



9-30-11

Village of Menomonee Falls
 W156 N8480 Pilgrim Road
 Menomonee Falls, WI 53051-3140
 Telephone: (262) 532-4200

STORMWATER MANAGEMENT FACILITIES OPERATION AND INSPECTION REPORT

Quarter Section NEXA Sect. 31 Name of Business/Subdivision Carter's Crossing
 Property Tax ID Number 0121-067 Address of Property South of Silver Spring
between Lannon Rd. &
Townline Rd.

Dry Pond	
Wet Pond	X
Other	

Location Of Pond Outlet #5

Description: Basin #1
SWP 31N004

Year Pond Constructed 2004 Year of Last Certification 2004

Compliance Verification	Design	Actual	Compliant Yes	No	Comments (Condition of Structure)
Primary Outlet Pipe					
Opening Diameter	12" w/ 10" opening	12"		X	Does not have the 10" opening, but acceptable (*)
Upstream Invert	840.00	839.93	X		
Downstream Invert	837.00	838.06	X		Although the invert is a tad higher, it's at a comparable slope.
Length	80'	61'	X		
Slope	.0375	.031	X		
Secondary Outlet Pipe	(If Applicable)		NA		
Opening Diameter					
Upstream Invert					
Downstream Invert					
Length					
Slope					
Riser	(If Applicable)				
Opening Diameter	36"	36"	X		
Elevation	842.0	842.0	X		
Upper Discharge Control	(If Applicable)		NA		
Opening Diameter					
Elevation					

* HydroCAD was used to model the overall effect of discrepancies.

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Compliance Verification	Design	Actual	Compliant Yes No		Comments	
Lower Discharge Control	(If Applicable)					
Opening Diameter	2"	3½"		X	Opening almost double the size (*)	
Elevation	840.00	839.67	X		Elevation off by about 4" but acceptable (*).	
Other (Description)	NA					
Opening Type						
Elevation						
Emergency Spillway						
Elevation	844.6	844.21	X		Elevation off by about 4½" but acceptable (*).	
Length of spillway	20'	22'	X			
Embankment			Present Yes No			
Unauthorized plantings, trees, or woody vegetation				X		
Animal burrows or slope erosion				X		
Storage Properties	Design	Actual	Compliant Yes No		Points Surveyed	Equipment Used
Normal Water Elevation (Wet Ponds)	840.00	839.67	X			Design - Obtained from plan detail Actual - Surveyed orifice invert elev.
Design High Water Elevation	844.6	844.21	X			Design - Overflow elev. from plan detail Actual - Surveyed riprapped overflow
Area at Normal Water Elevation (Ac) (Wet Ponds)	0.151	0.110	X			Design - Info obtained from report Actual - Calculated using AutoCAD
Area at Design High Water Elevation (Ac)	0.361	0.337	X			Design - calculated based on known elevation areas in report Actual - Calculated using AutoCAD
Active Storage Available (Ac-Ft)*	0.827	0.705	X			Used equations below see attached calculations
Lowest Elevation at Top of Embankment (If Applicable)	844.6	844.21	X			Design - Obtained from plan detail Actual - lowest surveyed point at the top of embankment
Average Elevation at Top of Embankment (If Applicable)	845.6	845.6	X			Design - Obtained from plan detail Actual - Based on surveyed points
Maximum Bottom Elevation	834.0	835.48		X		Design - Obtained from plan detail Actual - Based on surveyed points
Average Pond Bottom Elevation	834.0	836.00		X		Design - obtained from plan detail Actual - Based on surveyed points
Pond Bottom Area (Ac)	—	0.011		X		Actual - Calculated using AutoCAD
Maximum Pond Depth	6'	4.19'		X		Design - Obtained from plan detail Actual - Normal Water Elev - Max Bottom Elev.
Average Pond Depth	6'	3.67'		X		Design - Normal water elev - ave. bottom elev. Actual - Normal Water Elev - Ave. Bottom Elev.

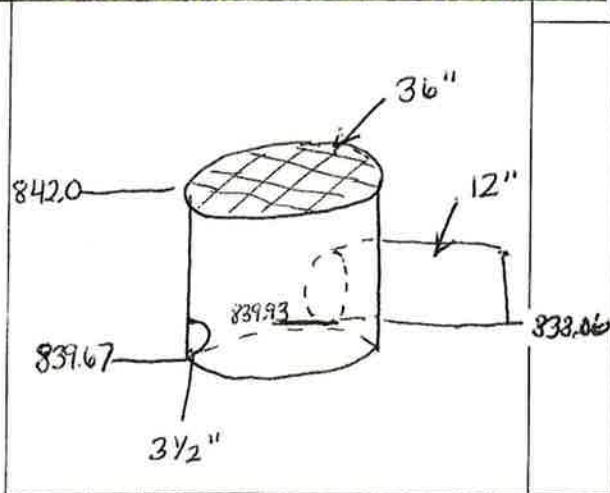
Note: Minimum pond depth is 3'. May need maintenance in near future.

*To Determine Active Storage $V = H/3(A1 + A2 + (A1 \times A2)^{1/2})$

Wet Ponds Use H = Height of Section, A1 = area at normal water elevation, A2 = area at top section

Dry Ponds Use H = Height of Section, A1 = pond bottom area, A2 = area at top section

HydroCAD was used to model the overall effect of discrepancies.



Inspection Firm: Bonestroo (now Stantec) Inspector Name : Joseph K. Tew
 Phone Number: 262-643-9012 Inspection Date: 8-24-11
 Address: 12075 Corporate Parkway,
Suite 200
Mequon, WI 53092

Certifying
 Professional Name: CarrieAnn M. Hewitt
 Phone Number: 262-643-9012



Date: 9-26-11 Signature: CarrieAnn M. Hewitt

Project	Carters Crossing - Basin	Project No	7667-10002-0	Page	
Client		Prepared by	CMH	Date	9-26-11
Calculations for	Storage Properties	Reviewed by	CMH + ARS	Date	



Area at ^{Design} Normal Water (A1) — 6,579 sf from report ($\frac{6579}{43560} = 0.151$ acres)

Area at Design High Water Elevation (A2) — 844.60 elevation
 844.00 — 14,318 sf (from report)
 845.00 — 16,645 sf (from report)
 of riprap per design detail

$$\frac{845-844}{16,645-14,318} = \frac{1}{2327} = \frac{0.6}{x} \quad x = 1396$$

$$14,318 \text{ sf} + 1,396 \text{ sf} = 15,714 \text{ sf} \quad \text{or} \quad 0.361$$

Active Storage Available (Design)

$$V = \frac{H}{3} (A_1 + A_2 + (A_1 \times A_2)^{1/2})$$

$$H = 4.6'$$

$$V = \frac{4.6}{3} (0.151 + 0.361 + (0.151 \times 0.361)^{1/2})$$

$$V = 0.827$$

Normal Water Elevation at Office elevation — 839.67

High Water Elevation at Riprap overflow elevation — 844.21

Area at Actual Normal Water Elevation (A1) — calculated the area of the contour in AutoCAD — 0.110 acres

Area at Actual High Water Elevation (A2) — calculated the area of the contour in AutoCAD — 0.337 acres

Active Storage Available (Actual)

$$V = \frac{H}{3} (A_1 + A_2 + (A_1 \times A_2)^{1/2})$$

$$H = 844.21 - 839.67 = 4.54'$$

$$V = \frac{4.54}{3} (0.110 + 0.337 + (0.110 \times 0.337)^{1/2})$$

$$V = 0.705$$

Reservoir Report

Page 1

Reservoir No. 1 - basin 1

Hydraflow Hydrographs by intellisolve

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	840.00	6,579	0	0
1.00	841.00	8,256	7,418	7,418
2.00	842.00	10,117	9,187	16,604
3.00	843.00	12,196	11,157	27,761
4.00	844.00	14,318	13,257	41,018
5.00	845.00	16,645	15,482	56,499
6.00	846.00	19,113	17,879	74,378

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 10.0	2.0	0.0	0.0
Span in	= 10.0	2.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 840.00	840.00	0.00	0.00
Length ft	= 49.0	0.0	0.0	0.0
Slope %	= 0.40	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

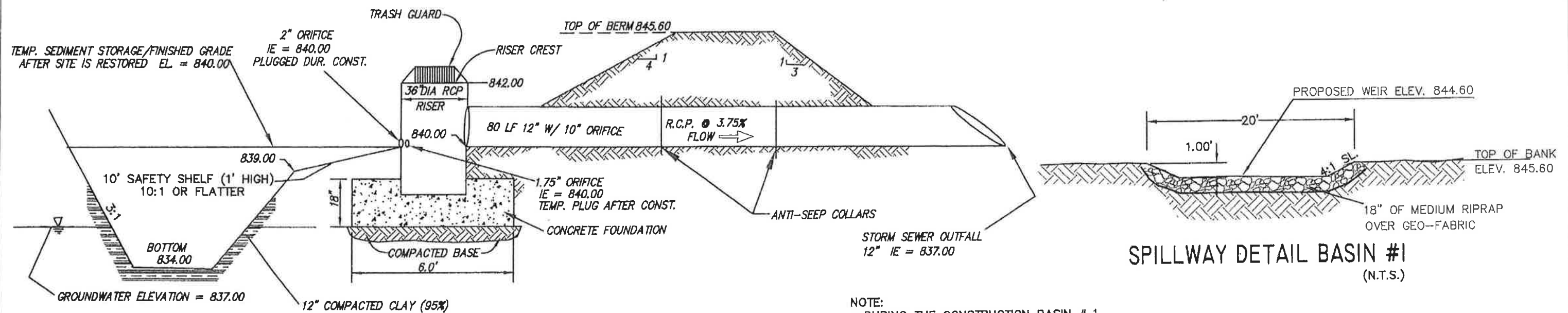
	[A]	[B]	[C]	[D]
Crest Len ft	= 2.00	0.00	0.00	0.00
Crest El. ft	= 842.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	840.00	0.00	0.00	---	---	0.00	---	---	---	---	0.00
1.00	7,418	841.00	0.10	0.10	---	---	0.00	---	---	---	---	0.10
2.00	16,604	842.00	0.15	0.14	---	---	0.00	---	---	---	---	0.14
3.00	27,761	843.00	3.53	0.04	---	---	3.49	---	---	---	---	3.53
4.00	41,018	844.00	4.31	0.02	---	---	4.29	---	---	---	---	4.31
5.00	56,499	845.00	4.93	0.01	---	---	4.91	---	---	---	---	4.93
6.00	74,378	846.00	5.46	0.01	---	---	5.43	---	---	---	---	5.44



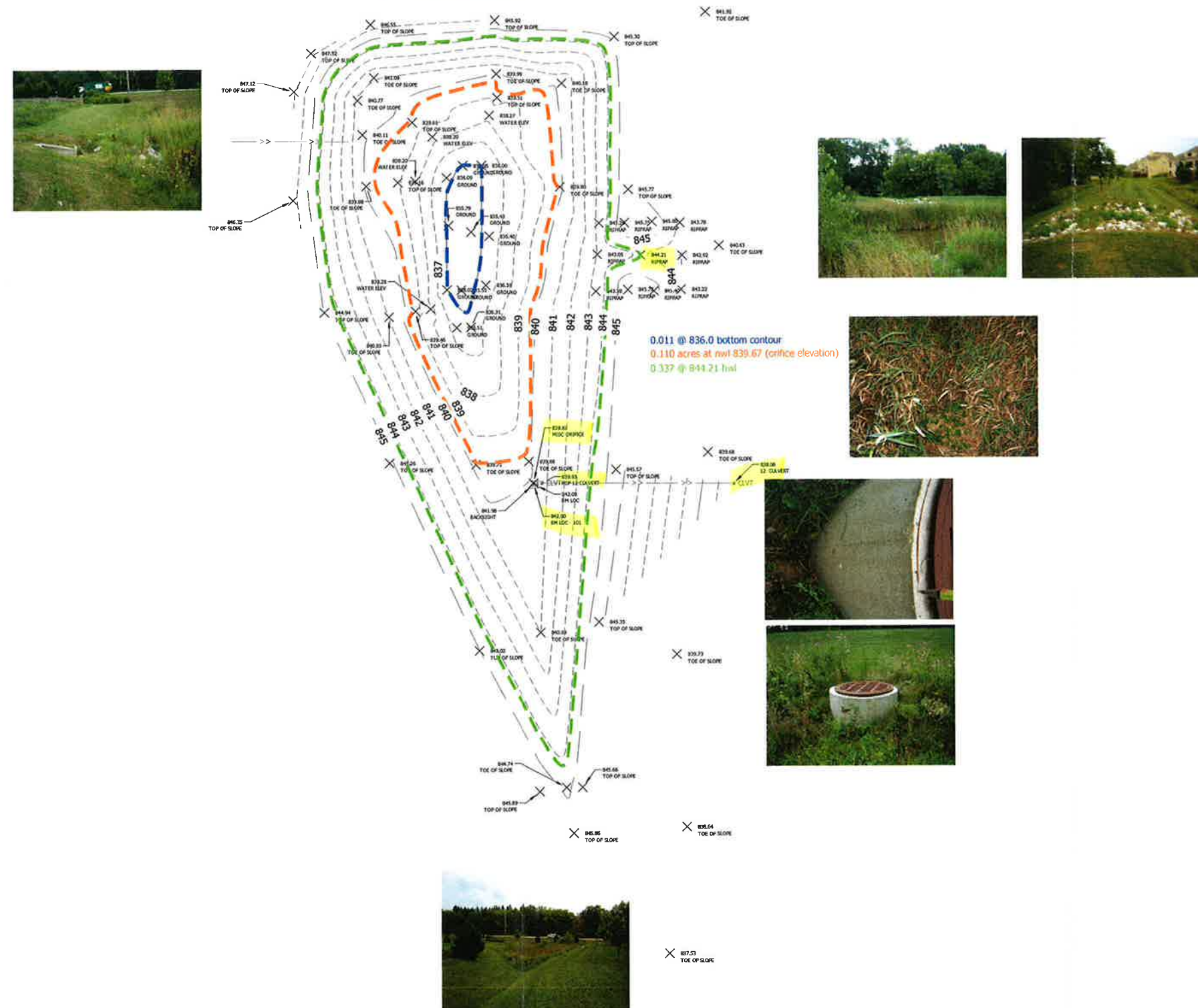
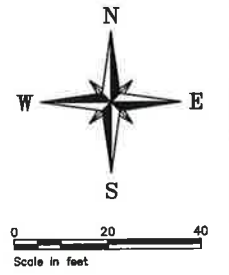
BASIN OUTFLOW CONTROL STRUCTURE

NOTE:
DURING THE CONSTRUCTION BASIN # 1
TO BE USED AS A SEDIMENT CONTROL BASIN
THE SEDIMENT BASIN IS TO BE CHECKED AFTER
EACH RUNOFF EVENT FOR STRUCTURAL
STABILITY AND DEPTH OF SEDIMENT. THE
BASIN IS TO BE CLEANED OUT WHEN THE
DEPTH OF SEDIMENT REACHES THE DEWATERING
HOLE.

DETENTION/SEDIMENTATION BASIN #1 DETAIL

(N.T.S.)

766711002
Menomonee Falls
Carters Crossing Basin 1
Surveyed 2011-08-24
JKT MJD





Village of Menomonee Falls
W156 N8480 Pilgrim Road
Menomonee Falls, WI 53051-3140
Telephone: (262) 532-4200

STORMWATER MANAGEMENT FACILITIES OPERATION AND INSPECTION REPORT

Quarter Section NE 1/4 Sect. 31 Name of Business/Subdivision Carter's Crossing
Property Tax ID Number 0121-064 Address of Property South of Silver Spring
between Lannon Rd. &
Townline Rd.

Dry Pond	☒
Wet Pond	☐
Other	☐

Description: Basin #2
SWP 31 N Col

Location Of Pond Outlot #2

Year Pond Constructed 2004 Year of Last Certification 2004

Compliance Verification	Design	Actual	Compliant Yes No	Comments (Condition of Structure)
Primary Outlet Pipe				
Opening Diameter	8"	8"	X	
Upstream Invert	839.00	839.09	X	within about 1" of design invert elevation (*)
Downstream Invert	837.85	—	—	
Length	229'	—	—	
Slope	0.005	—	—	
Secondary Outlet Pipe	(If Applicable)	NA		
Opening Diameter				
Upstream Invert				
Downstream Invert				
Length				
Slope				
Riser	(If Applicable)	NA		
Opening Diameter				
Elevation				
Upper Discharge Control	(If Applicable)	NA		
Opening Diameter				
Elevation				

* HydroCAD was used to model the overall effect of discrepancies.

Compliance Verification	Design	Actual	Compliant Yes No		Comments	
Lower Discharge Control	(If Applicable)		NA			
Opening Diameter						
Elevation						
Other (Description)			NA			
Opening Type						
Elevation						
Emergency Spillway						
Elevation	—	843.66	X		It does not appear from report data that an emergency spillway was originally included, but it's always good design to have one.	
Length of spillway	—	38'	X			
Embankment			Present Yes No			
Unauthorized plantings, trees, or woody vegetation				X		
Animal burrows or slope erosion				X		
Storage Properties	Design	Actual	Compliant Yes No		Points Surveyed	Equipment Used
Normal Water Elevation (Wet Ponds)	—	—	X			
Design High Water Elevation	842.89	843.66	X			Design — 100 yr. high water elev. Actual — low point in riprap
Area at Normal Water Elevation (Ac) (Wet Ponds)	—	—	X			
Area at Design High Water Elevation (Ac) (A2)	0.683	0.767	X			Design — From report Actual — calculated using AutoCAD
Active Storage Available (Ac-Ft)*	1.006	1.005	X			Calculations attached
Lowest Elevation at Top of Embankment (If Applicable)	—	843.66	X			
Average Elevation at Top of Embankment (If Applicable)	844.0	844.0	X			
Maximum Bottom Elevation	840	839.09	X			Deeper is fine.
Average Pond Bottom Elevation	840	840	X			
Pond Bottom Area (Ac) (A1)	0.241	.041	X			Although the area is smaller, it's somewhat misleading because there were many shots taken just over 840 and it made the 840 contour significantly smaller.
Maximum Pond Depth	2.89	4.57	X			
Average Pond Depth	—	3.66	X			

*To Determine Active Storage $V = H/3(A1 + A2 + (A1 \times A2)^{1/2})$

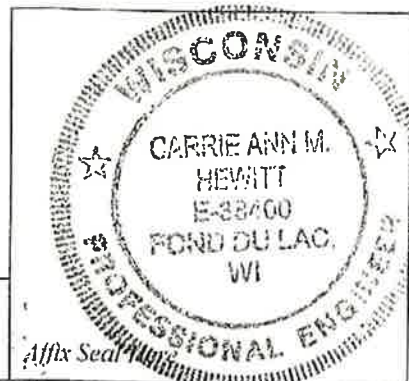
Wet Ponds Use H = Height of Section, $A1$ = area at normal water elevation, $A2$ = area at top section

Dry Ponds Use H = Height of Section, $A1$ = pond bottom area, $A2$ = area at top section

Sketch Outlet	
8" Culvert	

Inspection Firm: Bonestroo (now Starter) Inspector Name : Joseph K. Tew
 Phone Number: 262-643-9012 Inspection Date: 8-24-11
 Address: 12075 Corporate Parkway,
 Suite 200
 Mequon, WI 53092

Certifying
 Professional Name: CarrieAnn M. Hewitt
 Phone Number: 262-643-9012



Date: <u>9-26-11</u>	Signature: <u>CarrieAnn M. Hewitt</u>
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Project	Carters Crossing - Basin 2	Project No	7667-10002-0	Page	
Client		Prepared by	CMH	Date	9-26-11
Calculations for	Storage Properties	Reviewed by	CMH + AS	Date	



Area at Design High Water Elevation

According to plan sheet, the 100 year elevation is 842.89
From the pond data in the reservoir report,

$$842 - 26,243 \text{ sf}$$

$$843 - 30,172 \text{ sf}$$

$$\frac{843 - 842}{30,172 - 26,243} = \frac{1}{3929} = \frac{.89}{x} \quad x = 3,497$$

$$26,243 + 3,497 = 29,740 \text{ sf} \quad \text{or} \quad 0.683$$

Active Storage Available (Design)

$$V = H/3 (A1 + A2 + (A1 \times A2)^{1/2})$$

$$H = 842.89 - 840 = 2.89'$$

$$V = 2.89/3 (0.241 + 0.683 + (.241 \times .683)^{1/2})$$

$$V = 1.006$$

Active Storage Available (Actual)

$$V = H/3 (A1 + A2 + (A1 \times A2)^{1/2})$$

$$H = 843.66 - 840 = 3.66'$$

$$V = 3.66/3 (.041 + .767 + (.041 \times .767)^{1/2})$$

$$V = 1.005$$

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Hydraflow Hydrographs by Intelisolve

Pond storage is based on known contour areas. Conic method used.

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	839.00	00	0	0
1.00	840.00	10,482	3,494	3,494
2.00	841.00	23,280	16,459	19,953
3.00	842.00	26,243	24,744	44,697
4.00	843.00	30,172	28,182	72,879
5.00	844.00	36,450	33,258	106,137

	[A]	[B]	[C]	[D]
Rise in	= 8.0	0.0	0.0	0.0
Span in	= 8.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 839.00	0.00	0.00	0.00
Length ft	= 229.0	0.0	0.0	0.0
Slope %	= 0.50	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

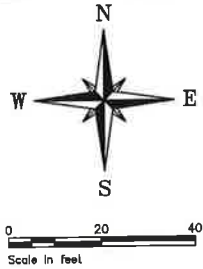
	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
Crest El, ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

[illegible]

766711002
Menomonee Falls
Carters Crossing Basin 2
Surveyed 2011-08-24
JKT MJD





Village of Menomonee Falls
W156 N8480 Pilgrim Road
Menomonee Falls, WI 53051-3140
Telephone: (262) 532-4200

STORMWATER MANAGEMENT FACILITIES OPERATION AND INSPECTION REPORT

Quarter Section NE 1/4 Sect. 31 Name of Business/Subdivision Carter's Crossing
Property Tax ID Number 0121-0644 Address of Property South of Silver Spring
0121-066 between Lannon Rd.
+ Townline Rd.

Dry Pond	
Wet Pond	☒
Other	

Location Of Pond Outlet #2 + Outlet #4

Description: Basin #3
SWP 31N002 and SWP 31N003

Year Pond Constructed 2004 Year of Last Certification 2004

Compliance Verification	Design	Actual	Compliant Yes No	Comments (Condition of Structure)
Primary Outlet Pipe				
Opening Diameter	18"	18"	X	
Upstream Invert	834.00	834.03	X	
Downstream Invert	833.80	833.68	X	Downstream invert slightly lower, but acceptable (*).
Length	44'	44'	X	
Slope	0.003	.008	X	
Secondary Outlet Pipe	(If Applicable)		NA	
Opening Diameter				
Upstream Invert				
Downstream Invert				
Length				
Slope				
Riser	(If Applicable)			
Opening Diameter	36"	36"	X	
Elevation	835.75'	836.19'	X	The riser should be lower (*).
Upper Discharge Control	(If Applicable)		NA	
Opening Diameter				
Elevation				

* HydroCAD was used to model the overall effect of discrepancies.

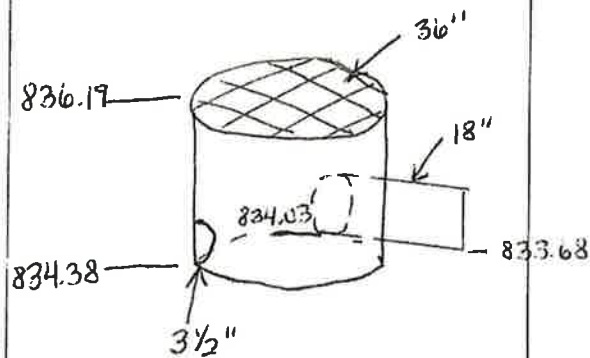
Compliance Verification	Design	Actual	Compliant Yes No		Comments	
Lower Discharge Control	(If Applicable)					
Opening Diameter	6"	3½"		X	The outlet should be almost double its size (*)	
Elevation	834.0	834.38		X	The outlet invert is 4½" higher than designed. Water level is lower than orifice elevation (*)	
Other (Description)			NA			
Opening Type						
Elevation						
Emergency Spillway						
Elevation	838.60	837.84		X	Emergency spillway is 9" lower than designed. (*)	
Length of spillway	30'	30'	X			
Embankment			Present Yes No			
Unauthorized plantings, trees, or woody vegetation				X	Water level is lower than orifice. May need to research clay liner on embankment.	
Animal burrows or slope erosion				X		
Storage Properties	Design	Actual	Compliant Yes No		Points Surveyed	Equipment Used
Normal Water Elevation (Wet Ponds)	834.00	834.38		X		Design - Obtained from plan detail Actual - Surveyed orifice invert elev.
Design High Water Elevation	838.60	837.84		X		Design - Overflow elev. from plan detail Actual - Surveyed riprapped overflow
Area at Normal Water (A1) Elevation (Ac) (Wet Ponds)	0.962	0.817		X		Design - Info. obtained from report Actual - Calculated using AutoCAD
Area at Design High (A2) Water Elevation (Ac)	1.651	1.416	X			Design - calculated based on known elevation areas in report Actual - Calculated using AutoCAD
Active Storage Available (Ac-Ft)*	5.224	3.910		X		Used equations below. See attached calculations
Lowest Elevation at Top of Embankment (If Applicable)	838.60	837.84		X		Design - Obtained from plan detail Actual - Surveyed
Average Elevation at Top of Embankment (If Applicable)	839.60	840.0	X			Design - Obtained from plan detail. Actual - Surveyed
Maximum Bottom Elevation	827.00	823.0	X			Design - Obtained from plan detail. Actual - surveyed
Average Pond Bottom Elevation	827.00	826.0	X			Design - Obtained from plan detail Actual - based on surveyed points
Pond Bottom Area (Ac)	—	0.047	X			— Actual - Calculated using AutoCAD
Maximum Pond Depth	7'	11' ±	X			Design - Obtained from plan detail Actual - Normal Water Elev - Max Bottom Elev
Average Pond Depth	7'	8'-11'	X			Design - Normal water elev. - ave. bottom elev Actual - Normal water elev. - ave. bottom elev

*To Determine Active Storage $V = H/3(A1 + A2 + (A1 \times A2)^{1/2})$

Wet Ponds Use H = Height of Section, $A1$ = area at normal water elevation, $A2$ = area at top section

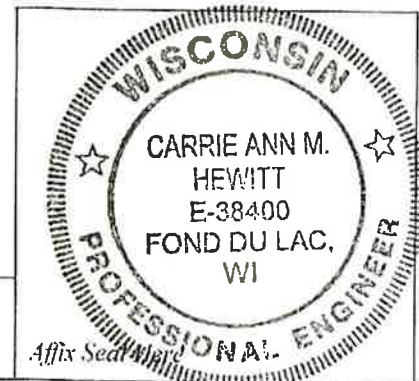
Dry Ponds Use H = Height of Section, $A1$ = pond bottom area, $A2$ = area at top section

* HydroCAD was used to model the overall effect of discrepancies.



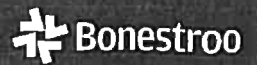
Inspection Firm: Bonestroo Crow Stantec Inspector Name : Joseph K. Tew
 Phone Number: 262-643-9012 Inspection Date: 8-24-11
 Address: 12075 Corporate Parkway,
Suite 200
Mequon, WI 53092

Certifying
 Professional Name: Carrie Ann M. Hewitt
 Phone Number: 262-643-9012



Date: 9-27-11 Signature: Carrie Ann M. Hewitt

Project	Carters Crossing - Basin 3	Project No	7667-10002-0	Page	
Client		Prepared by	CMH	Date	9-27-11
Calculations for	Storage Properties	Reviewed by	CMH + AS	Date	



Design High Water (A1) = 838.60 from detail

Area at Design High Water Elevation (A2) — areas at contour elevations from report

$$838 = 1.545 \text{ acres}$$

$$838.6 = x$$

$$839 = 1.722 \text{ acres}$$

$$\frac{839 - 838}{1.722 - 1.545} = \frac{1}{.177} = \frac{.6}{x} \quad x = .106$$

$$1.545 + 0.106 = \underline{1.651}$$

Active Storage Available (Design)

$$V = H/3 (A1 + A2 + (A1 \times A2)^{1/2})$$

$$H = 838.60 - 834.00 = 4.60'$$

$$V = 4.60/3 (0.962 + 1.651 + (0.962 \times 1.651)^{1/2})$$

$$V = 5.224$$

Active Storage Available (Actual)

$$V = H/3 (A1 + A2 + (A1 \times A2)^{1/2})$$

$$H = 837.84 - 834.38 = 3.46'$$

$$V = 3.46/3 (0.817 + 1.416 + (0.817 \times 1.416)^{1/2})$$

$$V = 3.910$$

Reservoir Report

Reservoir No. 3 - basin 3

Hydraflow Hydrographs by Intelisolve

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	834.00	41,896	0	0
1.00	835.00	48,712	45,304	45,304
2.00	836.00	54,201	51,457	96,761
3.00	837.00	59,702	56,952	153,712
4.00	838.00	67,300	63,501	217,213
5.00	839.00	74,991	71,146	288,359

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	6.0	0.0	0.0
Span in	= 18.0	6.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 834.00	834.00	0.00	0.00
Length ft	= 44.0	0.0	0.0	0.0
Slope %	= 0.30	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

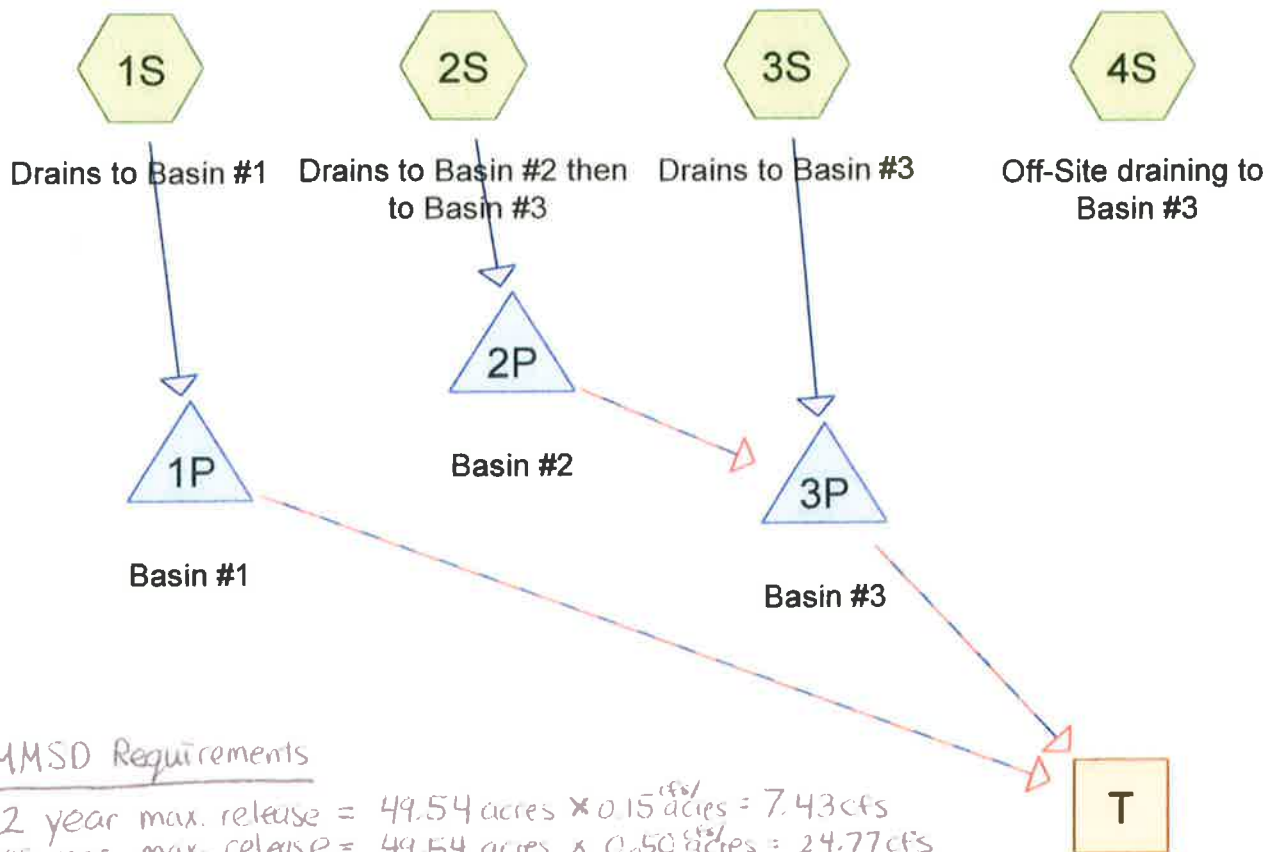
	[A]	[B]	[C]	[D]
Crest Len ft	= 6.00	0.00	0.00	0.00
Crest El. ft	= 835.75	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	--	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	834.00	0.00	0.00	---	---	0.00	---	---	---	---	0.00
1.00	45,304	835.00	0.72	0.72	---	---	0.00	---	---	---	---	0.72
2.00	96,761	836.00	3.28	0.79	---	---	2.50	---	---	---	---	3.28
3.00	153,712	837.00	11.65	0.27	---	---	11.38	---	---	---	---	11.65
4.00	217,213	838.00	15.10	0.16	---	---	14.93	---	---	---	---	15.10
5.00	288,359	839.00	17.51	0.12	---	---	17.37	---	---	---	---	17.49



From Model $\left\{ \begin{array}{l} 2 \text{ year} = 0.69 \text{ cfs} \\ 100 \text{ year} = 24.42 \text{ cfs} \end{array} \right.$

Meets Approved MMSD Requirements



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Type II 24-hr 2 year Rainfall=2.60"

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Summary for Subcatchment 1S: Drains to Basin #1

Runoff = 3.88 cfs @ 12.19 hrs, Volume= 0.324 af, Depth> 0.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 year Rainfall=2.60"

Area (ac)	CN	Description
* 7.100	73	
7.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.1					Direct Entry, According to previous design

Summary for Subcatchment 2S: Drains to Basin #2 then to Basin #3

Runoff = 4.24 cfs @ 12.22 hrs, Volume= 0.374 af, Depth> 0.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 year Rainfall=2.60"

Area (ac)	CN	Description
* 8.200	73	
8.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.2					Direct Entry, According to previous design

Summary for Subcatchment 3S: Drains to Basin #3

Runoff = 12.68 cfs @ 12.24 hrs, Volume= 1.162 af, Depth> 0.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 year Rainfall=2.60"

Area (ac)	CN	Description
* 25.500	73	
25.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.6					Direct Entry, According to previous design

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Summary for Subcatchment 4S: Off-Site draining to Basin #3

Runoff = 3.11 cfs @ 12.17 hrs, Volume= 0.272 af, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Type II 24-hr 2 year Rainfall=2.60"

Area (ac)	CN	Description
* 8.740	68	
8.740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					Direct Entry, According to previous design

Summary for Reach T: Total

Inflow Area = 40.800 ac, 0.00% Impervious, Inflow Depth > 0.11" for 2 year event

Inflow = 0.69 cfs @ 19.39 hrs, Volume= 0.378 af

Outflow = 0.69 cfs @ 19.39 hrs, Volume= 0.378 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Basin #1

Inflow Area = 7.100 ac, 0.00% Impervious, Inflow Depth > 0.55" for 2 year event

Inflow = 3.88 cfs @ 12.19 hrs, Volume= 0.324 af

Outflow = 0.13 cfs @ 20.00 hrs, Volume= 0.078 af, Atten= 97%, Lag= 468.4 min

Primary = 0.13 cfs @ 20.00 hrs, Volume= 0.078 af

Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 841.40' @ 20.00 hrs Surf.Area= 0.202 ac Storage= 0.246 af

Plug-Flow detention time= 245.8 min calculated for 0.078 af (24% of inflow)

Center-of-Mass det. time= 138.7 min (972.8 - 834.1)

Volume	Invert	Avail.Storage	Storage Description
#1	839.93'	1.280 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
839.93	0.131	0.000	0.000
841.00	0.183	0.168	0.168
842.00	0.229	0.206	0.374
843.00	0.276	0.252	0.626
844.00	0.325	0.300	0.927
845.00	0.381	0.353	1.280

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Type II 24-hr 2 year Rainfall=2.60"

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Device	Routing	Invert	Outlet Devices
#1	Primary	839.93'	12.0" Round Culvert L= 57.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 839.93' / 837.00' S= 0.0514 ' S= 0.0514 ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 1	839.67'	2.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	842.00'	36.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Secondary	844.21'	22.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.13 cfs @ 20.00 hrs HW=841.40' (Free Discharge)

1=Culvert (Passes 0.13 cfs of 3.73 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.13 cfs @ 5.85 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=839.93' (Free Discharge)

4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 2P: Basin #2

Inflow Area = 8.200 ac, 0.00% Impervious, Inflow Depth > 0.55" for 2 year event
 Inflow = 4.24 cfs @ 12.22 hrs, Volume= 0.374 af
 Outflow = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 466.9 min
 Discarded = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 841.31' @ 20.00 hrs Surf.Area= 0.480 ac Storage= 0.373 af

Plug-Flow detention time= 288.7 min calculated for 0.000 af (0% of inflow)
 Center-of-Mass det. time= 158.4 min (994.1 - 835.6)

Volume	Invert	Avail.Storage	Storage Description
#1	840.00'	2.168 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
840.00	0.041	0.000	0.000
841.00	0.424	0.232	0.232
842.00	0.603	0.513	0.746
843.00	0.708	0.656	1.401
844.00	0.825	0.766	2.168

Device	Routing	Invert	Outlet Devices
#1	Discarded	840.00'	0.600 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 834.00' Phase-In= 840.00'
#2	Secondary	843.06'	16.0' long x 15.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

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Type II 24-hr 2 year Rainfall=2.60"

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Discarded OutFlow Max=0.00 cfs @ 20.00 hrs HW=841.31' (Free Discharge)

└1=Exfiltration (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=840.00' (Free Discharge)

└2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 3P: Basin #3

Inflow Area = 33.700 ac, 0.00% Impervious, Inflow Depth > 0.41" for 2 year event
 Inflow = 12.68 cfs @ 12.24 hrs, Volume= 1.162 af
 Outflow = 0.56 cfs @ 19.31 hrs, Volume= 0.299 af, Atten= 96%, Lag= 424.2 min
 Primary = 0.56 cfs @ 19.31 hrs, Volume= 0.299 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 834.98' @ 19.31 hrs Surf.Area= 0.950 ac Storage= 0.865 af

Plug-Flow detention time= 269.4 min calculated for 0.298 af (26% of inflow)
 Center-of-Mass det. time= 163.3 min (1,000.0 - 836.6)

Volume	Invert	Avail.Storage	Storage Description
#1	834.00'	6.028 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
834.00	0.817	0.000	0.000
835.00	0.953	0.885	0.885
836.00	1.117	1.035	1.920
837.00	1.283	1.200	3.120
838.00	1.454	1.368	4.488
839.00	1.624	1.539	6.028

Device	Routing	Invert	Outlet Devices
#1	Primary	834.03'	18.0" Round Culvert L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 834.03' / 833.80' S= 0.0052 ' / Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Device 1	834.38'	6.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	836.19'	36.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Secondary	837.84'	30.0' long x 25.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.56 cfs @ 19.31 hrs HW=834.98' (Free Discharge)

└1=Culvert (Passes 0.56 cfs of 3.12 cfs potential flow)

└└2=Orifice/Grate (Orifice Controls 0.56 cfs @ 2.84 fps)

└└└3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=834.00' (Free Discharge)

└4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

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Type II 24-hr 2 year Rainfall=2.60"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Drains to Basin #1 Runoff Area=7.100 ac 0.00% Impervious Runoff Depth>0.55"
Tc=23.1 min CN=73 Runoff=3.88 cfs 0.324 af

Subcatchment 2S: Drains to Basin #2 then Runoff Area=8.200 ac 0.00% Impervious Runoff Depth>0.55"
Tc=25.2 min CN=73 Runoff=4.24 cfs 0.374 af

Subcatchment 3S: Drains to Basin #3 Runoff Area=25.500 ac 0.00% Impervious Runoff Depth>0.55"
Tc=26.6 min CN=73 Runoff=12.68 cfs 1.162 af

Subcatchment 4S: Off-Site draining to Basin Runoff Area=8.740 ac 0.00% Impervious Runoff Depth>0.37"
Tc=20.0 min CN=68 Runoff=3.11 cfs 0.272 af

Reach T: Total Inflow=0.69 cfs 0.378 af
Outflow=0.69 cfs 0.378 af

Pond 1P: Basin #1 Peak Elev=841.40' Storage=0.246 af Inflow=3.88 cfs 0.324 af
Primary=0.13 cfs 0.078 af Secondary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.078 af

Pond 2P: Basin #2 Peak Elev=841.31' Storage=0.373 af Inflow=4.24 cfs 0.374 af
Discarded=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 3P: Basin #3 Peak Elev=834.98' Storage=0.865 af Inflow=12.68 cfs 1.162 af
Primary=0.56 cfs 0.299 af Secondary=0.00 cfs 0.000 af Outflow=0.56 cfs 0.299 af

Total Runoff Area = 49.540 ac Runoff Volume = 2.132 af Average Runoff Depth = 0.52"
100.00% Pervious = 49.540 ac 0.00% Impervious = 0.000 ac

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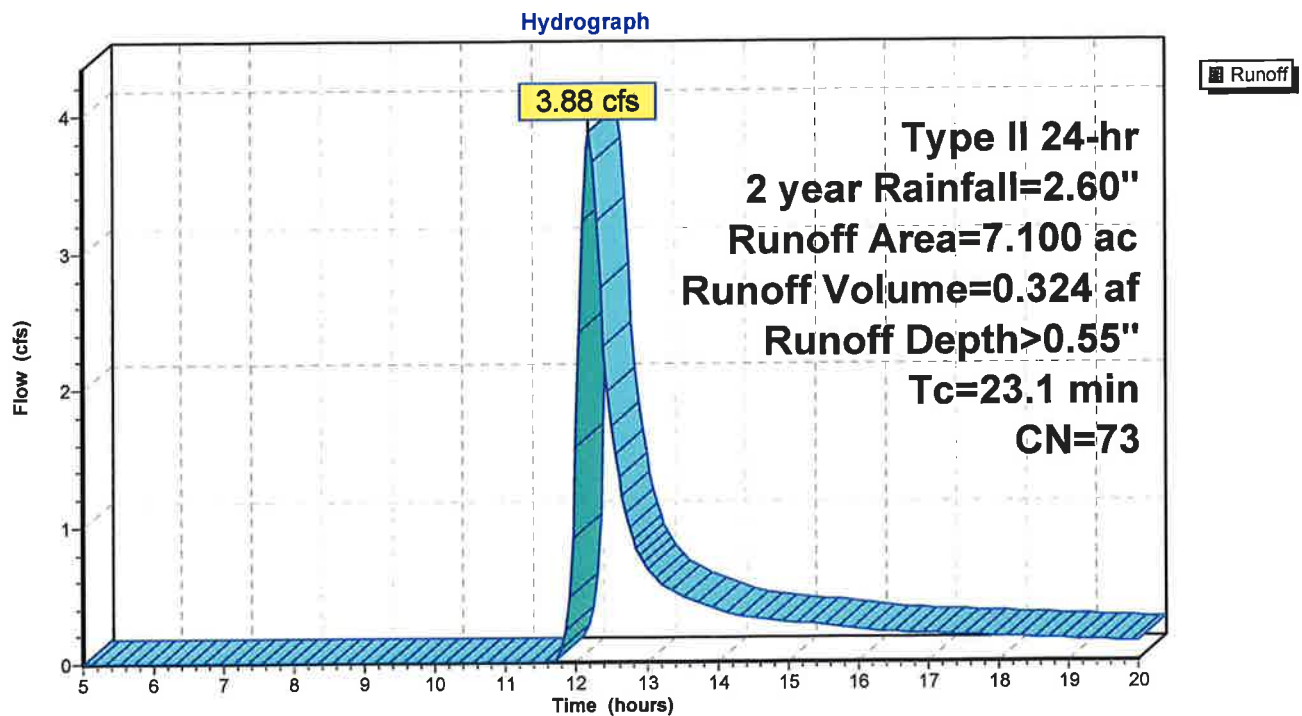
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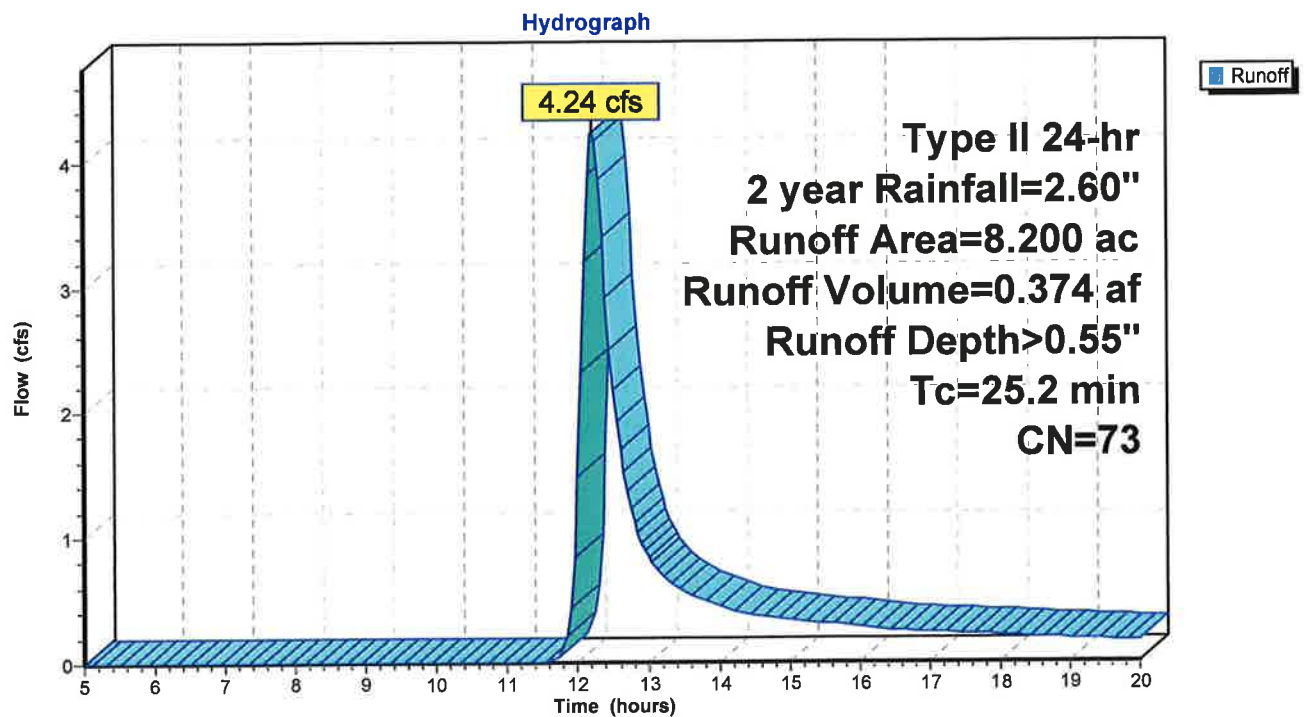
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Subcatchment 1S: Drains to Basin #1



Subcatchment 2S: Drains to Basin #2 then to Basin #3



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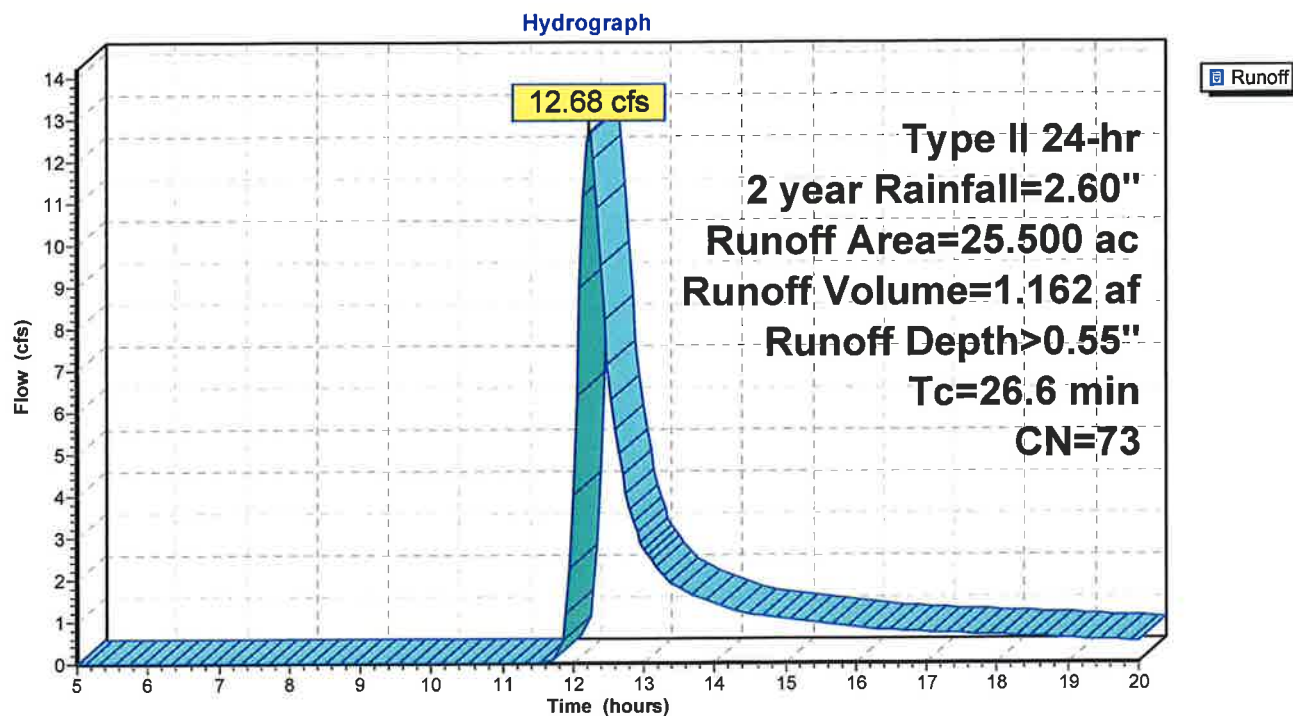
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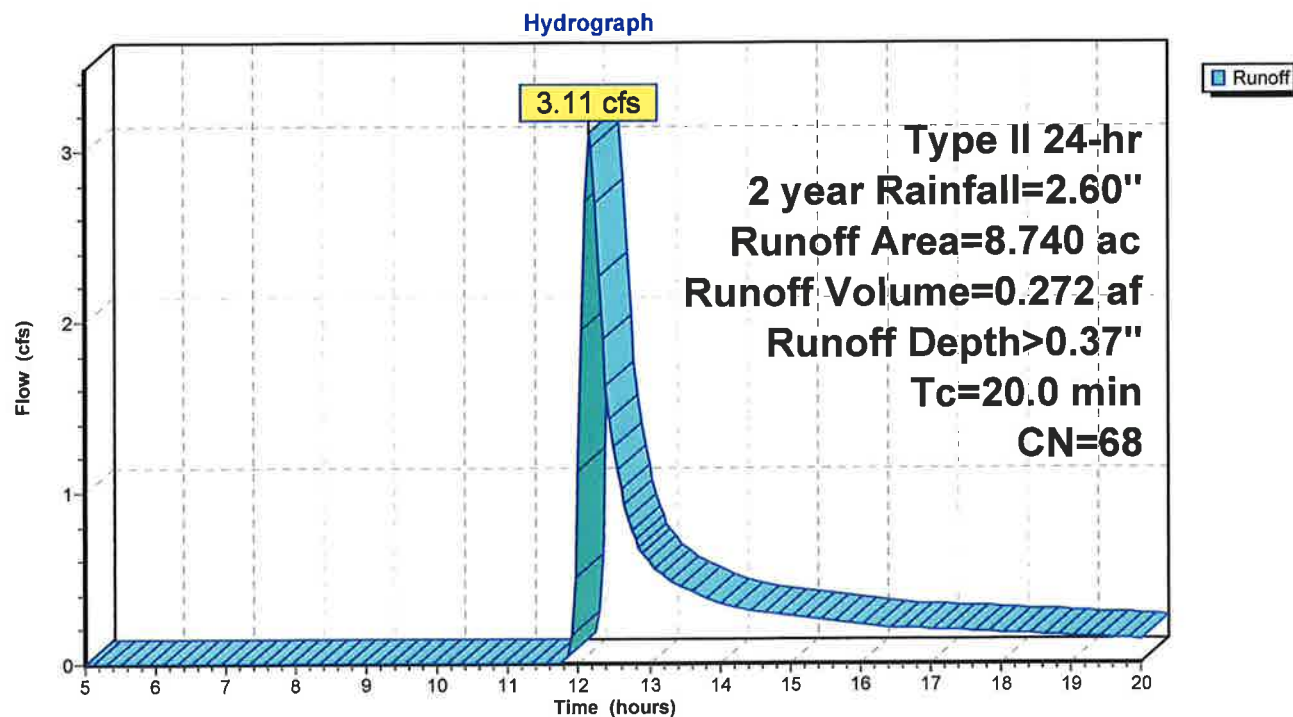
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Subcatchment 3S: Drains to Basin #3



Subcatchment 4S: Off-Site draining to Basin #3



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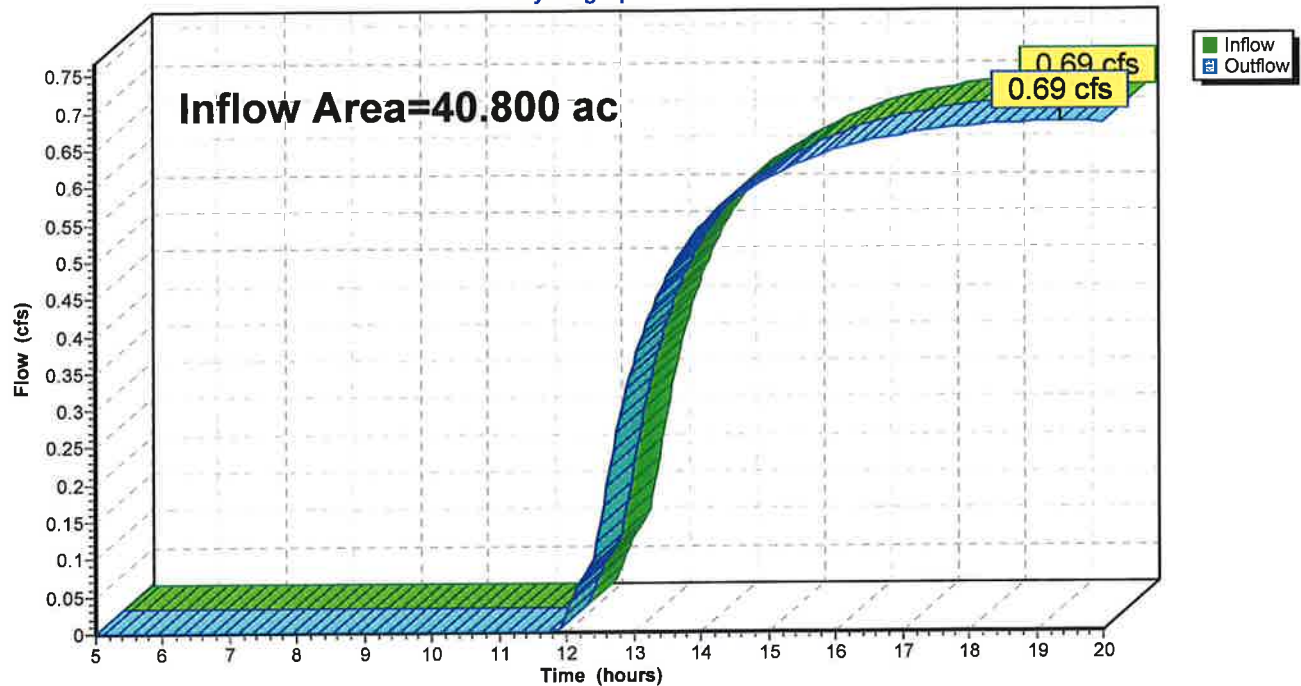
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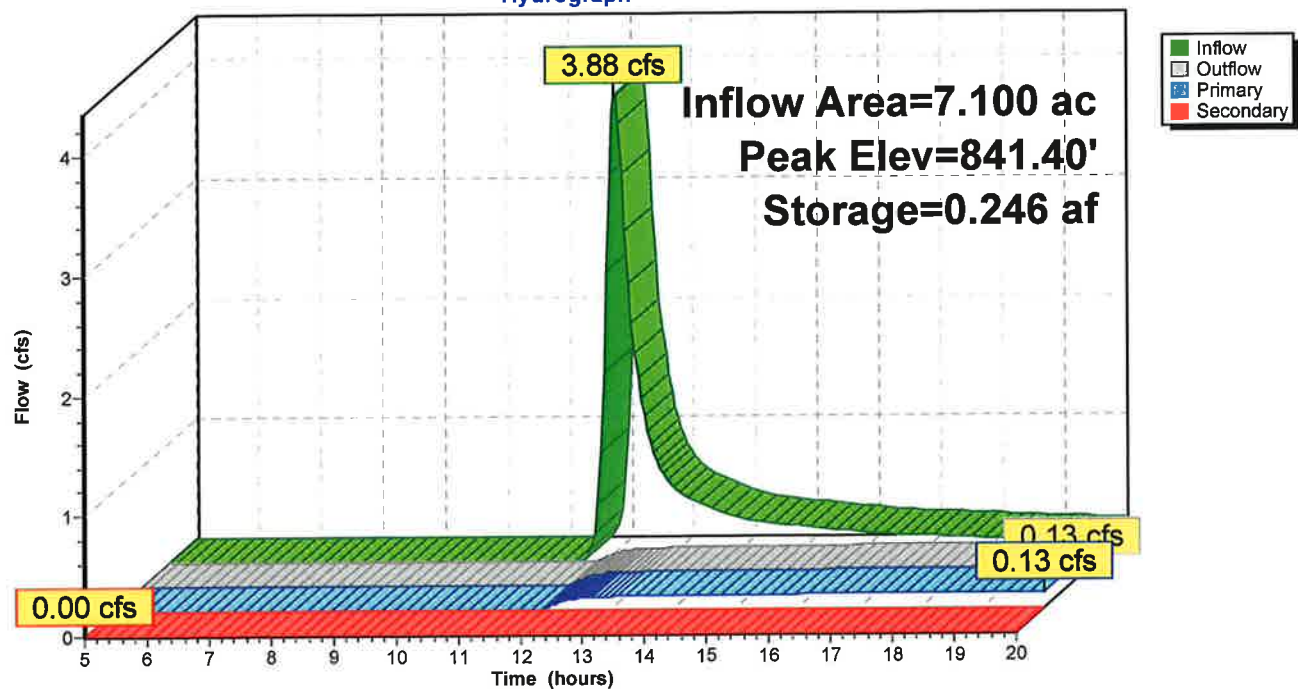
Reach T: Total

Hydrograph



Pond 1P: Basin #1

Hydrograph



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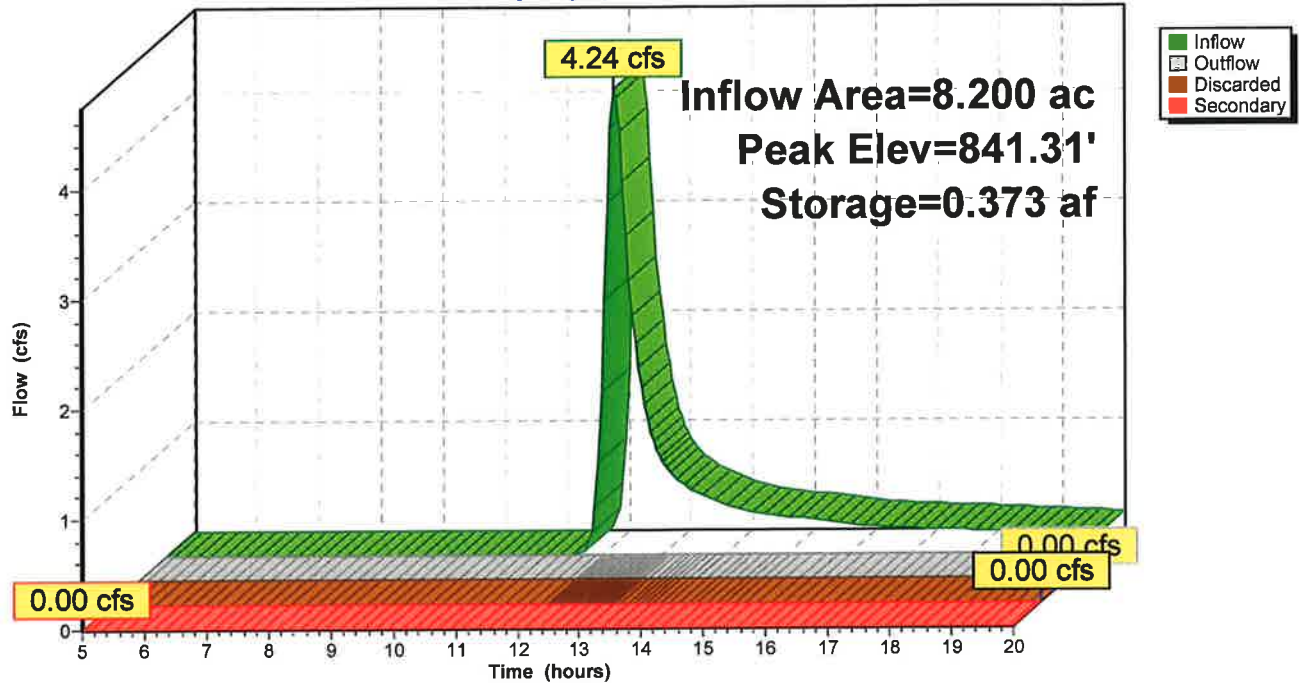
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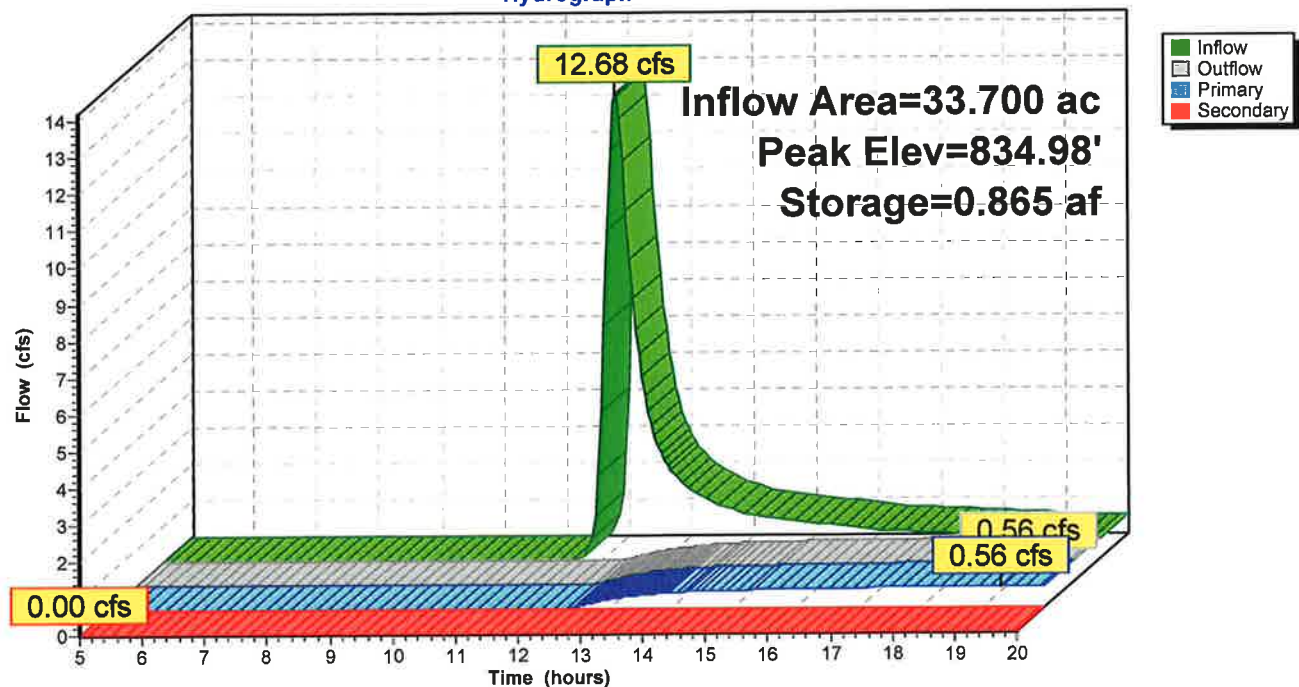
Pond 2P: Basin #2

Hydrograph



Pond 3P: Basin #3

Hydrograph



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Type II 24-hr 100 year Rainfall=7.10"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Drains to Basin #1 Runoff Area=7.100 ac 0.00% Impervious Runoff Depth>3.70"
Tc=23.1 min CN=73 Runoff=29.10 cfs 2.190 af

Subcatchment 2S: Drains to Basin #2 then Runoff Area=8.200 ac 0.00% Impervious Runoff Depth>3.70"
Tc=25.2 min CN=73 Runoff=31.87 cfs 2.527 af

Subcatchment 3S: Drains to Basin #3 Runoff Area=25.500 ac 0.00% Impervious Runoff Depth>3.70"
Tc=26.6 min CN=73 Runoff=95.93 cfs 7.855 af

Subcatchment 4S: Off-Site draining to Basin Runoff Area=8.740 ac 0.00% Impervious Runoff Depth>3.19"
Tc=20.0 min CN=68 Runoff=33.62 cfs 2.327 af

Reach T: Total Inflow=24.42 cfs 8.364 af
Outflow=24.42 cfs 8.364 af

Pond 1P: Basin #1 Peak Elev=844.20' Storage=0.995 af Inflow=29.10 cfs 2.190 af
Primary=7.35 cfs 1.802 af Secondary=0.00 cfs 0.000 af Outflow=7.35 cfs 1.802 af

Pond 2P: Basin #2 Peak Elev=843.27' Storage=1.599 af Inflow=31.87 cfs 2.527 af
Discarded=0.00 cfs 0.001 af Secondary=4.24 cfs 1.034 af Outflow=4.24 cfs 1.035 af

Pond 3P: Basin #3 Peak Elev=837.93' Storage=4.387 af Inflow=95.93 cfs 8.889 af
Primary=15.10 cfs 6.462 af Secondary=2.24 cfs 0.100 af Outflow=17.34 cfs 6.562 af

Total Runoff Area = 49.540 ac Runoff Volume = 14.899 af Average Runoff Depth = 3.61"
100.00% Pervious = 49.540 ac 0.00% Impervious = 0.000 ac

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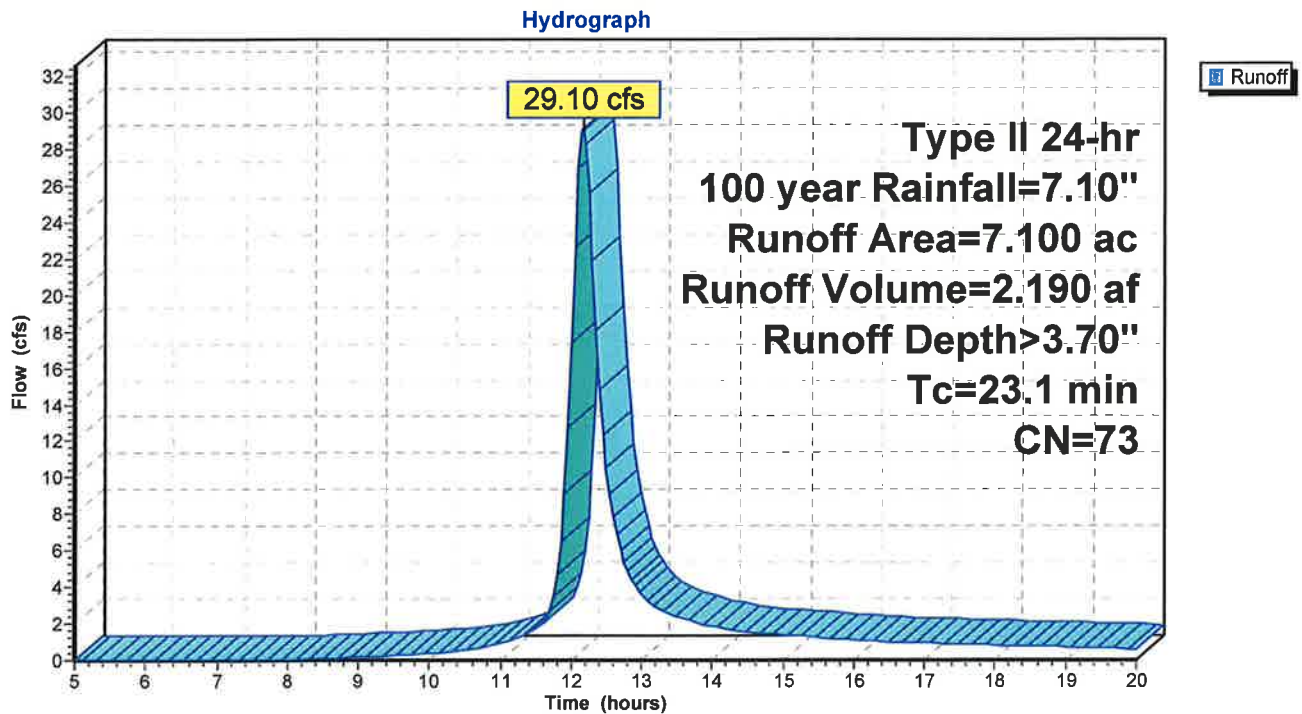
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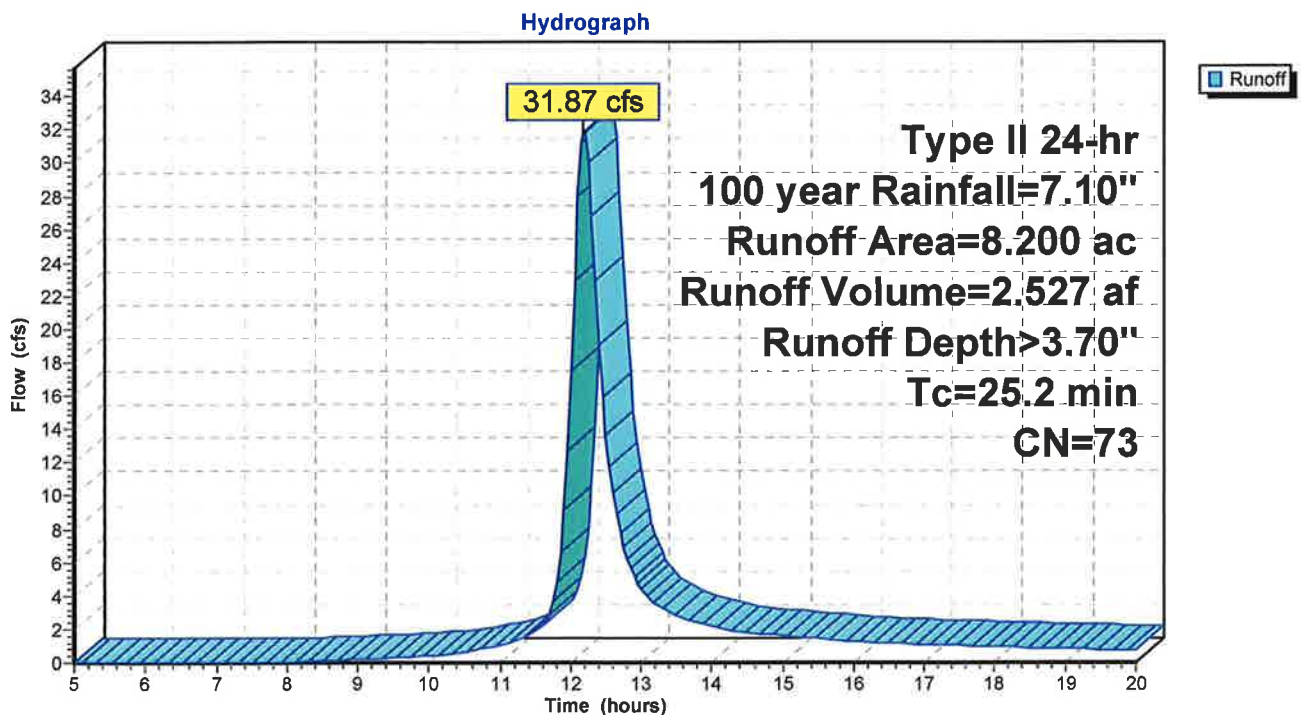
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Subcatchment 1S: Drains to Basin #1



Subcatchment 2S: Drains to Basin #2 then to Basin #3



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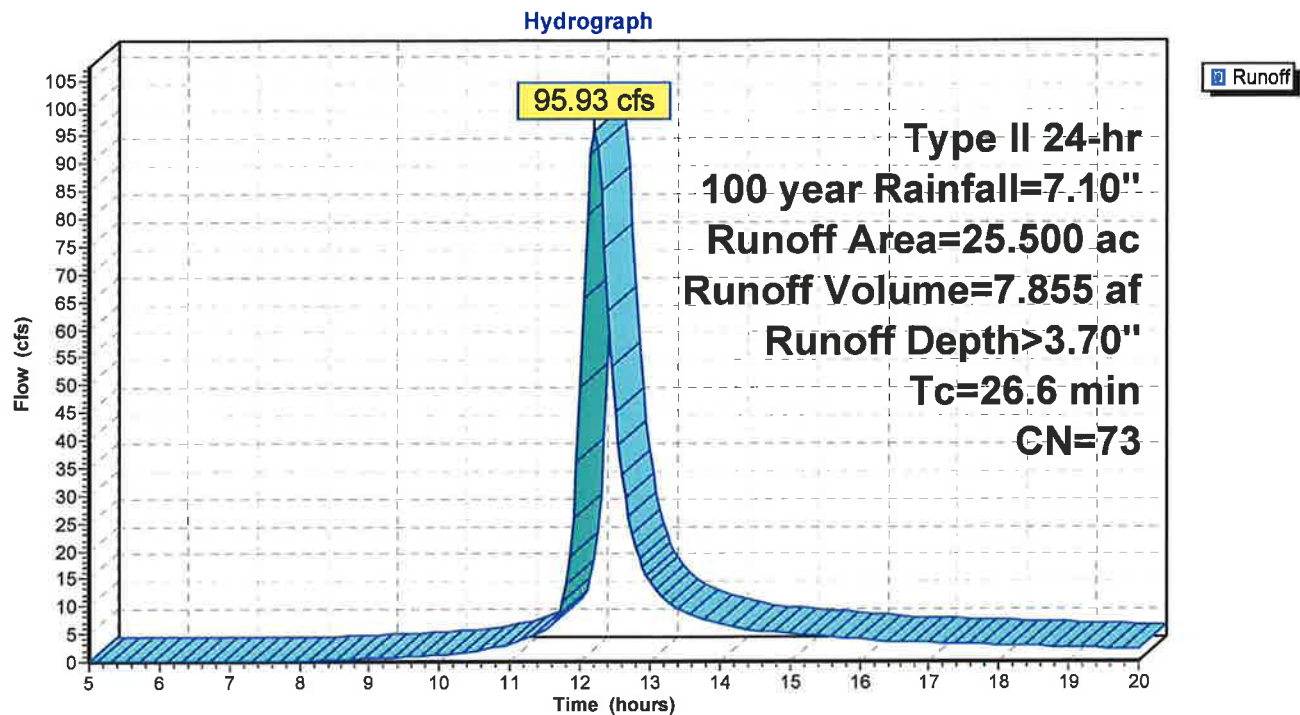
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Type II 24-hr 100 year Rainfall=7.10"

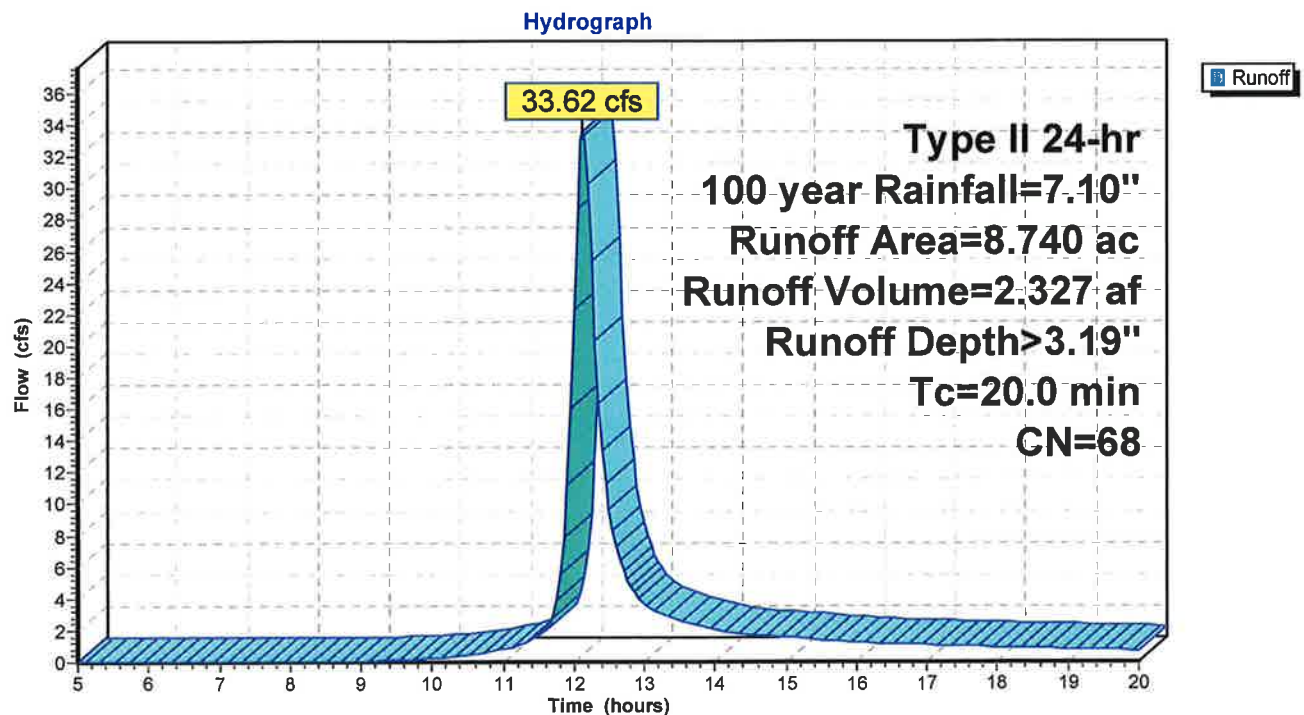
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Subcatchment 3S: Drains to Basin #3



Subcatchment 4S: Off-Site draining to Basin #3



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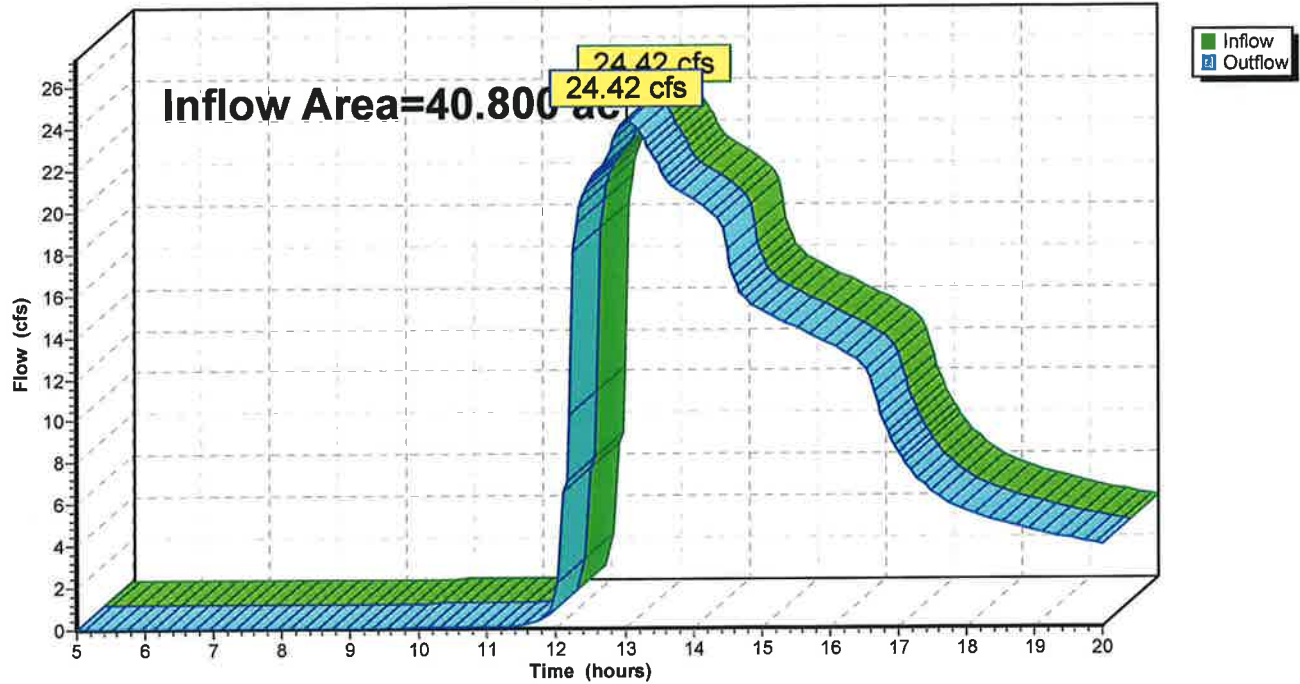
Type II 24-hr 100 year Rainfall=7.10"

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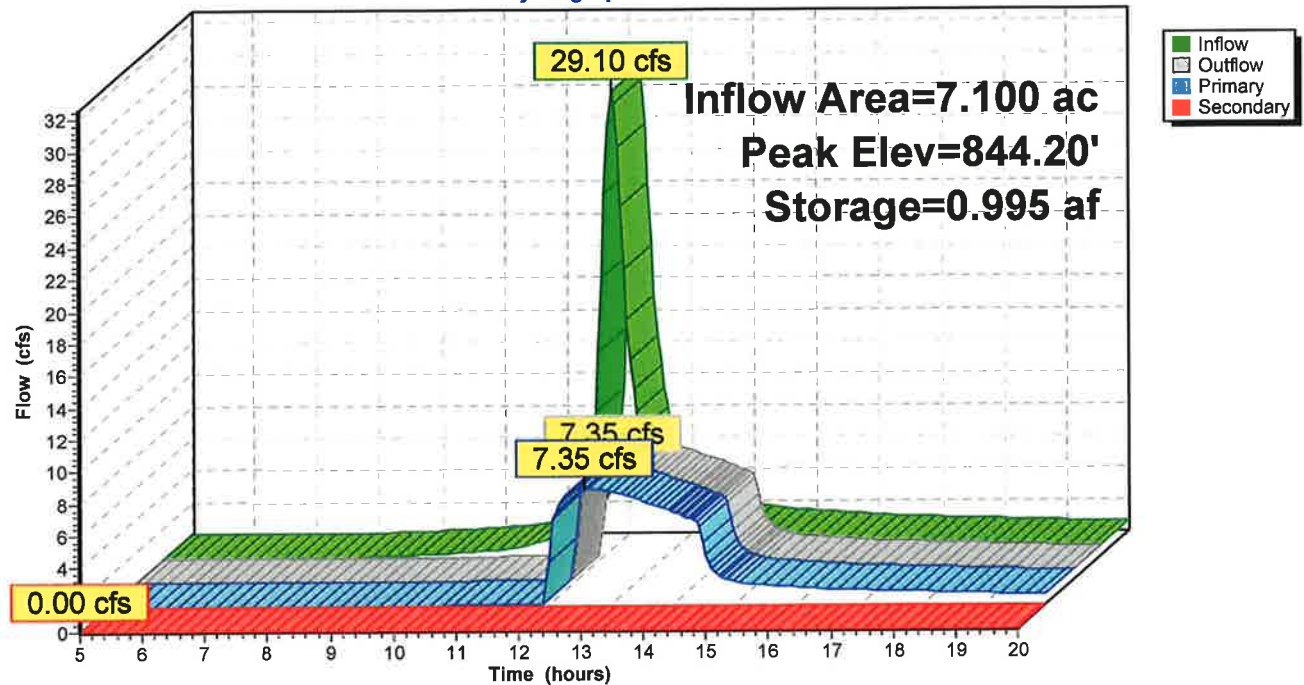
Reach T: Total

Hydrograph



Pond 1P: Basin #1

Hydrograph



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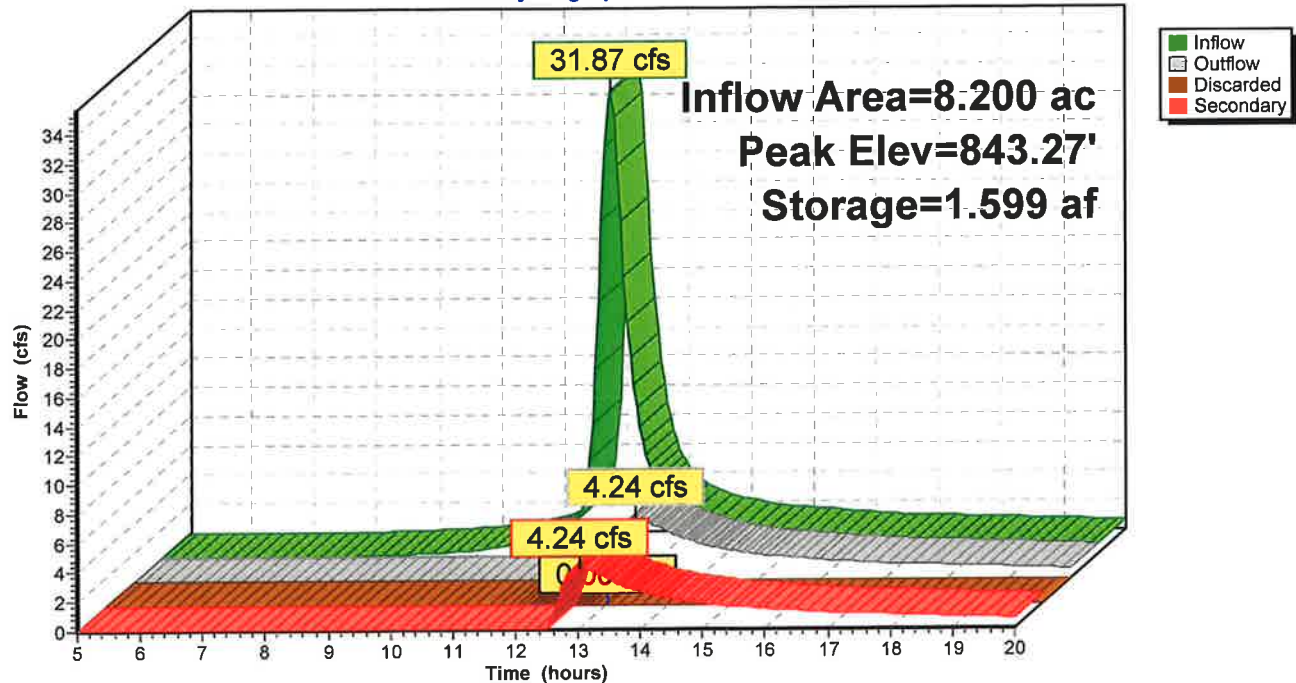
Type II 24-hr 100 year Rainfall=7.10"

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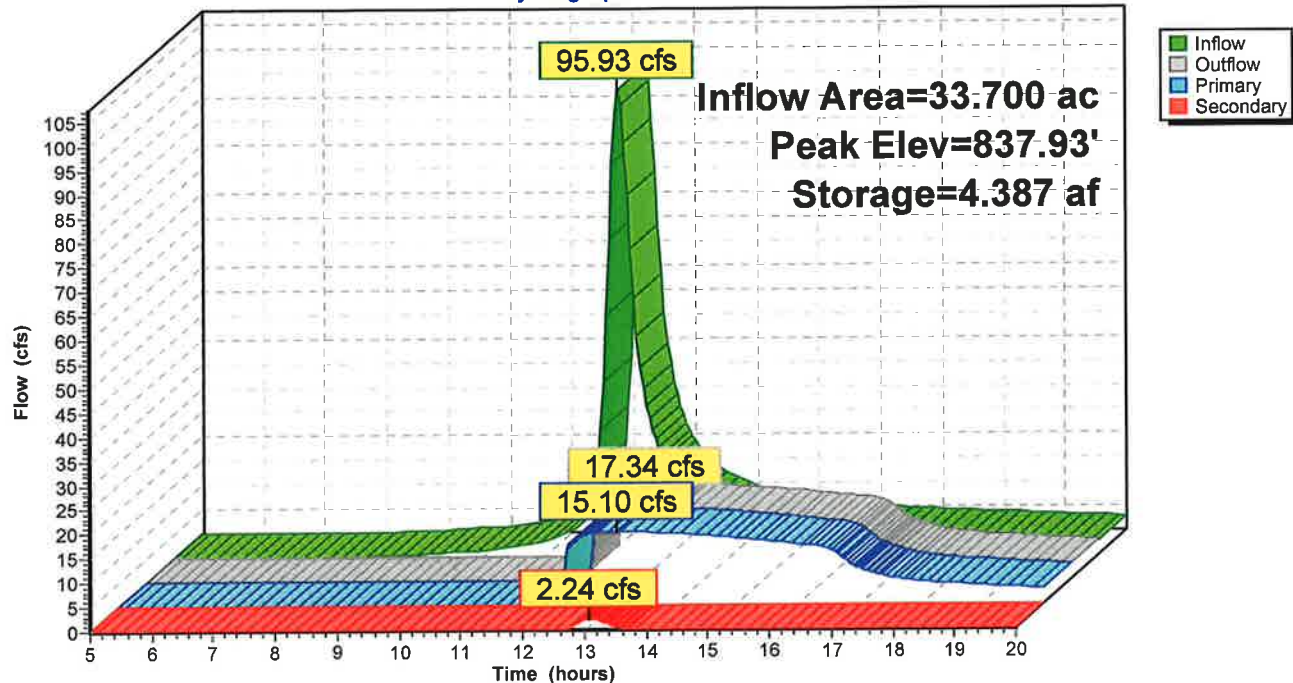
Pond 2P: Basin #2

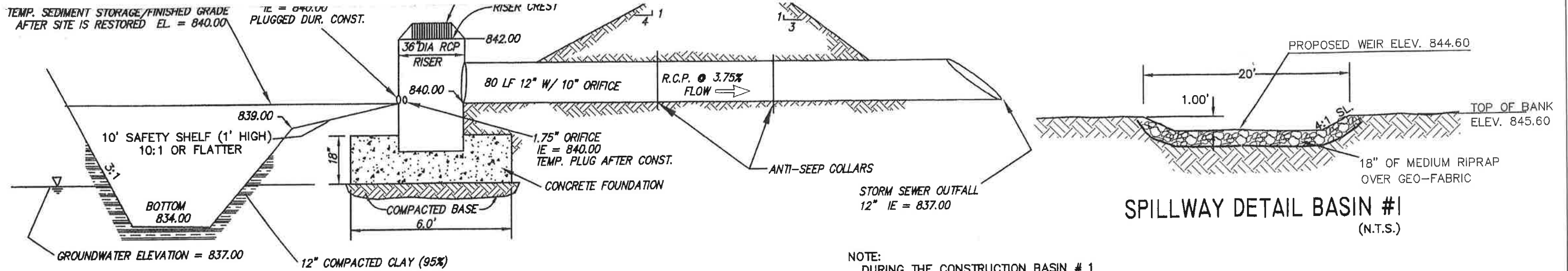
Hydrograph



Pond 3P: Basin #3

Hydrograph



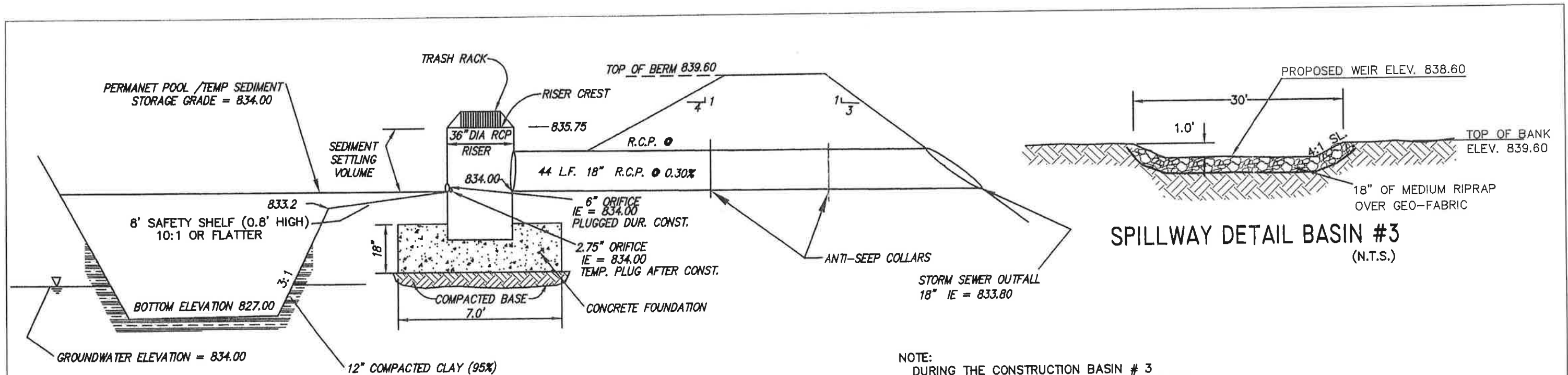


BASIN OUTFLOW CONTROL STRUCTURE

NOTE:
DURING THE CONSTRUCTION BASIN # 1
TO BE USED AS A SEDIMENT CONTROL BASIN
THE SEDIMENT BASIN IS TO BE CHECKED AFTER
EACH RUNOFF EVENT FOR STRUCTURAL
STABILITY AND DEPTH OF SEDIMENT. THE
BASIN IS TO BE CLEANED OUT WHEN THE
DEPTH OF SEDIMENT REACHES THE DEWATERING
HOLE.

DETENTION/SEDIMENTATION BASIN #1 DETAIL

(N.T.S.)



BASIN OUTFLOW CONTROL STRUCTURE

NOTE:
DURING THE CONSTRUCTION BASIN # 3
TO BE USED AS A SEDIMENT CONTROL BASIN
THE SEDIMENT BASIN IS TO BE CHECKED AFTER
EACH RUNOFF EVENT FOR STRUCTURAL
STABILITY AND DEPTH OF SEDIMENT. THE
BASIN IS TO BE CLEANED OUT WHEN THE
DEPTH OF SEDIMENT REACHES THE DEWATERING
HOLE.

766711002
Menomonee Falls
Carters Crossing Basin 3
Surveyed 2011-08-24
JKT MJD

