

Request for Letter of Map Revision

(LOMR)

For

BOCA NEGRA ARROYO

Bernalillo County, New Mexico

July 2015

SUBMITTED TO:

Federal Emergency Management Agency
(FEMA)

SUBMITTED BY:

Albuquerque Metropolitan Arroyo Flood Control Authority
(AMAFCA)



Prepared By

WILSON
& COMPANY

Wilson & Company, Inc., Engineers & Architects
4900 Lang Avenue, NE
Albuquerque, NM 87109
505-348-4000

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INTRODUCTION

The purpose of this Letter of Map Revision (LOMR) is to request a revision to Flood Insurance Rate Map (FIRM) Numbers 35001C0111G and 35001C0112G within Bernalillo County, New Mexico and incorporated areas.

A portion of Zone “AE” and “AO” floodplain along the Boca Negra Arroyo has changed due to the newly constructed Boca Negra Detention Dam. A detailed study of Boca Negra Arroyo begins at the eastern edge of the North Geological Window and ends at San Ildefonso Drive crossing, approximately 4,500 ft downstream of the confluence with the South Branch of the Boca Negra Arroyo.

This document contains the required forms associated with this LOMR. Supplemental data, such as modeling output and construction as-built drawings, are provided in the appendices that follow each respective form.

PROJECT OVERVIEW

The Boca Negra Detention Dam is bounded by Unser Boulevard to the southeast, Rainbow Boulevard to the northeast, Scenic Road to the northwest and Vista Vieja Subdivision to the west. See Figure 1, Vicinity Map. The City of Albuquerque (COA) 2014 parcel shape file is included on the CD included with this submittal to provide updated Corporate Limits. This information replaces information on the current annotated FIRM for the project area which shows outdated Corporate Limits.

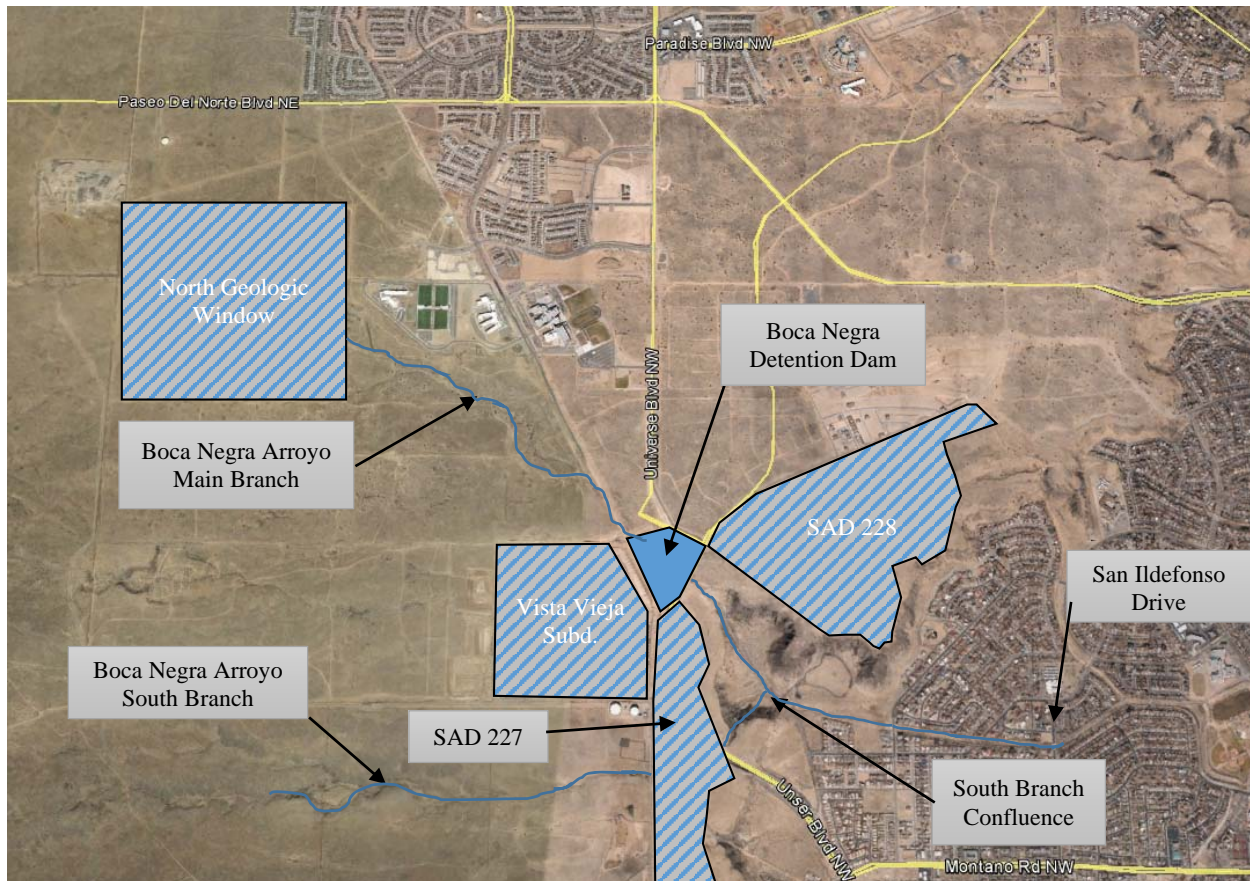


Figure 1: Vicinity Map

Calculations

LiDAR survey elevation data was used to generate a digital ground surface for the overall area of the Boca Negra Arroyo watershed. The LiDAR mapping was generated with a contour accuracy of +/- 1ft. The LiDAR mapping was supplemented with newly acquired as-built survey topography for the dam area along with cross section survey data for the segment of the Boca Negra Arroyo approximately 200ft upstream of Tesuque Drive downstream to San Ildefonso Drive. See Appendix 5 for Cross Section Survey Map. The data described above was utilized in developing the hydrologic and hydraulic models for the study area. Precipitation data dated 12-01-14 was obtained from the NOAA Atlas 14 website for use in the development of the Hydrologic models. See Appendix 1, Rainfall Data. Based on the original calculations of the dam and per agreement with Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA), Arid-lands Hydrologic Model (AHYMO_97) distributed by Anderson-Hydro was used in the hydrologic analysis. See Appendix 1 for AHYMO files.

HEC-RAS River Analysis System V 4.1.0 by U.S. Army Corps of Engineers was used for hydraulic calculations. Electronic data was obtained from FEMA, which included the effective HEC-RAS model and cross sections in GIS format. HEC-RAS cross sections were identified at locations consistent with existing FEMA cross sections and supplemental cross sections were identified for the current conditions models. Main channel bank stations and Manning's "n" values used in the models were obtained from the effective model. The parameters for the supplementary cross sections are consistent with the effective model. The main channel throughout the arroyo varies and in some areas is not definable. Although the effective model sets channel bank stations the Manning's "n" values for the overbank area and main channel do not vary. The channel Bank stations are approximate relating to the apparent main channel but since the cross section "n" values are uniform the specified main channel bank stations do not have an impact on the water surface elevation. See Floodplain Work Map in Appendix 7 for the cross section locations. See Tables 1 and 2, HEC-RAS Flow and Output Comparison and Appendix 2 for the Summary Tables, Profile and Cross Sections.

Table 1 - HEC-RAS Flow Comparison			
River Station	Cross Section	Peak Flow (cfs)	
		Effective	Current
Upstream Model			
Reach - 1 Upper			
25374.6	Q	1493	1175
24989.3	P	1534	1175
24106.4	O	1534	1175
23000	N	1534	1175
22241.1	M	1534	1175
22027.5	L	1451	0.01*
21845.5	K	1451	0.01*
21840	16	-	612
21830	15	-	612
21820	14	-	612
21335.5	J	1451	612
21001.7	I	1451	612
Reach - 1 Split Flow			
22027.5	30	1534	1185
22000	29	-	1185
21845.5	28	1534	1185
21835	27	-	1185
21800	26	-	603
21770.8	25	-	603
21520.8	24	-	603
21335.5	23	-	603
21325	22	-	603
21315	21	-	603
21250	20	-	603
21200	19	-	603
21335.5	C	1534	-
21194.9	18	-	603
21001.7	B	1534	-
21001.7	17	-	603
20774.5	A	1534	-
Reach - 1 Lower			
20573.7	H	1534	1188
20390.6	G	1534	1188
19770.6	F	1534	1188
19290.6	13	-	1188
19175.6	12	-	1188

Table 1, Cont'd - HEC-RAS Flow Comparison			
River Station	Cross Section	Peak Flow (cfs)	
		Effective	Current
Downstream Model			
19125.5	11	-	1188
19054.6	10	-	1188
19003.57	9	-	1188
18766.3	E**	1586	-
18016.1	D**	1586	-
18022.9	8	-	695
17987.1	7	-	695
17735.62	6	-	695
17129.8	C	1586	695
17000	B	1831	695
16550	A1	1831	695
16457	A	1831	695
15976	5	-	695
15247.7	4	-	695
15100	3B	-	695
15080	3A	-	695
14886.4	3	-	1110
14300.75	2	-	1147
14200	1D	-	1147
14100.75	1C	-	1149
13900.75	1B	-	1149
13700.75	1A	-	1149
13150.55	1	-	1149
13150.54	0.995	-	1149
13150	0.99	-	1149
13149.5	0.98	-	1149
13149	0.97	-	1149
13148.5	0.96	-	1149
13148	0.95	-	1149
13145	0.94	-	1149
13144	0.93	-	1149
13143	0.92	-	1149
13140	0.91	-	1149
13135	0.9	-	1149
13130	0.8	-	1149
13120	0.7	-	1149
13110	0.6	-	1150
13100	0.53	-	1150
13095	0.52	-	1150

Table 1, Cont'd - HEC-RAS Flow Comparison			
River Station	Cross Section	Peak Flow (cfs)	
		Effective	Current
Downstream Model			
13093	0.51	-	1150
13090	0.5	-	1150
13080	0.4	-	1150
13070	0.3	-	1151
13060	0.21	-	1151
13050	0.2	-	1151
13040	0.1	-	1151

* Diverted flow at Resolana Place

** Located in the Dam

The four existing 60 in. RCP culverts upstream of the dam which were constructed with the SAD 228 project were designed with the 2008 future developed conditions model flow of 610 cfs. The current conditions flow at the culverts is 1,188 cfs which results in overtopping Scenic Road.

Table 2 - HEC-RAS Output Comparison				
River Station	Cross Section	Water Surface Elevation (ft)		
		Effective	Duplicate Effective	Current
Upstream Model				
Reach - 1 Upper				
25374.6	Q	5435.67	5434.89	5434.87
24989.3	P	5431.84	5431.11	5431.09
24106.4	O	5422.96	5422.07	5422.05
23000	N	5409.68	5408.99	5408.97
22241.1	M	5401.59	5400.83	5400.73
Reach - 1 Mid				
22027.5	L	5397.65	5396.68	5394.25
21845.5	K	5392.61	5392.03	5388.80
21840	16	-	-	5381.39
21830	15	-	-	5378.27
21820	14	-	-	5375.34
21335.5	J	5375.48	5374.61	5374.00
21001.7	I	5368.37	5367.33	5366.48
Reach - 1 Split Flow				
22027.5	30	5400.04	5399.23	5400.45
22000	29	-	-	5399.45
21845.5	28	5397.14	5396.45	5398.43
21835	27	-	-	5396.52
21800	26	-	-	5393.66
21770.8	25	-	-	5393.19

Table 2, Cont'd - HEC-RAS Output Comparison				
River Station	Cross Section	Water Surface Elevation (ft)		
		Effective	Duplicate Effective	Current
21520.8	24	-	-	5390.13
21335.5	23	-	-	5386.94
21325	22	-	-	5383.46
21315	21	-	-	5381.37
21250	20	-	-	5377.97
21200	19	-	-	5372.76
21335.5	C	5383.91	5383.09	-
21194.9	18	-	-	5365.90
21001.7	B	5372.24	5371.14	-
21001.7	17	-	-	5363.87
20774.5	A	5369.90	5368.52	-
Reach - 1 Lower				
20573.7	H	5362.96	5362.16	5362.14
20390.6	G	5360.86	5360.25	5360.22
19770.6	F	5353.24	5352.70	5352.69
19290.6	13	-	-	5347.81
19200	CULVERT			
19175.6	12	-	-	5342.63
19125.5	11	-	-	5342.15
19054.6	10	-	-	5339.93
19003.57	9	-	-	5338.67
18766.3	E*	5342.36	5334.14	5338.67
18016.1	D*	5328.99	5327.94	5338.67
Downstream Model				
18022.9	8	-	-	5326.91
17987.1	7	-	-	5326.74
17735.62	6	-	-	5322.81
17129.8	C	5316.05	5315.1	5314.43
17000	B	5275.25	5275.33	5273.82
16550	A1	-	-	5237.45
16457	A	5204.29	5203.09	5202.71
15976	5	-	-	5197.56
15247.7	4	-	-	5187.85
15100	3B	-	-	5187.66
15090	CULVERT			
15080	3A	-	-	5184.11
14886.4	3	-	-	5181.32
14300.75	2	-	-	5176.26
14200	1D	-	-	5173.99
14100.75	1C	-	-	5171.59

Table 2, Cont'd - HEC-RAS Output Comparison				
River Station	Cross Section	Water Surface Elevation (ft)		
		Effective	Duplicate Effective	Current
13900.75	1B	-	-	5169.84
13700.75	1A	-	-	5167.85
13150.55	1	-	-	5167.76
13150.54	0.995			5167.53
13150.00	0.99	-	-	5167.26
13149.50	0.98			5166.34
13149.00	0.97			5165.51
13148.50	0.96			5164.45
13148	0.95			5164.71
13146	CULVERT			
13145	0.94			5162.04
13144	0.93			5161.76
13143	0.92	-	-	5161.55
13140	0.91	-	-	5159.20
13135	0.9	-	-	5156.87
13130	0.8	-	-	5155.35
13120	0.7	-	-	5153.08
13110	0.6	-	-	5151.04
13100	0.53	-	-	5147.29
13095	0.52	-	-	5143.24
13093	0.51	-	-	5143.32
13090	0.5	-	-	5142.88
13080	0.4	-	-	5140.60
13070	0.3	-	-	5136.95
13060	0.21	-	-	5134.23
13055	BRIDGE			
13050	0.2	-	-	5133.39
13040	0.1	-	-	5130.11

* Located in the Dam

Conclusion

Due to the newly constructed Boca Negra Detention Dam and updated mapping and hydrologic data the floodplain for the Boca Negra Arroyo required revision. Updated hydrologic and hydraulic analysis of the Boca Negra Arroyo has been completed to incorporate the new topography for the flood plain. The updated models show that peak flow has been reduced resulting in reduction in water surface elevation at most sections and within 1 ft, which is the contour accuracy of the LiDAR mapping, at cross sections where the water surface elevation is above the base flood elevation from the North Geologic Window to San Ildefonso Drive bridge crossing. The analysis shows some changes from the existing floodplain boundary at the following locations: 1) Boca Negra Detention Dam facility floodplain area; 2) just south of Resolana Place, the arroyo turns south and the channel is divided into a north and south branch

with flows focused on the south branch and 3) upstream of Tesuque Drive where the arroyo depth is shallow, the floodplain widens based on the more detailed topographic mapping. The existing Zone “X” area near the split flow is included in the annotated floodplain map because there is not a certified levee to protect the area which may cause the upstream existing embankment to fail. Changes are due to updated topography, construction of the Dam and revised hydrologic analysis. The results of the analysis indicate that the floodplain widens in several areas affecting 24 vacant properties. Notification Letters have been sent to the affected property owners. See Appendix 6 for Property owner Notification Letters.

Based on the analysis, the water surface widens at two properties, 6423 Star Bright east of Atrisco Drive and 6515 Tesuque Drive at the southwest corner of intersection of Boca Negra Arroyo and Tesuque Drive. Both properties include retaining walls which may divert the floodplain along the property boundary. The retaining wall at 6423 Star Bright is a flood wall. As-built drawings are included in Appendix 5, Petroglyph Shadows Subdivision Grading & Drainage Plan sheets 4-5A. The wall at 6515 Tesuque Drive has not been certified and the maps reflect the floodplain with no wall. See Appendix 5 for photos of both properties retaining wall.

The Boca Negra Detention Dam and outfall pipe storm drain will be maintained and operated by AMAFCA. The City of Albuquerque (COA) will maintain the Boca Negra Arroyo outside of the Dam. The AMAFCA Operation and Maintenance plan Volumes 1-3 and COA Operation and Maintenance schedule are included in the CD. AMAFCA and COA have maintenance programs with crews that maintain all drainage facilities on a routine schedule to ensure facilities are operating as intended.

MT-2 (FORM 1)
OVERVIEW & CONCURRENCE FORM

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY
OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

- ☐ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).
- ☒ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Example: 480301 480287	City of Katy Harris County	TX TX	48473C 48201C	0005D 0220G	02/08/83 09/28/90
350001	Bernalillo County, New Mexico and Incorporated Areas	NM	35001C	0111G	09/26/08
350001	Bernalillo County, New Mexico and Incorporated Areas	NM	35001C	0112G	09/26/08

2. a. Flooding Source: Boca Negra Arroyo

- b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
- ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: Boca Negra Detention Dam

4. FEMA zone designations affected: AE (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

- ☒ Physical Change ☐ Improved Methodology/Data ☐ Regulatory Floodway Revision ☐ Base Map Changes
- ☐ Coastal Analysis ☒ Hydraulic Analysis ☒ Hydrologic Analysis ☐ Corrections
- ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
- ☒ New Topographic Data ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures:

☐ Channelization

☐ Levee/Floodwall

☒ Bridge/Culvert

☒ Dam

☐ Fill

☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included?

☒ Yes

Fee amount: \$7,150.00

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Jerry Lovato

Company: AMAFCA

Mailing Address:

2600 Prospect Avenue, NE
Albuquerque, NM 87107

Daytime Telephone No.: 505-884-2215

Fax No.:

E-Mail Address: jlovato@amafca.org

Signature of Requester (required):

Date:

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Curtis Cherne, Floodplain Administrator

Community Name: Bernalillo County

Mailing Address:

600 2nd Street NW

Albuquerque, NM 87102

Daytime Telephone No.: (505) 924-3986

Fax No.:

E-Mail Address: ccherne@cabq.gov

Community Official's Signature (required):

Date:

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Donald Duneman

License No.: NM 17616

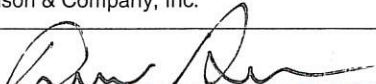
Expiration Date: 12-31-2016

Company Name: Wilson & Company, Inc.

Telephone No.: 505-348-4000

Fax No.: 505-348-4072

Signature:



Date: 6/18/15

E-Mail Address: donald.duneman@wilsonco.com

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☐ Channelization ☐ Levee/Floodwall ☒ Bridge/Culvert
☒ Dam ☐ Fill ☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: \$7,150.00
☐ No, Attach Explanation


Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Jerry Lovato	Company: AMAFCA	
Mailing Address: 2600 Prospect Avenue, NE Albuquerque, NM 87107	Daytime Telephone No.: 505-884-2215	Fax No.:
	E-Mail Address: jlovato@amafca.org	
Signature of Requester (required):		Date:

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Don Briggs, Floodplain Administrator		Community Name: County of Bernalillo	
Mailing Address: 2400 Broadway SE, Albuquerque, NM 87102	Daytime Telephone No.: (505) 848-1511	Fax No.: (505) 848-1510	
	E-Mail Address: drbriggs@bernco.gov		
Community Official's Signature (required): 		Date: 6/5/15	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Donald Duneman	License No.: NM 17616	Expiration Date: 12-31-2016
Company Name: Wilson & Company, Inc.	Telephone No.: 505-348-4000	Fax No.: 505-348-4072
Signature:	Date:	E-Mail Address: donald.duneman@wilsonco.com

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)

Required if ...

- | | |
|---|--|
| <input checked="" type="checkbox"/> Riverine Hydrology and Hydraulics Form (Form 2) | New or revised discharges or water-surface elevations |
| <input checked="" type="checkbox"/> Riverine Structures Form (Form 3) | Channel is modified, addition/revision of bridge/culverts,
addition/revision of levee/floodwall, addition/revision of dam |
| <input type="checkbox"/> Coastal Analysis Form (Form 4) | New or revised coastal elevations |
| <input type="checkbox"/> Coastal Structures Form (Form 5) | Addition/revision of coastal structure |
| <input type="checkbox"/> Alluvial Fan Flooding Form (Form 6) | Flood control measures on alluvial fans |

Seal (Optional)

MT-2 (FORM 2)

RIVERINE HYDROLOGY & HYDRAULICS FORM

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY
RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Boca Negra Arroyo

Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

- | | | |
|--|--|---|
| <input type="checkbox"/> Not revised (skip to section B) | <input type="checkbox"/> No existing analysis | <input checked="" type="checkbox"/> Improved data |
| <input type="checkbox"/> Alternative methodology | <input type="checkbox"/> Proposed Conditions (CLOMR) | <input checked="" type="checkbox"/> Changed physical condition of watershed |

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
West of Atrisco Drive	2.12	894	1,218
South Branch Confluence	4.38	1,653	1,208
Downstream Confluence	7.20	2,911	1,660

3. Methodology for New Hydrologic Analysis (check all that apply)

- | | |
|---|---|
| <input type="checkbox"/> Statistical Analysis of Gage Records | <input checked="" type="checkbox"/> Precipitation/Runoff Model → Specify Model: <u>AHYMO 97</u> |
| <input type="checkbox"/> Regional Regression Equations | <input type="checkbox"/> Other (please attach description) |

Please enclose all relevant models in digital format, maps, computations (including computation of parameters), and documentation to support the new analysis.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Is the hydrology for the revised flooding source(s) affected by sediment transport? ☒ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation..

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.)	
			Effective	Proposed/Revised
Downstream Limit*	<u>800 ft east of Unser Blvd</u>	<u>A</u>	<u>5204.29</u>	<u>5199.33</u>
Upstream Limit*	<u>655 ft upstream of Dam</u>	<u>F</u>	<u>5353.24</u>	<u>5352.71</u>

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

2. Hydraulic Method/Model Used: River Analysis System HEC-RAS V 4.1.0 by USACE

3. Pre-Submittal Review of Hydraulic Models*

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4.

<u>Models Submitted</u>	<u>Natural Run</u>		<u>Floodway Run</u>		<u>Datum</u>
Duplicate Effective Model*	File Name: _____	Plan Name: _____	File Name: _____ Boca Negra Arroyo	Plan Name: _____ Efftive Multiple	NAVD1988 _
Corrected Effective Model*	File Name: _____	Plan Name: _____	File Name: _____ Boca Negra Arroyo	Plan Name: _____ Duplicate Mutiple	NAVD1988
Existing or Pre-Project Conditions Model	File Name: _____	Plan Name: _____	File Name: _____	Plan Name: _____	_____
Revised or Post-Project Conditions Model	File Name: _____	Plan Name: _____	File Name: _____ BNA Prop Upst Dam	Plan Name: _____ Proposed Upstream_	_NAVD1988_
Other - (attach description)	File Name: _____	Plan Name: _____	File Name: _____ BNA Prop Dwn Dam_	Plan Name: _____ ProposedDownstream	NAVD1988 _

* For details, refer to the corresponding section of the instructions.

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic work map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☒ Digital Mapping (GIS/CADD) Data Submitted (preferred)

Topographic Information: Lidar, as-built survey & surveyed cross sections

Source: As-built drawings

Date: November 2014

Accuracy: 1' contour interval

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM**, at the same scale as the original, annotated to show the boundaries of the revised 1%-and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%-and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area on revision.

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase? ☒ Yes ☐ No
- a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot compared to pre-project conditions.
 - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot compared to pre-project conditions.
- b. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA? ☒ Yes ☐ No
If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notifications can be found in the MT-2 Form 2 Instructions.
2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No
If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(A)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.
3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☒ No
If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being established. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)
4. For CLOMR requests, please submit documentation to FEMA and the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA).

For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA. Please see the MT-2 instructions for more detail.

* Not inclusive of all applicable regulatory requirements. For details, see 44 CFR parts 60 and 65.

Comments to MT-2 Form 2: Riverine Hydrology & Hydraulics Form

Section A: Hydrology

The Punch Hyd command was used to recall flows directly from the drainage studies for The Trails Subdivision, SAD 228 Ponds 4, 5 and 6 and also the South Branch of Boca Negra Arroyo. See Plate 1, Current Conditions Basin Boundary Map for pond location. SAD 228 Pond 4 is located east of Unser Boulevard and Compass Drive intersection discharging 18 cfs. SAD Pond 5 is located at the northeast corner of intersection of Compass Drive and Petirrojo Road discharging 37 cfs. Pond 6 is located on the south edge of SAD 228 contributes 51 cfs to the Boca Negra Arroyo upstream of Tesuque Drive. See Pond 4, 5 and 6 Grading Plan sheet 109A, 110R and 111R of 156 in Appendix 3. Flood zones for SAD Ponds 4, 5 and 6 are shown on the annotated FIRMs. Flood zones for the Trails Subdivision Ponds J and K are not included as directed by the City Floodplain Administrator in a letter dated July 15, 2105.

The Unser Boulevard temporary ponds A and B drain into temporary Pond C with a 30 in. RCP outlet pipe discharging a maximum of 19 cfs. This pipe ultimately ties into the existing 54 in. RCP in Unser Boulevard. Peak flows from these areas were added to the outflow from the primary principal spillway from the dam. See Atrisco Storm Drain Plan & Profile sheet 43 of 62 in Appendix 3.

A 72 in. RCP in Emerald Drive conveys 378 cfs through SAD 227 to the South Branch just east of Unser Boulevard. See SAD 227 Storm Drain & Profile Emerald Drive sheet 63A of 135. Non-contributing basins to the Boca Negra Arroyo as shown on Plate 1, Current Conditions Basin Boundary Map are either retained on site or bypassed to the San Antonio Arroyo per Boca Negra – Mariposa Arroyo Drainage Management Plan (DMP) dated April 2005. See Appendix 5, Referenced Documents Vista Vieja Current Basin Boundary Map, SAD 227 Grading and Storm Drain Plan & Profile sheets 125A to 127A of 159, SAD 227 Storm Drain Plan & Profile, Onyx Drive NW sheet 71A of 135 and Vista Vieja Phase I Paving and Storm drain Plan & Profile Vista Vieja Avenue, NW sheet 14 of 35.

A hydrologic model for the Post Project Conditions (Current Conditions) using current rainfall data for the 100 year storm event was developed. See Appendix 1 for Rainfall data and AHYMO files, and Appendix 7 for Plate 1, Current Conditions Basin Boundary Map for results. Based on the hydrologic model, total inflow to the dam is 1,287 cfs and the outflow is 1,067 cfs. The maximum water surface elevation of the dam was calculated at 5338.61 ft. The Boca Negra Detention Dam was designed in between 2005 and 2012 to detain a flood as a result of the 100 year 24 hour storm event below the crest of the emergency spillway elevation of 5338.20 using NOAA 14 rainfall data from 2005. The current conditions model indicates flows will overtop the emergency spillway due to an increase in the precipitation data for 2014. The stepped soil cement emergency spillway is 17 ft wide and 419 ft long with an emergency spillway crest elevation of 5338.20 ft. See Appendix 3, Boca Negra Detention Dam As-Built drawings. The primary principal and secondary principal spillways are 48 in. x 48 in. CBCs. The primary principal spillway is capable of conveying 372 cfs through an underground storm drain to the confluence with the South Branch. The secondary principal spillway and emergency spillway drain on the surface via a concrete lined low flow channel under the Unser Boulevard Bridge to the Boca Negra Arroyo. Accumulated flows downstream of the Dam were routed based on the existing pipe sizes. See AHYMO calculations and flowchart in

Appendix 1. The existing culvert crossings in Atrisco Vista Boulevard were not included in the AHYMO calculations since the culverts have sufficient capacity to convey the runoff with minimal to no attenuation or accumulated backwater. See Plate 1, Current Conditions Basin Boundary Map for existing culverts size and location.

The total surface flow in the Boca Negra Arroyo downstream of the dam is 695 cfs just downstream of Unser Boulevard; 1,110 cfs upstream of the confluence with the South Branch, 1,147 cfs downstream of the confluence, 1,149 cfs at Tesuque Drive; and 1,151 cfs at San Ildefonso Drive.

Section B: Hydraulics

Four HEC-RAS models were developed for the study and utilized to compare water surface elevations. The models consist of the effective model, a duplicate effective model and two proposed models. The effective model consists of existing FEMA cross sections with updated flows while the duplicate effective model utilizes updated topography. The two current conditions models include the new dam and consist of: 1) from the east boundary of the North Geologic Window to the dam including four reaches of Upper, Mid, Split Flow and Lower; and 2) from the dam to San Ildefonso Drive bridge crossing, 4,500 ft downstream of the confluence with the South Branch. The models were developed for the 1% annual chance storm event. Based on the existing topography, the main channel is diverted south just downstream of Resolana Place due to a berm that has been constructed on the main arroyo. The capacity of the arroyo is exceeded just downstream of the berm where it overflows to the north branch. The overflow was computed based on the capacity of the arroyo. Due to updated hydrologic analysis and the dam, flows were revised and water surface elevations are modified based on the more detailed data for the current conditions. See Appendix 2 for the Summary Tables, Profile and Cross Sections.

MT-2 (FORM 3)
RIVERINE STRUCTURES FORM

DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY
RIVERINE STRUCTURES FORM

O.M.B. NO. 1660-0016
Expires February 28, 2014

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Flooding Source: Boca Negra Arroyo

Note: Fill out one form for each flooding source studied.

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization.....complete Section B
Bridge/Culvert.....complete Section C
Dam.....complete Section D
Levee/Floodwall.....complete Section E
Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure

1. Name of Structure: Boca Negra Detention Dam

Type (check one): ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☒ Dam

Location of Structure: Unser Blvd and Rainbow Blvd Intersection

Downstream Limit/Cross Section: 680 ft west of Unser Blvd/C

Upstream Limit/Cross Section: 1,880 ft east of Unser Blvd/F

2. Name of Structure: Scenic Road Culverts

Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

Location of Structure: Scenic Road / Boca Negra Arroyo

Downstream Limit/Cross Section: I2

Upstream Limit/Cross Section: I3

3. Name of Structure: _____

Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

Location of Structure: _____

Downstream Limit/Cross Section: _____

Upstream Limit/Cross Section: _____

NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.

B. CHANNELIZATION

Flooding Source: _____

Name of Structure: _____

1. Hydraulic Considerations

The channel was designed to carry _____ (cfs) and/or the _____-year flood.

The design elevation in the channel is based on (check one):

- ☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

- ☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions

☐ Other locations (specify): _____

2. Channel Design Plans

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)] ☐ Drop structures ☐ Superelevated sections
☐ Transitions in cross sectional geometry ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)] ☐ Energy dissipator
☐ Weir ☐ Other (Describe): _____

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Boca Negra Arroyo

Name of Structure: Scenic Road Culverts

1. This revision reflects (check one):

- ☒ Bridge/culvert not modeled in the FIS
☐ Modified bridge/culvert previously modeled in the FIS
☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): Bentley Culvert Master V3.3

If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- | | |
|---|---|
| <input type="checkbox"/> Dimensions (height, width, span, radius, length) | <input type="checkbox"/> Distances Between Cross Sections |
| <input checked="" type="checkbox"/> Shape (culverts only) | <input type="checkbox"/> Erosion Protection |
| <input checked="" type="checkbox"/> Material | <input type="checkbox"/> Low Chord Elevations – Upstream and Downstream |
| <input type="checkbox"/> Beveling or Rounding | <input checked="" type="checkbox"/> Top of Road Elevations – Upstream and Downstream |
| <input type="checkbox"/> Wing Wall Angle | <input checked="" type="checkbox"/> Structure Invert Elevations – Upstream and Downstream |
| <input type="checkbox"/> Skew Angle | <input checked="" type="checkbox"/> Stream Invert Elevations – Upstream and Downstream |
| | <input type="checkbox"/> Cross-Section Locations |

4. Sediment Transport Considerations

Are the hydraulics of the structure affected by sediment transport? ☒ Yes ☐ No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.

D. DAM/BASIN

Flooding Source: Boca Negra Arroyo
 Name of Structure: Boca Negra Detention Dam

1. This request is for (check one): ☐ Existing dam/basin ☒ New dam/basin ☐ Modification of existing dam/basin
 2. The dam/basin was designed by (check one): ☐ Federal agency ☐ State agency ☒ Private organization ☐ Local government agency

Name of the agency or organization: Wilson & Company, Inc.

3. The Dam was permitted as (check one): ☐ Federal Dam ☒ State Dam

Provide the permit or identification number (ID) for the dam and the appropriate permitting agency or organization

Permit or ID number D-695 Permitting Agency or Organization NMOSE-DSB

- a. ☒ Local Government Dam ☐ Private Dam

Provided related drawings, specification and supporting design information.

4. Does the project involve revised hydrology? ☒ Yes ☐ No

If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).

Was the dam/basin designed using critical duration storm? (must account for the maximum volume of runoff)

- ☒ Yes, provide supporting documentation with your completed Form 2.
☐ No, provide a written explanation and justification for not using the critical duration storm.

5. Does the submittal include debris/sediment yield analysis? ☐ Yes ☒ No

If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why debris/sediment analysis was not considered?

6. Does the Base Flood Elevation behind the dam/basin or downstream of the dam/basin change? ☒ Yes ☐ No

If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

FREQUENCY (% annual chance)	Stillwater Elevation Behind the Dam/Basin	
	FIS	REVISED
10-year (10%)	_____	_____
50-year (2%)	_____	_____
100-year (1%)	<u>5353.4</u>	<u>5338.61</u>
500-year (0.2%)	_____	_____
Normal Pool Elevation	_____	_____

7. Please attach a copy of the formal Operation and Maintenance Plan

E. LEVEE/FLOODWALL

The wall at 6423 Star Bright Road is treated as a floodwall based on as-built information, which is provided in appendix 5.

1. System Elements

a. This Levee/Floodwall analysis is based on (check one):

- ☐ upgrading of
an existing
levee/floodwall
system
- ☐ a newly
constructed
levee/floodwall
system
- ☐ reanalysis of
an existing
levee/floodwall
system

b. Levee elements and locations are (check one):

- ☐ earthen embankment, dike, berm, etc. Station _____ to _____
- ☐ structural floodwall Station _____ to _____
- ☐ Other (describe): Station _____ to _____

c. Structural Type (check one): ☐ monolithic cast-in place reinforced concrete ☐ reinforced concrete masonry block ☐ sheet piling
☐ Other (describe): _____

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☐ No

If Yes, by which agency? _____

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

- | | |
|---|----------------------|
| 1. Plan of the levee embankment and floodwall structures. | Sheet Numbers: _____ |
| 2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE),
levee and/or wall crest and foundation, and closure locations for the total levee system. | Sheet Numbers: _____ |
| 3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size
of opening, and kind of closure. | Sheet Numbers: _____ |
| 4. A layout detail for the embankment protection measures. | Sheet Numbers: _____ |
| 5. Location, layout, and size and shape of the levee embankment features, foundation treatment,
Floodwall structure, closure structures, and pump stations. | Sheet Numbers: _____ |

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

- | | | |
|--|------------------------------|-----------------------------|
| 3.0 feet or more at the downstream end and throughout | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 3.5 feet or more at the upstream end | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 4.0 feet within 100 feet upstream of all structures and/or constrictions | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

Coastal

- | | | |
|--|------------------------------|-----------------------------|
| 1.0 foot above the height of the one percent wave associated with the 1%-annual-chance
stillwater surge elevation or maximum wave runup (whichever is greater). | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| 2.0 feet above the 1%-annual-chance stillwater surge elevation | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☐ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☐ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

- a. The maximum levee slope land side is: _____
- b. The maximum levee slope flood side is: _____
- c. The range of velocities along the levee during the base flood is: _____ (min.) to _____ (max.)
- d. Embankment material is protected by (describe what kind): _____
- e. Riprap Design Parameters (check one): ☐ Velocity ☐ Tractive stress
Attach references

Reach	Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
					D ₁₀₀	D ₅₀	Thickness	
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								

(Extend table on an added sheet as needed and reference each entry)

- f. Is a bedding/filter analysis and design attached? ☐ Yes ☐ No
- g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

- a. Identify locations and describe the basis for selection of critical location for analysis:

- ☐ Overall height: Sta.: _____, height _____ ft.
- ☐ Limiting foundation soil strength:
- Strength ϕ = _____ degrees, c = _____ psf
- Slope: SS = _____ (h) to _____ (v)
- (Repeat as needed on an added sheet for additional locations)
- b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):

- c. Summary of stability analysis results:

E. LEVEE/FLOODWALL (CONTINUED)

5. Embankment And Foundation Stability (continued)

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

d. Was a seepage analysis for the embankment performed? ☐ Yes ☐ No

If Yes, describe methodology used:

e. Was a seepage analysis for the foundation performed? ☐ Yes ☐ No

f. Were uplift pressures at the embankment landside toe checked? ☐ Yes ☐ No

g. Were seepage exit gradients checked for piping potential? ☐ Yes ☐ No

h. The duration of the base flood hydrograph against the embankment is _____ hours.

Attach engineering analysis to support construction plans.

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one): ☐ UBC (1988) ☐ Other (specify): _____

b. Stability analysis submitted provides for: ☐ Overturning ☐ Sliding If not, explain: _____

c. Loading included in the analyses were: ☐ Lateral earth @ $P_A =$ _____ psf; $P_p =$ _____ psf

☐ Surcharge-Slope @ _____, ☐ surface _____ psf

☐ Wind @ $P_w =$ _____ psf

☐ Seepage (Uplift); _____ ☐ Earthquake @ $P_{eq} =$ _____ %g

☐ 1%-annual-chance significant wave height: _____ ft.

☐ 1%-annual-chance significant wave period: _____ sec.

d. Summary of Stability Analysis Results: Factors of Safety.
Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)
Note: (Extend table on an added sheet as needed and reference)

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability (continued)

e. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

- f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement

- a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No
- b. The computed range of settlement is _____ ft. to _____ ft.
- c. Settlement of the levee crest is determined to be primarily from : ☐ Foundation consolidation ☐ Embankment compression
☐ Other (Describe): _____
- d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

- a. Specify size of each interior watershed:

Draining to pressure conduit: _____ acres

Draining to ponding area: _____ acres

- b. Relationships Established

Ponding elevation vs. storage ☐ Yes ☐ No

Ponding elevation vs. gravity flow ☐ Yes ☐ No

Differential head vs. gravity flow ☐ Yes ☐ No

- c. The river flow duration curve is enclosed: ☐ Yes ☐ No

- d. Specify the discharge capacity of the head pressure conduit: _____ cfs

- e. Which flooding conditions were analyzed?

- Gravity flow (Interior Watershed) ☐ Yes ☐ No
- Common storm (River Watershed) ☐ Yes ☐ No
- Historical ponding probability ☐ Yes ☐ No
- Coastal wave overtopping ☐ Yes ☐ No

If No for any of the above, attach explanation.

- e. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No If No, attach explanation.

- g. The rate of seepage through the levee system for the base flood is _____ cfs

- h. The length of levee system used to drive this seepage rate in item g: _____ ft.

E. LEVEE/FLOODWALL (CONTINUED)

8. Interior Drainage (continued)

- i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants: _____ For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem

Hydrocompaction ☐ is ☐ is not a problem

Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☐ No Attach supporting documentation

d. Sediment Transport Considerations:

Was sediment transport considered? ☐ Yes ☐ No

If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why sediment transport was not considered.

10. Operational Plan And Criteria

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations?
☐ Yes ☐ No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations?
☐ Yes ☐ No If the answer is No to any of the above, please attach supporting documentation.

E. LEVEE/FLOODWALL (CONTINUED)

11. Maintenance Plan

Please attach a copy of the formal maintenance plan for the levee/floodwall

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

CERTIFICATION OF THE LEVEE DOCUMENTATION

This certification is to be signed and sealed by a licensed registered professional engineer authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.10(e) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: _____ License No.: _____ Expiration Date: _____

Company Name: _____ Telephone No.: _____ Fax No.: _____

Signature: _____ Date: _____ E-Mail Address: _____

F. SEDIMENT TRANSPORT

Flooding Source: Boca Negra Arroyo

Name of Structure: Boca Negra Detention Dam

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume 18.416 acre-feet

Debris load associated with the base flood discharge: Volume _____ acre-feet

Sediment transport rate 5% & 9% (percent concentration by volume) Based on community adopted numbers from Boca Negra-Mariposa DMP

Method used to estimate sediment transport: Bulking Factors

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition: _____

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport: Based on Boca Negra-Mariposa DMP

Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

Comments to MT-2 Form 3: Riverine Structures Form

Section C.2: Bridge / Culverts

Bentley Culvert Master V3.3 was used only for the purpose of generating the rating curve upstream of the Scenic Road culverts. See attached calculations.

Section F: Sediment Transport

Sediment transport was addressed by adding a 5% bulking factor to areas above the escarpment and 9% to areas below the escarpment to the flows in the hydrologic model. The percentages are based on the Boca Negra – Mariposa Arroyo DMP. The DMP notes annual sediment yield using Flaxman Method to be 0.132 ac-ft/sq mi/yr for the Boca Negra Arroyo.

Culvert Calculator Report

4-60 IN AT IP3 - LOMR

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	5,346.79 ft	Headwater Depth/Height	2.08
Computed Headwater Elev.	5,350.28 ft	Discharge	1,188.00 cfs
Inlet Control HW Elev.	5,350.28 ft	Tailwater Elevation	0.00 ft
Outlet Control HW Elev.	5,349.67 ft	Control Type	Inlet Control
Grades			
Upstream Invert	5,339.90 ft	Downstream Invert	5,339.81 ft
Length	56.00 ft	Constructed Slope	0.001607 ft/ft
Hydraulic Profile			
Profile	CompositeM2PressureProfile	Depth, Downstream	4.66 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	4.66 ft
Velocity Downstream	15.59 ft/s	Critical Slope	0.011246 ft/ft
Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	5.00 ft
Section Size	60 inch	Rise	5.00 ft
Number Sections	4		
Outlet Control Properties			
Outlet Control HW Elev.	5,349.67 ft	Upstream Velocity Head	3.56 ft
Ke	0.20	Entrance Loss	0.71 ft
Inlet Control Properties			
Inlet Control HW Elev.	5,350.28 ft	Flow Control	N/A
Inlet Type	Groove end w/headwall	Area Full	78.5 ft²
K	0.00180	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	2
C	0.02920	Equation Form	1
Y	0.74000		