

CITY OF ALBUQUERQUE

Planning Department
Alan Varela, Director



Mayor Timothy M. Keller

May 1, 2025

Christopher Archuleta
Community Design Solutions, LLC
9384 Valley View Drive NW, Suite 100
Albuquerque, NM 87114

**RE: Ladera Dam 9 Diversion
LOMR Request
Engineer's Stamp Date: 04/21/2025
Hydrology File: J08D003B
Case # HYDR-2025-00137**

Dear Mr. Archuleta:

PO Box 1293

Based on the information provided in the LOMR Request received on 04/21/2025, the above-referenced report can be submitted to FEMA with the City's concurrence (see attached Community Acknowledgement, MT-2 Form).

Albuquerque

You will need to submit the entire package to FEMA and pay FEMA's review fee. Please be sure to copy me and AMAFCA with all FEMA correspondence.

NM 87103

If you have any questions, please contact me at 505-924-3314 or amontoya@cabq.gov.

Sincerely,

www.cabq.gov

Anthony Montoya, Jr., P.E. CFM
Senior Engineer, Hydrology
Planning Department, Development Review Services

Community Design Solutions

LADERA DAM 9 DIVERSION LETTER OF MAP REVISION

Prepared by
Community Design Solutions, LLC
9384 Valley View Drive NW
Suite 100
Albuquerque, New Mexico
87114

Prepared for
Kevin Patton
Pulte Group
7601 Jefferson St. NE Suite 320
Albuquerque, NM 87109



April 21, 2025
Project Number 242004

**City of Albuquerque
Planning Department
Development Review Services
HYDROLOGY SECTION
APPROVED**

DATE: 5/1/2025

BY: *Antio M...*

HydroTrans # J08D003B

THE APPROVAL OF THESE PLANS/REPORTS SHALL NOT BE CONSTRUED TO PERMIT VIOLATIONS OF ANY CITY ORDINANCE OR STATE LAW, AND SHALL NOT PREVENT THE CITY OF ALBUQUERQUE FROM REQUIRING CORRECTIONS FOR ERRORS OR DIMENSIONS IN PLANS, SPECIFICATIONS, OR CONSTRUCTION DOCUMENTS. SUCH APPROVED PLANS/REPORTS SHALL NOT BE CHANGED, MODIFIED OR ALTERED WITHOUT AUTHORIZATION.

THE APPROVAL OF THESE PLANS/REPORTS SHALL EXPIRE TWO (2) YEARS AFTER THE APPROVAL DATE IF NO BUILDING PERMIT HAS BEEN PULLED ON THE DEVELOPMENT.

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CERTIFICATION

I, Cassy L. McClintock, do hereby certify that this report was duly prepared by me or under my direction and that I am a duly registered Professional Engineer under the laws of the state of New Mexico.



Cassy L. McClintock, P.E.
NMPE No. 29490

4/21/2025

Date



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SECTION 1. INTRODUCTION

PURPOSE

Community Design Solutions, LLC (CDS) was tasked to analyze the existing Federal Emergency Management Agency (FEMA) Zone AE floodplain within the Ladera Dam 9 Diversion Channel. The FEMA Zone AE for the Ladera Dam 9 Diversion Channel was established in August 2014 through a Letter of Map Revision (LOMR). The Ladera Dam 9 Diversion channel is currently publicly maintained by Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA). The Ladera Dam 9 Diversion Channel is located within the City of Albuquerque jurisdiction and National Flood Insurance Program (NFIP) community, as depicted in Figure 1. This investigation involved reviewing drainage master plans that culminated in the approved LOMR for this channel. Additionally, the study included analyzing the watershed for new developments to quantify the runoff draining into the channel. The primary objective of this study is to remap the floodplain boundary from Zone AE to Shaded Zone X.



FIGURE 1: PROJECT VICINITY MAP

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FIELD OBSERVATIONS

In February 2025, CDS conducted field observations of the Ladera Dam 9 Diversion Channel and its surrounding area. The fieldwork involved verifying the existing conditions of the channel, check structures, and watershed boundaries. Photos 1 and 2 illustrate significant sediment accumulation at the entrance of the 54-inch culvert and at the check structures, respectively. Detailed fieldwork photographs and their locations are provided in Appendix B.



PHOTO 1: 54- INCH CULVERT AT ARROYO VISTA BOULEVARD



PHOTO 2: CHECK STRUCTURE UPSTREAM OF 54-INCH CULVERT

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SECTION 2. HYDROLOGIC AND HYDRAULIC ANALYSIS

PREVIOUS STUDIES

The reports discussed below pertain to this LOMR. The referenced background reports are included in Appendix B.

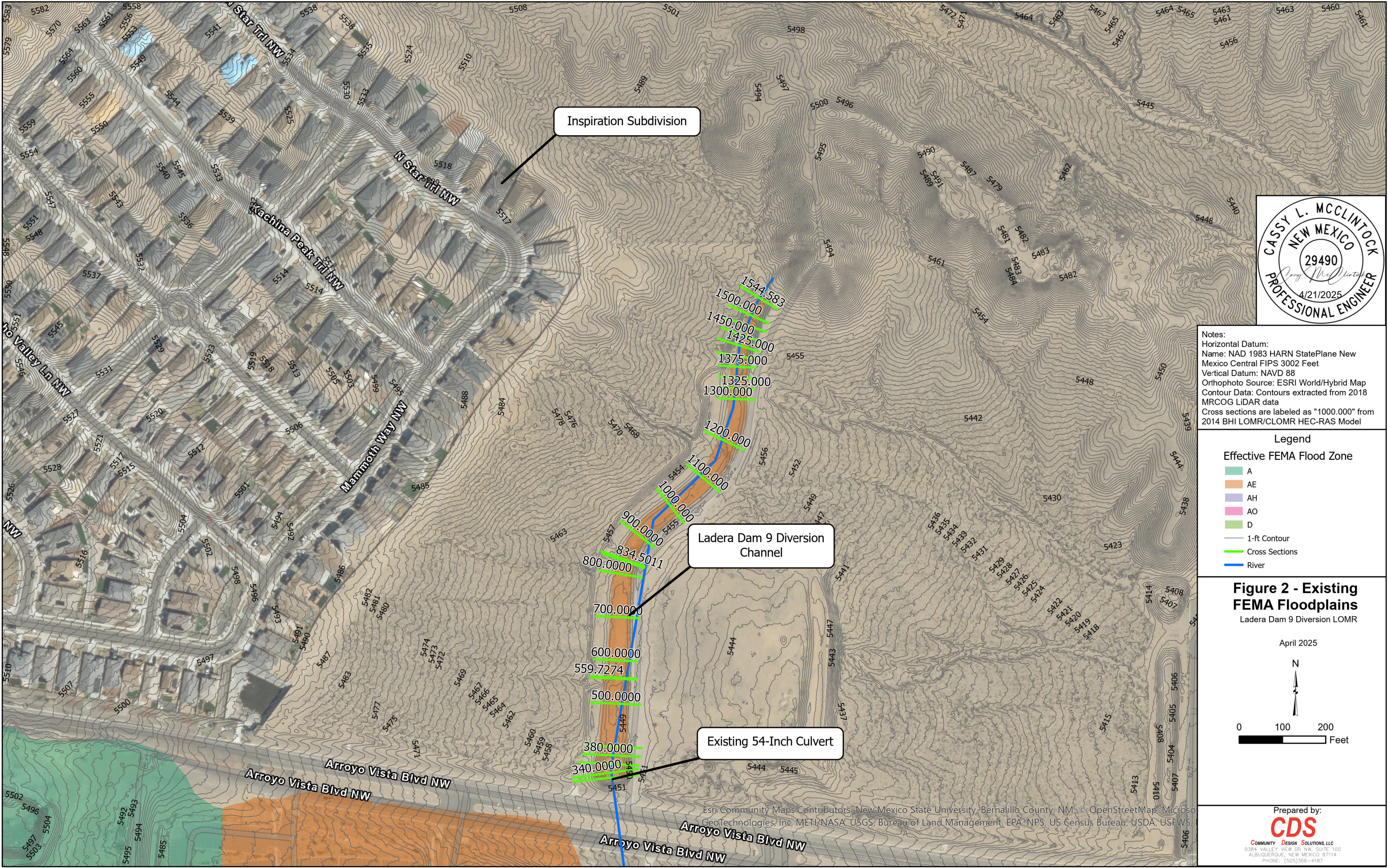
- / *West I-40 Diversion Drainage Management Plan (BHI, June 2000)*
This report established the original hydrologic and hydraulic analysis for the existing watershed, including the Upper Amole, Ladera, and West Bluff watersheds. AMAFCA tasked Bohannon Huston (BHI) with developing a comprehensive drainage management plan for the region. This plan was updated by BHI in December 2006, December 2011 and February 2020 to incorporate proposed developments in the area.
- / *APS/WALH Ladera Dam 5 and Dam 9 Arroyos: APS Projects Final Design Analysis Report (DAR) (BHI, April 2012)*
The purpose of this report is to provide analysis and design for the improvements proposed in the 2011 update of the West I-40 Diversion Drainage Management Plan by BHI.
- / *Ladera Dam 5 and 9 Arroyos Letter of Map Revision (LOMR) (BHI, October 2013)*
This report was completed based on the proposed development at the APS and stadium sites. The hydrology used in this LOMR for revised/post-project conditions stemmed from the APS/WAHL Ladera Dam 5 and 9 Arroyos: APS DAR (April 2012). Modifications to the LOMR included basin routing adjustments due to site, storm drain, and pond improvements within the watershed. These changes resulted in a LOMR to either remap or remove FEMA floodplains in the area west of the Albuquerque Public Schools (APS) site for the Ladera Dam 5 and 9 Arroyos. The report included in this study was completed in October 2013 by BHI.
 - » The LOMR, approved in 2014 (LOMR #14-06-0305P), established the AE flood zone in the Ladera Dam 9 Diversion Channel. The HEC-RAS model utilized for remapping the Ladera Dam 9 Diversion Channel floodplain, in this LOMR, was based on the 2014 LOMR. There were no changes to the hydraulic model from the CLOMR to the LOMR, stated in the 2013 report by BHI, therefore, this LOMR/CLOMR model became the approved effective model. The cross sections in the model were compared to the *Arroyo Vista Phase 1 APS Recreational Site APS Westside Sports Complex Public Infrastructure* as-builts in June of 2013 to confirm the as-built channel geometry.
- / *Drainage Report for Inspiration Subdivision (BHI, November 2019)*
This report was completed to document the analysis of the new site development west of the Ladera Dam 9 Diversion. It details which basin boundaries were assumed to be cut off or routed through the Inspiration Subdivision.

EXISTING FEMA FLOODPLAINS

According to the Flood Insurance Rate Maps (FIRMs) from FEMA, Ladera Dam 9 Arroyo is classified as a Flood Zone AE. This existing floodplain was revised based on the Letters of Map Revision (LOMRs) listed below:

- / 35001C0307H – Revised 8/16/2012
- / LOMR 14-06-035P - Effective 1/2/2015
- / LOMR 17-06-0303P - Effective 11/28/2016

The FIRM revised 8/16/2012 does not reflect the revised floodplain for the Ladera Dam 9 Diversion Channel and the Ladera Dam 9 Arroyo to the east, but is mapped this way on the National Flood Hazard Layer Viewer online. CDS approximated the location of the existing Ladera Dam 9 Diversion Channel Flood Zone AE on the annotated FIRM and LOMR FIRMette maps in Appendix D. The Flood Insurance Study (FEMA, 2016) for this area include identification numbers, 35001CV001D and 35001CV002D. The FIRMs, LOMRs and FIS study are included in Appendix B. An overview of the existing floodplains is provided in Figure 2.

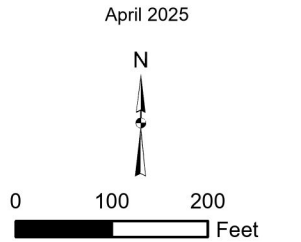


Notes:
Horizontal Datum:
Name: NAD 1983 HARN StatePlane New Mexico Central FIPS 3002 Feet
Vertical Datum: NAVD 88
Orthophoto Source: ESRI World/Hybrid Map
Contour Data: Contours extracted from 2018 MRCOG LiDAR data
Cross sections are labeled as "1000.000" from 2014 BHI LOMR/CLOMR HEC-RAS Model

- Legend
- Effective FEMA Flood Zone
- A
 - AE
 - AH
 - AO
 - D
 - 1-ft Contour
 - Cross Sections
 - River

Figure 2 - Existing FEMA Floodplains

Ladera Dam 9 Diversion LOMR



Prepared by:
CDS
COMMUNITY DESIGN SOLUTIONS, LLC
9384 VALLEY VIEW DR NW, SUITE 100
ALBUQUERQUE, NEW MEXICO 87114
PHONE: (505)366-4187

Community Design Solutions

HYDROLOGIC CONDITIONS

The hydrologic analysis for this LOMR was derived from the Ladera Dam 5 and 9 Arroyos DAR Report (BHI, 2012), which modeled contributing basins to the Ladera Dam 9 Diversion Channel using OS.5a, UD.5b, and L9.1A. Developed conditions flow rates from these basins generated approximately 443.2 cubic feet per second (cfs). Exhibit 2, in the appendices of the APS/WAHL Ladera Dam 5 and 9 Arroyos: APS DAR (April 2012), shows a developed conditions basin map with these flow rates. With improvements and new development in the area, the developed conditions flow rate decreased to 169 cfs. The flowrate of 169 cfs and the contributing basin area of 0.12 mi² was identified in the approved 2014 LOMR. An overview map is shown in Figure 3.

Post-construction of the Ladera Dam 9 Diversion, the Inspiration Subdivision was built west of the diversion, redirecting a portion of the runoff through this new subdivision and into the Arroyo Vista storm drain, bypassing the Ladera Dam 9 Diversion altogether. According to the Inspiration Subdivision Drainage Report (BHI, November 2019):

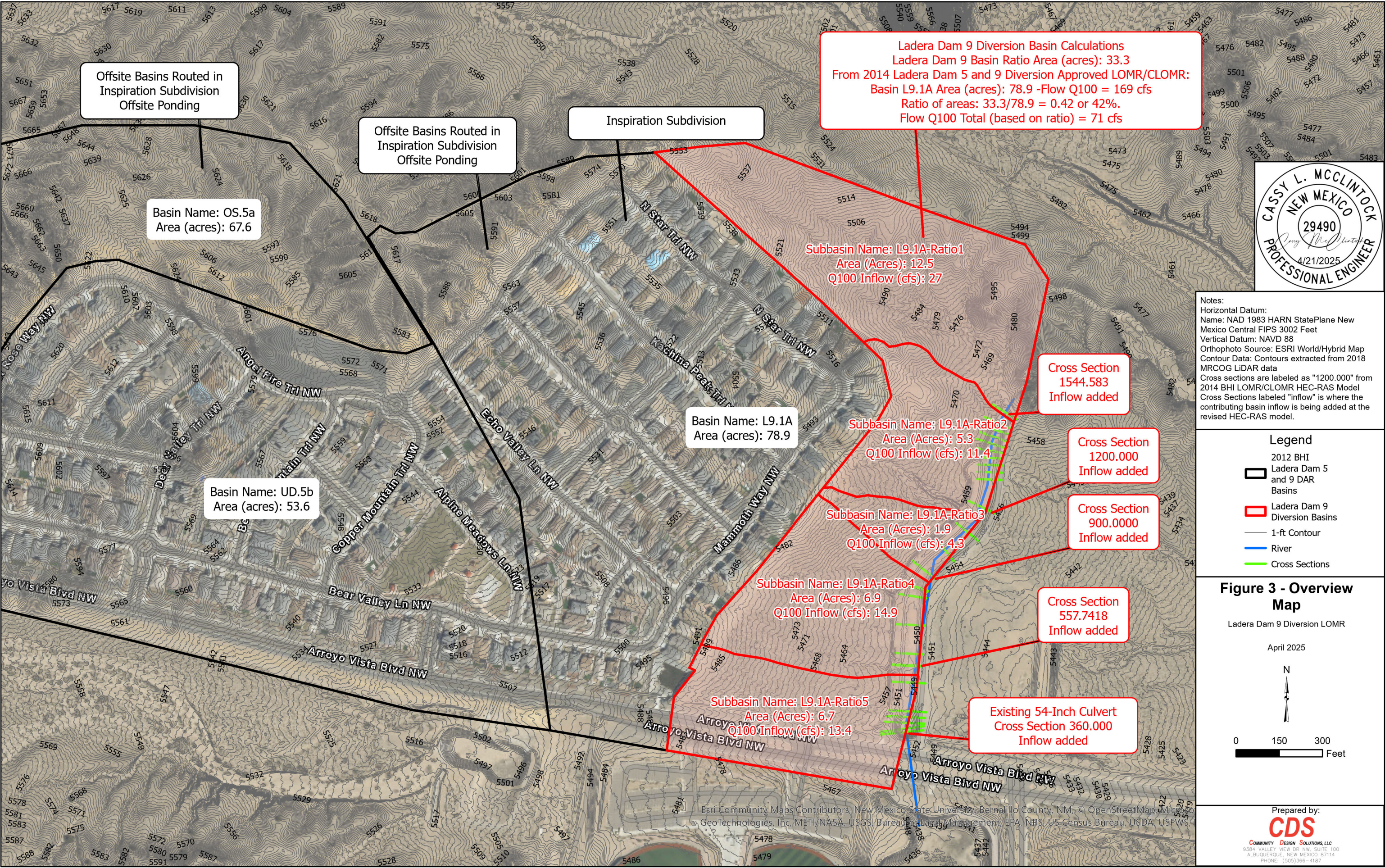
- / Basin UD.5b is routed through the onsite subdivision and drains to the storm drain in Arroyo Vista.
- / Basin OS.5a flow is split, with 40% routed through the subdivision and the remaining 60% routed through offsite ponding. The offsite ponding will bypass the Ladera Dam 9 Diversion Channel.
- / Basin L9.1A is split between the Inspiration Subdivision and the Ladera Dam 9 Diversion.

Therefore, CDS calculated a ratio of 58% of Basin L9.1A area that had been developed, to be diverted away from the Ladera Dam 9 Diversion, as this ratio area is routed through the Inspiration Subdivision. The remaining 42% of Basin L9.1A was assumed to be routed through the Ladera Dam 9 Diversion. This routed area was split into 5 subbasins to match the inflow points into the channel, consistent with the approved 2014 LOMR. Table 1 summarizes the results of the basin area ratio calculations.

TABLE 1: SUMMARY OF DISCHARGES AND AREAS TO LADERA DAM 9 DIVERSION

Location (Basin)	Description	Area (square miles)	Area (acres)	Model Discharge (cfs)
Ladera Dam 9 Diversion (Basin L9.1A)	Pre-Inspiration Subdivision	0.12	78.9	169*
	Post-Inspiration Subdivision Subbasin L9.1A-Ratio 1	0.019	12.5	27
	Post-Inspiration Subdivision Subbasin L9.1A-Ratio 2	0.008	5.3	11.4
	Post-Inspiration Subdivision Subbasin L9.1A-Ratio 3	0.003	1.9	4.3
	Post-Inspiration Subdivision Subbasin L9.1A-Ratio 4	0.01	6.9	14.9
	Post-Inspiration Subdivision Subbasin L9.1A-Ratio 5	0.01	6.7	13.4
	Post-Inspiration Subdivision Totals:	0.05	33.3	71

*Model discharge obtained from FEMA FIS November 4, 2016. The FIS flow was revised in the approved 2014 LOMR which was based on the APS/WAHL Ladera Dam 5 and 9 Arroyos: APS DAR (April 2012).



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HYDRAULIC CONDITIONS

The FEMA approved Ladera Dam 5 and 9 Arroyos LOMR (BHI, October 2013) 1-Dimensional (1D) steady state Hydrologic Engineering Center River Analysis System (HEC-RAS) effective hydraulic model was used in this LOMR. The version of HEC-RAS used in this LOMR is version 6.6. CDS did not change any input parameters within the model except for an update to the flow rate based on the revised drainage area as discussed in the Hydrology section. The following parameters were the only ones that were updated to develop the true inundation limits based on peak flows from the approved 2014 LOMR:

- / The revised model flowrate was updated to a total of 71 cfs. This flowrate was split and added at the same cross sections as the approved 2014 LOMR effective model. See Table 2 for the flow input locations at the cross sections in the model.
- / A new water surface elevation at 5446.50 feet at the entrance of the 54-inch culvert under Arroyo Vista Boulevard in revised model.

TABLE 2: SUMMARY OF DISCHARGES AT MODEL CROSS SECTIONS

Cross Section Location	Flow Added to Cross Section (cfs)	Cumulative Flow in Model (cfs)*
1544.583	27	27
1200.000	11.4	38.4
900.0000	4.3	42.7
557.7418	14.9	57.6
360.0000	13.4	71

*Computed the cumulative flow rate from the previous cross section to equate to 71 cfs at the downstream most cross section 360.000 in the HEC-RAS model.

In the revised hydraulic model, a new water surface elevation was computed at the inlet of the 54-inch culvert at Arroyo Vista Boulevard. To account for the reduced flowrate of 71 cfs to the 54-inch culvert, a new water surface elevation at the model's downstream boundary condition was computed using Federal Highway Administration HY-8 Version 8.0.0.1 software. The new water surface elevation at the inlet of the 54-inch culvert was computed to be 5446.50 feet, assuming clean conditions of the culvert. CDS wanted to confirm the true capacity of the culvert if maintained and in clean condition with the revised flowrate, even though there is sediment build up. In the AMAFCA Project Maintenance Plan No. 5 (January 2011), section 2.A.4 states "*routine work to maintain stormwater capacity.*" Therefore, even though there is sediment buildup observed during field work, CDS assumes the channel will be maintained to a clean condition. Updated LIDAR elevation data was not incorporated in the hydraulic model since CDS concluded to revise this hydraulic model based on as-built conditions of the channel. The culvert calculations and results are included in Appendix C.

HYDRAULIC RESULTS

The revised flowrate of 71 cfs reduced the water surface elevations to make the channel average depth below 1 foot overall. At the following locations in the channel, due to a change in channel slope from a check structure, the water surface elevation show a water depth exceeding 1 foot:

- / Cross section 1100.000
- / Cross section 830.7607
- / Cross section 557.7418
- / Directly upstream of the 54-inch culvert at Arroyo Vista Blvd

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CDS has concluded that these areas, shown in Figure 4, are anomalies in the model. Overall, the channel depths have significantly decreased from the effective model based on the revised analysis in this LOMR. Although there are very small areas where the calculated depth exceeds 1 foot, CDS concludes that these instances are due to minor low points in the channel geometry directly adjacent to the check structures and should be ignored. The channel depths calculated at the check structures, are shown in Figure 4. HEC-RAS model, layout, profile, water surface elevation comparisons, and data tables are included in Appendix C.

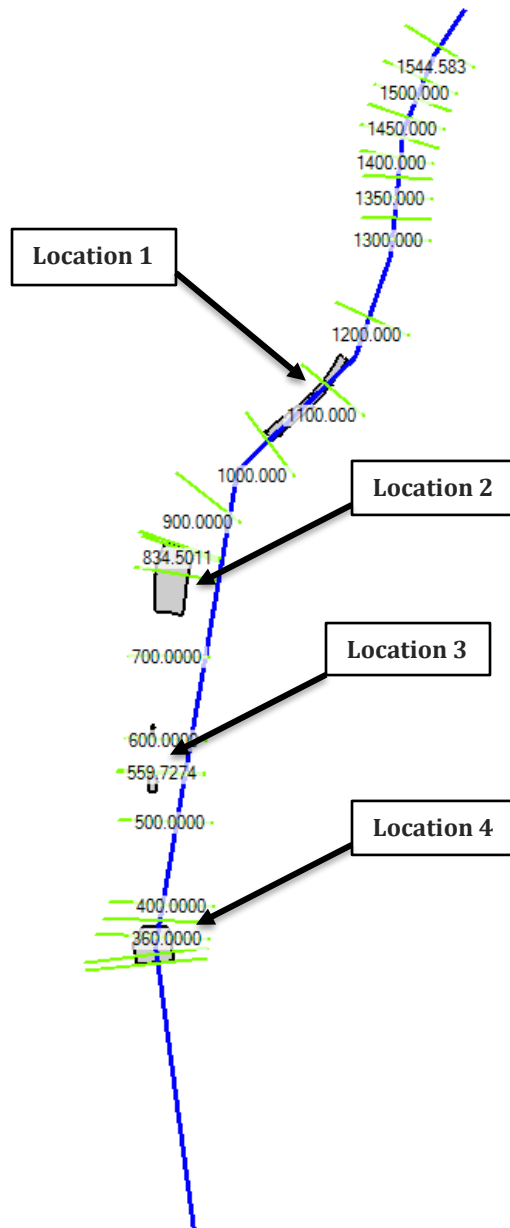


FIGURE 4: ANOMALIES IN HYDRAULIC MODEL

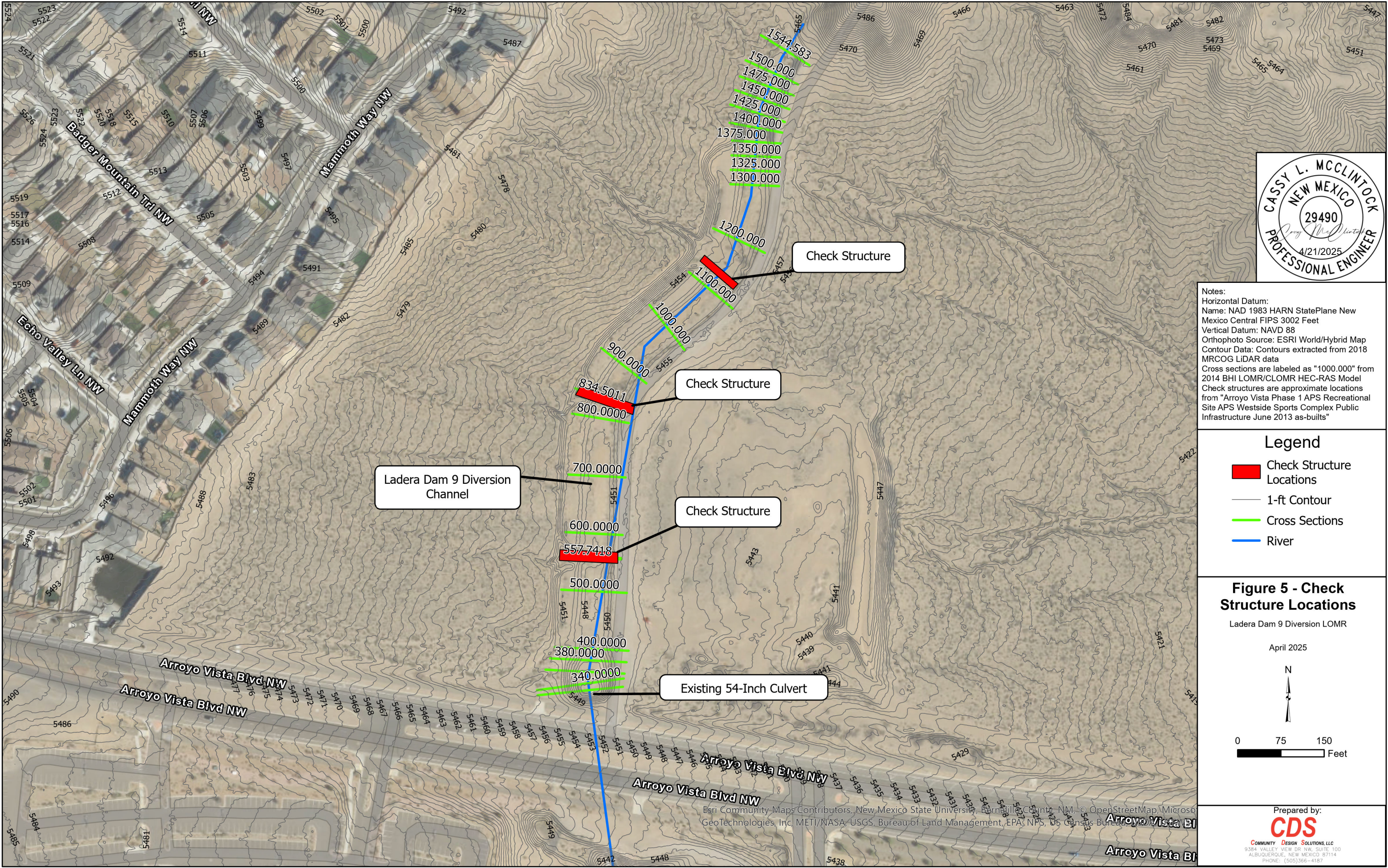
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SECTION 3. CONCLUSION

The drainage area to the Ladera Dam 9 Diversion has been reduced due to infrastructure improvements and is now less than 1 square mile, therefore, it is appropriate that this area should be remapped to accurately reflect these changes. The reduction in drainage area and subsequent decrease in flow rates have led to a significant decrease in flood risk for the area. Given these findings, it is recommended that the floodplain boundaries be revised from the existing Flood Zone AE to a Shaded Zone X.

The revised hydraulic model shows a significantly reduced water surface elevation throughout the channel. The average water surface depth is 0.8-ft from the start of the channel and directly upstream of the 54-inch culvert. Although there are very small areas where the calculated depth exceeds 1 foot, CDS concludes that these instances are due to minor low points in the channel geometry directly adjacent to the check structures and should be ignored. A check structure location map is shown in Figure 5. These larger depths are correlated by a possible hydraulic jump at the check structures. All the channel, except these anomalies, remain below 1 foot in depth.

Furthermore, the updated HEC-RAS model demonstrates that the channel can effectively manage the reduced flow rates, ensuring that the risk of flooding is minimized. The layout and data tables for the existing profile, provided in Appendix C, support this conclusion. These tables include detailed information on the channel geometry, flow rates, and water surface elevations, offering a comprehensive overview of the current conditions. This remapping will provide a more accurate representation of the flood hazard, benefiting both the community and future development planning.



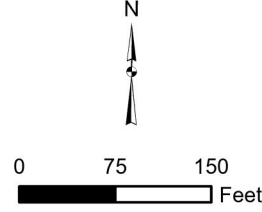
Notes:
Horizontal Datum:
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Vertical Datum: NAVD 88
Orthophoto Source: ESRI World/Hybrid Map
Contour Data: Contours extracted from 2018 MRCOG LiDAR data
Cross sections are labeled as "1000.000" from 2014 BHI LOMR/CLOMR HEC-RAS Model
Check structures are approximate locations from "Arroyo Vista Phase 1 APS Recreational Site APS Westside Sports Complex Public Infrastructure June 2013 as-builts"

- Legend**
- Check Structure Locations
 - 1-ft Contour
 - Cross Sections
 - River

Figure 5 - Check Structure Locations

Ladera Dam 9 Diversion LOMR

April 2025



Prepared by:

CDS
COMMUNITY DESIGN SOLUTIONS, LLC
9384 VALLEY VIEW DR NW, SUITE 100
ALBUQUERQUE, NEW MEXICO 87114
PHONE: (505)366-4187

Community Design Solutions

SECTION 4. REFERENCES

Albuquerque Metropolitan Arroyo Flood Control Authority, 2011. Project Operations, Project Maintenance, Inspections and Emergency Operations Plan for Flood Emergencies – Plan No. 5 & 7.

Bohannon Houston Inc., 2000. West: I-40 Diversion Drainage Management Plan

Bohannon Houston Inc., 2012. APS/WALH Ladera Dam 5 and Dam 9 Arroyos: APS Projects Final Design Analysis Report DAR

Bohannon Houston Inc., 2013. Ladera Dam 5 and 9 Arroyos Conditional Letter of Map Revision (LOMR)

Bohannon Houston Inc., 2019. Drainage Report for Inspiration Subdivision

Federal Emergency Management Agency, 2012. Flood Insurance Rate Map (FIRM), Bernalillo County, New Mexico. Map Number: 35001C0307H

Federal Emergency Management Agency, 2016. Flood Insurance Study Volume 1 & 2, Bernalillo County, New Mexico. Map Number: 35001CV001D and 35001CV002D

Federal Emergency Management Agency, 2016. Flood Insurance Rate Map (FIRM) LOMR 17-06-0303P-350002, Bernalillo County, New Mexico. Map Number: 35001C0307H Revised to Reflect LOMR Effective: November 28, 2016.

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APPENDIX A

MT-2 FORMS

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APPENDIX B

ASBUILTS AND PAST REPORTS

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APPENDIX C

MODELS AND CALCULATIONS

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APPENDIX D

MAPS