TECHNICAL MEMORANDUM

Date: August 15, 2025

To: Tiequan Chen, P.E., CFM, City of Albuquerque Floodplain Administrator

Rudy Rael, CFM, City of Albuquerque Assistant Floodplain Administrator

From: Jared Romero, P.E., CFM, AMAFCA Drainage Engineer

CC: Nicole Friedt, P.E., CFM, AMAFCA Director of Planning & Engineering

Adrienne Martinez, EIT, AMAFCA Project Engineer

Re: AMAFCA Swinburne Dam Grade Control Structures – Floodway No-Rise Analysis

Background

The Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) proposes to construct two grade control structures (GCSs) and associated bank and erosion protection (the Project) at Swinburne Dam in Albuquerque, New Mexico west of Unser Blvd. (Figure 1). The dam is proposed to be significantly excavated in the future to ensure downstream infrastructure is not overwhelmed in future, fully developed conditions. As part of the Project, the inlets to the dam will be excavated to construct the grade control structures and bank protection. The grades in the arroyo will be altered during construction and restored generally to existing conditions after construction with minimal grade changes as practicable. However, the improvements are considered an encroachment into the regulatory floodway for the Calabacillas Arroyo. This technical memorandum and no-rise floodway analysis is being submitted in support of a floodplain development permit from the City of Albuquerque, the NFIP community affected for the Project.

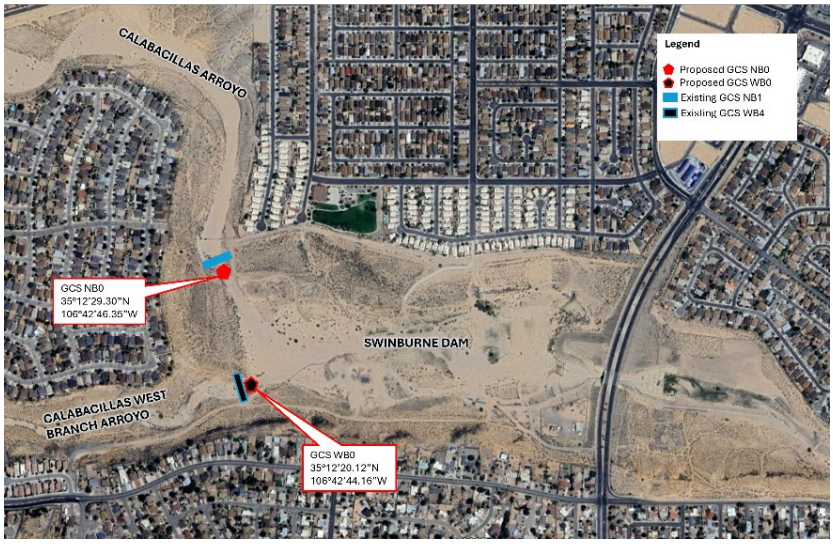

Figure 1: Project Location

Effective Floodplain Information

The Project is proposed to take place in the Calabacillas Arroyo, shown on effective FEMA FIRM Panel 35001C0104H dated August 16, 2012, as delineated floodway (Attachment 1). The effective *Flood Insurance Study for Bernalillo County, NM and incorporated areas 35001CV001D* [FEMA, 2016] (FIS) identifies regulatory and floodway base flood elevations (BFEs) for the Calabacillas Arroyo in the reach of the Project at four named cross sections, AC through Z (Attachment 2). The BFEs identified in the FIS were set as the criteria for this no-rise analysis. The effective floodway hydraulic model was obtained from the FEMA Engineering Library on October 2, 2024, and was the basis for the no-rise analysis.

Proposed Improvements

The Project proposes two new GCS and areas of new bank protection within Swinburne Dam west of Unser Blvd. These infrastructure needs were recommended in the *Calabacillas Arroyo Facility Plan Proposed Conditions Report* [Tetra Tech & Bohannan Huston, Inc., 2018] (CAFP), which identified the need to excavate Swinburne Dam to ensure that the dam discharge did not exceed the downstream infrastructure capacities. Excavation of the dam will expose the existing grade control structures at the inlets to the dam to additional scour and headcutting. Therefore, it is crucial that the new grade control structures be installed to protect the existing infrastructure from undermining and failure.

The proposed grade control structures and bank protection will be constructed with a combination of shotcrete and grouted riprap to maintain stylistic continuity with the existing arroyo infrastructure. Additionally, new access ramps will be built to improve mobilization in and out of the dam during operation and maintenance activities as well as emergency response.

The 90% construction plans for this document can be found in Attachment 3.

Hydraulic Analysis

The effective floodway HEC-RAS model dated (August 27, 2010) was obtained from FEMA on October 2, 2024, and was the basis for the no-rise analysis. The model was upgraded to HEC-RAS version 6.6 for this analysis. All modeling was done in the North American Datum of 1983 (NAD83) State Plane New Mexico Central FIPS 3002 Feet projection using the North American Vertical Datum of 1988 (NAVD88) consistent with the FEMA FIS and FIRMs.

Model Iterations, Geometry, and Discharge

Three hydraulic model iterations were developed for this analysis. The model iterations are as follows:

1. Duplicate Effective Model: duplicate of the effective model dated (August 27, 2010) obtained from the FEMA Engineering Library in October 2024.

2. Corrected Effective Model: effective model updated using current topography in the arroyo reach impacted by the Project. Site visits and comparison of topography show evidence of both channel bed and bank degredation and aggradation in the reach of the arroyo impacted by the Project.

3. Proposed Conditions Model: corrected effective model updated with the future condition grading in the Calabacillas Arroyo after the proposed GCSs are constructed and re-filling the arroyo to grades similar to existing conditions; this grading involves reburial of the new GCSs with 15 – 20 feet of fill.

The Mid-Region Council of Governments (MRCOG) lidar data from 2018 was used to update the model to existing conditions. The proposed conditions terrain was generated using the topographic surface prepared by AMAFCA's design engineer for the Project for the arroyo's proposed conditions. The proposed condition was generated assuming that at GCS NB0 (Cross Section Station 23,131) the stilling basin of the GCS was reburied to an elevation of 5,289.9ft.

The 1-percent annual chance floodway discharge of 7,071 cfs from the effective FIS was used for the analysis at Cross Section Station 24,000. There is a flow change at Cross Section Station 23,131 to 7,813 cfs, consistent with the effective model. All models were run under steady state conditions.

Table 1 provides a summary of the model iterations and how they correspond with the associated HEC-RAS geometries and model plans.

Table 1: Hydraulic Model Iterations

Iteration	Model Description	HEC-RAS Plan Name	Geometry/Terrain Used	Flow Discharge
1	Duplicate Effective Model	Floodway	Floodway Flows	Floodway Flows
2	Corrected Effective Model – Existing Conditions	Corr_Eff_Plan	Floodway Flows – Corrected Effective & Existing Terrain	Floodway Flows
3	Proposed Conditions	Prop_Plan	Floodway Flows – Proposed & Finished Terrain	Floodway Flows

Hydraulic Roughness

Hydraulic roughness was determined using recent aerial imagery and the proposed plans for the Project. The Manning's roughness values were assigned based on the determined land cover and consistent with the effective roughness values in the effective floodway model. Table 2 shows the roughness values and their associated land cover.

Table 2: Manning's Roughness Coefficients

Land Cover	Manning's Roughness Value
Main Arroyo Channel	0.022
Overbank – Sparse Vegetation	0.040 and 0.030
Riprap	0.035
Residential	0.100 and 0.200

Infiltration

Infiltration was not represented or analyzed in any model iterations.

Flow Regime

All model iterations were run under subcritical flow conditions, per FEMA's *Guidance for Flood Risk Analysis and Mapping - Floodway Analysis and Mapping* [FEMA, 2023].

Boundary Condition

All model iterations were set to a downstream normal depth boundary condition with a slope of 1.72%, consistent with the effective floodway model for the Calabacillas Arroyo.

Results

The results of the no-rise analysis show in general that there is largely a decrease in the BFEs for the overall project footprint. There is an identified increase in BFE from the effective regulatory values at Cross Section Station 22,092, just downstream of the proposed GCS NB0. Discussion on the increased BFE is shown in the following sections. Table 3 shows the BFE, mean channel velocity, and flow area for each model iteration.

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Table 3: Summary of Hydraulic Model Results

Model Iteration		Duplicate Effective			Corrected Effective			Proposed		
Cross Section	River Sta.	BFE (ft)	Vel (fps)	Area (sf)	BFE (ft)	Vel (fps)	Area (sf)	BFE (ft)	Vel (fps)	Area (sf)
AC	24000	5318.03	11.58	610.4	5317.44	11.58	610.57	5317.45	11.57	611.08
AB	23130.9	5299.97	11.41	684.83	5296.13	13.52	577.76	5293.46[1]	10.59	737.79
AA	22092.3	5280.85	8.89	878.37	5281.41[2]	7.28	1073.82	5281.41	7.28	1073.82
Z	21090.2	5281.21	0.78	10071.54	5281.21	0.78	10071.54	5281.21	0.78	10071.54

[1] This cross section is the location of GCS NB0 where the stilling basin of the GCS was reburied to an elevation of 5289.9ft and shows an increase in BFE from the corrected model; the proposed conditions BFE is still lower than the duplicate effective BFE.

[2] This cross section shows an increase in BFE from the duplicate effective model. The corrected effective model indicates that the Swinburne Dam sediment basin has aggraded downstream of the proposed GCS NB0, increasing the BFE from the effective model. This sediment detention dam is on property owned by AMAFCA and accumulated sediment will be removed with normal operations and maintenance activities such that there will not be an increase in effective BFE.

See Attachment 4 for the full hydraulic model results.

Table 4 shows the differences in BFE, mean channel velocity, and flow area for each model iteration compared to the duplicate effective model. Negative values indicate a decrease from the duplicate effective model, while positive values indicate an increase from the duplicate effective model.

When compared to the results from the duplicate effective model, there is an increase in the BFE at Cross Section Station 22,092 downstream of the project under the corrected effective condition and in the proposed model condition. While the BFE at this cross section increases in the corrected effective and proposed conditions, the overall flood depth decreased by roughly 0.6 ft (Effective depth = 3.75ft, Proposed depth = 3.19ft). The increase in the BFE is due to aggradation in the sediment basin of Swinburne Dam, as explained below.

Table 4: Model Results Comparison

Model Iteration		Corrected Effective			Proposed		
Cross Section	River Sta.	BFE (ft)	Vel (fps)	Area (sf)	BFE (ft)	Vel (fps)	Area (sf)
AC	24000	-0.6	0.0	0.2	-0.6	0.0	0.7
AB	23130.9	-3.8	2.1	-107.1	-6.5	-0.8	53.0
AA	22092.3	**0.6**	-1.6	195.5	0.6	-1.6	195.5
Z	21090.2	0.0	0.0	0.0	0.0	0.0	0.0

Examination of the topography revealed that the Swinburne Dam sediment detention basin, at Cross Section Station 22,092 downstream of the Project, has experienced aggradation (up to 1.1 ft) since the time of publishing of the effective model. Swinburne Dam is owned and operated by AMAFCA for flood control protection. AMAFCA has already identified a need to dredge the detention basin (as indicated in the CAFP). The accumulation of sediment will be removed such that the base flood elevation is restored to below the effective conditions model. Table 5 shows the changes in minimum channel elevation compared to the duplicate effective model. Negative values indicate a decrease from the duplicate effective model, while positive values indicate an increase from the duplicate effective model.

Table 5: Minimum Channel Elevation Comparison

Model Iteration		Corrected Effective	Proposed
Cross Section	River Sta.	Min. Elev(ft)	Min. Elev(ft)
AC	24000	-1.46	-1.46
AB	23130.9	-5.59	-5.13
AA	22092.3	**1.12**	1.12
Z	21090.2	0	0

Summary

This no-rise analysis supports the issuance of a floodplain development permit for the Swinburne Dam Grade Control Structures Project. As shown in the topographic comparison, the downstream sediment detention dam has experienced aggradation since the effective model was issued in 2010; the intent of the Project is to stabilize the arroyo, mitigate erosion, and allow for the excavation of the accumulated sediment in the sediment basin while protecting the existing flood control infrastructure. This no-rise analysis shows that in the corrected effective and proposed conditions analyses, there is an increase in the floodway BFE at Cross Section Station 22,092. This cross section is located within the Swinburne Dam sediment detention basin where removal of sediment to return the BFE to below the effective condition is controlled by AMAFCA, and said removal will be scheduled as soon as practicable. As such, a "No-Rise" Certification is included as Attachment 5. While this analysis identifies an increase of the downstream BFE in the sediment detention basin of the dam due to aggradation, it is not recommended to change the BFEs through a Letter of Map Revision, as the flood risk remains within the footprint of AMAFCA's flood control facility.

Attachments

Attachment 1 – FEMA FIRM Panels

Attachment 2 – FEMA Floodway Data Tables & Flood Profiles

Attachment 3 – 90% Construction Drawings

Attachment 4 – HEC-RAS Model Results

Attachment 5 – “No-Rise” Certification

90% Construction Drawings

Available upon request. Please contact Adrienne Martinez at amartinez@amafca.org to request the drawings.

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 (NAVD 88). 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 in this jurisdiction.

The **projection** used in the preparation of this map was New Mexico State Plane, Central Zone (FIPS 3002). The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane 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. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey, SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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 their website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by City of Albuquerque, 2010, Bernalillo County, 2004, and 2010, Bureau of Land Management, 2003, National Geodetic Survey, 2003, and United States Geological Survey (USGS), 1999. Additional Information was photogrammetrically compiled at a scale of 1:12,000 from U.S. Department of Agriculture aerial photography dated 2009.

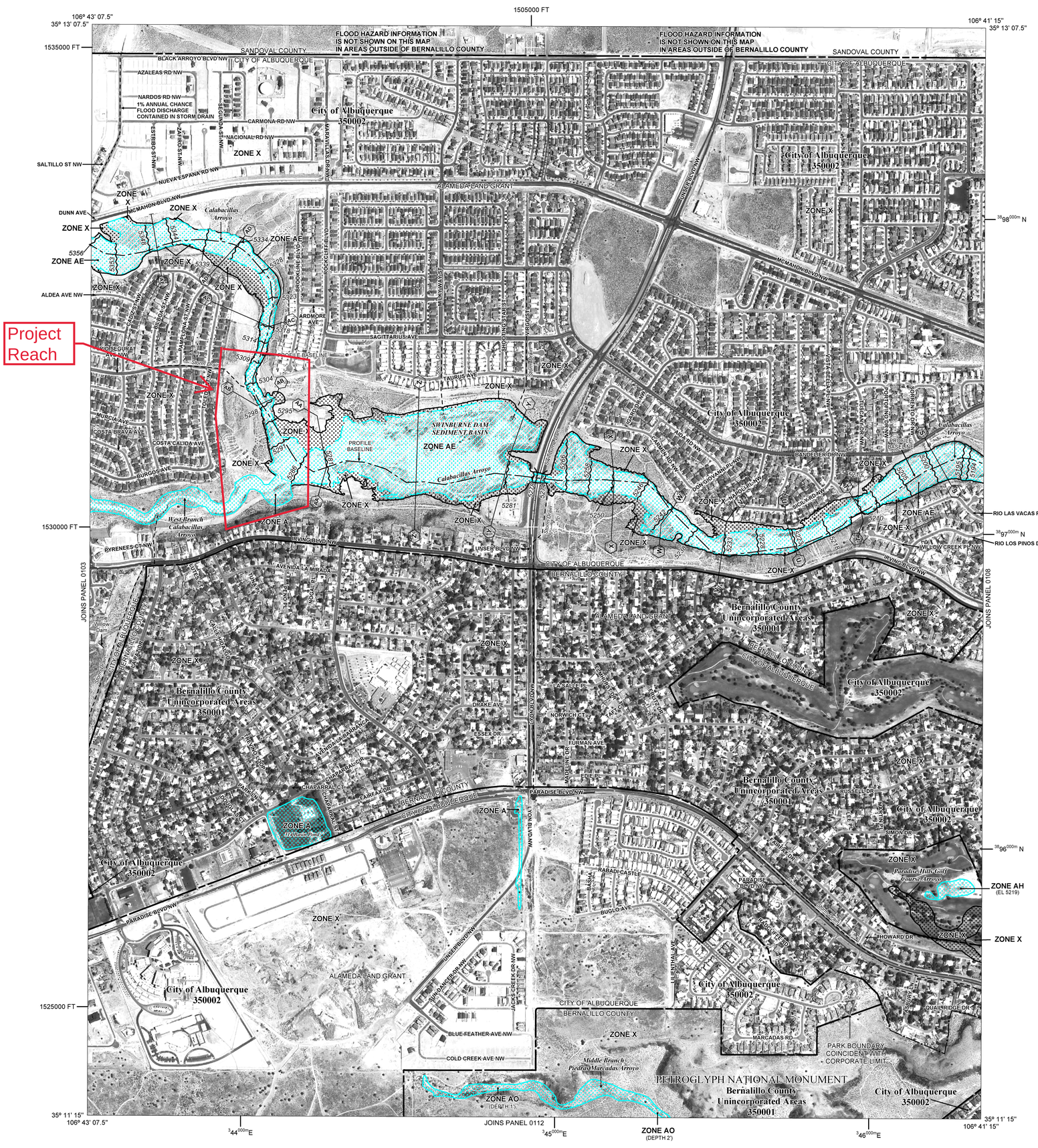
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, 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.

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.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

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



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 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.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D Boundary
- CBRS and OPA Boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 (EL 987) — Base Flood Elevation line and value; elevation in feet* (Base Flood Elevation value where uniform within zone; elevation in feet*)
- *Referenced to the North American Vertical Datum of 1988
- A — A — Cross section line
- 23 — 23 — Transect line
- 97° 07' 30", 32° 22' 30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 76000mE — 1000-meter Universal Transverse Mercator grid values, zone 13
- 600000 FT — 5000-foot grid ticks: New Mexico State Plane coordinate system, Central zone (FIPSZONE 3002), Transverse Mercator
- 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 PANEL

SEPTEMBER 20, 1996

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

April 2, 2002
November 19, 2003
September 26, 2008

August 16, 2012 - to update corporate limits, to change Base Flood Elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to add roads and road names, to incorporate previously issued Letters of Map Change.

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

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0104H

FIRM

FLOOD INSURANCE RATE MAP

BERNALILLO COUNTY, NEW MEXICO AND INCORPORATED AREAS

PANEL 104 OF 825

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ALBUQUERQUE, CITY OF	350002	0104	H
BERNALILLO COUNTY UNINCORPORATED AREAS	350001	0104	H

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
35001C0104H

MAP REVISED
AUGUST 16, 2012

Federal Emergency Management Agency

Table 11 - Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cfs) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Boca Negra Arroyo					
Cross-section A	14.1	482	1,335	1,831	3,246
Cross-section B	13.0	419	1,151	1,586	2,832
Cross-section E	12.2	404	1,111	1,534	2,745
Split Flow South Branch Cross-section A	11.8	0	40	83	300
Split Flow North Branch Section I	11.8	404	1,071	1,451	2,445
Cross-section M	11.7	404	1,111	1,534	2,745
Cross-section P	11.5	392	1,080	1,493	2,675
Calabacillas Arroyo					
At the confluence with the Rio Grande	93.2	1,968	5,998	9,013	16,350
2,900 feet upstream of Eagle Ranch Rd	92.5	1,747	5,161	7,378	13,686
At Unser Blvd	78.6	1,859	5,480	7,813	14,675
3,300 feet upstream of Unser Blvd.	71.5	1,695	4,966	7,071	13,295
Cedro Canyon Arroyo					
At confluence with Tijeras Arroyo (at Tijeras)	18.9	1,830	3,730	5,420	10,840

Project Reach

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE-FLOOD WATER SURFACE ELEVATION (FEET NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY[2]	WITHOUT FLOODWAY[2]	WITH FLOODWAY[2]	INCREASE[2]
CALABACILLAS ARROYO (continued)								
T	16,000	148.0	628	11.8	5,213.0	5,213.0	5,213.0	0.0
U	16,797	181.8	671	11.0	5,222.8	5,222.8	5,222.8	0.0
V	17,565	301.3	852	8.7	5,233.3	5,233.3	5,233.3	0.0
W	18,269	345.6	901	8.2	5,242.1	5,242.1	5,242.1	0.0
X	19,000	223.7	720	10.3	5,249.6	5,249.6	5,249.6	0.0
Y	20,145	283.9	8,121	2.2	5,281.1	5,281.1	5,281.1	0.0
Z	21,090	847.5	10,069	0.8	5,281.2	5,281.2	5,281.2	0.0
AA	22,092	362.3	878	8.9	5,280.9	5,280.9	5,280.9	0.0
AB	23,131	158.9	668	11.7	5,298.2	5,298.2	5,298.2	0.0
AC	24,000	147.8	609	11.6	5,318.0	5,318.0	5,318.0	0.0
AD	25,000	267.0	745	9.5	5,334.4	5,334.4	5,334.4	0.0
AE	29,517	268.2	742	9.5	5,347.5	5,347.5	5,347.5	0.0
AF	27,057	166.1	719	9.8	5,365.1	5,365.1	5,365.1	0.0
AG	28,047	198.9	674	10.5	5,378.0	5,378.0	5,378.0	0.0
AH	29,025	257.0	733	9.6	5,390.7	5,390.7	5,390.7	0.0
AI	29,713	367.7	825	8.6	5,401.2	5,401.2	5,401.2	0.0

Project Reach

[1]Feet above confluence with the Rio Grande

[2]Floodway coincident with floodplain

TABLE 15

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

FLOODWAY DATA

CALABACILLAS ARROYO

Project Reach

SWINBURNE DAM SEDIMENT BASIN

UNSER BLVD.

ELEVATION IN FEET (NAVD 88)

5360
5340
5320
5300
5280
5260
5240

19,500 20,000 20,500 21,000 21,500 22,000 22,500 23,000 23,500 24,000 24,500 25,000 25,500 26,000

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH RIO GRANDE

Y Z AA AB AC AD AE

LEGEND
- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD
- 10% ANNUAL CHANCE FLOOD
- STREAM BED
- CROSS SECTION LOCATION

FLOOD PROFILES

CALABACILLAS ARROYO

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM

AND INCORPORATED AREAS

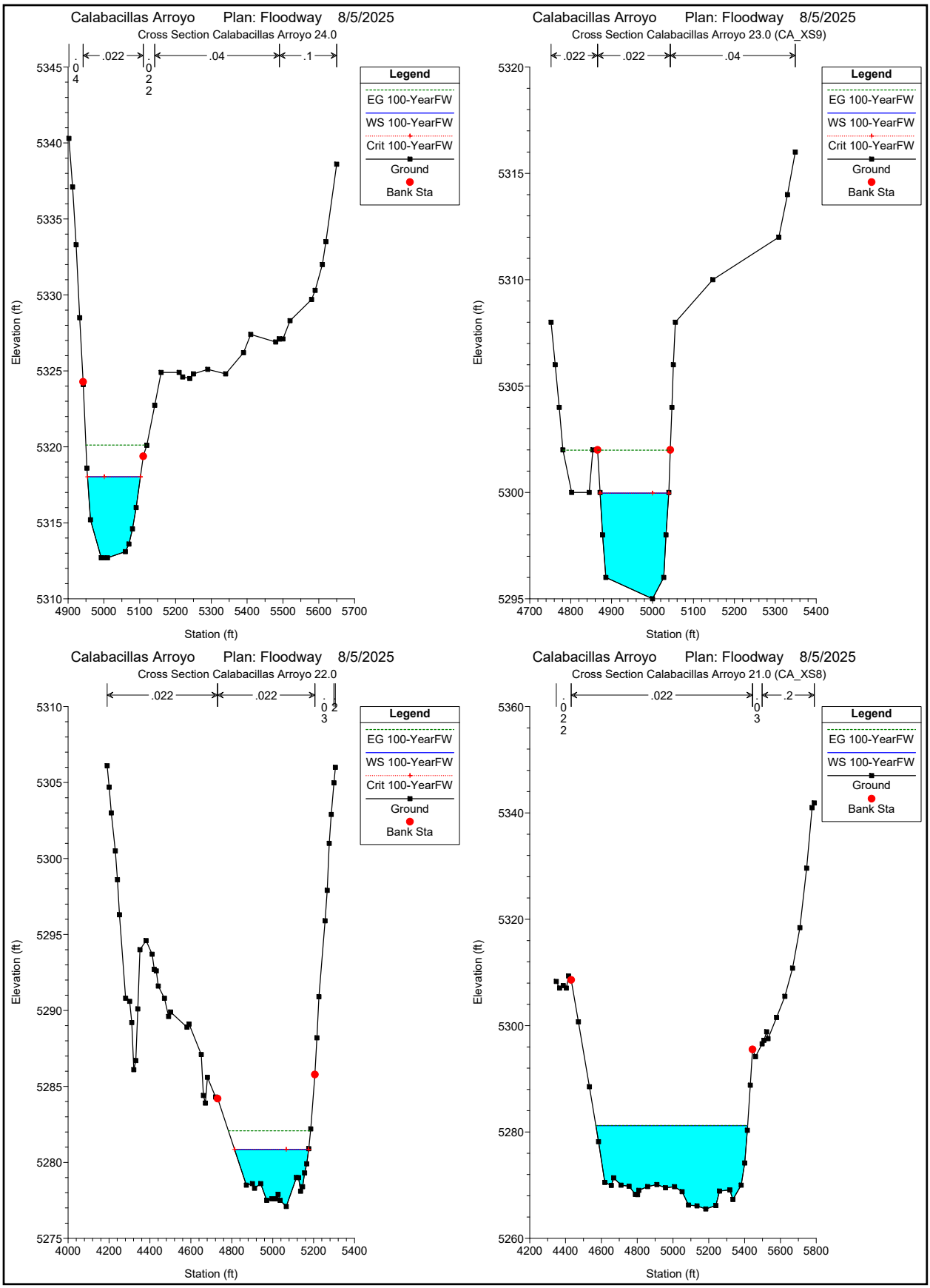
20P

DUPLICATE EFFECTIVE FLOODWAY HEC-RAS MODEL RESULTS

HEC-RAS Plan: FW River: CalabacillasArro Reach: Reach - 1 Profile: 100-YearFW

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)	
Reach - 1	29751	100-YearFW	7071.03	5398.00	5402.46	5402.46	5403.69	0.005232	8.92	794.29	327.73	1.00
Reach - 1	29000.0	100-YearFW	7071.03	5385.36	5391.40	5391.40	5392.89	0.004975	9.79	723.94	263.99	1.00
Reach - 1	28000.0	100-YearFW	7071.03	5374.00	5377.92	5377.92	5379.02	0.005485	8.39	842.61	387.13	1.00
Reach - 1	27000.0	100-YearFW	7071.03	5360.40	5364.43	5364.43	5365.44	0.005624	8.05	878.42	438.15	1.00
Reach - 1	25916.8	100-YearFW	7071.03	5343.00	5347.47	5347.47	5348.87	0.005100	9.51	743.90	268.24	1.01
Reach - 1	25000.0	100-YearFW	7071.03	5330.00	5334.40	5334.40	5335.81	0.005053	9.49	744.74	267.02	1.00
Reach - 1	24000.0	100-YearFW	7071.03	5312.70	5318.03	5318.03	5320.12	0.004480	11.58	610.40	147.90	1.01
Reach - 1	23130.9	100-YearFW	7813.08	5295.00	5299.97	5299.97	5301.99	0.004417	11.41	684.83	167.78	1.00
Reach - 1	22092.3	100-YearFW	7813.08	5277.10	5280.85	5280.85	5282.08	0.005331	8.89	878.37	362.34	1.01
Reach - 1	21090.2	100-YearFW	7813.08	5265.53	5281.21		5281.22	0.000005	0.78	10071.54	847.54	0.04
Reach - 1	20144.5	100-YearFW	7813.08	5261.10	5281.13	5266.32	5281.20	0.000029	2.20	3602.41	283.92	0.10
Reach - 1	19858.6	100-YearFW	7378.16	5257.44	5277.95	5274.24	5280.45	0.003419	13.08	626.29	282.54	0.61
Reach - 1	19787.6		Bridge									
Reach - 1	19716.6	100-YearFW	7378.16	5256.35	5273.14	5273.14	5278.66	0.009969	18.86	391.28	208.04	1.00
Reach - 1	19000.0	100-YearFW	7378.16	5244.60	5249.57	5249.57	5251.19	0.004808	10.21	722.59	223.88	1.00
Reach - 1	18269.1	100-YearFW	7378.16	5237.30	5242.13	5242.13	5243.41	0.004059	9.69	901.24	345.62	0.93
Reach - 1	17564.6	100-YearFW	7378.16	5226.79	5233.33	5233.33	5234.93	0.002465	10.82	853.29	301.36	0.79
Reach - 1	16796.8	100-YearFW	7378.16	5216.80	5222.76	5222.76	5224.64	0.004719	10.99	671.36	181.85	1.01
Reach - 1	16000.0	100-YearFW	7378.16	5206.90	5212.95	5212.95	5215.09	0.008268	11.74	628.51	148.08	1.00
Reach - 1	15040.7	100-YearFW	7378.16	5193.10	5198.74	5198.74	5200.00	0.009987	8.99	820.36	333.20	1.01
Reach - 1	14000.0	100-YearFW	7378.16	5176.60	5183.46	5183.46	5185.22	0.004745	10.64	693.68	198.20	1.00
Reach - 1	13518.5	100-YearFW	7378.16	5169.18	5175.83	5175.83	5178.36	0.004218	12.76	578.03	114.87	1.00
Reach - 1	12662.5	100-YearFW	7378.16	5157.32	5163.70	5163.70	5166.42	0.004179	13.21	558.41	102.98	1.00
Reach - 1	12000.0	100-YearFW	7378.16	5149.30	5155.79	5155.79	5158.04	0.004396	12.04	612.80	137.79	1.01
Reach - 1	11277.5	100-YearFW	7378.16	5137.45	5144.81	5143.50	5146.39	0.002029	10.08	731.73	117.14	0.71
Reach - 1	11227.0		Bridge									
Reach - 1	11176.5	100-YearFW	7378.16	5136.00	5142.05	5142.05	5144.56	0.004176	12.71	580.61	113.63	0.99
Reach - 1	11000.0	100-YearFW	7378.16	5133.40	5138.53	5138.53	5140.62	0.004533	11.58	637.20	154.74	1.01
Reach - 1	10000.0	100-YearFW	7378.16	5118.70	5124.08	5124.08	5125.83	0.004805	10.59	696.83	203.81	1.01
Reach - 1	9033.0	100-YearFW	7378.16	5102.47	5107.43	5107.43	5109.46	0.004530	11.45	644.59	159.88	1.00
Reach - 1	8000.0	100-YearFW	7378.16	5088.00	5094.27	5094.27	5096.80	0.004235	12.78	577.21	114.62	1.00
Reach - 1	7246.6	100-YearFW	9013.12	5077.00	5084.26	5084.26	5086.71	0.004305	12.57	717.17	148.02	1.01
Reach - 1	6875.9	100-YearFW	9013.12	5066.75	5073.57	5073.57	5076.57	0.004305	13.90	648.35	108.97	1.00
Reach - 1	6239.3	100-YearFW	9013.12	5063.00	5068.40	5068.40	5069.81	0.003411	10.06	1007.08	339.19	0.87
Reach - 1	5560.3	100-YearFW	9013.12	5056.50	5062.70	5062.70	5065.35	0.004190	13.05	690.75	131.57	1.00
Reach - 1	5000.0	100-YearFW	9013.12	5048.80	5056.11	5056.11	5059.22	0.004069	14.15	637.19	103.54	1.01
Reach - 1	4383.3	100-YearFW	9013.12	5039.85	5048.23	5045.98	5049.50	0.001357	9.03	998.28	140.18	0.60
Reach - 1	4339.3		Bridge									
Reach - 1	4295.3	100-YearFW	9013.12	5038.90	5045.02	5045.02	5047.65	0.004116	13.01	692.95	129.97	0.99
Reach - 1	4000.0	100-YearFW	9013.12	5036.00	5041.66	5041.66	5044.12	0.004272	12.58	716.75	147.49	1.01
Reach - 1	3439.4	100-YearFW	9013.12	5027.98	5035.92		5037.00	0.001152	8.32	1082.72	150.94	0.55
Reach - 1	3114.2	100-YearFW	9013.12	5022.62	5036.09	5029.00	5036.52	0.000263	5.28	1706.39	154.69	0.28
Reach - 1	3009.2		Culvert									
Reach - 1	2904.2	100-YearFW	9013.12	5019.42	5025.78	5025.78	5028.41	0.004108	13.00	693.34	130.53	0.99
Reach - 1	2624.4	100-YearFW	9013.12	5013.70	5021.08	5021.08	5024.10	0.004076	13.94	646.43	108.14	1.01
Reach - 1	2000.0	100-YearFW	9013.12	5007.10	5014.66	5014.66	5017.54	0.004124	13.60	662.81	116.81	1.01
Reach - 1	1308.5	100-YearFW	9013.12	5000.40	5008.14	5008.14	5011.18	0.004100	13.97	645.34	107.63	1.01

DUPLICATE EFFECTIVE FLOODWAY HEC-RAS MODEL RESULTS

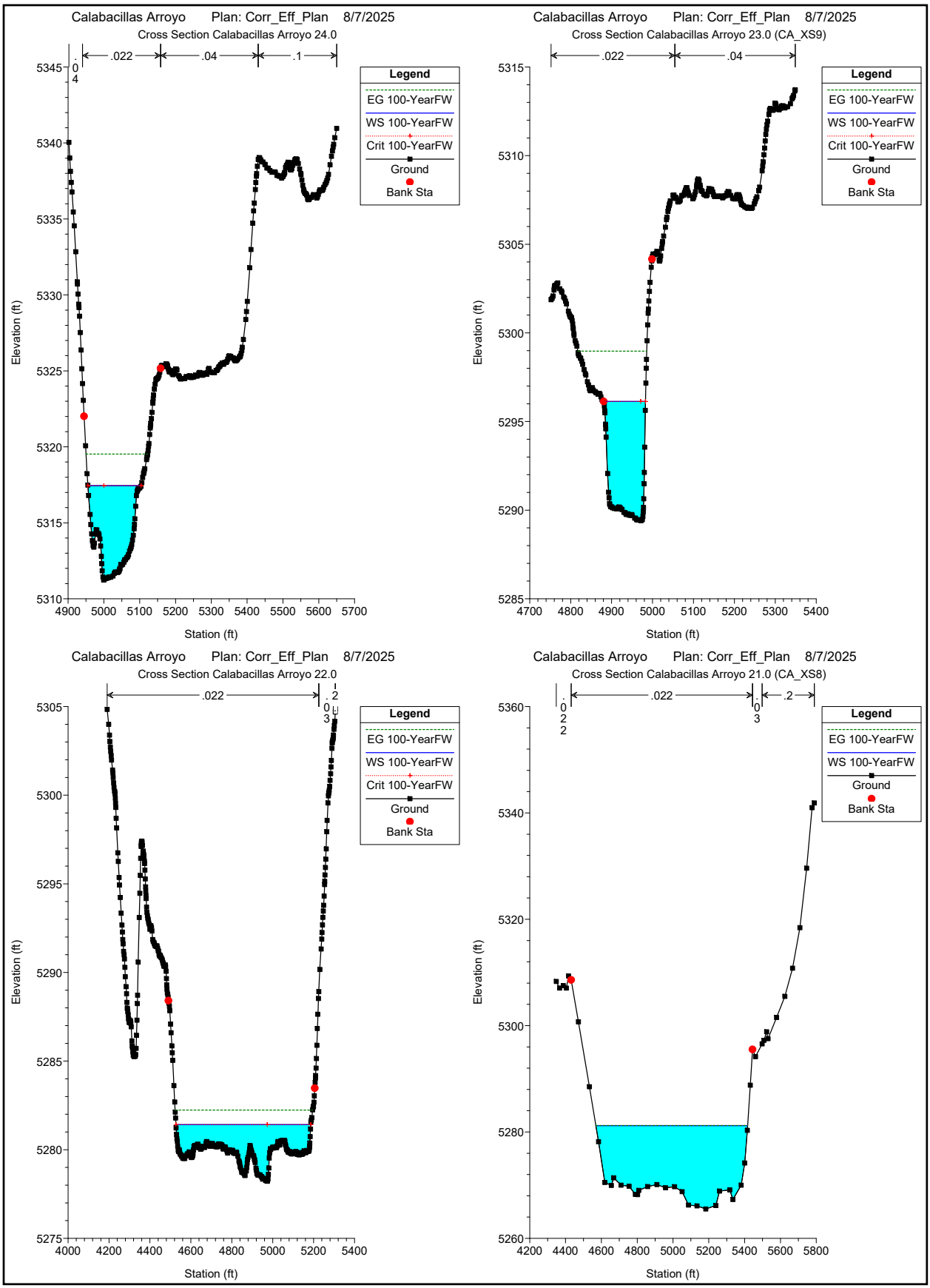


CORRECTED EFFECTIVE FLOODWAY HEC-RAS MODEL RESULTS

HEC-RAS Plan: CorrEff River: CalabacillasArro Reach: Reach - 1 Profile: 100-YearFW

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)	
Reach - 1	29751	100-YearFW	7071.03	5398.00	5402.46	5402.46	5403.69	0.005232	8.92	794.29	327.73	1.00
Reach - 1	29000.0	100-YearFW	7071.03	5385.36	5391.40	5391.40	5392.89	0.004973	9.79	724.06	264.03	1.00
Reach - 1	28000.0	100-YearFW	7071.03	5374.00	5377.93	5377.93	5379.02	0.005465	8.38	843.55	387.18	1.00
Reach - 1	27000.0	100-YearFW	7071.03	5360.40	5364.43	5364.43	5365.44	0.005633	8.05	877.99	438.14	1.00
Reach - 1	25916.8	100-YearFW	7071.03	5343.00	5347.46	5347.46	5348.87	0.005176	9.55	740.50	268.14	1.01
Reach - 1	25000.0	100-YearFW	7071.03	5330.00	5334.41	5334.41	5335.81	0.005039	9.49	745.39	267.05	1.00
Reach - 1	24000.0	100-YearFW	7071.03	5311.24	5317.44	5317.44	5319.53	0.004539	11.58	610.57	148.74	1.01
Reach - 1	23130.9	100-YearFW	7813.08	5289.41	5296.13	5296.13	5298.97	0.004186	13.52	577.76	101.97	1.00
Reach - 1	22092.3	100-YearFW	7813.08	5278.22	5281.41	5281.41	5282.24	0.006063	7.28	1073.82	659.18	1.01
Reach - 1	21090.2	100-YearFW	7813.08	5265.53	5281.21		5281.22	0.000005	0.78	10071.54	847.54	0.04
Reach - 1	20144.5	100-YearFW	7813.08	5261.10	5281.13	5266.32	5281.20	0.000029	2.20	3602.41	283.92	0.10
Reach - 1	19858.6	100-YearFW	7378.16	5257.44	5277.95	5274.24	5280.45	0.003419	13.08	626.29	282.54	0.61
Reach - 1	19787.6		Bridge									
Reach - 1	19716.6	100-YearFW	7378.16	5256.35	5273.14	5273.14	5278.66	0.009969	18.86	391.28	208.04	1.00
Reach - 1	19000.0	100-YearFW	7378.16	5244.60	5249.57	5249.57	5251.19	0.004808	10.21	722.59	223.88	1.00
Reach - 1	18269.1	100-YearFW	7378.16	5237.30	5242.13	5242.13	5243.41	0.004059	9.69	901.24	345.62	0.93
Reach - 1	17564.6	100-YearFW	7378.16	5226.79	5233.33	5233.33	5234.93	0.002465	10.82	853.29	301.36	0.79
Reach - 1	16796.8	100-YearFW	7378.16	5216.80	5222.76	5222.76	5224.64	0.004719	10.99	671.36	181.85	1.01
Reach - 1	16000.0	100-YearFW	7378.16	5206.90	5212.95	5212.95	5215.09	0.008268	11.74	628.51	148.08	1.00
Reach - 1	15040.7	100-YearFW	7378.16	5193.10	5198.74	5198.74	5200.00	0.009987	8.99	820.36	333.20	1.01
Reach - 1	14000.0	100-YearFW	7378.16	5176.60	5183.46	5183.46	5185.22	0.004745	10.64	693.68	198.20	1.00
Reach - 1	13518.5	100-YearFW	7378.16	5169.18	5175.83	5175.83	5178.36	0.004218	12.76	578.03	114.87	1.00
Reach - 1	12662.5	100-YearFW	7378.16	5157.32	5163.70	5163.70	5166.42	0.004179	13.21	558.41	102.98	1.00
Reach - 1	12000.0	100-YearFW	7378.16	5149.30	5155.79	5155.79	5158.04	0.004396	12.04	612.80	137.79	1.01
Reach - 1	11277.5	100-YearFW	7378.16	5137.45	5144.81	5143.50	5146.39	0.002029	10.08	731.73	117.14	0.71
Reach - 1	11227.0		Bridge									
Reach - 1	11176.5	100-YearFW	7378.16	5136.00	5142.05	5142.05	5144.56	0.004176	12.71	580.61	113.63	0.99
Reach - 1	11000.0	100-YearFW	7378.16	5133.40	5138.53	5138.53	5140.62	0.004533	11.58	637.20	154.74	1.01
Reach - 1	10000.0	100-YearFW	7378.16	5118.70	5124.08	5124.08	5125.83	0.004805	10.59	696.83	203.81	1.01
Reach - 1	9033.0	100-YearFW	7378.16	5102.47	5107.43	5107.43	5109.46	0.004530	11.45	644.59	159.88	1.00
Reach - 1	8000.0	100-YearFW	7378.16	5088.00	5094.27	5094.27	5096.80	0.004235	12.78	577.21	114.62	1.00
Reach - 1	7246.6	100-YearFW	9013.12	5077.00	5084.26	5084.26	5086.71	0.004305	12.57	717.17	148.02	1.01
Reach - 1	6875.9	100-YearFW	9013.12	5066.75	5073.57	5073.57	5076.57	0.004305	13.90	648.35	108.97	1.00
Reach - 1	6239.3	100-YearFW	9013.12	5063.00	5068.40	5068.40	5069.81	0.003411	10.06	1007.08	339.19	0.87
Reach - 1	5560.3	100-YearFW	9013.12	5056.50	5062.70	5062.70	5065.35	0.004190	13.05	690.75	131.57	1.00
Reach - 1	5000.0	100-YearFW	9013.12	5048.80	5056.11	5056.11	5059.22	0.004069	14.15	637.19	103.54	1.01
Reach - 1	4383.3	100-YearFW	9013.12	5039.85	5048.23	5045.98	5049.50	0.001357	9.03	998.28	140.18	0.60
Reach - 1	4339.3		Bridge									
Reach - 1	4295.3	100-YearFW	9013.12	5038.90	5045.02	5045.02	5047.65	0.004116	13.01	692.95	129.97	0.99
Reach - 1	4000.0	100-YearFW	9013.12	5036.00	5041.66	5041.66	5044.12	0.004272	12.58	716.75	147.49	1.01
Reach - 1	3439.4	100-YearFW	9013.12	5027.98	5035.92		5037.00	0.001152	8.32	1082.72	150.94	0.55
Reach - 1	3114.2	100-YearFW	9013.12	5022.62	5036.09	5029.00	5036.52	0.000263	5.28	1706.39	154.69	0.28
Reach - 1	3009.2		Culvert									
Reach - 1	2904.2	100-YearFW	9013.12	5019.42	5025.78	5025.78	5028.41	0.004108	13.00	693.34	130.53	0.99
Reach - 1	2624.4	100-YearFW	9013.12	5013.70	5021.08	5021.08	5024.10	0.004076	13.94	646.43	108.14	1.01
Reach - 1	2000.0	100-YearFW	9013.12	5007.10	5014.66	5014.66	5017.54	0.004124	13.60	662.81	116.81	1.01
Reach - 1	1308.5	100-YearFW	9013.12	5000.40	5008.14	5008.14	5011.18	0.004100	13.97	645.34	107.63	1.01

CORRECTED EFFECTIVE FLOODWAY HEC-RAS MODEL RESULTS

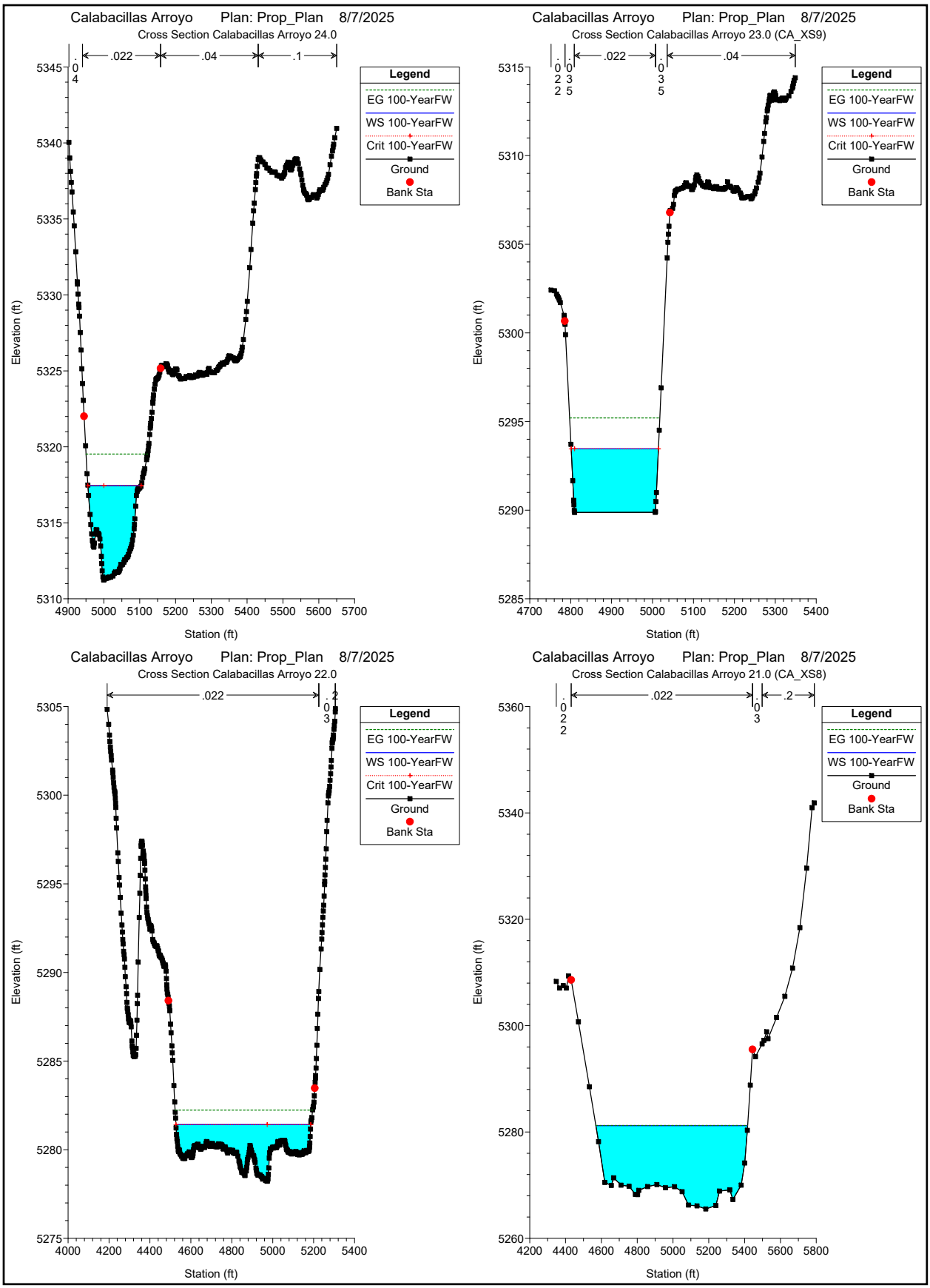


PROPOSED FLOODWAY HEC-RAS MODEL RESULTS

HEC-RAS Plan: Prop River: CalabacillasArro Reach: Reach - 1 Profile: 100-YearFW

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)	
Reach - 1	29751	100-YearFW	7071.03	5398.00	5402.46	5402.46	5403.69	0.005232	8.92	794.29	327.73	1.00
Reach - 1	29000.0	100-YearFW	7071.03	5385.36	5391.40	5391.40	5392.89	0.004973	9.79	724.06	264.03	1.00
Reach - 1	28000.0	100-YearFW	7071.03	5374.00	5377.93	5377.93	5379.02	0.005465	8.38	843.55	387.18	1.00
Reach - 1	27000.0	100-YearFW	7071.03	5360.40	5364.43	5364.43	5365.44	0.005633	8.05	877.99	438.14	1.00
Reach - 1	25916.8	100-YearFW	7071.03	5343.00	5347.46	5347.46	5348.87	0.005176	9.55	740.50	268.14	1.01
Reach - 1	25000.0	100-YearFW	7071.03	5330.00	5334.41	5334.41	5335.81	0.005039	9.49	745.39	267.05	1.00
Reach - 1	24000.0	100-YearFW	7071.03	5311.24	5317.45	5317.45	5319.53	0.004528	11.57	611.08	148.79	1.01
Reach - 1	23130.9	100-YearFW	7813.08	5289.87	5293.46	5293.46	5295.20	0.005244	10.59	737.79	213.24	1.00
Reach - 1	22092.3	100-YearFW	7813.08	5278.22	5281.41	5281.41	5282.24	0.006063	7.28	1073.82	659.18	1.01
Reach - 1	21090.2	100-YearFW	7813.08	5265.53	5281.21		5281.22	0.000005	0.78	10071.54	847.54	0.04
Reach - 1	20144.5	100-YearFW	7813.08	5261.10	5281.13	5266.32	5281.20	0.000029	2.20	3602.41	283.92	0.10
Reach - 1	19858.6	100-YearFW	7378.16	5257.44	5277.95	5274.24	5280.45	0.003419	13.08	626.29	282.54	0.61
Reach - 1	19787.6		Bridge									
Reach - 1	19716.6	100-YearFW	7378.16	5256.35	5273.14	5273.14	5278.66	0.009969	18.86	391.28	208.04	1.00
Reach - 1	19000.0	100-YearFW	7378.16	5244.60	5249.57	5249.57	5251.19	0.004808	10.21	722.59	223.88	1.00
Reach - 1	18269.1	100-YearFW	7378.16	5237.30	5242.13	5242.13	5243.41	0.004059	9.69	901.24	345.62	0.93
Reach - 1	17564.6	100-YearFW	7378.16	5226.79	5233.33	5233.33	5234.93	0.002465	10.82	853.29	301.36	0.79
Reach - 1	16796.8	100-YearFW	7378.16	5216.80	5222.76	5222.76	5224.64	0.004719	10.99	671.36	181.85	1.01
Reach - 1	16000.0	100-YearFW	7378.16	5206.90	5212.95	5212.95	5215.09	0.008268	11.74	628.51	148.08	1.00
Reach - 1	15040.7	100-YearFW	7378.16	5193.10	5198.74	5198.74	5200.00	0.009987	8.99	820.36	333.20	1.01
Reach - 1	14000.0	100-YearFW	7378.16	5176.60	5183.46	5183.46	5185.22	0.004745	10.64	693.68	198.20	1.00
Reach - 1	13518.5	100-YearFW	7378.16	5169.18	5175.83	5175.83	5178.36	0.004218	12.76	578.03	114.87	1.00
Reach - 1	12662.5	100-YearFW	7378.16	5157.32	5163.70	5163.70	5166.42	0.004179	13.21	558.41	102.98	1.00
Reach - 1	12000.0	100-YearFW	7378.16	5149.30	5155.79	5155.79	5158.04	0.004396	12.04	612.80	137.79	1.01
Reach - 1	11277.5	100-YearFW	7378.16	5137.45	5144.81	5143.50	5146.39	0.002029	10.08	731.73	117.14	0.71
Reach - 1	11227.0		Bridge									
Reach - 1	11176.5	100-YearFW	7378.16	5136.00	5142.05	5142.05	5144.56	0.004176	12.71	580.61	113.63	0.99
Reach - 1	11000.0	100-YearFW	7378.16	5133.40	5138.53	5138.53	5140.62	0.004533	11.58	637.20	154.74	1.01
Reach - 1	10000.0	100-YearFW	7378.16	5118.70	5124.08	5124.08	5125.83	0.004805	10.59	696.83	203.81	1.01
Reach - 1	9033.0	100-YearFW	7378.16	5102.47	5107.43	5107.43	5109.46	0.004530	11.45	644.59	159.88	1.00
Reach - 1	8000.0	100-YearFW	7378.16	5088.00	5094.27	5094.27	5096.80	0.004235	12.78	577.21	114.62	1.00
Reach - 1	7246.6	100-YearFW	9013.12	5077.00	5084.26	5084.26	5086.71	0.004305	12.57	717.17	148.02	1.01
Reach - 1	6875.9	100-YearFW	9013.12	5066.75	5073.57	5073.57	5076.57	0.004305	13.90	648.35	108.97	1.00
Reach - 1	6239.3	100-YearFW	9013.12	5063.00	5068.40	5068.40	5069.81	0.003411	10.06	1007.08	339.19	0.87
Reach - 1	5560.3	100-YearFW	9013.12	5056.50	5062.70	5062.70	5065.35	0.004190	13.05	690.75	131.57	1.00
Reach - 1	5000.0	100-YearFW	9013.12	5048.80	5056.11	5056.11	5059.22	0.004069	14.15	637.19	103.54	1.01
Reach - 1	4383.3	100-YearFW	9013.12	5039.85	5048.23	5045.98	5049.50	0.001357	9.03	998.28	140.18	0.60
Reach - 1	4339.3		Bridge									
Reach - 1	4295.3	100-YearFW	9013.12	5038.90	5045.02	5045.02	5047.65	0.004116	13.01	692.95	129.97	0.99
Reach - 1	4000.0	100-YearFW	9013.12	5036.00	5041.66	5041.66	5044.12	0.004272	12.58	716.75	147.49	1.01
Reach - 1	3439.4	100-YearFW	9013.12	5027.98	5035.92		5037.00	0.001152	8.32	1082.72	150.94	0.55
Reach - 1	3114.2	100-YearFW	9013.12	5022.62	5036.09	5029.00	5036.52	0.000263	5.28	1706.39	154.69	0.28
Reach - 1	3009.2		Culvert									
Reach - 1	2904.2	100-YearFW	9013.12	5019.42	5025.78	5025.78	5028.41	0.004108	13.00	693.34	130.53	0.99
Reach - 1	2624.4	100-YearFW	9013.12	5013.70	5021.08	5021.08	5024.10	0.004076	13.94	646.43	108.14	1.01
Reach - 1	2000.0	100-YearFW	9013.12	5007.10	5014.66	5014.66	5017.54	0.004124	13.60	662.81	116.81	1.01
Reach - 1	1308.5	100-YearFW	9013.12	5000.40	5008.14	5008.14	5011.18	0.004100	13.97	645.34	107.63	1.01

CORRECTED EFFECTIVE FLOODWAY HEC-RAS MODEL RESULTS



“NO-RISE” CERTIFICATION

This is to certify that I am a duly qualified registered professional engineer licensed to practice in the State of New Mexico.

It is further to certify that the attached technical data supports that that the proposed Swinburne Dam Grade Control Structures Project will not adversely impact the 100-year flood elevations or floodway elevations on the Calabacillas Arroyo at published sections in the Flood Insurance Study for Bernalillo County, New Mexico and Incorporated Areas dated November 4, 2016 such that the increase poses a risk to the community.

Attached is the following document that supports my findings:

AMAFCA, 2025. AMAFCA Swinburne Dam Grade Control Structures – Floodway No-Rise Analysis Technical Memorandum to the City of Albuquerque.

Date: August 15, 2025

Signature: