

**Storm Water Management
Feasibility Report
For
Gutierrez Acres
Moroni, UT
Date: November 1, 2022**

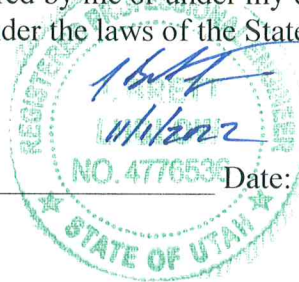


Prepared by:

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I hereby certify that these calculations were prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Utah.

Reg. No.



Date:

11/1/2022

Gutierrez Acres

Storm Drainage Calculator

Design Criteria

Intensity Table: Nephi UT - NOAA Atlas 14
Return Period: 10 year storm event

Sump Design Criteria

See Construction Standards (8' of 60" diameter perforated sections w/ a bottom, and 11.5' deep)

Manhole Volume (Inside Volume)

Volume Inside a 4' base section & a 4' perforated section:

where,

$$\begin{array}{llll} \text{ID} = & 5 \text{ ft.} & V=(\pi*\text{ID}^2)*\text{H}/4 & V=(\pi*5^2)*7.5/4 \\ \text{H} = & 7.5 \text{ ft.} & & V= 147.2 \text{ cu. ft.} \end{array}$$

Volume Inside Cone:

where,

$$\begin{array}{llll} \text{Avg D} = & 3.75 \text{ ft.} & V=(\pi*D^2)*\text{H}/12 & V=(\pi*3.75^2)*11.5/12 \\ \text{H} = & 3 \text{ ft.} & & V= 11.0 \text{ cu. ft.} \end{array}$$

Volume of Voids in Gravel

Volume Outside of Manhole Section (Using a 16'x12'x12' rectangular sump design)

where,

$$\begin{array}{llll} \text{L} = & 16 \text{ ft.} & & V= 677.6 \text{ cu. ft.} \\ \text{W} = & 10 \text{ ft.} & & \\ \text{H} = & 12 \text{ ft.} & & \\ \text{OD} = & 6 \text{ ft.} & & \\ \text{Md} = & 8 \text{ ft.} & & \\ \text{Void Ratio} = & 0.4 & & \end{array}$$

Total Sump Water Storage Volume (per sump)

$$V= 835.8 \text{ cu. ft.}$$

Percolation Area per Sump:

where,

$$\begin{array}{llll} \text{L} = & 16 \text{ ft.} & A=2*L*H + 2*W*H+L*W & A= 784 \text{ sq. ft.} \\ \text{W} = & 10 \text{ ft.} & & \\ \text{H} = & 12 \text{ ft.} & & \end{array}$$

Subdivision Parameters

Subdivision Name	Gutierrez Acres		
Number of Lots	1		
Total Right of Way Area	0.84	acre =	36590 sq. ft.
Total Lot Area	0	acre =	0 sq. ft.
Total Subdivision Area	0.84	acre =	36590 sq. ft.
Average Roof Area per Home	0	sq.ft.	
Average Driveway Area per Home	0	sq.ft.	
Average Infiltration Rate*	6	min/inch =	10.000 inches/hour

*per Geotechnical Report

Weighted "C" Value Calculation			
Surface Type	Area	"C" Value	C*A
Roofs	-	0.70	-
Driveways	-	0.85	-
Road Section	36,590	0.85	31,102
Landscape/Open Space	-	0.15	-
Totals	36,590		31,102

Weighted "C" Value = (Total C*A)/(Total Area) 0.850

Drainage Requirement Calculation

Number of Sumps	2	
Infiltration per Sump	0.181	cfs
Total Infiltration	0.363	cfs

Duration	Storm Intensity	Weighted "C"	Subdivision Area	Stormwater Flow	Accumulated Flow	Infiltration Rate	Total Infiltration	Required Storage	Available Storage	
(min)	(in/hr)		(sq.ft.)	(cfs)	(cf)	(cfs)	(cf)	(cf)	(cf)	
5	2.83	0.850	36590	2.04	611	0.363	109	502	1,672	ok
10	2.15	0.850	36590	1.55	930	0.363	218	713	1,672	ok
15	1.78	0.850	36590	1.28	1,153	0.363	327	827	1,672	ok
30	1.20	0.850	36590	0.86	1,553	0.363	653	899	1,672	ok
60	0.74	0.850	36590	0.53	1,923	0.363	1,307	616	1,672	ok
120	0.42	0.850	36590	0.30	2,185	0.363	2,613	(428)	1,672	ok
180	0.30	0.850	36590	0.21	2,317	0.363	3,920	(1,603)	1,672	ok
360	0.18	0.850	36590	0.13	2,773	0.363	7,840	(5,067)	1,672	ok
720	0.11	0.850	36590	0.08	3,291	0.363	15,680	(12,389)	1,672	ok
1440	0.06	0.850	36590	0.05	3,913	0.363	31,360	(27,447)	1,672	ok



POINT PRECIPITATION FREQUENCY ESTIMATES

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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	0.105 (0.091-0.124)	0.135 (0.117-0.159)	0.189 (0.163-0.222)	0.236 (0.202-0.279)	0.311 (0.259-0.368)	0.378 (0.309-0.448)	0.456 (0.364-0.543)	0.545 (0.422-0.655)	0.685 (0.507-0.835)	0.806 (0.578-0.996)
10-min	0.160 (0.139-0.188)	0.205 (0.178-0.243)	0.288 (0.248-0.338)	0.359 (0.307-0.425)	0.473 (0.394-0.560)	0.576 (0.470-0.683)	0.694 (0.553-0.827)	0.829 (0.642-0.996)	1.04 (0.772-1.27)	1.23 (0.880-1.52)
15-min	0.198 (0.172-0.233)	0.254 (0.221-0.300)	0.356 (0.308-0.419)	0.445 (0.381-0.527)	0.587 (0.489-0.694)	0.714 (0.582-0.846)	0.860 (0.686-1.02)	1.03 (0.796-1.24)	1.29 (0.957-1.58)	1.52 (1.09-1.88)
30-min	0.267 (0.232-0.314)	0.342 (0.298-0.405)	0.480 (0.414-0.565)	0.599 (0.513-0.709)	0.790 (0.658-0.934)	0.961 (0.784-1.14)	1.16 (0.924-1.38)	1.38 (1.07-1.66)	1.74 (1.29-2.12)	2.05 (1.47-2.53)
60-min	0.330 (0.287-0.388)	0.424 (0.368-0.501)	0.594 (0.513-0.699)	0.742 (0.634-0.877)	0.978 (0.814-1.16)	1.19 (0.970-1.41)	1.43 (1.14-1.71)	1.71 (1.33-2.06)	2.15 (1.60-2.63)	2.53 (1.82-3.13)
2-hr	0.407 (0.356-0.472)	0.513 (0.449-0.597)	0.686 (0.599-0.796)	0.843 (0.728-0.977)	1.09 (0.918-1.26)	1.31 (1.08-1.53)	1.56 (1.26-1.84)	1.86 (1.45-2.20)	2.32 (1.73-2.80)	2.73 (1.97-3.35)
3-hr	0.458 (0.408-0.525)	0.573 (0.510-0.658)	0.744 (0.662-0.857)	0.896 (0.791-1.03)	1.13 (0.981-1.30)	1.33 (1.13-1.54)	1.58 (1.31-1.86)	1.86 (1.52-2.22)	2.32 (1.82-2.82)	2.73 (2.07-3.38)
6-hr	0.592 (0.534-0.662)	0.735 (0.665-0.825)	0.915 (0.828-1.03)	1.07 (0.962-1.20)	1.29 (1.14-1.45)	1.48 (1.30-1.68)	1.70 (1.46-1.95)	1.96 (1.65-2.26)	2.41 (1.98-2.84)	2.82 (2.26-3.42)
12-hr	0.738 (0.676-0.812)	0.908 (0.833-0.999)	1.11 (1.01-1.22)	1.27 (1.16-1.40)	1.49 (1.35-1.65)	1.67 (1.49-1.85)	1.86 (1.64-2.07)	2.08 (1.81-2.34)	2.46 (2.10-2.87)	2.84 (2.38-3.45)
24-hr	0.893 (0.825-0.972)	1.10 (1.01-1.20)	1.32 (1.23-1.44)	1.51 (1.39-1.64)	1.75 (1.61-1.90)	1.93 (1.78-2.10)	2.12 (1.94-2.30)	2.31 (2.10-2.52)	2.56 (2.30-2.90)	2.87 (2.46-3.48)
2-day	0.975 (0.909-1.05)	1.20 (1.12-1.29)	1.44 (1.34-1.56)	1.64 (1.52-1.76)	1.91 (1.78-2.06)	2.13 (1.97-2.29)	2.34 (2.16-2.53)	2.56 (2.34-2.77)	2.86 (2.59-3.11)	3.09 (2.77-3.52)
3-day	1.05 (0.980-1.14)	1.29 (1.21-1.40)	1.56 (1.45-1.68)	1.78 (1.66-1.92)	2.09 (1.93-2.25)	2.33 (2.15-2.50)	2.57 (2.36-2.77)	2.83 (2.58-3.05)	3.17 (2.86-3.45)	3.44 (3.07-3.83)
4-day	1.13 (1.05-1.22)	1.38 (1.29-1.50)	1.68 (1.56-1.81)	1.92 (1.79-2.07)	2.26 (2.09-2.43)	2.53 (2.33-2.72)	2.80 (2.57-3.02)	3.09 (2.81-3.34)	3.48 (3.14-3.78)	3.79 (3.38-4.14)
7-day	1.32 (1.23-1.42)	1.62 (1.51-1.75)	1.95 (1.83-2.09)	2.23 (2.08-2.38)	2.60 (2.42-2.78)	2.88 (2.67-3.08)	3.17 (2.93-3.40)	3.46 (3.18-3.73)	3.85 (3.51-4.16)	4.15 (3.75-4.51)
10-day	1.47 (1.38-1.58)	1.81 (1.69-1.94)	2.17 (2.03-2.33)	2.46 (2.30-2.63)	2.85 (2.66-3.05)	3.14 (2.92-3.36)	3.43 (3.18-3.68)	3.72 (3.43-3.99)	4.09 (3.75-4.41)	4.37 (3.98-4.73)
20-day	1.89 (1.78-2.02)	2.32 (2.18-2.48)	2.78 (2.61-2.97)	3.13 (2.93-3.34)	3.59 (3.35-3.83)	3.93 (3.66-4.19)	4.25 (3.95-4.54)	4.57 (4.23-4.89)	4.96 (4.57-5.33)	5.23 (4.80-5.65)
30-day	2.23 (2.10-2.38)	2.74 (2.57-2.94)	3.27 (3.07-3.50)	3.70 (3.47-3.95)	4.25 (3.98-4.54)	4.65 (4.35-4.97)	5.06 (4.70-5.41)	5.45 (5.04-5.86)	5.94 (5.46-6.41)	6.32 (5.77-6.84)
45-day	2.74 (2.57-2.93)	3.36 (3.14-3.60)	3.98 (3.73-4.26)	4.46 (4.18-4.77)	5.07 (4.75-5.41)	5.51 (5.15-5.88)	5.92 (5.53-6.33)	6.32 (5.89-6.76)	6.79 (6.31-7.28)	7.12 (6.60-7.67)
60-day	3.30 (3.09-3.52)	4.04 (3.79-4.32)	4.78 (4.48-5.10)	5.35 (5.02-5.70)	6.06 (5.67-6.45)	6.58 (6.15-7.01)	7.06 (6.59-7.53)	7.52 (7.00-8.04)	8.06 (7.47-8.64)	8.43 (7.78-9.05)

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