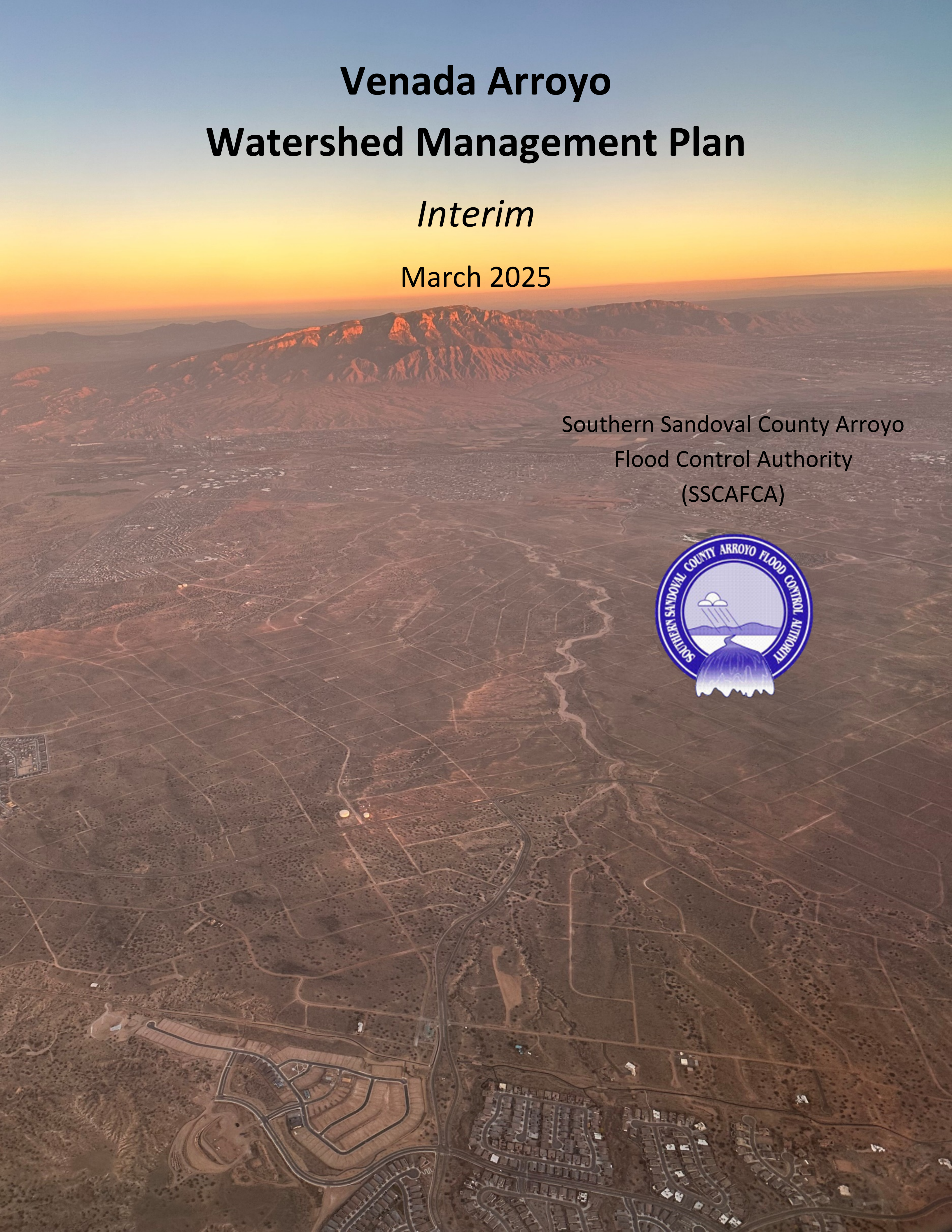
Venada Arroyo
Watershed Management Plan

Interim

March 2025



Southern Sandoval County Arroyo
Flood Control Authority
(SSCAFCA)

Management Plan Revision History

Version	*Date*	*Title*	*Prepared by*	*Notes*
v.1	March 2025		SSCAFCA	Correction of hydrology and HEC-HMS model; revised LEE boundaries to exclude hardened banks.

This is an interim planning document. Nothing herein constitutes any commitment by SSCAFCA to construct any project, study any area, acquire any right of way or enter into any contract. This watershed park management plan does not obligate SSCAFCA in any way.

Drainage facility alignments, conveyance treatments, corridors, locations, rights-of-way and cost estimates are conceptual only, and may be altered or revised based upon future project analysis, changed circumstances or otherwise. Land uses included in this document were assumed for the basis of hydrologic modeling only. This document does not grant free discharge from any proposed development. Naturalistic channel treatments and piped storm drains are to be used for conveyance stabilization, unless otherwise authorized by SSCAFCA.

To ensure public health, safety, and welfare, SSCAFCA develops and maintains a regional hydrologic model for all watersheds within its jurisdiction. Updates and revisions are made and tracked by SSCAFCA, or their designee. A copy of the regional hydrology model is available for reference or use by others. Contact SSCAFCA to obtain copies of the model and see the SSCAFCA website for the watershed management plan status. Use of electronic media provided by SSCAFCA is solely at the user’s risk.

Contents

Appendices

1. Introduction

Pending

1.1. Location

The Venada Watershed starts with the headwaters located in the Mariposa Subdivision north of Unser Boulevard and extends to the southwest at an average slope of 2.4 percent containing the entirety of the Enchanted Hills Neighborhood, crossing NM 528 before discharging into the Rio Grande (Figure 1-1). This watershed covers approximately 16 square miles with mixed land use ranging from semi-arid open space with natural desert landscape to high-density neighborhoods with commercial development. The watershed falls almost entirely in the City of Rio Rancho, except for a small portion north of US 550 and a small portion near the outlet. The area north of US550 is in the Santa Ana Pueblo, and a small portion of the watershed near the outlet is owned by the Town of Bernalillo.

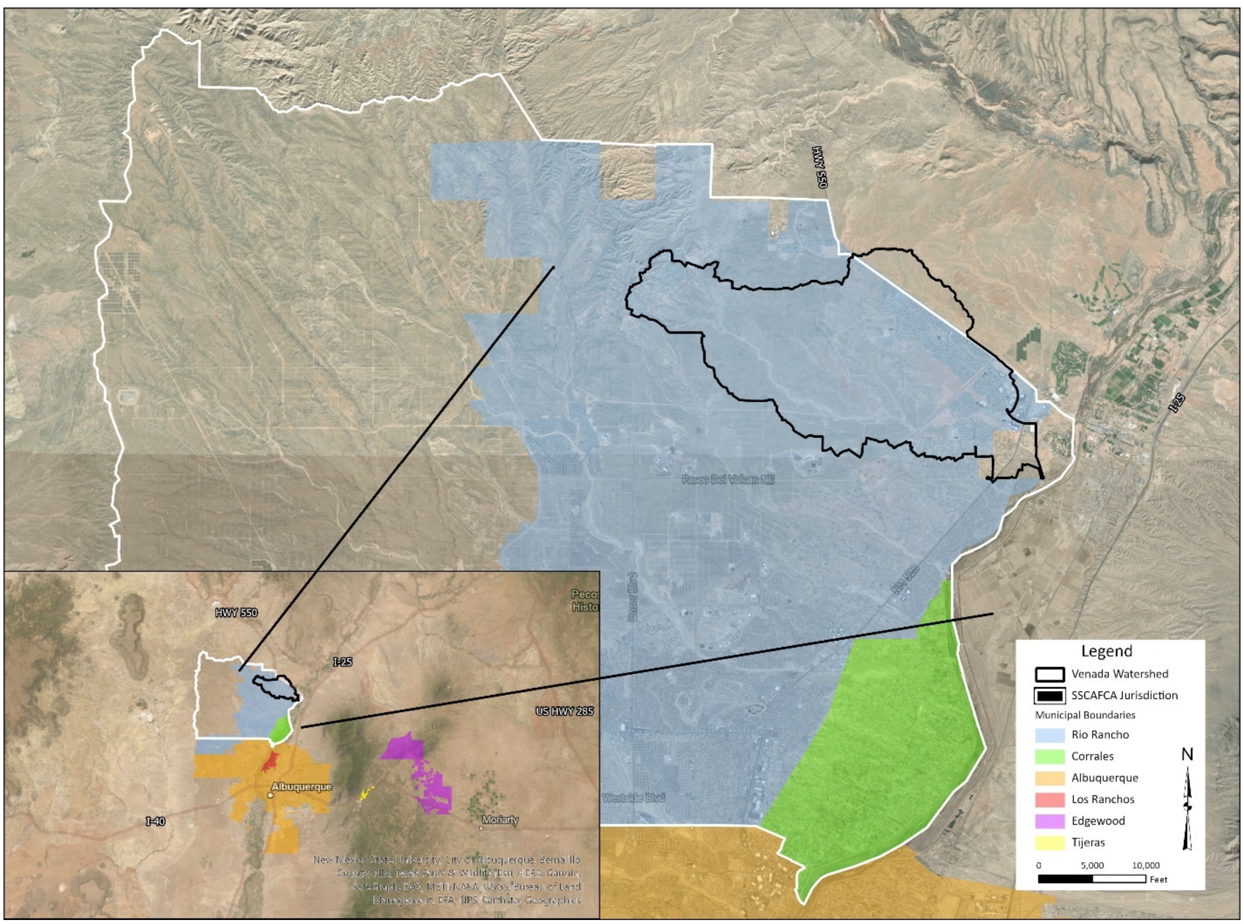


Figure 1-1. Vicinity Map

1.2. Climate

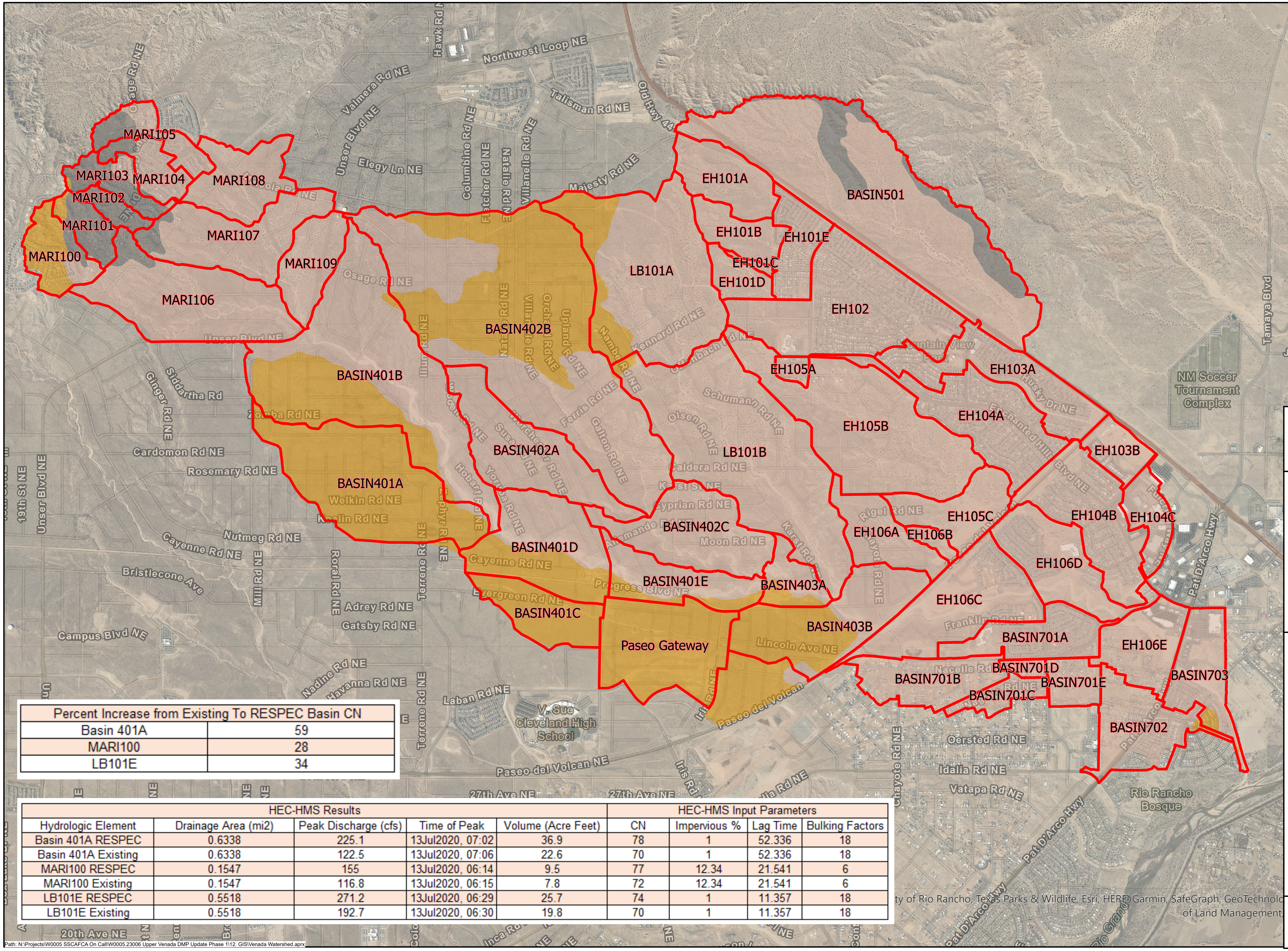
Pending

1.3. Soils

A soils report was collected from the USDA Web Soil Survey SSURGO database, which indicates that the watershed is dominated by loamy sand and sandy loam soils, with small sections of rock outcropping at the highest portions of the watershed near Mariposa. See Figure 1-2 for soils map.

1.4. Vegetation and Wildlife

With elevations ranging from 5,000 to 6,100 feet, the study area features semi-desert shrub and grasslands. Few juniper trees (Juniperus spp.) can be found in the higher elevations along ephemeral channels and at the toe of hillslopes where they receive increased runoff. Typical shrubs include big sagebrush (Artemisia tridentata), and fourwing saltbush (Atriplex canescens). Grama grasses (Bouteloua spp.) form important understory forage plants (Allison and Ashcroft, 2011). Cacti (Oppuntia spp. and Cylindropuntia spp.) are also commonly found in the area. Distribution of plant species has been affected by a combination of over-grazing and drought over the past century (Allison and Ashcroft, 2011). The Venada watershed and its ephemeral channels provide habitat for a variety of animal species. Examples include the burrowing owl (Athene cunicularia) and bank swallow (Riparia riparia), both migratory species that nest in vertical arroyo banks.



Percent Increase from Existing To RESPEC Basin CN	
Basin 401A	59
MARI100	28
LB101E	34

	HEC-HMS Results				HEC-HMS Input Parameters			
Hydrologic Element	Drainage Area (mi2)	Peak Discharge (cfs)	Time of Peak	Volume (Acre Feet)	CN	Impervious %	Lag Time	Bulking Factors
Basin 401A RESPEC	0.6338	225.1	13Jul2020, 07:02	36.9	78	1	52.336	18
Basin 401A Existing	0.6338	122.5	13Jul2020, 07:06	22.6	70	1	52.336	18
MARI100 RESPEC	0.1547	155	13Jul2020, 06:14	9.5	77	12.34	21.541	6
MARI100 Existing	0.1547	116.8	13Jul2020, 06:15	7.8	72	12.34	21.541	6
LB101E RESPEC	0.5518	271.2	13Jul2020, 06:29	25.7	74	1	11.357	18
LB101E Existing	0.5518	192.7	13Jul2020, 06:30	19.8	70	1	11.357	18

Notes:
Horizontal Datum:
Name: NAD 1983 HARN StatePlane New Mexico Central FIPS 3002 Feet
Orthophoto Source: MRCOG 2022

Legend

Soils
- Loamy Sand
- Rock Outcrop
- Sandy Loam
- Venada Watershed Basins

Figure 1-2: Soil Map

Venada Watershed

February 2024

N

0 0.25 0.5 Miles

Prepared for:

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2. Watershed Hydrology

RESPEC Company, LLC (RESPEC) used the U.S. Army Corps of Engineers' (USACE) software Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) (Version 4.10) to create a hydrologic model of the watershed. Figure 2-1 shows the overall HEC-HMS schematic of the watershed including delineated basins, subbasin nodes, and routing reaches as shown in the model interface.

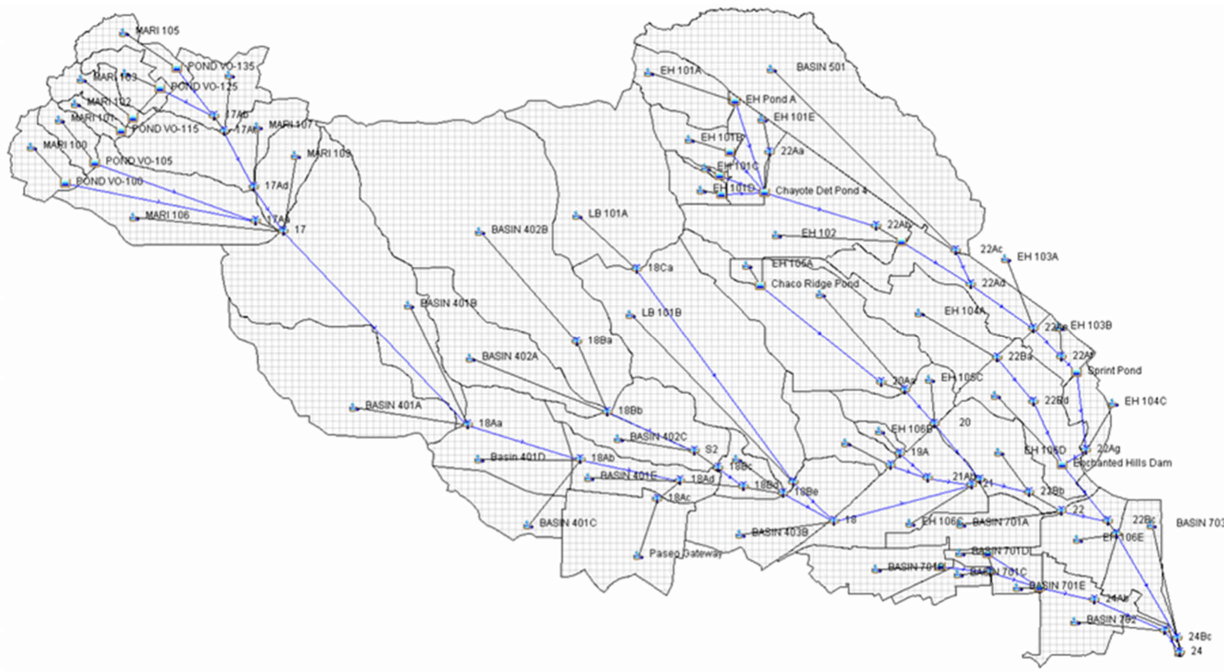


Figure 2-1. HEC-HMS Schematic

2.1. Basin Delineation

RESPEC used the previous version of the Venada Arroyo Watershed Management Plan (Wilson and Company, 2021) as the basis for subbasin delineation. The subbasins that were delineated from the 2021 watershed model were analyzed and edited based on updated topography and storm drainage infrastructure. Several basins that were delineated from the 2021 model were combined to keep the subbasin size more consistent throughout the watershed. The following criteria were methods applied across the analysis process to ensure proper hydrologic calculations could be performed:

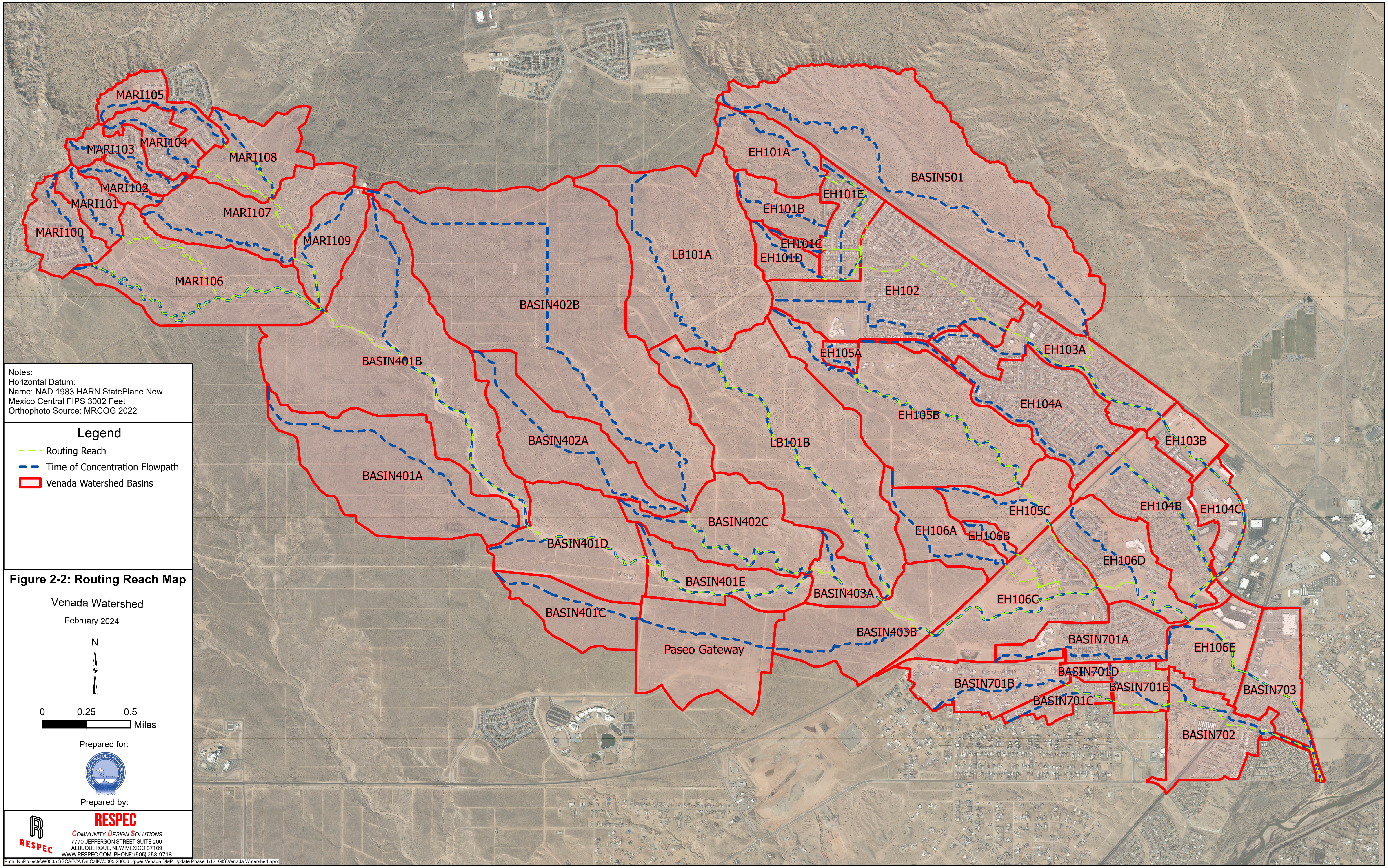
- Areas that drained directly to a ponding facility were identified as independent subbasins.
- Developed areas were separated from undeveloped basins.

- Existing storm drain infrastructure was used to inform subbasin boundaries and flow paths.
- Unpaved roads that cross basin boundaries were field verified

Basin boundaries were manually edited in ArcGIS Pro using LiDAR data from Mid-Region Council of Governments (MRCOG, 2022). RESPEC then conducted fieldwork to confirm basin boundaries, measure major structures within ponding facilities, and document any structures that alter natural flow paths, such as open channels and storm drains.

2.2. Reach Routing

The “Muskingum-Cunge” channel routing method was applied to route hydrographs. Manning’s roughness coefficients were chosen based on guidance provided in the SSCAFCA Hydrology Manual (SSCAFCA, 2021). Channel routing length, slope, and typical bottom width were measured from a DEM (MRCOG, 2018). Runoff losses caused by channel bed infiltration and percolation were assumed to be small and were not simulated. HEC-HMS (Version 4.10) requires either a celerity (velocity) or index flow to be defined to stabilize the routing reach computations. For this analysis, RESPEC used the Index Flow Method, which is also recommended by HEC. The index flow is representative of the average of the upper subbasin flow and base flow. Because the Venada watershed has no base flow, the index flow was assumed to be half of the upstream flow. See Figure 2-2 for a visual representation of routing reaches.


MARI105
MARI103
MARI104
MARI108
MARI102
MARI101
MARI107
MARI100
MARI109
MARI106
BASIN501
EH101A
EH101E
EH101B
EH101C
EH101D
LB101A
EH102
BASIN402B
EH103A
EH105A
BASIN401B
EH104A
EH105B
EH103B
BASIN402A
LB101B
BASIN401A
EH104B
EH104C
EH105C
BASIN402C
EH106A
EH106B
BASIN401D
EH106D
BASIN401E
BASIN403A
EH106C
BASIN401C
BASIN403B
BASIN701A
Paseo Gateway
EH106E
BASIN701D
BASIN701B
BASIN701E
BASIN703
BASIN701C
BASIN702
Notes:
Horizontal Datum:
Name: NAD 1983 HARN StatePlane New Mexico Central FIPS 3002 Feet
Orthophoto Source: MRCOG 2022
Legend
Routing Reach
Time of Concentration Flowpath
Venada Watershed Basins
Figure 2-2: Routing Reach Map
Venada Watershed
February 2024
N
0
0.25
0.5
Miles
Prepared for:
Prepared by:
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Path: N:\Projects\W0005 SSCAFCA On Call\W0005.23006 Upper Venada DMP Update Phase 1\12. GIS\Venada Watershed.aprx

2.3. Existing Land Use

Small portions of the Venada Watershed have been developed into residential areas, primarily in the upper and lower regions. Very little of the watershed is currently used for commercial development, except a small area within the Enchanted Hills subdivision. The middle of the watershed remains largely undeveloped as of 2023. The existing land use is best described qualitatively by breaking the watershed into sections according to location, which provides better characterization of the development areas. Land cover is described quantitatively in Section 2.4 using curve numbers and percent of directly connected impervious area.

Low Density Development

Toward the top of the watershed, in the headwaters of the Mariposa Neighborhood, land cover consists of rocky substrate intermixed with semi-arid desert landscape, as shown in Figures 2-3 and 2-4.

Figure 2-3. Natural Arroyo – Upper Watershed.

Figure 2-4. Desert Land Cover – Upper Watershed.

Approximately 80 percent, equating to 13 square miles of the watershed is currently undeveloped. Within the undeveloped subbasins, land cover consists primarily of semi-arid desert and large natural sandy arroyos, as shown in Figures 2-5 and 2-6.

Figure 2-5. Natural Arroyo – Mid Watershed.

Figure 2-6. Desert Land Cover – Mid Watershed.

Mid-Density Housing

Toward the middle of the watershed, development is characterized by larger lot sizes with more dispersed housing. Figures 2-7 and 2-8 represent a typical neighborhood and flow paths shown between the houses.

Figure 2-7. Mid Density Housing Development.

Figure 2-8. Arroyo Flow Path Through the Houses.

High-Density Development

The Enchanted Hills subbasins are considered fully developed because these subbasins are characterized by ¼- and ⅛-acre residential lot sizes and commercial properties, shown in Figures 2-9 and 2-10. These subbasins are located in the lower end of the watershed, just south of US 550.

Figure 2-9. Fully Developed Neighborhood.

Figure 2-10. Commercial Area Within the Watershed.

2.4. Existing Conditions Loss Parameters

SSCAFCA defines urban pervious and impervious land cover based on two parameters: directly connected impervious area (DCIA) and unconnected impervious area (UIA). DCIA represents areas of the watershed that are impervious and will drain directly to a conveyance system, whereas runoff from UIA incorporates other variables such as infiltration. For specific information regarding DCIA and UIA categorization methods, refer to the SSCAFCA Hydrology Manual (SSCAFCA, 2021). The measured DCIA is converted as a percentage of the overall subbasin area and applied directly to the HEC-HMS model. The following sections provide details regarding the specific methods used to estimate DCIA and UIA percentages for the existing conditions model for the updated WMP.

Representative DCIA and UIA Percentage

RESPEC created typical percentage values for various lot sizes and land use types. RESPEC used the categories proposed by the TR-55 Method and the model completed by the previous version of the Venada Arroyo Watershed Management Plan (Wilson and Company, 2021) for a total of 10 parcel categories: ⅛ acre, ¼ acre, ⅓ acre, ½ acre, ¾ acre, 1 acre, 2 acres, commercial lots, apartments, and schools. To obtain representative DCIA percentages for each category, RESPEC chose one parcel from each category in three regions of the watershed for a total of 24 representative lots. For commercial lots, apartments, and schools, only one parcel was chosen to be the representative percentage. For each example lot, a polygon was drawn over the roof, the driveway, any backyard impervious areas, and the total parcel to obtain an area for each. DCIA was then calculated using guidance from the SSCAFCA Hydrology Manual. For residential lots, this was done by adding together the area for half the roof and the entire driveway, then dividing by the total parcel area. UIA was calculated by adding half of the roof area and any backyard impervious structures, then dividing by the total area of the parcel. The area of the backyard was taken as any remaining area left in the parcel after subtracting UIA and DCIA areas. Similarly, commercial lots, apartments, and schools were treated according to the Hydrology Manual by determining the total area of roof, parking lot, and connected sidewalks and assigning each area to DCIA or UIA. The percentage values obtained with the example lots were used to estimate DCIA, UIA, and area of residential yards for the rest of the watershed (see Table 2-1).

Table 2-1. Average Percentages of the Three Representative Areas Within the Watershed

Parcel Size	Representative DCIA Percentage	Representative UIA Percentage
⅛ acre	29.6	20.0
¼ acre	19.5	12.5
⅓ acre	18.7	13.1
½ acre	13.2	8.0
¾ acre	9.0	5.4
1 acre	18.7	6.6
2 acres	6.7	2.4
Commercial lots	74.4	25.6
Apartments	33.8	66.2
Schools	41.2	58.8

Conversion to Subbasin DCIA and UIA

To then correlate these representative percentages to the subbasin as a whole, parcel data was associated to the basin shapefile to determine which parcels fell into each basin and to obtain the parcel size. The basin shapefile was combined with the parcel shapefile provided by SSCAFCA through a spatial join. RESPEC chose to spatially join the data using the “within” function, which states that any parcel “within” a basin will be combined in the new feature class. This process becomes tremendously tedious to ensure that parcels are not accounted for twice as the parcels along the subbasin boundary are categorized into both subbasins. To ensure that parcels were not accounted for twice, a basin I.D. was assigned to each parcel identifying the size of the lot and only allowing one associated basin for each parcel. The basin I.D. is an essential part of the attribute table because it was used to sum the parcel areas. The new feature class created by the spatial join contained all the attributes from the parcel shapefile and the basin I.D.

Using the feature class created during the spatial join, RESPEC hand selected parcels with development using orthophoto imagery (MRCOG, 2022). If the orthophoto imagery showed a parcel with recent grading, it was assigned the lot size adjacent to the new development. Similarly, fieldwork completed by RESPEC identified sites with development that could not be seen with orthophoto imagery and were incorporated into the calculations. RESPEC accounted for the new development by assigning to it the adjacent lot sizes as well. Some examples of these instances include the apartment complex near US 550 in the Enchanted Hills neighborhood and the new development area west of Paseo del Volcan in subbasin EH105C. Each commercial, school, and apartment site was determined using orthophoto imagery. This process was completed one basin at a time. After every parcel with development in the basin was selected, the attribute table was copied and exported to Microsoft Excel; then RESPEC organized the parcels according to subbasin and size of parcels. Any commercial lots, schools, and apartments were manually coded in because not many of these land classifications exist within the Venada Watershed. After all the parcels were organized based on size, the area was multiplied by the representative percentages of DCIA, UIA, and residential yard from the example lots to determine the area in acres of DCIA, UIA, and residential yard in each basin.

The paved roads were included in the analysis by completing a spatial join between the road shapefile, obtained from City of Rio Rancho shapefiles and the subbasin shapefile. This process created a new features class that contained the road name, length of road, and basin in which it was contained. This attribute table was exported to Microsoft Excel so the data could be sorted by basin and type of road. The road categories included principal arterial, minor arterial, major collector, minor collector, residential, and private. The average width of each type of road was determined using orthophoto imagery and the measure tool within ArcGIS. The sum of the lengths of each type of road within each basin was multiplied by the corresponding width to determine area in acres of road in each basin. This area is considered 100 percent DCIA and was included in the total DCIA percentage for each basin.

Curve Number Calculation

The SSCAFCA Hydrology Manual (SSCAFCA, 2021) was used to find a composite curve number (CN) for each subbasin to estimate the initial abstraction losses and determine excess precipitation (direct runoff). SSCAFCA Hydrology Manual, Table 2: Runoff Curve Numbers has a list of nine categories for classification, one of which is open space and indicates that CNs should be determined using soil type when possible. All soil data were gathered from the United States Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey website, which uses data from the Soil Survey Geographic Database (SSURGO) Database. SSCAFCA categorizes these soil groups into three categories—Sand, Loamy Sand, and Sandy Loam—and assigns each a representative CN. RESPEC used ArcGIS to overlay the soil type downloaded from Web Soil Survey (WSS) with the subbasin boundaries to calculate an area-weighted average CN for open space. For subbasins with development, as determined previously, the open space CN was applied to the undeveloped portion of the subbasin only, then weighted again using the CN recommended for development types UIA and residential yard.

Table 2-2. Composite Curve Number and Percentage of DCIA by Subbasin

Basin I.D.	RESPEC Composite CN	%DCIA
BASIN401A	78	0.00
BASIN401B	75	0.00
BASIN401C	78	0.00
BASIN401D	76	0.00
BASIN401E	75	0.00
BASIN402A	74	0.00
BASIN402B	76	0.00
BASIN402C	74	0.00
BASIN403A	75	0.00
BASIN403B	76	0.00
BASIN501	75	4.25
BASIN701A	83	34.53
BASIN701B	75	16.27
BASIN701C	75	19.79
BASIN701D	75	12.78
BASIN701E	75	14.67
BASIN702	79	18.94
BASIN703	79	26.76
EH101A	74	0.00
EH101B	75	2.76
EH101C	74	0.00
EH101D	74	0.00

EH101E	80	29.49
EH102	81	29.44
EH103A	79	23.35
EH103B	89	37.77
EH104A	80	31.09
EH104B	79	30.85
EH104C	82	53.77
EH105A	81	23.87
EH105B	74	0.00
EH105C	82	16.47
EH106A	74	0.00
EH106B	74	0.00
EH106C	77	17.77
EH106D	81	21.44
EH106E	76	16.33
LB101A	75	0.00
LB101B	74	0.00
MARI100	79	15.18
MARI101	80	6.43
MARI102	80	7.42
MARI103	80	12.27
MARI104	78	21.16
MARI105	78	34.44
MARI106	74	3.96
MARI107	75	1.30
MARI108	74	7.36
MARI109	74	9.61
Paseo Gateway*	85	39.00

* The values used for Paseo Gateway were taken directly from the Wilson and Company model [2021], as recommended by SSCAFCA.

2.5. Projected Future Land Use

Though the watershed is currently 80% undeveloped, nearly the entire watershed area has been platted and zoned, with most of the zoning comprised by single family residential lots held by a multitude of private owners. One of the challenges in planning for future flood control needs is that it is difficult to predict how areas will urbanize. If, for example, a sufficient number of adjacent lots can be accumulated by one private landowner to construct a master-planned subdivision, the developer is responsible for design and construction of drainage infrastructure to restrict peak flow to pre-developed conditions per City of Rio Rancho ordinance. Other areas urbanize one lot at a time when individual landowners construct houses on their property. This type of urbanization is typically less dense; at the same time, individual landowners are not required to construct public drainage infrastructure to support their development. Future development of the watershed should be accompanied by updated modeling of the area to accommodate changes in basin boundaries, curve numbers, DCIA percentages, routing reaches, etc.

2.6. Developed Conditions Loss Parameters

RESPEC was informed by SSCAFCA that a developed conditions existing infrastructure (DEVEX) model was not needed for this WMP. Future development models are to be created as new projects arise.

2.7. Transform Method

The TR-55 method, also referred to as the Velocity Method, was used to compute the time of concentration (Tc) for the subbasins in Venada Watershed. The Velocity Method, as defined in the National Engineering Handbook Part 630 Chapter 15 (USDA, 2010), takes the sum of the estimated Tc flow times for consecutive components of the drainage conveyance system, from the hydraulically farthest location within the watershed, as Sheet Flow, Shallow Concentrated Flow, and Open Channel Flow. This segmented approach was developed to account for a rapidly urbanizing environment and was first included in the 1986 edition of the TR-55 (Folmar and Miller, 2007). Below is a step-by-step summary of the Velocity Method as it was applied in this analysis.

- Sheet Flow, sometimes referred to as Overland Flow, is flow over plane surfaces that usually occur in the stream's headwaters. Sheet Flow is typically not to exceed 300 feet in length. The method allows the engineer to exercise judgement on the appropriate reach length based on watershed characteristics. The Sheet Flow equation is based on Manning's Kinematic Solution.

  Equation 2-1. Sheet Flow

  $$T_t = \frac{0.007(nL)^{0.8}}{(P_2)^{0.5} S^{0.4}}$$

  - Tt = Travel time (hour)
  - n = Manning's roughness coefficient
  - L = Flow length (feet)
  - P2 = 2-year 24-hour rainfall (inch)
  - S = Slope of hydraulic grade line (land slope, feet/feet)

- Shallow Concentrated flow occurs after a maximum of 300 feet up to 1,600 feet in length. Within this section, an average velocity is found given the slope of the channel.

  Equation 2-2. Shallow Flow

  Unpaved: $V = 16.1345\ (S)^{0.5}$
  Paved: $V = 20.3282\ (S)^{0.5}$

  - » V = Average velocity (ft/s)
  - » S = Slope of hydraulic grade line (watercourse slope, feet/feet)

- The final section of the watercourse is the Open Channel Flow, which encompasses the rest of the path but typically begins where surveyed cross-sectional information is obtained. Manning's equation is used to obtain the average velocity of the channel.

  Equation 2-3. Open Channel Flow

$$V = \frac{1.49 r^{2/3} S^{1/2}}{n}$$

  - » V = Average velocity (feet/second)
  - » r = Hydraulic radius (feet)
  - » S = Slope of hydraulic grade line (channel slope, feet/feet)
  - » n = Manning's roughness coefficient for open channel flow

The Velocity Method has the following associated limitations according to the TR-55:

- The equations are based on open and unconfined flow over land or in channels.
- After a flow event enters a closed system, the discharge can be assumed constant until another flow is encountered at a junction or inlet.
- Manning's kinematic solution should not be used for sheet flow longer than 300 feet. Equation 2-1 was developed for use with the four standard rainfall intensity-duration relationships.

- In watersheds with storm sewers, carefully identify the appropriate hydraulic flow path to estimate Tc. Storm sewers generally handle only a small portion of a large event. The rest of the peak flow travels by streets, lawns, and so on, to the outlet. Consult a standard hydraulics textbook to determine average velocity in pipes for either pressure or no pressure flow.
- The minimum Tc used in TR-55 is 0.1 hour.
- Lag time was calculated as Tc*0.6.

2.8. Sediment Bulking

The HEC-HMS models simulate clear water hydrographs unless a "Flow Ratio" is applied to simulate sediment volume within the hydrographs. This parameter is also called sediment bulking. For the southwestern area of Sandoval County, SSCAFCA recommends a range between 6 and 18 percent. In areas with little or no development, RESPEC assigned the subbasin a bulking factor of 18 percent. In subbasins with development, the area was assumed to have a bulking factor of 6 percent.

2.9. Existing Ponds and Diversions

Several hydraulic structures exist in the watershed to help attenuate peak flows in the watershed or convey water through the neighborhoods. The following sections contain details on structures that were hydrologically modeled, field verified from as-built information, or analyzed for capacity restrictions.

Ponds

RESPEC modeled 18 ponds throughout the watershed, for a total storage volume of 325 acre-feet (ac-ft). Approximately 265 ac-ft of storage is contained within Enchanted Hills Pond No. 1, Sprint Boulevard Detention Pond No. 2, Santa Fe Hills Boulevard Detention Pond No. 3, and Chayote Road Detention Pond No. 4, which are all located around the Enchanted Hills Subdivision on the northern side of the watershed, just south of US 550. The remainder of storage is spread throughout smaller structures within the same subdivision, as shown in Table 2-3; at the top of the watershed near the Mariposa Subdivision, as shown in Table 2-4; and closer to the river in the developed basins further east, as shown in Table 2-5. Each pond is in a separate table to show consistency in how the analysis was performed for the watershed and to match all information regarding these structures in Appendix B.

Table 2-3. Ponding Structures Within the Enchanted Hills Subdivision

Pond Name	Storage to Top of Pond (ac-ft)	Storage to Emergency Spillway (ac-ft)	Pond Bottom Elevation (ft)	Top of Pond Elevation (ft)	Emergency Spillway Elevation (ft)
Chaco Ridge Pond	2.1	1.5	5,456	5,464	5,463
Enchanted Hills Pond A	6.6	5.4	5,546	5,558	5,557
Enchanted Hills Pond B	3.2	2.0	5,523	5,531	5,230
Enchanted Hills Pond C	0.14	0.05	5,526	5,531	5,530
Enchanted Hills Pond D	0.4	0.2	5,503	5,512	5,511
Enchanted Hills (Pond No. 1)	145.0	131.0	5,145	5,173	5,172
Sprint Blvd Detention Pond (Pond No. 2)	52.1	44.6	5,209	5,221	5,220
Santa Fe Hills Blvd Detention Pond (Pond No. 3)	38.7	34.8	5,354	5,369	5,368
Chayote Road Detention Pond	29.4	25.5	5,466	5,481	5,480

Table 2-4. Ponding Structures Within the Mariposa Subdivision

Pond Name	Storage to Top of Pond (ac-ft)	Storage to Emergency Spillway (ac-ft)	Pond Bottom Elevation	Top of Pond Elevation	Emergency Spillway Elevation
Pond VO-100	5.5	3.1	5,829	5,837	5,835
Pond VO-105	3.0	1.6	5,824	5,832	5,830
Pond VO-115	5.8	4.5	5,811	5,821	5,820
Pond VO-120	2.6	1.9	5,804	5,812	5,811
Pond VO-125	7.0	4.5	5,788	5,799	5,797
Pond VO-135	4.8	2.7	5,783	5,791	5,789

Table 2-5. Ponding Structures Within the Lower Venada Watershed

Pond Name	Storage to Top of Pond (ac-ft)	Storage to Emergency Spillway (ac-ft)	Pond Bottom Elevation	Top of Pond Elevation	Emergency Spillway Elevation
SAD 5 Pond	9.2	7.6	5144	5154	5153
SAD Pond 52	1.7	1.3	5183	5191	5190
SAD Pond 8	7.7	6.4	5219	5229	5228

Channels

Several channels exist within the watershed to convey flow through urbanized sections. Table 2-6 shows the dimensions of the channels pulled from as-built information, and Figures 2-11 through 2-13 show physical representations of the channels.

Table 2-6. Channel Dimensions in the Venada Watershed

Channel Name	Side Slopes (1V:xH)	Bottom Width of Channel (ft)	Height of Channel (ft)
Enchanted Hills	2	10	6.5
Lower Venada	3	60	6
Santiago Channel	4	12	7

Figure 2-11. Enchanted Hills Channel at the Top of Enchanted Hills and Continued After Sprint Pond East of Safelite Boulevard.

Figure 2-12. Lower Venada Channel.

Figure 2-33. Santiago Channel

Culverts

Five major road crossings exist within the watershed—Unser Boulevard, Paseo del Volcan, Camino Encantadas, Lincoln Avenue, and NM 528—and are shown in Figures 2-14 through 2-18. Several other small crossings exist throughout the watershed, but these five structures were chosen because they fall along the main Venada Arroyo. RESPEC conducted fieldwork to verify the as-built information from previous studies and analysis of the culvert crossings using as-built information and field observations, which is provided in Table 2-7.

Figure 2-14. Unser Boulevard Crossing, Looking Downstream.

Figure 2-15. Paseo del Volcan Crossing, Looking Downstream.

Figure 2-164. Camino Encantadas Crossing, Looking Downstream.

Figure 2-17. Lincoln Avenue Crossing, Looking Downstream.

Figure 2-18. NM528 Crossing, Looking Downstream.

Table 2-7. Major Culvert Crossing Dimensions

Name	Type	Size (ft)	Headwater Elevation (ft)	Tailwater Elevation (ft)	Upstream Elevation (ft)	Downstream Elevation (ft)	Slope (ft/ft)	Length (ft)	K_e	Capacity (cfs)	Existing 100-yr 24-hr Discharge (cfs)
528 Crossing	3-Barrel CBC	10 × 12	5,098.3	5,086.8	5,085.34	5,081.8	0.02	155	0.2	4,517	5,180
Lincoln Crossing	4-Barrel CBC	8 × 12	5,146.3	5,134.9	5,132.1	5,130.9	0.01	106	0.2	6,018	4,346
Camino Encantadas	4-Barrel CBC	8 × 12	5,202.7	5,192.5	5,189.5	5,188.5	0.01	86	0.2	5,616	3,982

Paseo del Volcan	7-Barrel CBC	12 × 12	5,283.0	5,279.4	5,274.8	5,273.4	0.01	111	0.2	5,528	3,819
Unser Boulevard	4-Barrel CMP	5	5656	5648	5649	5645	0.07	60	0.7	667	957

CBC = concrete box culvert
cfs = cubic feet per second
ft = feet
K_e = Entrance Loss Coefficient

2.10. Design Storm

The area-reduction factor is a key parameter used for the observation of storm size versus area of the watershed. It accounts for decreases in precipitation intensity as the storm area increases. This factor can be applied to a frequency storm to eliminate the need for separate frequency storms for each evaluation point. Two input factors can be chosen within HEC-HMS—TP-40/TP-49 and a user identified input. Within these functions, equations require the percentage of point rainfall for a given area versus storm. For the WMP update, RESPEC chose to forgo this factor because of the size of the watershed and input from SSCAFCA hydrologists. Figure 2-19, taken from the HEC-HMS Technical Reference Manual (USACE, 2000), indicates that the Venada Watershed would require an adjustment factor of nearly 98 percent. This translates to the rainfall being reduced by only 2 percent. Additionally, HEC recommends that storms with durations shorter than 30 minutes and small subbasins require no further adjustment.

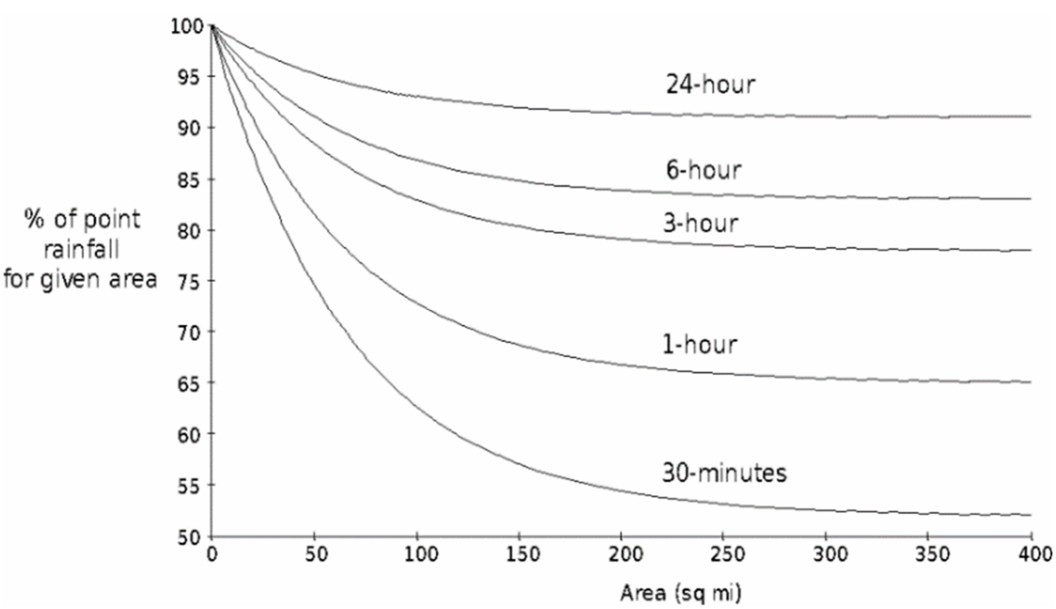

Figure 2-19. HEC-HMS Technical Reference Manual Reduction of Point Rainfall Depth as Storm Area Increases [USACE, 2000].

To obtain a meteorological model, RESPEC took an average rainfall dataset from a series of nine downloaded points throughout the watershed. See Figure 2-20 for a location of the downloaded points, and Table 2-8 for a list of the average precipitation depths. Rainfall data were gathered from National Oceanic and Atmospheric Administration (NOAA) Atlas 14. Using guidance from the SSCAFCA Hydrology Manual (SSCAFCA, 2021), a 5-minute intensity duration, a 24-hour storm duration, and an intensity position of 25 percent were used as input into the HEC-HMS meteorological model.

Table 2-8. 24-Hour NOAA 14 Point Precipitation Depths (inches)

Duration	2-year	5-year	10-year	25-year	50-year	100-year	500-year
5 minutes	0.23	0.31	0.37	0.45	0.51	0.58	0.75
15 minutes	0.43	0.58	0.69	0.85	0.97	1.10	1.42
1 hour	0.72	0.97	1.16	1.42	1.62	1.83	2.36
2 hours	0.82	1.09	1.30	1.59	1.83	2.08	2.71
3 hours	0.88	1.15	1.36	1.66	1.90	2.16	2.81
6 hours	1.01	1.30	1.53	1.84	2.08	2.34	2.98
12 hours	1.13	1.43	1.67	1.99	2.23	2.49	3.11
24 hours	1.30	1.63	1.89	2.24	2.51	2.80	3.48

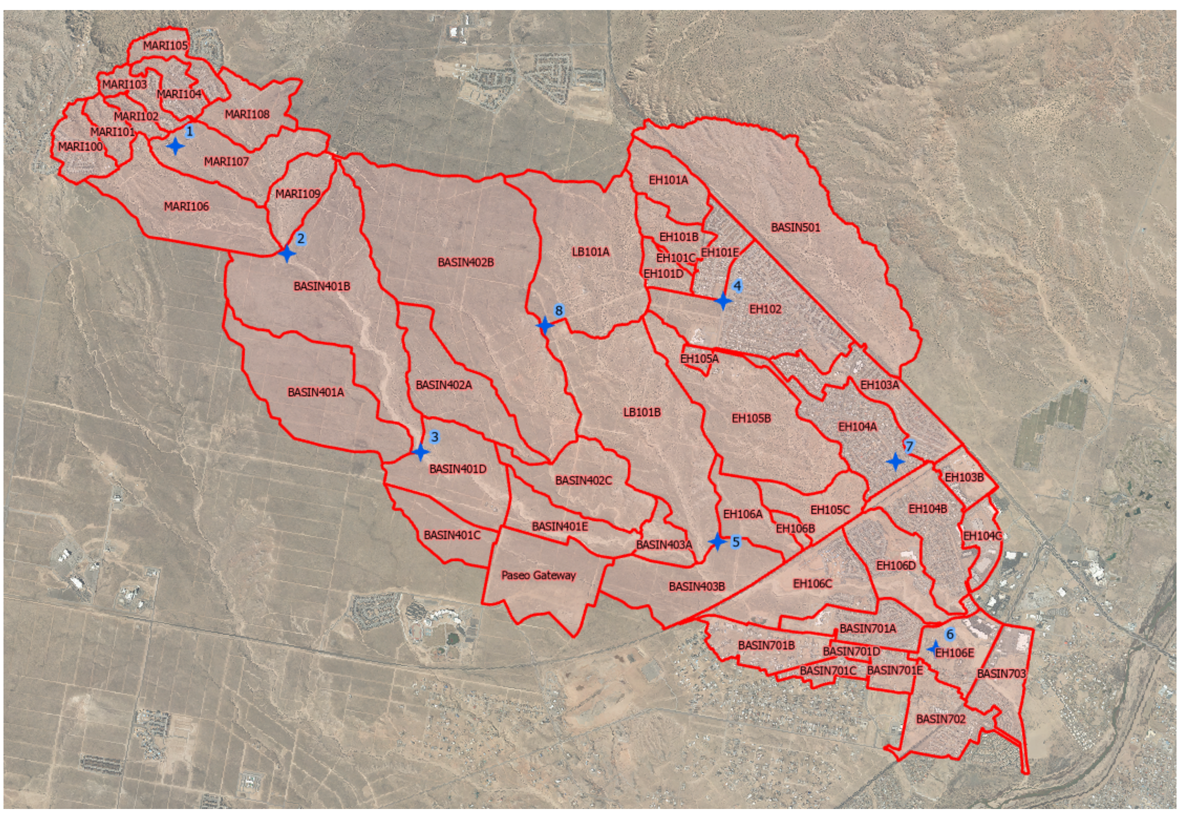

Figure 2-20. NOAA Atlas 14 Rainfall Download Point Map.

According to Hydrology Technical Note No. 4: Title 210 – Hydrologic Analyses of Post-Wildfire Conditions, released by the USDA NRCS in August 2016, the Peak Rate Factor (PRF) represents the ratio of runoff under the rising limb of the unit hydrograph to the total base time (USDA NRCS, 2016), which essentially changes the shape of the hydrograph without altering the total runoff volume. The default PRF in HEC-HMS is 484, which means that the rising side of the limb is 37.5 percent of the total runoff volume. Flatter watersheds tend to have lower PRFs, whereas steeper watersheds tend to have higher PRFs. Therefore, mountainous streams will have PRFs closer to that of 600, as stated in Chapter 15 of the National Engineering Handbook: Part 630 – Hydrology (USDA NRCS, 2010). For this project, the default PRF of 484 was used for the Venada Watershed.

2.11. Existing Conditions Results

Table 2-9 displays the final results for the 100-yr 24-hr storm event for the Venada Watershed, including basins, structures, and major crossing junctions. A detailed results table is provided in Appendix C. It is important to note that simulation results only provide a best estimate of the watershed runoff response from the design storm for current land use conditions. Model results are intended to be used for planning and design of flood control infrastructure but need to be interpreted with the underlying uncertainty in mind.

Table 2-9. 100yr 24hr HEC-HMS Results

Hydrologic Element	Area (MI^2)	Peak Discharge (CFS)	Time of Peak	Volume (ac-ft)
BASIN 401A	0.627	341.4	13Jul2020, 06:38	39
BASIN 401B	1.034	479.4	13Jul2020, 06:37	54.2
BASIN 401C	0.2	105.1	13Jul2020, 06:40	12.4
Basin 401D	0.405	247.4	13Jul2020, 06:27	22.5
BASIN 401E	0.227	103.5	13Jul2020, 06:37	11.9
BASIN 402A	0.393	150.4	13Jul2020, 06:43	19.4
BASIN 402B	1.609	636.7	13Jul2020, 06:49	89.4
BASIN 402C	0.359	149.4	13Jul2020, 06:39	17.7
BASIN 403A	0.109	60.1	13Jul2020, 06:28	5.7
BASIN 403B	0.409	188.1	13Jul2020, 06:41	22.7
BASIN 501	1.171	564	13Jul2020, 06:39	67.5
BASIN 701A	0.212	248.2	13Jul2020, 06:25	21.7
BASIN 701B	0.225	214.2	13Jul2020, 06:16	14.7
BASIN 701C	0.076	95.5	13Jul2020, 06:11	5.2
BASIN 701D	0.026	28	13Jul2020, 06:12	1.6

BASIN 701E	0.088	90.1	13Jul2020, 06:14	5.6
BASIN 702	0.264	366.8	13Jul2020, 06:12	20.6
BASIN 703	0.216	203.7	13Jul2020, 06:26	18.5
Chaco Ridge Pond	0.03	24.1	13Jul2020, 06:21	2.6
Chayote Det Pond 4	0.575	97.5	13Jul2020, 07:18	35.5
EH Pond A	0.199	67.8	13Jul2020, 06:43	9.8
EH Pond B	0.129	35.7	13Jul2020, 06:49	7.2
EH Pond C	0.012	6.7	13Jul2020, 06:25	0.6
EH Pond D	0.083	44.3	13Jul2020, 06:26	4.1
EH 101A	0.199	108.1	13Jul2020, 06:26	9.8
EH 101B	0.129	86.3	13Jul2020, 06:23	7.2
EH 101C	0.012	6.8	13Jul2020, 06:25	0.6
EH 101D	0.083	44.2	13Jul2020, 06:27	4.1
EH 101E	0.152	230.7	13Jul2020, 06:13	13.8
EH 102	0.611	584.2	13Jul2020, 06:30	56.8
EH 103A	0.314	480.2	13Jul2020, 06:11	25.8
EH 103B	0.1	235.3	13Jul2020, 06:11	12
EH 104A	0.367	554	13Jul2020, 06:14	33.8
EH 104B	0.359	354	13Jul2020, 06:26	32.2
EH 104C	0.115	249.5	13Jul2020, 06:11	13.5
EH 105A	0.03	55	13Jul2020, 06:09	2.6
EH 105B	0.699	302.9	13Jul2020, 06:37	34.5
EH 105C	0.198	323.9	13Jul2020, 06:11	16.6
EH 106A	0.191	76.9	13Jul2020, 06:40	9.4
EH 106B	0.032	14.7	13Jul2020, 06:34	1.6
EH 106C	0.403	301.5	13Jul2020, 06:28	28.8
EH 106D	0.291	313.7	13Jul2020, 06:22	24.9
EH 106E	0.21	156	13Jul2020, 06:26	14.2
Enchanted Hills Dam	3.612	746.4	13Jul2020, 07:25	277.1
LB 101A	0.773	360.1	13Jul2020, 06:36	40.5
LB 101B	0.958	358.2	13Jul2020, 06:44	47.3
MARI 100	0.155	155.3	13Jul2020, 06:20	11.5
MARI 101	0.093	100.2	13Jul2020, 06:16	6.4
MARI 102	0.057	63.6	13Jul2020, 06:15	4
MARI 103	0.113	116.6	13Jul2020, 06:19	8.4
MARI 104	0.115	120.4	13Jul2020, 06:19	8.9
MARI 105	0.126	148.6	13Jul2020, 06:20	11.5
MARI 106	0.503	211	13Jul2020, 06:43	27.3
MARI 107	0.356	223.4	13Jul2020, 06:24	19.2
MARI 108	0.226	152.5	13Jul2020, 06:24	13.3

MARI 109	0.177	168	13Jul2020, 06:15	10.9
Paseo Gateway	0.414	521.9	13Jul2020, 06:26	45.9
POND VO-100	0.155	104.9	13Jul2020, 06:32	11.5
POND VO-105	0.093	88.5	13Jul2020, 06:21	6.4
POND VO-115	0.057	28.6	13Jul2020, 06:33	4
POND VO-120	0.17	124.9	13Jul2020, 06:27	12.3
POND VO-125	0.285	175.6	13Jul2020, 06:37	21.2
POND VO-135	0.126	108.9	13Jul2020, 06:31	11.5
SAD Pond 52	0.026	13.4	13Jul2020, 06:25	1.6
SAD Pond 8	0.225	101.3	13Jul2020, 06:34	14.7
SAD 5 Pond	0.415	202.6	13Jul2020, 06:25	27.1
Santa Fe Hills Pond	1.186	291.7	13Jul2020, 07:05	92.3
Sprint Pond	2.771	881.2	13Jul2020, 06:51	197.6
17 (Unser Blvd)	1.921	957	13Jul2020, 06:44	121.3
18 (Paseo del Volcan)	9.438	3699	13Jul2020, 06:59	550.2
21 (Camino Encantadas)	10.064	3853.4	13Jul2020, 07:05	590.1
22 (Lincoln Ave)	11.494	4187.6	13Jul2020, 07:06	690.4
23 (NM528)	15.316	4854.9	13Jul2020, 07:09	981.7
24 (Lower Venada Channel)	16.211	5040.3	13Jul2020, 07:12	1047.9

2.12. Structure Capacities and Major Deficiencies

The model was analyzed at all major crossing structures in the watershed and the final channel near the outlet to the Rio Grande. Table 2-10 lists the structures, upstream to downstream, which include culverts along Unser Boulevard, Paseo del Volcan, Camino Encantadas, Lincoln Avenue, and NM528.

Table 2-10. Major Structures in the Venada Watershed

Major Junction	100-yr 24-hr Storm Event Peak Flow (cfs)	500-yr 24-hr Storm Event Peak Flow (cfs)
Unser Boulevard (17)	957	1480
Paseo del Volcan (18)	3,819	6,619
Camino Encantadas (21)	3,982	6,917
Lincoln Avenue (22)	4,346	7,571
NM528 (23)	4,981	8,579
Lower Venada Channel (24)	5,180	8,941

Several of these major crossings are currently undersized for existing conditions, including the Lower Venada Channel, NM528, and Unser Boulevard. The Upper Venada Off-Channel Facility described in Section 3.1.1 will de design to limit downstream flow to the capacity of

NM528 without a clogging factor applied (4517 cfs), however the Lower Venada Channel and Unser Boulevard will remain undersized for the expected existing conditions flow.

2.13. Lateral Erosion Envelope

Lateral migration is a natural arroyo process and occurs in both urbanized and natural watersheds. In 2008, SSCAFCA published the Sediment and Erosion Design Guide (Mussetter, 2008) to provide guidance for evaluating the lateral and vertical stability of arroyos, and for establishing the lateral erosion envelope (LEE). The LEE represents the maximum lateral migration distance of an arroyo that can be expected over the next 30-50 years and identifies a corridor where properties and infrastructure are potentially at risk from erosion. Figure 2-21 shows mapped lateral erosion envelopes in the Venada Watershed (see Appendix D for calculations). In this document, the LEE is delineated for any reach where peak discharge during the 100-year storm is expected to exceed 500 cfs under existing conditions, as well as for all SSCAFCA-owned arroyos, regardless of expected discharge. However, please note that erosion can cause problems and threaten structures and infrastructure in smaller arroyo systems where the LEE has not been calculated. SSCAFCA recommends performing LEE analysis prior to development of any land adjacent to a natural arroyo, regardless of size. Local municipalities may include LEE considerations in their development ordinances (see for example City of Rio Rancho Chapter 152.33 ordinance, flood-related erosion-prone areas).

In March 2025, SSCAFCA updated RESPEC's LEE boundaries to incorporate and exclude hardened banks.

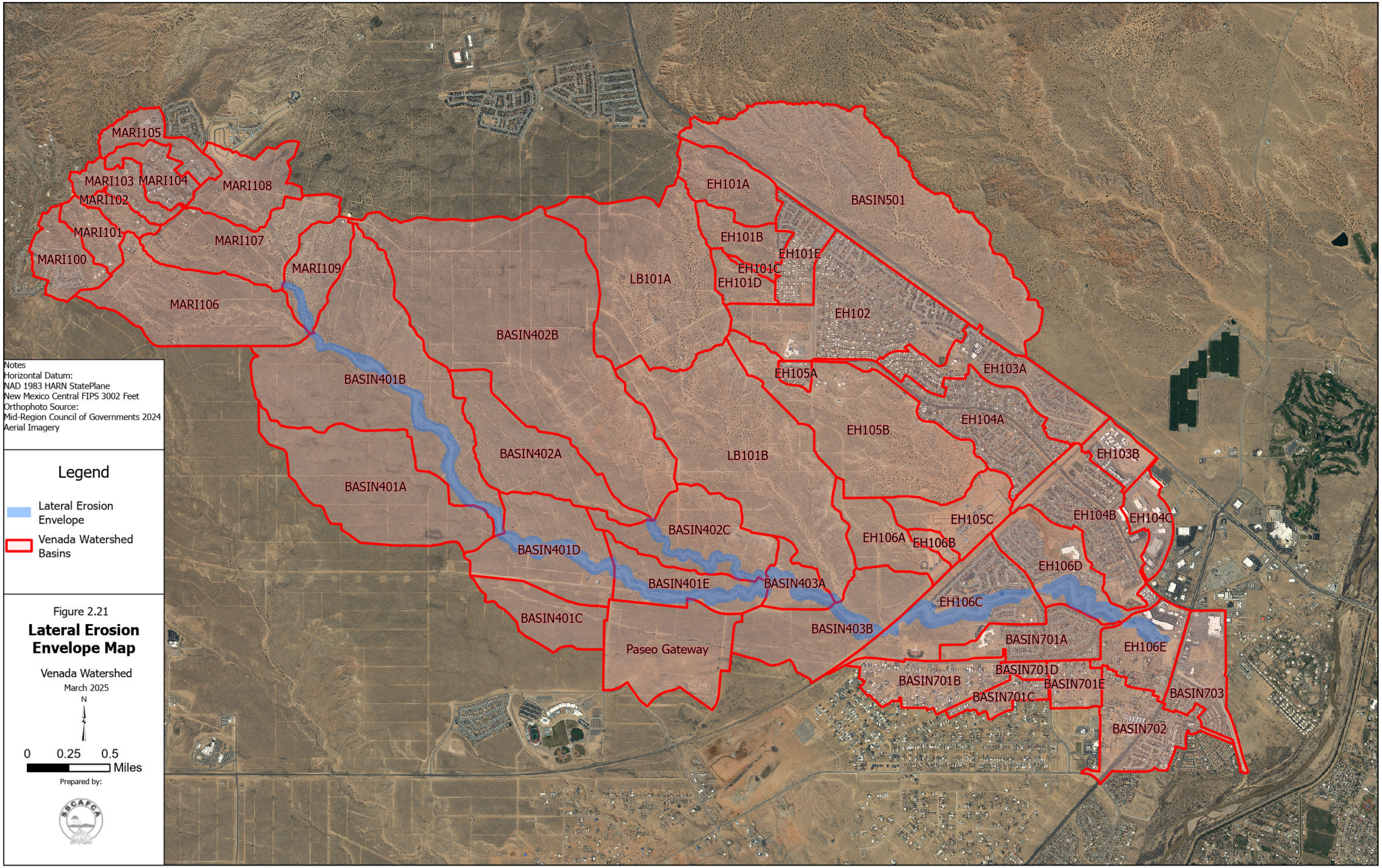

Figure 2.21

Lateral Erosion Envelope Map

Venada Watershed

March 2025

3. Proposed Improvements and Recommendations

Flash flooding during the summer monsoon season is a natural phenomenon in the semi-arid southwestern U.S. and is an integral part of the dynamics of ephemeral water courses. In urbanizing landscapes, flash flooding can cause considerable damage to property, public infrastructure, and endanger lives, especially if insufficient space is provided for the safe passage of floodwaters, or if drainage infrastructure is not designed and sized appropriately. This section discusses drainage deficiencies identified as part of this study, along with proposed solutions and needs for additional analysis.

3.1. Future Regional Stormwater Detention Facilities

3.1.1. Future Upper Venada Off-Channel Facility

RESPEC was selected by SSCAFCA to design a diversion structure along the upper portion of the Venada Arroyo, north of Progress Street to mitigate the risk of flooding downstream as the watershed experiences increasing development. In 2022 SSCAFCA adopted the Quality of Life Master Plan, which laid out a vision for the public to utilize SSCAFCA's facilities for outdoor recreation. Watershed parks are a great way to utilize the idea of multi-functional facilities, a way to share the design with the community around the project. Because of this, RESPEC designed this proposed project as a dual-use facility, incorporating a full-size regulation track towards the bottom of the pond. The access road into the facility was designed large enough to use as a parking lot for visitors and side slopes of the pond are designed flat enough to be used as a spectators stand. The bottom of the pond provides plenty of opportunity to have a multi-use sports field in the future as well.

At the time of the Venada Arroyo Watershed Management Plan, the proposed project was in the 30% design phase. The proposed project will function to minimize flooding downstream by attenuating the peak of the incoming storm using an off-channel ponding facility. The downstream constraint of the facility is limited to the full capacity of the NM 528 crossing, without clogging factors applied, at 4,517 cfs. Lower flows will remain in the channel until a 50-year 24-hour storm event occurs, the excess discharge will then overtop the weir to the pond attenuating the flow allowing the peak of the storm to pass. This will also help to maintain sediment continuity throughout the channel allowing for long-term channel stability.

A 12- foot by 6-foot triple-barrel box culvert situated in the channel was designed at a 90-degree angle to an intake weir to either convey the allotted 1,400 cfs downstream or divert water into the off-channel ponding facility. The culvert has a 2-foot headwall that acts as a barrier to divert any excess flow above 1,400 cfs to maintain the constraint at NM 528. The intake weir is 2 feet deep and 80 feet long. Adjacent to the intake weir in a 135-feet emergency spillway that connects directly back into the erosion-controlled channel to allow for storms larger than the 100-year 24-hour to continue downstream without disrupting the function of the ponding facility. The pond contains 39.6 acre-feet of volume to the emergency spillway. As this pond’s volume to the emergency spillway is less than 50 acre-feet, the pond does not fall under NMOSE jurisdictional dam status.

The ponding facility was designed to also control discharge coming from the Paseo Gateway development on the southern end of the pond. The developed flows will enter the facility through a 72-inch concrete pipe and outfall to a plunge pool to dissipate the high velocities associated with the runoff. The off-channel facility will attenuate flows through the principal spillway structure, a ported riser with a 48-inch outfall pipe. The principal spillway limits the discharge from the pond during the 100-year 24-hour storm event to 176 cfs. A conceptual drawing of the design is provided below in Figure 3-1.

FIGURE 3-1: Conceptual Design

3.2. Arroyo Preservation

Pending

3.3. Water Quality

Pending

3.4. Quality of Life

Pending

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Appendices

Appendix A
Model Parameters

Appendix B.3.1						
HEC-HMS Input Parameters						
Upper Venada DMP Update						
Basin ID	**Area (acres)**	**Area (sq mi)**	**Curve Number**	**DCIA %**	**Lag Time**	**Flow Ratio**
BASIN401A	401.5	0.627	78	0.00	30.8	1.18
BASIN401B	661.9	1.034	75	0.00	28.3	1.18
BASIN401C	128.1	0.200	78	0.00	32.4	1.18
BASIN401D	258.9	0.405	76	0.00	20.7	1.18
BASIN401E	145.4	0.227	75	0.00	29.0	1.18
BASIN402A	251.5	0.393	74	0.00	33.5	1.18
BASIN402B	1029.9	1.609	76	0.00	39.5	1.18
BASIN402C	229.6	0.359	74	0.00	29.6	1.18
BASIN403A	69.8	0.109	75	0.00	21.6	1.18
BASIN403B	261.5	0.409	76	0.00	31.9	1.18
BASIN501	749.5	1.171	75	4.25	31.2	1.18
BASIN701A	135.7	0.212	83	34.53	22.4	1.06
BASIN701B	144.2	0.225	75	16.27	12.9	1.06
BASIN701C	48.3	0.076	75	19.79	8.5	1.06
BASIN701D	16.8	0.026	75	12.78	8.9	1.06
BASIN701E	56.5	0.088	75	14.67	10.6	1.06
BASIN702	169.2	0.264	79	18.94	9.7	1.06
BASIN703	138.4	0.216	79	26.76	22.7	1.06
EH101A	127.4	0.199	74	0.00	19.5	1.18
EH101B	82.5	0.129	75	2.76	17.6	1.18
EH101C	7.7	0.012	74	0.00	18.3	1.18
EH101D	53.0	0.083	74	0.00	20.1	1.18
EH101E	97.2	0.152	80	29.49	11.2	1.06
EH102	390.8	0.611	81	29.44	25.9	1.06
EH103A	200.7	0.314	79	23.35	8.9	1.06
EH103B	64.2	0.100	89	37.77	9.0	1.06
EH104A	234.8	0.367	80	31.09	11.7	1.06
EH104B	229.7	0.359	79	30.85	22.9	1.06
EH104C	73.7	0.115	82	53.77	9.3	1.06
EH105A	19.2	0.030	81	23.87	7.2	1.06
EH105B	447.4	0.699	74	0.00	27.8	1.18
EH105C	126.6	0.198	82	16.47	8.6	1.06
EH106A	122.2	0.191	74	0.00	31.1	1.18
EH106B	20.2	0.032	74	0.00	25.4	1.18
EH106C	257.6	0.403	77	17.77	23.7	1.06
EH106D	186.3	0.291	81	21.44	18.8	1.06
EH106E	134.3	0.210	76	16.33	21.5	1.06
LB101A	494.4	0.773	75	0.00	28.1	1.18
LB101B	613.4	0.958	74	0.00	34.6	1.18
MARI100	99.2	0.155	79	15.18	16.1	1.06
MARI101	59.3	0.093	80	6.43	12.6	1.06
MARI102	36.3	0.057	80	7.42	12.2	1.06
MARI103	72.6	0.113	80	12.27	15.6	1.06
MARI104	73.7	0.115	78	21.16	15.9	1.06
MARI105	80.8	0.126	78	34.44	17.4	1.06
MARI106	321.7	0.503	74	3.96	34.2	1.18
MARI107	227.6	0.356	75	1.30	18.5	1.18
MARI108	144.8	0.226	74	7.36	18.6	1.18
MARI109	113.3	0.177	74	9.61	11.1	1.18
Paseo Gateway	265.0	0.414	85	39.00	23.0	1.06

from Wilson model parameters

Appendix B.3.2

HEC-HMS Input Parameters - Routing Summary

Upper Venada DMP Update

Reach	Initial Type	Length (ft)	Slope (ft/ft)	Manning's n	Space Time Method	Index Method	Index Flow	Shape	Diameter (ft)	Width (ft)	Side Slope
101BR1	Discharge = Inflow	10331.200	0.02	0.04	Auto DX Auto DT	Flow	500	Trapezoid		110	9
101ER1	Discharge = Inflow	4337.130	0.02	0.01	Auto DX Auto DT	Flow	500	Circle	6		
101ER2	Discharge = Inflow	2077.630	0.03	0.01	Auto DX Auto DT	Flow	500	Circle	3		
101ER3	Discharge = Inflow	1832.840	0.03	0.01	Auto DX Auto DT	Flow	500	Circle	4		
101ER4	Discharge = Inflow	1355.310	0.03	0.01	Auto DX Auto DT	Flow	500	Circle	4		
102R1	Discharge = Inflow	5345.460	0.02	0.01	Auto DX Auto DT	Flow	500	Circle	6		
103AR1	Discharge = Inflow	5578.740	0.02	0.01	Auto DX Auto DT	Flow	500	Trapezoid		10	
103AR2	Discharge = Inflow	3982.070	0.02	0.01	Auto DX Auto DT	Flow	500	Trapezoid		10	2
103BR1A	Discharge = Inflow	1120.740	0.03	0.01	Auto DX Auto DT	Flow	500	Trapezoid		10	2
103BR1B	Discharge = Inflow	1026.060	0.01	0.04	Auto DX Auto DT	Flow	500	Trapezoid		20	2
104BR1A	Discharge = Inflow	4582.260	0.02	0.04	Auto DX Auto DT	Flow	500	Trapezoid		19	6
104BR1B	Discharge = Inflow	1557.750	0.02	0.01	Auto DX Auto DT	Flow	500	Circle	8		2
104BR2	Discharge = Inflow	1300.620	0.01	0.01	Auto DX Auto DT	Flow	500	Trapezoid		10	
104CR1	Discharge = Inflow	3935.560	0.01	0.01	Auto DX Auto DT	Flow	500	Trapezoid		10	2
105BR1	Discharge = Inflow	7861.470	0.03	0.04	Auto DX Auto DT	Flow	500	Trapezoid		24	2
105CR1	Discharge = Inflow	1476.970	0.02	0.01	Auto DX Auto DT	Flow	500	Circle	6		3
106CR1A	Discharge = Inflow	2070.630	0.03	0.01	Auto DX Auto DT	Flow	500	Circle	3		
106CR1B	Discharge = Inflow	1317.590	0.02	0.04	Auto DX Auto DT	Flow	500	Trapezoid		50	
106CR2A	Discharge = Inflow	2291.540	0.04	0.01	Auto DX Auto DT	Flow	500	Circle	4		3
106CR3	Discharge = Inflow	6284.720	0.02	0.04	Auto DX Auto DT	Flow	500	Trapezoid		50	
106CR4	Discharge = Inflow	2330.080	0.02	0.04	Auto DX Auto DT	Flow	500	Circle	6		3
106DR1	Discharge = Inflow	4099.220	0.02	0.01	Auto DX Auto DT	Flow	500	Trapezoid		64	
106ER1	Discharge = Inflow	2743.520	0.03	0.04	Auto DX Auto DT	Flow	500	Trapezoid		107	5
106ER2	Discharge = Inflow	2653.970	0.02	0.04	Auto DX Auto DT	Flow	500	Trapezoid		107	1
106R1	Discharge = Inflow	9821.890	0.02	0.04	Auto DX Auto DT	Flow	500	Trapezoid		16	1
106R2	Discharge = Inflow	8904.480	0.02	0.04	Auto DX Auto DT	Flow	500	Trapezoid		16	6
107R1	Discharge = Inflow	2494.660	0.01	0.04	Auto DX Auto DT	Flow	500	Trapezoid		12	6
108R1	Discharge = Inflow	2743.550	0.03	0.04	Auto DX Auto DT	Flow	500	Trapezoid		6	2
108R2	Discharge = Inflow	2758.990	0.03	0.04	Auto DX Auto DT	Flow	500	Trapezoid		6	2
109R1	Discharge = Inflow	2035.080	0.02	0.04	Auto DX Auto DT	Flow	500	Trapezoid		18	2
401BR1	Discharge = Inflow	10006.900	0.02	0.04	Auto DX Auto DT	Flow	500	Trapezoid		60	6
401DR1	Discharge = Inflow	4423.220	0.01	0.04	Auto DX Auto DT	Flow	500	Trapezoid		30	4
401ER1	Discharge = Inflow	5977.220	0.02	0.04	Auto DX Auto DT	Flow	500	Trapezoid		26	13
402CR1	Discharge = Inflow	6337.980	0.01	0.04	Auto DX Auto DT	Flow	500	Trapezoid		23	3
403AR1	Discharge = Inflow	2610.180	0.01	0.04	Auto DX Auto DT	Flow	500	Trapezoid		30	2
403BR1	Discharge = Inflow	1982.660	0.01	0.04	Auto DX Auto DT	Flow	500	Trapezoid		8	6
403BR2	Discharge = Inflow	2011.330	0.01	0.04	Auto DX Auto DT	Flow	500	Trapezoid		8	2
701CR1	Discharge = Inflow	1537.980	0.02	0.04	Auto DX Auto DT	Flow	500	Trapezoid		32	2
701ER1	Discharge = Inflow	3034.160	0.02	0.01	Auto DX Auto DT	Flow	500	Circle	4		4
701ER2	Discharge = Inflow	1894.030	0.03	0.04	Auto DX Auto DT	Flow	500	Trapezoid		4	
702R1A	Discharge = Inflow	2491.870	0.03	0.04	Auto DX Auto DT	Flow	500	Trapezoid		37	2
702R1B	Discharge = Inflow	2167.670	0.02	0.01	Auto DX Auto DT	Flow	500	Trapezoid		20	2
703R1	Discharge = Inflow	4276.820	0.02	0.04	Auto DX Auto DT	Flow	500	Trapezoid		60	3
703R2	Discharge = Inflow	1124.150	0.01	0.04	Auto DX Auto DT	Flow	500	Trapezoid		60	3

NOAA Atlas 14, Volume 1, Version 5
Location name: Rio Rancho, New Mexico, USA*
Latitude: 35.3536°, Longitude: -106.6843°
Elevation: m/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	0.180 (0.155-0.209)	0.233 (0.201-0.270)	0.313 (0.269-0.364)	0.374 (0.320-0.433)	0.458 (0.391-0.530)	0.523 (0.444-0.605)	0.591 (0.498-0.684)	0.663 (0.556-0.766)	0.760 (0.631-0.880)	0.838 (0.690-0.971)
10-min	0.274 (0.236-0.318)	0.355 (0.306-0.412)	0.477 (0.409-0.554)	0.569 (0.487-0.659)	0.697 (0.595-0.807)	0.796 (0.676-0.922)	0.900 (0.758-1.04)	1.01 (0.846-1.17)	1.16 (0.960-1.34)	1.27 (1.05-1.48)
15-min	0.340 (0.292-0.394)	0.440 (0.379-0.510)	0.591 (0.508-0.686)	0.706 (0.604-0.817)	0.864 (0.737-1.00)	0.986 (0.838-1.14)	1.12 (0.940-1.29)	1.25 (1.05-1.45)	1.44 (1.19-1.66)	1.58 (1.30-1.83)
30-min	0.458 (0.394-0.531)	0.593 (0.511-0.687)	0.796 (0.684-0.924)	0.950 (0.814-1.10)	1.16 (0.993-1.35)	1.33 (1.13-1.54)	1.50 (1.27-1.74)	1.68 (1.41-1.95)	1.93 (1.60-2.24)	2.13 (1.76-2.47)
60-min	0.566 (0.487-0.657)	0.734 (0.632-0.850)	0.985 (0.846-1.14)	1.18 (1.01-1.36)	1.44 (1.23-1.67)	1.64 (1.40-1.90)	1.86 (1.57-2.15)	2.08 (1.75-2.41)	2.39 (1.98-2.77)	2.64 (2.17-3.05)
2-hr	0.654 (0.560-0.777)	0.841 (0.717-1.00)	1.11 (0.945-1.32)	1.33 (1.13-1.57)	1.63 (1.37-1.92)	1.87 (1.57-2.20)	2.13 (1.77-2.50)	2.40 (1.98-2.81)	2.77 (2.26-3.25)	3.08 (2.48-3.61)
3-hr	0.704 (0.605-0.831)	0.894 (0.769-1.05)	1.17 (1.01-1.38)	1.39 (1.19-1.64)	1.70 (1.44-1.99)	1.94 (1.64-2.28)	2.20 (1.85-2.58)	2.48 (2.06-2.90)	2.86 (2.35-3.34)	3.18 (2.59-3.71)
6-hr	0.814 (0.707-0.952)	1.03 (0.894-1.20)	1.33 (1.15-1.54)	1.56 (1.35-1.81)	1.88 (1.61-2.18)	2.12 (1.82-2.46)	2.39 (2.03-2.77)	2.66 (2.25-3.08)	3.04 (2.54-3.52)	3.34 (2.77-3.87)
12-hr	0.914 (0.806-1.05)	1.16 (1.02-1.32)	1.46 (1.29-1.67)	1.71 (1.49-1.94)	2.03 (1.77-2.31)	2.29 (1.99-2.60)	2.55 (2.20-2.90)	2.83 (2.42-3.21)	3.19 (2.71-3.63)	3.49 (2.94-3.98)
24-hr	1.07 (0.951-1.21)	1.34 (1.19-1.51)	1.68 (1.50-1.90)	1.95 (1.74-2.20)	2.32 (2.05-2.62)	2.60 (2.30-2.93)	2.90 (2.55-3.26)	3.20 (2.80-3.60)	3.60 (3.13-4.06)	3.92 (3.39-4.42)
2-day	1.15 (1.02-1.29)	1.44 (1.29-1.62)	1.82 (1.61-2.04)	2.11 (1.87-2.36)	2.51 (2.22-2.81)	2.82 (2.48-3.15)	3.14 (2.76-3.51)	3.47 (3.03-3.89)	3.91 (3.39-4.39)	4.26 (3.67-4.79)
3-day	1.27 (1.15-1.40)	1.58 (1.44-1.75)	1.97 (1.79-2.17)	2.27 (2.06-2.50)	2.68 (2.42-2.95)	2.99 (2.70-3.29)	3.31 (2.98-3.65)	3.64 (3.26-4.00)	4.08 (3.62-4.49)	4.41 (3.90-4.87)
4-day	1.39 (1.28-1.51)	1.72 (1.59-1.87)	2.12 (1.96-2.30)	2.43 (2.24-2.63)	2.85 (2.62-3.08)	3.17 (2.91-3.43)	3.49 (3.20-3.78)	3.81 (3.48-4.12)	4.24 (3.85-4.59)	4.56 (4.13-4.95)
7-day	1.60 (1.49-1.73)	1.99 (1.84-2.16)	2.43 (2.26-2.63)	2.77 (2.57-2.99)	3.22 (2.98-3.47)	3.56 (3.29-3.84)	3.90 (3.59-4.20)	4.22 (3.89-4.56)	4.65 (4.26-5.02)	4.96 (4.54-5.37)
10-day	1.76 (1.64-1.90)	2.19 (2.03-2.36)	2.68 (2.49-2.89)	3.07 (2.85-3.30)	3.58 (3.31-3.85)	3.97 (3.66-4.26)	4.36 (4.01-4.67)	4.74 (4.35-5.08)	5.24 (4.78-5.62)	5.60 (5.10-6.03)
20-day	2.25 (2.08-2.42)	2.79 (2.59-3.01)	3.40 (3.15-3.66)	3.85 (3.56-4.14)	4.43 (4.10-4.76)	4.85 (4.48-5.20)	5.26 (4.85-5.63)	5.64 (5.19-6.05)	6.13 (5.63-6.57)	6.47 (5.93-6.95)
30-day	2.72 (2.52-2.92)	3.37 (3.13-3.62)	4.06 (3.77-4.36)	4.58 (4.24-4.90)	5.22 (4.83-5.58)	5.67 (5.25-6.07)	6.11 (5.64-6.53)	6.52 (6.01-6.96)	7.01 (6.45-7.50)	7.36 (6.75-7.87)
45-day	3.34 (3.10-3.58)	4.13 (3.85-4.43)	4.93 (4.59-5.28)	5.50 (5.12-5.88)	6.20 (5.76-6.62)	6.67 (6.21-7.12)	7.11 (6.61-7.58)	7.50 (6.97-7.99)	7.95 (7.39-8.47)	8.23 (7.65-8.77)
60-day	3.84 (3.57-4.12)	4.76 (4.43-5.10)	5.68 (5.29-6.08)	6.33 (5.90-6.78)	7.13 (6.64-7.62)	7.68 (7.15-8.20)	8.18 (7.61-8.74)	8.63 (8.03-9.22)	9.15 (8.51-9.78)	9.48 (8.82-10.1)

[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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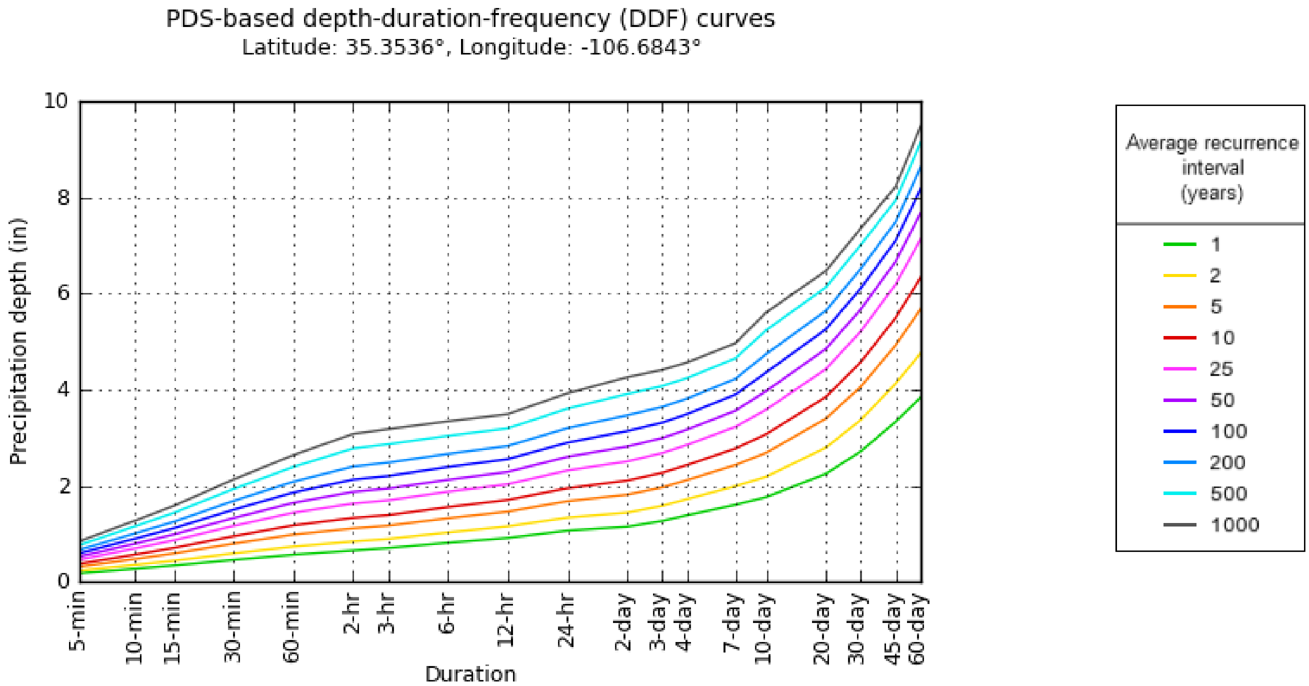
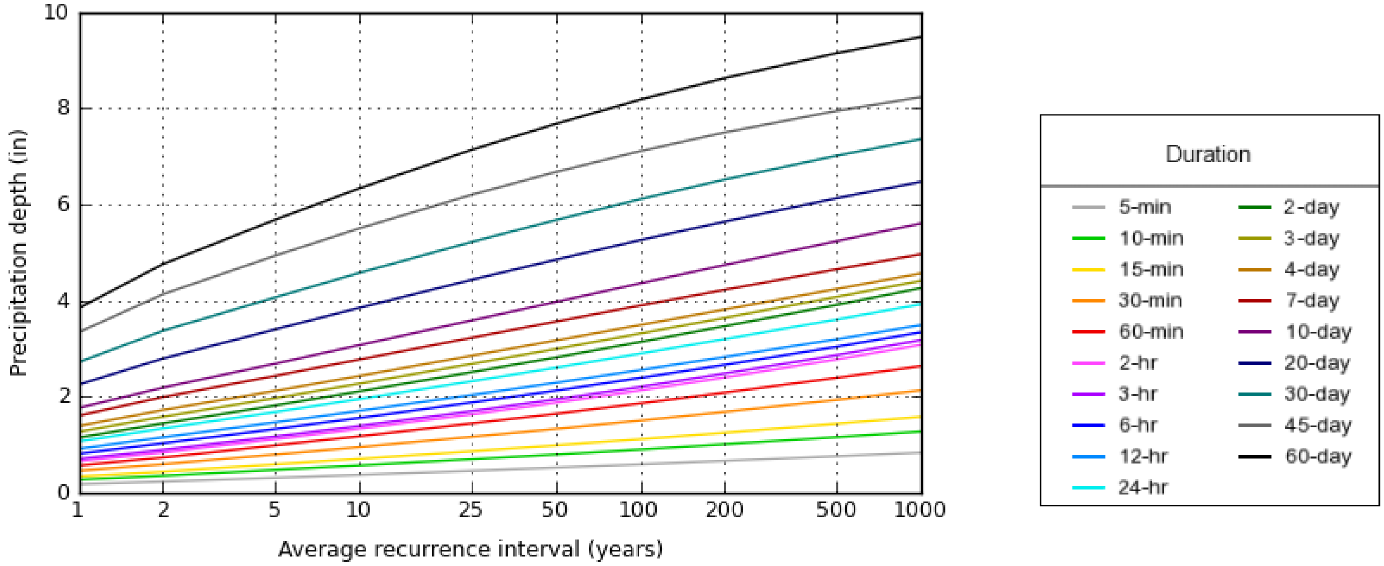
PF graphical





NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Tue May 16 17:19:18 2023

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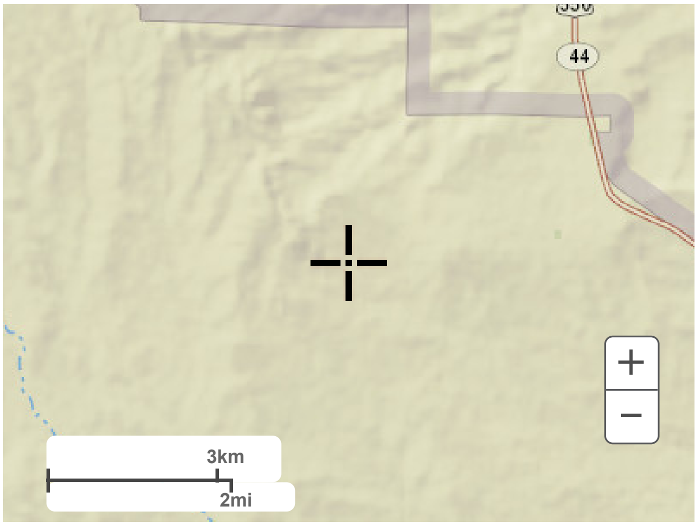
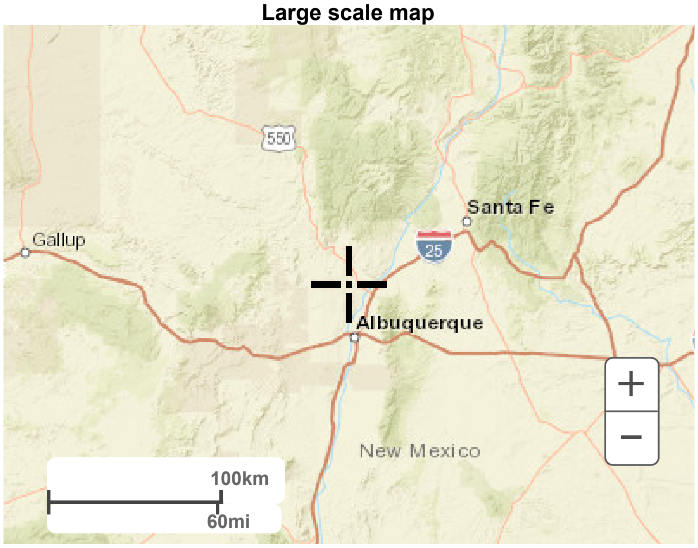
Maps & aerials

Small scale terrain

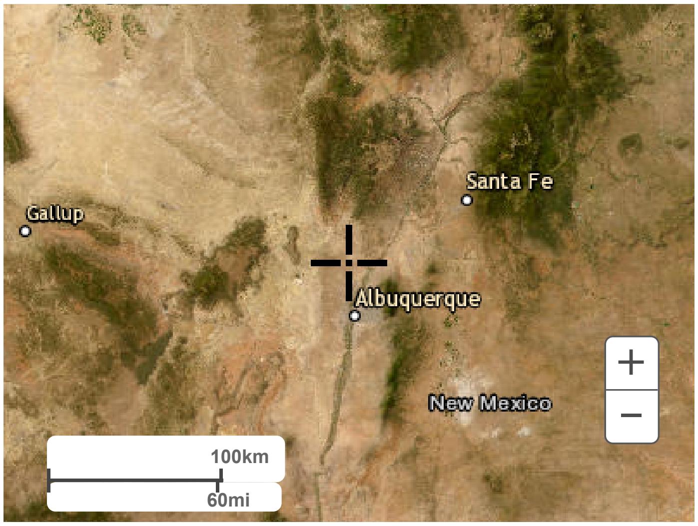


Large scale terrain

Large scale map



Large scale aerial



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

NOAA Atlas 14, Volume 1, Version 5
Location name: Rio Rancho, New Mexico, USA*
Latitude: 35.345°, Longitude: -106.6686°
Elevation: m/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	**0.179** (0.154-0.208)	**0.231** (0.199-0.268)	**0.311** (0.267-0.361)	**0.371** (0.318-0.430)	**0.455** (0.388-0.527)	**0.520** (0.441-0.602)	**0.588** (0.495-0.680)	**0.660** (0.552-0.762)	**0.757** (0.627-0.876)	**0.834** (0.687-0.966)
10-min	**0.272** (0.234-0.316)	**0.352** (0.303-0.408)	**0.473** (0.407-0.549)	**0.564** (0.484-0.654)	**0.692** (0.590-0.802)	**0.790** (0.671-0.916)	**0.894** (0.754-1.03)	**1.00** (0.841-1.16)	**1.15** (0.955-1.33)	**1.27** (1.05-1.47)
15-min	**0.337** (0.290-0.392)	**0.437** (0.376-0.506)	**0.586** (0.504-0.680)	**0.700** (0.600-0.811)	**0.858** (0.732-0.994)	**0.980** (0.832-1.14)	**1.11** (0.934-1.28)	**1.25** (1.04-1.44)	**1.43** (1.18-1.65)	**1.58** (1.30-1.82)
30-min	**0.454** (0.391-0.527)	**0.588** (0.507-0.682)	**0.790** (0.679-0.917)	**0.943** (0.808-1.09)	**1.16** (0.986-1.34)	**1.32** (1.12-1.53)	**1.49** (1.26-1.73)	**1.68** (1.40-1.94)	**1.92** (1.60-2.23)	**2.12** (1.75-2.46)
60-min	**0.562** (0.484-0.653)	**0.728** (0.627-0.844)	**0.977** (0.840-1.13)	**1.17** (1.00-1.35)	**1.43** (1.22-1.66)	**1.63** (1.39-1.89)	**1.85** (1.56-2.14)	**2.07** (1.74-2.40)	**2.38** (1.97-2.75)	**2.63** (2.16-3.04)
2-hr	**0.649** (0.555-0.772)	**0.833** (0.711-0.992)	**1.10** (0.937-1.31)	**1.32** (1.12-1.56)	**1.62** (1.36-1.91)	**1.86** (1.55-2.19)	**2.11** (1.75-2.48)	**2.38** (1.96-2.79)	**2.75** (2.24-3.23)	**3.05** (2.46-3.59)
3-hr	**0.698** (0.601-0.824)	**0.886** (0.762-1.05)	**1.16** (0.996-1.37)	**1.38** (1.18-1.62)	**1.68** (1.43-1.97)	**1.93** (1.63-2.26)	**2.18** (1.83-2.56)	**2.46** (2.04-2.88)	**2.84** (2.33-3.32)	**3.15** (2.56-3.69)
6-hr	**0.807** (0.703-0.945)	**1.02** (0.888-1.19)	**1.31** (1.14-1.53)	**1.54** (1.34-1.80)	**1.86** (1.60-2.16)	**2.11** (1.81-2.45)	**2.37** (2.02-2.75)	**2.64** (2.23-3.06)	**3.02** (2.52-3.49)	**3.32** (2.76-3.85)
12-hr	**0.906** (0.798-1.03)	**1.14** (1.01-1.30)	**1.45** (1.27-1.65)	**1.69** (1.48-1.92)	**2.01** (1.75-2.28)	**2.27** (1.96-2.57)	**2.53** (2.18-2.87)	**2.80** (2.40-3.17)	**3.16** (2.68-3.59)	**3.45** (2.91-3.93)
24-hr	**1.05** (0.941-1.19)	**1.32** (1.18-1.50)	**1.66** (1.48-1.88)	**1.93** (1.72-2.17)	**2.29** (2.03-2.58)	**2.57** (2.27-2.89)	**2.86** (2.52-3.21)	**3.16** (2.76-3.55)	**3.56** (3.09-4.00)	**3.87** (3.34-4.35)
2-day	**1.13** (1.01-1.27)	**1.43** (1.27-1.60)	**1.79** (1.59-2.01)	**2.08** (1.85-2.33)	**2.47** (2.19-2.77)	**2.77** (2.45-3.10)	**3.09** (2.71-3.45)	**3.41** (2.98-3.82)	**3.84** (3.34-4.31)	**4.18** (3.61-4.69)
3-day	**1.25** (1.13-1.38)	**1.56** (1.41-1.72)	**1.93** (1.75-2.13)	**2.23** (2.02-2.45)	**2.63** (2.38-2.89)	**2.94** (2.65-3.23)	**3.25** (2.92-3.57)	**3.57** (3.19-3.92)	**3.99** (3.55-4.40)	**4.32** (3.82-4.76)
4-day	**1.36** (1.25-1.48)	**1.69** (1.56-1.84)	**2.08** (1.92-2.25)	**2.38** (2.19-2.58)	**2.79** (2.57-3.02)	**3.10** (2.85-3.36)	**3.41** (3.13-3.69)	**3.73** (3.40-4.03)	**4.14** (3.77-4.49)	**4.45** (4.03-4.84)
7-day	**1.57** (1.45-1.70)	**1.95** (1.80-2.11)	**2.38** (2.20-2.57)	**2.71** (2.51-2.92)	**3.15** (2.91-3.39)	**3.47** (3.21-3.74)	**3.80** (3.51-4.10)	**4.12** (3.79-4.44)	**4.53** (4.15-4.89)	**4.83** (4.42-5.22)
10-day	**1.73** (1.60-1.86)	**2.14** (1.98-2.31)	**2.62** (2.43-2.82)	**3.00** (2.78-3.22)	**3.50** (3.24-3.75)	**3.87** (3.57-4.15)	**4.25** (3.91-4.55)	**4.62** (4.24-4.95)	**5.10** (4.66-5.47)	**5.45** (4.97-5.86)
20-day	**2.19** (2.03-2.36)	**2.72** (2.52-2.93)	**3.30** (3.06-3.55)	**3.74** (3.46-4.02)	**4.30** (3.98-4.62)	**4.71** (4.35-5.05)	**5.10** (4.71-5.46)	**5.48** (5.04-5.86)	**5.94** (5.46-6.36)	**6.27** (5.75-6.73)
30-day	**2.64** (2.45-2.83)	**3.27** (3.04-3.52)	**3.94** (3.66-4.23)	**4.43** (4.11-4.75)	**5.05** (4.68-5.40)	**5.49** (5.08-5.87)	**5.91** (5.47-6.31)	**6.30** (5.82-6.73)	**6.77** (6.24-7.24)	**7.10** (6.53-7.60)
45-day	**3.23** (3.00-3.46)	**3.99** (3.72-4.28)	**4.76** (4.43-5.10)	**5.31** (4.94-5.68)	**5.97** (5.56-6.38)	**6.43** (5.98-6.86)	**6.84** (6.37-7.29)	**7.20** (6.70-7.68)	**7.62** (7.10-8.12)	**7.88** (7.34-8.39)
60-day	**3.71** (3.45-3.98)	**4.60** (4.28-4.93)	**5.48** (5.11-5.87)	**6.11** (5.69-6.54)	**6.87** (6.40-7.35)	**7.39** (6.89-7.90)	**7.87** (7.33-8.41)	**8.29** (7.72-8.86)	**8.78** (8.18-9.38)	**9.09** (8.47-9.70)

[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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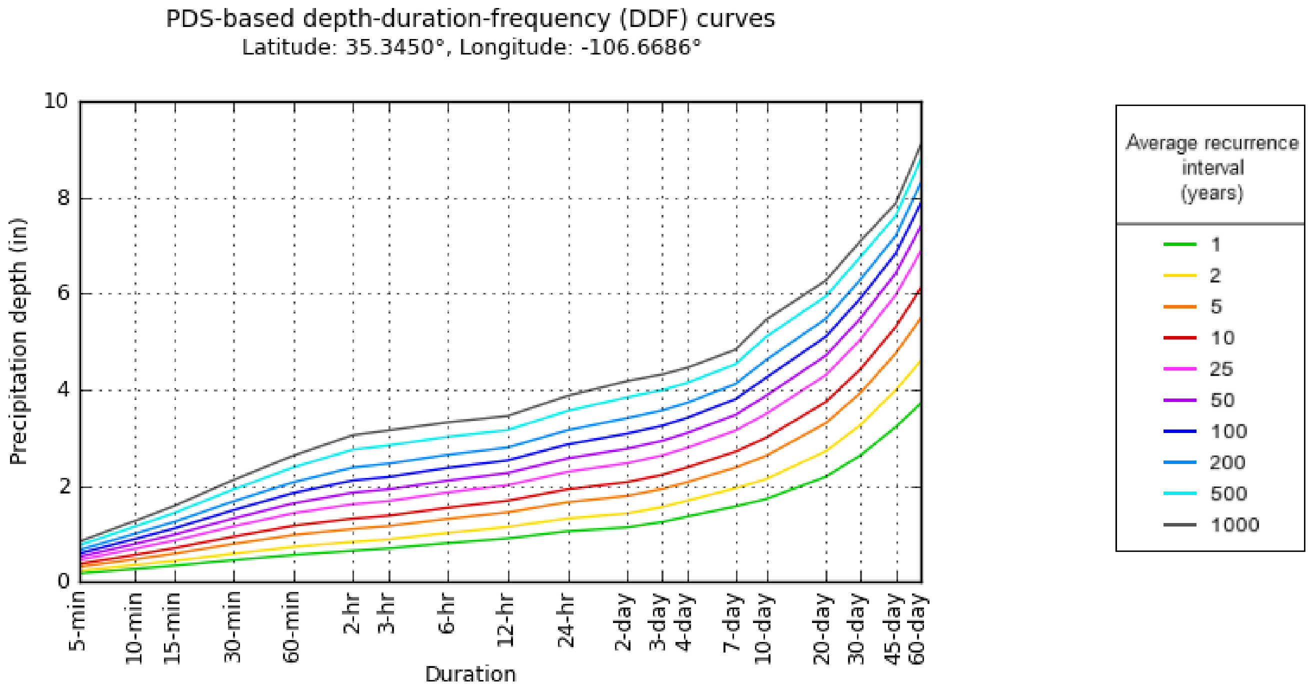
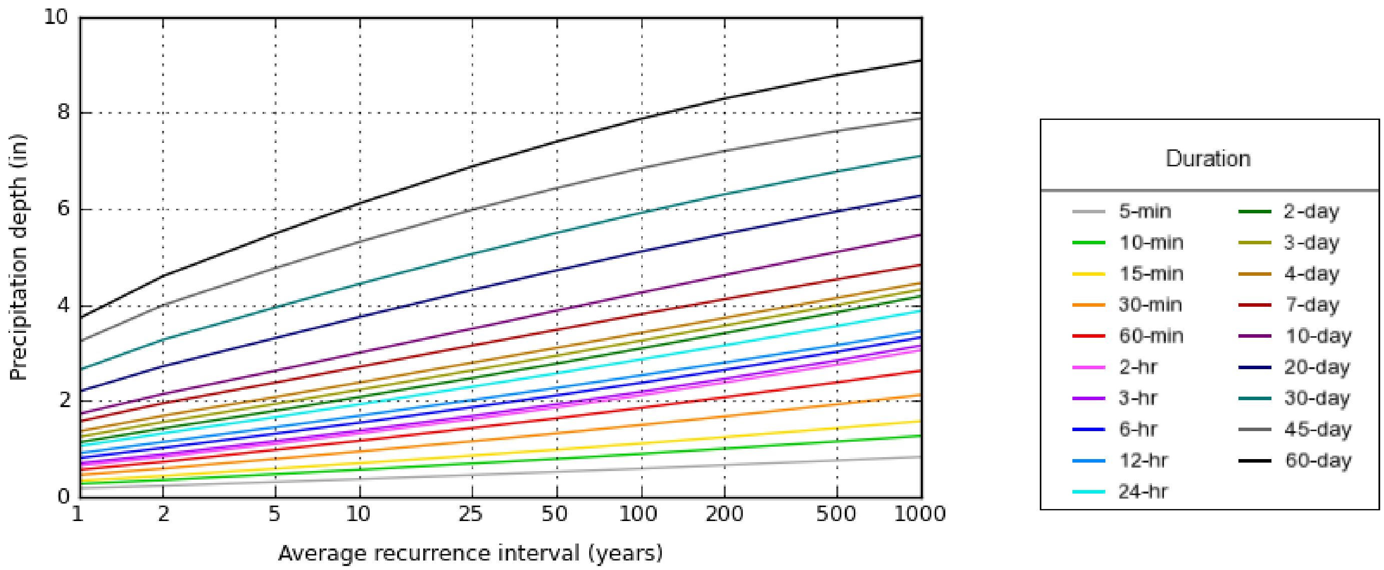
PF graphical





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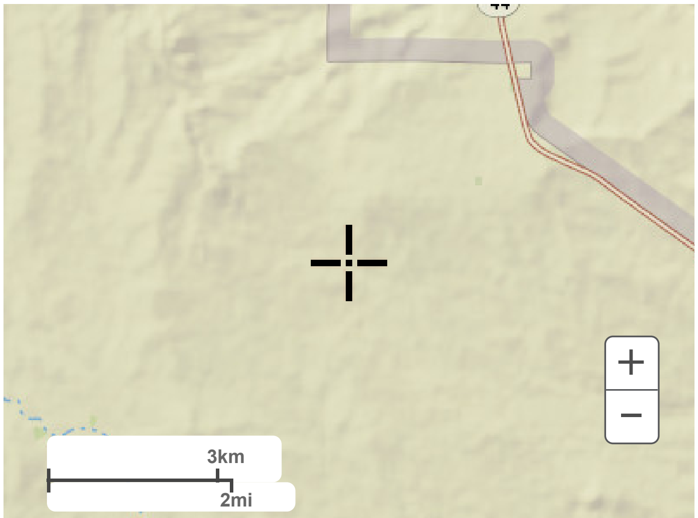
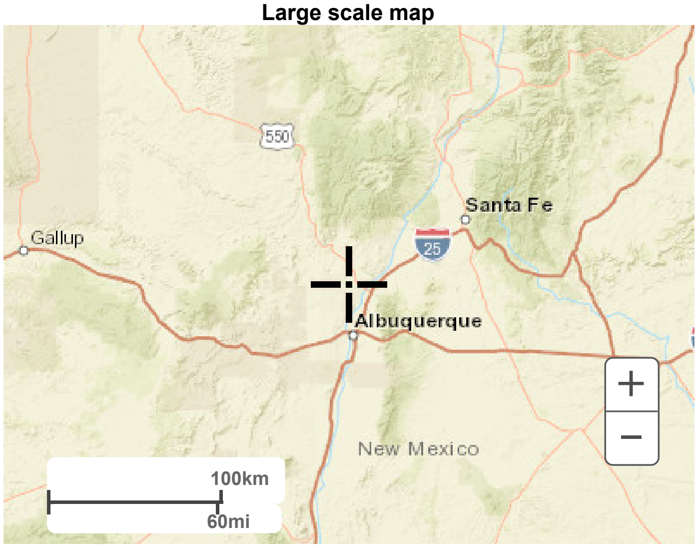
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map



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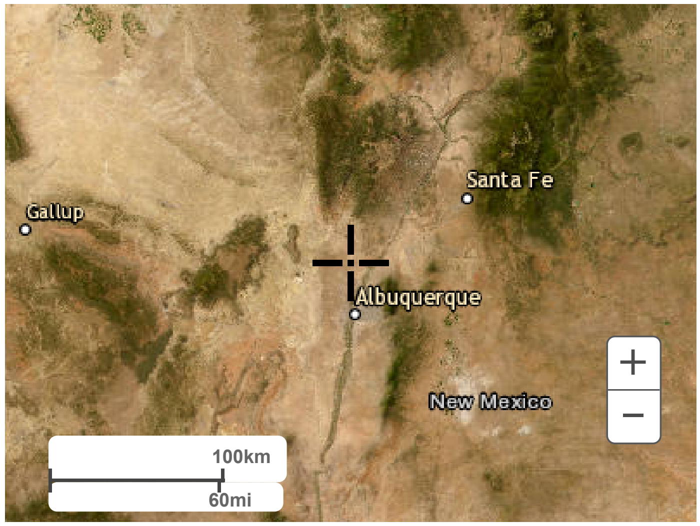

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Disclaimer

NOAA Atlas 14, Volume 1, Version 5
Location name: Rio Rancho, New Mexico, USA*
Latitude: 35.3279°, Longitude: -106.6483°
Elevation: m/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

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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	0.178 (0.153-0.206)	0.230 (0.198-0.267)	0.308 (0.265-0.358)	0.368 (0.315-0.427)	0.452 (0.385-0.524)	0.516 (0.437-0.598)	0.584 (0.491-0.676)	0.655 (0.547-0.758)	0.753 (0.622-0.872)	0.830 (0.681-0.962)
10-min	0.271 (0.232-0.313)	0.349 (0.301-0.406)	0.469 (0.403-0.545)	0.560 (0.479-0.650)	0.687 (0.585-0.797)	0.786 (0.665-0.911)	0.889 (0.747-1.03)	0.997 (0.833-1.15)	1.15 (0.947-1.33)	1.26 (1.04-1.46)
15-min	0.335 (0.288-0.388)	0.433 (0.372-0.503)	0.581 (0.500-0.676)	0.695 (0.594-0.806)	0.852 (0.725-0.988)	0.974 (0.824-1.13)	1.10 (0.926-1.28)	1.24 (1.03-1.43)	1.42 (1.17-1.65)	1.57 (1.29-1.82)
30-min	0.451 (0.388-0.523)	0.583 (0.502-0.677)	0.783 (0.672-0.910)	0.935 (0.800-1.09)	1.15 (0.976-1.33)	1.31 (1.11-1.52)	1.48 (1.25-1.72)	1.67 (1.39-1.93)	1.91 (1.58-2.22)	2.11 (1.73-2.44)
60-min	0.558 (0.480-0.647)	0.722 (0.621-0.838)	0.969 (0.832-1.13)	1.16 (0.990-1.34)	1.42 (1.21-1.65)	1.62 (1.37-1.88)	1.84 (1.54-2.13)	2.06 (1.72-2.38)	2.37 (1.96-2.74)	2.61 (2.14-3.03)
2-hr	0.643 (0.549-0.765)	0.825 (0.703-0.984)	1.09 (0.927-1.30)	1.31 (1.11-1.55)	1.60 (1.35-1.89)	1.84 (1.54-2.17)	2.09 (1.73-2.46)	2.36 (1.94-2.77)	2.73 (2.22-3.21)	3.03 (2.44-3.57)
3-hr	0.691 (0.595-0.818)	0.879 (0.754-1.04)	1.15 (0.985-1.36)	1.37 (1.16-1.61)	1.67 (1.41-1.96)	1.91 (1.61-2.24)	2.16 (1.81-2.54)	2.44 (2.02-2.86)	2.82 (2.31-3.30)	3.13 (2.54-3.67)
6-hr	0.800 (0.696-0.938)	1.01 (0.879-1.19)	1.30 (1.13-1.52)	1.53 (1.33-1.79)	1.85 (1.59-2.15)	2.09 (1.79-2.43)	2.35 (2.00-2.73)	2.62 (2.21-3.04)	2.99 (2.50-3.47)	3.29 (2.73-3.83)
12-hr	0.897 (0.790-1.02)	1.13 (0.996-1.29)	1.43 (1.26-1.64)	1.67 (1.46-1.90)	1.99 (1.74-2.26)	2.24 (1.94-2.55)	2.50 (2.15-2.84)	2.77 (2.37-3.15)	3.13 (2.65-3.56)	3.42 (2.87-3.90)
24-hr	1.04 (0.930-1.18)	1.31 (1.17-1.48)	1.64 (1.46-1.85)	1.90 (1.70-2.15)	2.26 (2.00-2.55)	2.53 (2.24-2.85)	2.82 (2.48-3.17)	3.11 (2.72-3.50)	3.51 (3.05-3.94)	3.82 (3.29-4.29)
2-day	1.12 (0.997-1.25)	1.40 (1.25-1.58)	1.76 (1.57-1.98)	2.04 (1.82-2.29)	2.43 (2.15-2.72)	2.72 (2.40-3.04)	3.03 (2.66-3.39)	3.34 (2.92-3.74)	3.76 (3.27-4.21)	4.09 (3.53-4.58)
3-day	1.23 (1.11-1.35)	1.53 (1.39-1.69)	1.90 (1.72-2.09)	2.19 (1.99-2.41)	2.58 (2.33-2.84)	2.88 (2.60-3.16)	3.18 (2.86-3.50)	3.49 (3.13-3.84)	3.90 (3.48-4.30)	4.22 (3.74-4.65)
4-day	1.34 (1.23-1.45)	1.66 (1.53-1.80)	2.04 (1.88-2.21)	2.33 (2.15-2.52)	2.73 (2.51-2.96)	3.03 (2.79-3.28)	3.34 (3.06-3.61)	3.65 (3.33-3.94)	4.05 (3.68-4.38)	4.36 (3.94-4.72)
7-day	1.54 (1.42-1.66)	1.90 (1.76-2.06)	2.32 (2.15-2.51)	2.64 (2.45-2.85)	3.07 (2.84-3.30)	3.39 (3.13-3.64)	3.70 (3.42-3.98)	4.01 (3.69-4.31)	4.40 (4.04-4.74)	4.69 (4.30-5.06)
10-day	1.69 (1.57-1.82)	2.10 (1.94-2.26)	2.57 (2.38-2.76)	2.93 (2.72-3.15)	3.42 (3.17-3.66)	3.78 (3.50-4.05)	4.15 (3.83-4.44)	4.51 (4.15-4.83)	4.97 (4.56-5.33)	5.32 (4.86-5.71)
20-day	2.14 (1.98-2.30)	2.65 (2.46-2.86)	3.22 (2.99-3.46)	3.64 (3.38-3.91)	4.19 (3.88-4.49)	4.58 (4.24-4.91)	4.96 (4.58-5.31)	5.32 (4.91-5.69)	5.77 (5.31-6.18)	6.08 (5.59-6.52)
30-day	2.57 (2.38-2.76)	3.19 (2.96-3.42)	3.83 (3.56-4.11)	4.31 (4.00-4.62)	4.91 (4.55-5.25)	5.33 (4.94-5.70)	5.73 (5.31-6.13)	6.11 (5.65-6.52)	6.56 (6.05-7.01)	6.87 (6.33-7.35)
45-day	3.13 (2.91-3.36)	3.87 (3.60-4.15)	4.61 (4.29-4.94)	5.14 (4.78-5.50)	5.78 (5.37-6.17)	6.21 (5.78-6.63)	6.60 (6.14-7.04)	6.95 (6.46-7.40)	7.33 (6.83-7.81)	7.57 (7.06-8.06)
60-day	3.60 (3.35-3.86)	4.45 (4.14-4.78)	5.30 (4.94-5.68)	5.91 (5.51-6.33)	6.64 (6.20-7.11)	7.14 (6.66-7.63)	7.60 (7.08-8.12)	8.00 (7.46-8.55)	8.45 (7.90-9.04)	8.74 (8.17-9.34)

[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.

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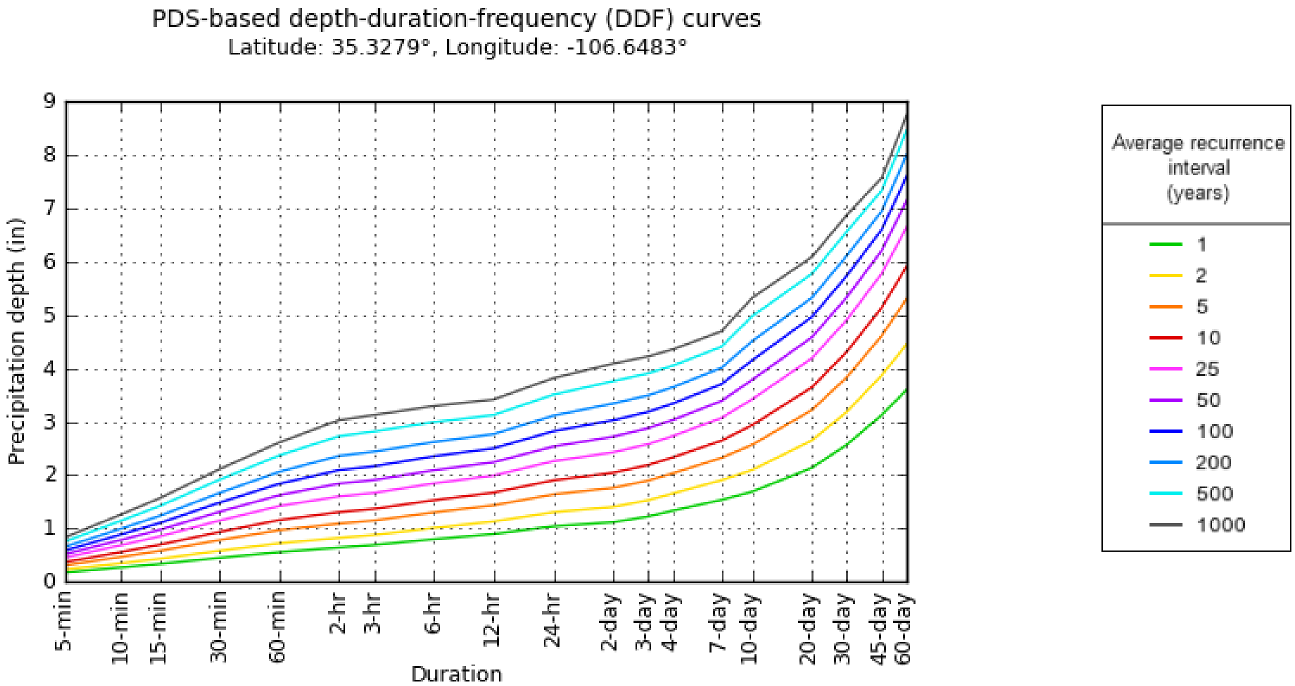
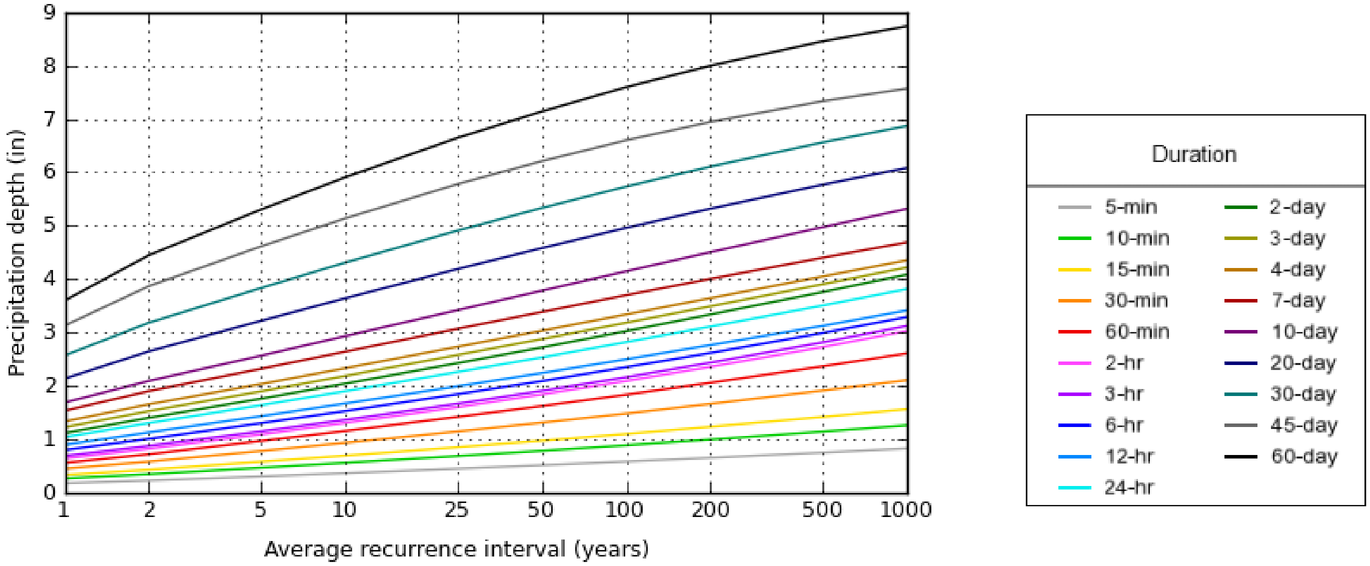
PF graphical





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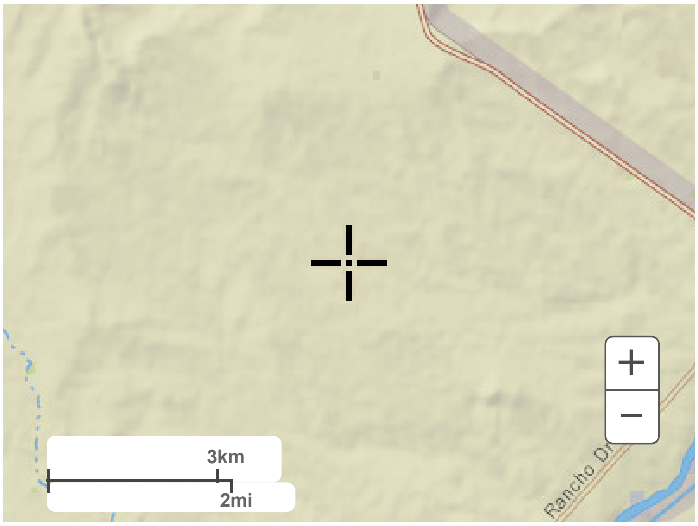
Small scale terrain



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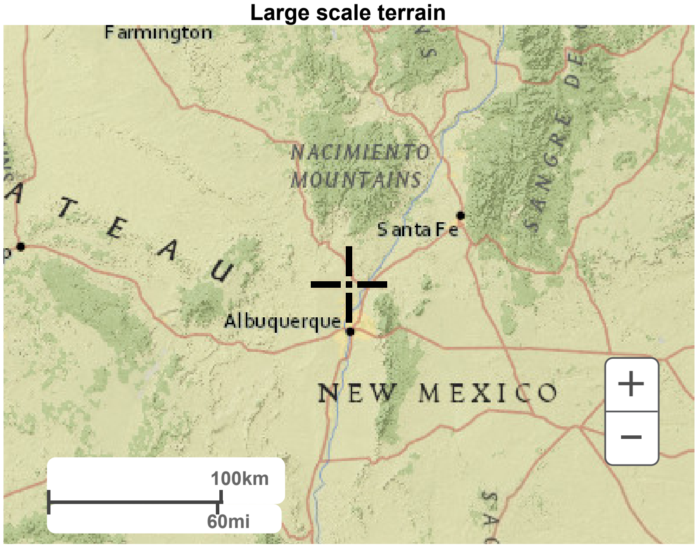

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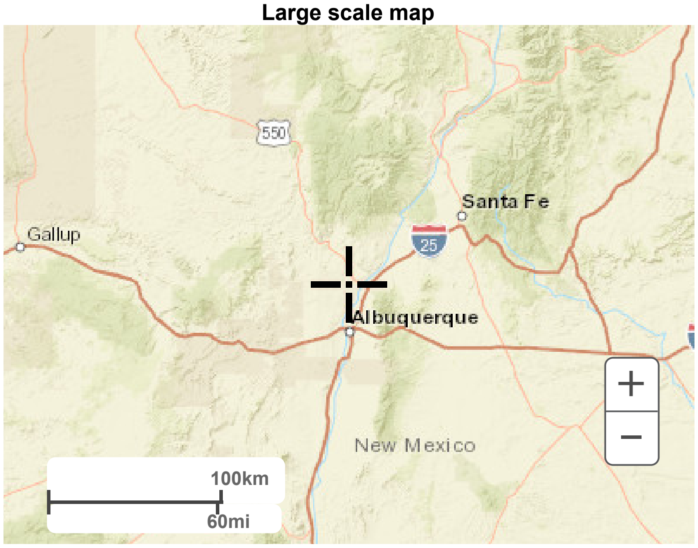

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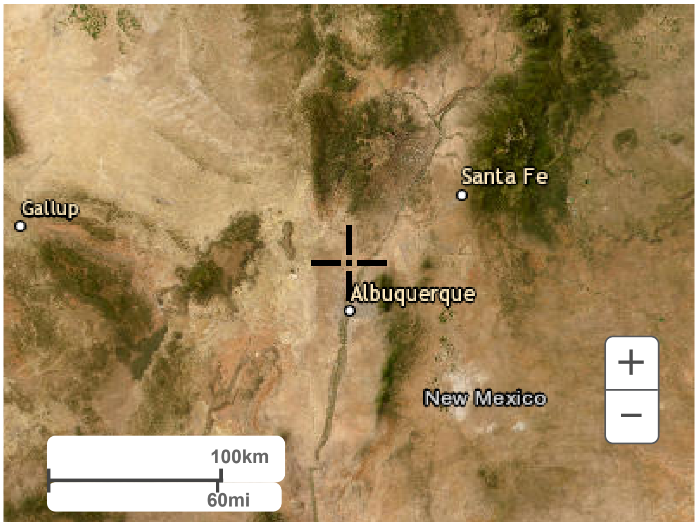

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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

NOAA Atlas 14, Volume 1, Version 5
Location name: Rio Rancho, New Mexico, USA*
Latitude: 35.3481°, Longitude: -106.6152°
Elevation: m/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	0.178 (0.153-0.205)	0.230 (0.199-0.266)	0.309 (0.267-0.358)	0.369 (0.317-0.426)	0.452 (0.387-0.522)	0.517 (0.440-0.597)	0.585 (0.494-0.674)	0.656 (0.551-0.756)	0.753 (0.626-0.869)	0.830 (0.685-0.958)
10-min	0.271 (0.234-0.313)	0.350 (0.303-0.405)	0.471 (0.406-0.545)	0.561 (0.483-0.648)	0.688 (0.589-0.795)	0.787 (0.669-0.908)	0.890 (0.752-1.03)	0.998 (0.839-1.15)	1.15 (0.952-1.32)	1.26 (1.04-1.46)
15-min	0.336 (0.290-0.388)	0.435 (0.376-0.502)	0.584 (0.503-0.675)	0.696 (0.599-0.803)	0.854 (0.731-0.985)	0.975 (0.830-1.13)	1.10 (0.932-1.27)	1.24 (1.04-1.43)	1.42 (1.18-1.64)	1.57 (1.29-1.81)
30-min	0.453 (0.390-0.523)	0.585 (0.506-0.676)	0.786 (0.678-0.909)	0.937 (0.806-1.08)	1.15 (0.984-1.33)	1.31 (1.12-1.52)	1.49 (1.25-1.71)	1.67 (1.40-1.92)	1.91 (1.59-2.21)	2.11 (1.74-2.43)
60-min	0.560 (0.483-0.647)	0.724 (0.626-0.836)	0.973 (0.839-1.13)	1.16 (0.998-1.34)	1.42 (1.22-1.64)	1.63 (1.38-1.88)	1.84 (1.55-2.12)	2.06 (1.73-2.38)	2.37 (1.97-2.73)	2.61 (2.15-3.01)
2-hr	0.640 (0.550-0.757)	0.822 (0.703-0.973)	1.09 (0.928-1.28)	1.30 (1.11-1.53)	1.59 (1.35-1.87)	1.83 (1.54-2.15)	2.08 (1.73-2.44)	2.35 (1.94-2.74)	2.71 (2.21-3.17)	3.01 (2.43-3.52)
3-hr	0.689 (0.596-0.810)	0.875 (0.756-1.03)	1.15 (0.987-1.34)	1.36 (1.16-1.59)	1.66 (1.41-1.94)	1.90 (1.61-2.22)	2.15 (1.81-2.51)	2.43 (2.02-2.83)	2.80 (2.31-3.26)	3.11 (2.54-3.62)
6-hr	0.798 (0.698-0.929)	1.01 (0.880-1.17)	1.30 (1.13-1.51)	1.53 (1.33-1.77)	1.84 (1.59-2.13)	2.08 (1.79-2.40)	2.34 (2.00-2.70)	2.61 (2.21-3.01)	2.98 (2.50-3.44)	3.28 (2.73-3.79)
12-hr	0.894 (0.792-1.02)	1.13 (0.998-1.28)	1.43 (1.26-1.62)	1.66 (1.46-1.88)	1.98 (1.74-2.24)	2.23 (1.94-2.52)	2.48 (2.15-2.81)	2.75 (2.37-3.11)	3.11 (2.65-3.52)	3.39 (2.87-3.85)
24-hr	1.03 (0.925-1.16)	1.29 (1.16-1.45)	1.62 (1.45-1.82)	1.88 (1.69-2.11)	2.24 (1.99-2.50)	2.50 (2.22-2.80)	2.79 (2.47-3.11)	3.08 (2.71-3.43)	3.46 (3.03-3.86)	3.77 (3.27-4.20)
2-day	1.12 (1.00-1.25)	1.40 (1.25-1.57)	1.76 (1.57-1.96)	2.04 (1.82-2.27)	2.41 (2.15-2.69)	2.70 (2.40-3.02)	3.01 (2.66-3.35)	3.32 (2.92-3.70)	3.73 (3.26-4.17)	4.05 (3.52-4.53)
3-day	1.21 (1.10-1.33)	1.51 (1.38-1.66)	1.87 (1.70-2.05)	2.15 (1.96-2.36)	2.53 (2.30-2.78)	2.82 (2.56-3.10)	3.12 (2.82-3.42)	3.42 (3.08-3.75)	3.82 (3.42-4.19)	4.12 (3.67-4.55)
4-day	1.31 (1.21-1.42)	1.62 (1.50-1.76)	1.98 (1.84-2.15)	2.27 (2.10-2.45)	2.65 (2.45-2.86)	2.94 (2.71-3.17)	3.23 (2.97-3.49)	3.52 (3.23-3.80)	3.91 (3.57-4.21)	4.19 (3.82-4.56)
7-day	1.50 (1.39-1.62)	1.86 (1.72-2.01)	2.26 (2.11-2.44)	2.57 (2.39-2.76)	2.98 (2.77-3.20)	3.28 (3.05-3.52)	3.58 (3.32-3.84)	3.86 (3.58-4.14)	4.23 (3.91-4.55)	4.50 (4.15-4.84)
10-day	1.66 (1.54-1.78)	2.05 (1.90-2.21)	2.51 (2.33-2.69)	2.86 (2.66-3.07)	3.33 (3.09-3.56)	3.68 (3.41-3.93)	4.03 (3.73-4.30)	4.37 (4.03-4.67)	4.81 (4.43-5.14)	5.13 (4.71-5.49)
20-day	2.08 (1.93-2.24)	2.58 (2.40-2.78)	3.13 (2.91-3.36)	3.54 (3.29-3.80)	4.07 (3.78-4.35)	4.44 (4.12-4.75)	4.81 (4.45-5.13)	5.14 (4.76-5.49)	5.57 (5.15-5.94)	5.86 (5.41-6.27)
30-day	2.50 (2.32-2.68)	3.10 (2.88-3.32)	3.72 (3.47-3.99)	4.18 (3.89-4.47)	4.76 (4.42-5.07)	5.16 (4.79-5.50)	5.54 (5.14-5.90)	5.89 (5.47-6.27)	6.31 (5.85-6.71)	6.60 (6.11-7.03)
45-day	3.03 (2.83-3.25)	3.75 (3.50-4.01)	4.46 (4.16-4.76)	4.96 (4.63-5.29)	5.57 (5.20-5.93)	5.98 (5.58-6.35)	6.34 (5.92-6.72)	6.65 (6.22-7.05)	6.99 (6.55-7.40)	7.18 (6.76-7.59)
60-day	3.48 (3.25-3.73)	4.31 (4.02-4.61)	5.13 (4.79-5.47)	5.70 (5.33-6.08)	6.40 (5.98-6.82)	6.87 (6.43-7.31)	7.29 (6.82-7.76)	7.66 (7.18-8.15)	8.07 (7.57-8.57)	8.31 (7.82-8.82)

[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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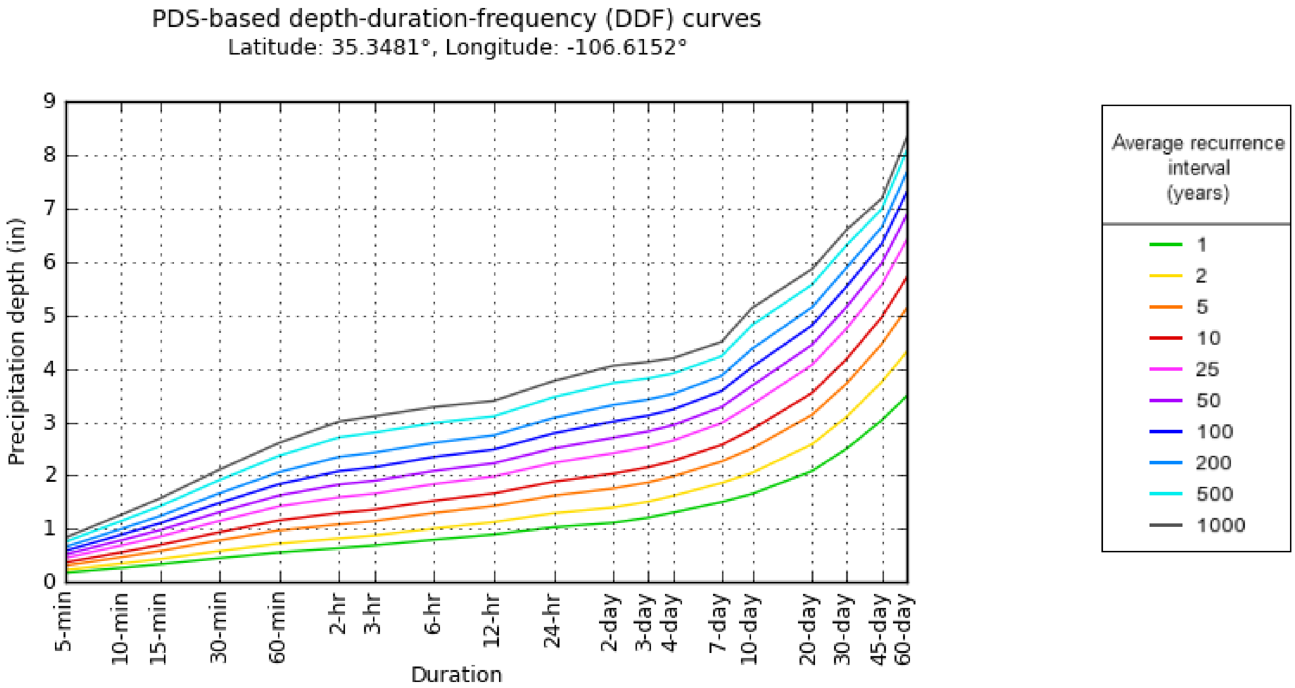
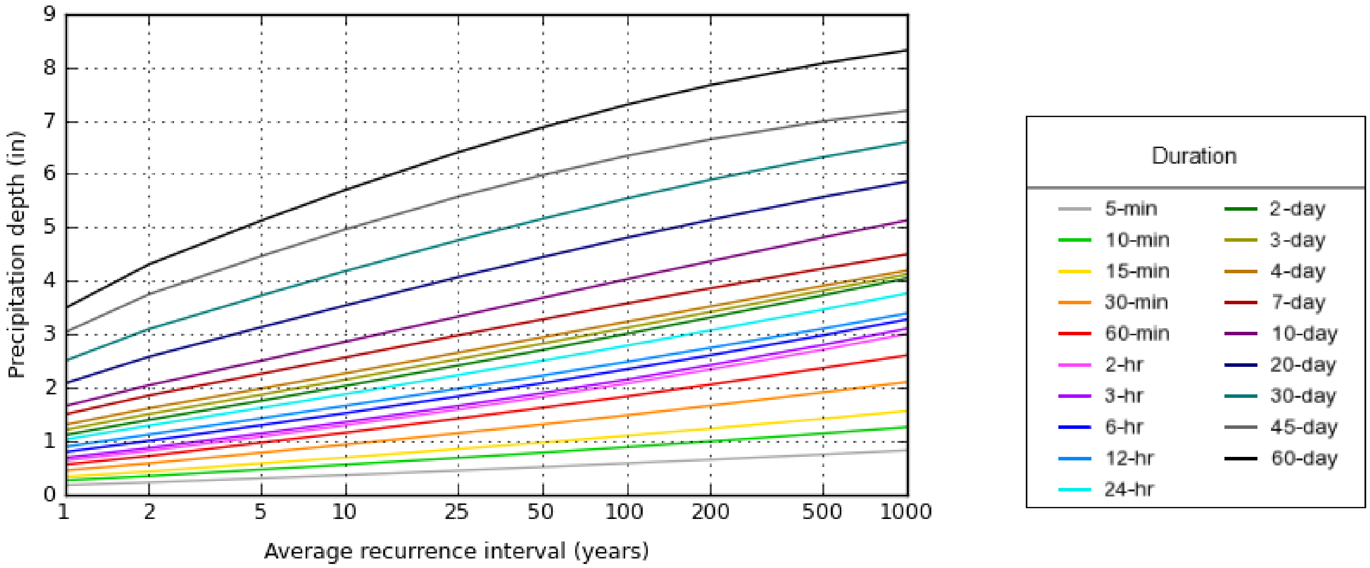
PF graphical





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Created (GMT): Tue May 16 17:21:09 2023

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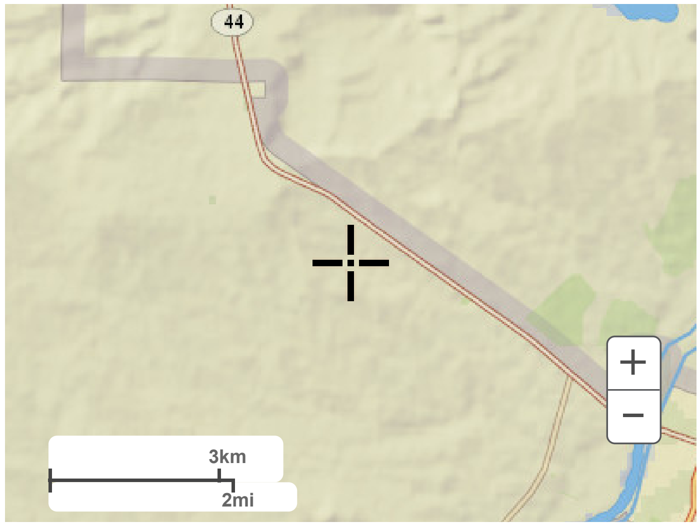
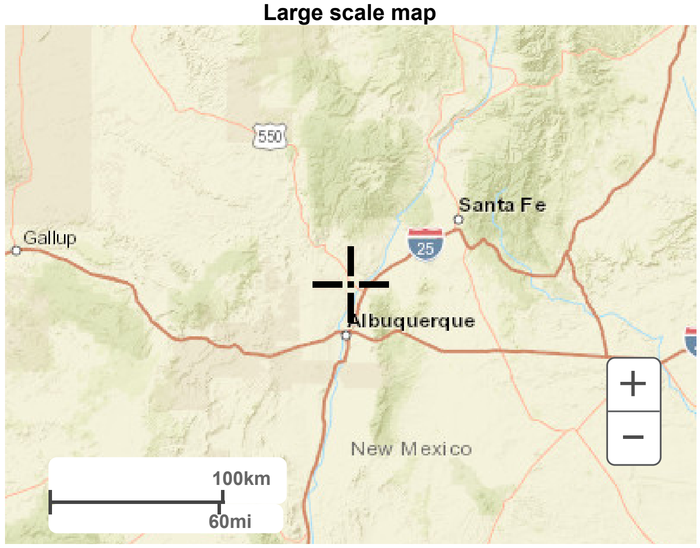
Maps & aerials

Small scale terrain

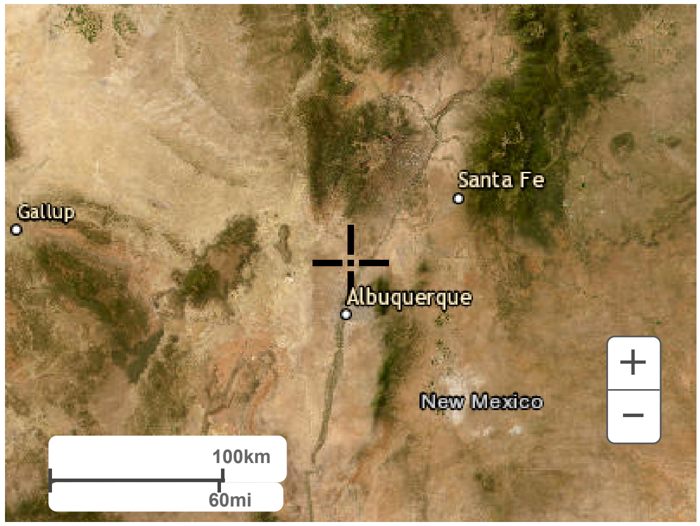


Large scale terrain

Large scale map



Large scale aerial



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Disclaimer

NOAA Atlas 14, Volume 1, Version 5
Location name: Rio Rancho, New Mexico, USA*
Latitude: 35.3244°, Longitude: -106.6107°
Elevation: m/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	**0.176** (0.151-0.203)	**0.227** (0.196-0.263)	**0.305** (0.263-0.354)	**0.364** (0.313-0.421)	**0.447** (0.381-0.517)	**0.510** (0.433-0.591)	**0.578** (0.486-0.668)	**0.648** (0.543-0.750)	**0.745** (0.617-0.862)	**0.821** (0.675-0.950)
10-min	**0.268** (0.230-0.310)	**0.346** (0.299-0.400)	**0.465** (0.400-0.539)	**0.554** (0.475-0.641)	**0.680** (0.580-0.787)	**0.777** (0.659-0.900)	**0.879** (0.741-1.02)	**0.987** (0.827-1.14)	**1.13** (0.939-1.31)	**1.25** (1.03-1.45)
15-min	**0.332** (0.286-0.384)	**0.429** (0.370-0.496)	**0.576** (0.495-0.668)	**0.687** (0.589-0.795)	**0.843** (0.720-0.976)	**0.963** (0.817-1.12)	**1.09** (0.918-1.26)	**1.22** (1.02-1.42)	**1.41** (1.17-1.63)	**1.55** (1.27-1.79)
30-min	**0.447** (0.385-0.517)	**0.578** (0.498-0.668)	**0.775** (0.668-0.899)	**0.925** (0.794-1.07)	**1.14** (0.969-1.31)	**1.30** (1.10-1.50)	**1.47** (1.24-1.70)	**1.65** (1.38-1.91)	**1.89** (1.57-2.19)	**2.09** (1.72-2.42)
60-min	**0.553** (0.476-0.640)	**0.715** (0.616-0.827)	**0.959** (0.826-1.11)	**1.15** (0.982-1.33)	**1.41** (1.20-1.63)	**1.61** (1.36-1.86)	**1.82** (1.53-2.10)	**2.04** (1.71-2.36)	**2.34** (1.94-2.71)	**2.58** (2.12-2.99)
2-hr	**0.634** (0.543-0.753)	**0.813** (0.693-0.969)	**1.08** (0.915-1.28)	**1.29** (1.09-1.52)	**1.58** (1.33-1.86)	**1.81** (1.52-2.13)	**2.06** (1.71-2.42)	**2.32** (1.91-2.73)	**2.69** (2.19-3.16)	**2.98** (2.40-3.51)
3-hr	**0.684** (0.589-0.807)	**0.868** (0.748-1.02)	**1.14** (0.976-1.34)	**1.35** (1.15-1.58)	**1.65** (1.39-1.93)	**1.89** (1.59-2.21)	**2.14** (1.79-2.50)	**2.41** (2.00-2.81)	**2.78** (2.28-3.24)	**3.09** (2.51-3.61)
6-hr	**0.792** (0.689-0.926)	**0.999** (0.870-1.17)	**1.29** (1.12-1.50)	**1.51** (1.31-1.76)	**1.82** (1.57-2.12)	**2.07** (1.77-2.39)	**2.32** (1.98-2.69)	**2.59** (2.19-3.00)	**2.96** (2.47-3.42)	**3.25** (2.70-3.77)
12-hr	**0.887** (0.784-1.01)	**1.12** (0.988-1.27)	**1.42** (1.25-1.61)	**1.65** (1.45-1.87)	**1.97** (1.72-2.23)	**2.21** (1.92-2.50)	**2.47** (2.13-2.79)	**2.73** (2.34-3.09)	**3.08** (2.62-3.49)	**3.37** (2.84-3.83)
24-hr	**1.02** (0.916-1.15)	**1.28** (1.15-1.44)	**1.61** (1.44-1.81)	**1.87** (1.67-2.09)	**2.21** (1.97-2.48)	**2.48** (2.20-2.78)	**2.76** (2.44-3.09)	**3.04** (2.67-3.41)	**3.43** (2.99-3.83)	**3.72** (3.23-4.17)
2-day	**1.10** (0.984-1.23)	**1.38** (1.23-1.54)	**1.72** (1.54-1.93)	**2.00** (1.79-2.23)	**2.37** (2.11-2.65)	**2.65** (2.36-2.96)	**2.94** (2.61-3.29)	**3.24** (2.86-3.62)	**3.64** (3.19-4.08)	**3.95** (3.44-4.43)
3-day	**1.20** (1.09-1.32)	**1.49** (1.36-1.64)	**1.84** (1.68-2.03)	**2.12** (1.93-2.33)	**2.50** (2.27-2.74)	**2.78** (2.52-3.05)	**3.07** (2.78-3.37)	**3.37** (3.03-3.69)	**3.76** (3.36-4.13)	**4.05** (3.61-4.46)
4-day	**1.29** (1.19-1.40)	**1.60** (1.48-1.74)	**1.96** (1.82-2.12)	**2.25** (2.08-2.42)	**2.63** (2.42-2.83)	**2.91** (2.68-3.14)	**3.20** (2.94-3.45)	**3.49** (3.20-3.76)	**3.87** (3.53-4.17)	**4.16** (3.78-4.49)
7-day	**1.48** (1.37-1.60)	**1.83** (1.70-1.98)	**2.23** (2.08-2.40)	**2.54** (2.36-2.73)	**2.94** (2.73-3.15)	**3.23** (3.01-3.47)	**3.53** (3.28-3.79)	**3.81** (3.54-4.09)	**4.18** (3.86-4.49)	**4.44** (4.10-4.78)
10-day	**1.63** (1.52-1.76)	**2.02** (1.88-2.17)	**2.47** (2.30-2.65)	**2.83** (2.63-3.02)	**3.29** (3.05-3.51)	**3.64** (3.37-3.88)	**3.98** (3.68-4.24)	**4.32** (3.98-4.60)	**4.76** (4.37-5.08)	**5.08** (4.65-5.42)
20-day	**2.05** (1.90-2.20)	**2.54** (2.36-2.73)	**3.08** (2.86-3.31)	**3.48** (3.23-3.73)	**4.00** (3.72-4.28)	**4.37** (4.06-4.67)	**4.72** (4.38-5.04)	**5.06** (4.68-5.40)	**5.47** (5.06-5.85)	**5.76** (5.33-6.16)
30-day	**2.46** (2.28-2.63)	**3.05** (2.83-3.27)	**3.66** (3.40-3.92)	**4.11** (3.82-4.39)	**4.67** (4.34-4.98)	**5.07** (4.70-5.40)	**5.45** (5.05-5.79)	**5.79** (5.36-6.16)	**6.21** (5.74-6.60)	**6.49** (5.99-6.90)
45-day	**2.98** (2.77-3.19)	**3.68** (3.43-3.94)	**4.38** (4.08-4.67)	**4.87** (4.54-5.19)	**5.47** (5.09-5.82)	**5.87** (5.47-6.23)	**6.22** (5.80-6.60)	**6.53** (6.09-6.91)	**6.86** (6.42-7.26)	**7.05** (6.62-7.45)
60-day	**3.42** (3.19-3.67)	**4.23** (3.94-4.53)	**5.03** (4.70-5.38)	**5.60** (5.23-5.98)	**6.28** (5.87-6.70)	**6.74** (6.31-7.18)	**7.16** (6.70-7.63)	**7.53** (7.05-8.02)	**7.93** (7.44-8.44)	**8.17** (7.68-8.68)

[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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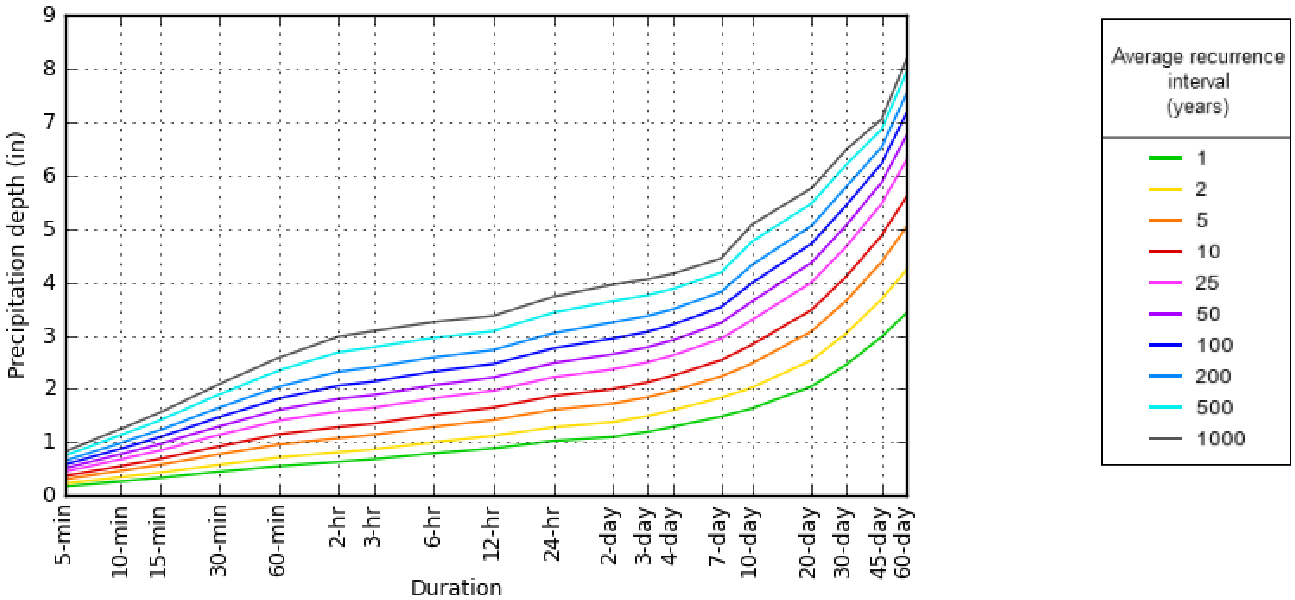
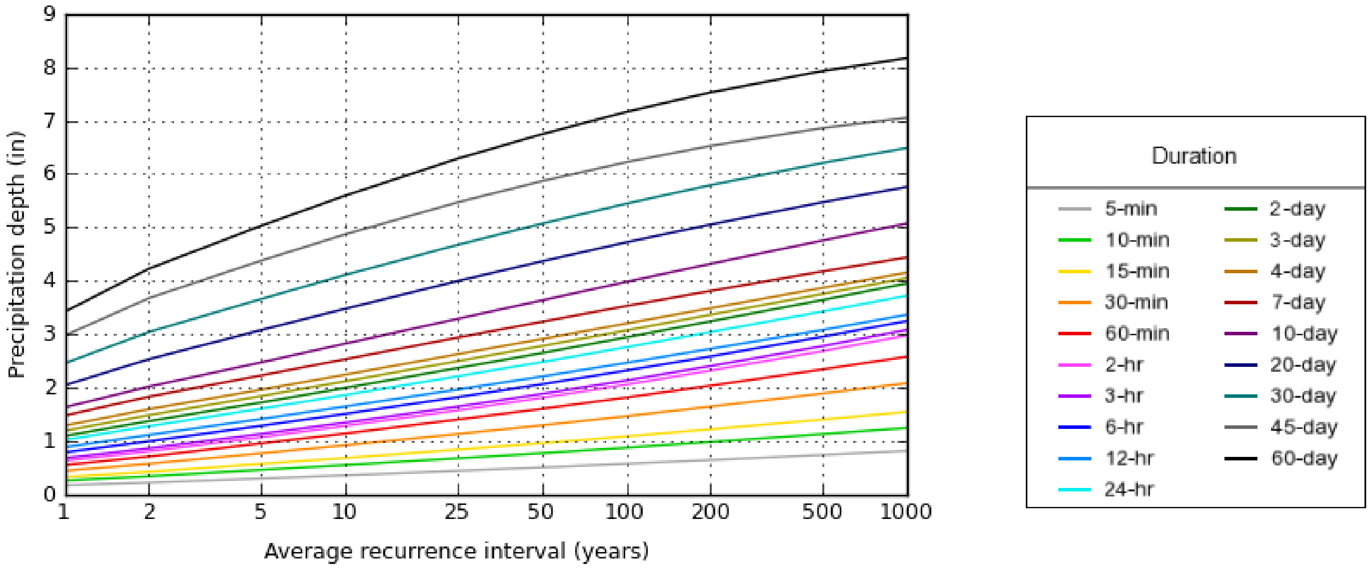
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 35.3244°, Longitude: -106.6107°





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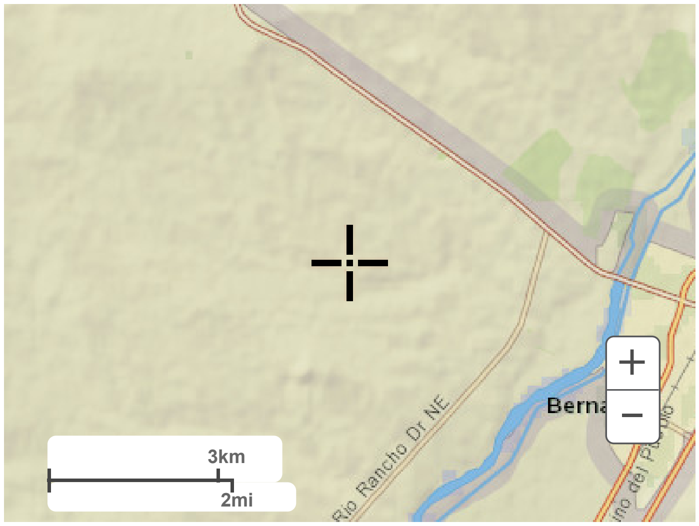
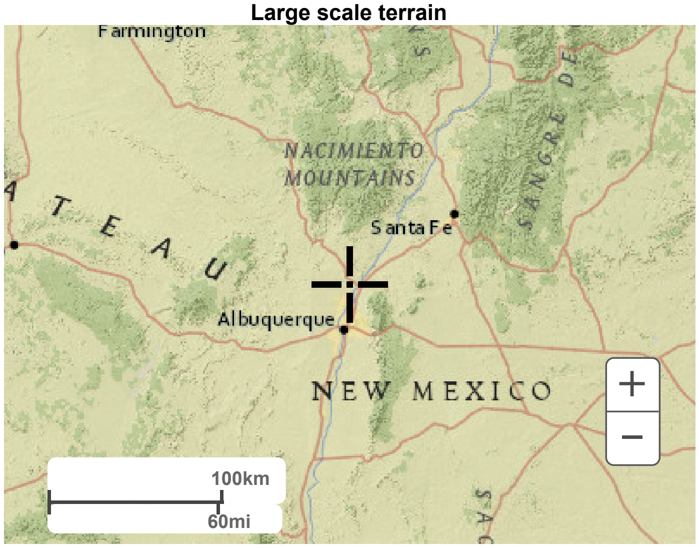
Maps & aerials

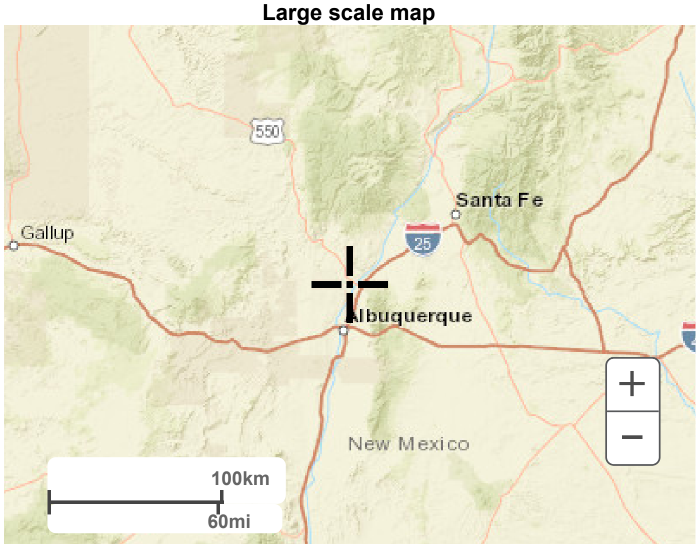
Small scale terrain



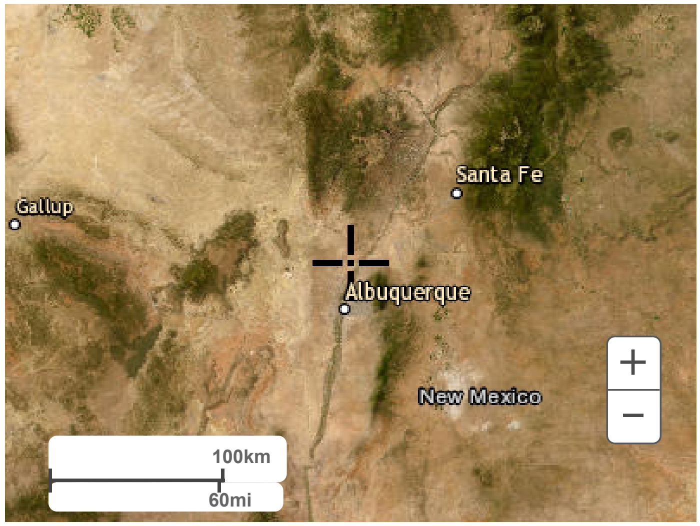
Large scale terrain



Large scale map



Large scale aerial



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

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NOAA Atlas 14, Volume 1, Version 5
Location name: Bernalillo, New Mexico, USA*
Latitude: 35.3177°, Longitude: -106.5822°
Elevation: m/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	0.174 (0.150-0.201)	0.225 (0.194-0.260)	0.302 (0.260-0.350)	0.360 (0.309-0.417)	0.442 (0.377-0.512)	0.505 (0.428-0.585)	0.572 (0.481-0.662)	0.642 (0.537-0.742)	0.737 (0.611-0.853)	0.813 (0.668-0.941)
10-min	0.265 (0.228-0.306)	0.342 (0.295-0.396)	0.459 (0.395-0.533)	0.548 (0.470-0.634)	0.673 (0.574-0.779)	0.769 (0.652-0.891)	0.870 (0.732-1.01)	0.977 (0.818-1.13)	1.12 (0.929-1.30)	1.24 (1.02-1.43)
15-min	0.328 (0.283-0.379)	0.424 (0.366-0.491)	0.569 (0.490-0.660)	0.680 (0.583-0.786)	0.834 (0.712-0.966)	0.953 (0.808-1.11)	1.08 (0.908-1.25)	1.21 (1.01-1.40)	1.39 (1.15-1.61)	1.53 (1.26-1.78)
30-min	0.442 (0.381-0.511)	0.571 (0.493-0.661)	0.767 (0.660-0.889)	0.915 (0.785-1.06)	1.12 (0.959-1.30)	1.28 (1.09-1.49)	1.45 (1.22-1.68)	1.63 (1.37-1.89)	1.87 (1.55-2.17)	2.07 (1.70-2.39)
60-min	0.547 (0.471-0.633)	0.707 (0.610-0.818)	0.949 (0.817-1.10)	1.13 (0.972-1.31)	1.39 (1.19-1.61)	1.59 (1.35-1.84)	1.80 (1.51-2.08)	2.02 (1.69-2.34)	2.32 (1.92-2.68)	2.56 (2.10-2.96)
2-hr	0.628 (0.537-0.745)	0.805 (0.686-0.960)	1.06 (0.905-1.26)	1.27 (1.08-1.51)	1.56 (1.31-1.84)	1.79 (1.50-2.11)	2.04 (1.69-2.40)	2.30 (1.89-2.70)	2.66 (2.16-3.12)	2.95 (2.37-3.47)
3-hr	0.679 (0.585-0.801)	0.862 (0.742-1.01)	1.13 (0.970-1.33)	1.34 (1.14-1.57)	1.63 (1.38-1.91)	1.87 (1.58-2.19)	2.12 (1.77-2.47)	2.39 (1.98-2.79)	2.76 (2.26-3.21)	3.06 (2.48-3.58)
6-hr	0.788 (0.686-0.920)	0.993 (0.865-1.16)	1.28 (1.11-1.49)	1.50 (1.30-1.75)	1.81 (1.56-2.10)	2.05 (1.76-2.37)	2.30 (1.96-2.67)	2.57 (2.17-2.97)	2.93 (2.45-3.39)	3.22 (2.67-3.73)
12-hr	0.882 (0.781-1.00)	1.11 (0.983-1.26)	1.41 (1.24-1.60)	1.64 (1.44-1.86)	1.95 (1.71-2.21)	2.19 (1.91-2.48)	2.44 (2.11-2.77)	2.70 (2.32-3.06)	3.05 (2.60-3.46)	3.33 (2.81-3.79)
24-hr	1.01 (0.908-1.14)	1.27 (1.14-1.42)	1.59 (1.42-1.78)	1.84 (1.65-2.06)	2.18 (1.94-2.44)	2.44 (2.17-2.74)	2.72 (2.41-3.04)	3.00 (2.64-3.34)	3.37 (2.95-3.76)	3.66 (3.18-4.09)
2-day	1.09 (0.975-1.21)	1.36 (1.22-1.52)	1.70 (1.53-1.90)	1.97 (1.77-2.19)	2.33 (2.08-2.59)	2.60 (2.32-2.90)	2.88 (2.57-3.21)	3.17 (2.81-3.54)	3.56 (3.13-3.97)	3.85 (3.38-4.30)
3-day	1.18 (1.07-1.29)	1.47 (1.34-1.61)	1.81 (1.66-1.99)	2.09 (1.90-2.29)	2.45 (2.23-2.69)	2.73 (2.48-2.99)	3.01 (2.73-3.30)	3.30 (2.97-3.61)	3.68 (3.30-4.03)	3.96 (3.54-4.35)
4-day	1.27 (1.17-1.38)	1.57 (1.45-1.71)	1.93 (1.79-2.09)	2.21 (2.04-2.38)	2.58 (2.38-2.78)	2.86 (2.64-3.08)	3.14 (2.89-3.39)	3.42 (3.14-3.68)	3.80 (3.47-4.09)	4.07 (3.71-4.40)
7-day	1.45 (1.35-1.56)	1.80 (1.67-1.94)	2.19 (2.04-2.36)	2.48 (2.32-2.67)	2.88 (2.68-3.08)	3.17 (2.95-3.39)	3.45 (3.21-3.70)	3.73 (3.47-4.00)	4.08 (3.79-4.38)	4.34 (4.01-4.66)
10-day	1.60 (1.49-1.72)	1.98 (1.84-2.13)	2.42 (2.26-2.59)	2.77 (2.58-2.96)	3.22 (2.99-3.43)	3.56 (3.30-3.79)	3.89 (3.61-4.14)	4.22 (3.90-4.49)	4.65 (4.28-4.95)	4.96 (4.55-5.29)
20-day	2.00 (1.85-2.15)	2.47 (2.30-2.67)	3.00 (2.79-3.22)	3.39 (3.15-3.63)	3.89 (3.62-4.16)	4.25 (3.95-4.54)	4.60 (4.27-4.90)	4.92 (4.56-5.25)	5.32 (4.93-5.68)	5.60 (5.18-5.98)
30-day	2.39 (2.22-2.56)	2.96 (2.75-3.17)	3.56 (3.31-3.80)	4.00 (3.71-4.26)	4.54 (4.22-4.83)	4.92 (4.57-5.24)	5.28 (4.90-5.62)	5.62 (5.21-5.97)	6.01 (5.57-6.38)	6.28 (5.81-6.68)
45-day	2.89 (2.69-3.09)	3.57 (3.33-3.82)	4.25 (3.96-4.53)	4.72 (4.40-5.03)	5.29 (4.94-5.63)	5.68 (5.30-6.02)	6.01 (5.62-6.37)	6.30 (5.90-6.67)	6.61 (6.21-6.99)	6.79 (6.39-7.16)
60-day	3.32 (3.10-3.56)	4.11 (3.83-4.39)	4.88 (4.56-5.21)	5.43 (5.07-5.79)	6.09 (5.69-6.49)	6.53 (6.11-6.95)	6.93 (6.49-7.37)	7.28 (6.82-7.74)	7.66 (7.20-8.14)	7.88 (7.42-8.37)

[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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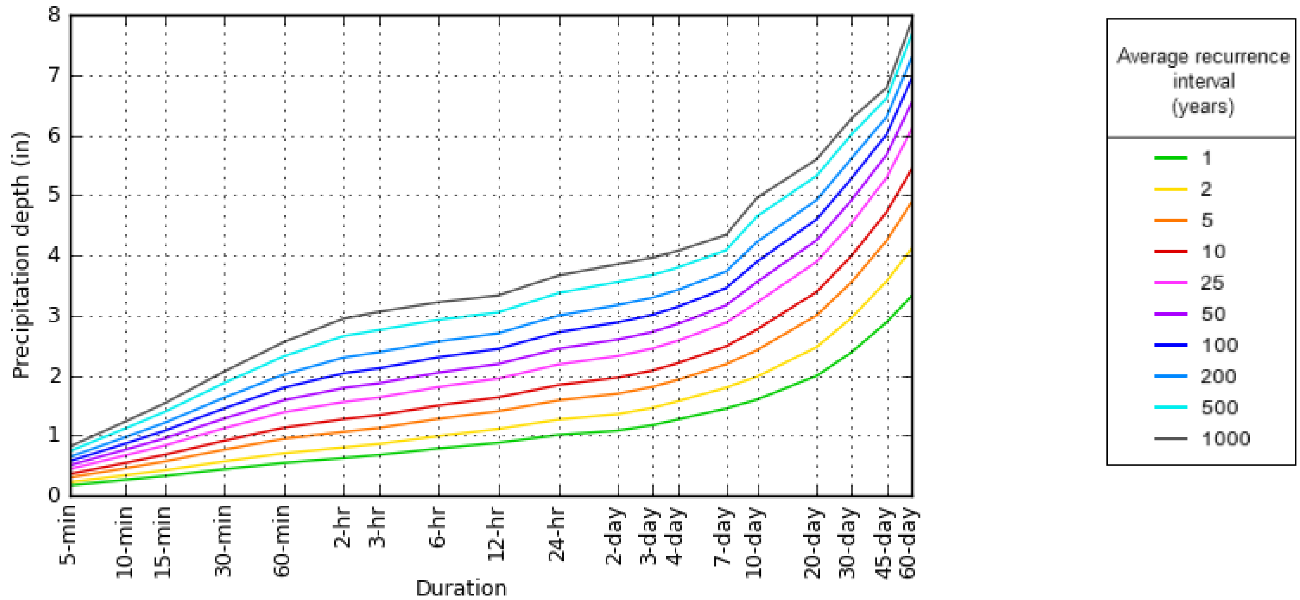
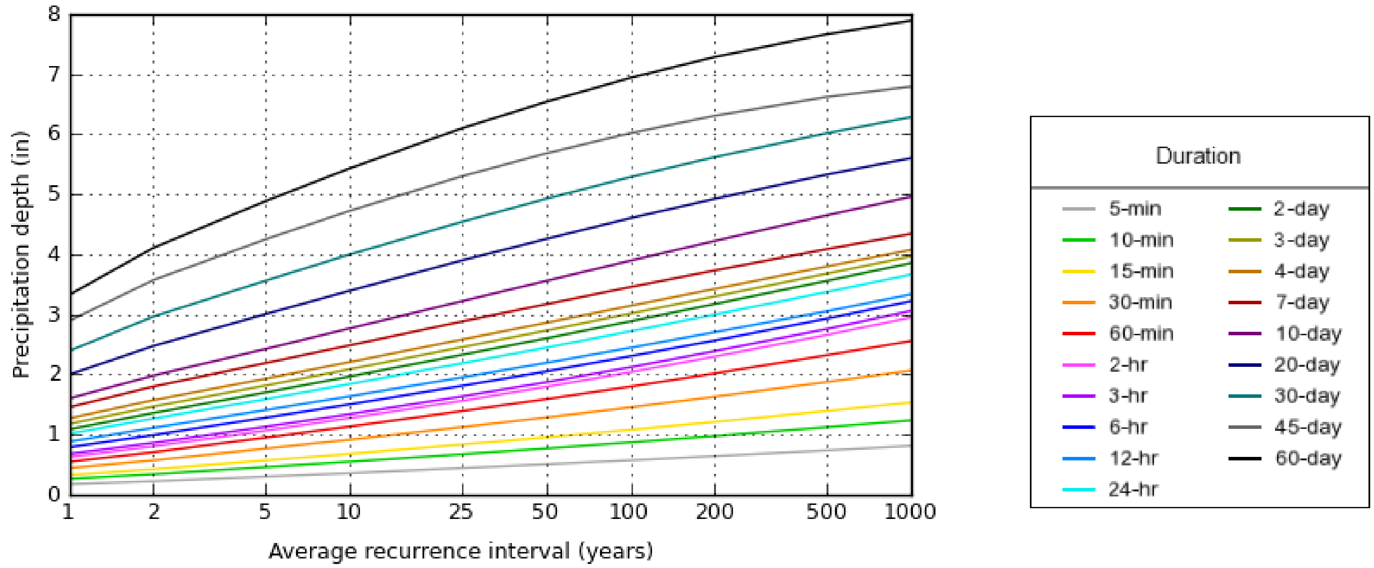
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 35.3177°, Longitude: -106.5822°





NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Tue May 16 17:22:02 2023

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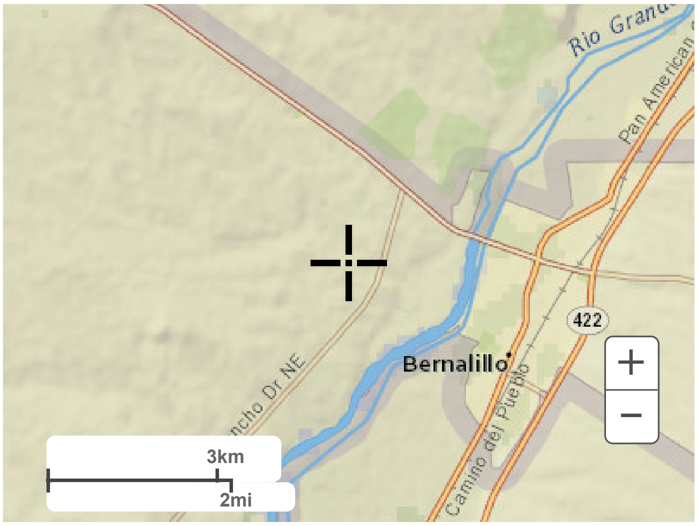
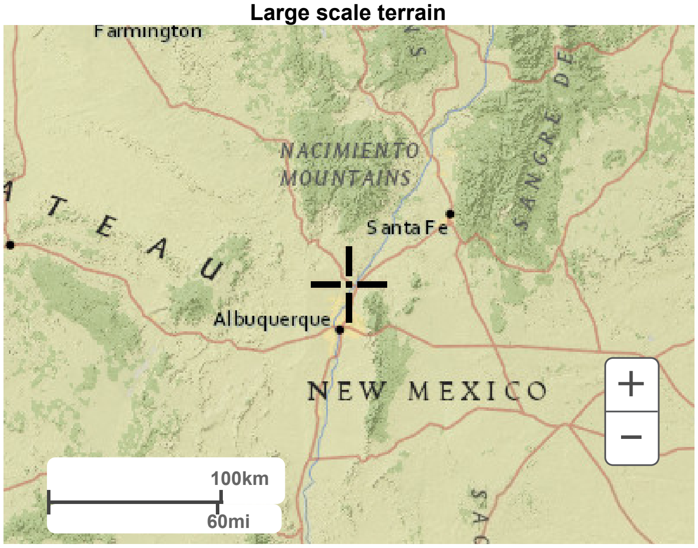
Maps & aerials

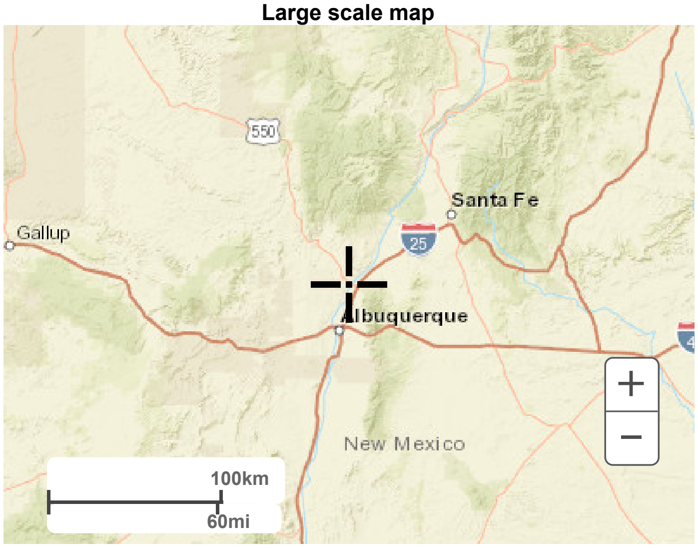
Small scale terrain



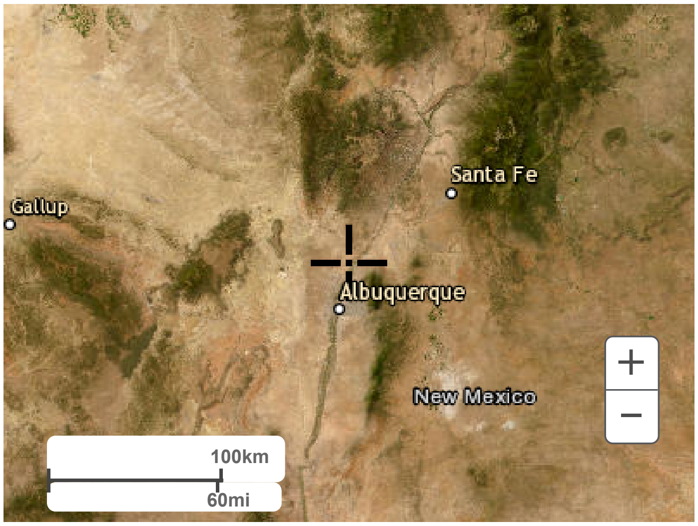
Large scale terrain



Large scale map



Large scale aerial



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Disclaimer

NOAA Atlas 14, Volume 1, Version 5
Location name: Rio Rancho, New Mexico, USA*
Latitude: 35.3354°, Longitude: -106.5911°
Elevation: m/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	**0.176** (0.151-0.202)	**0.227** (0.196-0.261)	**0.304** (0.263-0.352)	**0.363** (0.312-0.419)	**0.445** (0.381-0.515)	**0.509** (0.432-0.588)	**0.576** (0.486-0.665)	**0.646** (0.542-0.746)	**0.742** (0.616-0.857)	**0.817** (0.674-0.945)
10-min	**0.267** (0.230-0.308)	**0.345** (0.299-0.398)	**0.463** (0.400-0.536)	**0.552** (0.475-0.637)	**0.678** (0.580-0.784)	**0.774** (0.659-0.896)	**0.876** (0.740-1.01)	**0.983** (0.826-1.14)	**1.13** (0.938-1.30)	**1.24** (1.03-1.44)
15-min	**0.331** (0.285-0.382)	**0.428** (0.370-0.494)	**0.574** (0.496-0.664)	**0.685** (0.589-0.790)	**0.840** (0.720-0.971)	**0.960** (0.817-1.11)	**1.09** (0.917-1.25)	**1.22** (1.02-1.41)	**1.40** (1.16-1.62)	**1.54** (1.27-1.78)
30-min	**0.446** (0.384-0.514)	**0.576** (0.499-0.665)	**0.773** (0.668-0.895)	**0.922** (0.794-1.06)	**1.13** (0.969-1.31)	**1.29** (1.10-1.50)	**1.46** (1.24-1.69)	**1.64** (1.38-1.90)	**1.89** (1.57-2.18)	**2.08** (1.71-2.40)
60-min	**0.552** (0.476-0.637)	**0.713** (0.617-0.823)	**0.957** (0.826-1.11)	**1.14** (0.982-1.32)	**1.40** (1.20-1.62)	**1.60** (1.36-1.85)	**1.81** (1.53-2.09)	**2.03** (1.71-2.35)	**2.33** (1.94-2.70)	**2.57** (2.12-2.97)
2-hr	**0.631** (0.542-0.746)	**0.810** (0.693-0.961)	**1.07** (0.913-1.27)	**1.28** (1.09-1.51)	**1.57** (1.32-1.84)	**1.80** (1.51-2.12)	**2.05** (1.71-2.40)	**2.31** (1.91-2.70)	**2.67** (2.18-3.13)	**2.96** (2.39-3.48)
3-hr	**0.682** (0.589-0.801)	**0.866** (0.748-1.01)	**1.13** (0.976-1.33)	**1.35** (1.15-1.57)	**1.64** (1.39-1.91)	**1.88** (1.59-2.19)	**2.13** (1.79-2.47)	**2.40** (1.99-2.79)	**2.77** (2.28-3.22)	**3.07** (2.50-3.58)
6-hr	**0.790** (0.690-0.919)	**0.996** (0.871-1.16)	**1.28** (1.12-1.49)	**1.51** (1.31-1.75)	**1.82** (1.57-2.10)	**2.06** (1.77-2.37)	**2.31** (1.98-2.67)	**2.57** (2.18-2.97)	**2.94** (2.46-3.39)	**3.23** (2.69-3.73)
12-hr	**0.885** (0.785-1.00)	**1.12** (0.989-1.26)	**1.41** (1.25-1.60)	**1.64** (1.45-1.86)	**1.96** (1.72-2.21)	**2.20** (1.92-2.49)	**2.46** (2.13-2.77)	**2.72** (2.34-3.07)	**3.07** (2.61-3.47)	**3.35** (2.83-3.80)
24-hr	**1.02** (0.914-1.14)	**1.27** (1.15-1.43)	**1.60** (1.43-1.79)	**1.85** (1.66-2.07)	**2.20** (1.96-2.45)	**2.46** (2.19-2.75)	**2.74** (2.43-3.05)	**3.02** (2.66-3.36)	**3.40** (2.97-3.78)	**3.69** (3.21-4.12)
2-day	**1.10** (0.985-1.22)	**1.37** (1.24-1.53)	**1.72** (1.54-1.92)	**1.99** (1.79-2.22)	**2.36** (2.11-2.62)	**2.64** (2.36-2.94)	**2.93** (2.61-3.26)	**3.22** (2.86-3.59)	**3.62** (3.18-4.04)	**3.92** (3.44-4.38)
3-day	**1.19** (1.08-1.31)	**1.48** (1.35-1.63)	**1.83** (1.67-2.01)	**2.11** (1.92-2.31)	**2.48** (2.26-2.71)	**2.76** (2.51-3.02)	**3.05** (2.76-3.34)	**3.34** (3.01-3.65)	**3.72** (3.34-4.08)	**4.02** (3.59-4.41)
4-day	**1.28** (1.18-1.39)	**1.59** (1.47-1.72)	**1.94** (1.80-2.10)	**2.22** (2.06-2.40)	**2.60** (2.40-2.80)	**2.88** (2.66-3.11)	**3.17** (2.91-3.42)	**3.45** (3.16-3.72)	**3.83** (3.49-4.13)	**4.11** (3.74-4.44)
7-day	**1.46** (1.36-1.58)	**1.81** (1.68-1.96)	**2.21** (2.06-2.38)	**2.51** (2.34-2.69)	**2.91** (2.70-3.11)	**3.20** (2.98-3.43)	**3.49** (3.24-3.74)	**3.77** (3.50-4.04)	**4.13** (3.82-4.43)	**4.39** (4.05-4.71)
10-day	**1.62** (1.50-1.74)	**2.00** (1.86-2.15)	**2.44** (2.28-2.62)	**2.79** (2.60-2.99)	**3.25** (3.02-3.47)	**3.59** (3.33-3.83)	**3.93** (3.64-4.18)	**4.27** (3.94-4.54)	**4.70** (4.32-5.01)	**5.01** (4.60-5.35)
20-day	**2.02** (1.87-2.17)	**2.50** (2.33-2.70)	**3.04** (2.83-3.26)	**3.43** (3.19-3.68)	**3.94** (3.67-4.22)	**4.31** (4.00-4.60)	**4.66** (4.32-4.97)	**4.99** (4.62-5.32)	**5.39** (4.99-5.76)	**5.68** (5.25-6.07)
30-day	**2.42** (2.25-2.60)	**3.00** (2.79-3.22)	**3.61** (3.35-3.86)	**4.05** (3.76-4.32)	**4.60** (4.28-4.90)	**4.99** (4.64-5.32)	**5.36** (4.97-5.70)	**5.70** (5.29-6.06)	**6.11** (5.65-6.49)	**6.38** (5.90-6.79)
45-day	**2.93** (2.73-3.13)	**3.62** (3.37-3.87)	**4.31** (4.01-4.59)	**4.79** (4.46-5.10)	**5.37** (5.01-5.71)	**5.76** (5.38-6.12)	**6.11** (5.70-6.47)	**6.41** (5.98-6.78)	**6.73** (6.31-7.11)	**6.91** (6.50-7.29)
60-day	**3.36** (3.14-3.60)	**4.16** (3.88-4.45)	**4.94** (4.62-5.29)	**5.50** (5.14-5.87)	**6.18** (5.77-6.58)	**6.62** (6.20-7.05)	**7.03** (6.59-7.48)	**7.39** (6.93-7.86)	**7.78** (7.31-8.27)	**8.01** (7.54-8.51)

[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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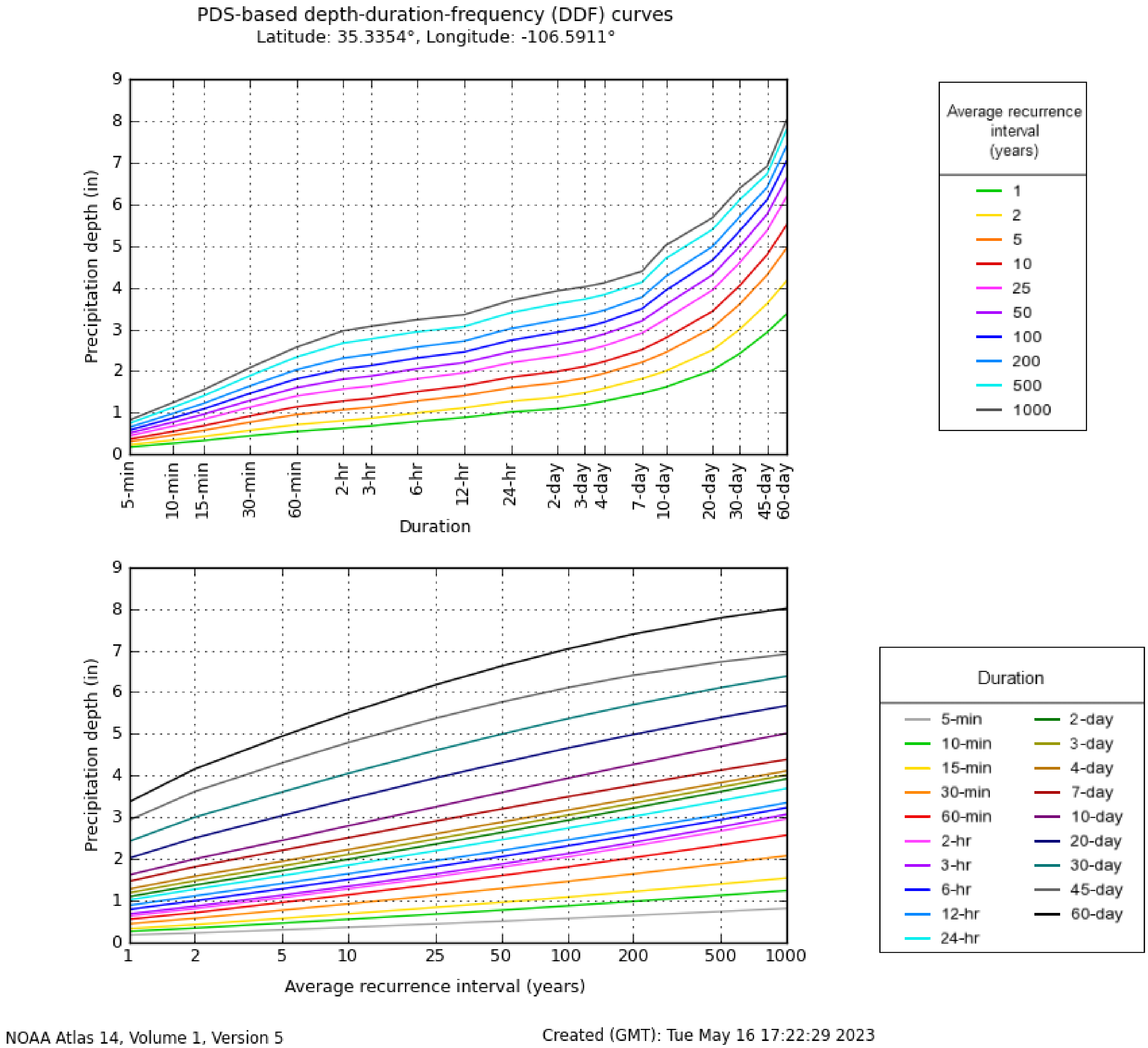
PF graphical



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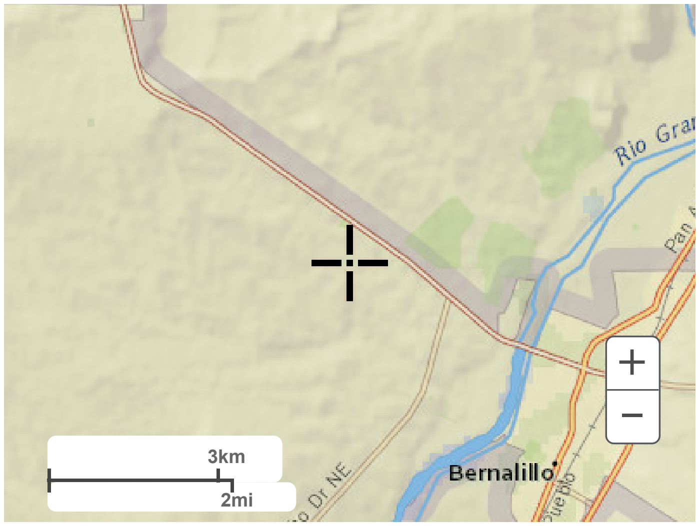
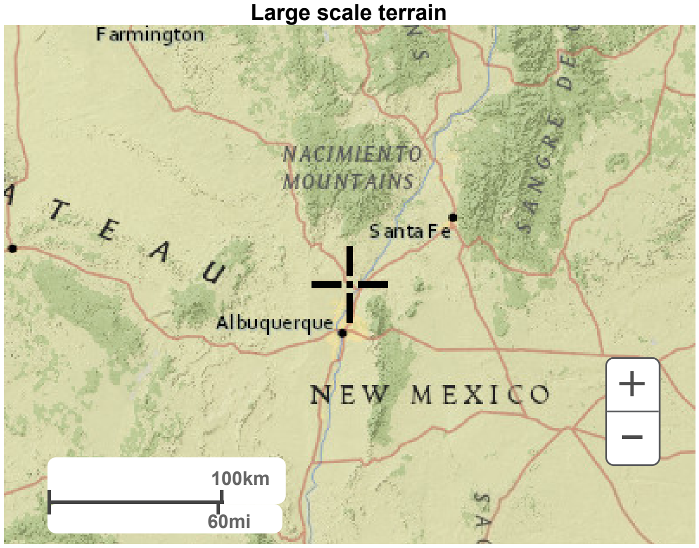
Maps & aerials

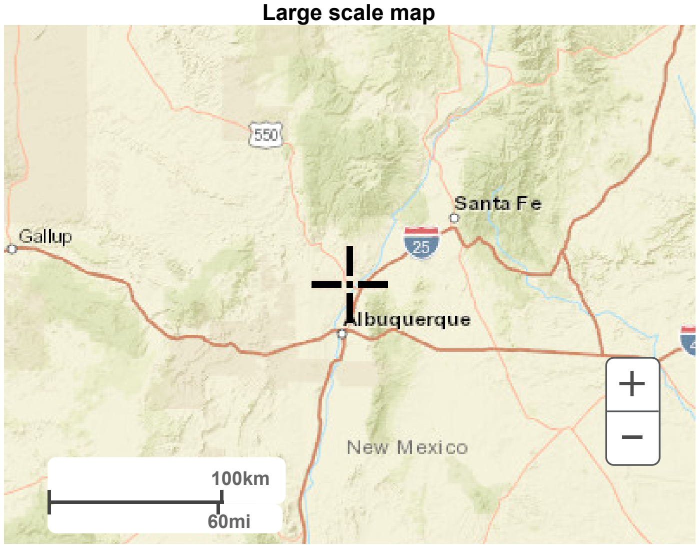
Small scale terrain



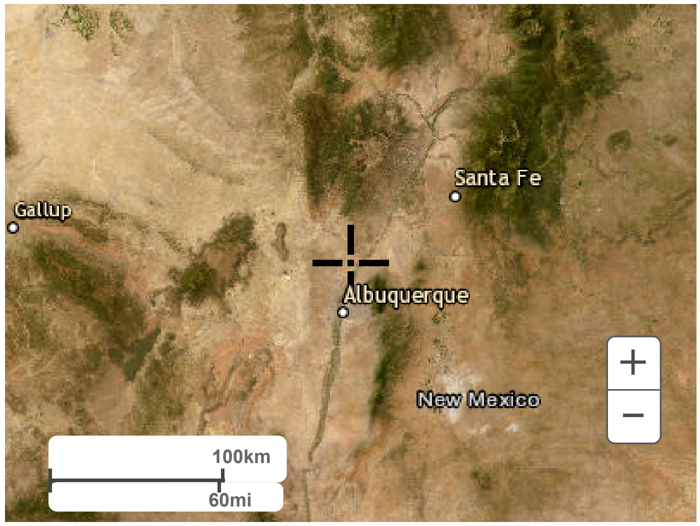
Large scale terrain



Large scale map



Large scale aerial



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

NOAA Atlas 14, Volume 1, Version 5
Location name: Rio Rancho, New Mexico, USA*
Latitude: 35.3425°, Longitude: -106.6361°
Elevation: m/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	**0.178** (0.153-0.206)	**0.230** (0.198-0.266)	**0.309** (0.266-0.358)	**0.369** (0.316-0.427)	**0.452** (0.386-0.523)	**0.517** (0.439-0.598)	**0.585** (0.493-0.676)	**0.656** (0.550-0.758)	**0.753** (0.625-0.871)	**0.830** (0.684-0.961)
10-min	**0.271** (0.233-0.313)	**0.350** (0.302-0.405)	**0.470** (0.405-0.545)	**0.561** (0.482-0.650)	**0.688** (0.588-0.797)	**0.787** (0.668-0.910)	**0.890** (0.751-1.03)	**0.999** (0.837-1.15)	**1.15** (0.951-1.33)	**1.26** (1.04-1.46)
15-min	**0.336** (0.289-0.388)	**0.434** (0.375-0.502)	**0.583** (0.502-0.676)	**0.695** (0.597-0.805)	**0.853** (0.729-0.988)	**0.975** (0.828-1.13)	**1.10** (0.930-1.27)	**1.24** (1.04-1.43)	**1.42** (1.18-1.64)	**1.57** (1.29-1.81)
30-min	**0.452** (0.389-0.523)	**0.584** (0.505-0.676)	**0.785** (0.676-0.910)	**0.937** (0.804-1.08)	**1.15** (0.982-1.33)	**1.31** (1.12-1.52)	**1.49** (1.25-1.72)	**1.67** (1.40-1.93)	**1.92** (1.59-2.21)	**2.11** (1.74-2.44)
60-min	**0.559** (0.482-0.647)	**0.723** (0.625-0.837)	**0.972** (0.837-1.13)	**1.16** (0.995-1.34)	**1.42** (1.22-1.65)	**1.63** (1.38-1.88)	**1.84** (1.55-2.13)	**2.06** (1.73-2.38)	**2.37** (1.97-2.74)	**2.61** (2.15-3.02)
2-hr	**0.642** (0.550-0.761)	**0.824** (0.703-0.979)	**1.09** (0.927-1.29)	**1.30** (1.11-1.54)	**1.60** (1.35-1.88)	**1.84** (1.54-2.16)	**2.09** (1.73-2.45)	**2.35** (1.94-2.76)	**2.72** (2.21-3.19)	**3.02** (2.43-3.55)
3-hr	**0.690** (0.595-0.814)	**0.877** (0.755-1.03)	**1.15** (0.987-1.35)	**1.36** (1.16-1.60)	**1.66** (1.41-1.95)	**1.91** (1.61-2.23)	**2.16** (1.81-2.52)	**2.43** (2.02-2.84)	**2.81** (2.31-3.28)	**3.12** (2.54-3.65)
6-hr	**0.800** (0.697-0.934)	**1.01** (0.880-1.18)	**1.30** (1.13-1.52)	**1.53** (1.33-1.78)	**1.84** (1.59-2.14)	**2.09** (1.79-2.42)	**2.35** (2.00-2.72)	**2.62** (2.21-3.03)	**2.99** (2.50-3.46)	**3.29** (2.73-3.81)
12-hr	**0.896** (0.791-1.02)	**1.13** (0.998-1.29)	**1.43** (1.26-1.63)	**1.67** (1.46-1.89)	**1.99** (1.74-2.25)	**2.24** (1.95-2.53)	**2.49** (2.15-2.83)	**2.76** (2.37-3.13)	**3.12** (2.65-3.54)	**3.41** (2.87-3.88)
24-hr	**1.04** (0.928-1.17)	**1.30** (1.17-1.47)	**1.63** (1.46-1.84)	**1.90** (1.70-2.13)	**2.25** (2.00-2.53)	**2.53** (2.24-2.83)	**2.81** (2.48-3.15)	**3.10** (2.72-3.47)	**3.49** (3.05-3.91)	**3.80** (3.29-4.26)
2-day	**1.12** (1.00-1.25)	**1.41** (1.26-1.57)	**1.76** (1.57-1.97)	**2.05** (1.82-2.29)	**2.43** (2.16-2.71)	**2.72** (2.41-3.04)	**3.03** (2.67-3.38)	**3.34** (2.93-3.73)	**3.76** (3.27-4.20)	**4.09** (3.54-4.57)
3-day	**1.22** (1.11-1.34)	**1.52** (1.38-1.68)	**1.89** (1.72-2.08)	**2.17** (1.98-2.39)	**2.56** (2.32-2.81)	**2.85** (2.58-3.14)	**3.16** (2.84-3.47)	**3.46** (3.11-3.80)	**3.87** (3.45-4.26)	**4.18** (3.71-4.61)
4-day	**1.32** (1.22-1.43)	**1.64** (1.51-1.78)	**2.01** (1.86-2.18)	**2.30** (2.13-2.49)	**2.69** (2.48-2.91)	**2.99** (2.75-3.23)	**3.29** (3.02-3.56)	**3.59** (3.28-3.87)	**3.98** (3.63-4.31)	**4.28** (3.88-4.64)
7-day	**1.52** (1.41-1.64)	**1.88** (1.75-2.04)	**2.29** (2.13-2.48)	**2.61** (2.42-2.81)	**3.03** (2.81-3.26)	**3.34** (3.10-3.59)	**3.64** (3.37-3.92)	**3.94** (3.64-4.24)	**4.32** (3.98-4.65)	**4.60** (4.23-4.96)
10-day	**1.67** (1.55-1.80)	**2.08** (1.93-2.24)	**2.54** (2.36-2.73)	**2.90** (2.70-3.11)	**3.38** (3.13-3.62)	**3.74** (3.46-4.00)	**4.10** (3.79-4.38)	**4.45** (4.10-4.76)	**4.90** (4.50-5.25)	**5.24** (4.80-5.62)
20-day	**2.11** (1.96-2.27)	**2.62** (2.43-2.83)	**3.18** (2.96-3.42)	**3.60** (3.34-3.86)	**4.14** (3.84-4.43)	**4.52** (4.19-4.84)	**4.89** (4.53-5.24)	**5.25** (4.85-5.61)	**5.68** (5.24-6.08)	**5.99** (5.52-6.42)
30-day	**2.54** (2.36-2.73)	**3.15** (2.93-3.38)	**3.79** (3.52-4.06)	**4.26** (3.96-4.56)	**4.85** (4.50-5.17)	**5.26** (4.88-5.61)	**5.66** (5.24-6.03)	**6.02** (5.57-6.42)	**6.46** (5.97-6.88)	**6.76** (6.24-7.21)
45-day	**3.09** (2.87-3.31)	**3.82** (3.56-4.10)	**4.55** (4.24-4.86)	**5.07** (4.72-5.41)	**5.69** (5.30-6.07)	**6.11** (5.70-6.52)	**6.49** (6.05-6.91)	**6.82** (6.36-7.26)	**7.19** (6.72-7.64)	**7.41** (6.94-7.87)
60-day	**3.55** (3.31-3.81)	**4.39** (4.09-4.71)	**5.23** (4.88-5.60)	**5.82** (5.44-6.22)	**6.54** (6.11-6.99)	**7.03** (6.56-7.50)	**7.47** (6.98-7.97)	**7.86** (7.35-8.39)	**8.30** (7.76-8.85)	**8.56** (8.03-9.13)

[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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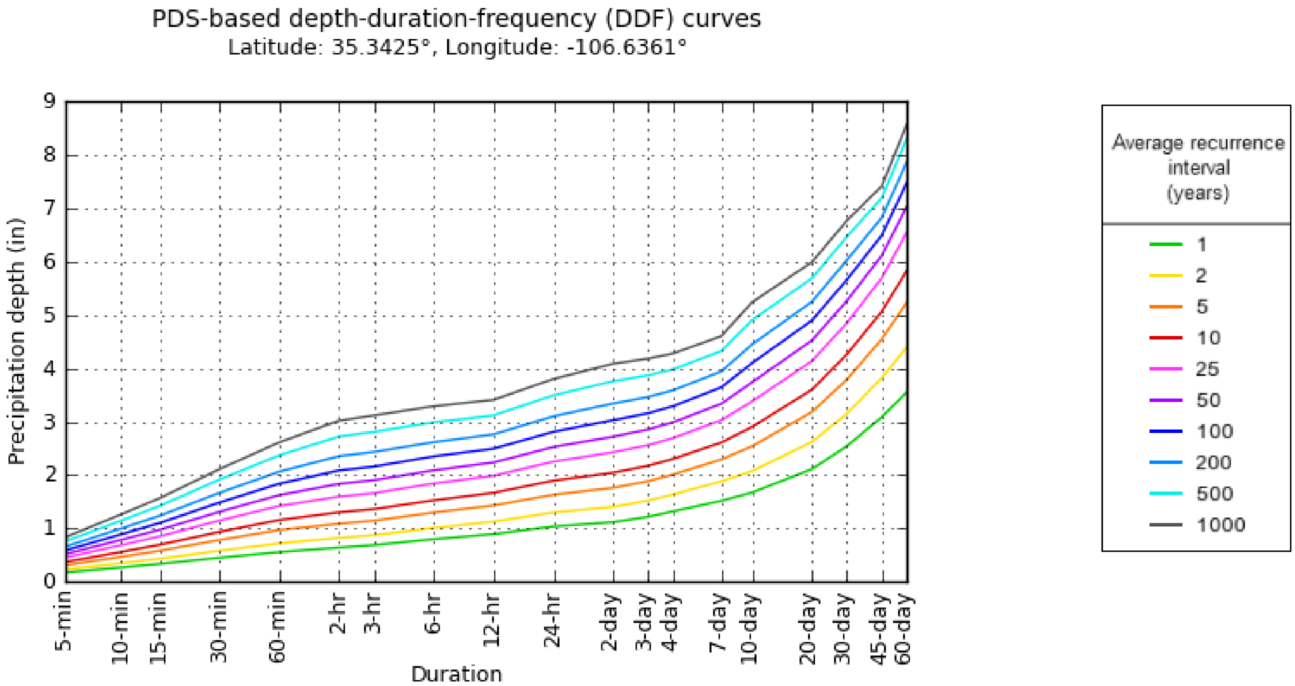
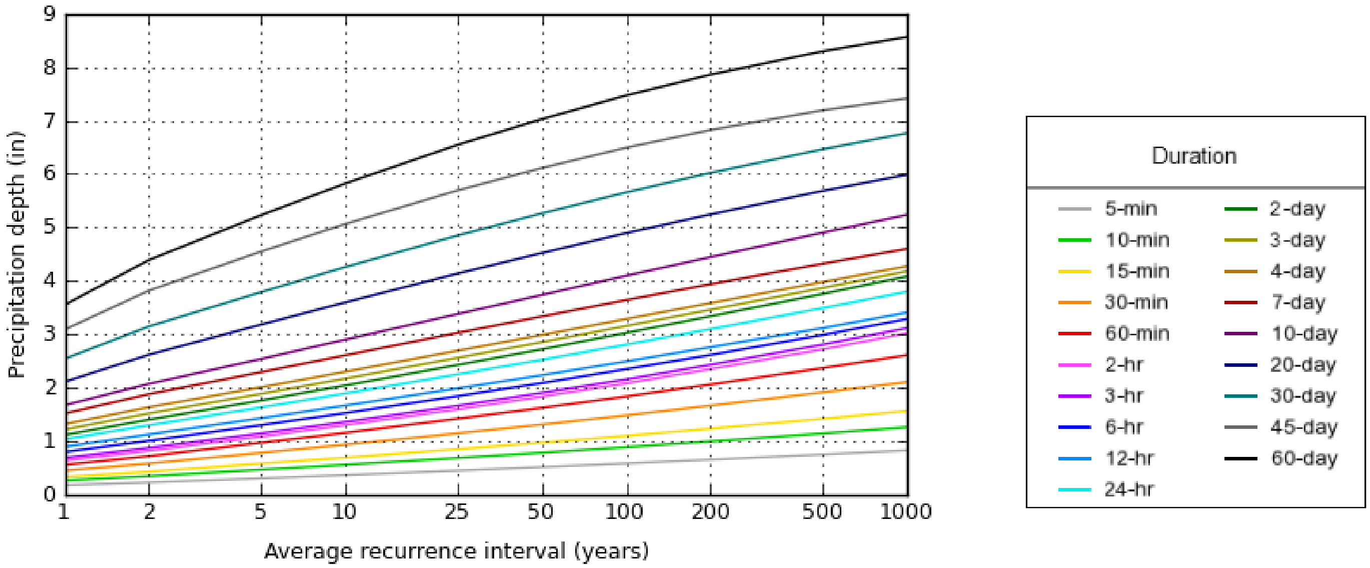
PF graphical





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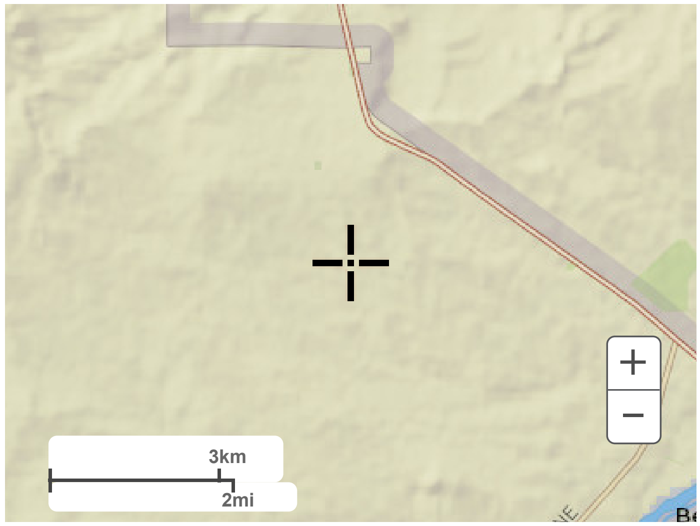
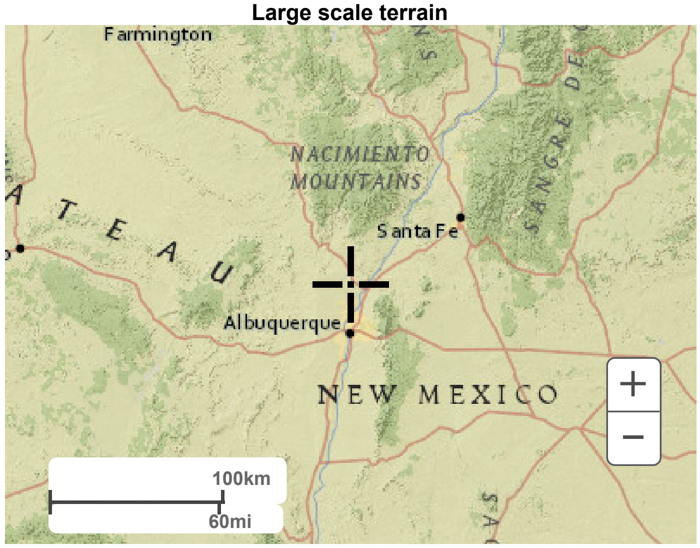
Small scale terrain



Large scale terrain



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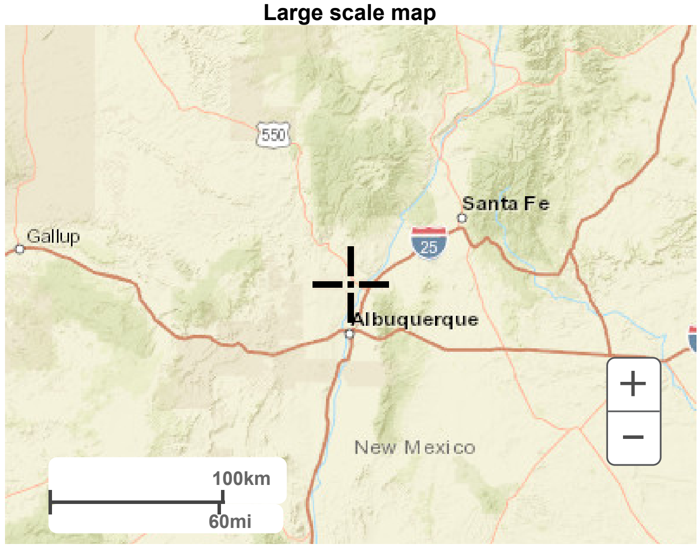

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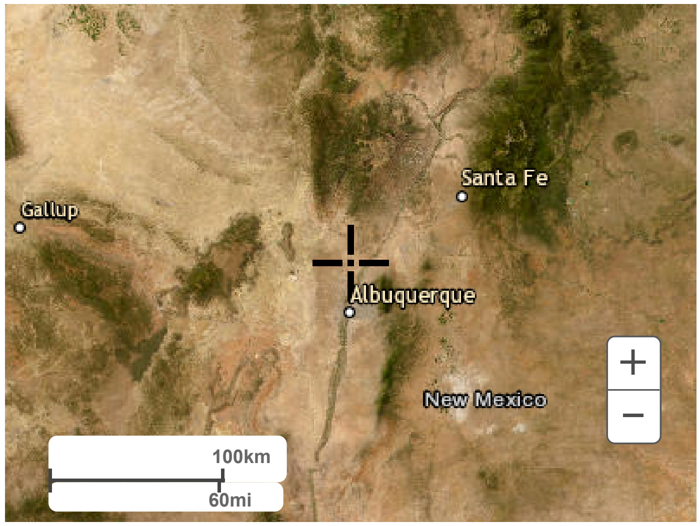

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US Department of Commerce
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NOAA Atlas 14, Volume 1, Version 5
Location name: Rio Rancho, New Mexico, USA*
Latitude: 35.3176°, Longitude: -106.6166°
Elevation: m/ft**
* source: ESRI Maps
** source: 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	0.176 (0.151-0.204)	0.227 (0.196-0.264)	0.305 (0.262-0.355)	0.364 (0.312-0.422)	0.447 (0.381-0.518)	0.511 (0.433-0.593)	0.579 (0.486-0.670)	0.650 (0.543-0.752)	0.746 (0.617-0.864)	0.823 (0.675-0.953)
10-min	0.268 (0.230-0.310)	0.346 (0.298-0.401)	0.465 (0.399-0.540)	0.555 (0.475-0.643)	0.681 (0.580-0.789)	0.778 (0.659-0.902)	0.881 (0.740-1.02)	0.989 (0.826-1.14)	1.14 (0.939-1.32)	1.25 (1.03-1.45)
15-min	0.332 (0.285-0.385)	0.429 (0.369-0.497)	0.576 (0.495-0.669)	0.688 (0.589-0.797)	0.844 (0.719-0.978)	0.964 (0.817-1.12)	1.09 (0.917-1.26)	1.23 (1.02-1.42)	1.41 (1.16-1.63)	1.55 (1.27-1.80)
30-min	0.447 (0.384-0.518)	0.578 (0.497-0.669)	0.776 (0.666-0.901)	0.926 (0.793-1.07)	1.14 (0.968-1.32)	1.30 (1.10-1.51)	1.47 (1.24-1.70)	1.65 (1.38-1.91)	1.90 (1.57-2.19)	2.09 (1.72-2.42)
60-min	0.553 (0.475-0.641)	0.715 (0.615-0.828)	0.960 (0.824-1.12)	1.15 (0.981-1.33)	1.41 (1.20-1.63)	1.61 (1.36-1.86)	1.82 (1.53-2.11)	2.04 (1.71-2.36)	2.35 (1.94-2.72)	2.59 (2.12-3.00)
2-hr	0.636 (0.543-0.757)	0.815 (0.693-0.972)	1.08 (0.915-1.28)	1.29 (1.09-1.53)	1.58 (1.33-1.87)	1.82 (1.52-2.14)	2.07 (1.71-2.43)	2.33 (1.92-2.74)	2.69 (2.19-3.17)	2.99 (2.41-3.52)
3-hr	0.685 (0.589-0.810)	0.869 (0.747-1.03)	1.14 (0.975-1.34)	1.35 (1.15-1.59)	1.65 (1.39-1.94)	1.89 (1.59-2.22)	2.14 (1.79-2.51)	2.41 (2.00-2.83)	2.79 (2.28-3.26)	3.09 (2.51-3.63)
6-hr	0.793 (0.689-0.929)	1.00 (0.870-1.18)	1.29 (1.12-1.51)	1.52 (1.31-1.77)	1.83 (1.57-2.13)	2.07 (1.77-2.40)	2.33 (1.98-2.70)	2.59 (2.19-3.01)	2.96 (2.47-3.44)	3.26 (2.70-3.79)
12-hr	0.888 (0.783-1.01)	1.12 (0.987-1.27)	1.42 (1.25-1.62)	1.65 (1.45-1.88)	1.97 (1.72-2.23)	2.21 (1.92-2.51)	2.47 (2.13-2.80)	2.73 (2.34-3.10)	3.09 (2.62-3.51)	3.37 (2.84-3.84)
24-hr	1.02 (0.916-1.16)	1.28 (1.15-1.45)	1.61 (1.44-1.82)	1.87 (1.67-2.10)	2.22 (1.97-2.49)	2.49 (2.20-2.80)	2.77 (2.44-3.10)	3.05 (2.67-3.42)	3.43 (2.99-3.85)	3.73 (3.23-4.19)
2-day	1.10 (0.982-1.23)	1.38 (1.23-1.54)	1.72 (1.54-1.93)	2.00 (1.78-2.24)	2.37 (2.11-2.65)	2.65 (2.35-2.96)	2.94 (2.60-3.29)	3.24 (2.85-3.63)	3.64 (3.18-4.08)	3.96 (3.44-4.43)
3-day	1.20 (1.09-1.32)	1.49 (1.36-1.65)	1.85 (1.68-2.03)	2.13 (1.93-2.34)	2.50 (2.27-2.75)	2.79 (2.52-3.06)	3.08 (2.78-3.38)	3.38 (3.03-3.70)	3.77 (3.36-4.14)	4.06 (3.61-4.47)
4-day	1.30 (1.20-1.41)	1.61 (1.48-1.75)	1.97 (1.82-2.13)	2.26 (2.08-2.44)	2.64 (2.43-2.85)	2.93 (2.69-3.16)	3.22 (2.95-3.47)	3.51 (3.21-3.78)	3.89 (3.55-4.20)	4.17 (3.79-4.51)
7-day	1.49 (1.38-1.60)	1.84 (1.71-1.99)	2.24 (2.08-2.42)	2.55 (2.37-2.74)	2.95 (2.74-3.17)	3.25 (3.02-3.49)	3.55 (3.29-3.81)	3.83 (3.55-4.11)	4.20 (3.88-4.51)	4.46 (4.11-4.80)
10-day	1.64 (1.52-1.76)	2.03 (1.89-2.19)	2.48 (2.31-2.66)	2.84 (2.64-3.04)	3.30 (3.07-3.53)	3.65 (3.38-3.90)	4.00 (3.70-4.26)	4.34 (4.00-4.63)	4.78 (4.39-5.10)	5.10 (4.67-5.45)
20-day	2.06 (1.91-2.21)	2.55 (2.37-2.75)	3.09 (2.88-3.32)	3.50 (3.25-3.75)	4.01 (3.73-4.30)	4.39 (4.08-4.69)	4.75 (4.40-5.07)	5.08 (4.71-5.43)	5.50 (5.09-5.88)	5.79 (5.35-6.20)
30-day	2.47 (2.29-2.65)	3.06 (2.84-3.28)	3.68 (3.42-3.94)	4.13 (3.83-4.42)	4.70 (4.36-5.01)	5.10 (4.72-5.43)	5.47 (5.07-5.83)	5.82 (5.39-6.20)	6.24 (5.76-6.64)	6.52 (6.02-6.95)
45-day	3.00 (2.79-3.21)	3.70 (3.45-3.97)	4.40 (4.10-4.70)	4.90 (4.57-5.23)	5.50 (5.13-5.86)	5.90 (5.51-6.28)	6.26 (5.84-6.65)	6.57 (6.14-6.97)	6.91 (6.47-7.32)	7.11 (6.67-7.52)
60-day	3.44 (3.21-3.69)	4.25 (3.97-4.56)	5.06 (4.72-5.41)	5.63 (5.26-6.01)	6.32 (5.91-6.74)	6.78 (6.35-7.23)	7.21 (6.74-7.68)	7.57 (7.09-8.07)	7.98 (7.48-8.50)	8.22 (7.73-8.75)

[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.

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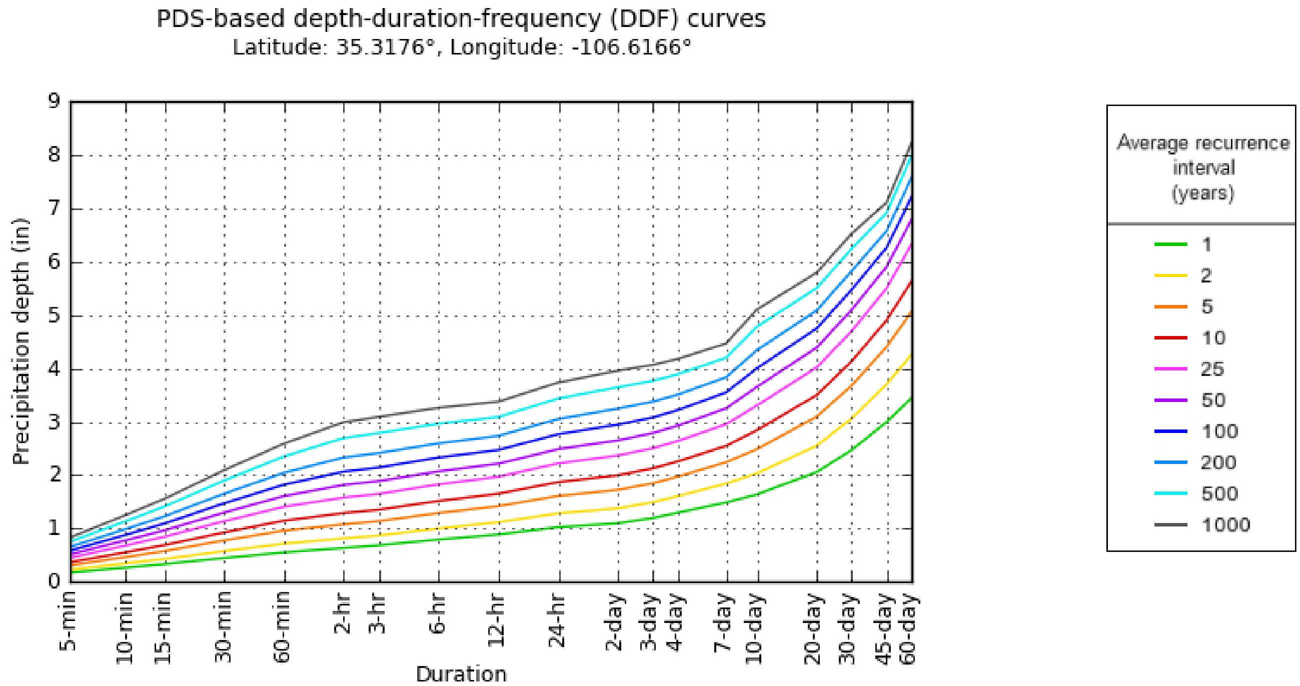
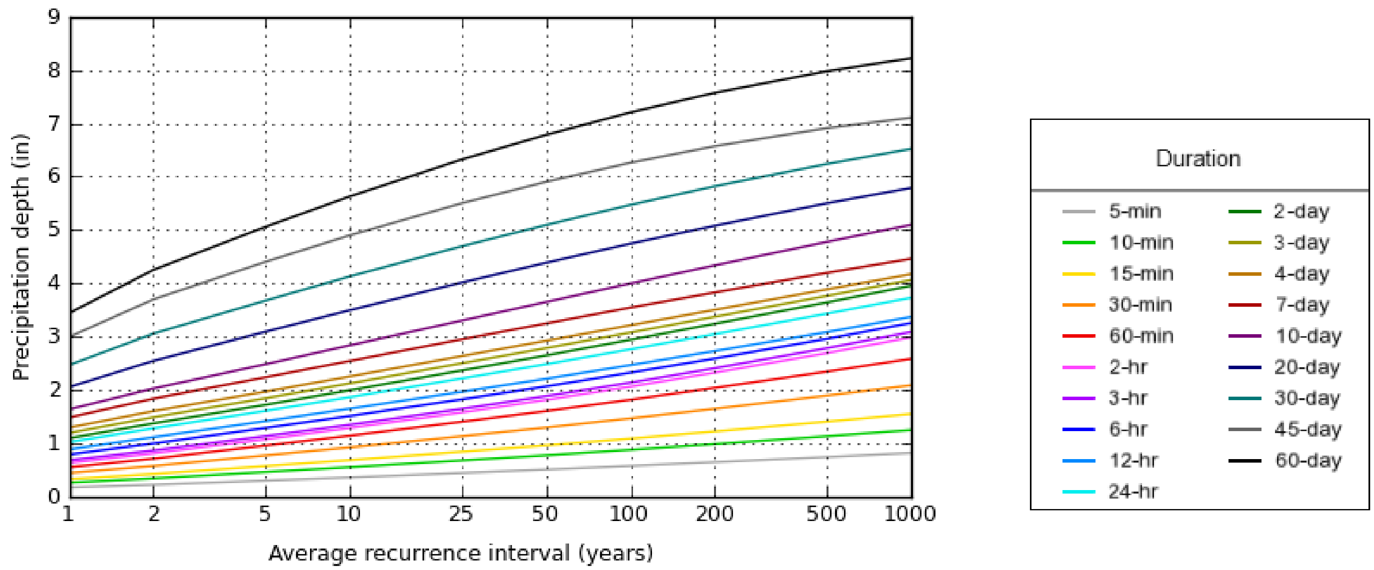
PF graphical





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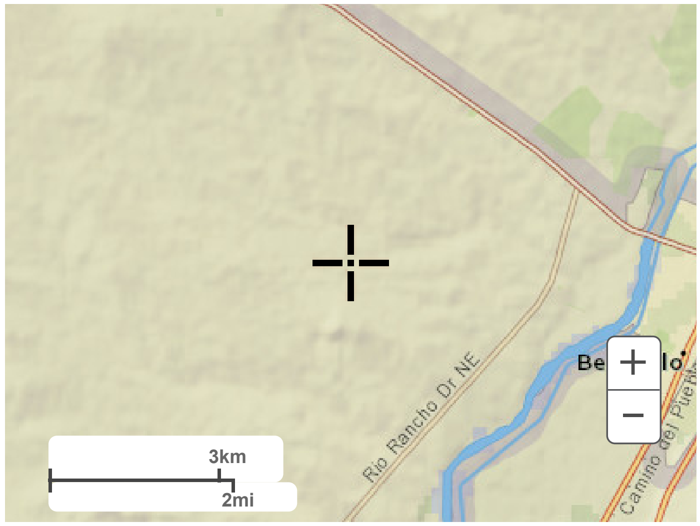
Small scale terrain



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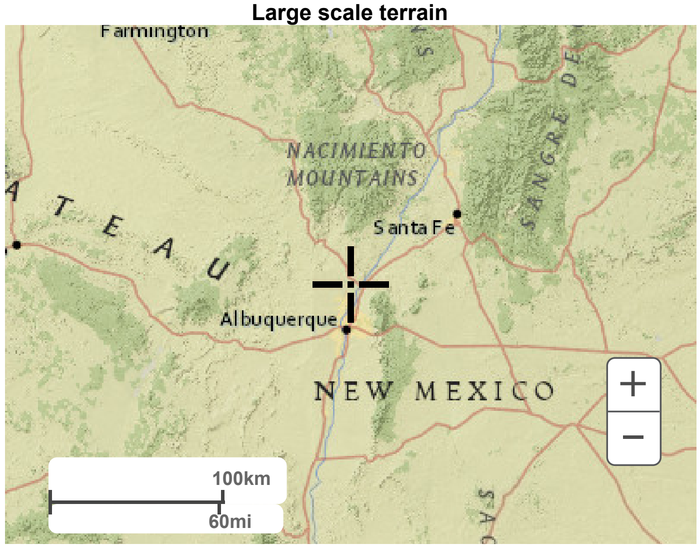

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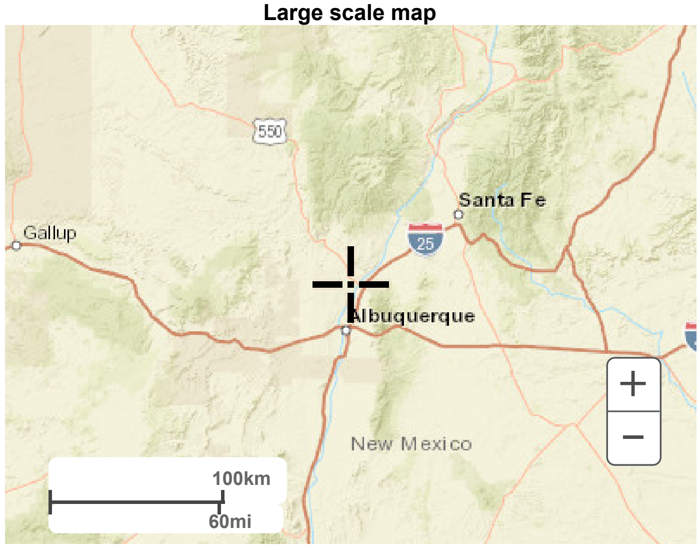

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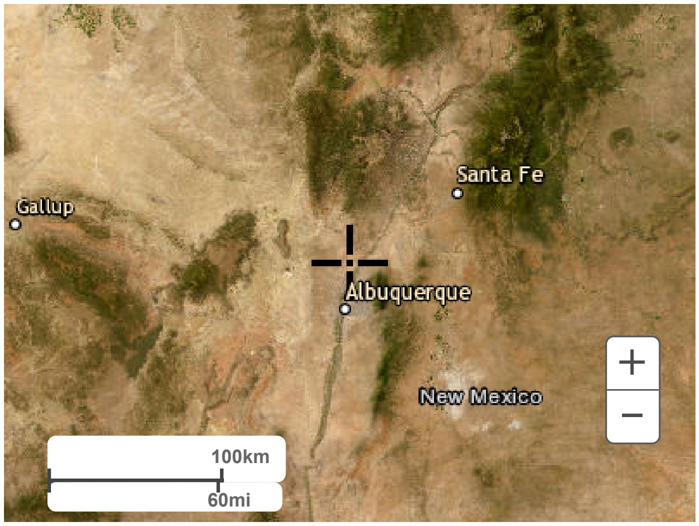

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National Water Center
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Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14, Volume 1, Version 5
Location name: Rio Rancho, New Mexico, USA*
Latitude: 35.3209°, Longitude: -106.6429°
Elevation: m/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	**0.177** (0.153-0.205)	**0.230** (0.198-0.266)	**0.308** (0.265-0.358)	**0.368** (0.315-0.426)	**0.451** (0.384-0.523)	**0.516** (0.437-0.598)	**0.584** (0.490-0.675)	**0.655** (0.547-0.757)	**0.752** (0.622-0.871)	**0.829** (0.681-0.960)
10-min	**0.270** (0.232-0.313)	**0.349** (0.301-0.405)	**0.469** (0.403-0.545)	**0.560** (0.479-0.649)	**0.686** (0.584-0.796)	**0.785** (0.664-0.909)	**0.888** (0.746-1.03)	**0.996** (0.832-1.15)	**1.14** (0.946-1.33)	**1.26** (1.04-1.46)
15-min	**0.335** (0.288-0.388)	**0.432** (0.372-0.502)	**0.581** (0.499-0.675)	**0.694** (0.594-0.804)	**0.851** (0.724-0.986)	**0.973** (0.823-1.13)	**1.10** (0.925-1.27)	**1.24** (1.03-1.43)	**1.42** (1.17-1.64)	**1.56** (1.28-1.81)
30-min	**0.451** (0.387-0.522)	**0.582** (0.502-0.676)	**0.782** (0.672-0.909)	**0.934** (0.799-1.08)	**1.15** (0.976-1.33)	**1.31** (1.11-1.52)	**1.48** (1.25-1.72)	**1.66** (1.39-1.93)	**1.91** (1.58-2.21)	**2.11** (1.73-2.44)
60-min	**0.558** (0.479-0.646)	**0.721** (0.621-0.836)	**0.968** (0.832-1.13)	**1.16** (0.989-1.34)	**1.42** (1.21-1.64)	**1.62** (1.37-1.88)	**1.84** (1.54-2.12)	**2.06** (1.72-2.38)	**2.37** (1.96-2.74)	**2.61** (2.14-3.02)
2-hr	**0.642** (0.548-0.763)	**0.823** (0.701-0.981)	**1.09** (0.924-1.30)	**1.30** (1.10-1.54)	**1.60** (1.34-1.89)	**1.84** (1.53-2.16)	**2.09** (1.73-2.46)	**2.35** (1.93-2.76)	**2.72** (2.21-3.20)	**3.02** (2.43-3.56)
3-hr	**0.689** (0.593-0.816)	**0.877** (0.753-1.04)	**1.15** (0.983-1.36)	**1.36** (1.16-1.61)	**1.66** (1.41-1.95)	**1.90** (1.61-2.24)	**2.16** (1.81-2.53)	**2.43** (2.02-2.85)	**2.81** (2.30-3.29)	**3.12** (2.53-3.66)
6-hr	**0.799** (0.694-0.936)	**1.01** (0.877-1.18)	**1.30** (1.13-1.52)	**1.53** (1.32-1.78)	**1.84** (1.58-2.14)	**2.09** (1.79-2.42)	**2.35** (1.99-2.73)	**2.61** (2.21-3.04)	**2.99** (2.49-3.47)	**3.29** (2.72-3.82)
12-hr	**0.895** (0.789-1.02)	**1.13** (0.994-1.29)	**1.43** (1.26-1.63)	**1.67** (1.46-1.90)	**1.99** (1.73-2.26)	**2.24** (1.94-2.54)	**2.49** (2.15-2.83)	**2.76** (2.36-3.14)	**3.12** (2.64-3.55)	**3.41** (2.87-3.89)
24-hr	**1.04** (0.927-1.17)	**1.30** (1.16-1.47)	**1.63** (1.46-1.84)	**1.90** (1.69-2.13)	**2.25** (2.00-2.53)	**2.52** (2.23-2.84)	**2.81** (2.47-3.16)	**3.10** (2.71-3.48)	**3.49** (3.04-3.92)	**3.80** (3.28-4.26)
2-day	**1.11** (0.994-1.25)	**1.40** (1.25-1.57)	**1.76** (1.56-1.97)	**2.04** (1.81-2.28)	**2.42** (2.14-2.70)	**2.71** (2.39-3.03)	**3.01** (2.65-3.37)	**3.32** (2.91-3.72)	**3.74** (3.25-4.19)	**4.06** (3.52-4.56)
3-day	**1.22** (1.11-1.35)	**1.52** (1.38-1.68)	**1.89** (1.71-2.08)	**2.17** (1.97-2.39)	**2.56** (2.32-2.82)	**2.86** (2.58-3.14)	**3.16** (2.84-3.47)	**3.47** (3.11-3.81)	**3.87** (3.45-4.26)	**4.19** (3.71-4.61)
4-day	**1.33** (1.22-1.44)	**1.65** (1.52-1.79)	**2.02** (1.86-2.19)	**2.31** (2.13-2.50)	**2.71** (2.49-2.93)	**3.01** (2.77-3.25)	**3.31** (3.03-3.58)	**3.61** (3.30-3.90)	**4.01** (3.65-4.34)	**4.31** (3.91-4.67)
7-day	**1.52** (1.41-1.65)	**1.89** (1.75-2.04)	**2.30** (2.14-2.49)	**2.62** (2.43-2.82)	**3.04** (2.82-3.27)	**3.35** (3.11-3.61)	**3.66** (3.39-3.94)	**3.96** (3.66-4.26)	**4.35** (4.00-4.68)	**4.64** (4.25-5.00)
10-day	**1.68** (1.56-1.81)	**2.08** (1.93-2.24)	**2.55** (2.37-2.74)	**2.91** (2.70-3.13)	**3.39** (3.14-3.63)	**3.75** (3.47-4.02)	**4.11** (3.80-4.40)	**4.47** (4.12-4.79)	**4.93** (4.52-5.29)	**5.27** (4.82-5.65)
20-day	**2.12** (1.96-2.28)	**2.63** (2.44-2.83)	**3.19** (2.96-3.43)	**3.61** (3.35-3.88)	**4.15** (3.85-4.45)	**4.54** (4.20-4.86)	**4.91** (4.54-5.26)	**5.27** (4.86-5.64)	**5.71** (5.26-6.11)	**6.02** (5.54-6.45)
30-day	**2.55** (2.36-2.73)	**3.16** (2.93-3.39)	**3.80** (3.53-4.08)	**4.27** (3.97-4.57)	**4.86** (4.51-5.20)	**5.28** (4.90-5.64)	**5.68** (5.26-6.06)	**6.05** (5.60-6.45)	**6.49** (5.99-6.93)	**6.80** (6.27-7.26)
45-day	**3.10** (2.88-3.32)	**3.83** (3.57-4.11)	**4.57** (4.25-4.89)	**5.09** (4.73-5.44)	**5.72** (5.32-6.10)	**6.14** (5.72-6.55)	**6.53** (6.08-6.95)	**6.86** (6.39-7.31)	**7.24** (6.75-7.70)	**7.47** (6.98-7.94)
60-day	**3.56** (3.32-3.82)	**4.41** (4.10-4.73)	**5.25** (4.89-5.62)	**5.85** (5.46-6.26)	**6.57** (6.13-7.02)	**7.06** (6.59-7.54)	**7.51** (7.01-8.02)	**7.90** (7.38-8.44)	**8.34** (7.81-8.91)	**8.62** (8.08-9.20)

[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.

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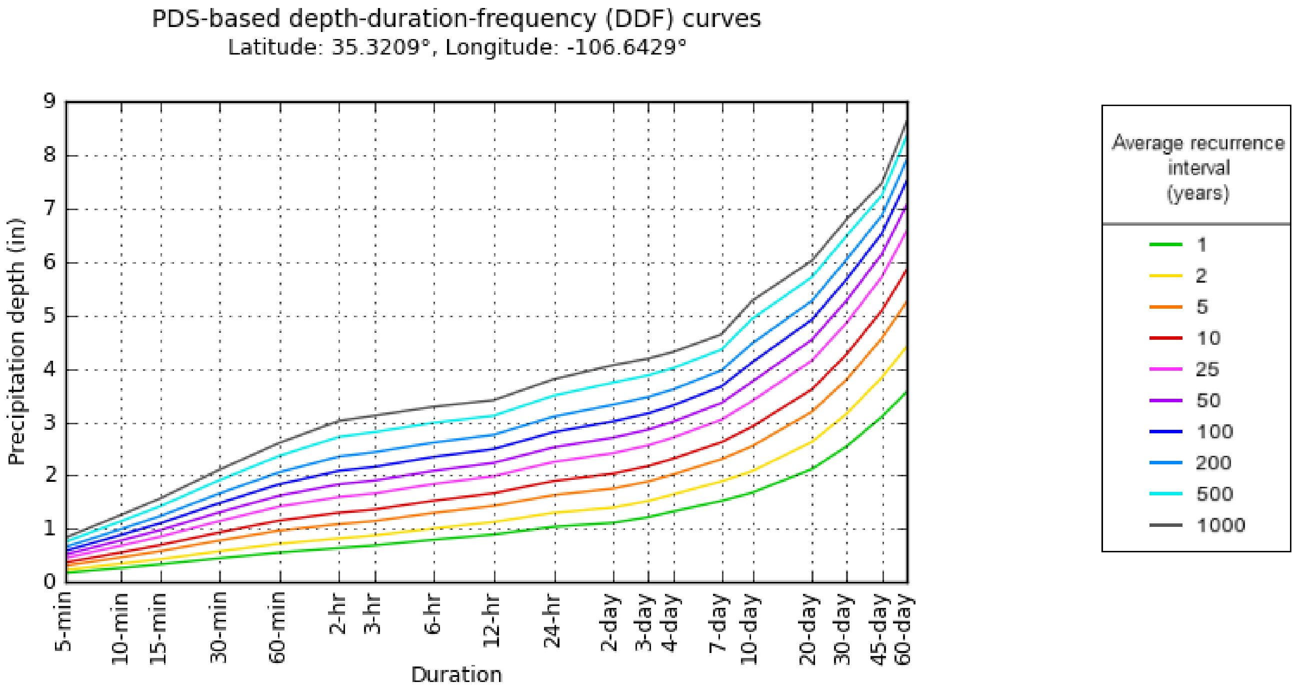
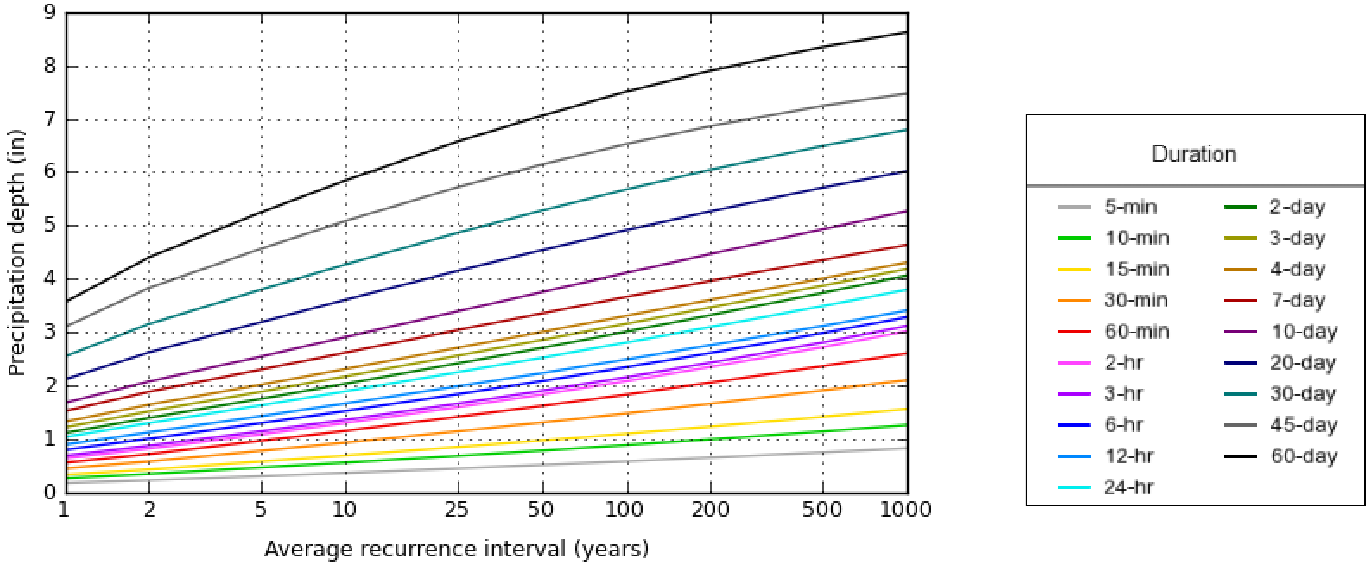
PF graphical





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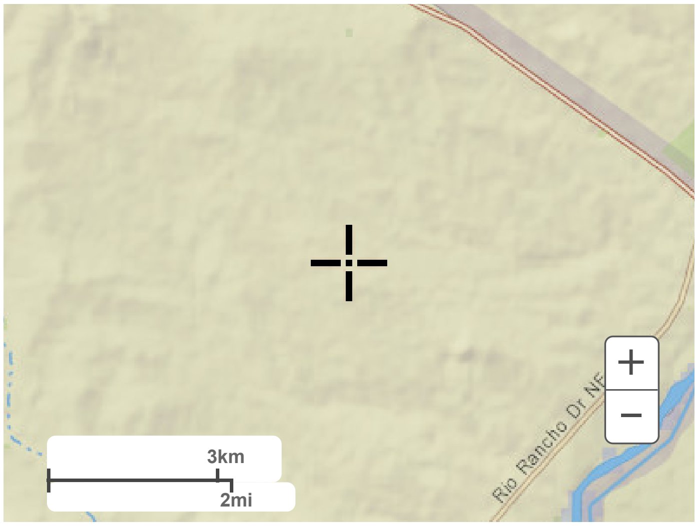
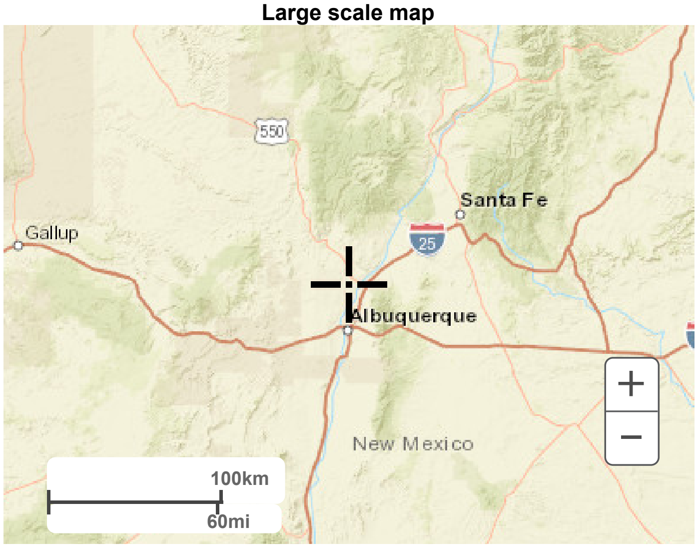
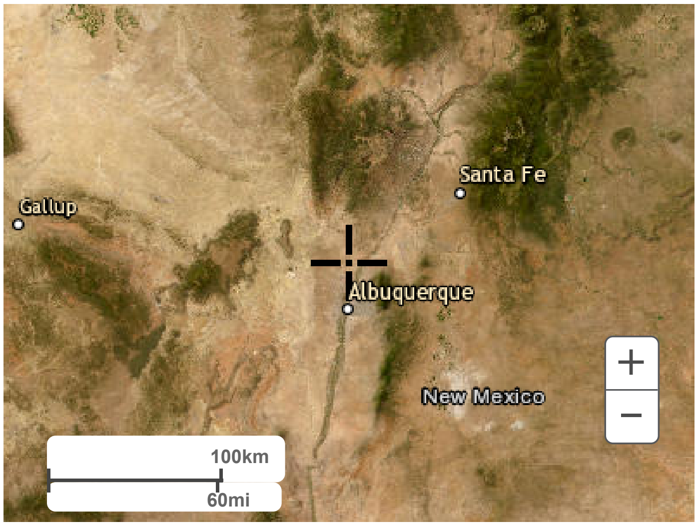


Large scale terrain

Large scale map



Large scale aerial



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Location name: Bernalillo, New Mexico, USA*
Latitude: 35.3167°, Longitude: -106.5706°
Elevation: m/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	0.173 (0.149-0.199)	0.223 (0.193-0.258)	0.300 (0.258-0.347)	0.357 (0.308-0.412)	0.439 (0.375-0.507)	0.501 (0.426-0.580)	0.567 (0.478-0.656)	0.636 (0.534-0.735)	0.731 (0.606-0.845)	0.806 (0.663-0.931)
10-min	0.263 (0.227-0.303)	0.340 (0.294-0.392)	0.456 (0.393-0.528)	0.544 (0.468-0.628)	0.667 (0.571-0.772)	0.763 (0.648-0.883)	0.863 (0.727-0.997)	0.968 (0.813-1.12)	1.11 (0.923-1.29)	1.23 (1.01-1.42)
15-min	0.326 (0.281-0.376)	0.421 (0.365-0.486)	0.566 (0.487-0.654)	0.674 (0.580-0.779)	0.828 (0.708-0.957)	0.946 (0.803-1.10)	1.07 (0.902-1.24)	1.20 (1.01-1.39)	1.38 (1.14-1.59)	1.52 (1.25-1.76)
30-min	0.439 (0.378-0.507)	0.567 (0.491-0.655)	0.762 (0.656-0.881)	0.909 (0.781-1.05)	1.12 (0.954-1.29)	1.27 (1.08-1.47)	1.44 (1.21-1.67)	1.62 (1.36-1.87)	1.86 (1.54-2.15)	2.05 (1.68-2.37)
60-min	0.543 (0.468-0.628)	0.702 (0.608-0.811)	0.943 (0.812-1.09)	1.12 (0.967-1.30)	1.38 (1.18-1.60)	1.58 (1.34-1.83)	1.78 (1.50-2.06)	2.00 (1.68-2.31)	2.30 (1.91-2.66)	2.53 (2.08-2.93)
2-hr	0.624 (0.535-0.739)	0.801 (0.683-0.951)	1.06 (0.899-1.25)	1.27 (1.07-1.49)	1.55 (1.30-1.82)	1.78 (1.49-2.09)	2.02 (1.68-2.37)	2.28 (1.87-2.67)	2.63 (2.14-3.09)	2.92 (2.35-3.43)
3-hr	0.676 (0.584-0.796)	0.859 (0.742-1.01)	1.12 (0.966-1.32)	1.33 (1.14-1.56)	1.62 (1.38-1.90)	1.86 (1.57-2.17)	2.11 (1.76-2.45)	2.37 (1.97-2.76)	2.74 (2.24-3.18)	3.03 (2.46-3.54)
6-hr	0.786 (0.685-0.914)	0.991 (0.863-1.15)	1.27 (1.11-1.48)	1.50 (1.30-1.73)	1.80 (1.55-2.08)	2.04 (1.75-2.35)	2.29 (1.95-2.65)	2.55 (2.15-2.94)	2.91 (2.43-3.36)	3.20 (2.65-3.69)
12-hr	0.880 (0.781-0.998)	1.11 (0.983-1.25)	1.40 (1.24-1.59)	1.63 (1.44-1.84)	1.94 (1.70-2.19)	2.18 (1.90-2.46)	2.43 (2.10-2.74)	2.69 (2.32-3.03)	3.03 (2.58-3.42)	3.31 (2.80-3.75)
24-hr	1.01 (0.908-1.13)	1.26 (1.14-1.41)	1.58 (1.42-1.77)	1.83 (1.65-2.04)	2.17 (1.94-2.42)	2.43 (2.17-2.71)	2.70 (2.40-3.01)	2.98 (2.63-3.31)	3.35 (2.94-3.72)	3.64 (3.17-4.04)
2-day	1.08 (0.977-1.21)	1.36 (1.22-1.51)	1.70 (1.53-1.89)	1.96 (1.77-2.18)	2.32 (2.08-2.57)	2.59 (2.32-2.87)	2.87 (2.56-3.19)	3.16 (2.81-3.50)	3.54 (3.12-3.93)	3.83 (3.37-4.26)
3-day	1.17 (1.07-1.29)	1.46 (1.34-1.61)	1.81 (1.65-1.98)	2.08 (1.90-2.27)	2.44 (2.23-2.67)	2.72 (2.47-2.97)	3.00 (2.72-3.28)	3.29 (2.97-3.59)	3.66 (3.29-4.01)	3.95 (3.53-4.32)
4-day	1.26 (1.17-1.37)	1.57 (1.45-1.70)	1.92 (1.78-2.08)	2.20 (2.03-2.37)	2.57 (2.37-2.77)	2.85 (2.63-3.07)	3.13 (2.88-3.38)	3.42 (3.13-3.68)	3.79 (3.46-4.08)	4.07 (3.70-4.39)
7-day	1.44 (1.34-1.56)	1.79 (1.66-1.93)	2.18 (2.03-2.35)	2.48 (2.31-2.66)	2.87 (2.67-3.08)	3.16 (2.94-3.39)	3.45 (3.20-3.70)	3.72 (3.46-3.99)	4.08 (3.78-4.38)	4.34 (4.01-4.66)
10-day	1.59 (1.48-1.71)	1.97 (1.84-2.12)	2.41 (2.25-2.58)	2.76 (2.56-2.95)	3.21 (2.98-3.42)	3.55 (3.29-3.78)	3.88 (3.59-4.13)	4.21 (3.89-4.48)	4.64 (4.26-4.94)	4.95 (4.54-5.28)
20-day	1.98 (1.84-2.13)	2.46 (2.28-2.65)	2.98 (2.78-3.20)	3.37 (3.13-3.61)	3.87 (3.60-4.14)	4.23 (3.93-4.51)	4.57 (4.24-4.88)	4.89 (4.54-5.22)	5.30 (4.90-5.65)	5.57 (5.16-5.96)
30-day	2.37 (2.20-2.54)	2.94 (2.73-3.15)	3.53 (3.29-3.78)	3.97 (3.69-4.24)	4.51 (4.19-4.80)	4.89 (4.54-5.21)	5.25 (4.88-5.59)	5.58 (5.18-5.94)	5.98 (5.54-6.36)	6.25 (5.78-6.65)
45-day	2.87 (2.67-3.07)	3.54 (3.30-3.79)	4.21 (3.93-4.49)	4.68 (4.37-4.99)	5.25 (4.90-5.59)	5.63 (5.26-5.98)	5.97 (5.58-6.33)	6.26 (5.85-6.63)	6.58 (6.17-6.95)	6.76 (6.36-7.13)
60-day	3.29 (3.07-3.53)	4.07 (3.80-4.36)	4.84 (4.52-5.17)	5.39 (5.03-5.74)	6.05 (5.65-6.44)	6.48 (6.07-6.90)	6.89 (6.44-7.32)	7.23 (6.77-7.69)	7.62 (7.15-8.09)	7.85 (7.37-8.32)

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

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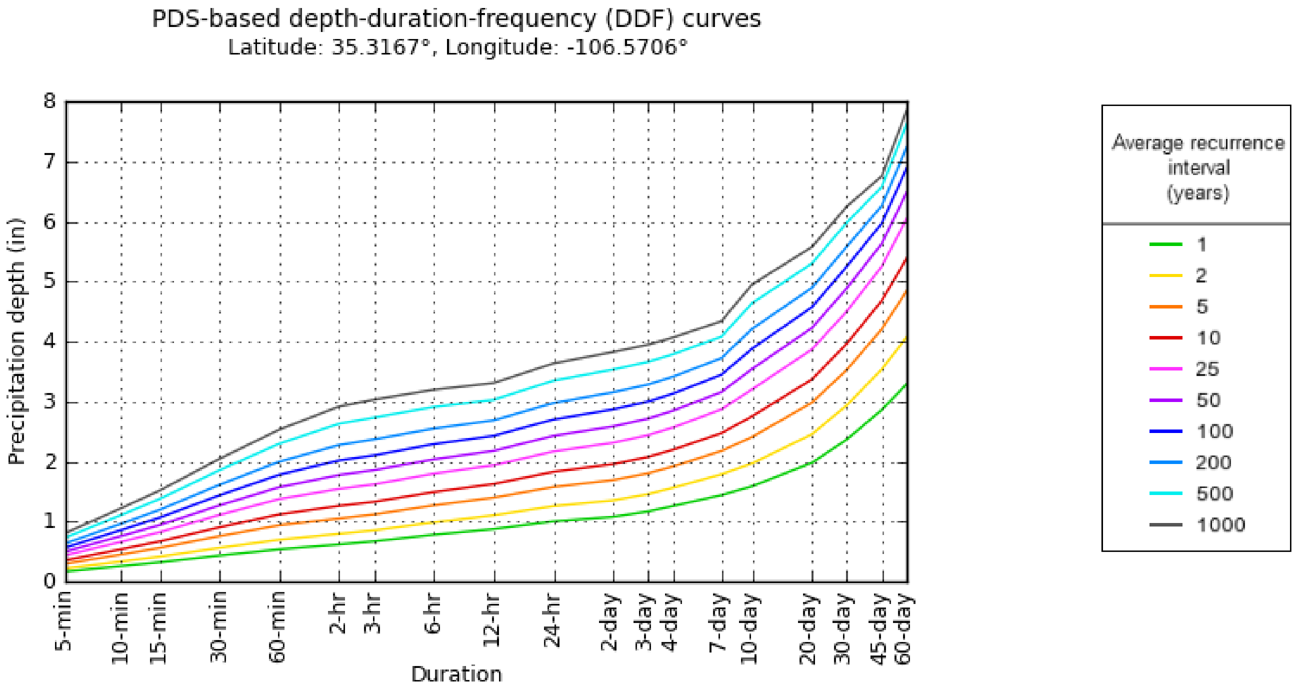
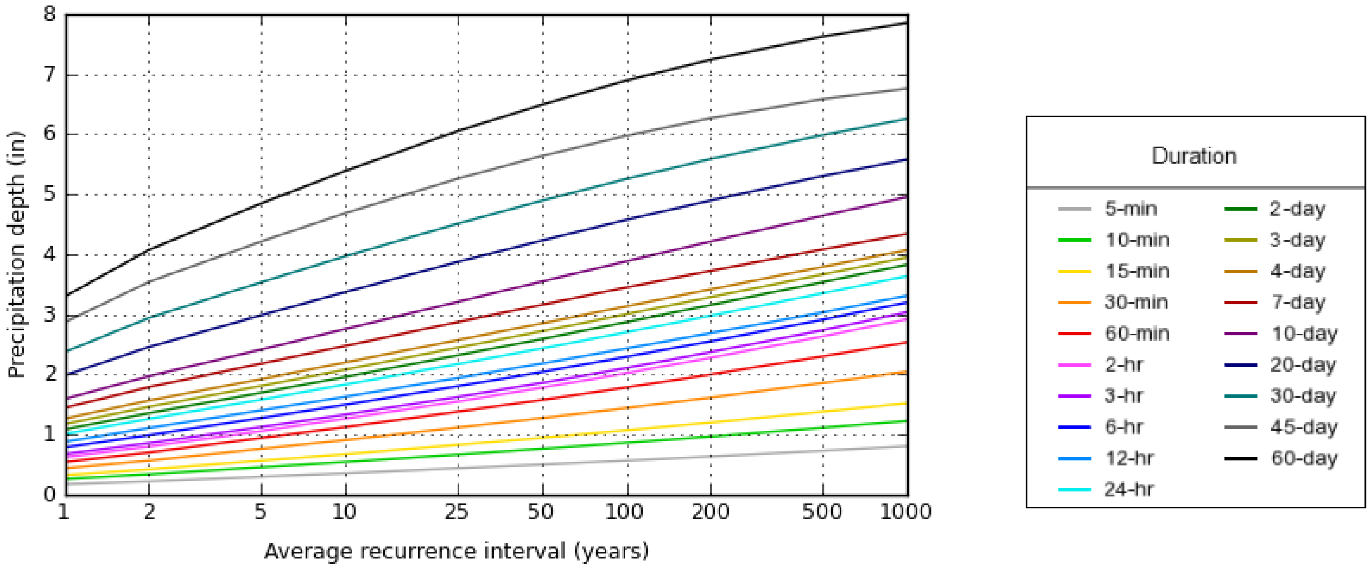
PF graphical





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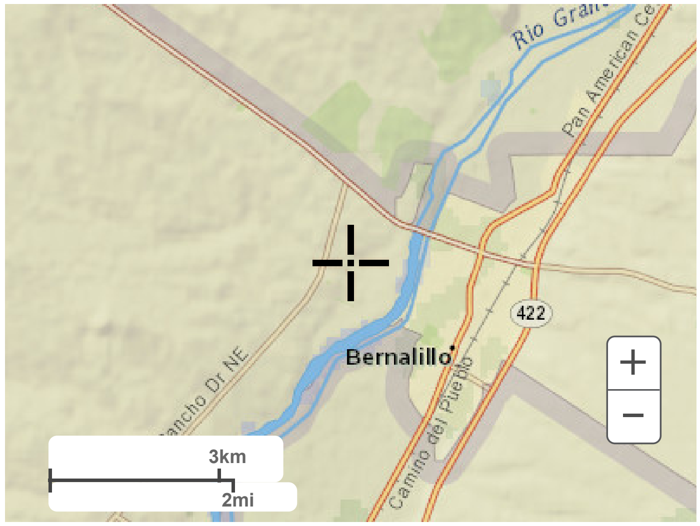
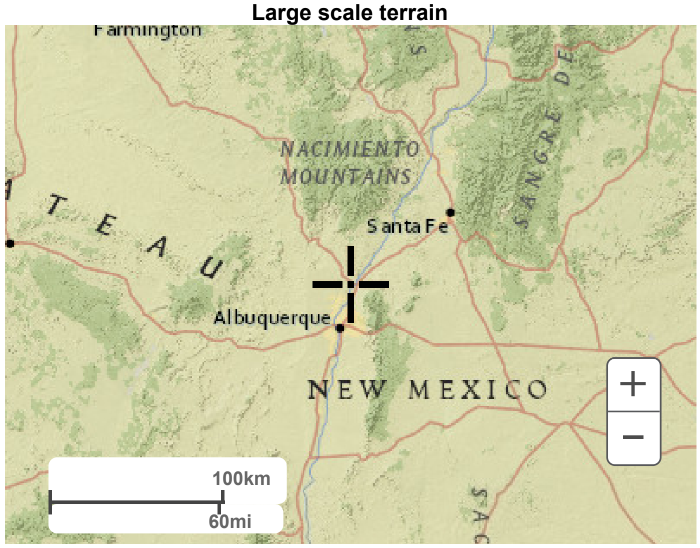
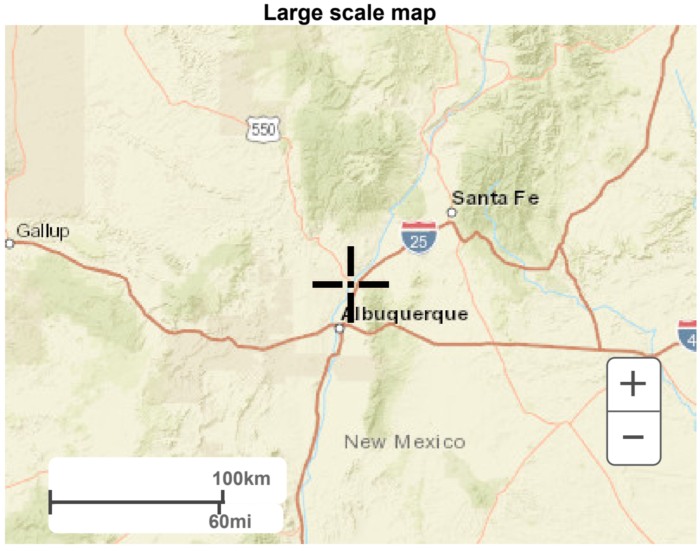


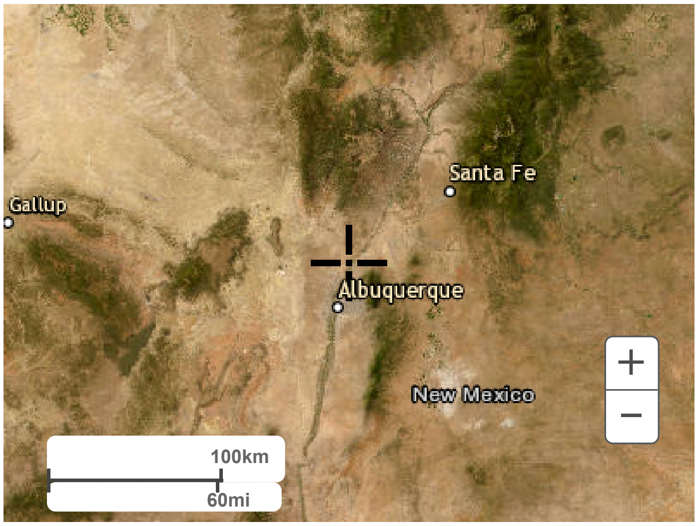
Large scale terrain



Large scale map



Large scale aerial



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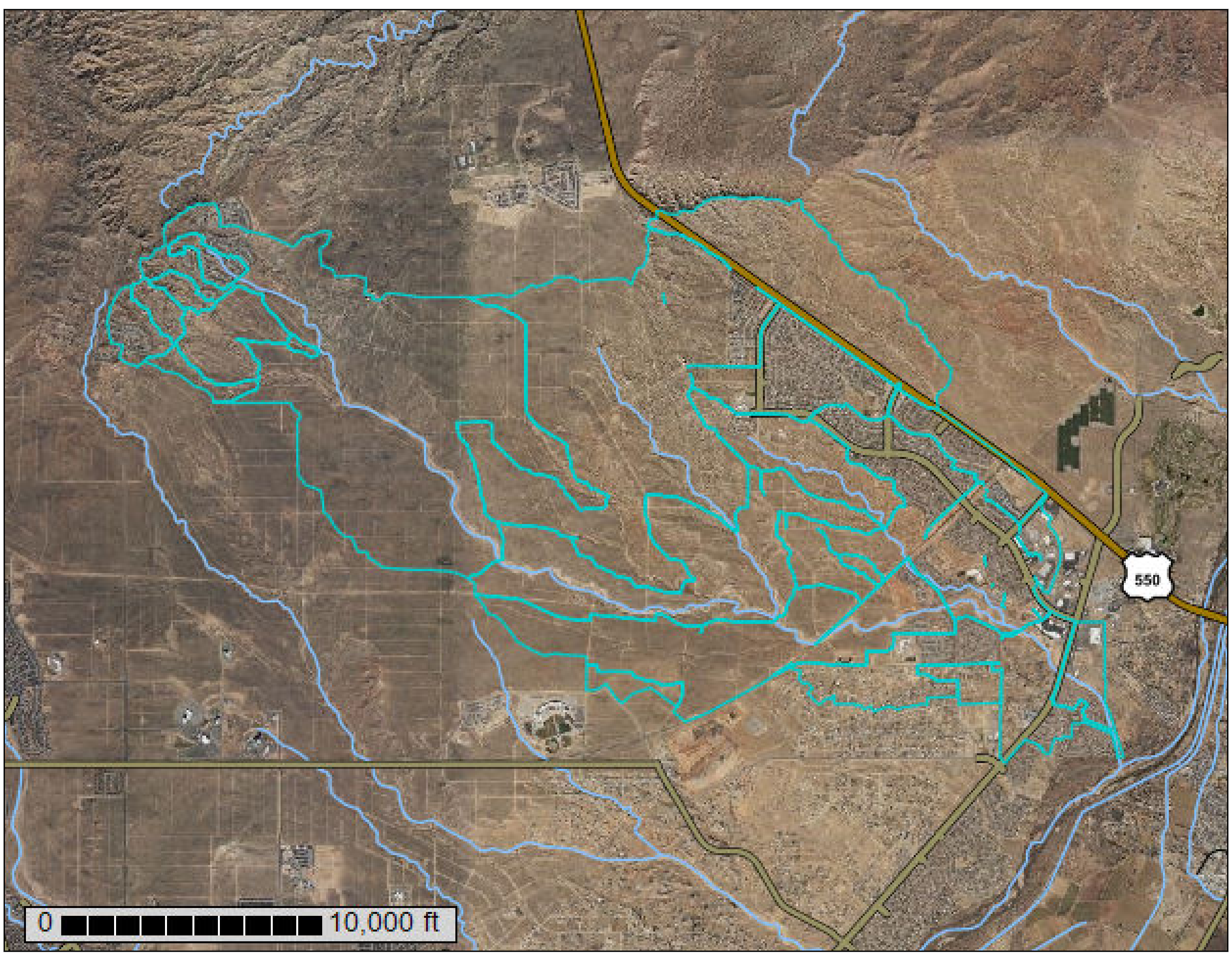
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties

Upper Venada



May 10, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

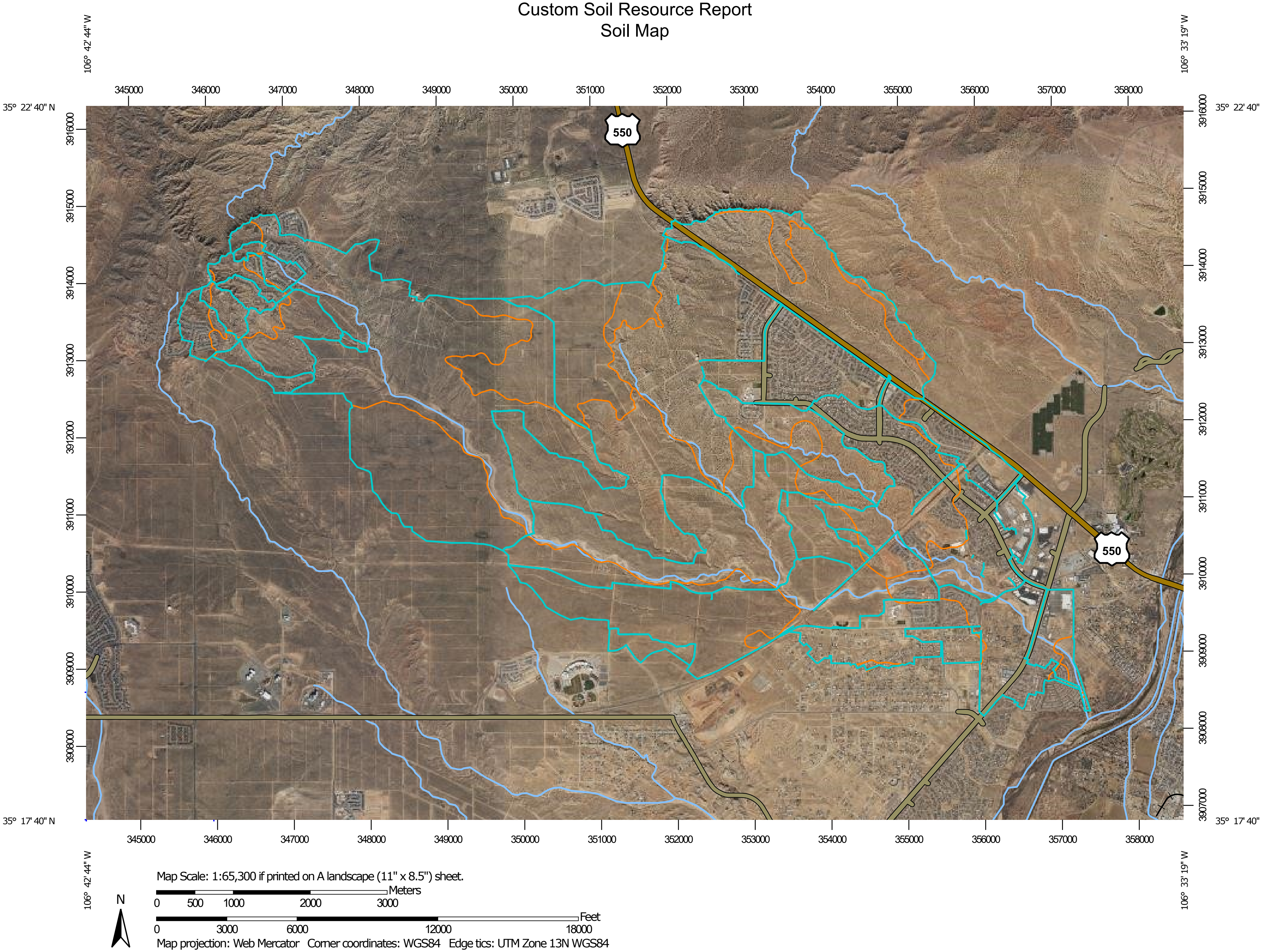
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:65,300 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 3000, 6000, 12000, 18000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

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MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties
Survey Area Data: Version 16, Sep 8, 2022

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

Date(s) aerial images were photographed: Feb 6, 2016—Dec 2, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
11	Trail fine sandy loam, 0 to 1 percent slopes	11.6	0.1%
29	Trail loamy sand, 0 to 1 percent slopes	29.7	0.3%
142	Grieta fine sandy loam, 1 to 4 percent slopes	2,039.8	19.5%
145	Grieta-Sheppard loamy fine sands, 2 to 9 percent slopes	4,108.2	39.3%
183	Sheppard loamy fine sand, 8 to 15 percent slopes	2,790.1	26.7%
191	Sheppard loamy fine sand, 3 to 8 percent slopes	1,000.2	9.6%
211	Zia-Clovis association, 2 to 10 percent slopes	80.1	0.8%
213	Pinavetes-Rock outcrop complex, 15 to 35 percent slopes	364.1	3.5%
250	Pinavetes loamy fine sand, 5 to 15 percent slopes	14.6	0.1%
823	Gilco loam, 1 to 4 percent slopes, unprotected	2.7	0.0%
Totals for Area of Interest		**10,441.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties

11—Trail fine sandy loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 1wlv
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 56 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Trail and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Trail

Setting

Landform: Valley-floor remnants, flood plains, channels, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Eolian deposits over stream alluvium derived from sandstone

Typical profile

Ap - 0 to 9 inches: fine sandy loam
C1 - 9 to 36 inches: stratified loamy sand to sandy loam
C2 - 36 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R042BE057NM - Bottomland, Cool Desert Grassland
Hydric soil rating: No

Minor Components

Aga

Percent of map unit: 5 percent
Ecological site: R042BE057NM - Bottomland, Cool Desert Grassland
Hydric soil rating: No

Gilco

Percent of map unit: 5 percent
Ecological site: R042BE057NM - Bottomland, Cool Desert Grassland
Hydric soil rating: No

Riverwash

Percent of map unit: 3 percent
Landform: Channels, streams
Hydric soil rating: Yes

Peralta

Percent of map unit: 2 percent
Ecological site: R042BE057NM - Bottomland, Cool Desert Grassland
Hydric soil rating: No

29—Trail loamy sand, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 1wns
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 55 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Trail and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Trail

Setting

Landform: Valley-floor remnants, flood plains, channels, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from sandstone over stream alluvium derived from igneous and sedimentary rock

Typical profile

A - 0 to 6 inches: loamy sand
C - 6 to 60 inches: stratified loamy sand to sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R042BE054NM - Deep Sand, Cool Desert Grassland
Hydric soil rating: No

Minor Components

Aga

Percent of map unit: 5 percent
Ecological site: R042BE057NM - Bottomland, Cool Desert Grassland
Hydric soil rating: No

Gilco

Percent of map unit: 5 percent
Ecological site: R042BE057NM - Bottomland, Cool Desert Grassland
Hydric soil rating: No

Peralta

Percent of map unit: 5 percent
Ecological site: R042BE057NM - Bottomland, Cool Desert Grassland
Hydric soil rating: No

142—Grieta fine sandy loam, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: 1wm5
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 55 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Grieta and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Grieta

Setting

Landform: Fan remnants, mesas, plateaus, ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over fan alluvium derived from sandstone

Typical profile

A - 0 to 3 inches: fine sandy loam
Bt1 - 3 to 11 inches: fine sandy loam
Bt2 - 11 to 34 inches: sandy clay loam
Bk1 - 34 to 48 inches: sandy clay loam
Bk2 - 48 to 60 inches: loamy sand

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R042BE052NM - Loamy, Cool Desert Grassland
Hydric soil rating: No

Minor Components

Sheppard

Percent of map unit: 15 percent
Ecological site: R042BE054NM - Deep Sand, Cool Desert Grassland
Hydric soil rating: No

145—Grieta-Sheppard loamy fine sands, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: 1wld
Elevation: 5,000 to 6,500 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 120 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Grieta and similar soils: 55 percent
Sheppard and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Grieta

Setting

Landform: Fan remnants, ridges, plateaus, mesas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over fan alluvium derived from sandstone

Typical profile

A - 0 to 7 inches: loamy fine sand
Bt1 - 7 to 14 inches: sandy clay loam
Bt2 - 14 to 21 inches: sandy clay loam
Bk1 - 21 to 38 inches: coarse sandy loam
Bk2 - 38 to 50 inches: coarse sandy loam
Bk3 - 50 to 60 inches: coarse sandy loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R042BE052NM - Loamy, Cool Desert Grassland
Hydric soil rating: No

Description of Sheppard

Setting

Landform: Terraces, structural benches, dunes, benches, alluvial fans
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Convex, linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from sandstone

Typical profile

A - 0 to 5 inches: loamy fine sand
C - 5 to 27 inches: loamy fine sand
C - 27 to 60 inches: loamy fine sand

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R042BE054NM - Deep Sand, Cool Desert Grassland
Hydric soil rating: No

Minor Components

Cascajo

Percent of map unit: 3 percent
Ecological site: R042BE058NM - Hills, Cool Desert Grassland
Hydric soil rating: No

Riverwash

Percent of map unit: 2 percent
Landform: Streams, channels
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear

Hydric soil rating: Yes

183—Sheppard loamy fine sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1wmg
Elevation: 5,000 to 8,000 feet
Mean annual precipitation: 8 to 20 inches
Mean annual air temperature: 43 to 56 degrees F
Frost-free period: 60 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Sheppard and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sheppard

Setting

Landform: Stream terraces, alluvial fans, benches, dunes, structural benches
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Eolian deposits derived from sandstone

Typical profile

A - 0 to 4 inches: loamy fine sand
C1 - 4 to 45 inches: loamy fine sand
C2 - 45 to 60 inches: loamy fine sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A

Ecological site: R042BE054NM - Deep Sand, Cool Desert Grassland
Hydric soil rating: No

Minor Components

Cascajo
Percent of map unit: 7 percent
Ecological site: R042BE058NM - Hills, Cool Desert Grassland
Hydric soil rating: No

Sheppard
Percent of map unit: 7 percent
Ecological site: R042BE054NM - Deep Sand, Cool Desert Grassland
Hydric soil rating: No

Riverwash
Percent of map unit: 1 percent
Landform: Channels, streams
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

191—Sheppard loamy fine sand, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 1wmk
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 56 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition
Sheppard and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sheppard

Setting
Landform: Stream terraces, alluvial fans, benches, dunes, structural benches
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Eolian deposits derived from sandstone

Typical profile
A - 0 to 3 inches: loamy fine sand

C1 - 3 to 27 inches: loamy fine sand
C2 - 27 to 60 inches: loamy fine sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R042BE054NM - Deep Sand, Cool Desert Grassland
Hydric soil rating: No

Minor Components

Grieta

Percent of map unit: 12 percent
Ecological site: R042BE052NM - Loamy, Cool Desert Grassland
Hydric soil rating: No

Riverwash

Percent of map unit: 3 percent
Landform: Channels, streams
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

211—Zia-Clovis association, 2 to 10 percent slopes

Map Unit Setting

National map unit symbol: 1wmw
Elevation: 5,200 to 6,400 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 120 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Zia and similar soils: 45 percent
Clovis and similar soils: 30 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zia

Setting

Landform: Plateaus
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits derived from sandstone over fan alluvium derived from sandstone; eolian deposits and alluvium derived from sandstone and shale

Typical profile

A - 0 to 5 inches: sandy loam
Bw - 5 to 14 inches: sandy loam
C1 - 14 to 33 inches: sandy loam
C2 - 33 to 46 inches: sandy clay loam
C3 - 46 to 60 inches: sandy loam

Properties and qualities

Slope: 2 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R035XA113NM - Sandy
Hydric soil rating: No

Description of Clovis

Setting

Landform: Plains, fan remnants
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Eolian deposits derived from sandstone over fan alluvium derived from sandstone and shale; eolian deposits and alluvium derived from sandstone and shale

Typical profile

A - 0 to 5 inches: fine sandy loam
B - 5 to 60 inches: sandy clay loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R035XA112NM - Loamy
Hydric soil rating: No

Minor Components

Penistaja

Percent of map unit: 15 percent
Ecological site: R035XA112NM - Loamy
Hydric soil rating: No

Pinavetes

Percent of map unit: 10 percent
Ecological site: R035XA115NM - Deep Sand
Hydric soil rating: No

213—Pinavetes-Rock outcrop complex, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: 1wmx
Elevation: 5,100 to 6,900 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 120 to 140 days

Farmland classification: Not prime farmland

Map Unit Composition

Pinavetes and similar soils: 55 percent
Rock outcrop: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pinavetes

Setting

Landform: Valley sides, dunes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Eolian deposits derived from sandstone

Typical profile

A - 0 to 7 inches: sand
C - 7 to 60 inches: stratified sand to loamy sand

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R035XA115NM - Deep Sand
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Breaks, escarpments

Typical profile

R - 0 to 60 inches: bedrock

Properties and qualities

Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to 0.01 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Skyvillage
Percent of map unit: 10 percent
Ecological site: R035XG121NM - Shallow Sandstone
Hydric soil rating: No

Zia
Percent of map unit: 5 percent
Ecological site: R035XA113NM - Sandy
Hydric soil rating: No

250—Pinavetes loamy fine sand, 5 to 15 percent slopes

Map Unit Setting
National map unit symbol: 1wnj
Elevation: 5,100 to 6,900 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 120 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition
Pinavetes and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pinavetes

Setting
Landform: Valley sides, dunes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Eolian deposits derived from sandstone

Typical profile
A - 0 to 4 inches: loamy fine sand
C - 4 to 60 inches: loamy sand

Properties and qualities
Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R035XA115NM - Deep Sand
Hydric soil rating: No

Minor Components

Zia

Percent of map unit: 10 percent
Ecological site: R035XA113NM - Sandy
Hydric soil rating: No

823—Gilco loam, 1 to 4 percent slopes, unprotected

Map Unit Setting

National map unit symbol: 1wrg
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 55 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Gilco, unprotected, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilco, Unprotected

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Stream alluvium derived from igneous and sedimentary rock

Typical profile

Ap - 0 to 8 inches: loam

C - 8 to 60 inches: stratified fine sandy loam to loam to silt loam

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R042BE057NM - Bottomland, Cool Desert Grassland
Hydric soil rating: No

Minor Components

Jocity

Percent of map unit: 6 percent
Ecological site: R042BE057NM - Bottomland, Cool Desert Grassland
Hydric soil rating: No

Aga

Percent of map unit: 5 percent
Ecological site: R042BE057NM - Bottomland, Cool Desert Grassland
Hydric soil rating: No

Trail

Percent of map unit: 2 percent
Ecological site: R042BE057NM - Bottomland, Cool Desert Grassland
Hydric soil rating: No

Peralta

Percent of map unit: 2 percent
Ecological site: R042BE057NM - Bottomland, Cool Desert Grassland
Hydric soil rating: No

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Appendix B

Existing Ponds

Appendix A.5

Pond Routing Summary Table

Upper Venada DMP Update

Pond	Design Storm	Drainage Area	Inflow Volume	Outflow Volume	Peak Inflow	Peak Outflow	Peak Attenuated	Design Pond Storage volume from Grading Plan	Peak Stored Volume for Design Storm	Pond Depth	Peak Water Surface Elevation	Peak Water Depth	Pond Invert	Emergency Spillway Elevation	Top Of Pond Elevation	Freeboard to Emergency Spillway	Freeboard to Top of Pond Embankment
		sq. mi	ac-ft	ac-ft	cfs	cfs	cfs	ac-ft	ac-ft	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
Chaco Ridge Pond	100-yr 24-hr	0.03	2.6	2.6	55.0	24.1	30.9	2.1	0.9	8	5461.5	5.5	5456.0	5463.0	5464.0	1.5	2.5
Chayote Det Pond 4	100-yr 24-hr	0.58	35.5	35.5	291.7	97.5	194.2	29.4	11.6	15	5476.0	10.0	5466.0	5480.0	5481.0	4.0	5.0
EH Pond A	100-yr 24-hr	0.20	9.8	9.8	108.1	67.8	40.3	6.6	2.0	12	5553.6	7.6	5546.0	5557.0	5558.0	3.4	4.4
EH Pond B	100-yr 24-hr	0.13	7.2	7.2	86.3	35.7	50.6	3.2	1.8	8	5529.8	6.8	5523.0	5530.0	5531.0	0.2	1.2
EH Pond C	100-yr 24-hr	0.01	0.6	0.6	6.8	6.7	0.1	0.1	0.0	5	5529.6	3.6	5526.0	5530.0	5531.0	0.4	1.4
EH Pond D	100-yr 24-hr	0.08	4.1	4.1	44.2	44.3	-0.1	0.4	0.0	9	5507.9	4.7	5503.2	5511.0	5512.0	3.1	4.1
Enchanted Hills Dam	100-yr 24-hr	3.61	277.1	277.1	1706.8	746.4	960.4	145.0	81.8	28	5168.0	23.0	5145.0	5172.0	5173.0	4.0	5.0
Pond VO-100	100-yr 24-hr	0.16	11.5	11.5	155.3	104.9	50.4	5.5	2.0	8	5833.8	5.1	5828.7	5835.2	5837.0	1.4	3.2
Pond VO-105	100-yr 24-hr	0.09	6.4	6.4	100.2	88.5	11.7	3.0	0.7	8	5828.1	4.2	5823.9	5830.0	5832.0	1.9	3.9
Pond VO-115	100-yr 24-hr	0.06	4.0	4.0	63.6	28.6	35.0	5.8	0.8	10	5815.4	4.3	5811.1	5820.0	5821.0	4.6	5.6
Pond VO-120	100-yr 24-hr	0.11	12.3	12.3	144.5	124.9	19.6	2.6	0.6	8	5808.1	3.7	5804.5	5811.0	5812.0	2.9	3.9
Pond VO-125	100-yr 24-hr	0.10	21.2	21.2	243.9	175.6	68.3	7.0	4.0	11	5796.5	8.7	5787.8	5797.1	5799.0	0.6	2.5
Pond VO-135	100-yr 24-hr	0.15	11.5	11.5	148.6	108.9	39.7	4.8	2.1	8	5788.4	5.4	5783.0	5789.0	5791.0	0.6	2.6
SAD 5 Pond	100-yr 24-hr	0.41	27.1	27.1	234.4	202.6	31.8	9.2	1.6	10	5147.5	3.5	5144.0	5153.0	5154.0	5.5	6.5
SAD Pond 52	100-yr 24-hr	0.03	1.6	1.6	28.0	13.4	14.6	1.7	0.3	8	5186.3	3.3	5183.0	5190.0	5191.0	3.7	4.7
SAD Pond 8	100-yr 24-hr	0.22	14.7	14.7	214.2	101.3	112.9	7.7	3.6	10	5225.5	6.5	5219.0	5228.0	5229.0	2.5	3.5
Sante Fe Hills Pond	100-yr 24-hr	0.58	92.3	92.3	672.5	291.7	380.8	38.7	19.4	15	5363.5	9.5	5354.0	5368.0	5369.0	4.5	5.5
Sprint Pond	100-yr 24-hr	2.77	197.6	197.6	970.9	881.2	89.7	51.1	9.1	12	5214.6	5.6	5209.0	5220.0	5221.0	5.4	6.4

Appendix C
HEC-HMS Output

Appendix B.4.1 HEC-HMS Output - 100-yr 24-hr Storm Upper Venada DMP Update				
Hydrologic Element	**Area (MI^2)**	**Peak Discharge (CFS)**	**Time of Peak**	**Volume (ac-ft)**
BASIN 401A	0.627	341.4	13Jul2020, 06:38	39
BASIN 401B	1.034	479.4	13Jul2020, 06:37	54.2
BASIN 401C	0.2	105.1	13Jul2020, 06:40	12.4
Basin 401D	0.405	247.4	13Jul2020, 06:27	22.5
BASIN 401E	0.227	103.5	13Jul2020, 06:37	11.9
BASIN 402A	0.393	150.4	13Jul2020, 06:43	19.4
BASIN 402B	1.609	636.7	13Jul2020, 06:49	89.4
BASIN 402C	0.359	149.4	13Jul2020, 06:39	17.7
BASIN 403A	0.109	60.1	13Jul2020, 06:28	5.7
BASIN 403B	0.409	188.1	13Jul2020, 06:41	22.7
BASIN 501	1.171	564	13Jul2020, 06:39	67.5
BASIN 701A	0.212	248.2	13Jul2020, 06:25	21.7
BASIN 701B	0.225	214.2	13Jul2020, 06:16	14.7
BASIN 701C	0.076	95.5	13Jul2020, 06:11	5.2
BASIN 701D	0.026	28	13Jul2020, 06:12	1.6
BASIN 701E	0.088	90.1	13Jul2020, 06:14	5.6
BASIN 702	0.264	366.8	13Jul2020, 06:12	20.6
BASIN 703	0.216	203.7	13Jul2020, 06:26	18.5
Chaco Ridge Pond	0.03	24.1	13Jul2020, 06:21	2.6
Chayote Det Pond 4	0.575	97.5	13Jul2020, 07:18	35.5
EH Pond A	0.199	67.8	13Jul2020, 06:43	9.8
EH Pond B	0.129	35.7	13Jul2020, 06:49	7.2
EH Pond C	0.012	6.7	13Jul2020, 06:25	0.6
EH Pond D	0.083	44.3	13Jul2020, 06:26	4.1
EH 101A	0.199	108.1	13Jul2020, 06:26	9.8
EH 101B	0.129	86.3	13Jul2020, 06:23	7.2
EH 101C	0.012	6.8	13Jul2020, 06:25	0.6
EH 101D	0.083	44.2	13Jul2020, 06:27	4.1
EH 101E	0.152	230.7	13Jul2020, 06:13	13.8
EH 102	0.611	584.2	13Jul2020, 06:30	56.8
EH 103A	0.314	480.2	13Jul2020, 06:11	25.8
EH 103B	0.1	235.3	13Jul2020, 06:11	12
EH 104A	0.367	554	13Jul2020, 06:14	33.8
EH 104B	0.359	354	13Jul2020, 06:26	32.2
EH 104C	0.115	249.5	13Jul2020, 06:11	13.5
EH 105A	0.03	55	13Jul2020, 06:09	2.6
EH 105B	0.699	302.9	13Jul2020, 06:37	34.5
EH 105C	0.198	323.9	13Jul2020, 06:11	16.6
EH 106A	0.191	76.9	13Jul2020, 06:40	9.4

EH 106B	0.032	14.7	13Jul2020, 06:34	1.6
EH 106C	0.403	301.5	13Jul2020, 06:28	28.8
EH 106D	0.291	313.7	13Jul2020, 06:22	24.9
EH 106E	0.21	156	13Jul2020, 06:26	14.2
Enchanted Hills Dam	3.612	746.4	13Jul2020, 07:25	277.1
LB 101A	0.773	360.1	13Jul2020, 06:36	40.5
LB 101B	0.958	358.2	13Jul2020, 06:44	47.3
MARI 100	0.155	155.3	13Jul2020, 06:20	11.5
MARI 101	0.093	100.2	13Jul2020, 06:16	6.4
MARI 102	0.057	63.6	13Jul2020, 06:15	4
MARI 103	0.113	116.6	13Jul2020, 06:19	8.4
MARI 104	0.115	120.4	13Jul2020, 06:19	8.9
MARI 105	0.126	148.6	13Jul2020, 06:20	11.5
MARI 106	0.503	211	13Jul2020, 06:43	27.3
MARI 107	0.356	223.4	13Jul2020, 06:24	19.2
MARI 108	0.226	152.5	13Jul2020, 06:24	13.3
MARI 109	0.177	168	13Jul2020, 06:15	10.9
Paseo Gateway	0.414	521.9	13Jul2020, 06:26	45.9
POND VO-100	0.155	104.9	13Jul2020, 06:32	11.5
POND VO-105	0.093	88.5	13Jul2020, 06:21	6.4
POND VO-115	0.057	28.6	13Jul2020, 06:33	4
POND VO-120	0.17	124.9	13Jul2020, 06:27	12.3
POND VO-125	0.285	175.6	13Jul2020, 06:37	21.2
POND VO-135	0.126	108.9	13Jul2020, 06:31	11.5
SAD Pond 52	0.026	13.4	13Jul2020, 06:25	1.6
SAD Pond 8	0.225	101.3	13Jul2020, 06:34	14.7
SAD 5 Pond	0.415	202.6	13Jul2020, 06:25	27.1
Santa Fe Hills Pond	1.186	291.7	13Jul2020, 07:05	92.3
Sprint Pond	2.771	881.2	13Jul2020, 06:51	197.6
S2	2.361	893.8	13Jul2020, 06:54	126.5
101BR1	0.773	359.6	13Jul2020, 07:01	40.6
101ER1	0.199	67.8	13Jul2020, 06:47	9.8
101ER2	0.129	35.7	13Jul2020, 06:50	7.2
101ER3	0.012	6.7	13Jul2020, 06:27	0.6
101ER4	0.083	44.3	13Jul2020, 06:27	4.1
102R1	0.575	97.5	13Jul2020, 07:21	35.5
103AR1	1.186	291.7	13Jul2020, 07:07	92.3
103AR2	1.171	563.9	13Jul2020, 06:40	67.5
103AR3	2.357	838.4	13Jul2020, 06:42	159.8
103BR1A	2.671	926.6	13Jul2020, 06:38	185.6
103BR1B	2.771	970.9	13Jul2020, 06:37	197.6
104BR1A	0.367	551.2	13Jul2020, 06:21	33.8
104BR1B	0.367	553.5	13Jul2020, 06:15	33.8
104BR2	2.886	910.2	13Jul2020, 06:45	211.1
104CR1	2.771	881.2	13Jul2020, 06:53	197.6

105BR1	0.03	29.8	13Jul2020, 06:43	2.6
105CR1	0.729	314.4	13Jul2020, 06:44	37.1
106CR1A	0.032	14.7	13Jul2020, 06:36	1.6
106CR1B	0.223	90.9	13Jul2020, 06:45	11
106CR2A	0.191	76.9	13Jul2020, 06:42	9.4
106CR3	9.438	3697.3	13Jul2020, 07:05	550.2
106CR4	0.927	378.6	13Jul2020, 06:36	53.7
106DR1	10.991	4075.7	13Jul2020, 07:06	643.8
106ER1	3.612	746.4	13Jul2020, 07:29	277.1
106ER2	11.494	4187.4	13Jul2020, 07:08	690.4
106R1	0.155	104.8	13Jul2020, 06:55	11.5
106R2	0.093	88.4	13Jul2020, 06:42	6.4
107R1	0.637	418.5	13Jul2020, 06:32	46
108R1	0.285	175.6	13Jul2020, 06:41	21.3
108R2	0.126	108.9	13Jul2020, 06:35	11.5
109R1	0.993	616	13Jul2020, 06:34	65.2
17	1.921	957	13Jul2020, 06:44	121.3
17Aa	0.248	185.2	13Jul2020, 06:45	17.9
17Ab	0.411	283.7	13Jul2020, 06:38	32.7
17Ac	0.637	418.8	13Jul2020, 06:29	46
17Ad	0.993	616.4	13Jul2020, 06:30	65.2
18	9.438	3699	13Jul2020, 06:59	550.2
18Aa	3.582	1631.3	13Jul2020, 06:47	214.6
18Ab	4.187	1813.7	13Jul2020, 06:54	249.6
18Ac	0.414	521.9	13Jul2020, 06:26	45.9
18Ad	4.828	2025.8	13Jul2020, 07:00	307.3
18Ba	1.609	636.7	13Jul2020, 06:49	89.4
18Bb	2.002	783.3	13Jul2020, 06:48	108.8
18Bc	7.189	2895.3	13Jul2020, 06:59	433.8
18Bd	7.189	2893.5	13Jul2020, 07:02	433.8
18Be	7.298	2914.4	13Jul2020, 07:02	439.5
18Ca	0.773	360.1	13Jul2020, 06:36	40.5
18Cb	1.731	662.4	13Jul2020, 06:56	87.9
19	0.191	76.9	13Jul2020, 06:40	9.4
19A	0.032	14.7	13Jul2020, 06:34	1.6
20	0.927	379	13Jul2020, 06:33	53.7
20Aa	0.03	29.8	13Jul2020, 06:43	2.6
20Ab	0.729	316.1	13Jul2020, 06:43	37.1
21	10.064	3853.4	13Jul2020, 07:05	590.1
21Ab	0.223	90.9	13Jul2020, 06:41	11
21Ac	10.991	4075.6	13Jul2020, 07:04	643.8
22	11.494	4187.6	13Jul2020, 07:06	690.4
22Aa	0.152	230.7	13Jul2020, 06:13	13.8
22Ab	0.575	97.5	13Jul2020, 07:21	35.5
22Ac	1.171	564	13Jul2020, 06:39	67.5

22Ad	2.357	838.5	13Jul2020, 06:40	159.8
22Ae	2.671	926.9	13Jul2020, 06:37	185.6
22Af	2.771	971.4	13Jul2020, 06:36	197.6
22Ag	2.886	910.2	13Jul2020, 06:44	211.1
22Ba	0.367	554	13Jul2020, 06:14	33.8
22Bb	11.282	4130.1	13Jul2020, 07:06	668.7
22Bc	15.106	4820.2	13Jul2020, 07:09	967.5
22Bd	0.367	553.5	13Jul2020, 06:15	33.8
23	15.316	4854.9	13Jul2020, 07:09	981.7
24	16.211	5040.3	13Jul2020, 07:12	1047.9
24Aa	0.301	139.7	13Jul2020, 06:18	19.9
24Ab	0.415	202.5	13Jul2020, 06:29	27.1
24Bb	0.679	409.6	13Jul2020, 06:13	47.6
24Bc	15.532	4893.1	13Jul2020, 07:12	1000.3
401BR1	1.921	946.8	13Jul2020, 06:59	121.4
401DR1	3.582	1625.2	13Jul2020, 06:55	214.6
401ER1	4.187	1807.8	13Jul2020, 07:01	249.6
402CR1	2.002	782.3	13Jul2020, 06:56	108.8
403AR1	7.189	2893.5	13Jul2020, 07:02	433.8
403BR1	7.298	2912.7	13Jul2020, 07:04	439.5
403BR2	1.731	661.7	13Jul2020, 06:58	87.9
701CR1	0.225	101.3	13Jul2020, 06:37	14.7
701ER1	0.026	13.4	13Jul2020, 06:29	1.6
701ER2	0.301	139.5	13Jul2020, 06:21	19.9
702R1A	0.415	202.5	13Jul2020, 06:29	27.1
702R1B	0.415	202.5	13Jul2020, 06:31	27.1
703R1	15.316	4852	13Jul2020, 07:12	981.8
703R2	0.679	408.6	13Jul2020, 06:16	47.6

Appendix B.4.2				
HEC-HMS Output - 500-yr 24-hr Storm				
Upper Venada DMP Update				
Hydrologic Element	Area (MI^2)	Peak Discharge (CFS)	Time of Peak	Volume (ac-ft)
BASIN 401A	0.627	557.2	13Jul2020, 06:37	58.5
BASIN 401B	1.034	820.3	13Jul2020, 06:35	83.8
BASIN 401C	0.2	171.5	13Jul2020, 06:39	18.7
Basin 401D	0.405	418.2	13Jul2020, 06:26	34.4
BASIN 401E	0.227	177.1	13Jul2020, 06:36	18.4
BASIN 402A	0.393	261.1	13Jul2020, 06:42	30.3
BASIN 402B	1.609	1069	13Jul2020, 06:48	136.8
BASIN 402C	0.359	259.8	13Jul2020, 06:37	27.7
BASIN 403A	0.109	103.2	13Jul2020, 06:27	8.8
BASIN 403B	0.409	316.4	13Jul2020, 06:39	34.8
BASIN 501	1.171	933.3	13Jul2020, 06:38	101.8
BASIN 701A	0.212	348.6	13Jul2020, 06:25	28.9
BASIN 701B	0.225	333.6	13Jul2020, 06:16	20.9
BASIN 701C	0.076	146.5	13Jul2020, 06:11	7.4
BASIN 701D	0.026	44.5	13Jul2020, 06:11	2.3
BASIN 701E	0.088	141.7	13Jul2020, 06:13	8
BASIN 702	0.264	549.1	13Jul2020, 06:12	28.6
BASIN 703	0.216	296.4	13Jul2020, 06:26	25.2
Chaco Ridge Pond	0.03	33.8	13Jul2020, 06:21	3.6
Chayote Det Pond 4	0.575	113.2	13Jul2020, 07:32	52.3
EH Pond A	0.199	93.5	13Jul2020, 06:48	15.4
EH Pond B	0.129	76.1	13Jul2020, 06:42	10.9
EH Pond C	0.012	11.8	13Jul2020, 06:24	0.9
EH Pond D	0.083	74.4	13Jul2020, 06:30	6.4
EH 101A	0.199	189.5	13Jul2020, 06:25	15.4
EH 101B	0.129	145.6	13Jul2020, 06:22	10.9
EH 101C	0.012	11.9	13Jul2020, 06:24	0.9
EH 101D	0.083	77.3	13Jul2020, 06:26	6.4
EH 101E	0.152	332.8	13Jul2020, 06:13	18.6
EH 102	0.611	835.8	13Jul2020, 06:29	76.6
EH 103A	0.314	708.9	13Jul2020, 06:11	35.5
EH 103B	0.1	320.6	13Jul2020, 06:10	15.7
EH 104A	0.367	795.5	13Jul2020, 06:14	45.6
EH 104B	0.359	509.3	13Jul2020, 06:26	43.5
EH 104C	0.115	340.6	13Jul2020, 06:11	17.5
EH 105A	0.03	80.2	13Jul2020, 06:09	3.6
EH 105B	0.699	527.4	13Jul2020, 06:35	53.9
EH 105C	0.198	476.9	13Jul2020, 06:11	22.9
EH 106A	0.191	133.7	13Jul2020, 06:39	14.7

EH 106B	0.032	25.7	13Jul2020, 06:32	2.5
EH 106C	0.403	457.2	13Jul2020, 06:28	40.6
EH 106D	0.291	458.6	13Jul2020, 06:22	34.1
EH 106E	0.21	239.8	13Jul2020, 06:26	20.2
Enchanted Hills Dam	3.612	1044.2	13Jul2020, 07:21	388.5
LB 101A	0.773	616.3	13Jul2020, 06:35	62.6
LB 101B	0.958	621.9	13Jul2020, 06:43	73.9
MARI 100	0.155	235.2	13Jul2020, 06:19	16.2
MARI 101	0.093	155.2	13Jul2020, 06:16	9.1
MARI 102	0.057	98.3	13Jul2020, 06:15	5.7
MARI 103	0.113	176.8	13Jul2020, 06:19	11.8
MARI 104	0.115	179.7	13Jul2020, 06:19	12.4
MARI 105	0.126	212.9	13Jul2020, 06:20	15.5
MARI 106	0.503	354	13Jul2020, 06:42	41.6
MARI 107	0.356	380.7	13Jul2020, 06:23	29.5
MARI 108	0.226	251.8	13Jul2020, 06:23	19.8
MARI 109	0.177	275.2	13Jul2020, 06:14	16.1
Paseo Gateway	0.414	721.4	13Jul2020, 06:26	60.3
POND VO-100	0.155	149.2	13Jul2020, 06:33	16.2
POND VO-105	0.093	138.6	13Jul2020, 06:20	9.1
POND VO-115	0.057	32.8	13Jul2020, 06:38	5.7
POND VO-120	0.17	134.1	13Jul2020, 06:34	17.5
POND VO-125	0.285	213.1	13Jul2020, 06:40	29.9
POND VO-135	0.126	151.7	13Jul2020, 06:31	15.5
SAD Pond 52	0.026	16.8	13Jul2020, 06:28	2.3
SAD Pond 8	0.225	151	13Jul2020, 06:34	20.9
SAD 5 Pond	0.415	250.4	13Jul2020, 06:29	38.6
Santa Fe Hills Pond	1.186	361.8	13Jul2020, 07:08	128.9
Sprint Pond	2.771	913.7	13Jul2020, 07:11	281.9
S2	2.361	1520.1	13Jul2020, 06:52	194.8
101BR1	0.773	615.5	13Jul2020, 06:55	62.8
101ER1	0.199	93.5	13Jul2020, 06:51	15.4
101ER2	0.129	76.1	13Jul2020, 06:43	10.9
101ER3	0.012	11.8	13Jul2020, 06:26	0.9
101ER4	0.083	74.4	13Jul2020, 06:31	6.4
102R1	0.575	113.2	13Jul2020, 07:36	52.3
103AR1	1.186	361.8	13Jul2020, 07:10	128.9
103AR2	1.171	933.1	13Jul2020, 06:39	101.8
103AR3	2.357	1243.9	13Jul2020, 06:42	230.7
103BR1A	2.671	1363.4	13Jul2020, 06:39	266.2
103BR1B	2.771	1416.8	13Jul2020, 06:39	281.9
104BR1A	0.367	792.5	13Jul2020, 06:20	45.6
104BR1B	0.367	794.6	13Jul2020, 06:14	45.6
104BR2	2.886	1074.7	13Jul2020, 06:21	299.3
104CR1	2.771	913.7	13Jul2020, 07:13	281.9

105BR1	0.03	49.2	13Jul2020, 06:39	3.6
105CR1	0.729	560.5	13Jul2020, 06:40	57.5
106CR1A	0.032	25.7	13Jul2020, 06:34	2.5
106CR1B	0.223	158.1	13Jul2020, 06:42	17.2
106CR2A	0.191	133.7	13Jul2020, 06:40	14.7
106CR3	9.438	6430.5	13Jul2020, 07:00	826.9
106CR4	0.927	639	13Jul2020, 06:35	80.4
106DR1	10.991	7129.6	13Jul2020, 07:00	965.2
106ER1	3.612	1044.2	13Jul2020, 07:25	388.5
106ER2	11.494	7337.7	13Jul2020, 07:01	1028.3
106R1	0.155	148.8	13Jul2020, 06:54	16.2
106R2	0.093	139.1	13Jul2020, 06:38	9.2
107R1	0.637	549	13Jul2020, 06:35	65.1
108R1	0.285	213.1	13Jul2020, 06:43	29.9
108R2	0.126	151.7	13Jul2020, 06:35	15.5
109R1	0.993	904.7	13Jul2020, 06:30	94.6
17	1.921	1479.6	13Jul2020, 06:40	177.6
17Aa	0.248	246.6	13Jul2020, 06:51	25.3
17Ab	0.411	359.2	13Jul2020, 06:38	45.3
17Ac	0.637	549.6	13Jul2020, 06:31	65.1
17Ad	0.993	907	13Jul2020, 06:26	94.6
18	9.438	6435.8	13Jul2020, 06:56	826.9
18Aa	3.582	2683.7	13Jul2020, 06:42	320
18Ab	4.187	3052.7	13Jul2020, 06:48	373.1
18Ac	0.414	721.4	13Jul2020, 06:26	60.3
18Ad	4.828	3468.5	13Jul2020, 06:53	451.8
18Ba	1.609	1069	13Jul2020, 06:48	136.8
18Bb	2.002	1322.9	13Jul2020, 06:47	167.1
18Bc	7.189	4987.6	13Jul2020, 06:52	646.6
18Bd	7.189	4983.9	13Jul2020, 06:55	646.6
18Be	7.298	5028.3	13Jul2020, 06:55	655.4
18Ca	0.773	616.3	13Jul2020, 06:35	62.6
18Cb	1.731	1184	13Jul2020, 06:51	136.7
19	0.191	133.7	13Jul2020, 06:39	14.7
19A	0.032	25.7	13Jul2020, 06:32	2.5
20	0.927	640	13Jul2020, 06:32	80.5
20Aa	0.03	49.2	13Jul2020, 06:39	3.6
20Ab	0.729	566.4	13Jul2020, 06:39	57.5
21	10.064	6717.1	13Jul2020, 07:00	884.8
21Ab	0.223	158.2	13Jul2020, 06:39	17.2
21Ac	10.991	7130	13Jul2020, 06:59	965.2
22	11.494	7336.3	13Jul2020, 06:59	1028.2
22Aa	0.152	332.8	13Jul2020, 06:13	18.6
22Ab	0.575	113.2	13Jul2020, 07:36	52.3
22Ac	1.171	933.3	13Jul2020, 06:38	101.8

22Ad	2.357	1243.9	13Jul2020, 06:41	230.7
22Ae	2.671	1363.5	13Jul2020, 06:38	266.2
22Af	2.771	1417.1	13Jul2020, 06:38	281.9
22Ag	2.886	1074.7	13Jul2020, 06:20	299.3
22Ba	0.367	795.5	13Jul2020, 06:14	45.6
22Bb	11.282	7230.4	13Jul2020, 07:00	999.4
22Bc	15.106	8289.3	13Jul2020, 07:02	1416.8
22Bd	0.367	794.6	13Jul2020, 06:14	45.6
23	15.316	8358.2	13Jul2020, 07:02	1436.9
24	16.211	8697.4	13Jul2020, 07:04	1529.4
24Aa	0.301	203.5	13Jul2020, 06:14	28.3
24Ab	0.415	250.4	13Jul2020, 06:33	38.6
24Bb	0.679	624.1	13Jul2020, 06:15	67.2
24Bc	15.532	8434.7	13Jul2020, 07:05	1462.2
401BR1	1.921	1457.9	13Jul2020, 06:53	177.7
401DR1	3.582	2675.6	13Jul2020, 06:48	320
401ER1	4.187	3042.4	13Jul2020, 06:53	373.1
402CR1	2.002	1321.4	13Jul2020, 06:54	167.1
403AR1	7.189	4983.9	13Jul2020, 06:55	646.6
403BR1	7.298	5023.1	13Jul2020, 06:56	655.4
403BR2	1.731	1184	13Jul2020, 06:53	136.7
701CR1	0.225	151.2	13Jul2020, 06:36	20.9
701ER1	0.026	16.8	13Jul2020, 06:32	2.3
701ER2	0.301	203	13Jul2020, 06:17	28.3
702R1A	0.415	250.4	13Jul2020, 06:33	38.6
702R1B	0.415	250.5	13Jul2020, 06:35	38.6
703R1	15.316	8356.2	13Jul2020, 07:05	1436.9
703R2	0.679	623.3	13Jul2020, 06:17	67.2

Appendix D

Lateral Erosion Envelopes

Reach	Existing Q_{100}	Dominant Discharge Q_D	Slope S_0	Critical Slope S_C	Flow Classification	Estimated channel width W_D	Meandering Channel Length	Total Channel Length M	Sinuosity k	Meander Wavelength λ	Downvalley Length of Arroyo Lv	Reach Classification Equation	Maximum lateral erosion distance Δmax	Offset
	cfs	cfs	ft/ft	ft/ft			ft	ft						ft
106CR3	3697.3	739.5	0.016	0.015	supercritical	65	6285	5201	1	6285	3142	3.49b	199	199
106DR1	4075.7	815.1	0.017	0.015	supercritical	67	4099	2942	1	4099	2050	3.49b	209	209
106ER2	4187.4	837.5	0.023	0.015	supercritical	68	2654	2248	1	2654	1327	3.49b	213	213
109R1	616	123.2	0.017	0.020	subcritical	32	2035	1837	1	2035	1018	3.5a	81	81
401BR1	946.8	189.4	0.015	0.018	subcritical	39	10007	8836	1	10007	5003	3.5b	97	97
401DR1	1625.2	325.0	0.014	0.017	subcritical	48	4423	3765	1	4423	2212	3.5b	131	131
401ER1	1807.8	361.6	0.015	0.017	subcritical	49	5977	4800	1	5977	2989	3.5b	138	138
402CR1	782.3	156.5	0.013	0.019	subcritical	37	6338	4046	2	6338	3169	3.5a	94	94
403AR1	2893.5	578.7	0.014	0.016	subcritical	60	2610	2322	1	2610	1305	3.5b	179	179
403BR1	2912.7	582.54	0.014	0.016	subcritical	60	1983	1754	1	1983	991	3.5b	181	181

Notes:

LEE Lines were filtered for channels over 500 cfs, but did not meet other qualifications (such are lined or man made).

Appendix E

Existing Structure Analysis

Culvert Calculator Report
Unser Crossing to Top of Headwall - RESPEC

Solve For: Discharge

Culvert Summary

Allowable HW Elevation	5,656.00	ft	Headwater Depth/Height	1.40	
Computed Headwater Eleva	5,656.00	ft	Discharge	666.92	cfs
Inlet Control HW Elev.	5,656.00	ft	Tailwater Elevation	5,648.00	ft
Outlet Control HW Elev.	5,655.72	ft	Control Type	Inlet Control	

Grades

Upstream Invert	5,649.00	ft	Downstream Invert	5,645.00	ft
Length	60.00	ft	Constructed Slope	0.066667	ft/ft

Hydraulic Profile

Profile	S2		Depth, Downstream	2.51	ft
Slope Type	Steep		Normal Depth	2.37	ft
Flow Regime	Supercritical		Critical Depth	3.70	ft
Velocity Downstream	16.91	ft/s	Critical Slope	0.017315	ft/ft

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	5.00	ft
Section Size	60 inch		Rise	5.00	ft
Number Sections	4				

Outlet Control Properties

Outlet Control HW Elev.	5,655.72	ft	Upstream Velocity Head	1.78	ft
Ke	0.70		Entrance Loss	1.24	ft

Inlet Control Properties

Inlet Control HW Elev.	5,656.00	ft	Flow Control	Transition	
Inlet Type	Mitered to slope		Area Full	78.5	ft²
K	0.02100		HDS 5 Chart	2	
M	1.33000		HDS 5 Scale	2	
C	0.04630		Equation Form	1	
Y	0.75000				

Culvert Calculator Report
Paseo del Vulcan Crossing to Top of Headwall - RESPEC

Solve For: Discharge

Culvert Summary

Allowable HW Elevation	5,283.00	ft	Headwater Depth/Height	0.68	
Computed Headwater Eleva	5,283.00	ft	Discharge	5,528.06	cfs
Inlet Control HW Elev.	5,282.87	ft	Tailwater Elevation	5,279.35	ft
Outlet Control HW Elev.	5,283.00	ft	Control Type	Entrance Control	

Grades

Upstream Invert	5,274.80	ft	Downstream Invert	5,273.35	ft
Length	111.00	ft	Constructed Slope	0.013063	ft/ft

Hydraulic Profile

Profile	CompositeS1S2		Depth, Downstream	6.00	ft
Slope Type	Steep		Normal Depth	3.12	ft
Flow Regime	N/A		Critical Depth	5.13	ft
Velocity Downstream	10.97	ft/s	Critical Slope	0.003254	ft/ft

Section

Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	12.00	ft
Section Size	12 x 12 ft		Rise	12.00	ft
Number Sections	7				

Outlet Control Properties

Outlet Control HW Elev.	5,283.00	ft	Upstream Velocity Head	2.56	ft
Ke	0.20		Entrance Loss	0.51	ft

Inlet Control Properties

Inlet Control HW Elev.	5,282.87	ft	Flow Control	Unsubmerged	
Inlet Type	90° headwall w 45° bevels		Area Full	1,008.0	ft²
K	0.49500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	2	
C	0.03140		Equation Form	2	
Y	0.82000				

Culvert Calculator Report
Camino Encantadas to Top of Headwall - RESPEC

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	5,202.73	ft	Headwater Depth/Height	1.65	
Computed Headwater Eleva	5,202.73	ft	Discharge	5,616.14	cfs
Inlet Control HW Elev.	5,202.73	ft	Tailwater Elevation	5,192.50	ft
Outlet Control HW Elev.	5,201.53	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	5,189.50	ft	Downstream Invert	5,188.50	ft
Length	86.00	ft	Constructed Slope	0.011628	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	6.10	ft
Slope Type	Steep		Normal Depth	4.90	ft
Flow Regime	Supercritical		Critical Depth	7.52	ft
Velocity Downstream	19.17	ft/s	Critical Slope	0.003714	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	12.00	ft
Section Size	12 x 8 ft		Rise	8.00	ft
Number Sections	4				

Outlet Control Properties					
Outlet Control HW Elev.	5,201.53	ft	Upstream Velocity Head	3.76	ft
Ke	0.20		Entrance Loss	0.75	ft

Inlet Control Properties					
Inlet Control HW Elev.	5,202.73	ft	Flow Control	N/A	
Inlet Type	90° headwall w 45° bevels		Area Full	384.0	ft²
K	0.49500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	2	
C	0.03140		Equation Form	2	
Y	0.82000				

Culvert Calculator Report
Lincoln Crossing to Top of Headwall - RESPEC

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	5,146.31	ft	Headwater Depth/Height	1.78	
Computed Headwater Eleva	5,146.31	ft	Discharge	6,018.22	cfs
Inlet Control HW Elev.	5,146.31	ft	Tailwater Elevation	5,134.95	ft
Outlet Control HW Elev.	5,144.68	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	5,132.08	ft	Downstream Invert	5,130.95	ft
Length	106.00	ft	Constructed Slope	0.010660	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	6.41	ft
Slope Type	Steep		Normal Depth	5.32	ft
Flow Regime	Supercritical		Critical Depth	7.88	ft
Velocity Downstream	19.57	ft/s	Critical Slope	0.003785	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	12.00	ft
Section Size	12 x 8 ft		Rise	8.00	ft
Number Sections	4				

Outlet Control Properties					
Outlet Control HW Elev.	5,144.68	ft	Upstream Velocity Head	3.94	ft
Ke	0.20		Entrance Loss	0.79	ft

Inlet Control Properties					
Inlet Control HW Elev.	5,146.31	ft	Flow Control	N/A	
Inlet Type	90° headwall w 45° bevels		Area Full	384.0	ft²
K	0.49500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	2	
C	0.03140		Equation Form	2	
Y	0.82000				

Culvert Calculator Report
528 Crossing to Top of Headwall - RESPEC

Solve For: Discharge

Culvert Summary

Allowable HW Elevation	5,098.34	ft	Headwater Depth/Height	1.30	
Computed Headwater Eleva	5,098.34	ft	Discharge	4,516.89	cfs
Inlet Control HW Elev.	5,098.34	ft	Tailwater Elevation	5,086.79	ft
Outlet Control HW Elev.	5,097.95	ft	Control Type	Inlet Control	

Grades

Upstream Invert	5,085.34	ft	Downstream Invert	5,081.79	ft
Length	155.00	ft	Constructed Slope	0.022903	ft/ft

Hydraulic Profile

Profile	S2		Depth, Downstream	5.26	ft
Slope Type	Steep		Normal Depth	4.03	ft
Flow Regime	Supercritical		Critical Depth	7.88	ft
Velocity Downstream	23.85	ft/s	Critical Slope	0.003786	ft/ft

Section

Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	12.00	ft
Section Size	12 x 10 ft		Rise	10.00	ft
Number Sections	3				

Outlet Control Properties

Outlet Control HW Elev.	5,097.95	ft	Upstream Velocity Head	3.94	ft
Ke	0.20		Entrance Loss	0.79	ft

Inlet Control Properties

Inlet Control HW Elev.	5,098.34	ft	Flow Control	Transition	
Inlet Type	90° headwall w 45° bevels		Area Full	360.0	ft²
K	0.49500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	2	
C	0.03140		Equation Form	2	
Y	0.82000				