs)	9393.2	Conv. (cfs)		9393.2	
Length Wtd. (ft)	105.38	Wetted Per. (ft)		473.03	
Min Ch El (ft)	6709.10	Shear (lb/sq ft)		0.38	
Alpha	1.00	Stream Power (lb/ft s)		1.57	
Frctn Loss (ft)	0.64	Cum Volume (acre-ft)	0.37	9.02	0.36
C & E Loss (ft)	0.05	Cum SA (acres)	0.45	10.65	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 985 Profile: PF# 1

E.G. Elev (ft)	6709.06	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.		0.025	
W.S. Elev (ft)	6708.96	Reach Len. (ft)	99.38	99.38	99.38
Crit W.S. (ft)	6708.77	Flow Area (sq ft)		396.30	
E.G. Slope (ft/ft)	0.003673	Area (sq ft)		396.30	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	659.07	Top Width (ft)		659.07	
Vel Total (ft/s)	2.57	Avg. Vel. (ft/s)		2.57	
Max Chl Dpth (ft)	1.06	Hydr. Depth (ft)		0.60	
Conv. Total (cfs)	16780.2	Conv. (cfs)		16780.2	
Length Wtd. (ft)	99.38	Wetted Per. (ft)		659.08	
Min Ch El (ft)	6707.90	Shear (lb/sq ft)		0.14	
Alpha	1.00	Stream Power (lb/ft s)		0.35	
Frctn Loss (ft)	0.46	Cum Volume (acre-ft)	0.37	8.24	0.36
C & E Loss (ft)	0.00	Cum SA (acres)	0.45	9.28	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 984 Profile: PF# 1

E.G. Elev (ft)	6708.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.		0.025	
W.S. Elev (ft)	6708.46	Reach Len. (ft)	98.39	98.39	98.39
Crit W.S. (ft)		Flow Area (sq ft)		340.66	
E.G. Slope (ft/ft)	0.006037	Area (sq ft)		340.66	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	655.36	Top Width (ft)		655.36	
Vel Total (ft/s)	2.99	Avg. Vel. (ft/s)		2.99	
Max Chl Dpth (ft)	0.96	Hydr. Depth (ft)		0.52	
Conv. Total (cfs)	13089.5	Conv. (cfs)		13089.5	
Length Wtd. (ft)	98.39	Wetted Per. (ft)		655.37	
Min Ch El (ft)	6707.50	Shear (lb/sq ft)		0.20	
Alpha	1.00	Stream Power (lb/ft s)		0.58	
Frctn Loss (ft)	0.78	Cum Volume (acre-ft)	0.37	7.40	0.36
C & E Loss (ft)	0.02	Cum SA (acres)	0.45	7.78	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 983 Profile: PF# 1

E.G. Elev (ft)	6707.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.33	Wt. n-Val.		0.025	
W.S. Elev (ft)	6707.48	Reach Len. (ft)	100.09	100.09	100.09
Crit W.S. (ft)	6707.48	Flow Area (sq ft)		221.33	
E.G. Slope (ft/ft)	0.010728	Area (sq ft)		221.33	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	343.22	Top Width (ft)		343.22	
Vel Total (ft/s)	4.60	Avg. Vel. (ft/s)		4.60	
Max Chl Dpth (ft)	1.28	Hydr. Depth (ft)		0.64	
Conv. Total (cfs)	9818.8	Conv. (cfs)		9818.8	
Length Wtd. (ft)	100.09	Wetted Per. (ft)		343.23	
Min Ch El (ft)	6706.20	Shear (lb/sq ft)		0.43	
Alpha	1.00	Stream Power (lb/ft s)		1.98	
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	0.37	6.77	0.36
C & E Loss (ft)	0.00	Cum SA (acres)	0.45	6.66	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 982 Profile: PF# 1

E.G. Elev (ft)	6706.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.31	Wt. n-Val.		0.025	
W.S. Elev (ft)	6706.55	Reach Len. (ft)	99.75	99.75	99.75
Crit W.S. (ft)		Flow Area (sq ft)		226.93	
E.G. Slope (ft/ft)	0.007584	Area (sq ft)		226.93	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	281.65	Top Width (ft)		281.65	
Vel Total (ft/s)	4.48	Avg. Vel. (ft/s)		4.48	
Max Chl Dpth (ft)	1.55	Hydr. Depth (ft)		0.81	
Conv. Total (cfs)	11678.3	Conv. (cfs)		11678.3	
Length Wtd. (ft)	99.75	Wetted Per. (ft)		281.67	
Min Ch El (ft)	6705.00	Shear (lb/sq ft)		0.38	
Alpha	1.00	Stream Power (lb/ft s)		1.71	
Frctn Loss (ft)	0.77	Cum Volume (acre-ft)	0.37	6.25	0.36
C & E Loss (ft)	0.00	Cum SA (acres)	0.45	5.94	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 981 Profile: PF# 1

E.G. Elev (ft)	6706.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.31	Wt. n-Val.		0.025	
W.S. Elev (ft)	6705.78	Reach Len. (ft)	100.56	100.56	100.56
Crit W.S. (ft)	6705.69	Flow Area (sq ft)		227.46	
E.G. Slope (ft/ft)	0.007768	Area (sq ft)		227.46	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	288.41	Top Width (ft)		288.41	
Vel Total (ft/s)	4.47	Avg. Vel. (ft/s)		4.47	
Max Chl Dpth (ft)	1.88	Hydr. Depth (ft)		0.79	
Conv. Total (cfs)	11539.0	Conv. (cfs)		11539.0	
Length Wtd. (ft)	100.56	Wetted Per. (ft)		288.45	
Min Ch El (ft)	6703.90	Shear (lb/sq ft)		0.38	
Alpha	1.00	Stream Power (lb/ft s)		1.71	
Frctn Loss (ft)	0.87	Cum Volume (acre-ft)	0.37	5.73	0.36
C & E Loss (ft)	0.01	Cum SA (acres)	0.45	5.29	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 980 Profile: PF# 1

E.G. Elev (ft)	6705.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.		0.025	
W.S. Elev (ft)	6704.76	Reach Len. (ft)	104.15	104.15	104.15
Crit W.S. (ft)	6704.76	Flow Area (sq ft)		190.89	
E.G. Slope (ft/ft)	0.009771	Area (sq ft)		190.89	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	221.02	Top Width (ft)		221.02	
Vel Total (ft/s)	5.33	Avg. Vel. (ft/s)		5.33	
Max Chl Dpth (ft)	1.46	Hydr. Depth (ft)		0.86	
Conv. Total (cfs)	10288.5	Conv. (cfs)		10288.5	
Length Wtd. (ft)	104.15	Wetted Per. (ft)		221.06	
Min Ch El (ft)	6703.30	Shear (lb/sq ft)		0.53	
Alpha	1.00	Stream Power (lb/ft s)		2.81	
Frctn Loss (ft)	0.94	Cum Volume (acre-ft)	0.37	5.25	0.36
C & E Loss (ft)	0.00	Cum SA (acres)	0.45	4.70	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 979 Profile: PF# 1

E.G. Elev (ft)	6703.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.49	Wt. n-Val.		0.025	
W.S. Elev (ft)	6702.85	Reach Len. (ft)	92.84	92.84	92.84
Crit W.S. (ft)	6702.83	Flow Area (sq ft)		181.64	
E.G. Slope (ft/ft)	0.008365	Area (sq ft)		181.64	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	173.74	Top Width (ft)		173.74	
Vel Total (ft/s)	5.60	Avg. Vel. (ft/s)		5.60	
Max Chl Dpth (ft)	1.95	Hydr. Depth (ft)		1.05	
Conv. Total (cfs)	11119.2	Conv. (cfs)		11119.2	
Length Wtd. (ft)	92.84	Wetted Per. (ft)		173.79	
Min Ch El (ft)	6700.90	Shear (lb/sq ft)		0.55	
Alpha	1.00	Stream Power (lb/ft s)		3.06	
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	0.37	4.81	0.36
C & E Loss (ft)	0.08	Cum SA (acres)	0.45	4.23	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 978 Profile: PF# 1

E.G. Elev (ft)	6702.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.		0.025	
W.S. Elev (ft)	6702.59	Reach Len. (ft)	105.22	105.22	105.22
Crit W.S. (ft)	6702.12	Flow Area (sq ft)		271.90	
E.G. Slope (ft/ft)	0.003102	Area (sq ft)		271.90	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	226.33	Top Width (ft)		226.33	
Vel Total (ft/s)	3.74	Avg. Vel. (ft/s)		3.74	
Max Chl Dpth (ft)	3.59	Hydr. Depth (ft)		1.20	
Conv. Total (cfs)	18259.6	Conv. (cfs)		18259.6	
Length Wtd. (ft)	105.22	Wetted Per. (ft)		226.39	
Min Ch El (ft)	6700.20	Shear (lb/sq ft)		0.23	
Alpha	1.00	Stream Power (lb/ft s)		0.87	
Frctn Loss (ft)	0.53	Cum Volume (acre-ft)	0.37	4.32	0.36
C & E Loss (ft)	0.02	Cum SA (acres)	0.45	3.80	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 977 Profile: PF# 1

E.G. Elev (ft)	6702.25	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.44	Wt. n-Val.		0.025	
W.S. Elev (ft)	6701.81	Reach Len. (ft)	98.55	98.55	98.55
Crit W.S. (ft)	6701.81	Flow Area (sq ft)		190.07	
E.G. Slope (ft/ft)	0.009728	Area (sq ft)		190.07	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	217.93	Top Width (ft)		217.93	
Vel Total (ft/s)	5.35	Avg. Vel. (ft/s)		5.35	
Max Chl Dpth (ft)	3.10	Hydr. Depth (ft)		0.87	
Conv. Total (cfs)	10311.2	Conv. (cfs)		10311.2	
Length Wtd. (ft)	98.55	Wetted Per. (ft)		217.96	
Min Ch El (ft)	6700.20	Shear (lb/sq ft)		0.53	
Alpha	1.00	Stream Power (lb/ft s)		2.83	
Frctn Loss (ft)	0.90	Cum Volume (acre-ft)	0.37	3.76	0.36
C & E Loss (ft)	0.01	Cum SA (acres)	0.45	3.26	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 976 Profile: PF# 1

E.G. Elev (ft)	6701.16	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.55	Wt. n-Val.		0.025	
W.S. Elev (ft)	6700.61	Reach Len. (ft)	100.86	100.86	100.86
Crit W.S. (ft)	6700.61	Flow Area (sq ft)		170.59	
E.G. Slope (ft/ft)	0.008512	Area (sq ft)		170.59	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	150.32	Top Width (ft)		150.32	
Vel Total (ft/s)	5.96	Avg. Vel. (ft/s)		5.96	
Max Chl Dpth (ft)	3.71	Hydr. Depth (ft)		1.13	
Conv. Total (cfs)	11022.8	Conv. (cfs)		11022.8	
Length Wtd. (ft)	100.86	Wetted Per. (ft)		150.49	
Min Ch El (ft)	6697.60	Shear (lb/sq ft)		0.60	
Alpha	1.00	Stream Power (lb/ft s)		3.59	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)	0.37	3.36	0.36
C & E Loss (ft)	0.03	Cum SA (acres)	0.45	2.85	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 975 Profile: PF# 1

E.G. Elev (ft)	6699.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.81	Wt. n-Val.		0.025	
W.S. Elev (ft)	6698.99	Reach Len. (ft)	105.30	105.30	105.30
Crit W.S. (ft)	6698.99	Flow Area (sq ft)		141.14	
E.G. Slope (ft/ft)	0.007457	Area (sq ft)		141.14	
Q Total (cfs)	1017.00	Flow (cfs)		1017.00	
Top Width (ft)	84.57	Top Width (ft)		84.57	
Vel Total (ft/s)	7.21	Avg. Vel. (ft/s)		7.21	
Max Chl Dpth (ft)	3.49	Hydr. Depth (ft)		1.67	
Conv. Total (cfs)	11777.3	Conv. (cfs)		11777.3	
Length Wtd. (ft)	105.30	Wetted Per. (ft)		84.85	
Min Ch El (ft)	6696.00	Shear (lb/sq ft)		0.77	
Alpha	1.00	Stream Power (lb/ft s)		5.58	
Frctn Loss (ft)	0.81	Cum Volume (acre-ft)	0.37	3.00	0.36
C & E Loss (ft)	0.03	Cum SA (acres)	0.45	2.57	0.66

Plan: Default Scenario WF-R7a Geick West Fork RS: 999.5 Culv Group: Culvert #1 Profile: PF# 1

Q Culv Group (cfs)	1.70	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	1.98
Q Barrel (cfs)	1.70	Culv Vel DS (ft/s)	2.73
E.G. US. (ft)	6726.37	Culv Inv El Up (ft)	6725.87
W.S. US. (ft)	6726.37	Culv Inv El Dn (ft)	6725.81
E.G. DS (ft)	6720.96	Culv Frctn Ls (ft)	0.09
W.S. DS (ft)	6720.87	Culv Exit Loss (ft)	5.31
Delta EG (ft)	5.40	Culv Entr Loss (ft)	0.03
Delta WS (ft)	5.50	Q Weir (cfs)	942.57
E.G. IC (ft)	6726.33	Weir Sta Lft (ft)	480.46
E.G. OC (ft)	6726.39	Weir Sta Rgt (ft)	1043.72
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (ft)	6726.30	Weir Max Depth (ft)	1.27
Culv WS Outlet (ft)	6726.16	Weir Avg Depth (ft)	0.69
Culv Nml Depth (ft)	0.45	Weir Flow Area (sq ft)	390.67
Culv Crt Depth (ft)	0.35	Min El Weir Flow (ft)	6725.11

Plan: Default Scenario WF-R7a Geick West Fork RS: 999.5 Culv Group: Culvert #2 Profile: PF# 1

Q Culv Group (cfs)	70.07	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	9.91
Q Barrel (cfs)	70.07	Culv Vel DS (ft/s)	11.88
E.G. US. (ft)	6726.37	Culv Inv El Up (ft)	6720.45
W.S. US. (ft)	6726.37	Culv Inv El Dn (ft)	6720.30
E.G. DS (ft)	6720.96	Culv Frctn Ls (ft)	0.78
W.S. DS (ft)	6720.87	Culv Exit Loss (ft)	3.86
Delta EG (ft)	5.40	Culv Entr Loss (ft)	0.76
Delta WS (ft)	5.50	Q Weir (cfs)	942.57
E.G. IC (ft)	6726.37	Weir Sta Lft (ft)	480.46
E.G. OC (ft)	6726.01	Weir Sta Rgt (ft)	1043.72
Culvert Control	Inlet	Weir Submerg	0.00
Culv WS Inlet (ft)	6723.45	Weir Max Depth (ft)	1.27
Culv WS Outlet (ft)	6722.63	Weir Avg Depth (ft)	0.69
Culv Nml Depth (ft)	3.00	Weir Flow Area (sq ft)	390.67
Culv Crt Depth (ft)	2.66	Min El Weir Flow (ft)	6725.11

APPENDIX C

REFERENCE MATERIALS

GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
El Paso County, Colorado

Volume 1 – Final Report

October 1, 2007
Revised: February 10, 2010

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DBC Project Number: C-7706-2

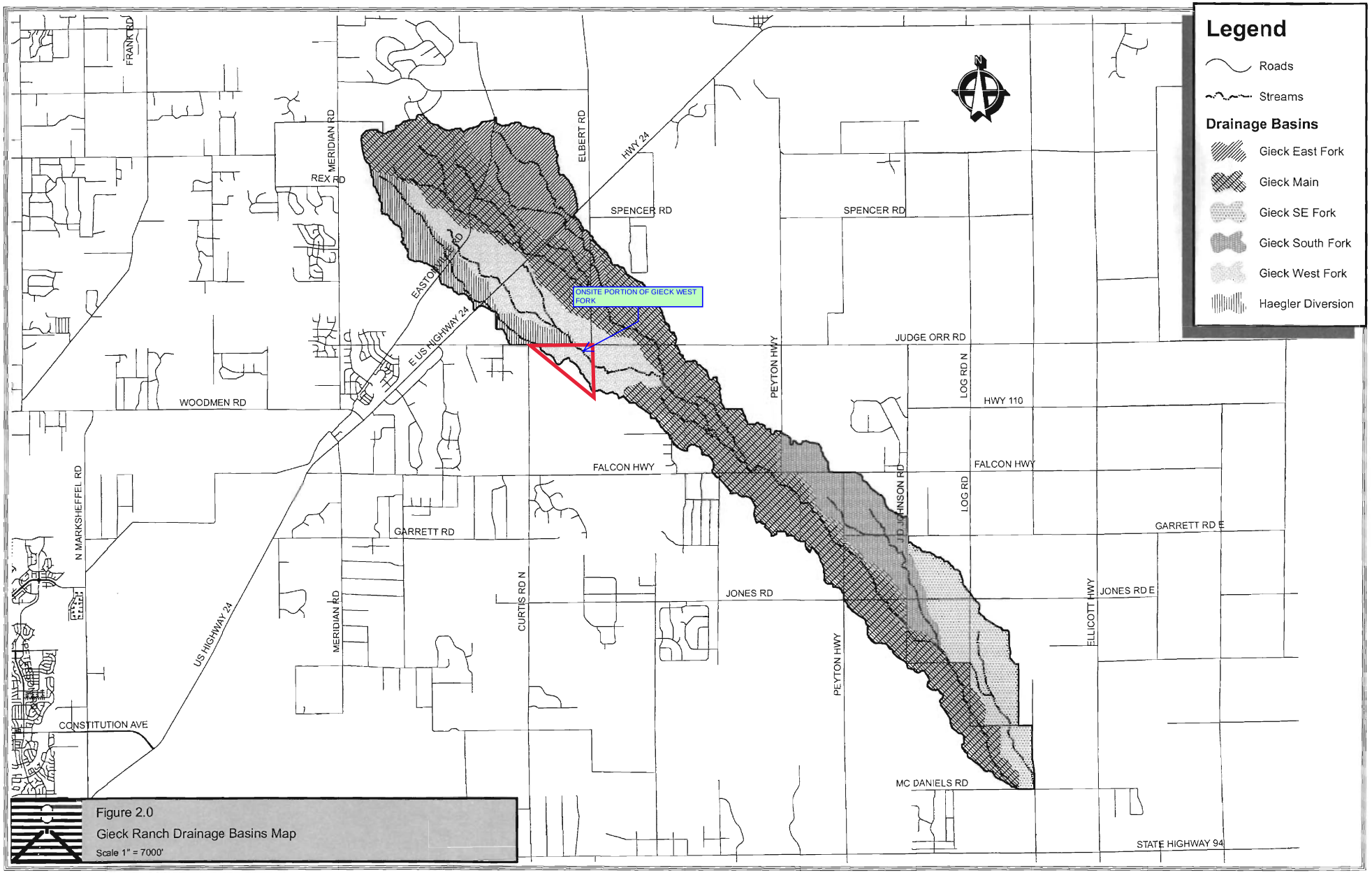


Figure 2.0
Gieck Ranch Drainage Basins Map
Scale 1" = 7000'

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%

CONTRIBUTING ACREAGE TO WF-R7A @ JUDGE ORR ROAD CROSSING

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.

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

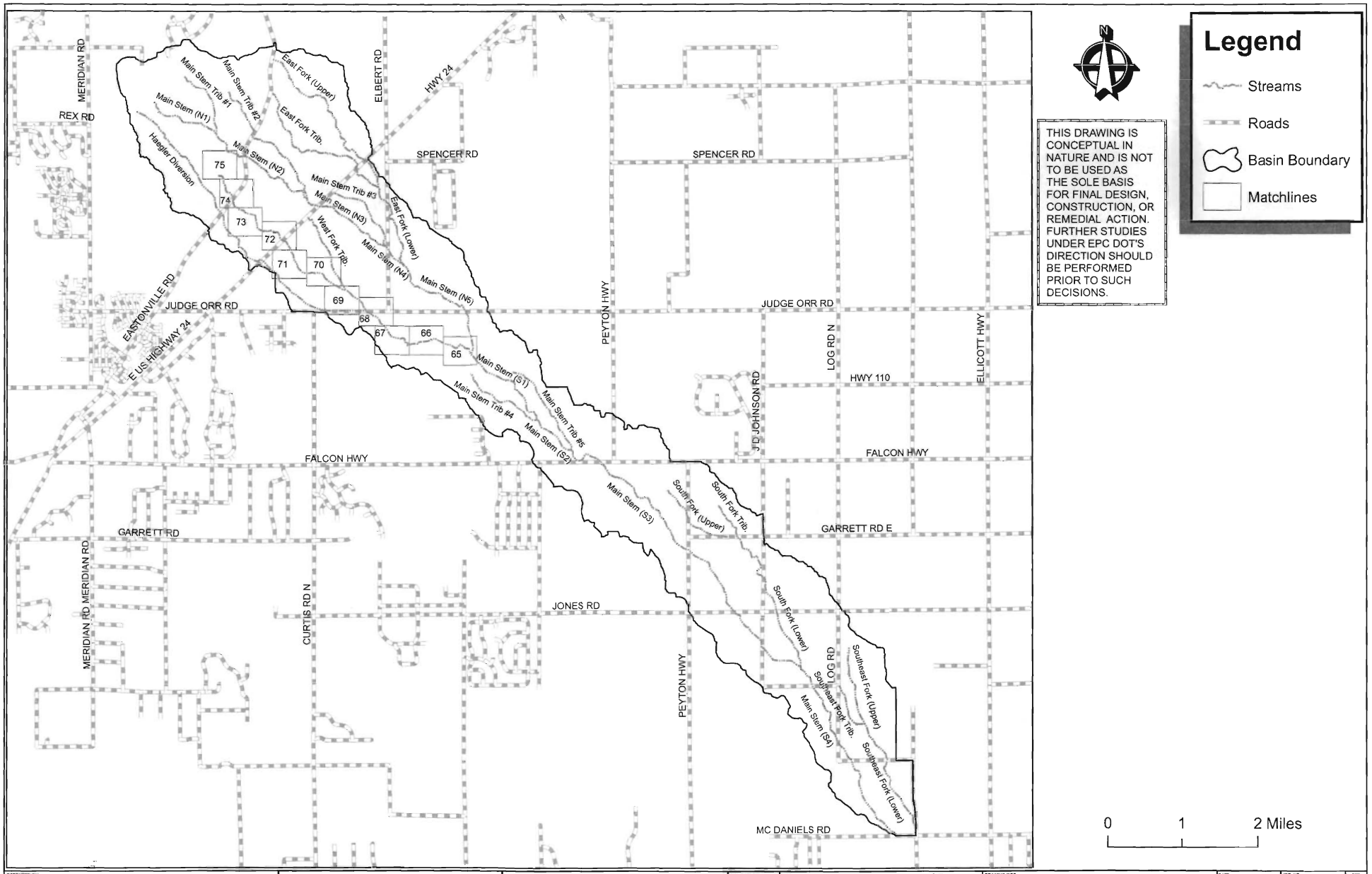
35	Elbert Road south of structure 34	24" CMP	Good	100%	Y	---
36	Elbert Road at Main Channel	2 - 48" CMP	Good	19%	N	3 - 12' x 4' CBC
37	Elbert Road south of structure 36	24" CMP	Poor	55%	Y	---
38	Judge Orr Road at West Fork	67" x 95" CMP	Good	20%	N	4 - 12' x 5' CBC
39	Judge Orr Road east of structure 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



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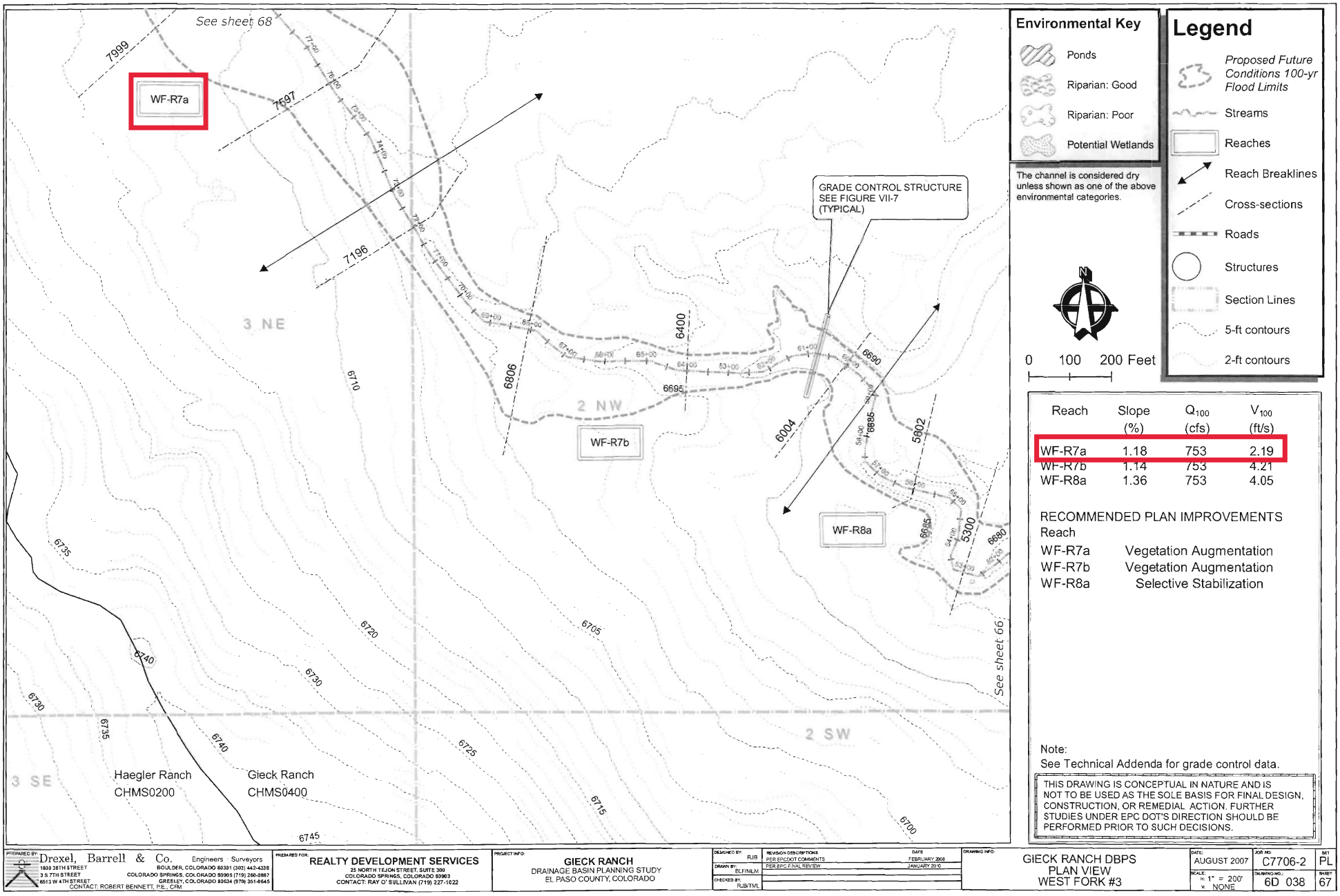
PROJECT INFO: GIECK RANCH
DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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

Reach	Slope (%)	Q_{100} (cfs)	V_{100} (ft/s)
WF-R7a	1.18	753	2.19
WF-R7b	1.14	753	4.21
WF-R8a	1.36	753	4.05

RECOMMENDED PLAN IMPROVEMENTS

Reach	
WF-R7a	Vegetation Augmentation
WF-R7b	Vegetation Augmentation
WF-R8a	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.

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

DESIGNED BY:	REVISION DESCRIPTIONS	DATE
RJB	PER EPCDOT COMMENTS	FEBRUARY 2008
DRAWN BY: BLF/MLM	PER EPC FINAL REVIEW	JANUARY 2010
CHECKED BY: RJB/TML		

DRAWING INFO: GIECK RANCH DBPS
PLAN VIEW
WEST FORK #3

DATE:	JOB NO:	SET
AUGUST 2007	C7706-2	PL
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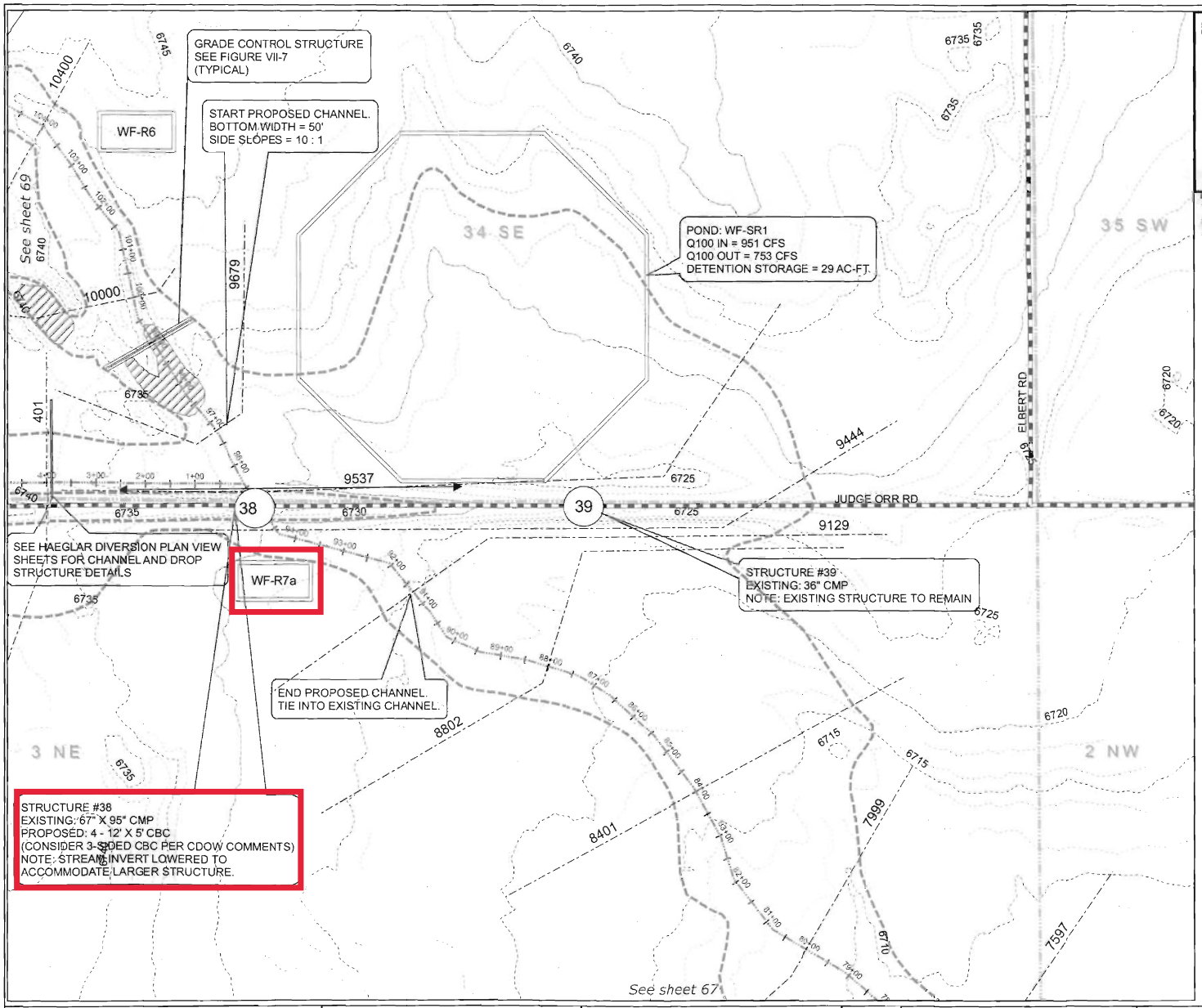

Environmental Key

- Ponds
- Riparian: Good
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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.

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DRAINAGE BASIN PLANNING STUDY
EL PASO COUNTY, COLORADO

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

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

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

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

MASTER DEVELOPMENT DRAINAGE PLAN
and PRELIMINARY DRAINAGE REPORT
FOR
SADDLEHORN RANCH

Prepared For:
ROI Property Group, LLC
2495 Rigdon Street
Napa, CA 94558
(707) 365-6891

May 8, 2020
Project No. 25142.00

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive
Colorado Springs, CO 80919
719-593-2593

El Paso County PCD File No.
SP-19-006

ENGINEER'S STATEMENT:
The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by 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.

Mike Bramlett, Colorado P.E. # 32314 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: ROI Property Group, LLC

By:

Title:
Address: 2495 Rigdon Street
Napa, CA 94558

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.

Jennifer Irvine, P.E. Date
County Engineer/ ECM Administrator

Conditions:

CONTENTS

PURPOSE

This document is the Master Development Drainage Plan (MDDP)/Preliminary Drainage Report (PDR) for the proposed Saddlehorn Ranch. The purpose of this report is to:

1. Identify on-site and off-site drainage patterns.
2. Recommend preliminary storm water 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.
4. Demonstrate compliance with surrounding major drainage basin planning studies, master plan and flood insurance studies.

GENERAL LOCATION AND DESCRIPTION

Location

The proposed Saddlehorn Ranch, known as "the site" from herein, is a parcel of land located in Section 3 and 10, Township 13 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. The proposed 824 acre, rural, single family-development is bound by Judge Orr Road to the North and Curtis Road to the West. To the East, the site is bound by undeveloped land owned by Brent Houser Enterprises, LLC. To the south, the site is bound by undeveloped properties owned by 7120 Sudiev, LLC and Faye Reyonlds. A vicinity map and property owner map is presented in Appendix A.

Currently, there are three major drainageways that run through the site: Haegler Ranch Main Stem 6 (MS-06), Haegler Ranch Tributary 6 (T-6), and Gieck Ranch West Fork – Reach 7A (WF-R7A). These drainageways were analyzed, both hydrologically and hydraulically, in the following reports:

1. Geick Ranch Drainage Basin Planning Study (DBPS), October 2007
2. Haegler Ranch Basin DBPS, May 2009
3. Sante Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision (LOMR), October 2004

The impact of these drainageways and planning studies on the proposed development will be discussed later in the report.

Description of Property

The proposed development contains approximately 824 acres and will be comprised of 227 rural 2.5 – 5 acre lots. The site is currently unoccupied and undeveloped. The existing ground cover is sparse vegetation and open space, typical of a Colorado rolling range land condition. In general, the site slopes from northwest to southeast and the existing drainageways follow this topography.

Per a NRCS web soil survey of the area, the site is made up of Type A, B and D soils. Type A soils cover roughly 80% of the site while Type B soils cover 3% and Type D cover the remaining 17% of the site. Group A soils have a high infiltration rate when thoroughly wet. Type B soils have a moderate infiltration when thoroughly wet. Type D soils have a very slow infiltration rate when thoroughly wet and have a high shrink-swell potential. A NRCS soil survey map has been presented in Appendix A.

Two existing wells are located in the southwest corner of the site. A 12" Cherokee Metropolitan District waterline runs through the site just south of the northern property line. Approximately a mile south of the Curtis Road and Judge Orr Road intersection, a two lane dirt road proceeds from Curtis Road east towards approximate center of the site. A water tank, pond and windmill are located within Major Drainageway MS-06 at the end of the dirt road.

Floodplain Statement

Based on the FEMA FIRM Map number 08041C0558G, dated December 7, 2018, the site lies within Zone A, Zone AE, and Zone X. Zone A is defined as areas subject to inundation by the 1-percent-annual-chance flood determined using approximate methodologies because BFEs have not been established. Zone AE is defined as area subject to inundation by the 1-percent-annual-chance flood event. Zone X is defined as area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. All proposed development within the site will occur in Zone X.

In the northeast corner of the site, proposed development borders the Zone A boundary of the Geick Ranch West Tributary (WF-R7). At time of Final Drainage Report for this future phase of the development, a LOMR will be presented to establish base flood elevations (BFEs) for all lots that border the current Zone A boundary. The current FIRM Map has been presented in Appendix A.

DRAINAGE BASINS AND SUBBASINS

Major Basin Descriptions

The site lies within two major drainage basins: the Gieck Ranch Drainage Basin based on the "*Gieck Ranch Drainage Basin Planning Study*" (DBPS) prepared by Drexel, Barrell & Co. in October, 2007 and revised in February 2010 and the Haegler Ranch Drainage Basin based on the "*Haegler Ranch Drainage Basin Planning Study*" prepared by URS Corporation in May 2009.

The Gieck Ranch Drainage Basin covers approximately 22 square miles and begins approximately five miles northeast of the Town of Falcon and travels approximately 15 miles to the southeast. The Gieck Ranch Drainage Basin is tributary to Black Squirrel Creek which drains south to the Arkansas River near the city of Pueblo, Colorado. The majority of the area within the basin is undeveloped and is characterized as rolling range land typically associated with Colorado's semi-arid climates.

Anticipated land use for the basin includes residential, industrial, agricultural and commercial development. Residential developments will range from 0.125 – 5 acre lots with a mix of low, medium and high density developments.

The Haegler Ranch Drainage Basin covers approximately 16.6 square miles in unincorporated El Paso County, CO. The Haegler Ranch Drainage Basin is tributary to Black Squirrel Creek. In its existing condition, the basin is comprised of rolling rangeland with poor vegetative cover associated with Colorado's semi-arid climate. The natural drainageways within the basin are typically shallow and wide with poorly defined flow paths in most areas. Anticipated land use for the basin includes residential and commercial development. Residential developments will range from 0.125 – 5 acre lots with a mix of low, medium and high density developments.

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)
- Haegler Ranch Drainage Basin Planning Study prepared by URS Corporation in May 2009
- Santa Fe Springs – Haegler Ranch Drainage Basin Letter of Map Revision prepared by Tri-Core Engineering in June 2004.

Existing Gieck Ranch Drainage Basin

The "*Gieck Ranch Drainage Basin Planning Study"* evaluated existing and future drainage conditions, identified future improvements, and established basin and bridge fees for the Gieck Ranch Drainage Basin. It should be noted that as of today the "*Gieck Ranch Drainage Basin Planning Study"* has not yet been approved and adopted by the County. All referenced information from the aforementioned report is presented for information purposes only.

Based upon provided drainage maps and analysis, Gieck Ranch discharges a total of 1,017 cfs onto the site within Major Drainageway Gieck Ranch West Fork Reach 7A (WF-R7A). An existing 66" CMP and 36" CMP convey the offsite flow across Judge Orr Road onto the site. The existing culverts at Judge Orr Road are undersized for existing and future flows resulting in localized overtopping. The DBPS recommends the culvert be upsized to four –12' x 5' box culverts. The culvert will not be upsized within the context of this report and development. The culvert is owned by El Paso County and timing of the recommended improvements will be controlled by the County. The overtopping at the intersection of WF-R7A is not contained within the 100-year floodplain. Therefore, at time of Final Drainage Report, berming will be provided that will protect proposed lots from overtopping flows. An overtopping analysis is presented in Appendix D and the limits of overtopping are presented on the existing and proposed drainage maps in Appendix F.

Based on existing channel analysis, the *Gieck Ranch DBPS* recommends WF-R7A channel improvements approximately 200' upstream and 300' downstream of the culvert crossing at Judge Orr Road (50' bottom width, 10:1 side slopes and vegetative augmentation). The recommended

channel improvements result from upsizing the culvert at Judge Orr Road, requiring the channel to be lowered. The channel improvements were not recommended due to existing channel instability. Existing velocities in the channel were found to be 2.19 ft/s, as presented in Appendix E. Per the MS4 permit requirements, the onsite reach of WF-R7A will be analyzed for channel stability with the corresponding Final Drainage Report for that phase of the development. At the time of Final Drainage Report, any necessary improvements to WF-R7A to satisfy the MS4 permit will be evaluated. It should be noted that the onsite reach of WF-R7A, where the aforementioned channel improvements were recommended, is comprised of jurisdictional wetlands which will limit the allowable improvements. Coordination with the Army Corps of Engineers will be required to grant permission to disturb the jurisdictional wetlands. Recommended channel improvements from the *Gieck Ranch DBPS* are presented in Appendix E.

Existing Haegler Ranch Drainage Basin

The "*Haegler Ranch Drainage Basin Planning Study*" was used to establish a stormwater management plan for the existing and future stormwater infrastructure needs within the Haegler Ranch Drainage Basin. Based on provided drainage maps and analysis, in the existing condition Haegler Ranch contributes a total of 710 cfs onto the site. Of the 710 cfs, 590 cfs crosses Curtis Road in an existing 24" CMP onto the site. Major Drainageway MS-06 conveys the stormwater through the site and to its off-site confluence with Major Drainageway MS-05. The remaining 210 cfs crosses Curtis Road in an existing 36" CMP onto the site. Major Drainageway T-6 conveys the stormwater through the site and to its off-site confluence with Major Drainageway MS-05. Both Curtis Road culverts are undersized for existing and future flows and overtopping occurs locally near the culvert crossings. Overtopping at the intersection of Curtis Road and T-6 is contained within the 100-year floodplain and will not affect proposed lots. The overtopping at the intersection of MS-06 and Curtis Road is not contained within the 100-year floodplain limits. Therefore, at time of Final Drainage Report, berming will be provided that will protect proposed lots from overtopping flows. An overtopping analysis is presented in Appendix D and the limits of overtopping are presented on the existing and proposed drainage maps in Appendix F.

The culverts are not proposed to be upsized within the context of this report and development. The culverts are owned by El Paso County and timing of the recommended improvements will be controlled by the County.

Furthermore, the *Haegler Ranch DBPS* recommends channel improvements within drainageways MS-06 and T-6. Per the *Haegler Ranch DBPS*, all recommended channel sections are trapezoidal with side slopes of 4:1 and a maximum depth of five feet. Within the limits of the site, three (3) channel bottom widths are recommended for MS-06. The first reach, from station 0+00 – 31+34, is proposed with a 15' bottom width, the second reach from 31+34 to 74+61, MS-06 is proposed with a 30' bottom width, and the last reach from station 74+61 - 103+62 is proposed with a 20' channel bottom. The *Haegler Ranch DBPS* recommends Major Drainageway T-6 be improved to a trapezoidal channel with an 8' bottom width, 4:1 side slopes and depth of 5'. Drop structures have

also been recommended within MS-06 and T-6. These improvements will not occur within the context of this report or development. However, due to the addition of culvert crossings within MS-06 and T-6, channel improvements are anticipated up and downstream of the proposed culverts. The extent of these channel improvements will be addressed with corresponding Final Drainage Reports for those phases of the development. At that time, channel stability will be evaluated and any necessary improvements will be proposed. Recommended channel improvements from the *Haegler Ranch DBPS* are presented in Appendix E.

Based on flood impacts, stream stability and cost effectiveness, this study recommended a sub-regional detention approach. This allows future development anywhere in the basin with the construction of an associated sub-regional pond. Within the boundary of Saddlehorn Ranch, the DBPS recommended a total of three (3) sub-regional ponds. Based on discussion with El Paso County, the site will utilize full spectrum water quality and detention ponds instead. These full spectrum detention ponds will limit developed discharge into the drainageways to less than historic rates. Future, upstream development will also require full spectrum detention in accordance with current El Paso County criteria, which is an effective alternative to the sub-regional pond approach.

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

Existing Sub-basin Drainage

On-site, existing drainage patterns are generally from northwest to southeast by way of existing, natural drainageways (MS-06, T-6, WF-R7A). On-site areas flow directly into these drainageways which also bypass off-site flows through the site. Offsite flows within the major drainageways that pass through the site will influence the on-site culvert designs and any channel improvements.

On-site, existing drainage basins were established based upon existing topography and the limits of 100-year floodplain. The site was divided into eleven existing sub-basins. See Table 1 below for summary of existing drainage sub-basins and corresponding peak flows. An existing drainage map is provided in Appendix F.

Table 1: Existing Drainage Basin Summary

EXISTING BASIN SUMMARY TABLE				
Tributary Sub-Basin	**Area (acres)**	**Percent Impervious**	**Q_5 (cfs)**	**Q_{100} (cfs)**
G1	10.1	2.0%	0.00	0.1
G2	87.6	2.0%	1.5	76.4
H1	166.5	2.0%	0.1	81.0
H2	111.1	2.0%	0.2	91.1
H3	118.9	2.0%	0.9	64.1
H4	63.3	2.0%	1.4	73.2
H5	53.2	2.0%	0.3	28.2
H6	87.6	2.0%	0.2	110.1
CH1	23.9	2.0%	5.4	21.0
CH2	84.2	2.0%	2.6	33.7
CH3	19.1	2.0%	0.1	6.5
Total	825.4	N/A	12.7	585.4

The existing condition of the three major drainageways are discussed below;

Existing Geick Ranch West Fork Reach 7A (WF-R7A)

The first major drainageway is the Gieck Ranch West Fork Reach 7A (WF-R7A), per the *Gieck Ranch DBPS*. WF-R7A crosses onto the site along Judge Orr Road, approximately ¼ mile west of the intersection with Elbert Road. Discharge from the developed site into this drainageway will be limited to historic rates via a full spectrum detention pond prior to discharge. This drainageway includes jurisdictional wetlands and the entire drainageway onsite is classified Zone A. Access to the drainage way will be provided from internal roadways and along an equestrian trail will be constructed adjacent to the drainageway. The equestrian train can be utilized for maintenance equipment as well.

Existing Haegler Ranch Main Stem (MS-06)

The second drainageway is the Haegler Ranch Main Stem (MS-06), per the *Haegler Ranch DBPS*, which crosses onto the site along Curtis Road, approximately 1,600' south of the intersection with Judge Orr Road. MS-06 flows south towards its offsite confluence with Black Squirrel Creek. MS-06 exits the site along the southern property line. Discharge from the developed site into this drainageway will be limited to historic rates via a full spectrum detention pond prior to discharge. This drainageway includes non-jurisdiction wetlands and the entire drainageway is classified Zone AE. Access to the channel will be provided at the culvert crossing of MS-06 and San Isidro Trail via

a 15' wide maintenance and access road that will proceed from San Isidro trail to the channel bottom. From here, access through the channel is achievable with existing grades within the channel. Furthermore, an equestrian trail will be constructed adjacent to the drainageway that can be utilized for maintenance equipment as well. The road alignments are displayed on the proposed drainage map presented in Appendix F.

Existing Haegler Ranch Tributary 6 (T-6)

The third drainageway is the Haegler Ranch Tributary 6 (T-6), per the *Haegler Ranch DBPS*, which crosses onto the site along Curtis Road, approximately ¾ mile south of the intersection with Judge Orr Road. T-6 conveys flows south through the site and towards its off-site confluence with Black Squirrel Creek. Discharge from the developed site into this drainageway will be limited to historic rates via a full spectrum detention pond prior to discharge. This drainageway is absent of any on-site wetlands and the entire drainageway is classified Zone AE. Access to the channel will be provided at the culvert crossing of T-6 and Del Cerro Trail via a 15' wide maintenance and access road that will proceed from Del Cerro Trail to the channel bottom. From here, access through the channel is achievable with existing grades within the channel. Furthermore, an equestrian trail will be constructed adjacent to the drainageway that can be utilized for maintenance equipment as well. The road alignments are displayed on the proposed drainage map presented in Appendix F.

The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR was executed on three Haegler Ranch basin drainageways. Two of the drainageways that were evaluated pass through the proposed development. These drainageways are the: Haegler Ranch Tributary 3 & 4. Within the boundary of the proposed development, Haegler Ranch Tributary 3 and 4 are synonymous with Main Stem 6 and Tributary 6 from the *Haegler Ranch DBPS*. The purpose of the LOMR was to revise the flood hazard depicted in the current Flood Insurance Study. Additionally, the LOMR provided existing, 100-year velocities within the drainageways that will be utilized in the design of any potential channel improvements. A FIRM panel with the limits of the detailed study as well as BFEs has been presented in Appendix E.

See Table 2 for comparison of drainageway identification and the naming convention used within the context of this report. See Table 3 for a comparison of 100-year flows as calculated in the aforementioned DBPS' and LOMR. An existing conditions drainage map is presented in Appendix F.

Table 2: Major Drainageways

Major Drainageway Naming Conventions			
Saddlehorn Ranch MDDP/PDR:	Per Haegler Ranch DBPS:	Per Geick Ranch DBPS:	Per Sante Fe Springs LOMR:
WF-R7A	N/A*	West Fork (Middle)/WF-R7A	N/A*
MS-06	Main Stem (MS-06)	N/A*	Haegler Ranch Tributary 3
T-6	Tributary 6 (T-6)	N/A*	Haegler Ranch Tributary 4

Table 3: Major Drainageways – Ex. 100-Year Flow Comparison

Major Drainageways: 100-Year Flow Comparison				
Drainageway Name	Contributing Area (sq. mi.)	Q_{100} Per Haegler Ranch DBPS:	Q_{100} Per Geick Ranch DBPS:	Q_{100} Per Sante Fe Springs LOMR:
WF-R7A @ Judge Orr Road	1.50	N/A*	1,017 cfs	N/A*
MS-06 @ Curtis Road	1.05	451 cfs	N/A*	505 cfs
T-6 @ Curtis Road	0.39	120 cfs	N/A*	130 cfs

*N/A: Flow regime outside limits of study.

Proposed Sub-basin Drainage

The proposed basin delineation is as follows;

Basin A is approximately 9.2 acres and in its existing condition is rolling rangeland. Runoff generally flows southeast away from Drainageway MS-06. In the proposed condition, Basin A will be rural 2.5 acre lots and roadway. Runoff from this basin will be collected in road side swales and conveyed south along Barrosito Drive to Pond A. Pond A, while considered temporary in this MDDP, will need to meet Full Spectrum Detention Criteria unless deviations are approved in the Final Drainage Report for this future filing. It is anticipated that Barrosito Drive will be extended south as part of the development of the adjacent parcel to the south. The most logical place for a permanent Full Spectrum pond is located approximately 1,000 feet south at the future road crossing with MS-06. When that pond is constructed, the Saddlehorn Metropolitan District No. 1 will remove Pond A. The peak flow rate for Basin A in the 5 and 100-year storm are 9.5 cfs and 20.7 cfs, respectively. However, Pond A will discharge at less than historic rates.

Basin B is approximately 60.4 acres and in its existing condition is rolling rangeland. Runoff generally flows southwest across the basin towards Drainageway MS-06. In the proposed condition, Basin B will be rural 2.5 acre lots, paved roadway and will include Pond B. Runoff from this basin will be collected in road side swales and conveyed south along Barrosito Drive to Pond B. The peak flow rate for Basin B in the 5 and 100-year storm are 9.9 cfs and 46.3 cfs, respectively. However, Pond B will discharge at less than historic rates. A portion of Basin B is inundated by the existing 100-year floodplain, however; at time of final platting berming will be constructed to reduce the floodplain limits within the drainageway tract and a corresponding LOMR will be executed on this stretch of channel to establish the revised floodplain.

Basin C is approximately 102.5 acres and in its existing condition is rolling rangeland. Runoff generally flows southwest across the basin towards Drainageway MS-06. In the proposed condition, Basin C will be rural 2.5 acre lots, paved roadway and will include Pond C. Runoff from this basin will be collected in road side swales and conveyed south along Barrosito Drive and Del Cambre Drive to Pond C. The peak flow rate for Basin C in the 5 and 100-year storm are 15.8 cfs and 69.4 cfs, respectively. However, Pond C will discharge at less than historic rates.

Basin D is approximately 99.2 acres and in its existing condition is rolling rangeland. Runoff generally flows east across the basin towards Drainageway WF-R7A. In the proposed condition, Basin D will be rural 2.5 acre lots, paved roadway and will include Pond D. Runoff from this basin will be collected in road side swales and conveyed east along Barrosito drive to Pond D. The peak flow rate for Basin D in the 5 and 100-year storm are 29.4 cfs and 95.4 cfs, respectively. However, Pond D will discharge at less than historic rates. A portion of Basin D is inundated by the existing 100-year floodplain, however; at time of final platting berming will be constructed to reduce the floodplain limits within the drainageway tract and a corresponding LOMR will be executed on this stretch of channel to establish the base flood elevations.

Basin E is approximately 11.6 acres and in its existing condition is rolling rangeland. Runoff generally flows east across the basin towards Drainageway MS-06. In the proposed condition, Basin E will be rural 2.5 acre lots, paved roadway and will include Pond E. Runoff from this basin will be collected in road side swales and conveyed southwest along San Isidro Trail to Pond E. The peak flow rate for Basin E in the 5 and 100-year storm are 2.0 cfs and 9.9 cfs, respectively. However, Pond E will discharge at less than historic rates.

Basin F is approximately 117.4 acres and in its existing condition is rolling rangeland. Runoff generally flows southeast across the basin towards Drainageway MS-06. In the proposed condition, Basin F will be rural 2.5 acre lots, paved roadway and will include Pond F. Runoff from this basin will be collected in road side swales and conveyed southwest along Benito Wells Trail to Pond F. The peak flow rate for Basin F in the 5 and 100-year storm are 17.0 cfs and 69.9 cfs, respectively. However, Pond F will discharge at less than historic rates.

Basin G is approximately 39.9 acres and in its existing condition is rolling rangeland. Runoff generally flows south across the basin towards Drainageway T-6. In the proposed condition, Basin G will be rural 2.5 acre lots, paved roadway and will include Pond G. Runoff from this basin will be collected in road side swales and conveyed southwest along El Raiceno Trail to Pond G. The peak flow rate for Basin G in the 5 and 100-year storm are 6.1 cfs and 25.3, respectively. However, Pond G will discharge at less than historic rates.

Basin H is approximately 30.7 acres and in its existing condition is rolling rangeland. Runoff generally flows east across the basin towards Drainageway T-6. In the proposed condition, Basin H will be rural 2.5 acre lots, paved roadway and will include Pond H. Runoff from this basin will be collected in road side swales and conveyed north along Rosalia Place to Pond H. The peak flow rate for Basin H in the 5 and 100-year storm are 3.7 cfs and 17.9 cfs, respectively. However, Pond H will discharge at less than historic rates.

Basin I is approximately 46.6 acres and in its existing condition is rolling rangeland. Runoff generally flows east across the basin towards Drainageway T-6. In the proposed condition, Basin I will be rural 2.5 acre lots, paved roadway and will include Pond I. Runoff from this basin will be collected in road side swales and conveyed south down Carrizo Springs Trail and east down Zaragoza Trail to Pond I. The peak flow rate for Basin I in the 5 and 100-year storm are 15.9 cfs and 63.1 cfs, respectively. However, Pond I will discharge at less than historic rates.

Basin J is approximately 10.1 acres and in its existing condition is rolling rangeland. This basin will not be developed and will remain in its existing condition, per Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedures this basin will not be detained in a full spectrum water quality and detention pond. Runoff generally flows east across the basin towards Drainageway T-6. In the proposed condition, Basin J will be an undeveloped tract. Undeveloped runoff from this basin will follow existing drainage patterns and sheet flow into Drainageway WF-R7A. The peak flow rate for Basin J in the 5 and 100-year storm are 3.0 cfs and 10.5 cfs, respectively.

Basins CH1, CH2 and CH3 are existing drainageway basins that will remain undeveloped in the proposed condition. There will be no development within Basin CH1-CH3, however; Basin CH2 & CH3 will require channel grading to accommodate proposed culverts. The scope of this grading will leave the channels in an undeveloped condition per Section I.7.1.B.7 and therefore will be excluded from permanent stormwater management. Basin CH1 contains jurisdictional wetlands. Basin CH2 contains non-jurisdictional wetlands. There are no wetlands located in Basin CH3. Peak flow rates for proposed undeveloped basins are presented in Appendix B.

Basins UD1-UD11 acre comprised of rural 2.5+ acre residential lots and will follow existing drainage patterns in the proposed condition. Development in these basins will be limited to a maximum of 10% impervious development via a plat covenant. Therefore, these basins can be excluded from permanent stormwater detention per Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedures (2.5+ acre lots with imperviousness less than 10% can be excluded from

permanent stormwater management practices). Therefore, Basins UD1-UD11 will not be included in the developments permanent stormwater management facilities. A Permanent BMP applicability form is presented in Appendix D to justify these exclusions. A map detailing each development site and any exclusion is presented in Appendix F. Basin UD1 flows directly into Major Drainageway WF-R7A. Basins UD2, UD2.1, UD2.2, UD3, UD4, UD5 and UD8 flow directly into Major Drainageway MS-06. Basins UD6, UD7, UD9, and UD9.1 flow directly into Major Drainageway T-6. Basins UD8.1, UD10, and UD11 follow existing drainage patterns as well but flow directly off-site prior to being captured in major drainageways. A portion of Basin UD2.2 is inundated by the existing 100-yr floodplain. However, at time of final drainage report, lot lines will be adjusted outside floodplain limits. Furthermore, a portion of Basin UD10 is inundated by the existing 100-year floodplain, however; at time of final platting berming will be constructed to reduce the floodplain limits within the drainageway tract and a corresponding LOMR will be executed on this stretch of channel to establish the revised floodplain.

In addition to undeveloped lot areas, a small portion of Del Cerro Trail (portion of Basins UD9 & UD9.1) and San Isidro Trail (a portion of Basin UD5) will be allowed to directly discharge into Drainageway T-6 and MS-06, respectively, and excluded from the developments permanent stormwater management facilities. Per Section I.7.1.C.1, the County may exclude up to 20 percent, not to exceed 1 acre, of the applicable development site area from permanent stormwater management. Approximately, 16,240 ft^2 of Del Cerro Drive and 14,000 ft^2 square feet of San Isidro Trail, totaling 0.08% of the total development area, will be excluded from stormwater management, which is significantly less than the 20% limit.

A summary of all basin parameters has been presented in Appendix B.

Developed basin's runoff will be captured in roadside ditches and conveyed to a full spectrum water quality and detention pond per El Paso County DCM Volume 1. Each full spectrum pond will release treated flows at less than historic rates to minimize adverse impacts downstream. Pond D will discharge into Major Drainageway WF-7A, Pond B, C, E, and F will discharge into Major Drainageway MS-06 and Ponds G, H, and I will discharge into Major Drainageway T-6. Due to existing topography, Pond A will discharge into open space south of the site. Based on existing topography in the area, this flow will eventually be captured off-site by Major Drainageway MS-06.

See Table 4 for comparison of proposed pond parameters including a comparison of proposed basin discharge versus existing discharge.

Table 4: Pond Summary

POND SUMMARY TABLE							
Tributary Sub-Basin	Pond Name	Tributary Acres	WQ Volume (ac-ft)	100-Year Volume (ac-ft)	Provided Volume (ac-ft)	100-Year Peak Discharge (cfs)	Ex. 100-Year Peak Discharge (cfs)
A	POND A	9.2	0.20	1.14	1.14	2.5	2.8
B	POND B	60.4	0.35	1.46	2.17	18.9	21.0
C	POND C	102.5	0.64	2.69	2.77	26.0	28.9
D	POND D	99.2	0.59	2.86	2.97	47.7	53.0
E	POND E	11.6	0.05	0.23	0.39	4.7	5.2
F	POND F	117.4	0.65	3.20	3.35	50.7	56.3
G	POND G	39.9	0.34	1.36	1.62	10.1	11.2
H	POND H	30.7	0.16	0.70	1.18	10.5	11.7
I	POND I	46.6	0.25	1.09	1.41	26.8	29.8

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. Onsite drainage improvements were designed based on the 5 year (minor) storm event and the 100-year (major) storm event. 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: 2.52 inches for 1-hour 100-year depth and 3.5 inches for 6-hour 100-year depth. EPA SWMM 5.1 was utilized to route runoff flow rates for the sizing of stormwater storage facilities. The CUHP calculations and SWMM model are presented in Appendix B.

Urban Drainage and Flood Control District's UD-Detention, Version 3.07 workbook was used for preliminary pond sizing. Required detention volumes and allowable release rates were designed per USDCM and CCS/EPCDCM. Pond sizing spreadsheets are presented in Appendix D.

Hydraulic Criteria

The Federal Highway Administration's HY-8 program (Volume 7.50) was used to analyze the proposed box culvert within Major Drainageways MS-06 and T-6. Per Section 14.3.2 of the CCS/EPCDCM, a maximum headwater-to-rise ratio of 1.5 was used for the sizing of box culverts. Furthermore, box culverts will be designed in conjunction with channel improvements to maintain the current floodplain and base flood elevations. Culvert sizing and corresponding channel improvements will be revised as roadway geometry becomes better defined. Preliminary culvert design sheets are presented in Appendix C.

Autodesk Inc.'s Hydraflow Express Extension (Volume 10.5) was used for preliminary roadside ditch design. For the purposes of this PDR/MDDP, the maximum roadside ditch size was determined based on peak 100-year flows and minimum roadway slopes within each basin. Swales were checked for velocity and Froude number per the EPC DCM Chapter 10, Section 10-7 and Table 10-4. Swale cross sections with a 100-year velocity greater than 5 ft/s or a Froude number greater than 0.9 will be lined with erosion control blanket and native grasses, or another approved method of stabilization, to limit erosive potential. Final swale designs and cross section details will be included with the Final Drainage Report. Preliminary swale design sheets are presented in Appendix C.

Autodesk Inc.'s Hydraflow Express Extension (Volume 10.5) will be used for final local road crossing culvert design with in the Final Drainage Report. All onsite, local road crossing culverts are assumed to be 18" or 24" CMP based on preliminary calculations. Culvert size was determined based on 100-year flows and hydraulic criteria from EPCDCM Chapter 9 –Culvert Design. The Final Drainage Report will provide final local road crossing culvert designs.

DRAINAGE FACILITY DESIGN

General Concept

The proposed stormwater conveyance system was designed to convey the developed Saddlehorn Ranch flows to full spectrum water quality and detention ponds. Water quality and detention ponds will be designed to release at less than historic rates to minimize adverse impacts downstream. All full spectrum water quality and detention ponds have been sized such that State Engineer review or approval is not required. Undeveloped basins are allowed to follow existing drainage patterns and discharge directly into major drainageways or off-site.

The undeveloped portion of developed lots will be allowed to discharge directly into Drainageways MS-06, T-6 and WF-R7A. Per the "Jurisdictional Determination Request for the 824 Acres Curtis Road subdivision Project" completed by Ecosystem System Services in October 2018, MS-06 and T-

6 are not waters of the state and WF-R7A is a water of the state however, any direct discharge into this drainageway will be historic, undeveloped flows. The direct discharge into drainageway situation occurs anywhere a lot naturally drains toward a drainageway rather than the street. It was determined for these lots that all development (i.e. house and driveway) will occur in the first 200' of the lot, measured from the street into the lot. The 200' developed region of the lot will drain towards the road and be conveyed to a full spectrum water quality pond, however; the remainder of the lot (undeveloped) will be allowed to follow historic drainage patterns and flow directly into the drainageways. Furthermore, at time of platting, a covenant will be established for the development that will limit imperviousness to 10% for areas draining directly to the drainageways in order to satisfy Section I.7.1.B.5 of the ECM Stormwater Quality Policy and Procedures.

A box culvert will be proposed within Major Drainageway MS-06 and T-6 to convey existing, off site and developed, on-site flows underneath proposed roadways and through the site, in accordance with the *Haegler Ranch DBPS*. Culverts will not be required in Major Drainageway WF-R7A to maintain the drainage patterns established in the *Gieck Ranch DBPS.*

Channel improvements will be proposed immediately up and downstream of culvert improvements in order to maintain the current floodplain. Further channel improvements may be required within the major drainageways and the need for these potential improvements will be evaluated in the Final Drainage Report for each Filing. Access roads will be provided from local roadways down into the drainageways to provide culvert and drainageway maintenance access. A proposed drainage map is presented in Appendix F showing locations of culvert improvements, approximate channel improvements and access roads.

Specific Details

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 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. 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.

Step 4 Consider the need for Industrial and Commercial BMP's: No industrial or commercial uses are proposed within this development. However, 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.

Water Quality

In accordance with Section 13.3.2.1 of the CCS/EPCDCM, full spectrum water quality and detention will be provided for all of the development site not meeting exclusions present in the ECM - Stormwater Quality Policy and Procedures Section I.7.1.B and C. Any areas of the development site not being included in the site's permeant stormwater management are presented on the MS4 Development Site Map with their specific exclusion, 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.

Erosion Control Plan

The El Paso County Drainage Criteria Manual specifies an Erosion Control Plan and associated cost estimate must be submitted with each Final Drainage Report. We respectfully request that the Erosion Control Plan and Cost Estimate be submitted in conjunction with the grading and erosion control plans and construction assurances posted prior to obtaining a grading permit.

Operation & Maintenance

In order to ensure the function and effectiveness of the stormwater infrastructure, maintenance activities such as inspection, routine maintenance, restorative maintenance, rehabilitation and repair, are required. All proposed drainage structures within the any platted County ROW (roadside ditches and local road culverts) will be owned and maintained by El Paso County. All proposed drainage structures within easements or tracts (full spectrum water quality ponds, drainageway culverts and drainageway improvements) will be owned and maintained by the Saddlehorn Ranch Metropolitan District No.1. Inspection access for El Paso County will be provided through a maintenance easement.

Drainage and Bridge Fees

An estimate of total basin fees for the proposed development within Haegler Ranch Drainage Basin is provided in Table 6. A portion of Saddlehorn Ranch (Basin J and CH1) is not within an approved

drainage basin, therefore; no drainage or bridge fees will be required for this area. Drainage and Bridge fees are for informational purposes only and do not include reductions for rural lots, permanent water quality facilities or reimbursable channel improvements. Final drainage reports for each phase of development will establish official drainage and bridge fees to be paid at time of platting.

Table 5: Site Composite Percent Imperviousness

Total Site Composite % Impervious for Basin Fees			
Basin	Area (ac)	% Imperviousness	(Area) * (% Imp.)
A	9.2	67%	6.13
B	60.4	10%	6.28
C	102.5	11%	11.69
D	99.2	11%	10.71
E	11.6	12%	1.35
F	117.4	10%	11.62
G	39.9	17%	6.70
H	30.7	9%	2.89
I	46.6	9%	4.38
J	10.1	9%	0.89
UD1	12.4	2%	0.25
UD2	12.8	2%	0.26
UD2.1	14.8	2%	0.30
UD2.2	7.2	2%	0.14
UD3	13.4	2%	0.27
UD4	4.8	2%	0.10
UD5	36.4	2%	0.73
UD6	22.1	2%	0.44
UD7	9.3	2%	0.19
UD8	4.6	2%	0.09
UD8.1	5.3	2%	0.11
UD9	4.8	2%	0.10
UD9.1	6.4	2%	0.13
UD10	10.4	2%	0.21
UD11	6.0	2%	0.12
CH1	23.9	2%	0.48
CH2	84.2	2%	1.68
CH3	19.0	2%	0.38
Total	825.4	-	68.59
Comp. % Imp. = 68.59%*ac/825.4 ac = 8.31%			

Table 6: Drainage Basin Fees

El Paso County - Haegler Ranch Drainage Basin Fees						
Area (acre)	Composite % Impervious	Total Impervious Acreage	2019 Drainage Fee (per Impervious Acre)	2019 Bridge Fee (per Impervious Acre)	Saddlehorn Ranch Drainage Fee	Saddlehorn Ranch Bridge Fee
825.4	8.31%	68.59	$10,324	$1,524	$708,123	$104,531

Construction Cost Opinion

(For Information Only / Non-Reimbursable)
Cost opinion to be provided with Final Drainage Report.

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.

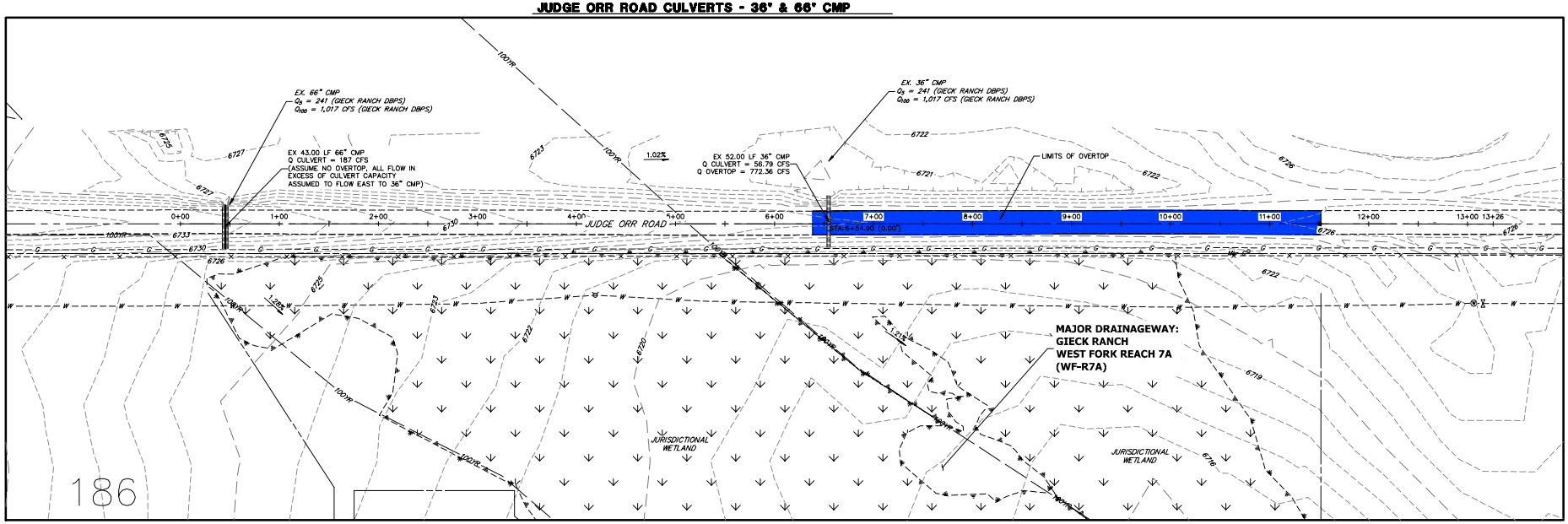
3. Gieck Ranch Drainage Basin Planning Study, Drexel, Barrell & Co., October 2007 and revised in February 2010.

4. Haegler Ranch Drainage Basin Planning Study, URS Corporation, May 2009.

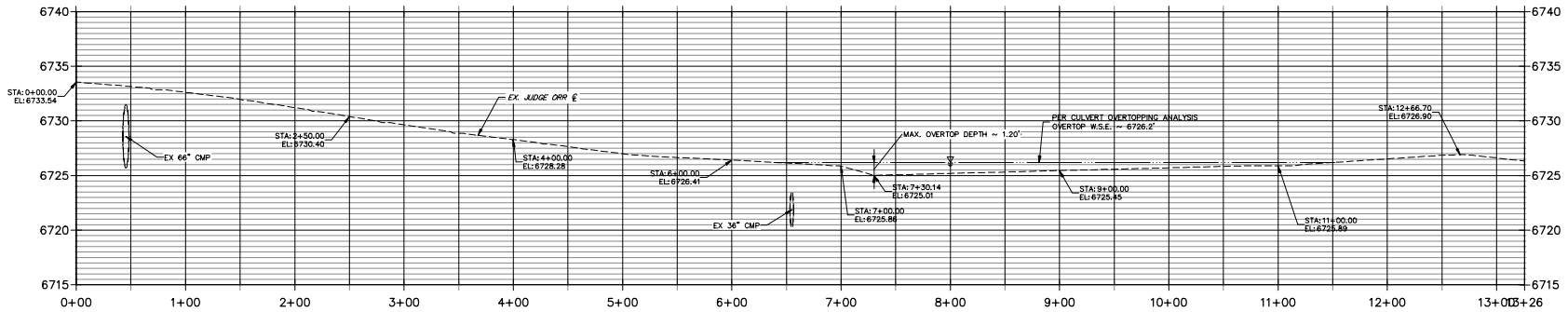
5. The Santa Fe Springs – Haegler Ranch Drainage Basin LOMR, Federal Emergency Management Agency, October 20, 2004.

SADDLEHORN RANCH

JUDGE ORR ROAD CULVERTS - 36" & 66" CMP



JUDGE ORR ROAD WEST & EAST CULVERT ROAD PROFILE PROFILE
STA 0+00.00 TO 13+25.72



SADDLEHORN RANCH
EX CULVERT OVERTOPPING
2514200
11/27/19
SHEET 2 OF 2

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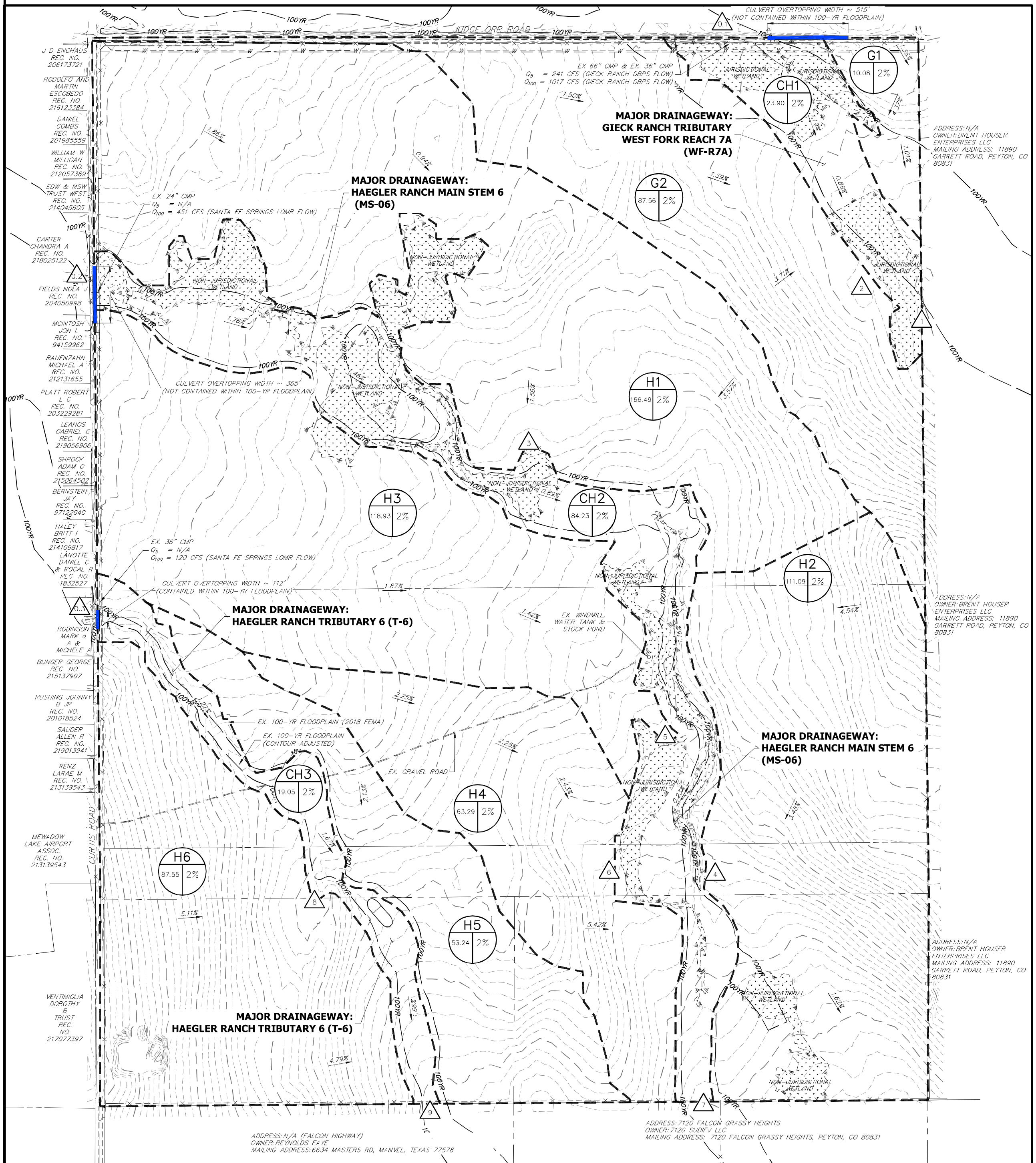
824 ACRE CURTIS ROAD SUBDIVISION

EX. CONDITIONS DRAINAGE MAP



LEGEND

- (I.D. / A | B) BASIN DESIGNATION — I.D.: BASIN IDENTIFIER; A: BASIN AREA; B: % IMPERVIOUS
- (triangle X) DESIGN POINT
- BASIN DELINEATION
- --6100-- EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION

BASIN SUMMARY TABLE

Tributary Sub-Basin	Area (acres)	Percent Impervious	Q_5 (cfs)	Q_{100} (cfs)
G1	10.1	2.0%	0.00	0.1
G2	87.6	2.0%	1.5	76.4
H1	166.5	2.0%	0.1	81.0
H2	111.1	2.0%	0.2	91.1
H3	118.9	2.0%	0.3	64.1
H4	63.3	2.0%	1.4	73.2
H5	53.2	2.0%	0.3	29.2
H6	87.6	2.0%	0.2	110.1
CH1	23.9	2.0%	5.4	31.0
CH2	84.2	2.0%	2.6	33.7
CH3	19.1	2.0%	0.1	5.5
Total	825.4	N/A	12.7	585.4

DESIGN POINT SUMMARY TABLE

Tributary Sub-	Q_5 (cfs)	Q_{100} (cfs)
0.1	241.00	1017.0
0.2	-	451.0
0.3	-	120.0
1	6.9	1114.0
2	1.5	76.4
3	0.1	80.9
4	0.1	91.1
5	0.9	64.1
6	1.4	73.2
7	4.1	704.9
8	0.2	110.1
9	0.4	248.1

EX. DRAINAGE MAP
824 CURTIS ROAD
25142.00
5/8/20
SHEET 1 OF 1

300 150 0 300 600
ORIGINAL SCALE: 1" = 300'

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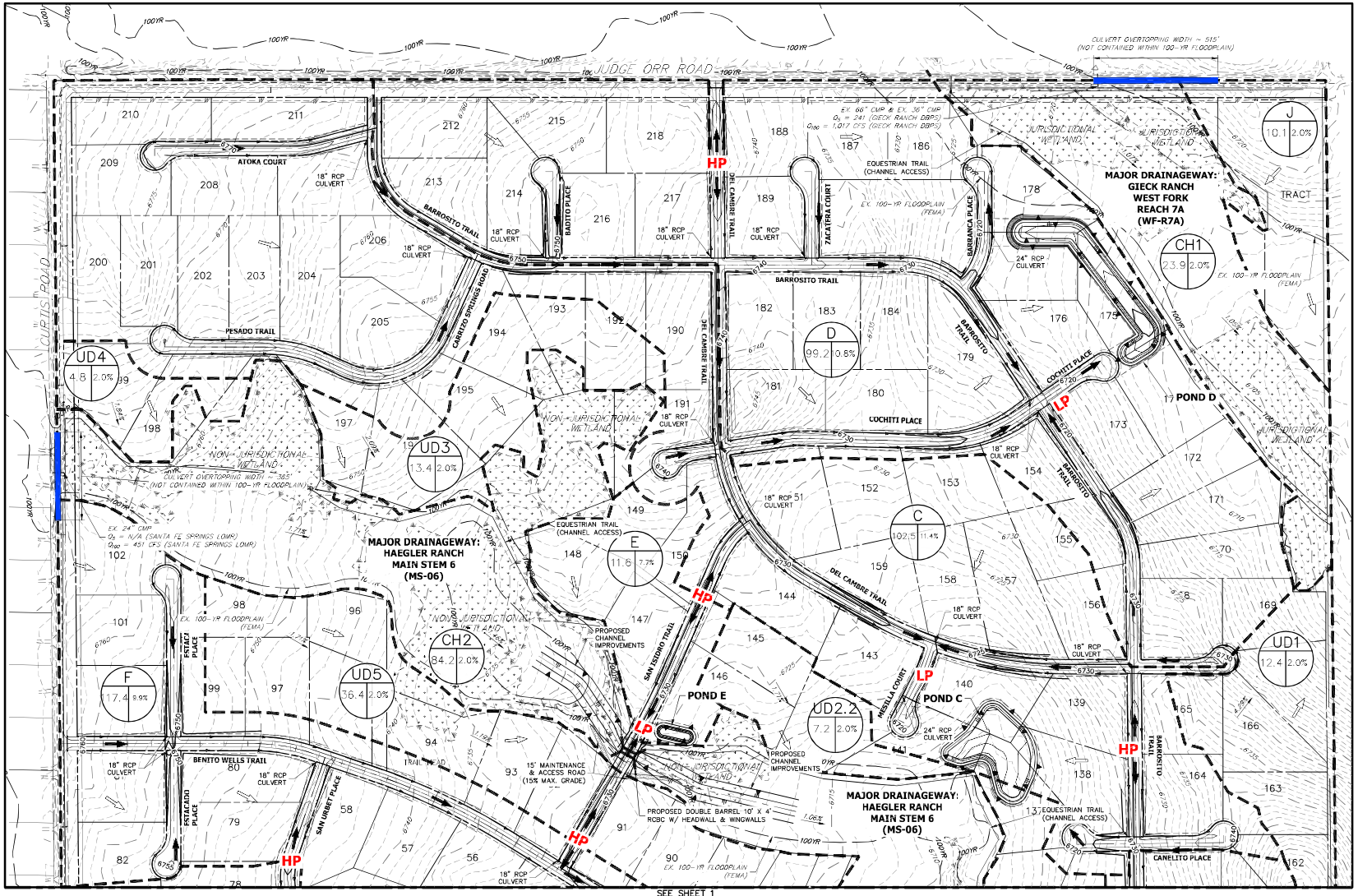
SADDLEHORN RANCH SUBDIVISION
PROPOSED DRAINAGE MAP



BASIN SUMMARY TABLE

Tributary Sub-Basin	Area (acres)	Composite Percent Impervious	Q_{100} (cfs)	Q_{500} (cfs)
A	9.2	48.8%	9.5	13.7
B	80.4	10.4%	9.8	42.3
C	102.5	11.4%	13.8	59.2
D	99.2	10.8%	13.4	58.4
E	11.8	11.8%	2.8	9.8
F	117.4	9.9%	17.0	60.0
G	38.9	16.8%	6.1	25.3
H	38.7	9.4%	5.7	17.3
I	38.8	9.4%	5.9	18.1
J	10.1	2.0%	3.0	10.5
UD1	12.4	2.0%	3.2	13.6
UD2	12.8	2.0%	3.1	7.7
UD2.1	14.8	2.0%	3.1	14.7
UD2.2	7.1	2.0%	0.1	3.3
UD3	13.4	2.0%	3.2	15.1
UD4	4.8	2.0%	0.03	3.4
UD5	36.4	2.0%	4.1	17.3
UD6	12.1	2.0%	0.1	12.6
UD7	9.3	2.0%	0.7	7.4
UD8	4.6	2.0%	0.03	2.3
UD8.1	5.3	2.0%	0.1	3.8
UD9	4.8	2.0%	0.1	4.2
UD10	9.4	2.0%	0.2	8.1
UD11	10.9	2.0%	0.1	9.7
UD12	6	2.0%	0.02	4.9
OFF1	23.9	2.0%	5.4	21.0
OFF2	84.2	2.0%	2.6	38.7
OFF3	19.0	2.0%	0.1	9.5
Total	825.4	N/A	126.7	467.3

POND SUMMARY TABLE

Tributary Sub-Basin	Pond Name	Tributary Acres	WQ Volume (ac-ft)	100-Year Volume (ac-ft)	Provided Volume (ac-ft)	100-Year Peak Discharge (cfs)	Ex. 100-Year Peak Discharge (cfs)
A	POND A	9.2	0.20	1.44	1.44	3.5	3.8
B	POND B	80.4	0.25	2.46	2.17	18.9	21.0
C	POND C	102.5	0.64	3.88	3.77	26.0	28.9
D	POND D	99.2	0.56	2.86	2.97	47.7	53.0
E	POND E	11.8	0.05	0.25	0.38	4.7	5.2
F	POND F	117.4	0.65	4.20	4.56	50.7	56.3
G	POND G	38.9	0.54	1.58	1.62	10.3	11.2
H	POND H	38.7	0.36	0.70	1.38	10.5	11.7
I	POND I	38.8	0.25	1.09	1.42	10.8	11.8

LEGEND

- I.D. / A / B — BASIN DESIGNATION
  - I.D.: BASIN IDENTIFIER
  - A: BASIN AREA
  - B: COMP. % IMPERVIOUS
- DESIGN POINT
- BASIN DELINEATION
- 6700 — EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6100 — PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP — PROPOSED HIGH POINT
- LP — PROPOSED LOW POINT

NOTES

1. ALL CULVERT SIZES ARE PRELIMINARY AND SUBJECT TO CHANGE WITH FINAL DRAINAGE REPORTS.

200 100 0 200 400
ORIGINAL SCALE: 1" = 200'

SADDLEHORN RANCH
MDDP DRAINAGE MAP
25142.00
12/18/19
SHEET 2 OF 3

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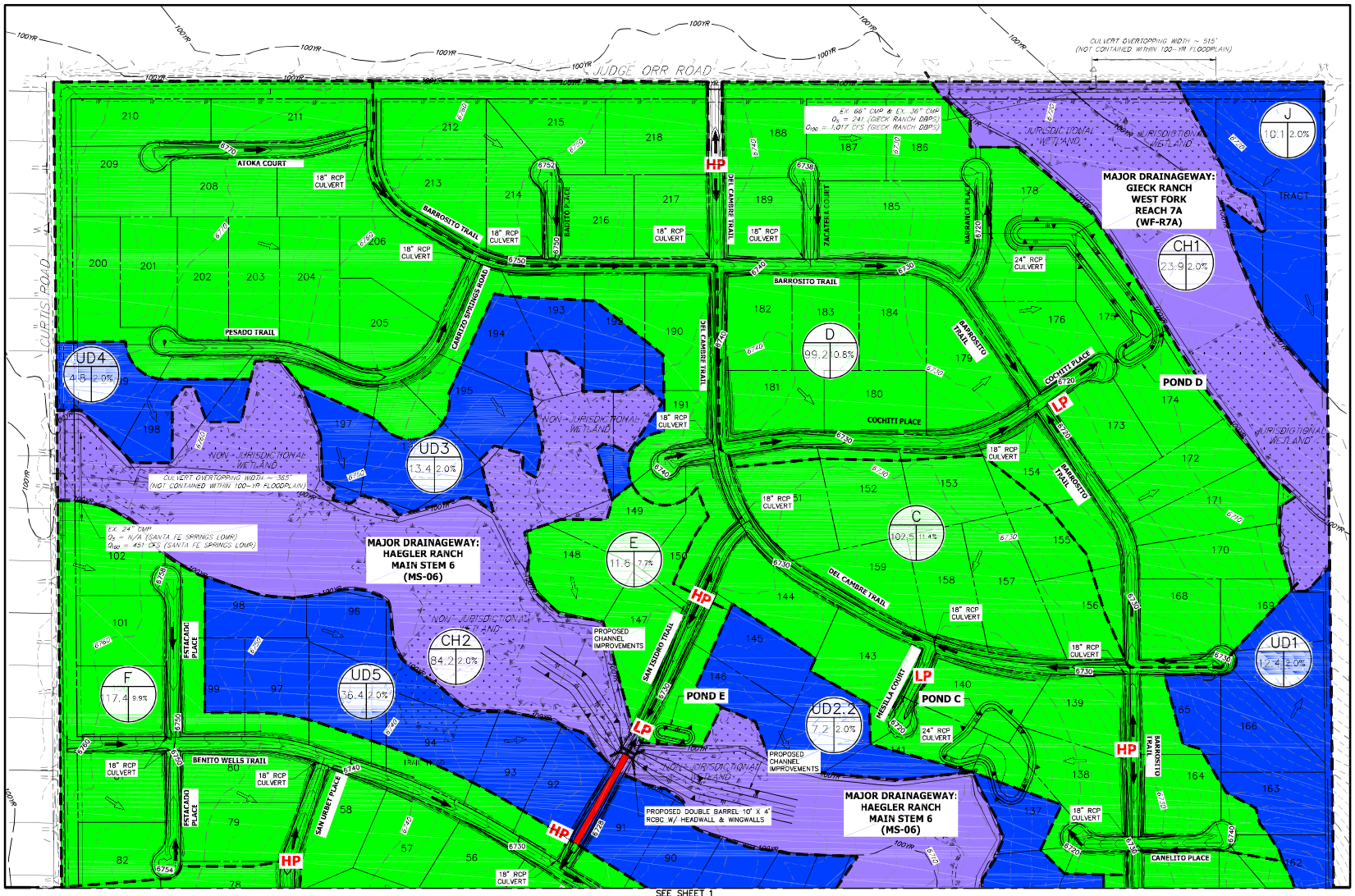
SADDLEHORN RANCH SUBDIVISION
PERMANENT BMP APPLICABILITY MAP



LEGEND

- I.D. (A | B): BASIN DESIGNATION — I.D.: BASIN IDENTIFIER; A: BASIN AREA; B: COMP. % IMPERVIOUS
- BASIN DELINEATION
- 6100 EXISTING INDEX CONTOURS
- EXISTING INTERMEDIATE CONTOURS
- 6100 PROPOSED INDEX CONTOURS
- PROPOSED INTERMEDIATE CONTOURS
- EXISTING FLOW DIRECTION
- PROPOSED FLOW DIRECTION
- HP: PROPOSED HIGH POINT
- LP: PROPOSED LOW POINT
- AREA DETAINED IN PBMP
- AREA NOT DETAINED IN PBMP PER SECTION I.7.1.B.5 (RURAL 2.5+ ACRE LOTS W/ IMPERVIOUSNESS < 10%)
- AREA NOT DETAINED IN PBMP PER SECTION I.7.1.C.1 (20% UP TO 1 AC. OF DEVELOPMENT SITE CAN BE EXCLUDED DUE TO TOPOGRAPHY)
- AREA NOT DETAINED IN PBMP PER SECTION I.7.1.B.7 (LAND DISTURBANCE TO UNDEV. LAND THAT WILL REMAIN UNDEV.)

NOTES

1. ALL CULVERT SIZES ARE PRELIMINARY AND SUBJECT TO CHANGE WITH FINAL DRAINAGE REPORTS.

200 100 0 200 400
ORIGINAL SCALE: 1" = 200'

SADDLEHORN RANCH
DRAINAGE MAP
25142.00
11/27/19
SHEET 2 OF 2

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