Onsite Drainage Analysis for Scenic Ridge Estates

Summary

Storm water from the proposed development will be collected in catch basins along two proposed roadways. This storm water will then be directed via underground piping into underground infiltration galleries. This is the initial system. Each underground infiltration gallery is sized to completely detain the 100-year storm event. All piping on site will be 18". The highest cfs requirement of all the basins during the 100-year storm event is 2.13 CFS, an 18" pipe will adequately handle the required flows. The major system is composed of the streets and curb and gutter and can pass storm events greater than the 100-year storm flows.

1 Post Development Flows

The proposed development is crossed by a debris channel on the eastern boundary. Storm water flows from above the channel will be diverted by the channel around the site. As such the total watershed area that includes the disturbed areas and the offsite areas that contribute to the watersheds is approximately 10.28 acres. Upon development of the subject property, the watershed is divided up into 6 individual sub basins, 4 current and 2 future. Please see the following map.

Please note that Basin 2 and 3 are future basins, necessary dry infrastructure will be installed in the roadway to facilitate future development without cutting the roadway. Receiving basins 1 and 4 have been upsized to handle the storm water generated by the roadway areas until future development as shown on the storm water map.

Storm water flows were calculated for several storm events, including the 2, 5, 10, 25, 50 and 100-year storm events. Those calculations are broken down by each basin and shown in the attached calculation sheets.

1.1 Existing Debris Channel

An existing debris channel was installed between 2002 and 2003 to provide protection to the resident's in Santaquin City from Debris Flows following fires along the eastern bench of the city. In the development of this subdivision, the existing debris channel will be dedicated to the city. It is proposed that a 10' wide asphalt trail will be installed and minor grading to level out the trail. Vegetation and existing channel features will be preserved to ensure safety and protection of this proposed and existing communities. It is our understanding that the developer intends to bond for this work, but for the summary of this report, the existing channel must be preserved.

2 Storm Water Storage

The runoff from the proposed basins was used in sizing the underground infiltration galleries in the initial systems for the development. The storm water runoff will be conveyed to the infiltration galleries via sheet flow, surface flow and catch basins. It is anticipated that the infiltration galleries will consist of Stormbrixx cells or equivalent. The calculations for layout of the Stormbrixx systems are included in this submittal.

Each infiltration gallery is sized to adequately detain the 100-year storm event as shown in the attached calculations. In all systems, the infiltration gallery is oversized and capable of detaining the entire storm event. The infiltration galleries are anticipated to infiltrate at a rate of 10 min/inch based on percolation testing performed by Epic Engineering.

3 Piping

The pipes were sized to accommodate the peak flow for the 100-year storm. The pipe flow requirements for each basin are attached, the maximum flow rate for the 100-year storm is in Basin 4, which anticipates 2.13 cfs. The minimum pipe size of 18" was determined by calculating the flow where the pipe has the least amount of slope (.4%) along the entire length to ensure there are no choke points that will result in the pipes backing up. In all cases, flow capacity exceeds demands for all piping.

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EACH INFILTRATION GALLERY WILL BE LOCATED IN A PLATTED STORM DRAIN EASEMENT LOCATED BEHIND THE SIDEWALK (SEE PLAT)

BASIN 7:
25-YR: 1.37 CFS/1356.95 CUBIC FEET
100-YR: 2.25 CFS/ 2042.03 CUBIC FEET

BASIN 1:
25-YR: 1.11 CFS/1309.02 CUBIC FEET
100-YR: 1.83 CFS/ 1973.53 CUBIC FEET

DOWNHILL LOTS WILL REQUIRE ON LOT INFILTRATION PER CITY CODE TO PREVENT RUNOFF INTO DOWNHILL NEIGHBORING PROPERTIES

BASIN 2 (FUTURE):
25-YR: 1.31 CFS/1445.82 CUBIC FEET
100-YR: 2.16 CFS/ 2181.91 CUBIC FEET

BASIN 6:
25-YR: 1.29 CFS/1426.42 CUBIC FEET
100-YR: 2.13 CFS/ 2,140.95 CUBIC FEET

BASIN 3 (FUTURE):
25-YR: 1.97 CFS/3158.73 CUBIC FEET
100-YR: 3.25 CFS/ 4741.20 CUBIC FEET

BASIN 4:
25-YR: 1.01 CFS/1566.80 CUBIC FEET
100-YR: 1.66 CFS/ 2354.20 CUBIC FEET

1200 E
1150 E
1100 E
1050 E
1000 E
370 S

LEGEND

- Infiltration Galleries
- Future Infiltration Gallery
- 5' Contours
- Development Lines

Drainage Basins

- 1
- 2
- 3
- 4
- 6
- 7

SOURCE UTAH AGRC, EPIC ENGINEERING, PC

FOR GENERAL ILLUSTRATIVE PURPOSES ONLY; BOUNDARIES NOT SURVEYED.

DATE
5/3/2022

epic ENGINEERING

REVISIONS
1.

DRAWN: JRC
DESIGNER: JRC
REVIEWED: JNS

PROJECT #
XXXX

SCALES
HORIZ: 1"=150'
(11"X17")
0 1/2"

PROJECT NAME:
SCENIC RIDGE ESTATES

SHEET TITLE:
DRAINAGE BASINS

PLAN SET: PRELIM.
FIGURE: ---

Date: 5/24/2021
By: Devin Earl
Approved: KW

Post Development Runoff Calculations Using Rational Method

Site Parameters	
Project	Scenic Ridge Estates
Location	Utah County, Utah
Basin	Basin 1

Choose the Design Storm Event		
Duration	24	hrs
Year	25	yr

Time of Concentration (Using the FAA method)			
Start Elevation	5314	ft	
End Elevation	5276	ft	
Length of Overland Flow	400	ft	
Slope	9.500	%	
Tc	12.54	min	(Enter C-values to calc correctly)

Site Conditions			
Cover	Area	C Value*	Weighted average
[Choose unit]-->	sq ft		
Asphalt Roadway	6511.23	0.95	0.14
Single Family Residential	32282.59	0.25	0.19
Detention Pond		0.1	0.00
Residential (Suburban)		0.4	0.00
Residential		0.4	0.00
Building Roof		1	0.00
Total Area (acres)	0.89	**0.37**	0.33
Total Area (sq ft)	38794		
Tc	12.54	min	
Tc	0.21	hrs	

*C values found in Table below

Storm Event			
Storm Event (yrs)	i (in/hr)	Q (cfs)	Volume (ac-ft)
1	1.08	0.35	0.0061
2	1.37	0.45	0.0078
5	1.90	0.62	0.0108
10	2.36	0.77	0.0134
25	3.08	1.11	0.0192
50	3.73	1.46	0.0253
100	4.47	1.83	0.0316
Flow Demand for Pipe/Culvert	**1.11**	**cfs**	

Date: 1/20/2022
By: Devin Earl
Approved: KW

Theoretical Basin Size Using Rational Method Calculations

Site Parameters	
Project	Scenic Ridge Estates
Location	Utah County, Utah
Specific Location of Basin	Basin 1

Choose Design Storm		
Duration	24	hrs
Year	100	yr

Site Conditions

Cover	Area	C Value*	Weighted average	Comments
[Choose unit]-->	sq ft			
Asphalt Roadway	6511.23	0.95	0.14	
Single Family Residential	32282.59	0.25	0.19	
Detention Pond	0.00	0.1	0.00	
Residential (Suburban)	0.00	0.4	0.00	
Residential	0.00	0.4	0.00	
Building Roof	0.00	1	0.00	
Total Area (acres)	0.89	**0.37**	0.33	
Total Area (sq ft)	38793.82			

*C Values found in Runoff Calcs Tab

Discharge/Infiltration/Evaporation

Allowable Discharge	0	cfs					
Infiltration		Sump Sizing		Perforated Trench		Evaporation	
i (min/in)	10	Diam (ft)	0	Pipe Diam (in)	0	e (in/year)	0
Factor of Safety	1	Depth below surface (ft)	0	Trench Width (ft)	0	e (in/day)	0.000
		Gravel Width beyond sump (ft)	0	Gravel Depth (ft)	0	e (ft/day)	0.000
		Gravel Width below sump (ft)	0	Trench Length (ft)	0		
		Gravel Porosity	0	Gravel Porosity	0	e (ft^3/day)	0
		Quantity of Sumps	0				
Infiltration Surface Area (SF)	258	Storage Capacity (CF)	0.0	Storage Capacity (CF)	0.0		

100 Year Storm Retention Basin Sizing Calculations: Rational Method

Duration	*Intensity*	*Area*	*C*	*Flow*	*Volume in*	*Volume out*	*Retention*
Hour	in/hr	Acre		cfs	ft^3	ft^3	ft^3
0.083	6.430	0.891	0.367	2.10	631	11	621
0.17	4.900	0.891	0.367	1.60	962	22	941
0.25	4.050	0.891	0.367	1.33	1193	32	1161
0.5	2.720	0.891	0.367	0.89	1602	65	1538
1	1.690	0.891	0.367	0.55	1991	129	1862
2	0.947	0.891	0.367	0.31	2232	258	1974
3	0.652	0.891	0.367	0.21	2305	387	1918
6	0.354	0.891	0.367	0.12	2503	774	1729
12	0.206	0.891	0.367	0.07	2913	1548	1365
24	0.128	0.891	0.367	0.04	3619	3096	523
		100 Year Retention Basin Volume		1,974 ft^3	OR	0.05	AF

Factor of Safety	1	
Recommended Minimum Retention Basin Volume	**1,973.53**	ft^3
Retention Basin Volume	**0.05**	acre-ft

Reference Tables	
Recurrence Interval (year)	**C factor**
1	1
2	1
5	1
10	1
25	1.1
50	1.2
100	1.25

Coefficient can not exceed 1.0 with adjustment factor

Coefficient can not exceed 1.0 with adjustment factor

Date: 5/24/2021
By: Devin Earl
Approved: KW

Post Development Runoff Calculations Using Rational Method

Site Parameters	
Project	Scenic Ridge Estates
Location	Utah County, Utah
Basin	Basin 2

Choose the Design Storm Event		
Duration	24	hrs
Year	25	yr

Time of Concentration (Using the FAA method)			
Start Elevation	5338	ft	
End Elevation	5300	ft	
Length of Overland Flow	380	ft	
Slope	10.000	%	
Tc	10.78	min	(Enter C-values to calc correctly)

Site Conditions

Cover	Area	C Value*	Weighted average
[Choose unit]-->	sq ft		
Asphalt Roadway	9841.70	0.95	0.21
Single Family Residential	25769.62	0.25	0.15
Detention Pond		0.1	0.00
Residential (Suburban)		0.4	0.00
Residential		0.4	0.00
Building Roof		1	0.00
Total Area (acres)	0.82	**0.44**	0.36
Total Area (sq ft)	35611		

Tc	10.78	min
Tc	0.18	hrs

*C values found in Table below

Storm Event

Storm Event (yrs)	i (in/hr)	Q (cfs)	Volume (ac-ft)
1	1.15	0.42	0.0062
2	1.47	0.53	0.0079
5	2.03	0.74	0.0109
10	2.52	0.91	0.0136
25	3.29	1.31	0.0195
50	3.98	1.73	0.0257
100	4.77	2.16	0.0321

Flow Demand for Pipe/Culvert	**1.31**	**cfs**

Date: 1/20/2022
By: Devin Earl
Approved: KW

Theoretical Basin Size Using Rational Method Calculations

Site Parameters	
Project	Scenic Ridge Estates
Location	Utah County, Utah
Specific Location of Basin	Basin 2

Choose Design Storm		
Duration	24	hrs
Year	100	yr

Site Conditions

Cover	Area	C Value*	Weighted average	Comments
[Choose unit]-->	sq ft			
Asphalt Roadway	9841.70	0.95	0.21	
Single Family Residential	25769.62	0.25	0.15	
Detention Pond	0.00	0.1	0.00	
Residential (Suburban)	0.00	0.4	0.00	
Residential	0.00	0.4	0.00	
Building Roof	0.00	1	0.00	
Total Area (acres)	0.82	**0.44**	0.36	
Total Area (sq ft)	35611.32			

*C Values found in Runoff Calcs Tab

Discharge/Infiltration/Evaporation

Allowable Discharge	0	cfs					
Infiltration		Sump Sizing		Perforated Trench		Evaporation	
i (min/in)	10	Diam (ft)	0	Pipe Diam (in)	0	e (in/year)	0
Factor of Safety	1	Depth below surface (ft)	0	Trench Width (ft)	0	e (in/day)	0.000
		Gravel Width beyond sump (ft)	0	Gravel Depth (ft)	0	e (ft/day)	0.000
		Gravel Width below sump (ft)	0	Trench Length (ft)	0		
		Gravel Porosity	0	Gravel Porosity	0	e (ft^3/day)	0
		Quantity of Sumps	0				
Infiltration Surface Area (SF)	290	Storage Capacity (CF)	0.0	Storage Capacity (CF)	0.0		

100 Year Storm Retention Basin Sizing Calculations: Rational Method

Duration	*Intensity*	*Area*	*C*	*Flow*	*Volume in*	*Volume out*	*Retention*
Hour	in/hr	Acre		cfs	ft^3	ft^3	ft^3
0.083	6.430	0.818	0.443	2.33	699	12	687
0.17	4.900	0.818	0.443	1.78	1066	24	1042
0.25	4.050	0.818	0.443	1.47	1321	36	1285
0.5	2.720	0.818	0.443	0.99	1775	73	1702
1	1.690	0.818	0.443	0.61	2206	145	2061
2	0.947	0.818	0.443	0.34	2472	290	2182
3	0.652	0.818	0.443	0.24	2553	435	2118
6	0.354	0.818	0.443	0.13	2772	870	1902
12	0.206	0.818	0.443	0.07	3226	1740	1486
24	0.128	0.818	0.443	0.05	4009	3480	529
		100 Year Retention Basin Volume	2,182	ft^3	OR	0.05	AF

Factor of Safety	1	
Recommended Minimum Retention Basin Volume	**2,181.91**	ft^3
Retention Basin Volume	**0.05**	acre-ft

Reference Tables	
Recurrence Interval (year)	**C factor**
1	1
2	1
5	1
10	1
25	1.1
50	1.2
100	1.25

Coefficient can not exceed 1.0 with adjustment factor

Coefficient can not exceed 1.0 with adjustment factor

Date: 5/24/2021
By: Devin Earl
Approved: KW

Post Development Runoff Calculations Using Rational Method

Site Parameters	
Project	Scenic Ridge Estates
Location	Utah County, Utah
Basin	Basin 3

Choose the Design Storm Event		
Duration	24	hrs
Year	25	yr

Time of Concentration (Using the FAA method)			
Start Elevation	5429	ft	
End Elevation	5311	ft	
Length of Overland Flow	950	ft	
Slope	12.421	%	
Tc	23.04	min	(Enter C-values to calc correctly)

Site Conditions

Cover	Area	C Value*	Weighted average
[Choose unit]-->	sq ft		
Asphalt Roadway	9850.32	0.95	0.21
Single Family Residential	16000.00	0.25	0.09
Native	205924.99	0.1	0.47
Residential (Suburban)		0.4	0.00
Residential		0.4	0.00
Building Roof		1	0.00
Total Area (acres)	5.32	**0.15**	0.78
Total Area (sq ft)	231775		

Tc	23.04	min
Tc	0.38	hrs

*C values found in Table below

Storm Event

Storm Event (yrs)	i (in/hr)	Q (cfs)	Volume (ac-ft)
1	0.80	0.63	0.0199
2	1.03	0.80	0.0254
5	1.42	1.11	0.0351
10	1.77	1.38	0.0436
25	2.30	1.97	0.0626
50	2.79	2.61	0.0827
100	3.34	3.25	0.1032

Flow Demand for Pipe/Culvert	**1.97**	**cfs**

Date: 1/20/2022
By: Devin Earl
Approved: KW

Theoretical Basin Size Using Rational Method Calculations

Site Parameters	
Project	Scenic Ridge Estates
Location	Utah County, Utah
Specific Location of Basin	Basin 3

Choose Design Storm		
Duration	24	hrs
Year	100	yr

Site Conditions

Cover	Area	C Value*	Weighted average	Comments
[Choose unit]-->	sq ft			
Asphalt Roadway	9850.32	0.95	0.21	
Single Family Residential	16000.00	0.25	0.09	
Native	205924.99	0.1	0.47	
Residential (Suburban)	0.00	0.4	0.00	
Residential	0.00	0.4	0.00	
Building Roof	0.00	1	0.00	
Total Area (acres)	5.32	**0.15**	0.78	
Total Area (sq ft)	231775.31			

*C Values found in Runoff Calcs Tab

Discharge/Infiltration/Evaporation

Allowable Discharge	0	cfs					
Infiltration		Sump Sizing		Perforated Trench		Evaporation	
i (min/in)	10	Diam (ft)	0	Pipe Diam (in)	0	e (in/year)	0
Factor of Safety	1	Depth below surface (ft)	0	Trench Width (ft)	0	e (in/day)	0.000
		Gravel Width beyond sump (ft)	0	Gravel Depth (ft)	0	e (ft/day)	0.000
		Gravel Width below sump (ft)	0	Trench Length (ft)	0		
		Gravel Porosity	0	Gravel Porosity	0	e (ft^3/day)	0
		Quantity of Sumps	0				
Infiltration Surface Area (SF)	573	Storage Capacity (CF)	0.0	Storage Capacity (CF)	0.0		

100 Year Storm Retention Basin Sizing Calculations: Rational Method

Duration	*Intensity*	*Area*	*C*	*Flow*	*Volume in*	*Volume out*	*Retention*
Hour	in/hr	Acre		cfs	ft^3	ft^3	ft^3
0.083	6.430	5.321	0.146	5.01	1503	24	1480
0.17	4.900	5.321	0.146	3.82	2291	48	2244
0.25	4.050	5.321	0.146	3.16	2841	72	2769
0.5	2.720	5.321	0.146	2.12	3816	143	3673
1	1.690	5.321	0.146	1.32	4742	287	4455
2	0.947	5.321	0.146	0.74	5314	573	4741
3	0.652	5.321	0.146	0.51	5488	860	4629
6	0.354	5.321	0.146	0.28	5960	1719	4241
12	0.206	5.321	0.146	0.16	6936	3438	3498
24	0.128	5.321	0.146	0.10	8619	6876	1743
		100 Year Retention Basin Volume	4,741	ft^3	OR	0.11	AF

Factor of Safety	1	
Recommended Minimum Retention Basin Volume	**4,741.20**	ft^3
Retention Basin Volume	**0.11**	acre-ft

Reference Tables	
Recurrence Interval (year)	**C factor**
1	1
2	1
5	1
10	1
25	1.1
50	1.2
100	1.25

Coefficient can not exceed 1.0 with adjustment factor

Coefficient can not exceed 1.0 with adjustment factor

Date: 5/24/2021
By: Devin Earl
Approved: KW

Post Development Runoff Calculations Using Rational Method

Site Parameters	
Project	Scenic Ridge Estates
Location	Utah County, Utah
Basin	Basin 4

Choose the Design Storm Event		
Duration	24	hrs
Year	25	yr

Time of Concentration (Using the FAA method)			
Start Elevation	5429	ft	
End Elevation	5311	ft	
Length of Overland Flow	950	ft	
Slope	12.421	%	
Tc	22.09	min	(Enter C-values to calc correctly)

Site Conditions			
Cover	Area	C Value*	Weighted average
[Choose unit]-->	sq ft		
Asphalt Roadway	7282.88	0.95	0.16
Single Family Residential	10666.00	0.25	0.06
Native	73074.59	0.1	0.17
Residential (Suburban)		0.4	0.00
Residential		0.4	0.00
Building Roof		1	0.00
Total Area (acres)	2.09	**0.19**	0.39
Total Area (sq ft)	91023		
Tc	22.09	min	
Tc	0.37	hrs	

*C values found in Table below

Storm Event			
Storm Event (yrs)	i (in/hr)	Q (cfs)	Volume (ac-ft)
1	0.82	0.32	0.0097
2	1.05	0.41	0.0124
5	1.46	0.56	0.0172
10	1.81	0.70	0.0213
25	2.36	1.01	0.0306
50	2.86	1.33	0.0404
100	3.42	1.66	0.0505
Flow Demand for Pipe/Culvert	**1.01**	**cfs**	

Date: 1/20/2022
By: Devin Earl
Approved: KW

Theoretical Basin Size Using Rational Method Calculations

Site Parameters	
Project	Scenic Ridge Estates
Location	Utah County, Utah
Specific Location of Basin	Basin 4

Choose Design Storm		
Duration	24	hrs
Year	100	yr

Site Conditions

Cover	Area	C Value*	Weighted average	Comments
[Choose unit]-->	sq ft			
Asphalt Roadway	7282.88	0.95	0.16	
Single Family Residential	10666.00	0.25	0.06	
Native	73074.59	0.1	0.17	
Residential (Suburban)	0.00	0.4	0.00	
Residential	0.00	0.4	0.00	
Building Roof	0.00	1	0.00	
Total Area (acres)	2.09	**0.19**	0.39	
Total Area (sq ft)	91023.47			

*C Values found in Runoff Calcs Tab

Discharge/Infiltration/Evaporation

Allowable Discharge	0	cfs					
Infiltration		Sump Sizing		Perforated Trench		Evaporation	
i (min/in)	10	Diam (ft)	0	Pipe Diam (in)	0	e (in/year)	0
Factor of Safety	1	Depth below surface (ft)	0	Trench Width (ft)	0	e (in/day)	0.000
		Gravel Width beyond sump (ft)	0	Gravel Depth (ft)	0	e (ft/day)	0.000
		Gravel Width below sump (ft)	0	Trench Length (ft)	0		
		Gravel Porosity	0	Gravel Porosity	0	e (ft^3/day)	0
		Quantity of Sumps	0				
Infiltration Surface Area (SF)	290	Storage Capacity (CF)	0.0	Storage Capacity (CF)	0.0		

100 Year Storm Retention Basin Sizing Calculations: Rational Method

Duration	*Intensity*	*Area*	*C*	*Flow*	*Volume in*	*Volume out*	*Retention*
Hour	in/hr	Acre		cfs	ft^3	ft^3	ft^3
0.083	6.430	2.090	0.186	2.49	748	12	736
0.17	4.900	2.090	0.186	1.90	1140	24	1116
0.25	4.050	2.090	0.186	1.57	1414	36	1377
0.5	2.720	2.090	0.186	1.05	1899	73	1826
1	1.690	2.090	0.186	0.66	2359	145	2214
2	0.947	2.090	0.186	0.37	2644	290	2354
3	0.652	2.090	0.186	0.25	2731	435	2296
6	0.354	2.090	0.186	0.14	2965	870	2095
12	0.206	2.090	0.186	0.08	3451	1740	1711
24	0.128	2.090	0.186	0.05	4289	3480	809
		100 Year Retention Basin Volume		2,354 ft^3	OR	0.05	AF

Factor of Safety	1	
Recommended Minimum Retention Basin Volume	**2,354.20**	ft^3
Retention Basin Volume	**0.05**	acre-ft

Reference Tables	
Recurrence Interval (year)	**C factor**
1	1
2	1
5	1
10	1
25	1.1
50	1.2
100	1.25

Coefficient can not exceed 1.0 with adjustment factor

Coefficient can not exceed 1.0 with adjustment factor

Date: 5/24/2021
By: Devin Earl
Approved: KW

Post Development Runoff Calculations Using Rational Method

Site Parameters	
Project	Scenic Ridge Estates
Location	Utah County, Utah
Basin	Basin 6

Choose the Design Storm Event		
Duration	24	hrs
Year	25	yr

Time of Concentration (Using the FAA method)			
Start Elevation	5330	ft	
End Elevation	5283	ft	
Length of Overland Flow	515	ft	
Slope	9.126	%	
Tc	10.40	min	(Enter C-values to calc correctly)

Site Conditions			
Cover	Area	C Value*	Weighted average
[Choose unit]-->	sq ft		
Asphalt Roadway	12324.11	0.95	0.27
Single Family Residential	14487.00	0.25	0.08
Native		0.1	0.00
Residential (Suburban)		0.4	0.00
Residential		0.4	0.00
Building Roof		1	0.00
Total Area (acres)	0.62	**0.57**	0.35
Total Area (sq ft)	26811		
Tc	10.40	min	
Tc	0.17	hrs	

*C values found in Table below

Storm Event			
Storm Event (yrs)	i (in/hr)	Q (cfs)	Volume (ac-ft)
1	1.16	0.41	0.0059
2	1.49	0.52	0.0075
5	2.06	0.73	0.0104
10	2.55	0.90	0.0129
25	3.33	1.29	0.0185
50	4.03	1.70	0.0244
100	4.83	2.13	0.0305
Flow Demand for Pipe/Culvert	**1.29**	**cfs**	

Date: 1/20/2022
By: Devin Earl
Approved: KW

Theoretical Basin Size Using Rational Method Calculations

Site Parameters	
Project	Scenic Ridge Estates
Location	Utah County, Utah
Specific Location of Basin	Basin 6

Choose Design Storm		
Duration	24	hrs
Year	100	yr

Site Conditions

Cover	Area	C Value*	Weighted average	Comments
[Choose unit]-->	sq ft			
Asphalt Roadway	12324.11	0.95	0.27	
Single Family Residential	14487.00	0.25	0.08	
Native	0.00	0.1	0.00	
Residential (Suburban)	0.00	0.4	0.00	
Residential	0.00	0.4	0.00	
Building Roof	0.00	1	0.00	
Total Area (acres)	0.62	**0.57**	0.35	
Total Area (sq ft)	26811.11			

*C Values found in Runoff Calcs Tab

Discharge/Infiltration/Evaporation

Allowable Discharge	0	cfs					
Infiltration		Sump Sizing		Perforated Trench		Evaporation	
i (min/in)	10	Diam (ft)	0	Pipe Diam (in)	0	e (in/year)	0
Factor of Safety	1	Depth below surface (ft)	0	Trench Width (ft)	0	e (in/day)	0.000
		Gravel Width beyond sump (ft)	0	Gravel Depth (ft)	0	e (ft/day)	0.000
		Gravel Width below sump (ft)	0	Trench Length (ft)	0		
		Gravel Porosity	0	Gravel Porosity	0	e (ft^3/day)	0
		Quantity of Sumps	0				
Infiltration Surface Area (SF)	259	Storage Capacity (CF)	0.0	Storage Capacity (CF)	0.0		

100 Year Storm Retention Basin Sizing Calculations: Rational Method

Duration	*Intensity*	*Area*	*C*	*Flow*	*Volume in*	*Volume out*	*Retention*
Hour	in/hr	Acre		cfs	ft^3	ft^3	ft^3
0.083	6.430	0.615	0.572	2.26	679	11	668
0.17	4.900	0.615	0.572	1.72	1035	22	1013
0.25	4.050	0.615	0.572	1.43	1283	32	1250
0.5	2.720	0.615	0.572	0.96	1723	65	1658
1	1.690	0.615	0.572	0.59	2141	129	2012
2	0.947	0.615	0.572	0.33	2400	259	2141
3	0.652	0.615	0.572	0.23	2478	388	2090
6	0.354	0.615	0.572	0.12	2691	776	1915
12	0.206	0.615	0.572	0.07	3132	1551	1580
24	0.128	0.615	0.572	0.05	3892	3103	789
		100 Year Retention Basin Volume	2,141	ft^3	OR	0.05	AF

Factor of Safety	1	
Recommended Minimum Retention Basin Volume	**2,140.95**	ft^3
Retention Basin Volume	**0.05**	acre-ft

Reference Tables	
Recurrence Interval (year)	**C factor**
1	1
2	1
5	1
10	1
25	1.1
50	1.2
100	1.25

Coefficient can not exceed 1.0 with adjustment factor

Coefficient can not exceed 1.0 with adjustment factor

Date: 5/24/2021
By: Devin Earl
Approved: KW

Post Development Runoff Calculations Using Rational Method

Site Parameters	
Project	Scenic Ridge Estates
Location	Utah County, Utah
Basin	Basin 7

Choose the Design Storm Event		
Duration	24	hrs
Year	25	yr

Time of Concentration (Using the FAA method)			
Start Elevation	5332	ft	
End Elevation	5275	ft	
Length of Overland Flow	525	ft	
Slope	10.857	%	
Tc	8.59	min	(Enter C-values to calc correctly)

Site Conditions			
Cover	Area	C Value*	Weighted average
[Choose unit]-->	sq ft		
Asphalt Roadway	12826.74	0.95	0.28
Single Family Residential	10049.14	0.25	0.06
Native		0.1	0.00
Residential (Suburban)		0.4	0.00
Residential		0.4	0.00
Building Roof		1	0.00
Total Area (acres)	0.53	**0.64**	0.34
Total Area (sq ft)	22876		
Tc	8.59	min	
Tc	0.14	hrs	

*C values found in Table below

Storm Event			
Storm Event (yrs)	i (in/hr)	Q (cfs)	Volume (ac-ft)
1	1.28	0.43	0.0051
2	1.64	0.55	0.0066
5	2.28	0.77	0.0091
10	2.82	0.95	0.0113
25	3.68	1.37	0.0162
50	4.45	1.80	0.0213
100	5.33	2.25	0.0266
Flow Demand for Pipe/Culvert	**1.37**	**cfs**	

Date: 1/20/2022
By: Devin Earl
Approved: KW

Theoretical Basin Size Using Rational Method Calculations

Site Parameters	
Project	Scenic Ridge Estates
Location	Utah County, Utah
Specific Location of Basin	Basin 7

Choose Design Storm		
Duration	24	hrs
Year	100	yr

Site Conditions

Cover	Area	C Value*	Weighted average	Comments
[Choose unit]-->	sq ft			
Asphalt Roadway	12826.74	0.95	0.28	
Single Family Residential	10049.14	0.25	0.06	
Native	0.00	0.1	0.00	
Residential (Suburban)	0.00	0.4	0.00	
Residential	0.00	0.4	0.00	
Building Roof	0.00	1	0.00	
Total Area (acres)	0.53	**0.64**	0.34	
Total Area (sq ft)	22875.88			

*C Values found in Runoff Calcs Tab

Discharge/Infiltration/Evaporation

Allowable Discharge	0	cfs					
Infiltration		Sump Sizing		Perforated Trench		Evaporation	
i (min/in)	10	Diam (ft)	0	Pipe Diam (in)	0	e (in/year)	0
Factor of Safety	1	Depth below surface (ft)	0	Trench Width (ft)	0	e (in/day)	0.000
		Gravel Width beyond sump (ft)	0	Gravel Depth (ft)	0	e (ft/day)	0.000
		Gravel Width below sump (ft)	0	Trench Length (ft)	0		
		Gravel Porosity	0	Gravel Porosity	0	e (ft^3/day)	0
		Quantity of Sumps	0				
Infiltration Surface Area (SF)	259	Storage Capacity (CF)	0.0	Storage Capacity (CF)	0.0		

100 Year Storm Retention Basin Sizing Calculations: Rational Method

Duration	*Intensity*	*Area*	*C*	*Flow*	*Volume in*	*Volume out*	*Retention*
Hour	in/hr	Acre		cfs	ft^3	ft^3	ft^3
0.083	6.430	0.525	0.642	2.17	651	11	640
0.17	4.900	0.525	0.642	1.65	992	22	970
0.25	4.050	0.525	0.642	1.37	1230	32	1198
0.5	2.720	0.525	0.642	0.92	1652	65	1587
1	1.690	0.525	0.642	0.57	2053	129	1924
2	0.947	0.525	0.642	0.32	2301	259	2042
3	0.652	0.525	0.642	0.22	2376	388	1988
6	0.354	0.525	0.642	0.12	2580	776	1804
12	0.206	0.525	0.642	0.07	3003	1551	1451
24	0.128	0.525	0.642	0.04	3732	3103	629
		100 Year Retention Basin Volume	2,042	ft^3	OR	0.05	AF

Factor of Safety	1	
Recommended Minimum Retention Basin Volume	**2,042.03**	ft^3
Retention Basin Volume	**0.05**	acre-ft

Reference Tables	
Recurrence Interval (year)	**C factor**
1	1
2	1
5	1
10	1
25	1.1
50	1.2
100	1.25
Coefficient can not exceed 1.0 with adjustment factor	
Coefficient can not exceed 1.0 with adjustment factor	

StormBrixx SD Basin 1 Volume Calculator

Model SD	Length	Width	Height	Volume	Void Ratio:
Half-Module Dimensions:	47.24 in	23.62 in	19.44 in		97.0%
Full-Module Dimensions:	47.24 in	23.62 in	35.98 in	23.23 CF	

MAX. INSTALL DEPTH (TO BOTTOM INVERT): 14.0'

Proposed System Sizing

Design Check:	**OK**	
Req'd Volume:	**1,974**	CF
Provided Volume:	**2,163**	CF

	# of Modules	System Dimensions	
Length:	4	16.08 LF	(Modules oriented in **LONG** direction)
Width:	8	16.08 LF	(Modules oriented in **SHORT** direction)
Height:	3	9.00 LF	(MAX. HEIGHT = 9 FT , i.e. 3 MODULES)
Total Modules:	32		

Area 258.5878

StormBrixx SD Basin 2 Volume Calculator

Model SD	Length	Width	Height	Volume	Void Ratio:
Half-Module Dimensions:	47.24 in	23.62 in	19.44 in		97.0%
Full-Module Dimensions:	47.24 in	23.62 in	35.98 in	23.23 CF	

MAX. INSTALL DEPTH (TO BOTTOM INVERT): 14.0'

Proposed System Sizing

Design Check:	**OK**	
Req'd Volume:	**2,182**	CF
Provided Volume:	**2,434**	CF

	# of Modules	System Dimensions	
Length:	4	16.08 LF	(Modules oriented in **LONG** direction)
Width:	9	18.05 LF	(Modules oriented in **SHORT** direction)
Height:	3	9.00 LF	(MAX. HEIGHT = 9 FT , i.e. 3 MODULES)
Total Modules:	36		

Area 290.24

StormBrixx SD Basin 3 Volume Calculator

Model SD	Length	Width	Height	Volume	Void Ratio:
Half-Module Dimensions:	47.24 in	23.62 in	19.44 in		97.0%
Full-Module Dimensions:	47.24 in	23.62 in	35.98 in	23.23 CF	

MAX. INSTALL DEPTH (TO BOTTOM INVERT): 14.0'

Proposed System Sizing

Design Check:	**OK**	
Req'd Volume:	**4,741**	CF
Provided Volume:	**4,868**	CF

	# of Modules	System Dimensions	
Length:	6	23.95 LF	(Modules oriented in **LONG** direction)
Width:	12	23.95 LF	(Modules oriented in **SHORT** direction)
Height:	3	9.00 LF	(MAX. HEIGHT = 9 FT , i.e. 3 MODULES)
Total Modules:	72		

Area 573.7941

StormBrixx SD Basin 4 Volume Calculator

Model SD	Length	Width	Height	Volume	Void Ratio:
Half-Module Dimensions:	47.24 in	23.62 in	19.44 in		97.0%
Full-Module Dimensions:	47.24 in	23.62 in	35.98 in	23.23 CF	

MAX. INSTALL DEPTH (TO BOTTOM INVERT): 14.0'

Proposed System Sizing

Design Check:	**OK**	
Req'd Volume:	**2,354**	CF
Provided Volume:	**2,434**	CF

	# of Modules	System Dimensions	
Length:	4	16.08 LF	(Modules oriented in **LONG** direction)
Width:	9	18.05 LF	(Modules oriented in **SHORT** direction)
Height:	3	9.00 LF	(MAX. HEIGHT = 9 FT , i.e. 3 MODULES)
Total Modules:	36		

Area 290.24

StormBrixx SD Basin 5 Volume Calculator

Model SD	Length	Width	Height	Volume	Void Ratio:
Half-Module Dimensions:	47.24 in	23.62 in	19.44 in		97.0%
Full-Module Dimensions:	47.24 in	23.62 in	35.98 in	23.23 CF	

MAX. INSTALL DEPTH (TO BOTTOM INVERT): 14.0'

Proposed System Sizing

Design Check:	**OK**	
Req'd Volume:	**773**	CF
Provided Volume:	**1,623**	CF

	# of Modules	System Dimensions	
Length:	4	16.08 LF	(Modules oriented in **LONG** direction)
Width:	9	18.05 LF	(Modules oriented in **SHORT** direction)
Height:	2	6.00 LF	(MAX. HEIGHT = 9 FT , i.e. 3 MODULES)
Total Modules:	36		

Area 290.24

StormBrixx SD Basin 6 Volume Calculator

Model SD	Length	Width	Height	Volume	Void Ratio:
Half-Module Dimensions:	47.24 in	23.62 in	19.44 in		97.0%
Full-Module Dimensions:	47.24 in	23.62 in	35.98 in	23.23 CF	

MAX. INSTALL DEPTH (TO BOTTOM INVERT): 14.0'

Proposed System Sizing

Design Check:	**OK**		
Req'd Volume:	**2,141**	CF	
Provided Volume:	**2,163**	CF	

	# of Modules	System Dimensions	
Length:	4	16.08 LF	(Modules oriented in **LONG** direction)
Width:	8	16.08 LF	(Modules oriented in **SHORT** direction)
Height:	3	9.00 LF	(MAX. HEIGHT = 9 FT , i.e. 3 MODULES)
Total Modules:	32		

Area 258.5878

StormBrixx SD Basin 7 Volume Calculator

Model SD	Length	Width	Height	Volume	Void Ratio:
Half-Module Dimensions:	47.24 in	23.62 in	19.44 in		97.0%
Full-Module Dimensions:	47.24 in	23.62 in	35.98 in	23.23 CF	

MAX. INSTALL DEPTH (TO BOTTOM INVERT): 14.0'

Proposed System Sizing

Design Check:	**OK**	
Req'd Volume:	**2,042**	CF
Provided Volume:	**2,163**	CF

	# of Modules	System Dimensions	
Length:	4	16.08 LF	(Modules oriented in **LONG** direction)
Width:	8	16.08 LF	(Modules oriented in **SHORT** direction)
Height:	3	9.00 LF	(MAX. HEIGHT = 9 FT , i.e. 3 MODULES)
Total Modules:	32		

Area 258.5878