ASB design group

August 5, 2015

Mr. Ross Povenmire
Director of Conservation
7A Spofford Road
Boxford, MA 01921

RE: Job No. : 2011-57
Description: Notice of Intent – Lot 9
Project Location: Lot 9
Deer Run Road
Boxford MA. 01921

Dear Ross:

ASB design group llc (ASB) is submitting revised drainage calculations for BMP 1 on Deer Run Road. As a result of the new house, driveway, and lawn area we have increased the storage area within BMP 1 to mitigate for any increase in the peak rate of runoff.

BMP 1 was part of the original roadway Notice of Intent – DEP No. 114-1151. The only change in BMP 1 is increased storage.

Table 1 below shows the peak rate of runoff to Design Point 2 for each storm event under the original Notice of Intent filing. The existing condition is shown red and the impacts due to the original roadway development are shown black.

TABLE 1 – Original Notice of Intent

Design Point	2 Year Storm (3.1")	10 Year Storm (4.7")	25 Year Storm (5.8")	50 Year Storm (7.1")	100 Year Storm (8.3")
Design Point 2*	0.00 / 0.00	0.05 / 0.00	0.12 / 0.00	0.22 / 0.02	0.36 / 0.08

Table 2 below shows the peak rate of runoff to Design Point 2 for each storm event as a result of the increased storage provided in the Notice of Intent for Lot 9. Keep in mind that BMP 1 also continues to take the roadway drainage. We had this section of roadway surveyed (as-built) so that we could be sure that we were design to the actual field conditions for both Lot 9 and the roadway. The existing condition is shown red and the impacts due to the development of LOT 9 and the existing roadway (Deer Run Road) are shown black.

TABLE 2 – Lot 9 and Existing Roadway

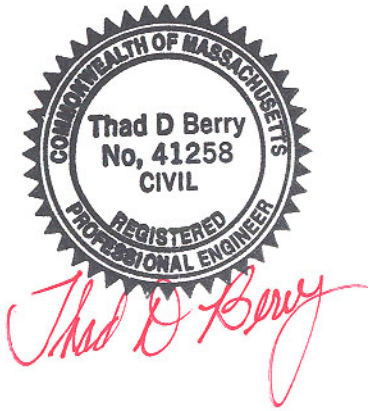
Design Point	2 Year Storm (3.1")	10 Year Storm (4.7")	25 Year Storm (5.8")	50 Year Storm (7.1")	100 Year Storm (8.3")
Design Point 2*	0.00 / 0.00	0.05 / 0.00	0.12 / 0.00	0.22 / 0.00	0.36 / 0.00

The increased volume in BMP 1 prevents any stormwater discharge from BMP 1. All stormwater will be retained and then infiltrated into the soils.

Let me know if you have any concerns or questions.

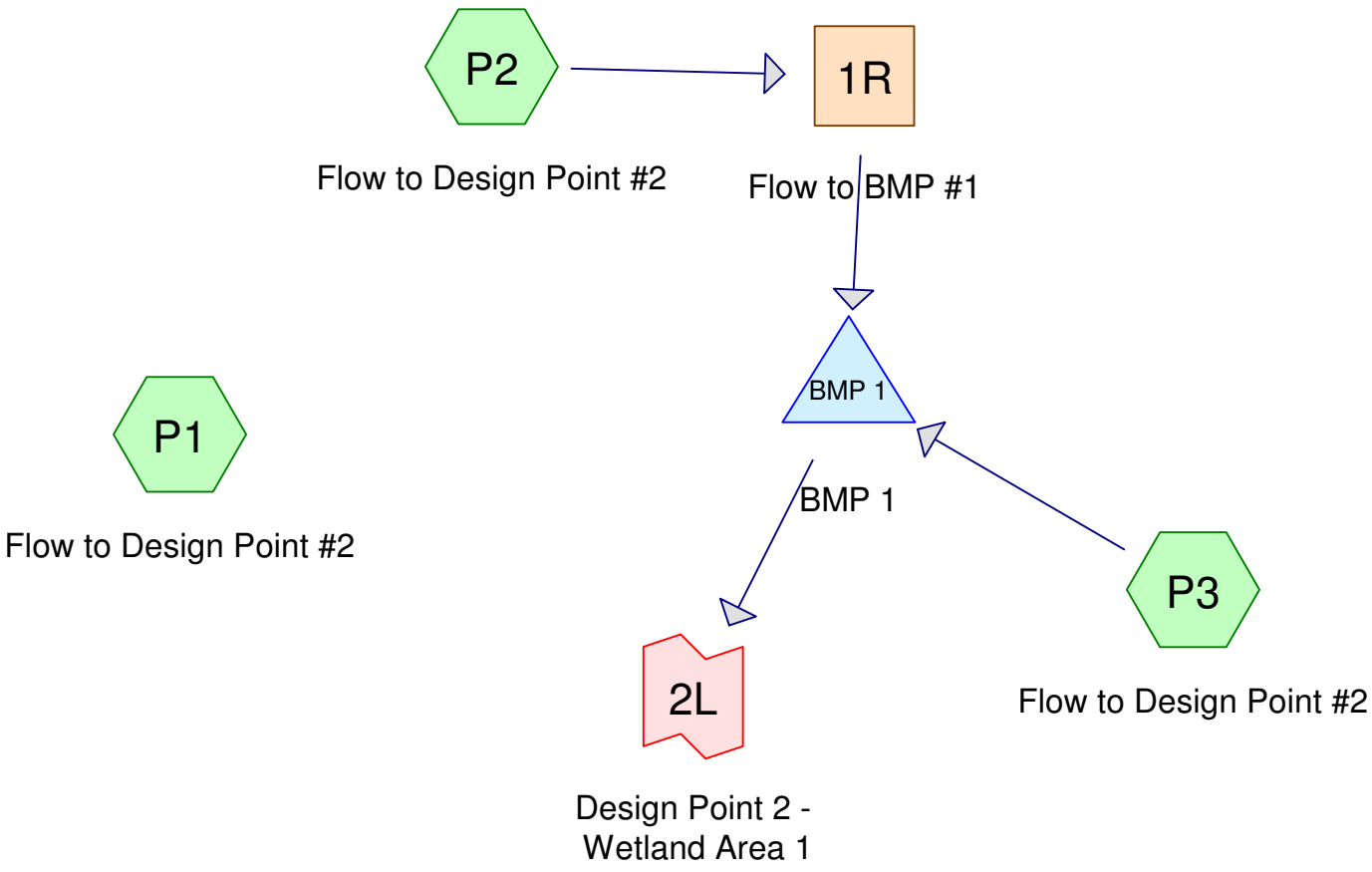
Sincerely Yours,

Thad Berry P.E.
ASB design group llc
363 Boston Street, Route 1
Topsfield MA. 01983



Cc:

Rimmer Environmental Consulting Inc.



Subcat Reach Pond Link

Routing Diagram for Boxford -Lot 9 Post Development (NOI Submittal)
Prepared by Microsoft, Printed 8/6/2015

Summary for Subcatchment P1: Flow to Design Point #2

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Storm Rainfall=3.10"

Area (sf)	CN	Description
1,896	39	>75% Grass cover, Good, HSG A
14,068	30	Woods, Good, HSG A
15,964	31	Weighted Average
15,964		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	85	0.0820	0.24		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P2: Flow to Design Point #2

Runoff = 0.00 cfs @ 14.89 hrs, Volume= 98 cf, Depth> 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Storm Rainfall=3.10"

Area (sf)	CN	Description
3,217	98	Paved roads w/curbs & sewers, HSG A
18,672	39	>75% Grass cover, Good, HSG A
21,889	48	Weighted Average
18,672		85.30% Pervious Area
3,217		14.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	305	0.0360	0.33		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P3: Flow to Design Point #2

Runoff = 0.04 cfs @ 12.43 hrs, Volume= 331 cf, Depth> 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Storm Rainfall=3.10"

Area (sf)	CN	Description
18,496	39	>75% Grass cover, Good, HSG A
6,045	98	Paved parking, HSG A
24,541	54	Weighted Average
18,496		75.37% Pervious Area
6,045		24.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	251	0.0530	0.45		**Lag/CN Method, Overland Flow**

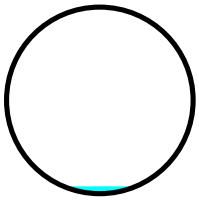
Summary for Reach 1R: Flow to BMP #1

Inflow Area = 21,889 sf, 14.70% Impervious, Inflow Depth > 0.05" for 2 Year Storm event
Inflow = 0.00 cfs @ 14.89 hrs, Volume= 98 cf
Outflow = 0.00 cfs @ 14.91 hrs, Volume= 98 cf, Atten= 0%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.99 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.80 fps, Avg. Travel Time= 1.0 min

Peak Storage= 0 cf @ 14.90 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.79 cfs

6.0" Round Pipe
n= 0.010
Length= 105.0' Slope= 0.0600 '/'
Inlet Invert= 0.00', Outlet Invert= -6.30'



Summary for Pond BMP 1: BMP 1

Inflow Area = 46,430 sf, 19.95% Impervious, Inflow Depth > 0.11" for 2 Year Storm event
Inflow = 0.04 cfs @ 12.43 hrs, Volume= 429 cf
Outflow = 0.04 cfs @ 12.46 hrs, Volume= 428 cf, Atten= 1%, Lag= 1.8 min
Discarded = 0.04 cfs @ 12.46 hrs, Volume= 428 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 119.51' @ 12.46 hrs Surf.Area= 679 sf Storage= 4 cf

Plug-Flow detention time= 1.7 min calculated for 427 cf (99% of inflow)
Center-of-Mass det. time= 1.2 min (918.2 - 917.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	119.50'	453 cf	**14.00'W x 48.50'L x 2.04'H Field A** 1,386 cf Overall - 254 cf Embedded = 1,132 cf x 40.0% Voids
#2A	120.00'	254 cf	**Cultec C-100** x 18 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 3 rows
#3	123.00'	10,105 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		10,811 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
123.00	998	0	0
124.00	2,573	1,786	1,786
125.00	3,950	3,262	5,047
126.00	6,165	5,058	10,105

Device	Routing	Invert	Outlet Devices
#1	Discarded	119.50'	**0.17 cfs Exfiltration at all elevations**
#2	Primary	125.50'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.17 cfs @ 12.46 hrs HW=119.51' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=119.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BMP 1: BMP 1 - Chamber Wizard Field A

Chamber Model = Cultec C-100
Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf
Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap
Row Length Adjustment= +0.50' x 1.86 sf x 3 rows

36.0" Wide + 12.0" Spacing = 48.0" C-C Row Spacing

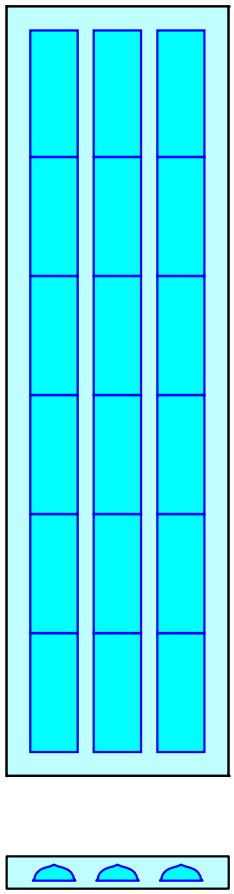
6 Chambers/Row x 7.50' Long +0.50' Row Adjustment = 45.50' Row Length +18.0" End Stone x 2 = 48.50' Base Length
3 Rows x 36.0" Wide + 12.0" Spacing x 2 + 18.0" Side Stone x 2 = 14.00' Base Width
6.0" Base + 12.5" Chamber Height + 6.0" Cover = 2.04' Field Height

18 Chambers x 14.0 cf +0.50' Row Adjustment x 1.86 sf x 3 Rows = 254.1 cf Chamber Storage

1,386.3 cf Field - 254.1 cf Chambers = 1,132.2 cf Stone x 40.0% Voids = 452.9 cf Stone Storage

Chamber Storage + Stone Storage = 707.0 cf = 0.016 af
Overall Storage Efficiency = 51.0%

18 Chambers
51.3 cy Field
41.9 cy Stone



Summary for Link 2L: Design Point 2 - Wetland Area 1

Inflow Area = 46,430 sf, 19.95% Impervious, Inflow Depth = 0.00" for 2 Year Storm event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment P1: Flow to Design Point #2

Runoff = 0.00 cfs @ 20.00 hrs, Volume= 0 cf, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Storm Rainfall=4.70"

Area (sf)	CN	Description
1,896	39	>75% Grass cover, Good, HSG A
14,068	30	Woods, Good, HSG A
15,964	31	Weighted Average
15,964		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	85	0.0820	0.24		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P2: Flow to Design Point #2

Runoff = 0.11 cfs @ 12.41 hrs, Volume= 745 cf, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Storm Rainfall=4.70"

Area (sf)	CN	Description
3,217	98	Paved roads w/curbs & sewers, HSG A
18,672	39	>75% Grass cover, Good, HSG A
21,889	48	Weighted Average
18,672		85.30% Pervious Area
3,217		14.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	305	0.0360	0.33		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P3: Flow to Design Point #2

Runoff = 0.33 cfs @ 12.17 hrs, Volume= 1,405 cf, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Storm Rainfall=4.70"

Area (sf)	CN	Description
18,496	39	>75% Grass cover, Good, HSG A
6,045	98	Paved parking, HSG A
24,541	54	Weighted Average
18,496		75.37% Pervious Area
6,045		24.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	251	0.0530	0.45		**Lag/CN Method, Overland Flow**

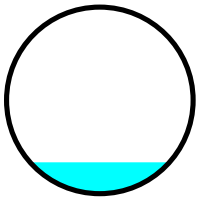
Summary for Reach 1R: Flow to BMP #1

Inflow Area = 21,889 sf, 14.70% Impervious, Inflow Depth > 0.41" for 10 Year Storm event
Inflow = 0.11 cfs @ 12.41 hrs, Volume= 745 cf
Outflow = 0.11 cfs @ 12.42 hrs, Volume= 745 cf, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.02 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.12 fps, Avg. Travel Time= 0.6 min

Peak Storage= 2 cf @ 12.42 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.79 cfs

6.0" Round Pipe
n= 0.010
Length= 105.0' Slope= 0.0600 '/'
Inlet Invert= 0.00', Outlet Invert= -6.30'



Summary for Pond BMP 1: BMP 1

Inflow Area = 46,430 sf, 19.95% Impervious, Inflow Depth > 0.56" for 10 Year Storm event
Inflow = 0.37 cfs @ 12.21 hrs, Volume= 2,150 cf
Outflow = 0.17 cfs @ 12.10 hrs, Volume= 2,147 cf, Atten= 54%, Lag= 0.0 min
Discarded = 0.17 cfs @ 12.10 hrs, Volume= 2,147 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 120.34' @ 12.69 hrs Surf.Area= 679 sf Storage= 299 cf

Plug-Flow detention time= 10.3 min calculated for 2,140 cf (100% of inflow)
Center-of-Mass det. time= 9.9 min (870.5 - 860.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	119.50'	453 cf	**14.00'W x 48.50'L x 2.04'H Field A** 1,386 cf Overall - 254 cf Embedded = 1,132 cf x 40.0% Voids
#2A	120.00'	254 cf	**Cultec C-100** x 18 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 3 rows
#3	123.00'	10,105 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		10,811 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
123.00	998	0	0
124.00	2,573	1,786	1,786
125.00	3,950	3,262	5,047
126.00	6,165	5,058	10,105

Device	Routing	Invert	Outlet Devices
#1	Discarded	119.50'	**0.17 cfs Exfiltration at all elevations**
#2	Primary	125.50'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.17 cfs @ 12.10 hrs HW=119.59' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=119.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BMP 1: BMP 1 - Chamber Wizard Field A

Chamber Model = Cultec C-100
Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf
Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap
Row Length Adjustment= +0.50' x 1.86 sf x 3 rows

36.0" Wide + 12.0" Spacing = 48.0" C-C Row Spacing

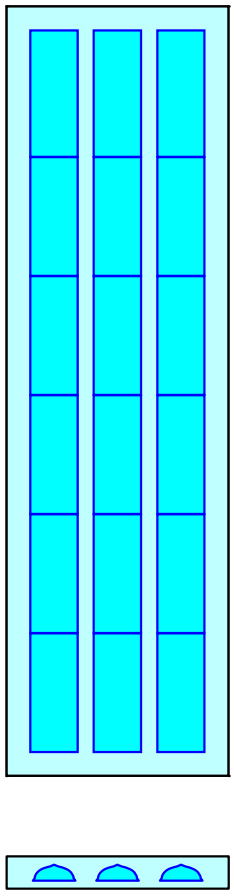
6 Chambers/Row x 7.50' Long +0.50' Row Adjustment = 45.50' Row Length +18.0" End Stone x 2 = 48.50' Base Length
3 Rows x 36.0" Wide + 12.0" Spacing x 2 + 18.0" Side Stone x 2 = 14.00' Base Width
6.0" Base + 12.5" Chamber Height + 6.0" Cover = 2.04' Field Height

18 Chambers x 14.0 cf +0.50' Row Adjustment x 1.86 sf x 3 Rows = 254.1 cf Chamber Storage

1,386.3 cf Field - 254.1 cf Chambers = 1,132.2 cf Stone x 40.0% Voids = 452.9 cf Stone Storage

Chamber Storage + Stone Storage = 707.0 cf = 0.016 af
Overall Storage Efficiency = 51.0%

18 Chambers
51.3 cy Field
41.9 cy Stone



Summary for Link 2L: Design Point 2 - Wetland Area 1

Inflow Area = 46,430 sf, 19.95% Impervious, Inflow Depth = 0.00" for 10 Year Storm event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment P1: Flow to Design Point #2

Runoff = 0.00 cfs @ 15.39 hrs, Volume= 68 cf, Depth> 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.80"

Area (sf)	CN	Description
1,896	39	>75% Grass cover, Good, HSG A
14,068	30	Woods, Good, HSG A
15,964	31	Weighted Average
15,964		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	85	0.0820	0.24		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P2: Flow to Design Point #2

Runoff = 0.28 cfs @ 12.28 hrs, Volume= 1,457 cf, Depth> 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.80"

Area (sf)	CN	Description
3,217	98	Paved roads w/curbs & sewers, HSG A
18,672	39	>75% Grass cover, Good, HSG A
21,889	48	Weighted Average
18,672		85.30% Pervious Area
3,217		14.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	305	0.0360	0.33		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P3: Flow to Design Point #2

Runoff = 0.66 cfs @ 12.15 hrs, Volume= 2,438 cf, Depth> 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.80"

Area (sf)	CN	Description
18,496	39	>75% Grass cover, Good, HSG A
6,045	98	Paved parking, HSG A
24,541	54	Weighted Average
18,496		75.37% Pervious Area
6,045		24.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	251	0.0530	0.45		**Lag/CN Method, Overland Flow**

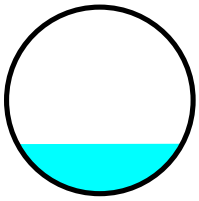
Summary for Reach 1R: Flow to BMP #1

Inflow Area = 21,889 sf, 14.70% Impervious, Inflow Depth > 0.80" for 25 Year Storm event
Inflow = 0.28 cfs @ 12.28 hrs, Volume= 1,457 cf
Outflow = 0.28 cfs @ 12.30 hrs, Volume= 1,456 cf, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.62 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.69 fps, Avg. Travel Time= 0.5 min

Peak Storage= 4 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.79 cfs

6.0" Round Pipe
n= 0.010
Length= 105.0' Slope= 0.0600 '/'
Inlet Invert= 0.00', Outlet Invert= -6.30'



Summary for Pond BMP 1: BMP 1

Inflow Area = 46,430 sf, 19.95% Impervious, Inflow Depth > 1.01" for 25 Year Storm event
Inflow = 0.85 cfs @ 12.18 hrs, Volume= 3,894 cf
Outflow = 0.17 cfs @ 12.00 hrs, Volume= 3,890 cf, Atten= 80%, Lag= 0.0 min
Discarded = 0.17 cfs @ 12.00 hrs, Volume= 3,890 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 123.35' @ 13.21 hrs Surf.Area= 2,225 sf Storage= 1,150 cf

Plug-Flow detention time= 64.8 min calculated for 3,877 cf (100% of inflow)
Center-of-Mass det. time= 64.2 min (908.4 - 844.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	119.50'	453 cf	**14.00'W x 48.50'L x 2.04'H Field A** 1,386 cf Overall - 254 cf Embedded = 1,132 cf x 40.0% Voids
#2A	120.00'	254 cf	**Cultec C-100** x 18 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 3 rows
#3	123.00'	10,105 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		10,811 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
123.00	998	0	0
124.00	2,573	1,786	1,786
125.00	3,950	3,262	5,047
126.00	6,165	5,058	10,105

Device	Routing	Invert	Outlet Devices
#1	Discarded	119.50'	**0.17 cfs Exfiltration at all elevations**
#2	Primary	125.50'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.17 cfs @ 12.00 hrs HW=119.58' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=119.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BMP 1: BMP 1 - Chamber Wizard Field A

Chamber Model = Cultec C-100
Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf
Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap
Row Length Adjustment= +0.50' x 1.86 sf x 3 rows

36.0" Wide + 12.0" Spacing = 48.0" C-C Row Spacing

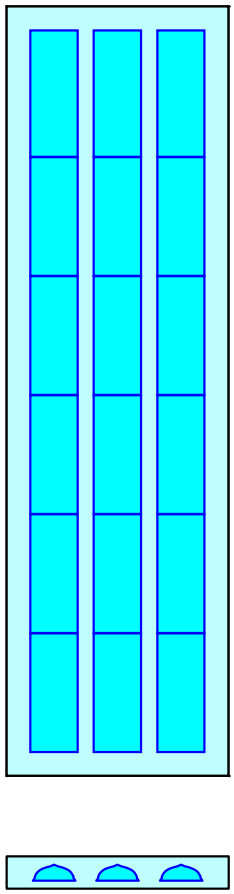
6 Chambers/Row x 7.50' Long +0.50' Row Adjustment = 45.50' Row Length +18.0" End Stone x 2 = 48.50' Base Length
3 Rows x 36.0" Wide + 12.0" Spacing x 2 + 18.0" Side Stone x 2 = 14.00' Base Width
6.0" Base + 12.5" Chamber Height + 6.0" Cover = 2.04' Field Height

18 Chambers x 14.0 cf +0.50' Row Adjustment x 1.86 sf x 3 Rows = 254.1 cf Chamber Storage

1,386.3 cf Field - 254.1 cf Chambers = 1,132.2 cf Stone x 40.0% Voids = 452.9 cf Stone Storage

Chamber Storage + Stone Storage = 707.0 cf = 0.016 af
Overall Storage Efficiency = 51.0%

18 Chambers
51.3 cy Field
41.9 cy Stone



Summary for Link 2L: Design Point 2 - Wetland Area 1

Inflow Area = 46,430 sf, 19.95% Impervious, Inflow Depth = 0.00" for 25 Year Storm event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment P1: Flow to Design Point #2

Runoff = 0.02 cfs @ 12.48 hrs, Volume= 295 cf, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
1,896	39	>75% Grass cover, Good, HSG A
14,068	30	Woods, Good, HSG A
15,964	31	Weighted Average
15,964		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	85	0.0820	0.24		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P2: Flow to Design Point #2

Runoff = 0.56 cfs @ 12.25 hrs, Volume= 2,509 cf, Depth> 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
3,217	98	Paved roads w/curbs & sewers, HSG A
18,672	39	>75% Grass cover, Good, HSG A
21,889	48	Weighted Average
18,672		85.30% Pervious Area
3,217		14.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	305	0.0360	0.33		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P3: Flow to Design Point #2

Runoff = 1.13 cfs @ 12.15 hrs, Volume= 3,881 cf, Depth> 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
18,496	39	>75% Grass cover, Good, HSG A
6,045	98	Paved parking, HSG A
24,541	54	Weighted Average
18,496		75.37% Pervious Area
6,045		24.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	251	0.0530	0.45		**Lag/CN Method, Overland Flow**

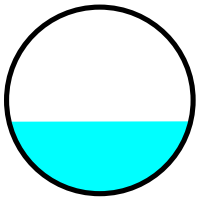
Summary for Reach 1R: Flow to BMP #1

Inflow Area = 21,889 sf, 14.70% Impervious, Inflow Depth > 1.38" for 50 Year Storm event
Inflow = 0.56 cfs @ 12.25 hrs, Volume= 2,509 cf
Outflow = 0.56 cfs @ 12.26 hrs, Volume= 2,508 cf, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.07 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.21 fps, Avg. Travel Time= 0.4 min

Peak Storage= 7 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.79 cfs

6.0" Round Pipe
n= 0.010
Length= 105.0' Slope= 0.0600 '/'
Inlet Invert= 0.00', Outlet Invert= -6.30'



Summary for Pond BMP 1: BMP 1

Inflow Area = 46,430 sf, 19.95% Impervious, Inflow Depth > 1.65" for 50 Year Storm event
Inflow = 1.58 cfs @ 12.17 hrs, Volume= 6,389 cf
Outflow = 0.17 cfs @ 11.85 hrs, Volume= 5,113 cf, Atten= 89%, Lag= 0.0 min
Discarded = 0.17 cfs @ 11.85 hrs, Volume= 5,113 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 124.11' @ 14.58 hrs Surf.Area= 3,399 sf Storage= 2,775 cf

Plug-Flow detention time= 173.1 min calculated for 5,113 cf (80% of inflow)
Center-of-Mass det. time= 118.6 min (950.8 - 832.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	119.50'	453 cf	**14.00'W x 48.50'L x 2.04'H Field A** 1,386 cf Overall - 254 cf Embedded = 1,132 cf x 40.0% Voids
#2A	120.00'	254 cf	**Cultec C-100** x 18 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 3 rows
#3	123.00'	10,105 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		10,811 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
123.00	998	0	0
124.00	2,573	1,786	1,786
125.00	3,950	3,262	5,047
126.00	6,165	5,058	10,105

Device	Routing	Invert	Outlet Devices
#1	Discarded	119.50'	**0.17 cfs Exfiltration at all elevations**
#2	Primary	125.50'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.17 cfs @ 11.85 hrs HW=119.57' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=119.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BMP 1: BMP 1 - Chamber Wizard Field A

Chamber Model = Cultec C-100
Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf
Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap
Row Length Adjustment= +0.50' x 1.86 sf x 3 rows

36.0" Wide + 12.0" Spacing = 48.0" C-C Row Spacing

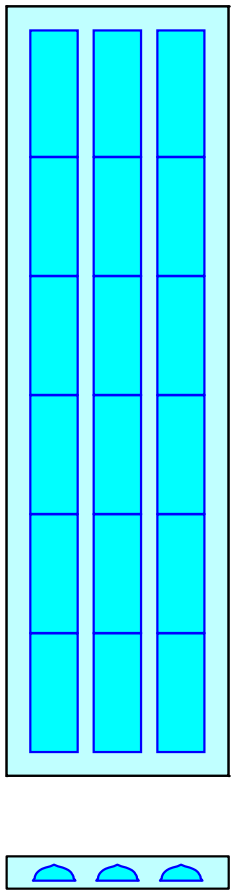
6 Chambers/Row x 7.50' Long +0.50' Row Adjustment = 45.50' Row Length +18.0" End Stone x 2 = 48.50' Base Length
3 Rows x 36.0" Wide + 12.0" Spacing x 2 + 18.0" Side Stone x 2 = 14.00' Base Width
6.0" Base + 12.5" Chamber Height + 6.0" Cover = 2.04' Field Height

18 Chambers x 14.0 cf +0.50' Row Adjustment x 1.86 sf x 3 Rows = 254.1 cf Chamber Storage

1,386.3 cf Field - 254.1 cf Chambers = 1,132.2 cf Stone x 40.0% Voids = 452.9 cf Stone Storage

Chamber Storage + Stone Storage = 707.0 cf = 0.016 af
Overall Storage Efficiency = 51.0%

18 Chambers
51.3 cy Field
41.9 cy Stone



Summary for Link 2L: Design Point 2 - Wetland Area 1

Inflow Area = 46,430 sf, 19.95% Impervious, Inflow Depth = 0.00" for 50 Year Storm event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment P1: Flow to Design Point #2

Runoff = 0.08 cfs @ 12.36 hrs, Volume= 627 cf, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=8.30"

Area (sf)	CN	Description
1,896	39	>75% Grass cover, Good, HSG A
14,068	30	Woods, Good, HSG A
15,964	31	Weighted Average
15,964		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	85	0.0820	0.24		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P2: Flow to Design Point #2

Runoff = 0.87 cfs @ 12.24 hrs, Volume= 3,640 cf, Depth> 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=8.30"

Area (sf)	CN	Description
3,217	98	Paved roads w/curbs & sewers, HSG A
18,672	39	>75% Grass cover, Good, HSG A
21,889	48	Weighted Average
18,672		85.30% Pervious Area
3,217		14.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	305	0.0360	0.33		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P3: Flow to Design Point #2

Runoff = 1.61 cfs @ 12.14 hrs, Volume= 5,377 cf, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=8.30"

Area (sf)	CN	Description
18,496	39	>75% Grass cover, Good, HSG A
6,045	98	Paved parking, HSG A
24,541	54	Weighted Average
18,496		75.37% Pervious Area
6,045		24.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	251	0.0530	0.45		**Lag/CN Method, Overland Flow**

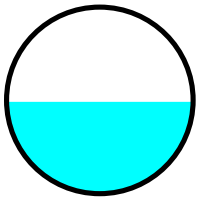
Summary for Reach 1R: Flow to BMP #1

Inflow Area = 21,889 sf, 14.70% Impervious, Inflow Depth > 2.00" for 100 Year Storm event
Inflow = 0.87 cfs @ 12.24 hrs, Volume= 3,640 cf
Outflow = 0.87 cfs @ 12.24 hrs, Volume= 3,639 cf, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.04 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.58 fps, Avg. Travel Time= 0.4 min

Peak Storage= 10 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.79 cfs

6.0" Round Pipe
n= 0.010
Length= 105.0' Slope= 0.0600 '/'
Inlet Invert= 0.00', Outlet Invert= -6.30'



Summary for Pond BMP 1: BMP 1

Inflow Area = 46,430 sf, 19.95% Impervious, Inflow Depth > 2.33" for 100 Year Storm event
Inflow = 2.33 cfs @ 12.17 hrs, Volume= 9,016 cf
Outflow = 0.17 cfs @ 11.75 hrs, Volume= 5,253 cf, Atten= 93%, Lag= 0.0 min
Discarded = 0.17 cfs @ 11.75 hrs, Volume= 5,253 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 124.75' @ 15.62 hrs Surf.Area= 4,281 sf Storage= 4,799 cf

Plug-Flow detention time= 203.2 min calculated for 5,235 cf (58% of inflow)
Center-of-Mass det. time= 119.3 min (943.7 - 824.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	119.50'	453 cf	**14.00'W x 48.50'L x 2.04'H Field A** 1,386 cf Overall - 254 cf Embedded = 1,132 cf x 40.0% Voids
#2A	120.00'	254 cf	**Cultec C-100** x 18 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 3 rows
#3	123.00'	10,105 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		10,811 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
123.00	998	0	0
124.00	2,573	1,786	1,786
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Device	Routing	Invert	Outlet Devices
#1	Discarded	119.50'	**0.17 cfs Exfiltration at all elevations**
#2	Primary	125.50'	**5.0' long x 1.0' breadth Broad-Crested Rectangular Weir** 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.17 cfs @ 11.75 hrs HW=119.59' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=119.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BMP 1: BMP 1 - Chamber Wizard Field A

Chamber Model = Cultec C-100
Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf
Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap
Row Length Adjustment= +0.50' x 1.86 sf x 3 rows

36.0" Wide + 12.0" Spacing = 48.0" C-C Row Spacing

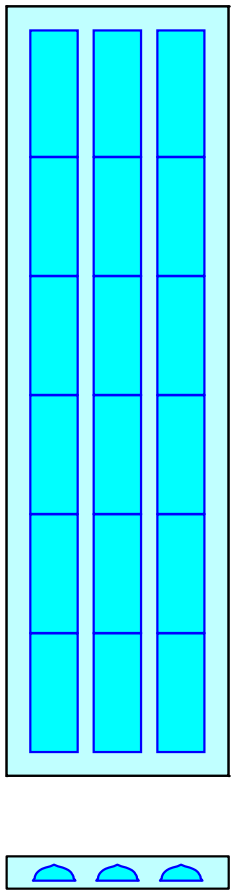
6 Chambers/Row x 7.50' Long +0.50' Row Adjustment = 45.50' Row Length +18.0" End Stone x 2 = 48.50' Base Length
3 Rows x 36.0" Wide + 12.0" Spacing x 2 + 18.0" Side Stone x 2 = 14.00' Base Width
6.0" Base + 12.5" Chamber Height + 6.0" Cover = 2.04' Field Height

18 Chambers x 14.0 cf +0.50' Row Adjustment x 1.86 sf x 3 Rows = 254.1 cf Chamber Storage

1,386.3 cf Field - 254.1 cf Chambers = 1,132.2 cf Stone x 40.0% Voids = 452.9 cf Stone Storage

Chamber Storage + Stone Storage = 707.0 cf = 0.016 af
Overall Storage Efficiency = 51.0%

18 Chambers
51.3 cy Field
41.9 cy Stone



Summary for Link 2L: Design Point 2 - Wetland Area 1

Inflow Area = 46,430 sf, 19.95% Impervious, Inflow Depth = 0.00" for 100 Year Storm event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs