GREAT BASIN ENGINEERING INC

SUMMERSET FARMS
2200 SOUTH 3500 WEST
WEBER COUNTY, UTAH
STORM WATER STUDY
Project No. 02N302
6-3-2019
Updated 7-16-2019

General Site Information:

The proposed Summerset Farms Subdivision 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 near the east end of the site. A small section of roadway (3750 West Street) will not be included as part of the study area, as storm water falling on 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. Discharge 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 requirement calculations have been provided for the site. (See attached figure and calculations).

The study area is broken up into 10 drainage areas (labeled A-1 through A-9 and U-1). Area U-1 is an undetained area, as site grading does not allow for capture of this area into a detention pond. 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 drainage area. The overall coefficient for the study area is 0.43.

A time of concentration is calculated using the FAA method assuming flow resistance 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 detained areas and is about 7 minutes for the undetained area. These times are based on the hydraulically longest path inside each respective drainage area over grass or other vegetation, asphalt, concrete, and/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 Atlas 14 provided by the 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.

TEL (801) 394-4515 • FAX (801) 392-7544 • 5746 South 1475 East • Ogden, Utah 84403 • www.greatbasinengineering.com

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 detention area. The orifice for the northwest pond will be placed on the downstream face of the inlet/outlet structure at Node 28. The orifice itself is assigned node number 100 for convenience in modeling the restricted flows allowed to leave this detention facility. This orifice will have a diameter of about 8.2 inches to ensure no more than 0.1 cfs/ac is allowed to be released from the contributing areas. For the east facility, the downstream face of the structure that is to be designed at Node 34 will be used. The orifice plate opening for the east facility will be sized when this facility is designed to allow no more than 0.1 cfs/acre to be released from the contributing areas. 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:

As mentioned previously, the required detention storage volume for the 10-year storm with a release rate of 0.1 cfs/acre is calculated for two separate areas: one on the north side of the existing canal, and one on the south side. The areas on the north side of the canal, A-1 through A-7, require a storage volume of 39,283 cf. The northwest detention facility, which will provide the storage for these areas, is comprised of an above-ground pond as well as the first four lengths of 24" diameter storm drain pipes immediately upstream of the pond. The available storage for this facility is 38,756 cf in the pond and 822 cf in the piping, for a total of 39,578 cf. This yields a small excess storage volume of 295 cf. For the areas south of the canal, A-8 and A-9, the requirement is 7,553 cf. Since final design plans have not yet been developed for these areas, the exact capacity is not yet known, but it will be designed to provide at least the required 7,553 cf. Calculations for the requirements are provided in the attached sheets. 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 east 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.

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2200 South Street

101 102 103 104 105 106 201 202 203 204

U-1

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

Open Space: C Opens Space: D

Favero's Legacy Cluster Subdivision - Phase 2

Opens Space: C

LDS Church

Weber County Fire

Parcel # 150780052
Entry No. 2150945

Castellano

Charles J. Marsh

Charles J. Marsh

Rick L. Underwood Jr.

Robert L. & Kathryn H. Favero

Outfall 1

3500 West Street

2200 South Street

Clark Farr & Inez C. Farr (Trustees)

A-1

A-2

A-3

A-4

A-5

Giovanni Favero Jr. Family Living Trust

A-6

A-7

A-8

A-9

Gary F Farr Family Trust

Gary F Farr Family Trust

Parcel # 150780013
Book 0856, Page 0421

Glenn Farr & Inez C. Farr (Trustees)

Outfall 2

3500 West Street

Cameron Cluster Subdivision

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

7/16/2019

9 Detained Areas
1 Undetained Area

Hardscape C =	0.90
Landscape C =	0.15

	Zone 1 (ft^2)
Avg. lot size	38440
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**
∑ Det. Areas	47.413	5.055	42.358	0.433
∑ 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	0.458
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	0.467
A-6	4.284	0.196	4.088	0.411
A-7	4.532	0.694	3.837	0.450
A-8	5.096	0.000	5.096	0.394
A-9	3.825	0.000	3.825	0.394
U-1	0.135	0.107	0.028	0.685

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	30.00	0.25	17.88
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
U-1	13.00	2.00	3.86	109.00	1.50	3.12	0.00	0.00	6.98

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	17.9	1.86
A-8	21.2	1.69
A-9	18.6	1.82
U-1	7.0	2.94

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	0.458	1.717
A-3	0.434	1.551
A-4	0.460	1.657
A-5	0.467	1.625
A-6	0.411	1.430
A-7	0.450	1.864
A-8	0.394	1.687
A-9	0.394	1.818
U-1	0.685	2.941

	Peak Flows
∑ detained =	33.51
A (acres)	Q (10-yr.) (cfs)
7.28	4.49
6.56	5.16
7.15	4.81
4.98	3.80
3.71	2.81
4.28	2.52
4.53	3.80
5.10	3.39
3.82	2.74
0.14	0.27

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%	2.17
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%	0.95
A-7	28	75.0%	2.85
A-7	100	-1.0%	(0.04)
A-8	31	100.0%	3.39
A-9	32	40.0%	1.10
A-9	33	30.0%	0.82
A-9	34	30.0%	0.82
U-1	29	25.0%	0.07
U-1	30	75.0%	0.20

Summary of Node Inlet Requirements

Node	Is required to take (cfs)
1	3.82
2	0.67
3	0.36
4	3.87
5	0.52
6	0.10
7	0.15
8	0.15
9	0.29
10	2.17
11	0.29
12	0.29
13	0.29
14	0.53
15	0.96
16	3.23
17	0.57
18	0.17
19	0.22
20	0.22
21	0.25
22	1.74
23	0.20
24	0.20
25	0.38
26	1.94
27	0.95
28	2.85
29	0.07
30	0.20
31	3.39
32	1.10
33	0.82
34	0.82
100	-0.04

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	9.50
8	9	9.65
9	11	9.94
10	11	2.17
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	3.97
19	20	4.19
20	21	4.41
21	23	4.67
22	23	1.74
23	24	6.61
24	25	21.27
25	26	21.65
26	27	23.58
27	28	24.53
28	100	27.39
29	30	27.42
30	Outfall 1	27.62
31	32	3.39
32	34	4.48
33	34	0.82
34	Outfall 2	6.12
100	29	27.35

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2	3	4.49
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8	9	9.65
9	11	9.94
10	11	2.17
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	3.97
19	20	4.19
20	21	4.41
21	23	4.67
22	23	1.74
23	24	6.61
24	25	21.27
25	26	21.65
26	27	23.58
27	28	24.53
28	100	27.39
29	30	27.42
30	Outfall 1	27.62
31	32	3.39
32	34	4.48
33	34	0.82
34	Outfall 2	6.12
100	29	27.35

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	0.350%	1.227	0.313	0.013	0.150%	**15**
		3.82	18	0.132%	1.767	0.375	0.013	0.120%	
		3.82	24	0.029%	3.142	0.500	0.013	0.080%	
2	3	4.49	15	0.484%	1.227	0.313	0.013	0.150%	**15**
		4.49	18	0.183%	1.767	0.375	0.013	0.120%	
		4.49	24	0.039%	3.142	0.500	0.013	0.080%	
3	6	4.85	15	0.565%	1.227	0.313	0.013	0.150%	**18**
		4.85	18	0.214%	1.767	0.375	0.013	0.120%	
		4.85	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**
		3.87	18	0.135%	1.767	0.375	0.013	0.120%	
		3.87	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**
		4.38	18	0.174%	1.767	0.375	0.013	0.120%	
		4.38	24	0.038%	3.142	0.500	0.013	0.080%	
6	7	9.34	15	2.090%	1.227	0.313	0.013	0.150%	**24**
		9.34	18	0.791%	1.767	0.375	0.013	0.120%	
		9.34	24	0.170%	3.142	0.500	0.013	0.080%	
7	8	9.50	15	2.160%	1.227	0.313	0.013	0.150%	**24**
		9.50	18	0.817%	1.767	0.375	0.013	0.120%	
		9.50	24	0.176%	3.142	0.500	0.013	0.080%	
8	9	9.65	15	2.231%	1.227	0.313	0.013	0.150%	**24**
		9.65	18	0.844%	1.767	0.375	0.013	0.120%	
		9.65	24	0.182%	3.142	0.500	0.013	0.080%	
9	11	9.94	15	2.367%	1.227	0.313	0.013	0.150%	**24**
		9.94	18	0.895%	1.767	0.375	0.013	0.120%	
		9.94	24	0.193%	3.142	0.500	0.013	0.080%	
10	11	2.17	15	0.112%	1.227	0.313	0.013	0.150%	**15**
		2.17	18	0.042%	1.767	0.375	0.013	0.120%	
		2.17	24	0.009%	3.142	0.500	0.013	0.080%	
11	12	12.39	15	3.680%	1.227	0.313	0.013	0.150%	**24**
		12.39	18	1.392%	1.767	0.375	0.013	0.120%	
		12.39	24	0.300%	3.142	0.500	0.013	0.080%	
12	13	12.68	15	3.853%	1.227	0.313	0.013	0.150%	**24**
		12.68	18	1.457%	1.767	0.375	0.013	0.120%	
		12.68	24	0.314%	3.142	0.500	0.013	0.080%	
13	14	12.97	15	4.031%	1.227	0.313	0.013	0.150%	**24**
		12.97	18	1.524%	1.767	0.375	0.013	0.120%	
		12.97	24	0.329%	3.142	0.500	0.013	0.080%	
14	15	13.50	15	4.367%	1.227	0.313	0.013	0.150%	**24**
		13.50	18	1.651%	1.767	0.375	0.013	0.120%	
		13.50	24	0.356%	3.142	0.500	0.013	0.080%	

15	24	14.46	18	1.895%	1.767	0.375	0.013	0.120%	
		14.46	24	0.409%	3.142	0.500	0.013	0.080%	**24**
		14.46	30	0.124%	4.909	0.625	0.013	0.060%	
16	17	3.23	15	0.250%	1.227	0.313	0.013	0.150%	
		3.23	18	0.094%	1.767	0.375	0.013	0.120%	**15**
		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%	
		3.80	18	0.131%	1.767	0.375	0.013	0.120%	**15**
		3.80	24	0.028%	3.142	0.500	0.013	0.080%	
18	19	3.97	15	0.377%	1.227	0.313	0.013	0.150%	
		3.97	18	0.142%	1.767	0.375	0.013	0.120%	**15**
		3.97	24	0.031%	3.142	0.500	0.013	0.080%	
19	20	4.19	15	0.421%	1.227	0.313	0.013	0.150%	
		4.19	18	0.159%	1.767	0.375	0.013	0.120%	**15**
		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%	
		4.41	18	0.177%	1.767	0.375	0.013	0.120%	**15**
		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%	
		4.67	18	0.197%	1.767	0.375	0.013	0.120%	**18**
		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%	
		1.74	18	0.027%	1.767	0.375	0.013	0.120%	**15**
		1.74	24	0.006%	3.142	0.500	0.013	0.080%	
23	24	6.61	15	1.046%	1.227	0.313	0.013	0.150%	
		6.61	18	0.395%	1.767	0.375	0.013	0.120%	**18**
		6.61	24	0.085%	3.142	0.500	0.013	0.080%	
24	25	21.27	18	4.099%	1.767	0.375	0.013	0.120%	
		21.27	24	0.884%	3.142	0.500	0.013	0.080%	**30**
		21.27	30	0.269%	4.909	0.625	0.013	0.060%	
25	26	21.65	18	4.246%	1.767	0.375	0.013	0.120%	
		21.65	24	0.915%	3.142	0.500	0.013	0.080%	**30**
		21.65	30	0.278%	4.909	0.625	0.013	0.060%	
26	27	23.58	18	5.040%	1.767	0.375	0.013	0.120%	
		23.58	24	1.087%	3.142	0.500	0.013	0.080%	**30**
		23.58	30	0.331%	4.909	0.625	0.013	0.060%	
27	28	24.53	18	5.455%	1.767	0.375	0.013	0.120%	
		24.53	24	1.176%	3.142	0.500	0.013	0.080%	**30**
		24.53	30	0.358%	4.909	0.625	0.013	0.060%	
28	100	27.39	24	1.466%	3.142	0.500	0.013	0.080%	
		27.39	30	0.446%	4.909	0.625	0.013	0.060%	**30**
		27.39	36	0.169%	7.069	0.750	0.013	0.050%	
29	30	27.42	24	1.469%	3.142	0.500	0.013	0.080%	
		27.42	30	0.447%	4.909	0.625	0.013	0.060%	**30**
		27.42	36	0.169%	7.069	0.750	0.013	0.050%	

30	Outfall 1	27.62	24	1.491%	3.142	0.500	0.013	0.080%	**30**
		27.62	30	0.453%	4.909	0.625	0.013	0.060%	
		27.62	36	0.172%	7.069	0.750	0.013	0.050%	
31	32	3.39	15	0.275%	1.227	0.313	0.013	0.150%	**15**
		3.39	18	0.104%	1.767	0.375	0.013	0.120%	
		3.39	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	0.899%	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%	
100	29	27.35	24	1.461%	3.142	0.500	0.013	0.080%	**30**
		27.35	30	0.445%	4.909	0.625	0.013	0.060%	
		27.35	36	0.168%	7.069	0.750	0.013	0.050%	

Summerset Farms

Detention Facility Serving A-1 through A-7

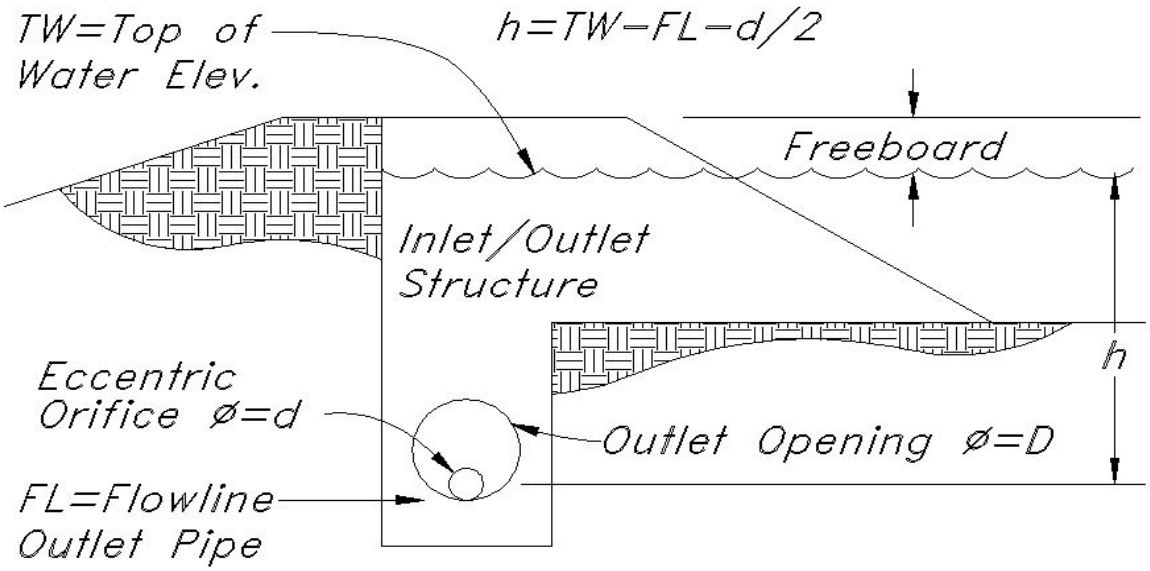
		Unit Discharge =	0.100	cfs/acre
C =	0.44	Total Allow. Rel. =	3.849	cfs
Area =	38.49 acres	Release from U-1 =	0.273	
		Release through Restriction =	3.576	cfs

Detention Pond Sized For The 10 Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	3.25	16599	1073	15526	
10	2.47	25231	2146	23085	
15	2.04	31258	3219	28039	
20	1.74	35450	4291	31159	
25	1.53	38982	5364	33617	
30	1.37	41983	6437	35546	
35	1.26	44896	7510	37386	
40	1.14	46701	8583	38118	
45	1.05	48252	9656	38596	
50	0.97	49540	10729	38812	
55	0.90	50773	11802	38972	
60	0.85	52157	12874	39283	<- Det
90	0.62	56712	19312	37400	
120	0.49	60064	25749	34315	
180	0.36	65273	38623	26650	
360	0.23	82741	77246	5494	
720	0.14	104437	154493	-50055	
1440	0.09	125030	308985	-183955	

Required Storage Volume = **39283** ft^3

ORIFICE PLATE CALCULATIONS



Q = Total Discharge Rate

$$Q = 0.62 \cdot A_o \cdot \sqrt{64.4 \cdot h}$$

$$A_o = \frac{\pi \cdot d^2}{4}$$

Solving for d, we have…..

$$d = \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot \left(TW - FL - d/2\right)}}}$$

Let

$$\Delta = d - \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot \left(TW - FL - d/2\right)}}}$$

Goal-seek Δ to zero by changing "trial d"

TW =	4247.25	
FL =	4243.01	
Q =	3.576	cfs
trial d=	0.6807	ft
Δ =	0.000	ft

d =	8.17	inches

Summerset Farms

Detention Facility Serving A-8 and A-9

C = 0.39

Area = 8.92 acres

Unit Discharge = 0.100 cfs/acre

Release through Restriction = 0.892 cfs

Detention Pond Sized For The 10 Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	3.25	3426	268	3158	
10	2.47	5207	535	4672	
15	2.04	6451	803	5648	
20	1.74	7316	1070	6246	
25	1.53	8045	1338	6707	
30	1.37	8665	1606	7059	
35	1.26	9266	1873	7393	
40	1.14	9639	2141	7498	
45	1.05	9959	2409	7550	
50	0.97	10225	2676	7548	
55	0.90	10479	2944	7535	
60	0.85	10765	3211	7553	<- Det
90	0.62	11705	4817	6888	
120	0.49	12396	6423	5974	
180	0.36	13472	9634	3837	
360	0.23	17077	19269	-2192	
720	0.14	21555	38538	-16983	
1440	0.09	25805	77075	-51270	

Required Storage Volume = **7553** ft^3