CITY OF ALBUQUERQUE

Planning Department
Alan Varela, Interim Director

Mayor Timothy M. Keller

November 8, 2021

Howard Cake, P.E.
TyLin International
500 4th St NW, Suite 403F
Albuquerque, NM 87102

RE: Shari Vista Road Improvements
Drainage Memo
Engineer's Stamp Date: 10/26/21
Hydrology File: L12D013

Dear Mr. Cake:

Based upon the information provided in your submittal received 09/29/2021, the Drainage Memo is approved for DRC Work Order.

As a reminder, if the project total area of disturbance (including the staging area and any work within the adjacent Right-of-Way) is 1 acre or more, then an Erosion and Sediment Control (ESC) Plan and Owner's certified Notice of Intent (NOI) is required to be submitted to the Stormwater Quality Engineer (Doug Hughes, PE, jhughes@cabq.gov, 924-3420) 14 days prior to any earth disturbance.

If you have any questions, please contact me at 924-3995 or rbrissette@cabq.gov.

Sincerely,

Renée C. Brissette

Renée C. Brissette, P.E. CFM
Senior Engineer, Hydrology
Planning Department

PO Box 1293

Albuquerque

NM 87103

www.cabq.gov

City of Albuquerque

Planning Department

Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET (REV 11/2018)

Project Title: Shar Vista Blvd Building Permit #: None Hydrology File #: None

DRB#: None EPC#: None Work Order#: None

Legal Description: Shari Vista Road East of Pear Road

City Address: _____

Applicant: T.Y. Lin for Bernalillo County Contact: Howard Cake

Address: 500 4th Street NW, Suite 403

Phone#: 505-730-0882 Fax#: None E-mail: Howard.cake@tylin.com

Owner: City of Albuquerque Contact: John MacKenzie

Address: DMD

Phone#: 768-3965 Fax#: _____ E-mail: jmackenzie@cabq.gov

TYPE OF SUBMITTAL: _____ PLAT (___# OF LOTS) ____ RESIDENCE ____ DRB SITE ____ ADMIN SITE

IS THIS A RESUBMITTAL?: _____ Yes X No

DEPARTMENT: _____ TRAFFIC/ TRANSPORTATION X HYDROLOGY/ DRAINAGE

Check all that Apply:

TYPE OF SUBMITTAL:

____ ENGINEER/ARCHITECT CERTIFICATION
____ PAD CERTIFICATION
____ CONCEPTUAL G & D PLAN
____ GRADING PLAN
____ DRAINAGE MASTER PLAN
X DRAINAGE REPORT
____ FLOODPLAIN DEVELOPMENT PERMIT APPLIC
____ ELEVATION CERTIFICATE
____ CLOMR/LOMR
____ TRAFFIC CIRCULATION LAYOUT (TCL)
____ TRAFFIC IMPACT STUDY (TIS)
____ OTHER (SPECIFY) _____
____ PRE-DESIGN MEETING?

TYPE OF APPROVAL/ACCEPTANCE SOUGHT:

____ BUILDING PERMIT APPROVAL
____ CERTIFICATE OF OCCUPANCY
____ PRELIMINARY PLAT APPROVAL
____ SITE PLAN FOR SUB'D APPROVAL
____ SITE PLAN FOR BLDG. PERMIT APPROVAL
____ FINAL PLAT APPROVAL
____ SIA/ RELEASE OF FINANCIAL GUARANTEE
____ FOUNDATION PERMIT APPROVAL
____ GRADING PERMIT APPROVAL
____ SO-19 APPROVAL
____ PAVING PERMIT APPROVAL
____ GRADING/ PAD CERTIFICATION
____ WORK ORDER APPROVAL
____ CLOMR/LOMR
____ FLOODPLAIN DEVELOPMENT PERMIT
X OTHER (SPECIFY) For DRC Review

DATE SUBMITTED: 9/28/21 By: Howard Cake

COA STAFF: ELECTRONIC SUBMITTAL RECEIVED: _____

FEE PAID: _____

Subject: *Final Drainage Memo for Shari Vista Road (Pear Road to End of Shari Vista Road), Albuquerque, New Mexico Bernalillo County Engineering Services On-Call Task Order #3 C.P.N 5538.92* *October 26, 2021*

This memo documents the drainage improvements for the Shari Vista Road project (Pear Road to End of Shari Vista Road). Included are the onsite hydrologic and hydraulic calculations for the proposed drainage infrastructure based on the roadway improvements. A hydraulic analysis was performed to determine the extent of drainage improvements required to address ponding issues within the roadway.

SITE DESCRIPTION

The Shari Vista Road project is located in Albuquerque, New Mexico. Shari Vista Road is an existing 2-lane roadway without curb and gutter or pedestrian facilities. Shari Vista terminates at a cul-de-sac and does not have an outlet. Roadway slopes vary greatly and have a longitudinal slope ranging from zero to 0.5% with an average cross-slope of 0.5%. The roadway is bounded in all directions by single-family residential developments. The area is relatively flat.

Existing onsite stormwater runoff flows from adjacent properties onto Shari Vista Road and pond within the roadway and to the adjacent properties. There are no existing storm inlets or drainage infrastructure within the project corridor.

Exhibit 1 in **Appendix C** displays the Shari Vista Road existing conditions and hydrologic results.

PROPOSED IMPROVEMENTS

The general design of the proposed roadway is a two-lane facility with mountable roll curb, gutter and sidewalk on each side. The typical section is at a normal crown with a low point within the cul-de-sac where stormwater runoff will be captured by proposed storm inlets. **Figure 1** depicts the proposed typical section for the Shari Vista project.

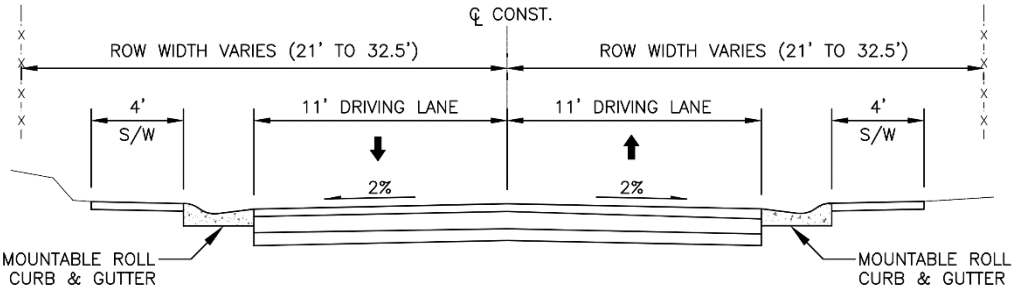


Figure 1 Proposed Typical Section

OFFSITE HYDROLOGY

Smaller localized flow generated within the residential development adjacent to the roadway will not be analyzed. Adjacent residential properties are required to maintain localized storm runoff without discharging additional flow onto the project right-of-way. Based on our initial review, the proposed roadway improvements along Shari Vista Road will not impact offsite or onsite flow patterns or concentration points.

Re-evaluating the offsite hydrology is beyond the scope of this project. However, future review of the Pear Road improvement project, drainage report and field verification of flow patterns and concentration points will be conducted upon receipt of the Pear Road improvement project documents. Based on current conditions along Pear Road and adjacent residences, existing grading, wall elevations and elevations slope away from Shari Vista Road. There is not expected to be any offsite flow impacts.

HYDROLOGIC CALCULATIONS

A hydrologic evaluation was performed for the Shari Vista Road project using the methodology from Chapter 6 of the City of Albuquerque Development Process Manual (DPM) (2020). The peak discharges for the 2-year, 10-year, and 100-year frequency design storms were calculated for the existing and proposed conditions of the new improvements. As specified in the DPM, the 6-hour storm duration for these events was used. Only the improvement areas were calculated. The existing areas consist of both soil type C (unpaved lots, roads, trails and desert landscaping) and soil type D (impervious areas) as specified in the DPM. The volumetric runoffs were calculated for the onsite basin for the 100-year design storm based on the 6-hour, 24-hour, 4-day and 10-day durations. This will allow us to determine the volume of water accumulated within Shari Vista Road. **Table 1** and **Table 2** summarizes the onsite stormwater discharge and volumetric calculations.

Table 1 Onsite Subbasin Discharge

Basin ID	Contributing Area (sf)	Contributing Area (ac)	Q_{P2} Discharge (cfs)	Q_{P10} Discharge (cfs)	Q_{P100} Discharge (cfs)
BASIN01	13,900	0.32	0.5	0.9	1.4

Table 2 Volumetric Runoff 100-year Storm

Volumetric Runoff	V_{360} Discharge	V_{1440} Discharge	V_{4DAYS} Discharge	V_{10DAYS} Discharge
acre-ft	0.060	0.068	0.085	0.106
cubic feet	2,595	2,965	3,695	4,598

Exhibit 2 in **Appendix C** displays the Shari Vista proposed improvements. Onsite hydrologic calculations are provided in **Appendix A**.

HYDRAULIC CALCULATIONS

Onsite roadway drainage is intercepted by storm drain inlets designed at the low point of the roadway, within the cul-de-sac, based upon criteria established within Chapter 6 of the DPM. Once intercepted, storm water captured by open-bottom storm inlets drain down into the subbase.

Inlet capacities and spread calculations for storm inlets were calculated using Bentley FlowMaster V8i. FlowMaster calculates inlet interception capacity and spread based on roadway variables including cross-slope, pavement grade, etc. Clogging factors used for grate calculations was 50%.

Spread calculations were performed just upstream of catch basins utilizing the concrete gutter and asphalt Manning's n-values. According to the DPM, flow depths in the event of a 10-year design discharge may not exceed 0.5 feet in any collector or arterial street. For a 100-year design discharge, flow depths may not exceed 0.2 feet above curb height and shall be contained within the street right-of-way. Once the spread calculations were performed and deemed adequate, catch basins were placed and designed to capture a minimum of 80% of the incoming flow. Bypass flows were routed to the appropriate downstream catch basin.

Table 3 Shari Vista Proposed Storm Inlets – 100-year Design Storm

Inlet ID	Station	Type	Storm Runoff Captured (cfs)	Inlet Efficiency	Calculated Spread (ft)	Inlet Capacity (cubic feet)
Inlet-01	3+96 RT	Double Grate Inlet	0.68	99%	8.0	50
Inlet-02	4+17 LT	Double Grate Inlet	0.68	99%	8.0	50
Inlet-03	4+23 RT	Double Grate Inlet	0.01	100%	-	50

Inlet capacities and spread calculations are provided in **Appendix B**.

VOLUME CAPACITY

The existing roadway corridor does not have storm infrastructure and is relatively flat with no curb and gutter to convey any storm runoff, resulting in zero volume capacity. The water spreads among the surrounding properties and based on the Bernalillo County 2010 2-ft GIS contours has a minimum slope to the south with natural small retention ponding areas spaced throughout the area. Based on this, larger storm events would retain some water but would drain to the south.

With the proposed improvements, the capacity of the proposed roadway before overtopping the curb and gutter onto adjacent residential properties is approximately 950 cubic feet. The total inlet volume capacity is 150 cubic feet. See **Appendix B** for inlet capacity calculations. The roadway and storm inlet system have provided a total volume capacity of 1,100 cubic feet.

For this report, it was assumed that the drainage would be captured at the southern backyard fence of the properties adjacent to the roadway. The contours indicate that the drainage in larger events (i.e. 100-year, 10-day storm) would drain to the south but for the purposes of mapping the

spread limits this is a conservative approach. The proposed and existing spread limits are shown on Exhibit 3 in **Appendix C**. The existing and proposed spread is almost identical despite the proposed condition providing 1,100 cubic feet of additional capacity. This is due to the existing conditions being essentially flat over a large area, so the water spread is consistent despite the increase storage capacity of the roadway. Therefore, in large storm events there is minimal improvement for the proposed condition verses the existing condition.

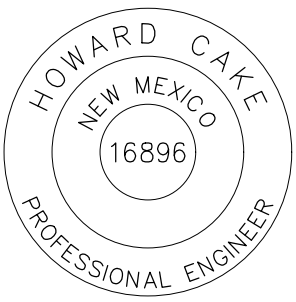
While the improvements will minimally impact in the larger storm events it will improve the drainage and water spread in the smaller more common storms. The roadway will provide the capacity to the entirely hold the 2-year, 6-hour storm. For all other storms it does provide an additional 1,100 cubic feet of storage that is not available in the existing condition.

Based on the volumetric runoff calculation results, summarized in **Table 2**, the system is not capable of holding a 100-year storm of any duration without flooding onto adjacent properties. The calculations show that the improvements will not adversely impact the adjacent areas but will provide a minimal improvement due to the increase storage capacity of the roadway. The roadway and inlet system can adequately capture and hold a 2-year, 6-hour storm with a volumetric runoff of 1,066 cubic feet and will provide additional storage for all storm events.

SUMMARY

This memo documents the drainage analysis of the Shari Vista roadway improvements. The existing roadway does not have the infrastructure nor the volume capacity to sufficiently capture stormwater runoff. The existing ponding issues within Shari Vista Road have been improved with the three storm inlets that have been proposed within the cul-de-sac of Shari Vista Road. The provided volume capacity of 1,100 cubic feet will improve conditions for adjacent properties and not adversely impact their properties during storm events. The proposed roadway improvements and storm drain infrastructure adequately address the existing ponding issues for a 2-year, 6-hour storm. Based on the hydrologic and hydraulic analyses, the proposed improvements do not address the ponding issues for the governing 100-year design storm. However, there are no adverse impacts to the properties and will provide a minimal improvement to the properties in larger storm events.

Sincerely,



Howard Cake , P.E.
Sr. Project Manager
T.Y. Lin International

APPENDIX A

Hydrologic Data & Calculations

T·Y·LIN INTERNATIONAL

On-Site Subbasin Calculations - Existing

Project: Shari Vista Road
Location: Albuquerque, NM
Date: September 21, 2021

References: City of Albuquerque Development Process Manual (2020), Chapter 6 - Drainage, Flood Control, and Erosion Control

Precipitation Zone: 1

	Intensity
2-yr, 6-hr=	1.86
10-yr, 6-hr=	3.00
100-yr, 6-hr=	4.77

Basin ID: BASIN01

1. Land Treatment Areas

A:	0 sq.ft.	0.00 ac.
B:	0 sq.ft.	0.00 ac.
C:	0 sq.ft.	0.00 ac.
D:	12922 sq.ft.	0.30 ac.
TOTAL:	12922 sq.ft.	0.30 ac.

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.3
$C*A_{10}$=	0.3
$C*A_{100}$=	0.3

3. Peak Discharge, Q

Q_2=	0.5	cfs
Q_{10}=	0.8	cfs
Q_{100}=	1.3	cfs

T·Y·LIN INTERNATIONAL

On-Site Subbasin Calculations - Proposed

Project: Shari Vista Road
Location: Albuquerque, NM
Date: September 21, 2021

References: City of Albuquerque Development Process Manual (2020), Chapter 6 - Drainage, Flood Control, and Erosion Control

Precipitation Zone: 1

	Intensity
2-yr, 6-hr=	1.86
10-yr, 6-hr=	3.00
100-yr, 6-hr=	4.77

Basin ID: BASIN01

1. Land Treatment Areas

A:	0 sq.ft.	0.00 ac.
B:	0 sq.ft.	0.00 ac.
C:	0 sq.ft.	0.00 ac.
D:	13900 sq.ft.	0.32 ac.
TOTAL:	13900 sq.ft.	0.32 ac.

2. Weighted C*A, Rational Coefficient*Acre

$C*A_2$=	0.3
$C*A_{10}$=	0.3
$C*A_{100}$=	0.3

3. Peak Discharge, Q

Q_2=	0.5	cfs
Q_{10}=	0.9	cfs
Q_{100}=	1.4	cfs

TY LIN INTERNATIONAL

Excess Precipitation & Volumetric Runoff (2-year)

Project: Shari Vista Road
Location: Albuquerque, NM
Date: September 27, 2021

References: City of Albuquerque Development Process Manual (2020), Chapter 6 - Drainage, Flood Control, and Erosion Control

Precipitation Zone: 1
Basin ID: BASIN01

1. Land Treatment Areas, A

A:	0 sq.ft.	0.00 ac.
B:	0 sq.ft.	0.00 ac.
C:	0 sq.ft.	0.00 ac.
D:	13900 sq.ft.	0.32 ac.
Total:	13900 sq.ft.	0.32 ac.

Excess Precipitation, E		Precipitation Depth, P	
A:	0.00 in.	P_{360}:	0.92 in.
B:	0.01 in.	P_{1440}:	1.16 in.
C:	0.13 in.	P_{4DAYS}:	1.56 in.
D:	0.92 in.	P_{10DAYS}:	1.97 in.

2. Weighted E

E*A / Total A= 0.92

3. Runoff Volume (6-hour), V_{360}

Weighted E * Total A= 0.024 acre-ft
1,066 cf

4. Runoff Volume (24-hour), V_{1440}

$V_{360}+A_D * (P_{1440} - P_{360}) / 12$ = 0.031 acre-ft
1,344 cf

5. Runoff Volume (4-day), V_{4DAYS}

$V_{360}+A_D * (P_{4DAYS} - P_{360}) / 12$ = 0.041 acre-ft
1,807 cf

6. Runoff Volume (10-day), V_{10DAYS}

$V_{360}+A_D * (P_{10DAYS} - P_{360}) / 12$ = 0.052 acre-ft
2,282 cf

TY LIN INTERNATIONAL

Excess Precipitation & Volumetric Runoff (10-year)

Project: Shari Vista Road
Location: Albuquerque, NM
Date: September 27, 2021

References: City of Albuquerque Development Process Manual (2020), Chapter 6 - Drainage, Flood Control, and Erosion Control

Precipitation Zone: 1
Basin ID: BASIN01

1. Land Treatment Areas, A

A:	0 sq.ft.	0.00 ac.
B:	0 sq.ft.	0.00 ac.
C:	0 sq.ft.	0.00 ac.
D:	13900 sq.ft.	0.32 ac.
Total:	13900 sq.ft.	0.32 ac.

Excess Precipitation, E		Precipitation Depth, P	
A:	0.11 in.	P_{360}:	1.4 in.
B:	0.26 in.	P_{1440}:	1.68 in.
C:	0.43 in.	P_{4DAYS}:	2.19 in.
D:	1.43 in.	P_{10DAYS}:	2.76 in.

2. Weighted E

E*A / Total A= 1.43

3. Runoff Volume (6-hour), V_{360}

Weighted E * Total A= 0.038 acre-ft
1,656 cf

4. Runoff Volume (24-hour), V_{1440}

$V_{360}+A_D * (P_{1440} - P_{360}) / 12$ = 0.045 acre-ft
1,981 cf

5. Runoff Volume (4-day), V_{4DAYS}

$V_{360}+A_D * (P_{4DAYS} - P_{360}) / 12$ = 0.059 acre-ft
2,571 cf

6. Runoff Volume (10-day), V_{10DAYS}

$V_{360}+A_D * (P_{10DAYS} - P_{360}) / 12$ = 0.074 acre-ft
3,232 cf

TY LIN INTERNATIONAL

Excess Precipitation & Volumetric Runoff (100-year)

Project: Shari Vista Road
Location: Albuquerque, NM
Date: September 27, 2021

References: City of Albuquerque Development Process Manual (2020), Chapter 6 - Drainage, Flood Control, and Erosion Control

Precipitation Zone: 1
Basin ID: BASIN01

1. Land Treatment Areas, A

A:	0 sq.ft.	0.00 ac.
B:	0 sq.ft.	0.00 ac.
C:	0 sq.ft.	0.00 ac.
D:	13900 sq.ft.	0.32 ac.
Total:	13900 sq.ft.	0.32 ac.

Excess Precipitation, E		Precipitation Depth, P	
A:	0.55 in.	P_{360}:	2.17 in.
B:	0.73 in.	P_{1440}:	2.49 in.
C:	0.95 in.	P_{4DAYS}:	3.12 in.
D:	2.24 in.	P_{10DAYS}:	3.90 in.

2. Weighted E

E*A / Total A= 2.24

3. Runoff Volume (6-hour), V_{360}

Weighted E * Total A= 0.060 acre-ft
2,595 cf

4. Runoff Volume (24-hour), V_{1440}

$V_{360}+A_D * (P_{1440} - P_{360}) / 12$ = 0.068 acre-ft
2,965 cf

5. Runoff Volume (4-day), V_{4DAYS}

$V_{360}+A_D * (P_{4DAYS} - P_{360}) / 12$ = 0.085 acre-ft
3,695 cf

6. Runoff Volume (10-day), V_{10DAYS}

$V_{360}+A_D * (P_{10DAYS} - P_{360}) / 12$ = 0.106 acre-ft
4,598 cf

NOAA Atlas 14, Volume 1, Version 5
Location name: Albuquerque, New Mexico, USA*
Latitude: 35.0641°, Longitude: -106.6862°
Elevation: 4942.65 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	2.03 (1.75-2.36)	2.64 (2.27-3.06)	3.53 (3.02-4.10)	4.24 (3.61-4.91)	5.20 (4.40-6.01)	5.94 (5.02-6.89)	6.73 (5.65-7.80)	7.57 (6.31-8.76)	8.71 (7.18-10.1)	9.60 (7.86-11.1)
10-min	1.55 (1.33-1.80)	2.00 (1.72-2.33)	2.69 (2.30-3.13)	3.22 (2.75-3.73)	3.95 (3.35-4.58)	4.52 (3.82-5.24)	5.13 (4.30-5.93)	5.76 (4.80-6.67)	6.62 (5.46-7.67)	7.31 (5.98-8.46)
15-min	1.28 (1.10-1.49)	1.66 (1.42-1.93)	2.22 (1.90-2.58)	2.66 (2.27-3.09)	3.27 (2.77-3.78)	3.74 (3.16-4.33)	4.24 (3.55-4.90)	4.76 (3.96-5.51)	5.47 (4.51-6.34)	6.04 (4.94-7.00)
30-min	0.862 (0.742-1.00)	1.12 (0.958-1.30)	1.49 (1.28-1.74)	1.79 (1.53-2.08)	2.20 (1.87-2.55)	2.52 (2.13-2.91)	2.85 (2.39-3.30)	3.21 (2.67-3.71)	3.69 (3.04-4.27)	4.07 (3.33-4.71)
60-min	0.533 (0.459-0.619)	0.690 (0.592-0.803)	0.925 (0.792-1.08)	1.11 (0.947-1.29)	1.36 (1.15-1.58)	1.56 (1.32-1.80)	1.77 (1.48-2.04)	1.98 (1.65-2.30)	2.28 (1.88-2.64)	2.52 (2.06-2.91)
2-hr	0.302 (0.260-0.358)	0.387 (0.332-0.459)	0.512 (0.438-0.606)	0.614 (0.522-0.720)	0.754 (0.636-0.884)	0.868 (0.727-1.01)	0.988 (0.821-1.16)	1.11 (0.919-1.30)	1.29 (1.05-1.51)	1.44 (1.16-1.68)
3-hr	0.216 (0.187-0.255)	0.275 (0.237-0.324)	0.360 (0.311-0.424)	0.429 (0.368-0.502)	0.524 (0.445-0.611)	0.600 (0.508-0.700)	0.682 (0.573-0.794)	0.769 (0.640-0.895)	0.889 (0.732-1.03)	0.987 (0.804-1.15)
6-hr	0.126 (0.110-0.147)	0.158 (0.138-0.185)	0.204 (0.178-0.238)	0.241 (0.209-0.280)	0.290 (0.250-0.337)	0.329 (0.282-0.381)	0.370 (0.316-0.429)	0.412 (0.350-0.478)	0.472 (0.396-0.547)	0.521 (0.433-0.605)
12-hr	0.070 (0.061-0.080)	0.088 (0.077-0.100)	0.111 (0.098-0.127)	0.130 (0.114-0.148)	0.155 (0.135-0.176)	0.174 (0.151-0.198)	0.194 (0.167-0.220)	0.215 (0.184-0.244)	0.243 (0.206-0.276)	0.266 (0.223-0.303)
24-hr	0.039 (0.035-0.045)	0.049 (0.044-0.056)	0.061 (0.054-0.069)	0.071 (0.063-0.080)	0.084 (0.074-0.095)	0.094 (0.083-0.106)	0.105 (0.092-0.118)	0.115 (0.101-0.130)	0.130 (0.112-0.146)	0.141 (0.121-0.158)
2-day	0.021 (0.018-0.023)	0.026 (0.023-0.029)	0.032 (0.029-0.036)	0.037 (0.033-0.041)	0.044 (0.039-0.048)	0.049 (0.043-0.054)	0.054 (0.047-0.060)	0.059 (0.052-0.066)	0.066 (0.058-0.074)	0.071 (0.062-0.079)
3-day	0.015 (0.014-0.017)	0.019 (0.017-0.021)	0.023 (0.021-0.025)	0.026 (0.024-0.029)	0.031 (0.028-0.034)	0.034 (0.031-0.038)	0.038 (0.034-0.042)	0.041 (0.037-0.045)	0.046 (0.041-0.051)	0.049 (0.044-0.054)
4-day	0.012 (0.011-0.013)	0.015 (0.014-0.016)	0.018 (0.017-0.020)	0.021 (0.019-0.023)	0.025 (0.022-0.027)	0.027 (0.025-0.030)	0.030 (0.027-0.032)	0.032 (0.029-0.035)	0.036 (0.032-0.039)	0.038 (0.035-0.042)
7-day	0.008 (0.007-0.009)	0.010 (0.009-0.011)	0.012 (0.011-0.013)	0.014 (0.012-0.015)	0.016 (0.014-0.017)	0.017 (0.016-0.018)	0.019 (0.017-0.020)	0.020 (0.018-0.022)	0.022 (0.020-0.024)	0.023 (0.021-0.025)
10-day	0.006 (0.006-0.007)	0.008 (0.007-0.008)	0.009 (0.009-0.010)	0.011 (0.010-0.011)	0.012 (0.011-0.013)	0.013 (0.012-0.014)	0.015 (0.013-0.016)	0.016 (0.015-0.017)	0.017 (0.016-0.019)	0.019 (0.017-0.020)
20-day	0.004 (0.003-0.004)	0.005 (0.004-0.005)	0.006 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.007-0.008)	0.008 (0.007-0.009)	0.009 (0.008-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.010 (0.010-0.011)
30-day	0.003 (0.003-0.003)	0.004 (0.003-0.004)	0.004 (0.004-0.005)	0.005 (0.005-0.005)	0.006 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.006-0.007)	0.007 (0.006-0.008)	0.007 (0.007-0.008)	0.008 (0.007-0.008)
45-day	0.002 (0.002-0.003)	0.003 (0.003-0.003)	0.004 (0.003-0.004)	0.004 (0.004-0.004)	0.004 (0.004-0.005)	0.005 (0.004-0.005)	0.005 (0.005-0.005)	0.005 (0.005-0.006)	0.006 (0.005-0.006)	0.006 (0.005-0.006)
60-day	0.002 (0.002-0.002)	0.003 (0.002-0.003)	0.003 (0.003-0.003)	0.003 (0.003-0.004)	0.004 (0.004-0.004)	0.004 (0.004-0.004)	0.004 (0.004-0.005)	0.005 (0.004-0.005)	0.005 (0.005-0.005)	0.005 (0.005-0.005)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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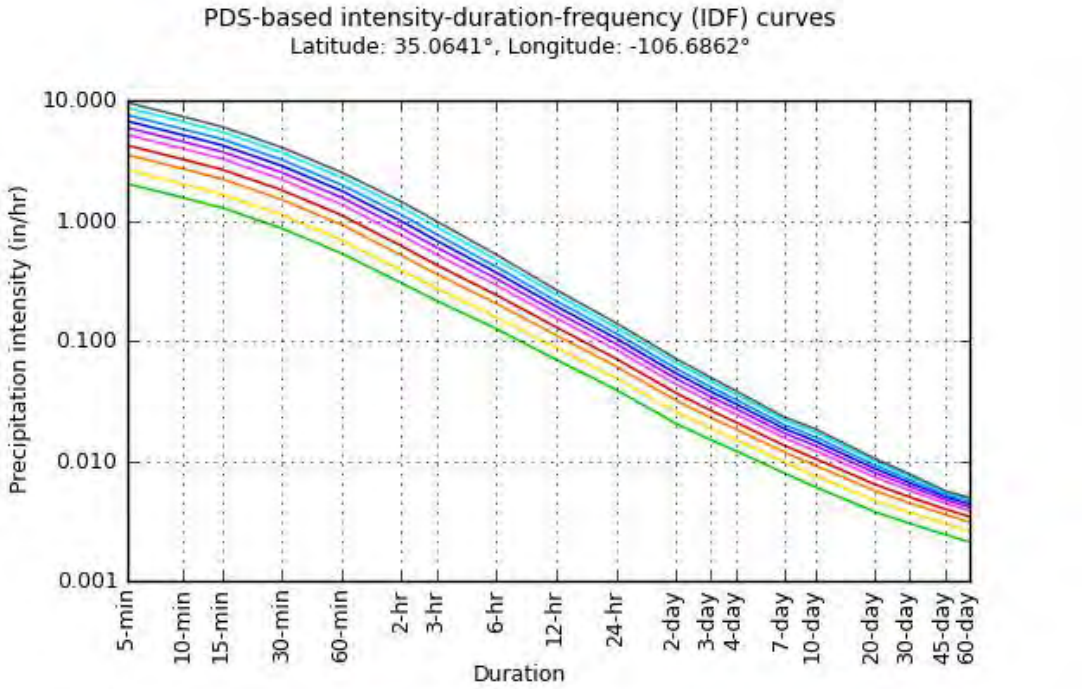
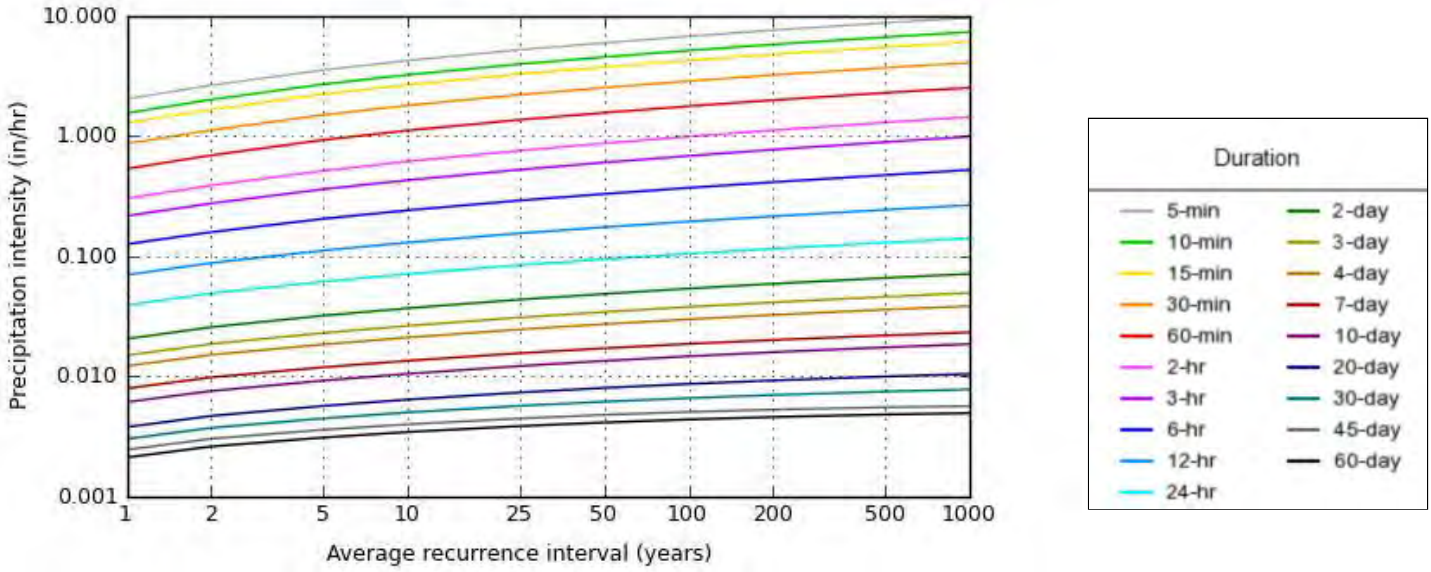
PF graphical





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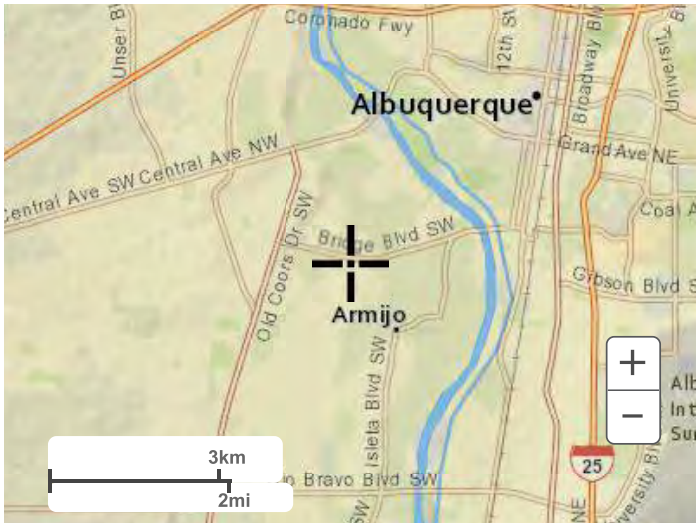
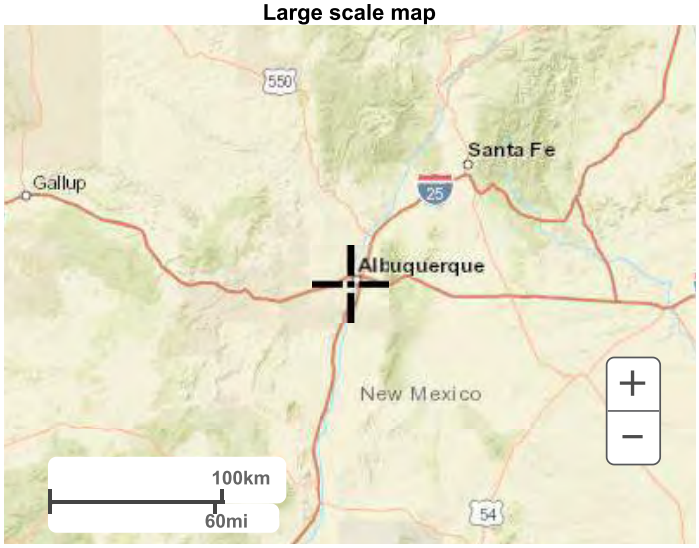
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map



Large scale aerial

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US Department of Commerce
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National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14, Volume 1, Version 5
Location name: Albuquerque, New Mexico, USA*
Latitude: 35.0641°, Longitude: -106.6862°
Elevation: 4942.65 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.169** (0.146-0.197)	**0.220** (0.189-0.255)	**0.294** (0.252-0.342)	**0.353** (0.301-0.409)	**0.433** (0.367-0.501)	**0.495** (0.418-0.574)	**0.561** (0.471-0.650)	**0.631** (0.526-0.730)	**0.726** (0.598-0.840)	**0.800** (0.655-0.927)
10-min	**0.258** (0.222-0.300)	**0.334** (0.287-0.389)	**0.448** (0.383-0.521)	**0.537** (0.458-0.622)	**0.659** (0.559-0.763)	**0.754** (0.637-0.873)	**0.855** (0.716-0.989)	**0.960** (0.800-1.11)	**1.10** (0.910-1.28)	**1.22** (0.997-1.41)
15-min	**0.320** (0.275-0.372)	**0.414** (0.356-0.482)	**0.555** (0.475-0.646)	**0.665** (0.568-0.772)	**0.817** (0.693-0.946)	**0.934** (0.789-1.08)	**1.06** (0.888-1.23)	**1.19** (0.991-1.38)	**1.37** (1.13-1.59)	**1.51** (1.24-1.75)
30-min	**0.431** (0.371-0.501)	**0.558** (0.479-0.649)	**0.747** (0.640-0.870)	**0.896** (0.765-1.04)	**1.10** (0.933-1.27)	**1.26** (1.06-1.46)	**1.43** (1.20-1.65)	**1.60** (1.34-1.86)	**1.84** (1.52-2.13)	**2.03** (1.67-2.36)
60-min	**0.533** (0.459-0.619)	**0.690** (0.592-0.803)	**0.925** (0.792-1.08)	**1.11** (0.947-1.29)	**1.36** (1.15-1.58)	**1.56** (1.32-1.80)	**1.77** (1.48-2.04)	**1.98** (1.65-2.30)	**2.28** (1.88-2.64)	**2.52** (2.06-2.91)
2-hr	**0.605** (0.519-0.716)	**0.774** (0.663-0.918)	**1.02** (0.876-1.21)	**1.23** (1.04-1.44)	**1.51** (1.27-1.77)	**1.74** (1.45-2.03)	**1.98** (1.64-2.31)	**2.23** (1.84-2.60)	**2.59** (2.11-3.02)	**2.87** (2.32-3.36)
3-hr	**0.649** (0.562-0.765)	**0.825** (0.712-0.973)	**1.08** (0.934-1.27)	**1.29** (1.11-1.51)	**1.57** (1.34-1.84)	**1.80** (1.53-2.10)	**2.05** (1.72-2.38)	**2.31** (1.92-2.69)	**2.67** (2.20-3.11)	**2.96** (2.42-3.46)
6-hr	**0.753** (0.656-0.880)	**0.949** (0.828-1.11)	**1.22** (1.07-1.43)	**1.44** (1.25-1.68)	**1.74** (1.50-2.02)	**1.97** (1.69-2.28)	**2.22** (1.89-2.57)	**2.47** (2.09-2.86)	**2.83** (2.37-3.28)	**3.12** (2.59-3.62)
12-hr	**0.840** (0.737-0.959)	**1.06** (0.931-1.21)	**1.34** (1.18-1.53)	**1.57** (1.37-1.78)	**1.87** (1.63-2.12)	**2.10** (1.82-2.38)	**2.34** (2.02-2.66)	**2.59** (2.21-2.94)	**2.93** (2.48-3.33)	**3.20** (2.69-3.65)
24-hr	**0.941** (0.834-1.07)	**1.18** (1.05-1.33)	**1.47** (1.31-1.67)	**1.71** (1.51-1.93)	**2.02** (1.78-2.28)	**2.26** (1.99-2.55)	**2.52** (2.20-2.83)	**2.77** (2.41-3.11)	**3.11** (2.69-3.50)	**3.38** (2.91-3.80)
2-day	**0.986** (0.879-1.11)	**1.23** (1.10-1.38)	**1.54** (1.37-1.72)	**1.77** (1.58-1.98)	**2.09** (1.86-2.33)	**2.33** (2.07-2.60)	**2.58** (2.28-2.87)	**2.83** (2.49-3.16)	**3.16** (2.77-3.53)	**3.42** (2.98-3.82)
3-day	**1.08** (0.976-1.19)	**1.34** (1.22-1.48)	**1.65** (1.50-1.82)	**1.90** (1.72-2.09)	**2.23** (2.01-2.45)	**2.47** (2.22-2.72)	**2.72** (2.44-2.99)	**2.98** (2.66-3.27)	**3.31** (2.94-3.64)	**3.56** (3.15-3.92)
4-day	**1.17** (1.07-1.28)	**1.45** (1.33-1.58)	**1.77** (1.62-1.93)	**2.02** (1.85-2.20)	**2.36** (2.15-2.56)	**2.61** (2.38-2.84)	**2.87** (2.61-3.11)	**3.12** (2.83-3.39)	**3.45** (3.12-3.75)	**3.69** (3.33-4.02)
7-day	**1.34** (1.23-1.45)	**1.65** (1.52-1.79)	**2.00** (1.84-2.17)	**2.27** (2.09-2.45)	**2.62** (2.41-2.83)	**2.88** (2.64-3.11)	**3.13** (2.87-3.38)	**3.38** (3.09-3.64)	**3.68** (3.37-3.98)	**3.90** (3.57-4.22)
10-day	**1.47** (1.35-1.59)	**1.82** (1.67-1.97)	**2.21** (2.04-2.39)	**2.52** (2.33-2.72)	**2.93** (2.70-3.15)	**3.23** (2.97-3.47)	**3.53** (3.24-3.79)	**3.82** (3.50-4.11)	**4.19** (3.82-4.51)	**4.46** (4.06-4.80)
20-day	**1.82** (1.67-1.98)	**2.25** (2.08-2.45)	**2.73** (2.51-2.96)	**3.08** (2.84-3.34)	**3.53** (3.25-3.82)	**3.85** (3.54-4.16)	**4.16** (3.82-4.49)	**4.44** (4.08-4.79)	**4.79** (4.39-5.17)	**5.03** (4.61-5.43)
30-day	**2.17** (2.00-2.35)	**2.69** (2.48-2.90)	**3.23** (2.97-3.47)	**3.62** (3.33-3.89)	**4.10** (3.78-4.40)	**4.44** (4.09-4.76)	**4.76** (4.38-5.10)	**5.05** (4.65-5.41)	**5.39** (4.96-5.77)	**5.62** (5.17-6.02)
45-day	**2.65** (2.45-2.86)	**3.28** (3.03-3.53)	**3.89** (3.60-4.18)	**4.32** (4.00-4.64)	**4.83** (4.48-5.18)	**5.17** (4.80-5.55)	**5.47** (5.09-5.86)	**5.72** (5.33-6.12)	**5.98** (5.59-6.39)	**6.12** (5.74-6.52)
60-day	**3.05** (2.82-3.30)	**3.76** (3.49-4.06)	**4.47** (4.15-4.81)	**4.97** (4.62-5.34)	**5.56** (5.17-5.98)	**5.96** (5.55-6.40)	**6.32** (5.88-6.78)	**6.62** (6.18-7.11)	**6.95** (6.50-7.46)	**7.13** (6.70-7.65)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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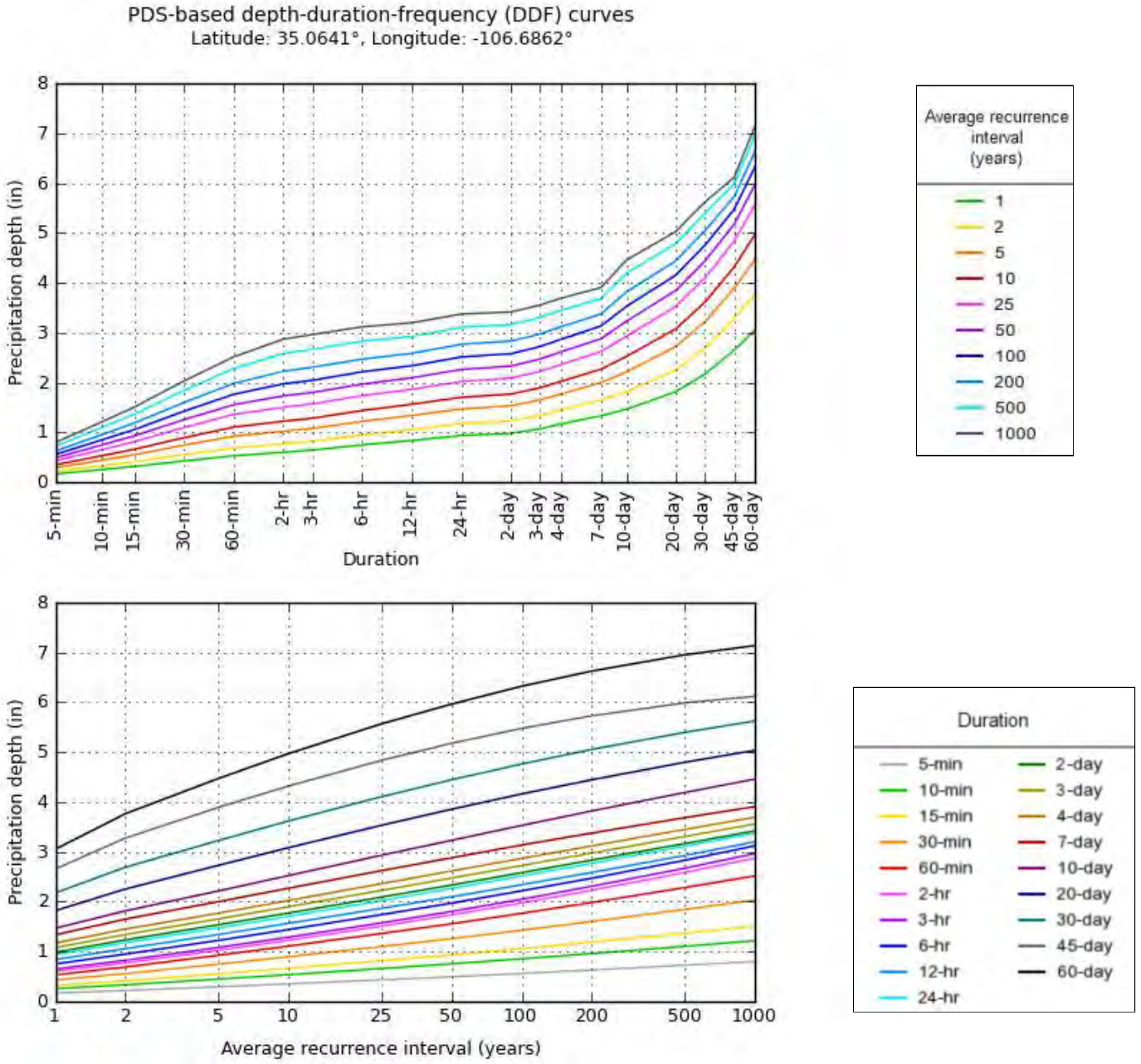
PF graphical



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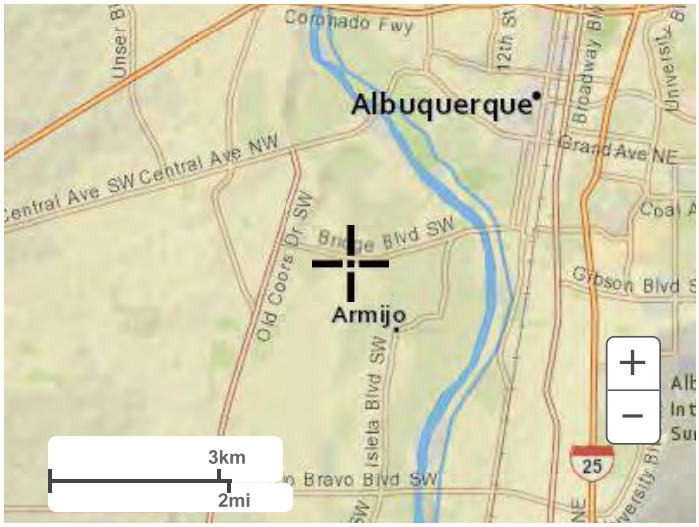
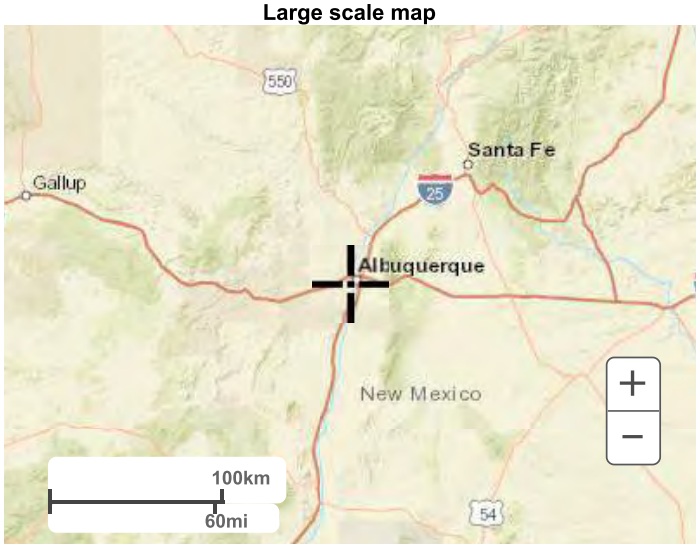
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map



Large scale aerial

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National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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APPENDIX B

Hydraulic Calculation

Project: Shari Vista Road
Location: Albuquerque, NM
Date: September 22, 2021
Subject: Inlet Summary Calculations

Proj. Engineer: T. Toledo
Checker: A. Herting / H. Cake

10-year Design Storm

Inlet (ID)	Road	Station	Offset	Contributing Subbasins	Inlet Type	Slope (ft/ft)	Subbasin Flow (cfs)	Total Flow (Including Bypass) (cfs)	Captured Flow (cfs)	Captured Flow (%)	Bypass Flow (cfs)	Bypass To (Inlet ID)	Max Spread (ft)	Calculated Spread (ft)	Spread Acceptable? (Yes/No)
Inlet-01	Shari Vista Road	3+96	31' Rt	BASIN01	Double Grate Inlet	0.0035	0.43	0.43	0.43	100%	0.00	Inlet-03	12.0	6.4	Yes
Inlet-02	Shari Vista Road	4+17	20' Lt	BASIN01	Double Grate Inlet	0.0035	0.43	0.43	0.43	100%	0.00	Inlet-03	12.0	6.4	Yes
Inlet-03	Shari Vista Road	4+23	12' Rt	BASIN01	Double Grate Inlet	SUMP	-	0.00	0.00	-	0.00	End of Project	-	-	-

100-year Design Storm

Inlet (ID)	Road	Station	Offset	Contributing Subbasins	Inlet Type	Slope (ft/ft)	Subbasin Flow (cfs)	Total Flow (Including Bypass) (cfs)	Captured Flow (cfs)	Captured Flow (%)	Bypass Flow (cfs)	Bypass To (Inlet ID)	Calculated Spread (ft)	Calculated Depth (in)	Depth Acceptable? (Yes/No)
Inlet-01	Shari Vista Road	3+96	31' Rt	BASIN01	Double Grate Inlet	0.0035	0.69	0.69	0.68	99%	0.01	Inlet-03	8.0	2.9	Yes
Inlet-02	Shari Vista Road	4+17	20' Lt	BASIN01	Double Grate Inlet	0.0035	0.69	0.69	0.68	99%	0.01	Inlet-03	8.0	2.9	Yes
Inlet-03	Shari Vista Road	4+23	12' Rt	BASIN01	Double Grate Inlet	SUMP	-	0.01	0.01	-	0.00	End of Project	-	-	-

Notes:

1) Grates have a 50% clogging factor appied.
2) Captured flow calculations were performed using Bentley Flowmaster V8i.
3) Spread calculations were performed using Bentley Flowmaster V8i.
4) Storm Inlet per Sheet 6-1 to 6-4 of Shari Vista plan sheet.
5) Per COA DPM, flow depths in the event of a 10-year design discharge may not exceed 0.5 feet in any collector or arterial street. One lane free of flowing or standing water in each traffic direction must be preserved on arterial streets.
6) Per COA DPM, flow depths in the event of a 100-year design discharge may not exceed 0.2 feet above curb height and shall be contained within the street right-of-way.

Worksheet for 10yr Spread Calculation - S=0.35%

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.004 ft/ft
Discharge	0.43 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	10.00
0+02	9.67
0+03	9.79
0+14	10.01

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 10.00)	(0+03, 9.79)	0.013
(0+03, 9.79)	(0+14, 10.01)	0.017

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	2.6 in
Roughness Coefficient	0.016
Elevation	9.88 ft
Elevation Range	9.7 to 10.0 ft
Flow Area	0.5 ft²
Wetted Perimeter	6.5 ft
Hydraulic Radius	0.8 in
Top Width	6.42 ft
Normal Depth	2.6 in
Critical Depth	2.2 in
Critical Slope	0.009 ft/ft
Velocity	0.95 ft/s
Velocity Head	0.01 ft
Specific Energy	0.23 ft
Froude Number	0.628
Flow Type	Subcritical

Worksheet for 10yr Spread Calculation - S=0.35%

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	2.6 in
Critical Depth	2.2 in
Channel Slope	0.004 ft/ft
Critical Slope	0.009 ft/ft

Worksheet for 10yr Storm Inlet 1&2 - On Grade

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.43 cfs
Slope	0.000 ft/ft
Gutter Width	3.46 ft
Gutter Cross Slope	0.122 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.013
Grate Width	2.08 ft
Grate Length	6.7 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	99.76 %
Intercepted Flow	0.43 cfs
Bypass Flow	0.00 cfs
Spread	3.3 ft
Depth	4.8 in
Flow Area	0.7 ft²
Gutter Depression	4.2 in
Total Depression	4.2 in
Velocity	0.66 ft/s
Splash Over Velocity	10.50 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.965
Grate Flow Ratio	0.933
Active Grate Length	3.3 ft

Worksheet for 10yr Storm Inlet 1&2 - On Grade

Messages:

Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Notes:

Gutter slope = 0.02% and 0.03%

Worksheet for 100yr Spread Calculation - S=0.35%

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.004 ft/ft
Discharge	0.69 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	10.00
0+02	9.67
0+03	9.79
0+14	10.01

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 10.00)	(0+03, 9.79)	0.013
(0+03, 9.79)	(0+14, 10.01)	0.017

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	2.9 in
Roughness Coefficient	0.016
Elevation	9.91 ft
Elevation Range	9.7 to 10.0 ft
Flow Area	0.7 ft²
Wetted Perimeter	8.0 ft
Hydraulic Radius	1.0 in
Top Width	7.99 ft
Normal Depth	2.9 in
Critical Depth	2.6 in
Critical Slope	0.009 ft/ft
Velocity	1.04 ft/s
Velocity Head	0.02 ft
Specific Energy	0.26 ft
Froude Number	0.637
Flow Type	Subcritical

Worksheet for 100yr Spread Calculation - S=0.35%

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	2.9 in
Critical Depth	2.6 in
Channel Slope	0.004 ft/ft
Critical Slope	0.009 ft/ft

Worksheet for 100yr Storm Inlet 1&2 - On Grade

Project Description	
Solve For	Efficiency

Input Data	
Discharge	0.69 cfs
Slope	0.000 ft/ft
Gutter Width	3.46 ft
Gutter Cross Slope	0.122 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.013
Grate Width	2.08 ft
Grate Length	6.7 ft
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Options	
Grate Flow Option	Exclude None

Results	
Efficiency	99.14 %
Intercepted Flow	0.68 cfs
Bypass Flow	0.01 cfs
Spread	6.0 ft
Depth	5.7 in
Flow Area	1.0 ft²
Gutter Depression	4.2 in
Total Depression	4.2 in
Velocity	0.71 ft/s
Splash Over Velocity	10.50 ft/s
Frontal Flow Factor	1.000
Side Flow Factor	0.960
Grate Flow Ratio	0.782
Active Grate Length	3.3 ft

Worksheet for 100yr Storm Inlet 1&2 - On Grade

Messages:

Grate Length should be within the defined range of HEC-22's Chart 5 (approx. 0.5-4.5 ft / 0.15-1.35 m).

Notes:

Gutter slope = 0.02% and 0.03%

Worksheet for Storm Inlet 3 - Sag

Project Description	
Solve For	Spread

Input Data	
Discharge	0.01 cfs
Gutter Width	3.46 ft
Gutter Cross Slope	0.122 ft/ft
Road Cross Slope	0.020 ft/ft
Grate Width	2.08 ft
Grate Length	6.7 ft
Local Depression	2.0 in
Local Depression Width	92.8 in
Grate Type	P-50 mm (P-1 -7/8")
Clogging	50.0 %

Results	
Spread	1.2 ft
Depth	0.0 in
Gutter Depression	4.2 in
Total Depression	6.2 in
Open Grate Area	6.2 ft²
Active Grate Weir Length	8.8 ft

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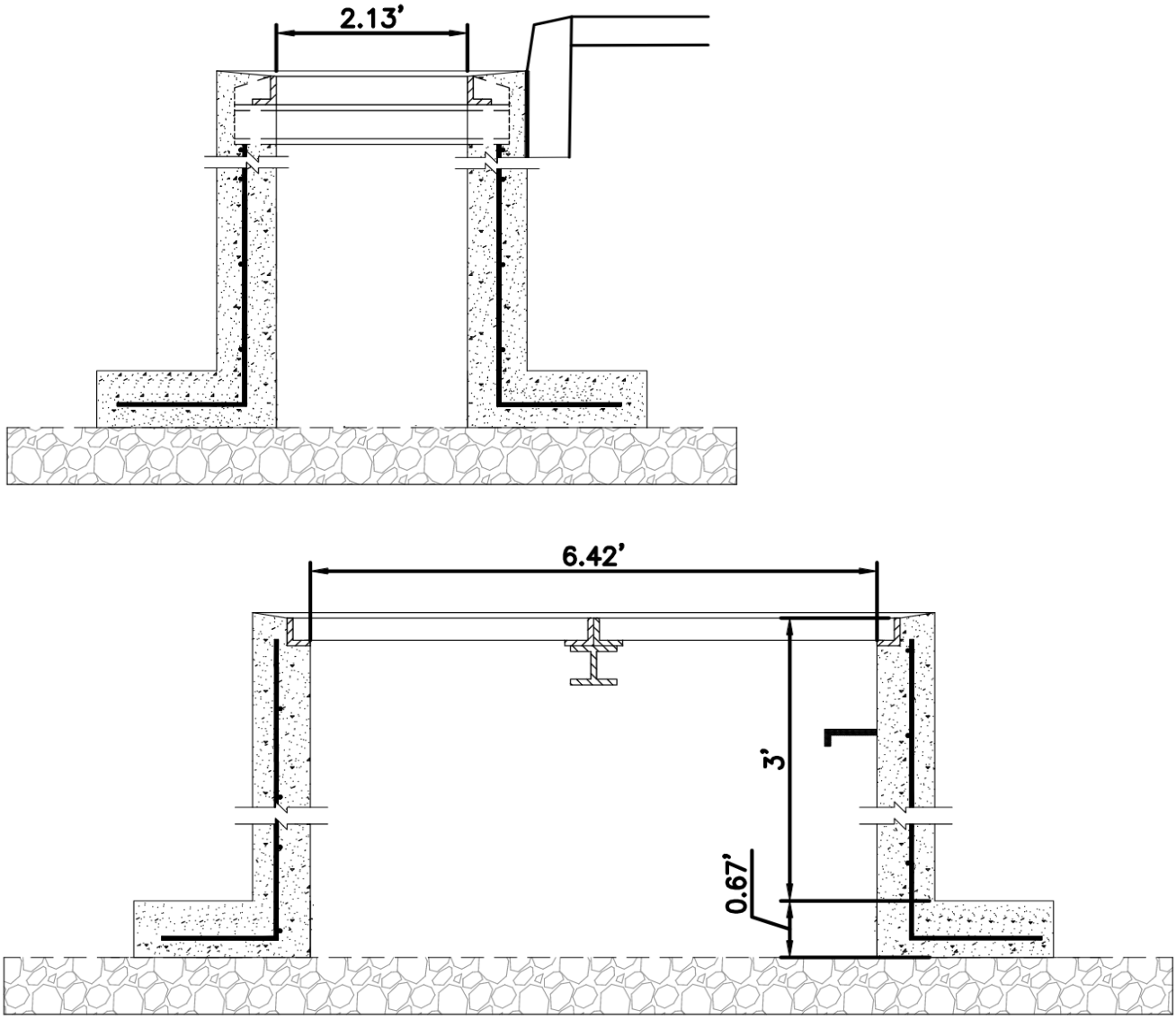
Storm Inlet Volume Capacity

Project: Shari Vista Road
Location: Albuquerque, NM
Date: October 21, 2021

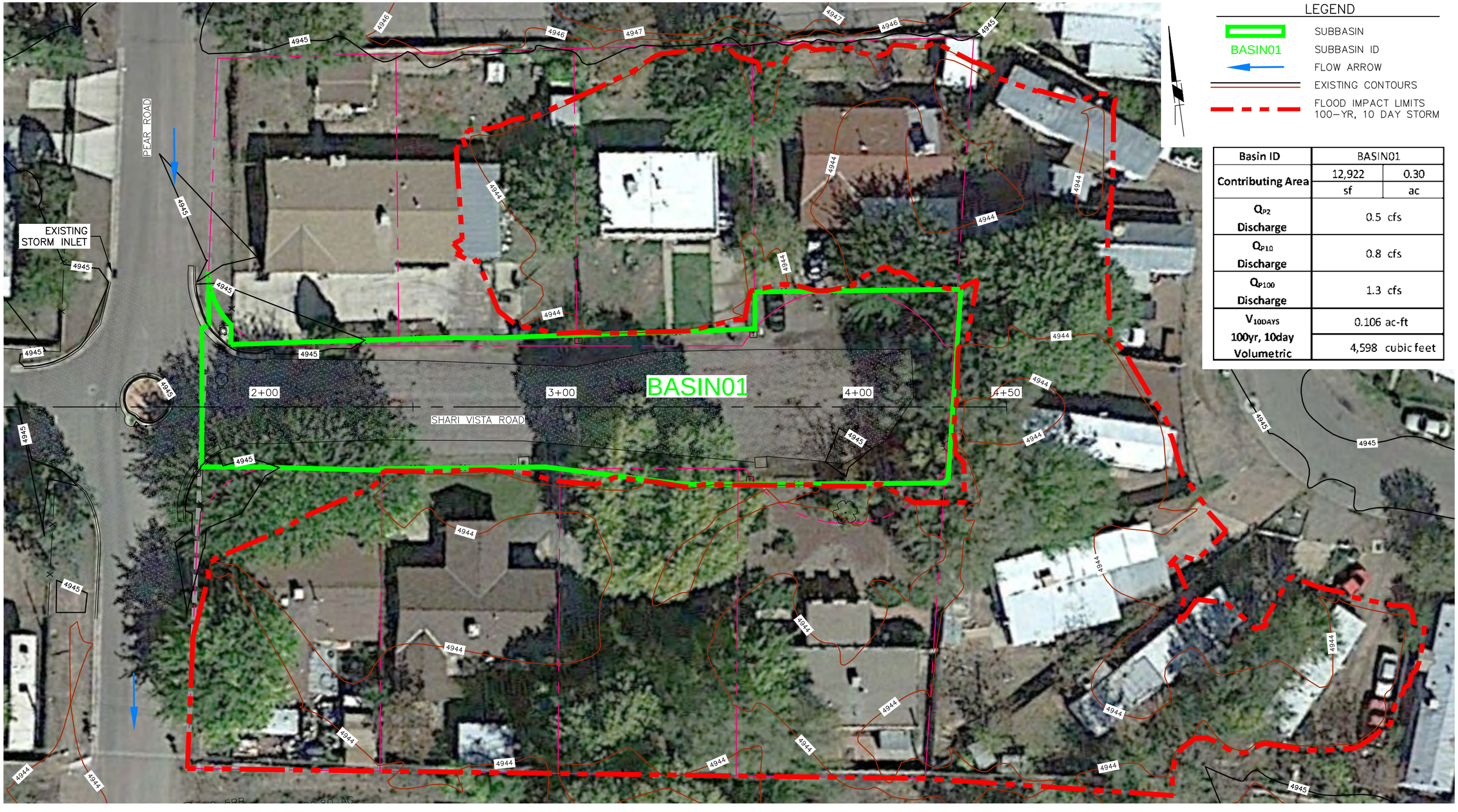
Inlet Width =	2.13	ft	Inlet Volume =	50.2	cubic feet
Inlet Length =	6.42	ft	Total Proposed Inlets =	3	each
Inlet Depth =	3.67	ft	**Total Inlet Volume =**	**150.56**	**cubic feet**



Notes:
1.) Refer to Shari Vista project plans for storm drain improvements and inlet details.

APPENDIX C

Drainage Exhibits



LEGEND

- SUBBASIN
- BASIN01 — SUBBASIN ID
- FLOW ARROW
- EXISTING CONTOURS
- FLOOD IMPACT LIMITS 100-YR, 10 DAY STORM

Basin ID	BASIN01	
Contributing Area	12,922 sf	0.30 ac
Q_{P2} Discharge	0.5 cfs	
Q_{P10} Discharge	0.8 cfs	
Q_{P100} Discharge	1.3 cfs	
V_{10DAYS} 100yr, 10day Volumetric	0.106 ac-ft	
	4,598 cubic feet	

SHARI VISTA ROAD
PEAR RD. TO SHARI VISTA RD.
CPN 5538.92

EXHIBIT 1
ONSITE DRAINAGE MAP
EXISTING CONDITIONS

0 15' 30' 60'
SCALE: 1"= 30'

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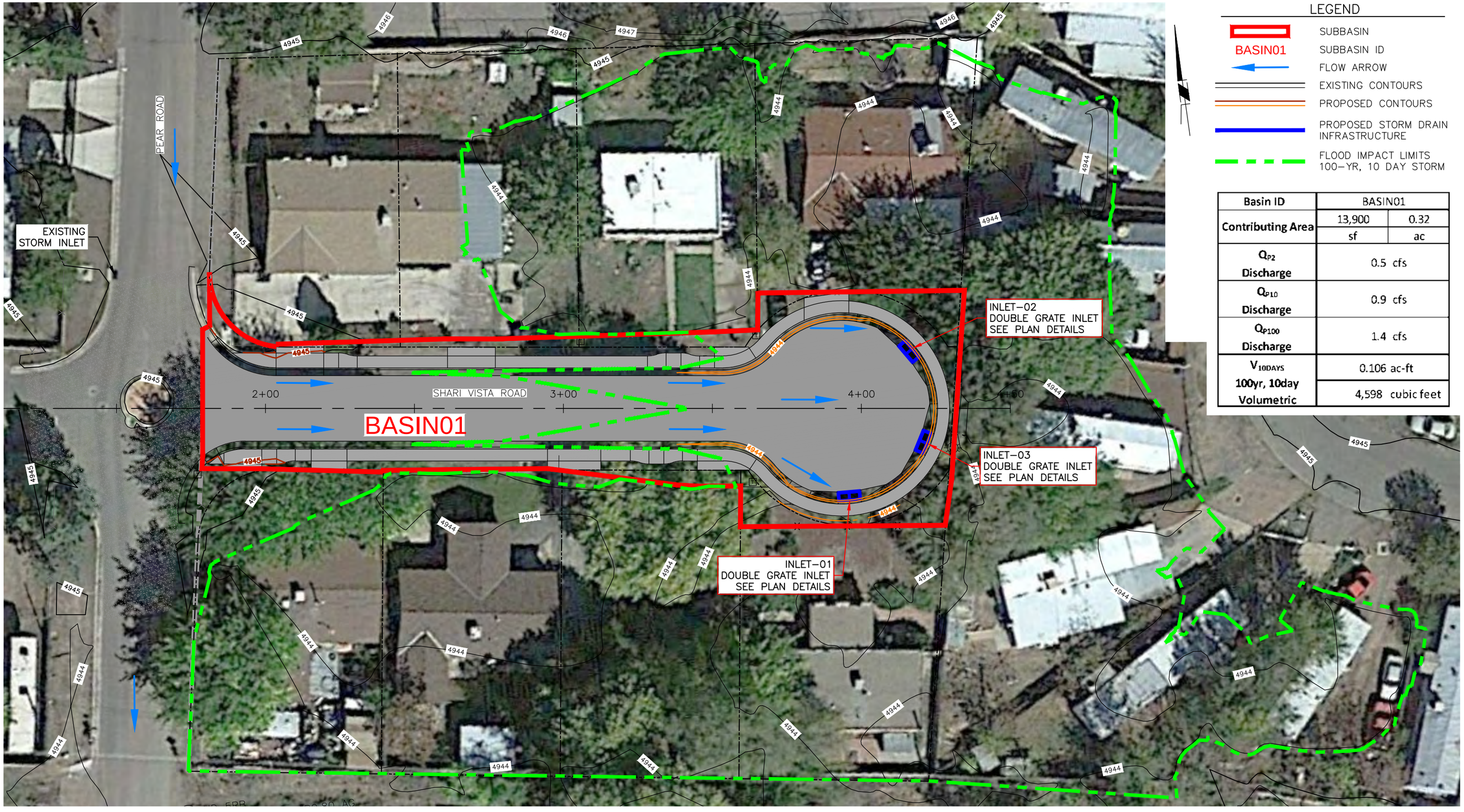

LEGEND

- SUBBASIN
- BASIN01 — SUBBASIN ID
- FLOW ARROW
- EXISTING CONTOURS
- PROPOSED CONTOURS
- PROPOSED STORM DRAIN INFRASTRUCTURE
- FLOOD IMPACT LIMITS 100–YR, 10 DAY STORM

Basin ID	BASIN01	
Contributing Area	13,900 sf	0.32 ac
Q_{P2} Discharge	0.5 cfs	
Q_{P10} Discharge	0.9 cfs	
Q_{P100} Discharge	1.4 cfs	
V_{10DAYS} 100yr, 10day Volumetric	0.106 ac-ft	
	4,598 cubic feet	

SHARI VISTA ROAD
PEAR RD. TO SHARI VISTA RD.
CPN 5538.92

EXHIBIT 2
ONSITE DRAINAGE MAP
PROPOSED CONDITIONS

0 15’ 30’ 60’
SCALE: 1”= 30’

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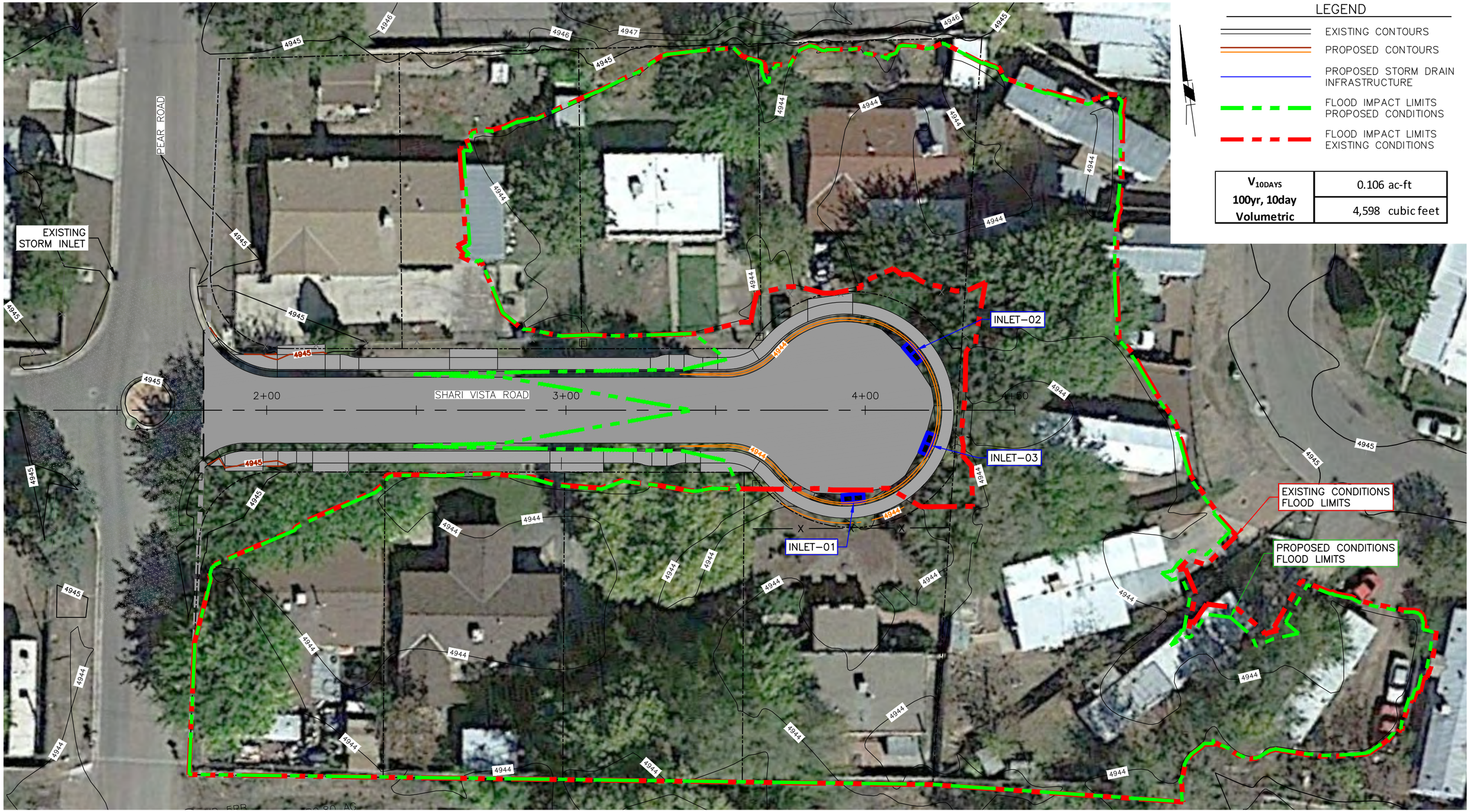

SHARI VISTA ROAD
PEAR RD. TO SHARI VISTA RD.
CPN 5538.92

EXHIBIT 3
100-YEAR, 10-DAY STORM
FLOOD LIMITS

0 15' 30' 60'
SCALE: 1"= 30'

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