

PRIMARY CHILDREN'S WASATCH CANYONS BEHAVIORAL HEALTH REPLACEMENT
5770 SOUTH 1500 WEST
TAYLORSVILLE, UTAH 84123
STORM WATER STUDY
Project No. 22N217
2-28-2023
Updated 3-17-2023
Updated 6-1-2023

General Site Information:

The Primary Children's Wasatch Canyons Behavioral Health Campus is located on the North side of I-215, about 1000 feet east of Redwood Road in Taylorsville, Utah. Work will consist of demolition of several building and onsite improvements and construction of a new building, several parking lot areas, sidewalks, curb and gutter, underground utilities, landscaped areas, and an underground storm water storage facility when completed.

Storm water from the site will be collected in inlet boxes and catch basins and will continue via storm drain to the southeast corner of the site. Storm water will be stored in a hybrid retention/detention facility located near that corner of the site. The site is required to completely retain the 80th Percentile Storm Event for LID purposes. Additional runoff generated is allowed a unit-release of 0.2 cfs per acre for the 100-yr storm into an existing storm drainage system at the intersection of 5770 South Street and 1500 West Street and will continue easterly along 5770 South Street in a historical fashion. The attached figure shows the project site and location of the storm water outfall. Retention and detention calculations have been provided for the site. (See attached figure and calculations).

The study area is broken up into 2 drainage areas (labeled A-1 and A-2). 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. Average runoff coefficients of 0.75 and 0.51 are calculated for areas A-1 and A-2, respectively. This yields a coefficient of 0.62 for the overall study area.

Times of concentration are calculated using the FAA method assuming flow resistance coefficients of $K=0.35$ for landscape and $K=0.91$ for hardscape for each of the drainage areas. The times of concentration are about 21 and 20 minutes respectively for areas A-1 and A-2. These times are based on the hydraulically longest drainage 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 are rounded to 5 minutes (as applicable) when using this method. Rainfall intensities were taken from NOAA Atlas 14 for pipe sizing and detention requirements. The values obtained were interpolated as necessary. A copy of these data is attached.

Data showing area information, runoff coefficient, time of concentration, peak flows, and retention/detention storage requirements for the site are provided in the attached calculations.

Design Requirements:

The design storms and allowable stormwater release rate were found on 2/28/2023 in Section 17.05.130 of City Code at https://codelibrary.amlegal.com/codes/tailorsvilleut/latest/tailorsville_ut/0-0-0-17512. For storm drain piping, the requirement is the 10-year frequency storm. For LID, the requirement is to retain the 80th Percentile Event ($d = 0.45$ inches). For detention sizing, the requirement is to release no more than 0.20 cubic feet per second per acre (cfs/ac) during a 100-year Storm Event.

Pipe Sizes:

Storm water pipes in the project are proposed to be polyvinylchloride pipes (PVC), 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 are designed with enough capacity to convey the 10-year storm without surcharging.

The site must also reroute an existing storm drain line that passes through the site. It appears that about 7 acres of the neighboring development to the west utilizes an existing detention pond before releasing into the rerouted discharge pipe. Node 8 in the study is used to account for the additional flow that must pass through the proposed onsite storm drain system to accommodate the restricted release from the neighboring property. If 7 acres at 0.2 cfs is currently being utilized, this gives a pass-through flow of 1.4 cfs. This is accounted for in pipe sizing.

Orifice Plate:

An orifice plate will be used to control the rate that storm water flows from the project after the required retention is satisfied. It will be located on the east side of the inlet box at node 39 (See attached figure). The bottom of the orifice plate opening will be set at 4320.00 and have a diameter of 7.6 inches for the stormwater storage facility to utilize its capacity during a 100-yr storm with a release rate of 0.2 cfs/ac after the required retention is provided. The orifice plate will allow small flows more than the 80th Percentile Retention to pass through without further storage. As the rate of storm water into the pipes and underground stormwater storage facility increases, the orifice plate will restrict the flow. The maximum flow through the plate will occur when the stormwater storage basin reaches its maximum design depth at an elevation of 4324.92. A detailed exhibit of an orifice plate can be found in the construction documents for this project.

Required Stormwater Storage:

The required 80th Percentile retention is based on a City-provided depth of 0.45 inches. Using the site imperviousness percentage, an Rv value is calculated using the Reese Method. Over the $\approx$ 10-acre site, this yields a required retention storage of 8,903 cf. This is provided when the water level in the hybrid retention/detention facility reaches an elevation of 4320.00. The elevation of the orifice will prevent stormwater from being discharged below that elevation.

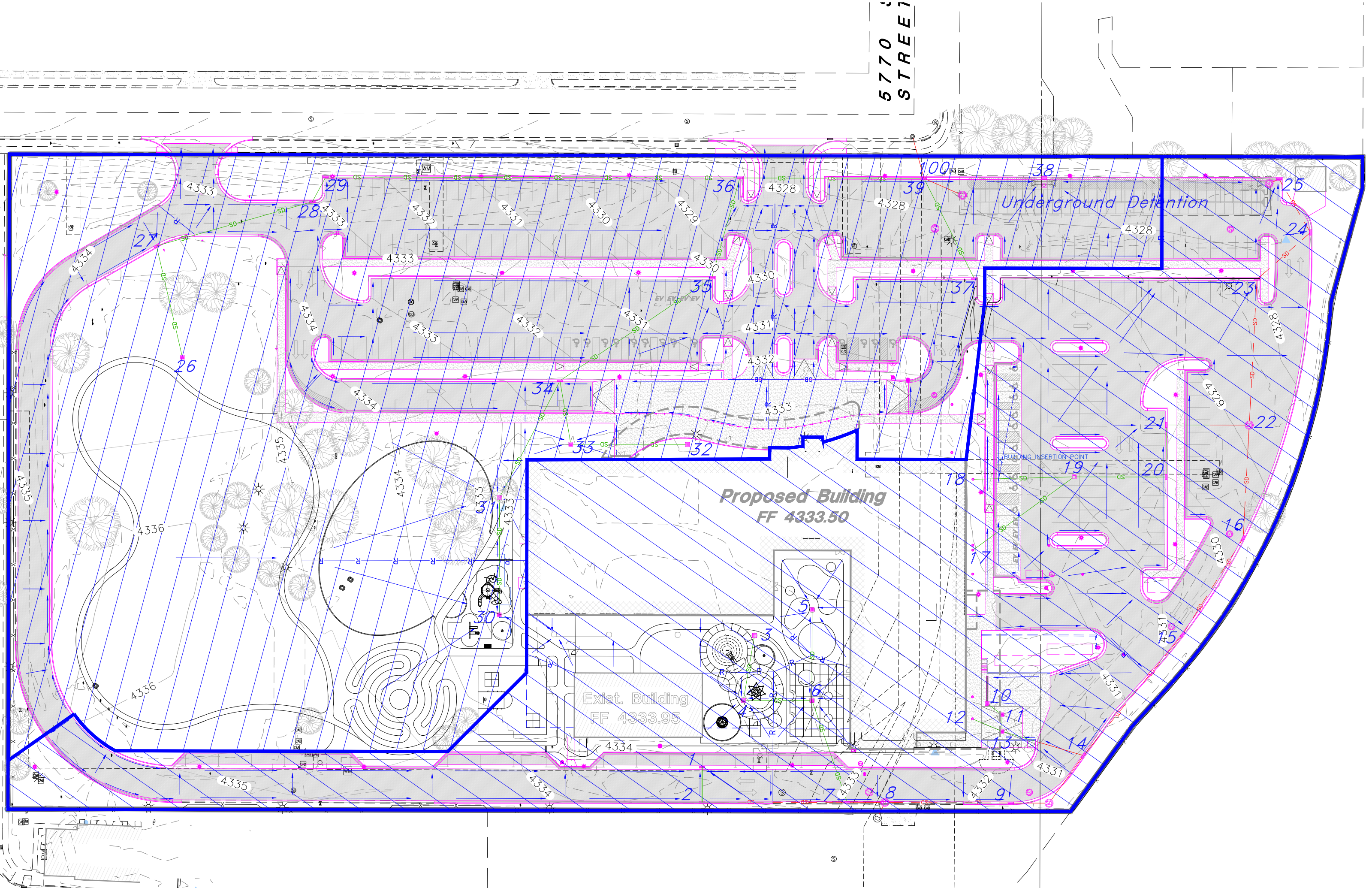
The required hybrid retention/detention for the 100-year storm with a release rate of 0.2 cfs/acre after retention is provided is 30,877 cubic feet for the study area. The available volume in the stormwater storage facility is 30,895 cubic feet. There is a slight excess capacity. In the event the underground facility experiences a storm much larger than the design storm water will then spill out onto 5770 South Street and continue easterly in a historical fashion.

Great Basin Engineering, Inc.

Prepared by Ryan Bingham, P.E.



5770 STREET



Storm Water Calculations
 Primary Children's Wasatch Canyons Behavioral Health Replacement
 5770 South 1500 West, Taylorsville, UT 84123
 22N217 - S5 SWS Exhib.dwg

6/1/2023

2 Detained Areas

Hardscape C = 0.90
 Landscape C = 0.15

Drainage Areas	Total Area (ft^2)	Total Area (acres)	Hardscape Area (ft^2)	Hardscape Area (acres)	Landscape Area (ft^2)	Landscape Area (acres)	C
Σ Det. Areas	435595	10.000	270653	6.213	164942	3.787	0.616
Σ All Areas	435595	10.000	270653	6.213	164942	3.787	0.616
A-1	191332	4.392	153130	3.515	38202	0.877	0.750
A-2	244263	5.608	117523	2.698	126740	2.910	0.511

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	38.00	2.00	6.61	453.00	0.75	8.01	813.00	6.78	21.39
A-2	153.00	2.00	13.25	330.00	1.50	5.43	211.00	1.76	20.44

Rainfall Intensities
Data From NOAA

10-Year and 100-Year Intensities

The equations used for the 10-Year and 100-Year 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.)	I (100-yr.) (in./hr.)
A-1	21.4	1.67	3.33
A-2	20.4	1.71	3.41

Peak Flow Information
 Use Rational Method
 10-Year and 100-Year Intensities

$$Q = CIA$$

					Peak Flows	
Σ detained =					10.40	20.76
AREA	C	I10 (in./hr.)	I100 (in./hr.)	A (acres)	Q (10-yr.) (cfs)	Q (100-yr.) (cfs)
A-1	0.750	1.670	3.334	4.39	5.50	10.99
A-2	0.511	1.710	3.413	5.61	4.90	9.78

Node Inlet Requirements

Size pipes for		10	year storm
Area	Node #	% of Total	Q (cfs)
A-1	1	10.0%	0.55
A-1	2	0.0%	0.00
A-1	3	4.0%	0.22
A-1	4	4.0%	0.22
A-1	5	2.0%	0.11
A-1	6	2.0%	0.11
A-1	7	3.0%	0.17
A-1	8	25.4%	1.40
A-1	9	2.0%	0.11
A-1	10	2.0%	0.11
A-1	11	2.0%	0.11
A-1	12	7.0%	0.39
A-1	13	2.0%	0.11
A-1	14	2.0%	0.11
A-1	15	3.0%	0.17
A-1	16	3.0%	0.17
A-1	17	9.0%	0.50
A-1	18	9.0%	0.50
A-1	19	0.0%	0.00
A-1	20	7.0%	0.39
A-1	21	7.0%	0.39
A-1	22	0.0%	0.00
A-1	23	10.0%	0.55
A-1	24	7.0%	0.39
A-1	25	3.0%	0.17
A-2	26	10.0%	0.49
A-2	27	6.0%	0.29
A-2	28	3.0%	0.15
A-2	29	1.0%	0.05
A-2	30	10.0%	0.49
A-2	31	10.0%	0.49
A-2	32	2.0%	0.10
A-2	33	2.0%	0.10
A-2	34	4.0%	0.20
A-2	35	11.0%	0.54
A-2	36	11.0%	0.54
A-2	37	12.0%	0.59
A-2	38	6.0%	0.29
A-2	39	12.0%	0.59
A-2	100	0.0%	0.00

PIPE FLOWS

Upstream Node	Downstream node	Pipe Flow (cfs)
1	2	0.55
2	7	0.55
3	4	0.22
4	6	0.44
5	6	0.11
6	7	0.66
7	8	1.38
8	9	2.78
9	14	2.89
10	11	0.11
11	13	0.22
12	13	0.39
13	14	0.72
14	15	3.71
15	16	3.88
16	22	4.04
17	19	0.50
18	19	0.50
19	20	0.99
20	21	1.38
21	22	1.76
22	23	5.80
23	24	6.35
24	25	6.74
25	38	6.90
26	27	0.49
27	28	0.78
28	29	0.93
29	36	0.98
30	31	0.49
31	34	0.98
32	33	0.10
33	34	0.20
34	35	1.37
35	36	1.91
36	39	3.43
37	39	0.59
38	39	7.20
39	100	11.80
100	Outfall	11.80

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	0.55	6	0.689%	0.196	0.125	0.011	1.000%	8
		0.55	8	0.149%	0.349	0.167	0.011	0.400%	
		0.55	10	0.045%	0.545	0.208	0.011	0.280%	
2	7	0.55	6	0.689%	0.196	0.125	0.011	1.000%	8
		0.55	8	0.149%	0.349	0.167	0.011	0.400%	
		0.55	10	0.045%	0.545	0.208	0.011	0.280%	
3	4	0.22	6	0.110%	0.196	0.125	0.011	1.000%	8
		0.22	8	0.024%	0.349	0.167	0.011	0.400%	
		0.22	10	0.007%	0.545	0.208	0.011	0.280%	
4	6	0.44	6	0.441%	0.196	0.125	0.011	1.000%	8
		0.44	8	0.095%	0.349	0.167	0.011	0.400%	
		0.44	10	0.029%	0.545	0.208	0.011	0.280%	
5	6	0.11	6	0.028%	0.196	0.125	0.011	1.000%	8
		0.11	8	0.006%	0.349	0.167	0.011	0.400%	
		0.11	10	0.002%	0.545	0.208	0.011	0.280%	
6	7	0.66	6	0.992%	0.196	0.125	0.011	1.000%	8
		0.66	8	0.214%	0.349	0.167	0.011	0.400%	
		0.66	10	0.065%	0.545	0.208	0.011	0.280%	
7	8	1.38	6	4.306%	0.196	0.125	0.011	1.000%	10
		1.38	8	0.928%	0.349	0.167	0.011	0.400%	
		1.38	10	0.282%	0.545	0.208	0.011	0.280%	
8	9	2.78	10	1.149%	0.545	0.208	0.011	0.280%	15
		2.78	12	0.607%	0.785	0.250	0.013	0.200%	
		2.78	15	0.185%	1.227	0.313	0.013	0.145%	
9	14	2.89	10	1.242%	0.545	0.208	0.011	0.280%	15
		2.89	12	0.656%	0.785	0.250	0.013	0.200%	
		2.89	15	0.200%	1.227	0.313	0.013	0.145%	
10	11	0.11	6	0.028%	0.196	0.125	0.011	1.000%	8
		0.11	8	0.006%	0.349	0.167	0.011	0.400%	
		0.11	10	0.002%	0.545	0.208	0.011	0.280%	
11	13	0.22	6	0.110%	0.196	0.125	0.011	1.000%	8
		0.22	8	0.024%	0.349	0.167	0.011	0.400%	
		0.22	10	0.007%	0.545	0.208	0.011	0.280%	
12	13	0.39	6	0.338%	0.196	0.125	0.011	1.000%	8
		0.39	8	0.073%	0.349	0.167	0.011	0.400%	
		0.39	10	0.022%	0.545	0.208	0.011	0.280%	
13	14	0.72	6	1.164%	0.196	0.125	0.011	1.000%	8
		0.72	8	0.251%	0.349	0.167	0.011	0.400%	
		0.72	10	0.076%	0.545	0.208	0.011	0.280%	
14	15	3.71	10	2.055%	0.545	0.208	0.011	0.280%	15
		3.71	12	1.085%	0.785	0.250	0.013	0.200%	
		3.71	15	0.330%	1.227	0.313	0.013	0.145%	

15	16	3.88	10	2.241%	0.545	0.208	0.011	0.280%	15
		3.88	12	1.184%	0.785	0.250	0.013	0.200%	
		3.88	15	0.360%	1.227	0.313	0.013	0.145%	
16	22	4.04	10	2.436%	0.545	0.208	0.011	0.280%	15
		4.04	12	1.287%	0.785	0.250	0.013	0.200%	
		4.04	15	0.391%	1.227	0.313	0.013	0.145%	
17	19	0.50	6	0.558%	0.196	0.125	0.011	1.000%	8
		0.50	8	0.120%	0.349	0.167	0.011	0.400%	
		0.50	10	0.037%	0.545	0.208	0.011	0.280%	
18	19	0.50	6	0.558%	0.196	0.125	0.011	1.000%	8
		0.50	8	0.120%	0.349	0.167	0.011	0.400%	
		0.50	10	0.037%	0.545	0.208	0.011	0.280%	
19	20	0.99	6	2.232%	0.196	0.125	0.011	1.000%	8
		0.99	8	0.481%	0.349	0.167	0.011	0.400%	
		0.99	10	0.146%	0.545	0.208	0.011	0.280%	
20	21	1.38	6	4.306%	0.196	0.125	0.011	1.000%	10
		1.38	8	0.928%	0.349	0.167	0.011	0.400%	
		1.38	10	0.282%	0.545	0.208	0.011	0.280%	
21	22	1.76	8	1.521%	0.349	0.167	0.011	0.400%	10
		1.76	10	0.463%	0.545	0.208	0.011	0.280%	
		1.76	12	0.244%	0.785	0.250	0.013	0.200%	
22	23	5.80	12	2.653%	0.785	0.250	0.013	0.200%	18
		5.80	15	0.807%	1.227	0.313	0.013	0.145%	
		5.80	18	0.305%	1.767	0.375	0.013	0.114%	
23	24	6.35	12	3.180%	0.785	0.250	0.013	0.200%	18
		6.35	15	0.967%	1.227	0.313	0.013	0.145%	
		6.35	18	0.366%	1.767	0.375	0.013	0.114%	
24	25	6.74	15	1.088%	1.227	0.313	0.013	0.145%	18
		6.74	18	0.412%	1.767	0.375	0.013	0.114%	
		6.74	24	0.089%	3.142	0.500	0.013	0.078%	
25	38	6.90	15	1.142%	1.227	0.313	0.013	0.145%	18
		6.90	18	0.432%	1.767	0.375	0.013	0.114%	
		6.90	24	0.093%	3.142	0.500	0.013	0.078%	
26	27	0.49	6	0.546%	0.196	0.125	0.011	1.000%	8
		0.49	8	0.118%	0.349	0.167	0.011	0.400%	
		0.49	10	0.036%	0.545	0.208	0.011	0.280%	
27	28	0.78	6	1.397%	0.196	0.125	0.011	1.000%	8
		0.78	8	0.301%	0.349	0.167	0.011	0.400%	
		0.78	10	0.092%	0.545	0.208	0.011	0.280%	
28	29	0.93	6	1.970%	0.196	0.125	0.011	1.000%	8
		0.93	8	0.425%	0.349	0.167	0.011	0.400%	
		0.93	10	0.129%	0.545	0.208	0.011	0.280%	

29	36	0.98	6	2.183%	0.196	0.125	0.011	1.000%	8
		0.98	8	0.471%	0.349	0.167	0.011	0.400%	
		0.98	10	0.143%	0.545	0.208	0.011	0.280%	
30	31	0.49	6	0.546%	0.196	0.125	0.011	1.000%	8
		0.49	8	0.118%	0.349	0.167	0.011	0.400%	
		0.49	10	0.036%	0.545	0.208	0.011	0.280%	
31	34	0.98	6	2.183%	0.196	0.125	0.011	1.000%	8
		0.98	8	0.471%	0.349	0.167	0.011	0.400%	
		0.98	10	0.143%	0.545	0.208	0.011	0.280%	
32	33	0.10	6	0.022%	0.196	0.125	0.011	1.000%	8
		0.10	8	0.005%	0.349	0.167	0.011	0.400%	
		0.10	10	0.001%	0.545	0.208	0.011	0.280%	
33	34	0.20	6	0.087%	0.196	0.125	0.011	1.000%	8
		0.20	8	0.019%	0.349	0.167	0.011	0.400%	
		0.20	10	0.006%	0.545	0.208	0.011	0.280%	
34	35	1.37	6	4.279%	0.196	0.125	0.011	1.000%	10
		1.37	8	0.923%	0.349	0.167	0.011	0.400%	
		1.37	10	0.281%	0.545	0.208	0.011	0.280%	
35	36	1.91	8	1.790%	0.349	0.167	0.011	0.400%	12
		1.91	10	0.544%	0.545	0.208	0.011	0.280%	
		1.91	12	0.288%	0.785	0.250	0.013	0.200%	
36	39	3.43	10	1.754%	0.545	0.208	0.011	0.280%	15
		3.43	12	0.926%	0.785	0.250	0.013	0.200%	
		3.43	15	0.282%	1.227	0.313	0.013	0.145%	
37	39	0.59	6	0.786%	0.196	0.125	0.011	1.000%	8
		0.59	8	0.169%	0.349	0.167	0.011	0.400%	
		0.59	10	0.052%	0.545	0.208	0.011	0.280%	
38	39	7.20	15	1.242%	1.227	0.313	0.013	0.145%	18
		7.20	18	0.470%	1.767	0.375	0.013	0.114%	
		7.20	24	0.101%	3.142	0.500	0.013	0.078%	
39	100	11.80	15	3.338%	1.227	0.313	0.013	0.145%	24
		11.80	18	1.262%	1.767	0.375	0.013	0.114%	
		11.80	24	0.272%	3.142	0.500	0.013	0.078%	
100	Outfall	11.80	15	3.338%	1.227	0.313	0.013	0.145%	24
		11.80	18	1.262%	1.767	0.375	0.013	0.114%	
		11.80	24	0.272%	3.142	0.500	0.013	0.078%	

LID Calcs (90th Percentile Event)

i =	62.1%	
Rv =	0.545	
d =	0.45	inches (90th Percentile for LEED)
A =	435595	sf
V_goal = Rv*d*A =	8903	cf
Geotech Perc Rate =	40	min/in for onsite Clay
S.F. =	3	
Design Perc Rate =	120	min/in
Required Storage Provided at	30	inch depth
Time for 80th Percentile Event to Perc =	60	hours √ (acceptable)

Primary Children's Wasatch Canyons Behavioral Health Replacement Hybrid Retention/Detention Facility

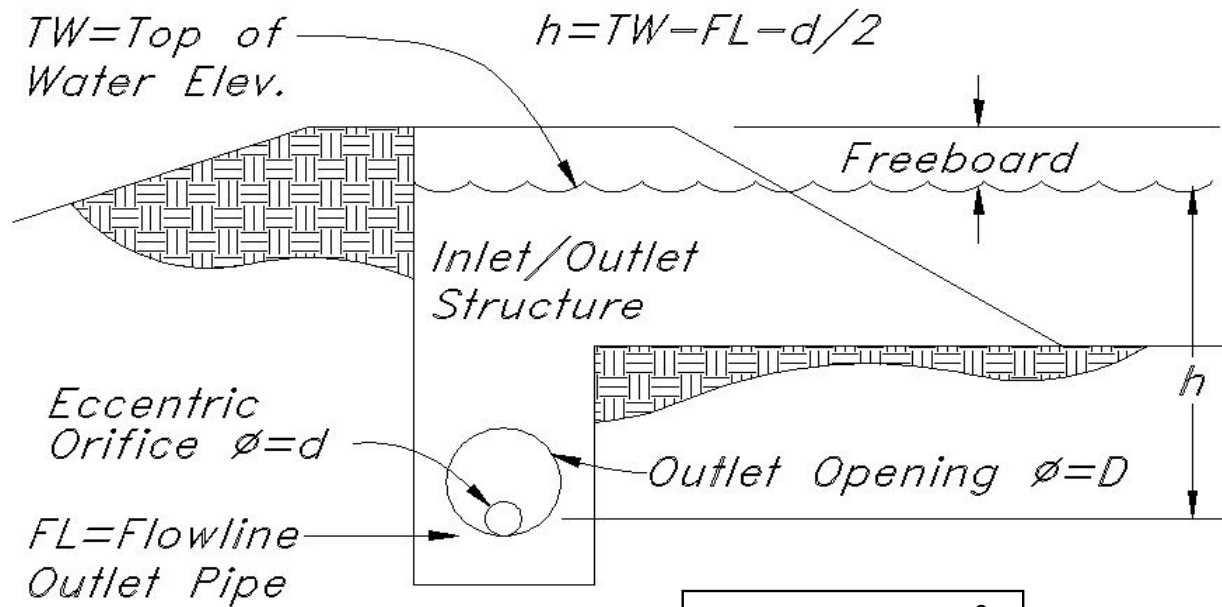
C =	0.62	Remaining Unit Discharge =	0.200	cfs/acre	
Area =	10.00	acres	Release through Restriction =	2.000	cfs

Detention Pond Sized For The 100 Year Storm

Time min	Rainfall Intensity in./hr.	Accum. Volume (CF)	Allowable Release (CF)	Needed Detention (CF)	
5	6.44	11901	0	11901	
10	4.90	18110	600	17510	
15	4.05	22453	1200	21253	
20	3.45	25493	1800	23693	
25	3.04	28070	2400	25670	
30	2.73	30270	3000	27270	
35	2.50	32376	3600	28776	
40	2.28	33682	4200	29482	
45	2.09	34791	4800	29991	
50	1.93	35696	5400	30296	
55	1.80	36543	6000	30543	
60	1.69	37477	6600	30877	<- Det
90	1.20	39839	10200	29639	
120	0.92	40759	13800	26960	
180	0.62	41314	21000	20314	
360	0.33	44441	42600	1841	
720	0.20	51892	85799	-33907	
1440	0.10	54819	172198	-117379	

Required Storage Volume = 30877 ft³

ORIFICE PLATE CALCULATIONS



Let $\Delta = Q_{req} - Q_{orif}$, and Goal Seek Δ to zero by changing "trial d".

TW =	4324.92	
FL =	4320.00	
Q(upstream pass through) =	1.400	cfs
Q(allowable) =	2.000	cfs
Q(orifice) =	3.400	cfs
trial d =	0.6369	ft
Δ =	0.000	ft
d =	7.64	inches



NOAA Atlas 14, Volume 1, Version 5
Location name: Salt Lake City, Utah, USA*
Latitude: 40.6469°, Longitude: -111.9349°
Elevation: 4333.62 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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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	1.49 (1.31-1.72)	1.87 (1.64-2.17)	2.57 (2.24-2.99)	3.22 (2.77-3.76)	4.27 (3.59-5.03)	5.28 (4.30-6.26)	6.44 (5.08-7.74)	7.82 (5.92-9.60)	10.1 (7.19-12.7)	12.1 (8.26-15.6)
10-min	1.13 (0.996-1.31)	1.43 (1.25-1.65)	1.96 (1.71-2.27)	2.45 (2.11-2.86)	3.26 (2.74-3.82)	4.01 (3.27-4.76)	4.90 (3.86-5.89)	5.95 (4.49-7.30)	7.66 (5.47-9.64)	9.22 (6.28-11.9)
15-min	0.936 (0.820-1.08)	1.18 (1.04-1.37)	1.62 (1.41-1.88)	2.03 (1.74-2.36)	2.69 (2.26-3.16)	3.32 (2.70-3.93)	4.05 (3.19-4.87)	4.92 (3.72-6.04)	6.33 (4.52-7.96)	7.62 (5.19-9.83)
30-min	0.630 (0.552-0.728)	0.796 (0.696-0.920)	1.09 (0.952-1.26)	1.36 (1.18-1.59)	1.81 (1.52-2.13)	2.23 (1.82-2.65)	2.73 (2.15-3.28)	3.31 (2.50-4.06)	4.26 (3.04-5.36)	5.13 (3.50-6.62)
60-min	0.389 (0.341-0.450)	0.492 (0.431-0.569)	0.674 (0.589-0.783)	0.844 (0.727-0.984)	1.12 (0.941-1.32)	1.38 (1.13-1.64)	1.69 (1.33-2.03)	2.05 (1.55-2.51)	2.64 (1.88-3.32)	3.18 (2.16-4.10)
2-hr	0.246 (0.222-0.278)	0.306 (0.274-0.346)	0.398 (0.356-0.451)	0.485 (0.428-0.552)	0.629 (0.540-0.721)	0.762 (0.636-0.882)	0.919 (0.742-1.08)	1.11 (0.856-1.33)	1.41 (1.03-1.75)	1.69 (1.18-2.15)
3-hr	0.190 (0.173-0.211)	0.234 (0.213-0.260)	0.294 (0.267-0.327)	0.350 (0.315-0.390)	0.440 (0.387-0.495)	0.520 (0.447-0.592)	0.621 (0.518-0.728)	0.741 (0.599-0.896)	0.943 (0.725-1.18)	1.13 (0.831-1.45)
6-hr	0.123 (0.114-0.134)	0.150 (0.139-0.164)	0.182 (0.168-0.199)	0.212 (0.194-0.231)	0.255 (0.230-0.281)	0.292 (0.259-0.324)	0.334 (0.290-0.377)	0.384 (0.325-0.454)	0.482 (0.394-0.597)	0.569 (0.453-0.733)
12-hr	0.076 (0.070-0.082)	0.092 (0.085-0.101)	0.112 (0.103-0.122)	0.128 (0.118-0.140)	0.153 (0.138-0.168)	0.173 (0.154-0.192)	0.195 (0.170-0.219)	0.219 (0.187-0.250)	0.256 (0.213-0.300)	0.287 (0.232-0.368)
24-hr	0.044 (0.041-0.048)	0.054 (0.050-0.059)	0.064 (0.059-0.070)	0.073 (0.067-0.079)	0.085 (0.078-0.092)	0.094 (0.086-0.102)	0.103 (0.094-0.112)	0.113 (0.102-0.127)	0.130 (0.112-0.152)	0.145 (0.120-0.187)
2-day	0.025 (0.023-0.027)	0.030 (0.028-0.033)	0.036 (0.033-0.039)	0.041 (0.038-0.044)	0.047 (0.043-0.051)	0.052 (0.047-0.056)	0.057 (0.052-0.061)	0.061 (0.056-0.067)	0.068 (0.061-0.077)	0.073 (0.065-0.094)
3-day	0.018 (0.016-0.019)	0.021 (0.020-0.023)	0.026 (0.024-0.028)	0.029 (0.027-0.031)	0.033 (0.031-0.036)	0.037 (0.034-0.040)	0.040 (0.037-0.044)	0.044 (0.040-0.048)	0.049 (0.044-0.054)	0.053 (0.047-0.063)
4-day	0.014 (0.013-0.015)	0.017 (0.016-0.018)	0.020 (0.019-0.022)	0.023 (0.021-0.025)	0.027 (0.025-0.029)	0.029 (0.027-0.032)	0.032 (0.030-0.035)	0.035 (0.032-0.038)	0.039 (0.035-0.043)	0.042 (0.038-0.048)
7-day	0.009 (0.009-0.010)	0.011 (0.010-0.012)	0.013 (0.012-0.014)	0.015 (0.014-0.016)	0.017 (0.016-0.019)	0.019 (0.018-0.020)	0.021 (0.019-0.022)	0.023 (0.021-0.024)	0.025 (0.023-0.027)	0.027 (0.024-0.029)
10-day	0.007 (0.007-0.008)	0.009 (0.008-0.009)	0.010 (0.010-0.011)	0.012 (0.011-0.013)	0.013 (0.012-0.014)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.020)	0.019 (0.018-0.021)
20-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)
30-day	0.004 (0.004-0.004)	0.005 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.006-0.006)	0.007 (0.006-0.007)	0.007 (0.007-0.008)	0.008 (0.007-0.008)	0.008 (0.008-0.009)	0.009 (0.008-0.009)	0.009 (0.008-0.010)
45-day	0.003 (0.003-0.003)	0.004 (0.004-0.004)	0.004 (0.004-0.005)	0.005 (0.005-0.005)	0.005 (0.005-0.006)	0.006 (0.006-0.006)	0.006 (0.006-0.007)	0.007 (0.006-0.007)	0.007 (0.007-0.008)	0.007 (0.007-0.008)
60-day	0.003 (0.003-0.003)	0.003 (0.003-0.004)	0.004 (0.004-0.004)	0.004 (0.004-0.005)	0.005 (0.005-0.005)	0.005 (0.005-0.006)	0.006 (0.006-0.006)	0.006 (0.006-0.006)	0.006 (0.006-0.007)	0.007 (0.006-0.007)

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