



**STORMWATER MANAGEMENT AND EROSION CONTROL PLAN**  
for  
**PONDERAY COTTAGES**  
**PONDERAY, IDAHO**

Applicant: Ponderay Cottage, LLC

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## **INTRODUCTION**

Ponderay Cottages, LLC is proposing to subdivide a 3-acre vacant parcel of land into 17 residential lots. As a result, approximately 0.6-acres of paved roadway and driveways will be constructed. It is also anticipated building footprints will cover about 0.7-acres of the site. The purpose of this report is to recommend facilities to control storm water and prevent erosion and sediment transport, and to describe the analysis used in the selection and design of those facilities. The design and selection of storm water facilities are based on and limited to known topography of the site and soils information obtained from the "Soil Survey of Bonner County Area, Idaho".

During frequent storm events, runoff will be detained onsite in shallow grass lined filtration swales and landscaped areas prior to regaining predevelopment flow patterns.

## **EXISTING SITE CONDITIONS**

The site is currently undeveloped. Runoff from impervious surfaces currently sheet flows unmanaged in all directions.

## **SOILS**

The NRCS Soil survey shows on site soils consisting of Mission Silt Loam. The soil has a low infiltration rate and depth to water table is generally 6-inches to 18-inches below the surface.

A summary of the typical properties of each soil type found on the site is included in Appendix A, and is taken from the NCRS Soil survey of *Bonner County Area, Idaho, Parts of Bonner and Boundary Counties (Version 14, September 13, 2018)*.

## **PRE-CONSTRUCTION LAND COVER – TOTAL SITE**

Undeveloped/Landscaped Area (C = 0.25)	=	3 ac
Total all surface types	=	3 ac
Composite Runoff Coefficient (C)	=	0.25

## **POST-CONSTRUCTION LAND COVER – TOTAL SITE**

Paved Surface (C = 0.9)	=	0.6 ac
Rooftops (C= 0.9)	=	0.7 ac
Undeveloped/Landscaped Area (C = 0.25)	=	1.7 ac
Total all surface types	=	3 ac
Total post-construction impervious	=	1.3 ac
Composite Runoff Coefficient (C)	=	0.5

## **STORMWATER MANAGEMENT**

Based on the given site, topography and soil characteristics, surface dispersion of storm water and shallow detainment areas are recommended for flow management and treatment. It is further recommended that site disturbance be minimal and existing, well vegetated areas be retained and protected as much as possible.

The proposed filtration facilities have been sized to retain and treat the first ½” of roadway and driveway areas from new development only, and also detain the difference between pre-development and post-development runoff based on a 25-year storm event, 24-hour period. Post development flows will be detained and released at pre-development rates by transmissivity through geotextile fabric.

The site has been divided into three drainage areas, including the northwest quadrant of the site (0.70-acres); the northeast quadrant (0.55 acres); and the southwest quadrant (0.76-acres).

### **Calculation Summary – Grassy Filtration Area Detention Design**

#### **Area 1 (northwest quadrant) – Predevelopment Conditions**

Undeveloped Area (to be covered with pavement) = 0.3 ac

Time of Concentration = 10 min.

Runoff Coefficient = 0.25

Predeveloped Peak Flow = 0.2 cfs

#### **Area 1 – Post Development Conditions**

Developed Area (pavement only) = 0.3 ac

Time of Concentration = 5 min.

Runoff Coefficient = 0.9

Post Developed Peak Flow = 0.76 cfs

#### **Area 1 - Resulting Filtration Volume Required (Grassy Filtration Swale #1)**

First ½-inch of Runoff = 546 cf

24-hour, 25-year Storm = 422 cf (Bowstring Method)

Swale Volume Provided = 549 cf

(see Bowstring Method calculation in Appendix B for detail)

#### **Area 2 (northeast quadrant) – Predevelopment Conditions**

Undeveloped Area (to be covered with pavement) = 0.22 ac

Time of Concentration = 10 min.

Runoff Coefficient = 0.25

Predeveloped Peak Flow = 0.14 cfs

Area 2 – Post Development Conditions

Developed Area (pavement only) = 0.22 ac

Time of Concentration = 5 min.

Runoff Coefficient = 0.9

Post Developed Peak Flow = 0.54 cfs

Area 2 - Resulting Filtration Volume Required (Grassy Filtration Swale #2)

First ½-inch of Runoff = 392 cf

24-hour, 25-year Storm = 265 cf (Bowstring Method)

Swale Volume Provided = 395 cf

(see Bowstring Method calculation in Appendix B for detail)

Area 3 (southwest quadrant) – Predevelopment Conditions

Undeveloped Area (to be covered with pavement) = 0.05 ac

Time of Concentration = 10 min.

Runoff Coefficient = 0.25

Predeveloped Peak Flow = 0.03 cfs

Area 3 – Post Development Conditions

Developed Area (pavement only) = 0.05 ac

Time of Concentration = 5 min.

Runoff Coefficient = 0.9

Post Developed Peak Flow = 0.12 cfs

Area 3 - Resulting Filtration Volume Required (Grassy Filtration Swale #3)

First ½-inch of Runoff = 88 cf

24-hour, 25-year Storm = 59 cf (Bowstring Method)

Swale Volume Provided = 99 cf

(see Bowstring Method calculation in Appendix B for detail)

**Calculation Summary – Grassy Filtration Area Channel Flow Design**

Area 1 (northwest quadrant) – Post Development Conditions

Area (total quadrant) = 30,742 sf (0.70 ac)

Time of Concentration = 5 min.

Pavement = 13,100 sf

Rooftop = 6,048 sf

Green Space/Landscaped = 11,594 sf

Runoff Coefficient = 0.65

Predeveloped Peak Flow = 1.28 cfs (flow capacity required)

Area 1 – Open Channel Flow

Bottom Width = 2'; Top Width = 6'; Depth = 8"; Roughness = 0.03  
Resulting Velocity = 1.4 fps  
Resulting Channel Flow Capacity = 3.79 cfs  
Resulting Weir Flow capacity = 1.37 cfs  
(see open channel and weir calculations in Appendix B for detail)

Area 2 (northeast quadrant) – Post Development Conditions

Area (total quadrant) = 23,787 sf (0.55 ac)  
Time of Concentration = 5 min.  
Pavement = 9,400 sf  
Rooftop = 5,376 sf  
Green Space/Landscaped = 9,011 sf  
Runoff Coefficient = 0.65  
Predeveloped Peak Flow = 1.0 cfs (flow capacity required)

Area 2 – Open Channel Flow

Bottom Width = 2'; Top Width = 6'; Depth = 8"; Roughness = 0.03  
Resulting Velocity = 1.4 fps  
Resulting Channel Flow Capacity = 3.79 cfs  
Resulting Weir Flow capacity = 1.15 cfs  
(see open channel and weir calculations in Appendix B for detail)

Area 3 (southwest quadrant) – Post Development Conditions

Area (total quadrant) = 32,896 sf (0.76 ac)  
Time of Concentration = 5 min.  
Pavement = 6,650 sf  
Rooftop = 15,120 sf  
Green Space/Landscaped = 11,126 sf  
Runoff Coefficient = 0.68  
Predeveloped Peak Flow = 1.44 cfs (flow capacity required)

Area 3 – Open Channel Flow

Bottom Width = 2'; Top Width = 6'; Depth = 8"; Roughness = 0.03  
Resulting Velocity = 3.7 fps  
Resulting Channel Flow Capacity = 49.4 cfs  
Resulting Weir Flow capacity = 1.49 cfs  
(see open channel and weir calculations in Appendix B for detail)

## **EROSION CONTROL PLAN**

Temporary erosion control shall be maintained through the use of existing vegetation and an existing stabilized construction entrance (gravel access road). Permanent facilities that will also serve to control erosion during construction include the grass infiltration basins, grass ditches, vegetated buffer, and reseeding of disturbed areas. Use the BMP's described in *Catalog of Stormwater Best Management Practices for Idaho Cities and Counties* (Idaho BMP Manual). Silt fence shall be placed downslope of construction areas as shown in the stormwater management plan. Areas where construction activities temporarily cease for more than 21 days shall be stabilized with seeding or straw mulching. All erosion control measures shall be maintained in good working order. The contractor shall be responsible for maintenance of erosion control measures until such time that final stabilization of the site is complete. Once final stabilization is complete, the owner shall be responsible for maintenance of permanent erosion control measures.

### **Site Re-seeding Recommendation:**

Existing areas disturbed during construction shall be reseeded with natural grasses, lawn grasses, or sod as soon as possible after finish grading. Seed mixture recommendations may be obtained from the U.S.D.A. Natural Resource Conservation Service, a licensed landscape architect or a commercially marketed grass mixture may be applied.

### **Fertilization**

It is recommended that a soil analysis be performed prior to fertilization and seeding. The fertilization guidelines should be determined by the soil analysis. The fertilizer type and rate of application should follow the recommendation of the U.S.D.A. Natural Resource Conservation Service or a landscape architect.

## **OPERATION AND MAINTENANCE PLAN**

### **During Construction**

During construction the contractor shall walk the site and inspect storm water and erosion control measures at least once every 7 days and following any storm event of 0.5 inches or greater. Items the contractor shall inspect are:

- Reseeding / Straw Mulching
  - Re-seed add straw mulch to bare spots and washouts, and verify healthy growth
- Grass ditches
  - Periodically inspect ditches and remove any sediment deeper than 6 inches
  - Re-establish vegetation that is damaged during high runoff events.
- Grass filtration basins
  - Periodically inspect basins and remove any sediment deeper than 6 inches
  - Re-establish vegetation that is damaged during high runoff events.

If maintenance of any temporary or final BMP is found to be necessary, the contractor shall begin repairs within 24 hours.

#### After Final Stabilization

Upon completion of construction and final stabilization, the owners shall take responsibility for operation and maintenance of the stormwater management and erosion control system as well as the funding for the continued maintenance of this system. After final stabilization, the stormwater management and erosion control system shall be inspected at least every six months. The items that shall be inspected are:

- Grass filtration swales
  - Remove all sediment from the basin and dispose off-site at the end of construction, and during each inspection.
- Grass ditches
  - Remove all sediment from the ditches and dispose off-site at the end of construction, and during each inspection.
- Sloped areas
  - Re-establish grass or vegetation in bare spots found on all sloped areas, or stabilize with another best management practice.
  -

#### **IMPLEMENTATION SCHEDULE**

The proposed construction schedule is as follows:

##### Spring 2021

- Install temporary erosion control
- Perform fill and excavation work for building pad, utilities and drive surfaces

##### Spring/Summer 2021

- Complete construction
- Check re-vegetated areas for bare spots, washouts, etc.

##### Late Summer 2021

- Repair and reseed as necessary
- Final stabilization complete

#### **SUMMARY**

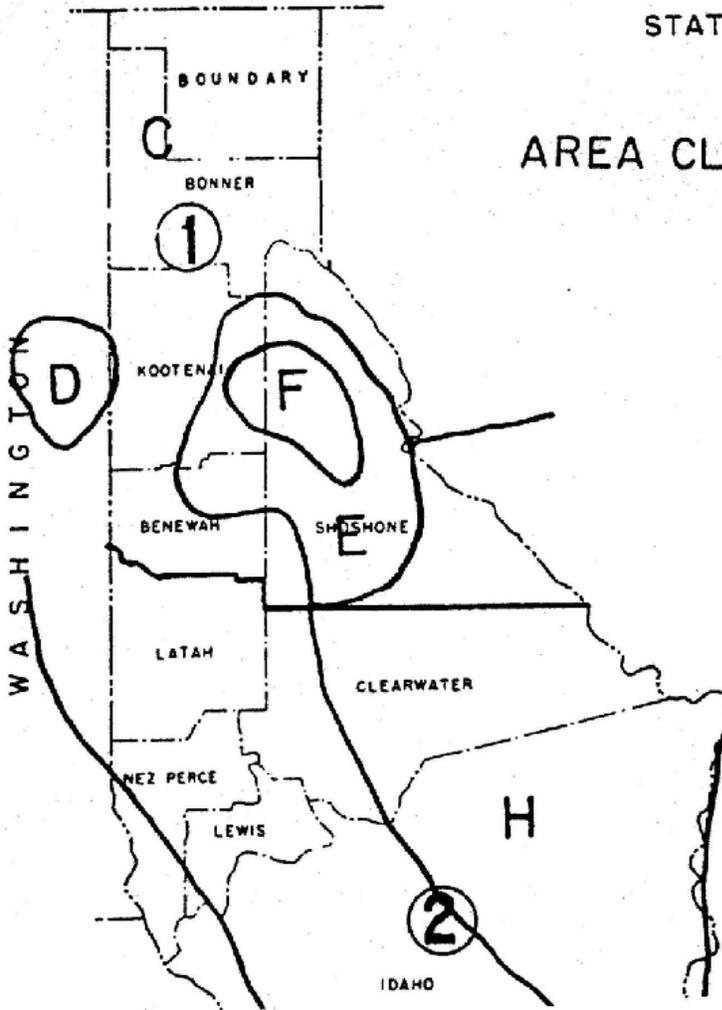
With the proper implementation of the best management practices listed above, the subject property is capable of supporting the proposed site development without substantial risk of soil erosion or sedimentation of surface waters. The site is capable of treating and conveying stormwater runoff from the proposed pavement using the best management practices described in this report.

# APPENDIX A

NRCS Soils Classification, IDF Curve Area Classification Map, Rainfall Intensity Diagram, Runoff Coefficients

STATE OF IDAHO

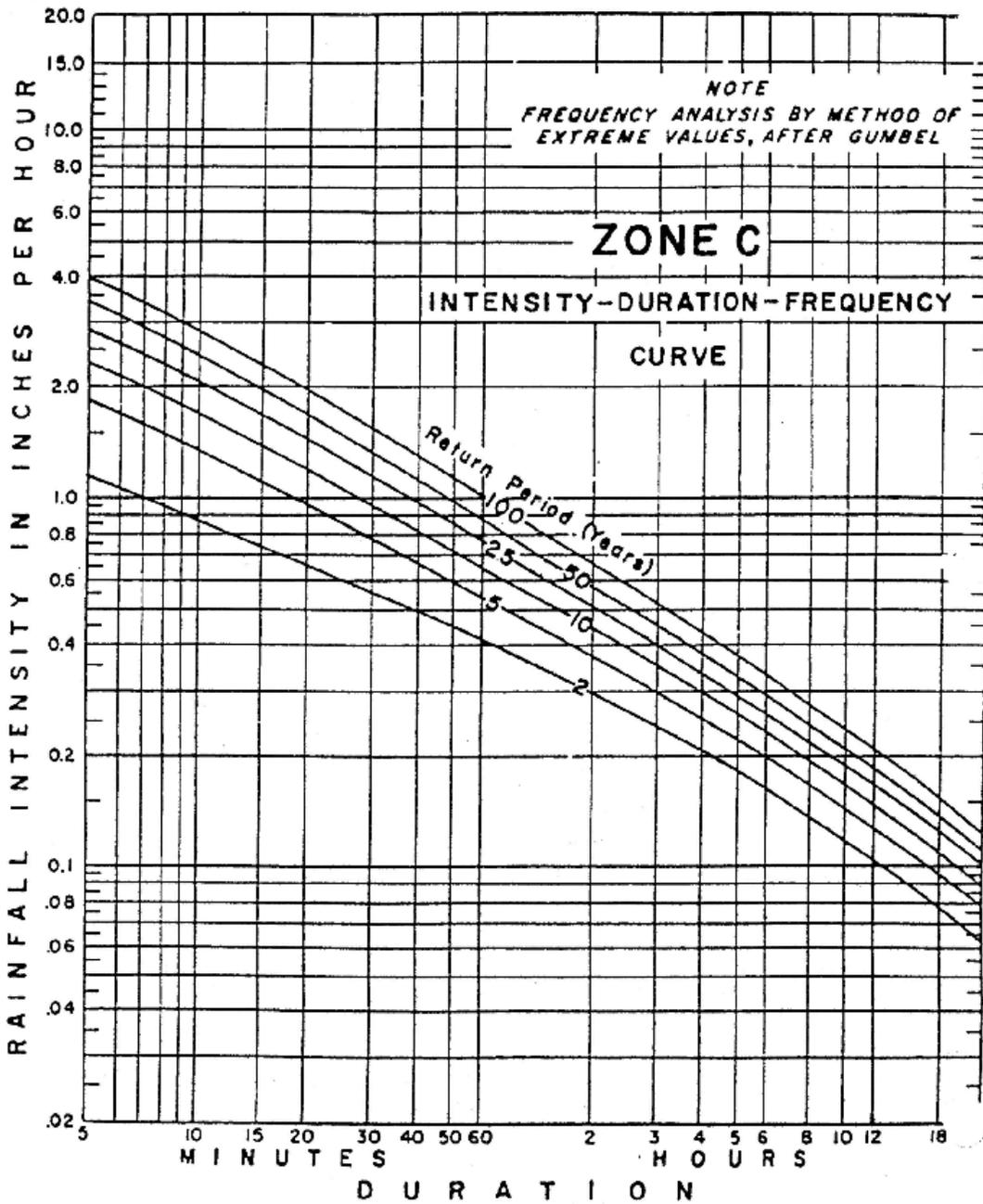
AREA CLASSIFICATION MAP



① - District Number  
F - Zone Designation

FIGURE 6-3 AREA CLASSIFICATION MAP FOR IDF CURVES - IDAHO  
(IDAHO TRANSPORTATION DEPARTMENT)

FIGURE 6-4 ZONE C, INTENSITY-DURATION-FREQUENCY CURVE  
(IDAHO TRANSPORTATION DEPARTMENT)



**Table 4B.2. Values of Runoff Coefficient (C) for Rational Formula**

Land Use	Description	Hydrologic Soils Group			
		A	B	C	D
Cultivated Land	Without conservation treatment	0.49	0.67	0.81	0.88
	With conservation treatment	0.27	0.43	0.67	0.67
Pasture or Range Land	Poor condition	0.38	0.63	0.78	0.84
	Good condition	---	0.25	0.51	0.65
Meadow	Good condition	---	---	0.41	0.61
Wood or Forest Land	Thin stand, poor cover, no mulch	---	0.34	0.59	0.70
	Good cover	---	---	0.45	0.59
Open Space, Lawn, Park, Golf Course, or Cemetery	Good condition (grass cover on 75% or more)	---	0.25	0.51	0.65
	Fair condition (grass cover on 50% to 75%)	---	0.45	0.63	0.74
Commercial and Business Area	85% impervious	0.84	0.90	0.93	0.96
Industrial District	72% impervious	0.67	0.81	0.88	0.92
Residential Lot					
<u>Average lot size (acres):</u>	<u>Average % of lot impervious:</u>				
1/8	65	0.59	0.76	0.86	0.90
1/4	38	0.29	0.55	0.70	0.80
1/3	30	---	0.49	0.67	0.78
1/2	25	---	0.45	0.65	0.76
1.0	20	---	0.41	0.63	0.74
Paved Area	Parking lots, roofs, driveways, etc.	0.99	0.99	0.99	0.99
Street or Road	Paved with curbs and storm sewers	0.99	0.99	0.99	0.99
		0.57	0.76	0.84	0.88
	Gravel	0.49	0.69	0.80	0.84

**Note:** The designer must use judgment to select the appropriate C value within the range. Generally, larger areas with permeable soils, flat slopes, and dense vegetation should have the lowest C values. Smaller areas with dense soils, moderate to steep slopes, and sparse vegetation should assigned the highest C values.

**SOURCE:** Panhandle Stormwater Erosion Control and Education Program Training Manual (2007)

# APPENDIX B

Storm Water Management Calculations

# Grassy Filtration Area No. 1

## BOWSTRING METHOD

DATE:	3/3/21			
Design Storm Return Period	25	yr	<b>Infiltration (max. 2 in/hr)</b>	
Drywell Outflow	0.00	cfs	Infiltration Rate (in/hr)=	0.0
Bed of GIA Outflow	0.00	cfs	GIA Bed Area (sf) =	0
Check Dam Outflow (Geotex + Drain Rock)	0.042	cfs	<b>Fabric Transmissivity</b>	
Wier Outflow	0.00	cfs	Trans. Rate (cfs/sf)=	0.125
Orifice Outflow	0.00	cfs	Outlet Area (sf) =	0.33
<b>Post Developed</b>			<b>Treatment Storage (cf)</b>	
Impervious Area (Roadway & Driveways)	0.30	acres	First 1/2-Inch Runoff =	546
Composite Runoff Coefficient	0.90			
AxC=	0.27		<b>Drywell Capacities</b>	
Time of Concentration	5.00	min	Single Barell (cfs) =	0.30
<b>Pre-Developed:</b>			Double Barell (cfs) =	1.00
Sub Basin Area	0.30	acres		
Composite Runoff Coefficient	0.30			
AxC=	0.09			
Time of Concentration	10	min		
Pre-Developed Flow Rate (cfs)	0.20	<i>(flow rate based on 10-min time of concentration)</i>		

25-Year Storm				Operating			
Time (min)	Time (sec)	Intensity (in/hr)	Qpost(cfs)	Vpost (cf)	Qpre(cfs)	Vpre(cf)	Storage (cf)
5	300	2.8	0.76	305	0.25	102	191
10	600	2.17	0.59	412	0.20	137	250
15	900	1.83	0.50	496	0.17	165	293
20	1200	1.65	0.45	581	0.15	194	338
25	1500	1.45	0.39	629	0.13	210	357
30	1800	1.27	0.34	654	0.11	218	361
35	2100	1.19	0.32	709	0.11	236	385
40	2400	1.11	0.30	752	0.10	251	401
45	2700	1.04	0.28	789	0.09	263	414
50	3000	0.96	0.26	806	0.09	269	413
55	3300	0.88	0.24	810	0.08	270	403
60	3600	0.8	0.22	802	0.07	267	385
65	3900	0.78	0.21	845	0.07	282	401
70	4200	0.75	0.20	873	0.07	291	408
75	4500	0.72	0.19	897	0.06	299	411
80	4800	0.7	0.19	929	0.06	310	420

85	5100	0.67	0.18	943	0.06	314	417
90	5400	0.65	0.18	968	0.06	323	421
95	5700	0.63	0.17	989	0.06	330	422
100	6000	0.61	0.17	1,007	0.06	336	422
105	6300	0.59	0.16	1,022	0.05	341	420
110	6600	0.57	0.15	1,034	0.05	345	415
115	6900	0.55	0.15	1,042	0.05	347	408
120	7200	0.53	0.14	1,047	0.05	349	399
125	7500	0.51	0.14	1,049	0.05	350	388
130	7800	0.49	0.13	1,048	0.04	349	374
135	8100	0.47	0.13	1,043	0.04	348	359
150	9000	0.43	0.12	1,059	0.04	353	332
165	9900	0.4	0.11	1,083	0.04	361	310
180	10800	0.38	0.10	1,121	0.03	374	298
195	11700	0.37	0.10	1,182	0.03	394	301
210	12600	0.36	0.10	1,238	0.03	413	301
225	13500	0.34	0.09	1,252	0.03	417	273
240	14400	0.33	0.09	1,295	0.03	432	265
300	18000	0.29	0.08	1,421	0.03	474	199
360	21600	0.25	0.07	1,468	0.02	489	81
365	21900	0.25	0.07	1,489	0.02	496	82
370	22200	0.25	0.07	1,509	0.02	503	83
1080	64800	0.14	0.04	2,459	0.01	820	-1,056
1440	86400	0.11	0.03	2,575	0.01	858	-1,877

## Grassy Filtration Area No. 2

### BOWSTRING METHOD

DATE: 3/3/21

Design Storm Return Period	25	yr	<b>Infiltration (max. 2 in/hr)</b>
	0.00	cfs	Infiltration Rate (in/hr)=
Drywell Outflow	0.00	cfs	0.0
Bed of GIA Outflow	0.00	cfs	GIA Bed Area (sf) =
Check Dam Outflow (Geotex + Drain Rock)	0.042	cfs	0
Wier Outflow	0.00	cfs	<b>Fabric Transmissivity</b>
Orifice Outflow	0.00	cfs	Trans. Rate (cfs/sf)=
			0.125
			Outlet Area (sf) =
			0.33
			<b>Treatment Storage (cf)</b>
			First 1/2-Inch Runoff =
			392
<b>Post Developed</b>			
Impervious Area (Roadway & Driveways)	0.22	acres	
Composite Runoff Coefficient	0.90		
AxC=	0.19		<b>Drywell Capacities</b>
Time of Concentration	5.00	min	Single Barell (cfs) =
			0.30
<b>Pre-Developed:</b>			Double Barell (cfs) =
Sub Basin Area	0.22	acres	1.00
Composite Runoff Coefficient	0.30		
AxC=	0.06		
Time of Concentration	10	min	
Pre-Developed Flow Rate (cfs)	0.14	<i>(flow rate based on 10-min time of concentration)</i>	

Time (min)	Time (sec)	25-Year Storm				Operating	
		Intensity (in/hr)	Qpost(cfs)	Vpost (cf)	Qpre(cfs)	Vpre(cf)	Storage (cf)
5	300	2.8	0.54	219	0.18	73	133
10	600	2.17	0.42	296	0.14	99	172
15	900	1.83	0.36	356	0.12	119	200
20	1200	1.65	0.32	417	0.11	139	228
25	1500	1.45	0.28	451	0.09	150	238
30	1800	1.27	0.25	469	0.08	156	238
35	2100	1.19	0.23	509	0.08	170	252
40	2400	1.11	0.22	539	0.07	180	260
45	2700	1.04	0.20	566	0.07	189	265
50	3000	0.96	0.19	578	0.06	193	261
55	3300	0.88	0.17	581	0.06	194	250
60	3600	0.8	0.16	575	0.05	192	234
65	3900	0.78	0.15	606	0.05	202	242
70	4200	0.75	0.15	627	0.05	209	243

75	4500	0.72	0.14	644	0.05	215	242
80	4800	0.7	0.14	666	0.05	222	245
85	5100	0.67	0.13	677	0.04	226	239
90	5400	0.65	0.13	695	0.04	232	238
95	5700	0.63	0.12	710	0.04	237	236
100	6000	0.61	0.12	723	0.04	241	232
105	6300	0.59	0.11	734	0.04	245	227
110	6600	0.57	0.11	742	0.04	247	220
115	6900	0.55	0.11	748	0.04	249	212
120	7200	0.53	0.10	752	0.03	251	202
125	7500	0.51	0.10	753	0.03	251	190
130	7800	0.49	0.10	752	0.03	251	177
135	8100	0.47	0.09	749	0.03	250	162
150	9000	0.43	0.08	760	0.03	253	132
165	9900	0.4	0.08	777	0.03	259	106
180	10800	0.38	0.07	805	0.02	268	87
195	11700	0.37	0.07	848	0.02	283	79
210	12600	0.36	0.07	888	0.02	296	68
225	13500	0.34	0.07	898	0.02	299	37
240	14400	0.33	0.06	929	0.02	310	21
300	18000	0.29	0.06	1,020	0.02	340	-69
360	21600	0.25	0.05	1,054	0.02	351	-196
365	21900	0.25	0.05	1,068	0.02	356	-199
370	22200	0.25	0.05	1,083	0.02	361	-201
1080	64800	0.14	0.03	1,765	0.01	588	-1,519
1440	86400	0.11	0.02	1,848	0.01	616	-2,362

## Grassy Filtration Area No. 3

### BOWSTRING METHOD

DATE: 3/3/2021

Design Storm Return Period	25	yr	<b>Infiltration (max. 2 in/hr)</b>
	0.00	cfs	Infiltration Rate (in/hr)=
Drywell Outflow	0.00	cfs	0.0
Bed of GIA Outflow	0.00	cfs	GIA Bed Area (sf) =
Check Dam Outflow (Geotex + Drain Rock)	0.010	cfs	0
Wier Outflow	0.00	cfs	<b>Fabric Transmissivity</b>
Orifice Outflow	0.00	cfs	Trans. Rate (cfs/sf)=
			0.004
			Outlet Area (sf) =
			2.67
			<b>Treatment Storage (cf)</b>
			First 1/2-Inch Runoff =
			88
<b>Post Developed</b>			
Impervious Area (Roadway & Driveways)	0.05	acres	
Composite Runoff Coefficient	0.90		
AxC=	0.04		
Time of Concentration	5.00	min	
<b>Pre-Developed:</b>			<b>Drywell Capacities</b>
Sub Basin Area	0.05	acres	Single Barell (cfs) =
Composite Runoff Coefficient	0.30		0.30
AxC=	0.01		Double Barell (cfs) =
Time of Concentration	10	min	1.00
Pre-Developed Flow Rate (cfs)	0.03	<i>(flow rate based on 10-min time of concentration)</i>	

	<b>25-Year Storm</b>				<b>Operating</b>		
Time (min)	Time (sec)	Intensity (in/hr)	Qpost(cfs)	Vpost (cf)	Qpre(cfs)	Vpre(cf)	Storage (cf)
5	300	2.8	0.12	49	0.04	16	30
10	600	2.17	0.09	66	0.03	22	38
15	900	1.83	0.08	80	0.03	27	44
20	1200	1.65	0.07	93	0.02	31	51
25	1500	1.45	0.06	101	0.02	34	53
30	1800	1.27	0.06	105	0.02	35	53
35	2100	1.19	0.05	114	0.02	38	56
40	2400	1.11	0.05	120	0.02	40	58
45	2700	1.04	0.05	126	0.02	42	59
50	3000	0.96	0.04	129	0.01	43	58
55	3300	0.88	0.04	130	0.01	43	55
60	3600	0.8	0.03	128	0.01	43	51
65	3900	0.78	0.03	135	0.01	45	53
70	4200	0.75	0.03	140	0.01	47	53

75	4500	0.72	0.03	144	0.01	48	53
80	4800	0.7	0.03	149	0.01	50	54
85	5100	0.67	0.03	151	0.01	50	52
90	5400	0.65	0.03	155	0.01	52	52
95	5700	0.63	0.03	159	0.01	53	52
100	6000	0.61	0.03	162	0.01	54	51
105	6300	0.59	0.03	164	0.01	55	49
110	6600	0.57	0.02	166	0.01	55	48
115	6900	0.55	0.02	167	0.01	56	46
120	7200	0.53	0.02	168	0.01	56	43
125	7500	0.51	0.02	168	0.01	56	41
130	7800	0.49	0.02	168	0.01	56	38
135	8100	0.47	0.02	167	0.01	56	35
150	9000	0.43	0.02	170	0.01	57	28
165	9900	0.4	0.02	174	0.01	58	22
180	10800	0.38	0.02	180	0.01	60	17
195	11700	0.37	0.02	189	0.01	63	15
210	12600	0.36	0.02	198	0.01	66	12
225	13500	0.34	0.01	201	0.00	67	5
240	14400	0.33	0.01	208	0.00	69	2
300	18000	0.29	0.01	228	0.00	76	-19
360	21600	0.25	0.01	235	0.00	78	-48
365	21900	0.25	0.01	239	0.00	80	-49
370	22200	0.25	0.01	242	0.00	81	-50
1080	64800	0.14	0.01	394	0.00	131	-353
1440	86400	0.11	0.00	413	0.00	138	-546

### **GFA-1 - Trapezoidal Open Channel Flow**

Bottom Width	2.00	ft	X-Sectional Area	2.68	sf
Top Width	6.00	ft	Wetted Perimeter	6.24	ft
Depth	0.67	ft	Hydraulic Radius	0.43	ft
Roughness Coeff.	0.03		Velocity	1.41	fps
Channel Slope	0.0025	ft/ft	Discharge	3.79	cfs
Side Slopes	3.00	:1			

### **Rectangular**

#### **Weir**

P =	0.67	ft
H =	0.17	ft
L =	6.00	ft

#### **Standard Weir Equation:**

Q = 1.36 cfs

#### **Bureau of Reclamation Weir Equations:**

Q = 1.36 cfs Suppressed

H/P = 0.25 (H/P ≤ 0.33)

H/L = 0.03 (H/L ≤ 0.33)

Q = 1.35 cfs Contracted

P = 0.67 (P > 2H)

H/L = 0.03 (H/L ≤ 0.33)

B-L = 0.67 (B-L > 4H)

#### **Trapezoidal Weir**

Q = 1.37 cfs

### **GFA-2 - Trapezoidal Open Channel Flow**

Bottom Width	2.00	ft	X-Sectional Area	2.68	sf
Top Width	6.00	ft	Wetted Perimeter	6.24	ft
Depth	0.67	ft	Hydraulic Radius	0.43	ft
Roughness Coeff.	0.03		Velocity	1.41	fps
Channel Slope	0.0025	ft/ft	Discharge	3.79	cfs
Side Slopes	3.00	:1			

### **Rectangular**

#### **Weir**

P =	0.67	ft
H =	0.17	ft
L =	5.00	ft

#### **Standard Weir Equation:**

Q = 1.14 cfs

#### **Bureau of Reclamation Weir Equations:**

Q = 1.13 cfs Suppressed

H/P = 0.25 (H/P <= 0.33)

H/L = 0.03 (H/L <= 0.33)

Q = 1.13 cfs Contracted

P = 0.67 (P > 2H)

H/L = 0.03 (H/L <= 0.33)

B-L = 0.67 (B-L > 4H)

#### **Trapezoidal Weir**

Q = 1.15 cfs

### **GFA-3 - Trapezoidal Open Channel Flow**

Bottom Width	2.00	ft	X-Sectional Area	13.28	sf
Top Width	30.00	ft	Wetted Perimeter	7.25	ft
Depth	0.83	ft	Hydraulic Radius	1.83	ft
Roughness Coeff.	0.03		Velocity	3.72	fps
Channel Slope	0.0025	ft/ft	Discharge	49.37	cfs
Side Slopes	3.00	:1			

### **Rectangular**

#### **Weir**

P =	0.83	ft
H =	0.17	ft
L =	6.50	ft

#### **Standard Weir Equation:**

Q = 1.48 cfs

#### **Bureau of Reclamation Weir Equations:**

Q = 1.47 cfs Suppressed

H/P = 0.20 (H/P ≤ 0.33)

H/L = 0.03 (H/L ≤ 0.33)

Q = 1.47 cfs Contracted

P = 0.83 (P > 2H)

H/L = 0.03 (H/L ≤ 0.33)

B-L = 0.67 (B-L > 4H)

#### **Trapezoidal Weir**

Q = 1.49 cfs