

**SUMMERSET FARMS
2200 SOUTH 3500 WEST
WEBER COUNTY, UTAH
STORM WATER STUDY**

Project No. 02N302

6-3-2019

General Site Information:

The proposed Farr Favero Property site is located at approximately 2200 South 3500 West in Weber County, Utah to the west of Ogden City. Construction will consist of a new residential development with roadways, curb and gutter, and sidewalk. Underground utilities such as sewer, water, storm drain, and gas lines will be installed as part of this project. Lots will be rough graded to accommodate the street designs.

The storm water that falls to the north of the existing canal on the site will be collected in inlet boxes and continue via storm drain to a detention facility at the northwest corner of the site. Storm water that falls south of the canal will drain to a detention facility at the southeast corner of the site. A small section of roadway (3750 West Street) will not be included as part of the study area, as it will be detained along with the subdivision to the north. The study area is allowed an overall unit-release of 0.1 cfs per acre into existing storm drainage systems along 2200 South Street and 3500 West Street. Drainage will continue westerly and southerly, respectively, in these systems in a historical fashion. The attached figure shows the project site and location of storm water outfall points. Detention calculations have been provided for the site. (See attached figure and calculations).

The study area is broken up into 9 drainage areas (labeled A-1 through A-9). A runoff coefficient of 0.15 is used for natural ground and landscaped areas. A runoff coefficient of 0.90 is used for asphalt, concrete, buildings, and other hard surfaced areas. An average runoff coefficient was calculated for each area. The overall coefficient for the study area is 0.43.

A time of concentration is calculated using the FAA method and rational coefficients of 0.35 for landscape and 0.91 for hardscape for each of the areas. The time of concentration ranges from about 19 to 28 minutes for the nine areas. This time is based on the longest path inside the drainage area over grass or other vegetation, asphalt, concrete, or through a pipeline as applicable. Times calculated to be less than 5 minutes should be rounded to 5 minutes when using this method. Rainfall Intensities were taken from NOAA for pipe sizing and detention requirements. The values obtained were interpolated as necessary. A copy of this data is attached.

Data showing area information, runoff coefficient, time of concentration, peak flow, and required detention for the site is also provided and can be found in the attached calculations.

Pipe Sizes:

Storm water pipes in the project are proposed to be concrete pipe (CP), and/or reinforced concrete pipe (RCP). All pipes in the project are sloped to provide the design capacity while maintaining a minimum scour speed of at least 2 feet per second when the pipes are flowing at least half full. The pipes and inlet boxes have enough capacity to convey the 10-year storm without surcharging.

Orifice Plate:

An orifice plate will be used at each detention facility to control the rate that storm water flows from the project. They will be located at the downstream end of each drainage area. The orifice for the northwest pond will be placed on the downstream face of the inlet box at Node 30. For the southeast pond, the downstream face of Node 34 will be used. The orifice plate openings will each have a diameter sized to allow no more than 0.1 cfs/acre to be released from the study area. The orifice plates will allow small flows to pass through without detention. As the rate of storm water into the pipes and detention facilities increases, the orifice plates will restrict the flow. The maximum flow through the plates will occur when the detention basins reach the maximum design depth. A detail of an orifice plate is attached.

Required Detention:

The required detention storage volume for the 10-year storm with a release rate of 0.1 cfs/acre is 46,068 cubic feet for the entire study area. This volume is broken into two parts. The areas south of the canal, A-8 and A-9, require 7,549 cf. The remaining areas, A-1 through A-7 require the remaining volume 38,519 cf. Calculations are provided for each of these figures. Storage volume will be provided to meet these requirements. In the event the ponding areas experience a storm larger than the design storm water will then spill out onto 3900 West and toward 2200 South Street for the northwest ponding area and onto 3500 West for the southeast ponding area. From there, flows will be allowed to continue downhill in a historical fashion, ultimately reaching the Great Salt Lake to the west.

Great Basin Engineering, Inc.

Prepared by Ryan Bingham, P.E.



2200 South Street

101 102 103 104 105 106

201 202 203 204

Castellano

LDS Church

Weber County Fire

Charles J. Marsh

Charles J. Marsh

Favero's Legacy Cluster Subdivision - Phase 1 - 1st Amendment

Favero's Legacy Cluster Subdivision - Phase 2

Parcel # 150780052
Entry No. 2150945

Outfall 1

A-7

Rick L. Underwood Jr.

Robert L. & Kathryn H. Favero

A-1

A-3

A-9

A-5

Glenn Farr & Inez C. Farr (Trustees)

A-2

Gary F Farr Family Trust

A-8

Gary F Farr Family Trust
Parcel # 150780013
Book 0856, Page 0421

A-6

A-4

Glenn Farr & Inez C. Farr (Trustees)

Cameron Cluster Subdivision

3500 West Street
Outfall 2

Storm Water Calculations
 Summerset Farms
 Approx. 2300 W 3800 South Weber County, UT 84401
 02N302 SWS.dwg

6/3/2019

9 Detained Areas

Hardscape C = 0.90
 Landscape C = 0.15

Zone 1 (ft²)

Avg. lot size 38466
 Avg. home size 7000
 Avg. patio/driveway size 5500
 C = 0.394

Category Runoff Coefficients

0.763 0.394

Drainage Areas	Total Area (acres)	60' Road Area (acres)	Zone 1 Area (acres)	C
Σ Det. Areas	47.549	5.162	42.387	0.434
Σ All Areas	47.549	5.162	42.387	0.434
A-1	7.277	0.632	6.645	0.426
A-2	6.561	1.134	5.427	0.457
A-3	7.151	0.774	6.377	0.434
A-4	4.982	0.893	4.089	0.460
A-5	3.706	0.731	2.975	0.466
A-6	4.284	0.196	4.088	0.411
A-7	4.667	0.801	3.866	0.457
A-8	5.096	0.000	5.096	0.394
A-9	3.825	0.000	3.825	0.394

Time of Concentration--use FAA Method

For FAA Method, use K's of..

K = 0.35 for landscape
 K = 0.91 for hardscape

$$t_c = \frac{1.8(1.1 - K)\sqrt{L}}{\sqrt[3]{S}}$$

Assume Pipe Flow is at 2 ft/s Scour Speed

**Note: S is in percent, 5 min is smallest allowed Tc

Area	Length on Landscape (ft)	Slope of Landscape (%)	Time on Landscape (min.)	Length on Hardscape (ft)	Slope of Hardscape (%)	Time on Hardscape (min.)	Length in Pipe (ft)	Time in Pipe (min.)	TC for entire Area (min.)
A-1	418.00	2.00	21.91	368.00	2.00	5.21	39.00	0.33	27.44
A-2	137.00	2.00	12.54	499.00	1.50	6.67	146.00	1.22	20.43
A-3	247.00	2.00	16.84	24.00	1.50	1.46	732.00	6.10	24.40
A-4	181.00	2.00	14.42	571.00	1.50	7.14	39.00	0.33	21.88
A-5	248.00	2.00	16.87	248.00	1.00	5.39	47.00	0.39	22.65
A-6	616.00	2.00	26.59	24.00	2.00	1.33	20.00	0.17	28.09
A-7	73.00	2.00	9.15	805.00	1.50	8.48	132.00	1.10	18.73
A-8	254.00	2.00	17.08	226.00	2.00	4.08	0.00	0.00	21.16
A-9	149.00	2.00	13.08	420.00	2.00	5.56	0.00	0.00	18.64

Rainfall Intensities
Data From NOAA

10-Year Storm Intensities

The equations used for the 10-Year Storm Intensities were found using the attached Rainfall data as well as Interpolated data where applicable.

Storm Intensities		
AREA	Tc (minutes)	I (10-yr.) (in./hr.)
A-1	27.4	1.45
A-2	20.4	1.72
A-3	24.4	1.55
A-4	21.9	1.66
A-5	22.7	1.62
A-6	28.1	1.43
A-7	18.7	1.81
A-8	21.2	1.69
A-9	18.6	1.82

Peak Flow Information
 Use Rational Method
 10-Year Storm Intensities

$Q=CIA$

AREA	C	I10 (in./hr.)
A-1	0.426	1.450
A-2	0.457	1.717
A-3	0.434	1.551
A-4	0.460	1.657
A-5	0.466	1.625
A-6	0.411	1.430
A-7	0.457	1.813
A-8	0.394	1.687
A-9	0.394	1.818

Peak Flows	
Σ detained =	33.56
A (acres)	Q (10-yr.) (cfs)
7.28	4.49
6.56	5.15
7.15	4.81
4.98	3.80
3.71	2.81
4.28	2.51
4.67	3.87
5.10	3.38
3.82	2.74

Node Inlet Requirements

Size pipes for		10	year storm
Area	Node #	% of Total	Q (cfs)
A-1	1	85.0%	3.82
A-1	2	15.0%	0.67
A-2	3	7.0%	0.36
A-2	4	75.0%	3.87
A-2	5	10.0%	0.52
A-2	6	2.0%	0.10
A-2	7	3.0%	0.15
A-2	8	3.0%	0.15
A-3	9	6.0%	0.29
A-3	10	45.0%	2.16
A-3	11	6.0%	0.29
A-3	12	6.0%	0.29
A-3	13	6.0%	0.29
A-3	14	11.0%	0.53
A-3	15	20.0%	0.96
A-4	16	85.0%	3.23
A-4	17	15.0%	0.57
A-5	18	6.0%	0.17
A-5	19	8.0%	0.22
A-5	20	8.0%	0.22
A-5	21	9.0%	0.25
A-5	22	62.0%	1.74
A-5	23	7.0%	0.20
A-6	24	8.0%	0.20
A-6	25	15.0%	0.38
A-6	26	77.0%	1.94
A-7	27	25.0%	0.97
A-7	28	10.0%	0.39
A-7	29	60.0%	2.32
A-7	30	5.0%	0.19
A-8	31	100.0%	3.38
A-9	32	40.0%	1.10
A-9	33	30.0%	0.82
A-9	34	30.0%	0.82

PIPE FLOWS

Upstream Node	Downstream node	Pipe Flow (cfs)
1	2	3.82
2	3	4.49
3	6	4.85
4	5	3.87
5	6	4.38
6	7	9.34
7	8	9.49
8	9	9.65
9	11	9.94
10	11	2.16
11	12	12.39
12	13	12.68
13	14	12.97
14	15	13.50
15	24	14.46
16	17	3.23
17	18	3.80
18	19	3.96
19	20	4.19
20	21	4.41
21	23	4.67
22	23	1.74
23	24	6.60
24	25	21.26
25	26	21.64
26	27	23.58
27	29	24.54
28	29	0.39
29	30	27.25
30	Outfall 1	27.44
31	32	3.38
32	34	4.48
33	34	0.82
34	Outfall 2	6.12

Options for Pipe Sizes Between the Specified Nodes

Up Stream Node	Dn Stream Node	Q (cfs)	Pipe Size (in)	Design Min Slope (%)	Area (ft ²)	Rh (ft)	Manning's n	Scour Min. Slope (%)	First Trial Pipe Size
1	2	3.82	15	0.349%	1.227	0.313	0.013	0.150%	15
			18	0.132%	1.767	0.375	0.013	0.120%	
			24	0.028%	3.142	0.500	0.013	0.080%	
2	3	4.49	15	0.484%	1.227	0.313	0.013	0.150%	15
			18	0.183%	1.767	0.375	0.013	0.120%	
			24	0.039%	3.142	0.500	0.013	0.080%	
3	6	4.85	15	0.564%	1.227	0.313	0.013	0.150%	18
			18	0.213%	1.767	0.375	0.013	0.120%	
			24	0.046%	3.142	0.500	0.013	0.080%	
4	5	3.87	15	0.358%	1.227	0.313	0.013	0.150%	15
			18	0.135%	1.767	0.375	0.013	0.120%	
			24	0.029%	3.142	0.500	0.013	0.080%	
5	6	4.38	15	0.460%	1.227	0.313	0.013	0.150%	15
			18	0.174%	1.767	0.375	0.013	0.120%	
			24	0.038%	3.142	0.500	0.013	0.080%	
6	7	9.34	15	2.089%	1.227	0.313	0.013	0.150%	24
			18	0.790%	1.767	0.375	0.013	0.120%	
			24	0.170%	3.142	0.500	0.013	0.080%	
7	8	9.49	15	2.159%	1.227	0.313	0.013	0.150%	24
			18	0.816%	1.767	0.375	0.013	0.120%	
			24	0.176%	3.142	0.500	0.013	0.080%	
8	9	9.65	15	2.230%	1.227	0.313	0.013	0.150%	24
			18	0.843%	1.767	0.375	0.013	0.120%	
			24	0.182%	3.142	0.500	0.013	0.080%	
9	11	9.94	15	2.365%	1.227	0.313	0.013	0.150%	24
			18	0.894%	1.767	0.375	0.013	0.120%	
			24	0.193%	3.142	0.500	0.013	0.080%	
10	11	2.16	15	0.112%	1.227	0.313	0.013	0.150%	15
			18	0.042%	1.767	0.375	0.013	0.120%	
			24	0.009%	3.142	0.500	0.013	0.080%	
11	12	12.39	15	3.678%	1.227	0.313	0.013	0.150%	24
			18	1.391%	1.767	0.375	0.013	0.120%	
			24	0.300%	3.142	0.500	0.013	0.080%	
12	13	12.68	15	3.851%	1.227	0.313	0.013	0.150%	24
			18	1.456%	1.767	0.375	0.013	0.120%	
			24	0.314%	3.142	0.500	0.013	0.080%	
13	14	12.97	15	4.028%	1.227	0.313	0.013	0.150%	24
			18	1.523%	1.767	0.375	0.013	0.120%	
			24	0.328%	3.142	0.500	0.013	0.080%	
14	15	13.50	15	4.364%	1.227	0.313	0.013	0.150%	24
			18	1.650%	1.767	0.375	0.013	0.120%	
			24	0.356%	3.142	0.500	0.013	0.080%	

15	24	14.46	18	1.894%	1.767	0.375	0.013	0.120%	24
		14.46	24	0.408%	3.142	0.500	0.013	0.080%	
		14.46	30	0.124%	4.909	0.625	0.013	0.060%	
16	17	3.23	15	0.249%	1.227	0.313	0.013	0.150%	15
		3.23	18	0.094%	1.767	0.375	0.013	0.120%	
		3.23	24	0.020%	3.142	0.500	0.013	0.080%	
17	18	3.80	15	0.345%	1.227	0.313	0.013	0.150%	15
		3.80	18	0.131%	1.767	0.375	0.013	0.120%	
		3.80	24	0.028%	3.142	0.500	0.013	0.080%	
18	19	3.96	15	0.377%	1.227	0.313	0.013	0.150%	15
		3.96	18	0.142%	1.767	0.375	0.013	0.120%	
		3.96	24	0.031%	3.142	0.500	0.013	0.080%	
19	20	4.19	15	0.420%	1.227	0.313	0.013	0.150%	15
		4.19	18	0.159%	1.767	0.375	0.013	0.120%	
		4.19	24	0.034%	3.142	0.500	0.013	0.080%	
20	21	4.41	15	0.467%	1.227	0.313	0.013	0.150%	15
		4.41	18	0.177%	1.767	0.375	0.013	0.120%	
		4.41	24	0.038%	3.142	0.500	0.013	0.080%	
21	23	4.67	15	0.522%	1.227	0.313	0.013	0.150%	18
		4.67	18	0.197%	1.767	0.375	0.013	0.120%	
		4.67	24	0.043%	3.142	0.500	0.013	0.080%	
22	23	1.74	15	0.073%	1.227	0.313	0.013	0.150%	15
		1.74	18	0.027%	1.767	0.375	0.013	0.120%	
		1.74	24	0.006%	3.142	0.500	0.013	0.080%	
23	24	6.60	15	1.045%	1.227	0.313	0.013	0.150%	18
		6.60	18	0.395%	1.767	0.375	0.013	0.120%	
		6.60	24	0.085%	3.142	0.500	0.013	0.080%	
24	25	21.26	18	4.097%	1.767	0.375	0.013	0.120%	30
		21.26	24	0.883%	3.142	0.500	0.013	0.080%	
		21.26	30	0.269%	4.909	0.625	0.013	0.060%	
25	26	21.64	18	4.243%	1.767	0.375	0.013	0.120%	30
		21.64	24	0.915%	3.142	0.500	0.013	0.080%	
		21.64	30	0.278%	4.909	0.625	0.013	0.060%	
26	27	23.58	18	5.037%	1.767	0.375	0.013	0.120%	30
		23.58	24	1.086%	3.142	0.500	0.013	0.080%	
		23.58	30	0.330%	4.909	0.625	0.013	0.060%	

27	29	24.54	18	5.458%	1.767	0.375	0.013	0.120%	30
		24.54	24	1.177%	3.142	0.500	0.013	0.080%	
		24.54	30	0.358%	4.909	0.625	0.013	0.060%	
28	29	0.39	15	0.004%	1.227	0.313	0.013	0.150%	15
		0.39	18	0.001%	1.767	0.375	0.013	0.120%	
		0.39	24	0.000%	3.142	0.500	0.013	0.080%	
29	30	27.25	24	1.451%	3.142	0.500	0.013	0.080%	30
		27.25	30	0.441%	4.909	0.625	0.013	0.060%	
		27.25	36	0.167%	7.069	0.750	0.013	0.050%	
30	Outfall 1	27.44	24	1.471%	3.142	0.500	0.013	0.080%	30
		27.44	30	0.448%	4.909	0.625	0.013	0.060%	
		27.44	36	0.169%	7.069	0.750	0.013	0.050%	
31	32	3.38	15	0.274%	1.227	0.313	0.013	0.150%	15
		3.38	18	0.104%	1.767	0.375	0.013	0.120%	
		3.38	24	0.022%	3.142	0.500	0.013	0.080%	
32	34	4.48	15	0.481%	1.227	0.313	0.013	0.150%	15
		4.48	18	0.182%	1.767	0.375	0.013	0.120%	
		4.48	24	0.039%	3.142	0.500	0.013	0.080%	
33	34	0.82	15	0.016%	1.227	0.313	0.013	0.150%	15
		0.82	18	0.006%	1.767	0.375	0.013	0.120%	
		0.82	24	0.001%	3.142	0.500	0.013	0.080%	
34	Outfall 2	6.12	15	0.898%	1.227	0.313	0.013	0.150%	18
		6.12	18	0.340%	1.767	0.375	0.013	0.120%	
		6.12	24	0.073%	3.142	0.500	0.013	0.080%	

Summerset Farms

Detention Facility Serving A-1 through A-7

$$\begin{aligned} C &= 0.44 & \text{Remaining Unit Discharge} &= 0.100 \text{ cfs/acre} \\ \text{Area} &= 38.63 \text{ acres} & \text{Release through Restriction} &= 3.863 \text{ cfs} \end{aligned}$$

Detention Pond Sized For The 10 Year Storm

Time min	Rainfall Intensity in./hr.	Accumulated Volume (CF)	Allowable Release (CF)	Needed Detention (CF)
5	3.25	16684	1159	15526
10	2.47	25360	2318	23043
15	2.04	31418	3477	27942
20	1.74	35632	4635	30997
25	1.53	39182	5794	33388
30	1.37	42199	6953	35246
35	1.26	45127	8112	37015
40	1.14	46941	9271	37670
45	1.05	48499	10430	38070
50	0.97	49794	11588	38206
55	0.90	51034	12747	38286
60	0.85	52425	13906	38519
90	0.62	57003	20859	36144
120	0.49	60372	27812	32560
180	0.36	65608	41718	23890
360	0.23	83165	83436	-271
720	0.14	104973	166873	-61900
1440	0.09	125672	333746	-208073

<- Det

$$\text{Required Storage Volume} = 38519 \text{ ft}^3$$

Summerset Farms

Detention Facility Serving A-8 and A-9

C = **0.39** Remaining Unit Discharge = **0.100** cfs/acre
Area = **8.92** acres Release through Restriction = **0.892** cfs

Detention Pond Sized For The **10** Year Storm

Time min	Rainfall Intensity in./hr.	Accumulated Volume (CF)	Allowable Release (CF)	Needed Detention (CF)
5	3.25	3424	268	3157
10	2.47	5205	535	4670
15	2.04	6449	803	5646
20	1.74	7313	1070	6243
25	1.53	8042	1338	6704
30	1.37	8661	1606	7056
35	1.26	9262	1873	7389
40	1.14	9635	2141	7494
45	1.05	9955	2409	7546
50	0.97	10220	2676	7544
55	0.90	10475	2944	7531
60	0.85	10760	3211	7549
90	0.62	11700	4817	6883
120	0.49	12391	6423	5968
180	0.36	13466	9634	3832
360	0.23	17070	19269	-2199
720	0.14	21546	38538	-16992
1440	0.09	25794	77075	-51281

<- Det

Required Storage Volume = **7549** ft³



NOAA Atlas 14, Volume 1, Version 5
Location name: Ogden, Utah, USA*
Latitude: 41.2257°, Longitude: -112.0744°
Elevation: 4248.8 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.51 (1.31-1.75)	1.90 (1.68-2.21)	2.59 (2.27-3.01)	3.25 (2.82-3.78)	4.32 (3.66-5.06)	5.32 (4.36-6.31)	6.52 (5.16-7.81)	7.94 (6.05-9.71)	10.2 (7.37-12.9)	12.4 (8.47-16.0)
10-min	1.15 (0.996-1.33)	1.45 (1.27-1.68)	1.97 (1.73-2.29)	2.47 (2.15-2.88)	3.29 (2.79-3.85)	4.05 (3.32-4.80)	4.96 (3.92-5.95)	6.04 (4.60-7.39)	7.79 (5.60-9.84)	9.43 (6.44-12.2)
15-min	0.952 (0.824-1.10)	1.19 (1.05-1.39)	1.63 (1.43-1.89)	2.04 (1.78-2.38)	2.72 (2.30-3.18)	3.34 (2.74-3.96)	4.10 (3.24-4.91)	4.99 (3.80-6.11)	6.44 (4.63-8.13)	7.79 (5.32-10.1)
30-min	0.640 (0.554-0.740)	0.804 (0.710-0.934)	1.10 (0.962-1.28)	1.37 (1.19-1.60)	1.83 (1.55-2.14)	2.25 (1.85-2.67)	2.76 (2.18-3.31)	3.36 (2.56-4.11)	4.34 (3.12-5.47)	5.25 (3.59-6.77)
60-min	0.396 (0.343-0.458)	0.497 (0.439-0.578)	0.679 (0.595-0.789)	0.851 (0.739-0.991)	1.13 (0.959-1.33)	1.39 (1.14-1.65)	1.71 (1.35-2.05)	2.08 (1.59-2.55)	2.68 (1.93-3.39)	3.25 (2.22-4.19)
2-hr	0.248 (0.220-0.284)	0.312 (0.276-0.356)	0.402 (0.354-0.460)	0.490 (0.426-0.562)	0.636 (0.542-0.738)	0.770 (0.640-0.906)	0.930 (0.746-1.11)	1.12 (0.866-1.37)	1.43 (1.04-1.80)	1.71 (1.19-2.21)
3-hr	0.194 (0.174-0.218)	0.239 (0.214-0.270)	0.299 (0.267-0.337)	0.355 (0.315-0.401)	0.445 (0.388-0.508)	0.529 (0.452-0.612)	0.635 (0.527-0.746)	0.761 (0.610-0.914)	0.966 (0.736-1.21)	1.15 (0.843-1.49)
6-hr	0.132 (0.121-0.145)	0.161 (0.146-0.178)	0.194 (0.176-0.215)	0.225 (0.202-0.249)	0.271 (0.241-0.303)	0.310 (0.272-0.350)	0.354 (0.306-0.405)	0.404 (0.341-0.469)	0.507 (0.413-0.614)	0.600 (0.473-0.752)
12-hr	0.084 (0.077-0.091)	0.102 (0.094-0.111)	0.123 (0.113-0.135)	0.142 (0.129-0.155)	0.169 (0.153-0.187)	0.192 (0.171-0.214)	0.216 (0.189-0.244)	0.243 (0.208-0.278)	0.284 (0.235-0.333)	0.317 (0.256-0.380)
24-hr	0.051 (0.047-0.055)	0.063 (0.058-0.068)	0.075 (0.069-0.081)	0.085 (0.079-0.092)	0.099 (0.091-0.107)	0.109 (0.101-0.118)	0.120 (0.110-0.130)	0.131 (0.120-0.142)	0.146 (0.132-0.169)	0.161 (0.141-0.193)
2-day	0.030 (0.028-0.032)	0.036 (0.034-0.039)	0.043 (0.040-0.046)	0.049 (0.045-0.052)	0.056 (0.052-0.060)	0.062 (0.057-0.066)	0.068 (0.062-0.073)	0.073 (0.067-0.079)	0.081 (0.074-0.087)	0.086 (0.078-0.097)
3-day	0.022 (0.020-0.023)	0.026 (0.024-0.028)	0.031 (0.029-0.034)	0.035 (0.033-0.038)	0.041 (0.038-0.044)	0.045 (0.042-0.049)	0.050 (0.046-0.053)	0.054 (0.049-0.058)	0.060 (0.054-0.065)	0.064 (0.058-0.071)
4-day	0.017 (0.016-0.019)	0.021 (0.020-0.023)	0.025 (0.024-0.027)	0.029 (0.027-0.031)	0.033 (0.031-0.036)	0.037 (0.034-0.040)	0.041 (0.037-0.044)	0.044 (0.041-0.048)	0.049 (0.045-0.053)	0.053 (0.048-0.058)
7-day	0.012 (0.011-0.013)	0.014 (0.013-0.016)	0.017 (0.016-0.018)	0.019 (0.018-0.021)	0.022 (0.021-0.024)	0.025 (0.023-0.026)	0.027 (0.025-0.029)	0.029 (0.027-0.031)	0.032 (0.029-0.035)	0.034 (0.031-0.037)
10-day	0.009 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.013-0.014)	0.015 (0.014-0.016)	0.017 (0.016-0.019)	0.019 (0.018-0.020)	0.020 (0.019-0.022)	0.022 (0.020-0.024)	0.024 (0.022-0.026)	0.025 (0.023-0.027)
20-day	0.006 (0.006-0.006)	0.007 (0.007-0.008)	0.009 (0.008-0.009)	0.010 (0.009-0.010)	0.011 (0.010-0.012)	0.012 (0.011-0.013)	0.013 (0.012-0.013)	0.013 (0.012-0.014)	0.014 (0.013-0.015)	0.015 (0.014-0.016)
30-day	0.005 (0.004-0.005)	0.006 (0.005-0.006)	0.007 (0.006-0.007)	0.008 (0.007-0.008)	0.009 (0.008-0.009)	0.009 (0.009-0.010)	0.010 (0.009-0.011)	0.010 (0.010-0.011)	0.011 (0.010-0.012)	0.012 (0.011-0.013)
45-day	0.004 (0.004-0.004)	0.005 (0.004-0.005)	0.006 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.007-0.007)	0.007 (0.007-0.008)	0.008 (0.007-0.008)	0.008 (0.008-0.009)	0.009 (0.008-0.010)	0.009 (0.009-0.010)
60-day	0.003 (0.003-0.004)	0.004 (0.004-0.005)	0.005 (0.005-0.005)	0.005 (0.005-0.006)	0.006 (0.006-0.007)	0.007 (0.006-0.007)	0.007 (0.007-0.008)	0.007 (0.007-0.008)	0.008 (0.007-0.008)	0.008 (0.008-0.009)

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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