

FWW App.#: 20-0257  
A.P. 47-2, Lot 120 South Kingstown

July 28, 2022

### **Proposed Modification Narrative**

The parcel of land identified as assessor's plat 47-2, lot 120 in the town of South Kingstown is in the permitting and planning process of being subdivided into 16 residential lots. A DEM freshwater wetlands insignificant alteration permit has already been obtained for the subject property, said permit number is 20-0257. The Town of South Kingstown has requested that two of the BMPs be reconfigured to reduce the amount of area of stormwater BMPs within the residential lots, and to improve the treatment of stormwater that flows into Sublot 2. Two of the proposed and permitted BMPs, "Sand Filter-C" and "Sand Filter-D" are proposed to be modified to adjust their shape in order to reduce their footprints within the proposed private residential lots. Additional stormwater treatment is proposed prior to "Sand Filter-D" in the form of a grassed filter strip and infiltration basin treatment train as shown on the *RIDEM Permit Modification Plan*. The changes made to each BMP are outlined below:

"Sand Filter-C" has been reshaped slightly such that it no longer crosses into Sublot 7. Proposed subdivision property lines have also been reconfigured slightly such that the BMP is not within any proposed residential lot area. All upstream and downstream conditions of "Sand Filter-C" remain unchanged from the original permit.

"Sand Filter-D" has been reshaped to reduce its total area by removing the island within the middle of the BMP and the sediment forebay. The sediment forebay has been replaced by a treatment train composed of a grassed filter strip and "Infiltration Basin-C" located adjacent to the proposed roadway. "Sand Filter-D" holds equivalent volume as previously permitted and its infiltrative capacity is increased due to a larger bottom basin surface area and therefore is adequate in size to provide all necessary BMP functions as originally permitted, yet it is now pretreated by a grassed filter strip and an infiltration basin, therefore additional treatment of runoff is proposed than originally permitted. All upstream and downstream conditions of the Stormwater BMP treatment train remain unchanged from the original permit.

The treatment train of the newly proposed grassed filter strip and "Infiltration Basin-C" receives runoff from approximately 1,500 square feet of roadway and has been sized to provide the adequate water quality volume for said runoff prior to it overflowing into "Sand Filter-C." See the water quality calculation following this paragraph.

Infiltration Basin-C

I = 1,500 square feet

WQV = 1,500/12 = 125 cu.ft.

Proposed Infiltration Basin-C sizing:

bottom area = 100 square feet

Top area = 270 square feet

Depth prior to overflowing = 1 ft.

**Volume = (100+270)/2 x 1 = 185 cu.ft. provided > 125 cu.ft. required**

Separation Distance to Groundwater:

E.S.H.G.W.T. = 150.0' (SEV 2B & 2A)

Proposed bottom of basin = 159.5'

**Proposed separation distance = 9.5' > 3' required**

The top of filter elevation of both "Sand Filter-C" and "Sand Filter-D" remain at the same elevation as the original permit, maintaining the same separation distance to the seasonal high water table. Both BMPs have been reconfigured such that they hold the same amount of volume of water as the original permit. The flowpath of runoff remains unchanged from the original permit and peak runoff rates to each design point is equivalent or less than the originally permitted values.

See the HydroCAD Report included and the table below depicting the details of each BMP as originally permitted compared to the newly proposed modification:

	"Sand Filter-C" (Design Point-2)		"Sand Filter-D" (Design Point-3)	
	Original Permit	Proposed Modification	Original Permit	Proposed Modification
Top of Filter Elev.	159.0'	159.0'	158.0'	158.0'
Surface Area of Filter	265 SF	360 SF	1,110 SF	1,400 SF
Volume Provided	458 CF	530 CF	2,600 CF	2,600 CF
1.2" Peak Flow Rate (CFS) to applicable Design Point	0.05 CFS	0.05 CFS	0.00 CFS	0.00 CFS
1-year Peak Flow Rate (CFS) to applicable Design Point	1.10 CFS	1.10 CFS	0.00 CFS	0.00 CFS
10-year Peak Flow Rate (CFS) to applicable Design Point	8.18 CFS	8.18 CFS	0.00 CFS	0.00 CFS
100-year Peak Flow Rate (CFS) to applicable Design Point	33.14 CFS	33.13 CFS	0.00 CFS	0.00 CFS

No additional impervious area is proposed nor is any additional land disturbance proposed within any jurisdictional wetland areas as a result of the proposed modification and the general intent of the project remains unchanged.

Please contact me should there be any questions, see below for contact information.

Sincerely,



David K. Manoni, P.E.

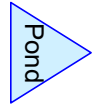
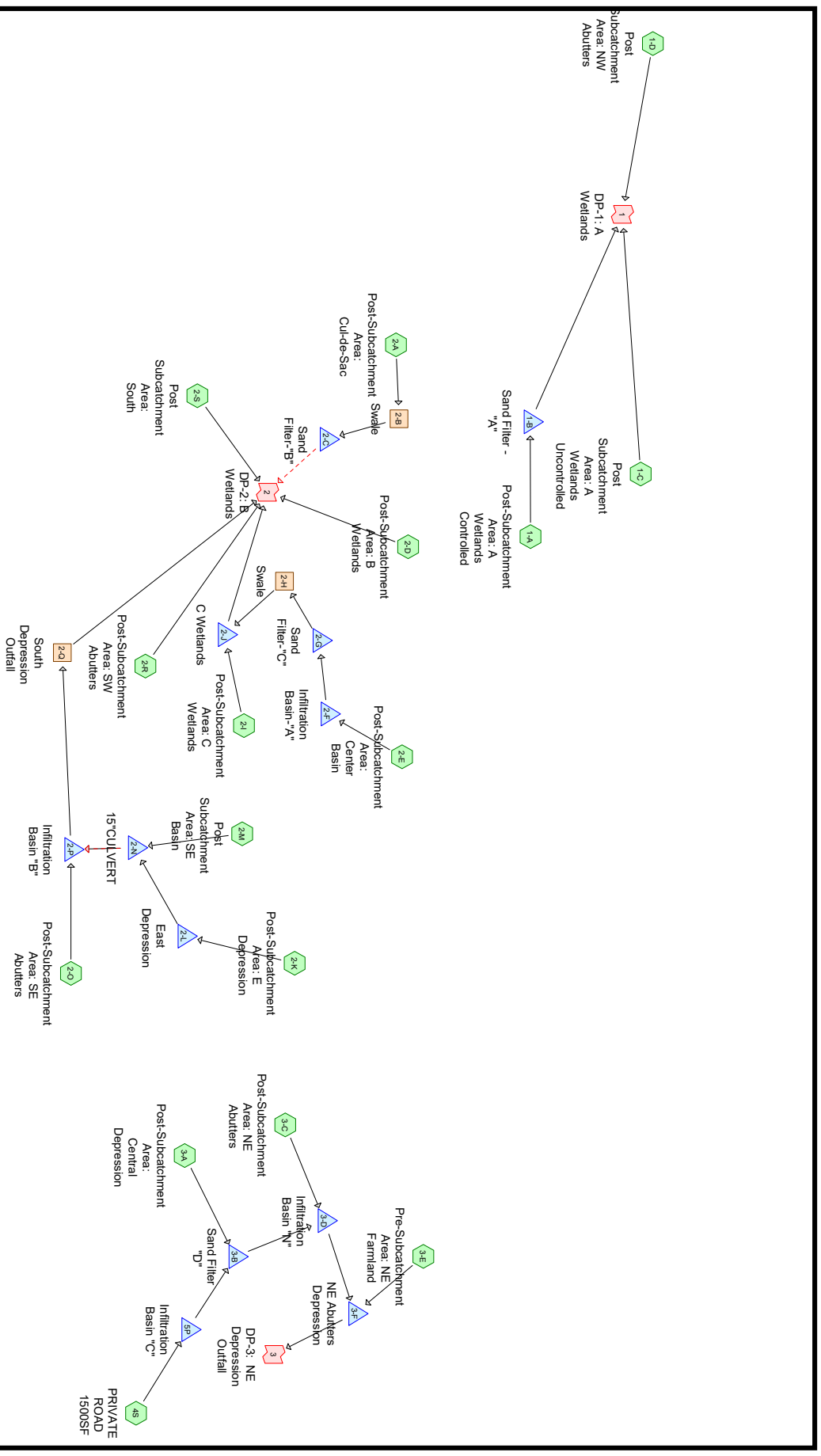
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Groundbreaking Designs, LLC  
90 Highland Avenue  
South Kingstown, RI 02879

[dkm@groundbreaking-designs.com](mailto:dkm@groundbreaking-designs.com)

(401) 622-2932





**Routing Diagram for North Woods Subdivision - Proposed Modification 7-28-22**  
 Prepared by Groundbreaking Designs, LLC, Printed 7/29/2022  
 HydroCAD® 10.10-4a s/n 11520 © 2020 HydroCAD Software Solutions LLC

PRIVATE  
ROAD  
1500SF

**Summary for Link 2: DP-2: B-Wetlands**

Inflow Area = 13.070 ac, 5.74% Impervious, Inflow Depth = 0.01" for WQV-1.2" event  
 Inflow = 0.05 cfs @ 12.34 hrs, Volume= 0.008 af  
 Primary = 0.05 cfs @ 12.34 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

**Summary for Pond 2-G: Sand Filter-"C"**

Inflow Area = 0.590 ac, 32.20% Impervious, Inflow Depth = 0.00" for WQV-1.2" event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 159.00' @ 0.00 hrs Surf.Area= 360 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	893 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.00	360	0	0
160.00	700	530	530
160.50	750	363	893

Device	Routing	Invert	Outlet Devices
#1	Discarded	159.00'	<b>8.270 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'
#2	Primary	160.00'	<b>10.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=159.00' (Free Discharge)  
 ↑1=Exfiltration ( Controls 0.00 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=159.00' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Summary for Link 3: DP-3: NE Depression Outfall**

Inflow Area = 7.454 ac, 6.90% Impervious, Inflow Depth = 0.00" for WQV-1.2" event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

**Summary for Pond 3-B: Sand Filter "D"**

Inflow Area = 1.204 ac, 18.63% Impervious, Inflow Depth = 0.16" for WQV-1.2" event  
 Inflow = 0.14 cfs @ 12.25 hrs, Volume= 0.016 af  
 Outflow = 0.14 cfs @ 12.31 hrs, Volume= 0.016 af, Atten= 5%, Lag= 3.4 min  
 Discarded = 0.14 cfs @ 12.31 hrs, Volume= 0.016 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 158.02' @ 12.31 hrs Surf.Area= 1,409 sf Storage= 28 cf

Plug-Flow detention time= 3.5 min calculated for 0.016 af (100% of inflow)  
 Center-of-Mass det. time= 3.5 min ( 797.5 - 794.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	10,930 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	1,400	0	0
159.00	1,830	1,615	1,615
160.00	2,200	2,015	3,630
161.00	3,600	2,900	6,530
162.00	5,200	4,400	10,930

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	<b>8.270 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'
#2	Primary	161.70'	<b>7.0' long x 14.0' breadth Overflow</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63
#3	Primary	159.50'	<b>12.0" Round Culvert</b> L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.50' / 158.00' S= 0.0150' /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Discarded OutFlow** Max=0.27 cfs @ 12.31 hrs HW=158.02' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.27 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=158.00' (Free Discharge)  
 ↑2=Overflow ( Controls 0.00 cfs)  
 ↓3=Culvert ( Controls 0.00 cfs)

**Summary for Pond 5P: Infiltration Basin "C"**

Inflow Area = 0.034 ac, 100.00% Impervious, Inflow Depth = 0.99" for WQV-1.2" event  
 Inflow = 0.04 cfs @ 12.07 hrs, Volume= 0.003 af  
 Outflow = 0.00 cfs @ 12.83 hrs, Volume= 0.003 af, Atten= 90%, Lag= 45.4 min  
 Discarded = 0.00 cfs @ 12.83 hrs, Volume= 0.003 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 159.87' @ 12.83 hrs Surf.Area= 163 sf Storage= 48 cf

Plug-Flow detention time= 112.0 min calculated for 0.003 af (100% of inflow)  
 Center-of-Mass det. time= 112.0 min ( 893.1 - 781.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	159.50'	950 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.50	100	0	0
160.50	270	185	185
162.00	750	765	950

Device	Routing	Invert	Outlet Devices
#1	Primary	160.50'	<b>12.0" Round Culvert</b> L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 160.50' / 160.00' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	159.50'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.00 cfs @ 12.83 hrs HW=159.87' (Free Discharge)  
 ↑**2=Exfiltration** (Exfiltration Controls 0.00 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=159.50' (Free Discharge)  
 ↑**1=Culvert** ( Controls 0.00 cfs)

**Summary for Link 2: DP-2: B Wetlands**

Inflow Area = 13.250 ac, 7.02% Impervious, Inflow Depth = 0.21" for 1-YR. event  
 Inflow = 1.10 cfs @ 12.42 hrs, Volume= 0.236 af  
 Primary = 1.10 cfs @ 12.42 hrs, Volume= 0.236 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs

**Summary for Pond 2-G: Sand Filter-"C"**

Inflow Area = 0.590 ac, 32.20% Impervious, Inflow Depth = 0.17" for 1-YR. event  
 Inflow = 0.32 cfs @ 12.22 hrs, Volume= 0.008 af  
 Outflow = 0.10 cfs @ 12.53 hrs, Volume= 0.008 af, Atten= 70%, Lag= 18.7 min  
 Discarded = 0.10 cfs @ 12.53 hrs, Volume= 0.008 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs  
 Peak Elev= 159.45' @ 12.53 hrs Surf.Area= 514 sf Storage= 198 cf

Plug-Flow detention time= 22.0 min calculated for 0.008 af (100% of inflow)  
 Center-of-Mass det. time= 22.0 min ( 761.5 - 739.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	893 cf	<b>Custom Stage Data (Prismatic) Listed below (Recalc)</b>

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.00	360	0	0
160.00	700	530	530
160.50	750	363	893

Device	Routing	Invert	Outlet Devices
#1	Discarded	159.00'	<b>8.270 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'
#2	Primary	160.00'	<b>10.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b>
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00			
2.50 3.00 3.50 4.00 4.50 5.00 5.50			
Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65			
2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88			

**Discarded OutFlow** Max=0.10 cfs @ 12.53 hrs HW=159.45' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.10 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=159.00' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Summary for Link 3: DP-3: NE Depression Outfall**

Inflow Area = 7.334 ac, 5.38% Impervious, Inflow Depth = 0.00" for 1-YR. event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs

**Summary for Pond 3-B: Sand Filter "D"**

Inflow Area = 1.204 ac, 18.63% Impervious, Inflow Depth = 0.60" for 1-YR. event  
 Inflow = 0.40 cfs @ 12.28 hrs, Volume= 0.060 af  
 Outflow = 0.28 cfs @ 12.54 hrs, Volume= 0.060 af, Atten= 31%, Lag= 15.8 min  
 Discarded = 0.28 cfs @ 12.54 hrs, Volume= 0.060 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs  
 Peak Elev= 158.12' @ 12.54 hrs Surf.Area= 1,450 sf Storage= 164 cf

Plug-Flow detention time= 4.6 min calculated for 0.060 af (100% of inflow)  
 Center-of-Mass det. time= 4.5 min ( 837.3 - 832.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	10,930 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	1,400	0	0
159.00	1,830	1,615	1,615
160.00	2,200	2,015	3,630
161.00	3,600	2,900	6,530
162.00	5,200	4,400	10,930

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	<b>8.270 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'
#2	Primary	161.70'	<b>7.0' long x 14.0' breadth Overflow</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63
#3	Primary	159.50'	<b>12.0" Round Culvert</b> L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.50' / 158.00' S= 0.0150' /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Discarded OutFlow** Max=0.28 cfs @ 12.54 hrs HW=158.12' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.28 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=158.00' (Free Discharge)  
 ↑2=Overflow ( Controls 0.00 cfs)  
 ↓3=Culvert ( Controls 0.00 cfs)

**Summary for Pond 5P: Infiltration Basin "C"**

Inflow Area = 0.034 ac, 100.00% Impervious, Inflow Depth = 2.57" for 1-YR. event  
 Inflow = 0.10 cfs @ 12.07 hrs, Volume= 0.007 af  
 Outflow = 0.01 cfs @ 13.55 hrs, Volume= 0.007 af, Atten= 94%, Lag= 89.1 min  
 Discarded = 0.01 cfs @ 13.55 hrs, Volume= 0.007 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs  
 Peak Elev= 160.39' @ 13.55 hrs Surf.Area= 251 sf Storage= 157 cf

Plug-Flow detention time= 272.3 min calculated for 0.007 af (100% of inflow)  
 Center-of-Mass det. time= 272.2 min ( 1,030.5 - 758.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	159.50'	950 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.50	100	0	0
160.50	270	185	185
162.00	750	765	950

Device	Routing	Invert	Outlet Devices
#1	Primary	160.50'	<b>12.0" Round Culvert</b> L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 160.50' / 160.00' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	159.50'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.01 cfs @ 13.55 hrs HW=160.39' (Free Discharge)  
 ↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=159.50' (Free Discharge)  
 ↑**1=Culvert** ( Controls 0.00 cfs)

**Summary for Link 2: DP-2: B Wetlands**

Inflow Area = 13.430 ac, 8.04% Impervious, Inflow Depth = 1.03" for 10-YR. event  
 Inflow = 8.18 cfs @ 12.35 hrs, Volume= 1.151 af  
 Primary = 8.18 cfs @ 12.35 hrs, Volume= 1.151 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs

**Summary for Pond 2-G: Sand Filter-"C"**

Inflow Area = 0.590 ac, 32.20% Impervious, Inflow Depth = 0.67" for 10-YR. event  
 Inflow = 1.03 cfs @ 12.18 hrs, Volume= 0.033 af  
 Outflow = 0.78 cfs @ 12.30 hrs, Volume= 0.033 af, Atten= 25%, Lag= 7.4 min  
 Discarded = 0.14 cfs @ 12.30 hrs, Volume= 0.021 af  
 Primary = 0.64 cfs @ 12.30 hrs, Volume= 0.012 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs  
 Peak Elev= 160.09' @ 12.30 hrs Surf.Area= 709 sf Storage= 594 cf

Plug-Flow detention time= 31.0 min calculated for 0.033 af (100% of inflow)  
 Center-of-Mass det. time= 31.0 min ( 770.2 - 739.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	893 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.00	360	0	0
160.00	700	530	530
160.50	750	363	893

Device	Routing	Invert	Outlet Devices
#1	Discarded	159.00'	<b>8.270 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'
#2	Primary	160.00'	<b>10.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

**Discarded OutFlow** Max=0.14 cfs @ 12.30 hrs HW=160.09' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.14 cfs)

**Primary OutFlow** Max=0.63 cfs @ 12.30 hrs HW=160.09' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 0.63 cfs @ 0.70 fps)

**Summary for Link 3: DP-3: NE Depression Outfall**

Inflow Area = 7.454 ac, 6.90% Impervious, Inflow Depth = 0.00" for 10-YR. event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs

**Summary for Pond 3-B: Sand Filter "D"**

Inflow Area = 1.204 ac, 18.63% Impervious, Inflow Depth = 1.73" for 10-YR. event  
 Inflow = 1.49 cfs @ 12.28 hrs, Volume= 0.173 af  
 Outflow = 0.36 cfs @ 12.93 hrs, Volume= 0.173 af, Atten= 76%, Lag= 39.2 min  
 Discarded = 0.36 cfs @ 12.93 hrs, Volume= 0.173 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs  
 Peak Elev= 159.20' @ 12.93 hrs Surf.Area= 1,906 sf Storage= 1,997 cf

Plug-Flow detention time= 40.3 min calculated for 0.173 af (100% of inflow)  
 Center-of-Mass det. time= 40.3 min ( 873.9 - 833.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	10,930 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	1,400	0	0
159.00	1,830	1,615	1,615
160.00	2,200	2,015	3,630
161.00	3,600	2,900	6,530
162.00	5,200	4,400	10,930

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	<b>8.270 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'
#2	Primary	161.70'	<b>7.0' long x 14.0' breadth Overflow</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63
#3	Primary	159.50'	<b>12.0" Round Culvert</b> L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.50' / 158.00' S= 0.0150' /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Discarded OutFlow** Max=0.36 cfs @ 12.93 hrs HW=159.20' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.36 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=158.00' (Free Discharge)  
 ↑2=Overflow ( Controls 0.00 cfs)  
 ↓3=Culvert ( Controls 0.00 cfs)

**Summary for Pond 5P: Infiltration Basin "C"**

Inflow Area = 0.034 ac, 100.00% Impervious, Inflow Depth = 4.66" for 10-YR. event  
 Inflow = 0.17 cfs @ 12.07 hrs, Volume= 0.013 af  
 Outflow = 0.07 cfs @ 12.24 hrs, Volume= 0.013 af, Atten= 57%, Lag= 10.3 min  
 Discarded = 0.01 cfs @ 12.24 hrs, Volume= 0.010 af  
 Primary = 0.07 cfs @ 12.24 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs  
 Peak Elev= 160.64' @ 12.24 hrs Surf.Area= 314 sf Storage= 225 cf

Plug-Flow detention time= 242.6 min calculated for 0.013 af (100% of inflow)  
 Center-of-Mass det. time= 242.7 min ( 990.1 - 747.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	159.50'	950 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.50	100	0	0
160.50	270	185	185
162.00	750	765	950

Device	Routing	Invert	Outlet Devices
#1	Primary	160.50'	<b>12.0" Round Culvert</b> L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 160.50' / 160.00' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	159.50'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.01 cfs @ 12.24 hrs HW=160.64' (Free Discharge)  
 ↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.07 cfs @ 12.24 hrs HW=160.64' (Free Discharge)  
 ↑**1=Culvert** (Inlet Controls 0.07 cfs @ 1.00 fps)

**Summary for Link 2: DP-2: B Wetlands**

Inflow Area = 13.430 ac, 8.04% Impervious, Inflow Depth = 3.60" for 100-YR. event  
 Inflow = 33.13 cfs @ 12.25 hrs, Volume= 4.027 af  
 Primary = 33.13 cfs @ 12.25 hrs, Volume= 4.027 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs

**Summary for Pond 2-G: Sand Filter-"C"**

Inflow Area = 0.590 ac, 32.20% Impervious, Inflow Depth = 2.49" for 100-YR. event  
 Inflow = 2.55 cfs @ 12.19 hrs, Volume= 0.123 af  
 Outflow = 2.53 cfs @ 12.20 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.8 min  
 Discarded = 0.14 cfs @ 12.20 hrs, Volume= 0.040 af  
 Primary = 2.40 cfs @ 12.20 hrs, Volume= 0.083 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs  
 Peak Elev= 160.22' @ 12.20 hrs Surf.Area= 722 sf Storage= 685 cf

Plug-Flow detention time= 18.2 min calculated for 0.123 af (100% of inflow)  
 Center-of-Mass det. time= 18.2 min ( 764.0 - 745.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	893 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.00	360	0	0
160.00	700	530	530
160.50	750	363	893

Device	Routing	Invert	Outlet Devices
#1	Discarded	159.00'	<b>8.270 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'
#2	Primary	160.00'	<b>10.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

**Discarded OutFlow** Max=0.14 cfs @ 12.20 hrs HW=160.22' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.14 cfs)

**Primary OutFlow** Max=2.38 cfs @ 12.20 hrs HW=160.22' (Free Discharge)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 2.38 cfs @ 1.10 fps)

**Summary for Link 3: DP-3: NE Depression Outfall**

Inflow Area = 7.454 ac, 6.90% Impervious, Inflow Depth = 0.00" for 100-YR. event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs

**Summary for Pond 3-B: Sand Filter "D"**

Inflow Area = 1.204 ac, 18.63% Impervious, Inflow Depth = 4.34" for 100-YR. event  
 Inflow = 4.04 cfs @ 12.26 hrs, Volume= 0.436 af  
 Outflow = 2.61 cfs @ 12.51 hrs, Volume= 0.436 af, Atten= 35%, Lag= 14.8 min  
 Discarded = 0.51 cfs @ 12.51 hrs, Volume= 0.314 af  
 Primary = 2.11 cfs @ 12.51 hrs, Volume= 0.121 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs  
 Peak Elev= 160.32' @ 12.51 hrs Surf.Area= 2,641 sf Storage= 4,393 cf

Plug-Flow detention time= 50.7 min calculated for 0.436 af (100% of inflow)  
 Center-of-Mass det. time= 50.7 min ( 873.9 - 823.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	10,930 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	1,400	0	0
159.00	1,830	1,615	1,615
160.00	2,200	2,015	3,630
161.00	3,600	2,900	6,530
162.00	5,200	4,400	10,930

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.00'	<b>8.270 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'
#2	Primary	161.70'	<b>7.0' long x 14.0' breadth Overflow</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63
#3	Primary	159.50'	<b>12.0" Round Culvert</b> L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 159.50' / 158.00' S= 0.0150 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Discarded OutFlow** Max=0.51 cfs @ 12.51 hrs HW=160.31' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.51 cfs)

**Primary OutFlow** Max=2.11 cfs @ 12.51 hrs HW=160.31' (Free Discharge)  
 ↑2=Overflow ( Controls 0.00 cfs)  
 ↓3=Culvert (Inlet Controls 2.11 cfs @ 3.07 fps)

**Summary for Pond 5P: Infiltration Basin "C"**

Inflow Area = 0.034 ac, 100.00% Impervious, Inflow Depth = 8.26" for 100-YR. event  
 Inflow = 0.30 cfs @ 12.07 hrs, Volume= 0.024 af  
 Outflow = 0.25 cfs @ 12.12 hrs, Volume= 0.024 af, Atten= 15%, Lag= 2.9 min  
 Discarded = 0.01 cfs @ 12.12 hrs, Volume= 0.012 af  
 Primary = 0.24 cfs @ 12.12 hrs, Volume= 0.011 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs  
 Peak Elev= 160.77' @ 12.12 hrs Surf.Area= 357 sf Storage= 270 cf

Plug-Flow detention time= 182.1 min calculated for 0.024 af (100% of inflow)  
 Center-of-Mass det. time= 182.0 min ( 921.6 - 739.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	159.50'	950 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.50	100	0	0
160.50	270	185	185
162.00	750	765	950

Device	Routing	Invert	Outlet Devices
#1	Primary	160.50'	<b>12.0" Round Culvert</b> L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 160.50' / 160.00' S= 0.0111 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	159.50'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.01 cfs @ 12.12 hrs HW=160.77' (Free Discharge)  
 ↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.24 cfs @ 12.12 hrs HW=160.77' (Free Discharge)  
 ↑**1=Culvert** (Inlet Controls 0.24 cfs @ 1.40 fps)