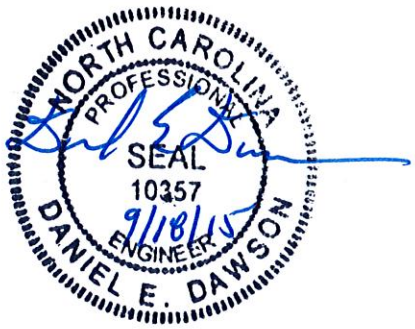
STORMWATER CALCULATIONS

Vertex Rail and Site Improvements
Phase 1

Vertex Property

Vertex Railcar Corporation
202 Raleigh Street
Wilmington, NC 28412

September 2015



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Land Planning
Surveying

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VERTEX PHASE 1 – WET DETENTION POND #1

AREA DRAINING TO POND = 453,250 SF = 10.41 AC

IMPERVIOUS SURFACE AREA DRAINING TO POND:

PARKING	=	0 SF
SIDEWALK	=	0 SF
BUILDING	=	0 SF
STREETS	=	0 SF
OTHER	=	0 SF
FUTURE	=	0 SF
TOTAL	=	263,793 SF

PERCENT IMPERVIOUS DRAINAGE AREA:

= (263,793 SF / 453,250 SF) x 100

= 58.2% **SAY 58%**

POND DEPTH (FT)	SA/DA %	POND SURFACE AREA (MIN.) (SF)
4.00	**5.1**	**23,116 SF**

IF POND DEPTH = 4.00, MINIMUM SURFACE AREA = 23,116 SF

USED 90% TSS REMOVAL EFFICIENT IN COASTAL REGION CHART TO SIZE POND

AREA @ ELEVATION 40.2 = 24,331 SF > 23,116 SF

REQUIRED STORAGE FOR FOREBAY: 20% OF TOTAL PERMANENT POOL VOLUME
= (0.2)(85,706)
= 17,141 (19,013 CF PROVIDED)

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Pond Volume

	Contour Elevation (ft)	Area (sf)	Incremental Volume (cf)	Cumulative Volume (cf)
Bottom Elevation	34.0	7118	0	0
Bottom of Shelf	39.7	19141	74838	74838
Permanent Pool	40.2	24331	10868	85706

Forebay Volume

	Contour Elevation (ft)	Area (sf)	Incremental Volume (cf)	Cumulative Volume (cf)
Bottom Elevation	34.0	924	0	0
Bottom of Shelf	39.7	4805	16328	16328
Permanent Pool	40.2	5936	2685	19013

Forebay Volume is

22.2%

of Pond Volume

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REQUIRED STORAGE FOR 1.5-INCH OF RUNOFF FOR POND: (use Simple Method)

Volume = 3630*Rd*Rv*A

Rd = 1.5″

Rv = 0.05+0.9*I = 0.05 + 0.9(0.582) = 0.5738

A = 453,250 SF / 43,560 Acre/SF = 10.41 Acres

Volume = 3630*1.5″*0.5738*10.41 Acres

= 32,510 CF (33,134 CF PROVIDED)

1.5" Runoff Volume Storage & Release Time

Contour Elevation (ft)	Area (sf)	Incremental Volume (cf)	Cumulative Volume (cf)	Outflow Rate (cfs)	Release Time (hrs)
40.20	24331	0	0	0.000	0.000
40.70	27906	13059	13059	0.116	31.3
41.00	28566	8471	21530	0.147	16.0
41.30	29231	8670	30200	0.172	14.0
41.40	29454	2934	33134	0.180	4.5
				TOTAL HOURS	**65.8**
				DAYS	**2.74**

Orifice Diameter = 2.50 inches
Area = 0.03409
Cd = 0.6

USED ORIFICE EQUATION TO DETERMINE OUTFLOW RATE
Q = Cd*A*(2gh)^1/2

INFILTRATION BASIN DRAWDOWN CALCULATIONS

1 Design Event: 1.5" Volume per Schueler's Method = 32510 CF

2 Wet Detention Basin: Set Normal Bottom Elevation at SHW Elevation = 40.20

Contour Elevation (FMSL)	Area (SF)	Volume (CF)	Cumulative Volume (CF)
40.20	24331	0	0
40.70	27906	13059	13059
41.00	28566	8471	21530
42.00	30804	29685	51215
43.00	33097	31951	83166
44.00	35448	34273	117438

Water Surface Elevation for the 1.5" Volume = 41.4 EL

3 Wet Detention Basin Outlet:

2.5 " diameter orifice

Q = Cd*A*sqrt(2gh) = (0.6)(π(d/(2*12))^2)(sqrt(64.4*h)

Q = (d^2/36.1)*sqrt(h) cfs

4 Discharge from Wet Detention Pond to Infiltration Basin

Assume 1.5" Volume is Instantaneous

Orifice Head = h

h = 41.4-(40.2-((d/12)/2)) = 1.2-(d/24) = 1.1 in

Q = 0.18 cfs

Q = 0.18 cfs = 15,659 cf/day

Wet Detention Basin Release Time:

T = 1.5" Volume/Q (cf/day)

T = 2.08 days

5 Infiltration Basin:

Bottom = 40.20 EL
Infiltration Rate = 30 in/hr

Contour Elevation (FMSL)	Area (SF)	Volume (CF)	Cumulative Volume (CF)
40.20	886	0	0
41.00	1205	836	836
42.00	1653	1429	2265
43.00	2158	1906	4171
44.00	2719	2439	6609

6 Infiltration Basin Release & Storage

1st Hour:

1.5 Volume = 32510 CF
Detention Basin Release Rate = 0.18 cfs
Volume to Infiltration Basin = 652 CF/hr or CF/1st hr
WSE Infiltration Basin = 40.8 EL
Area at WSE = 1,135 SF
Qi = k(A)(h) = Q leaving the Infiltration Basin

Qi = 0.49 cfs

Qi = 0.49 cfs > Q = 0.18 cfs

1st 30 Minutes:

1.5 Volume = 32510 CF
Detention Basin Release Rate = 0.18 cfs
Volume to Infiltration Basin = 326 CF/30 mins
WSE Infiltration Basin = 40.51 EL
Area at WSE = 1,010 SF
Qi = k(A)(h) = Q leaving the Infiltration Basin

Qi = 0.22 cfs

Qi = 0.22 cfs > Q = 0.18 cfs

Hydrograph Report

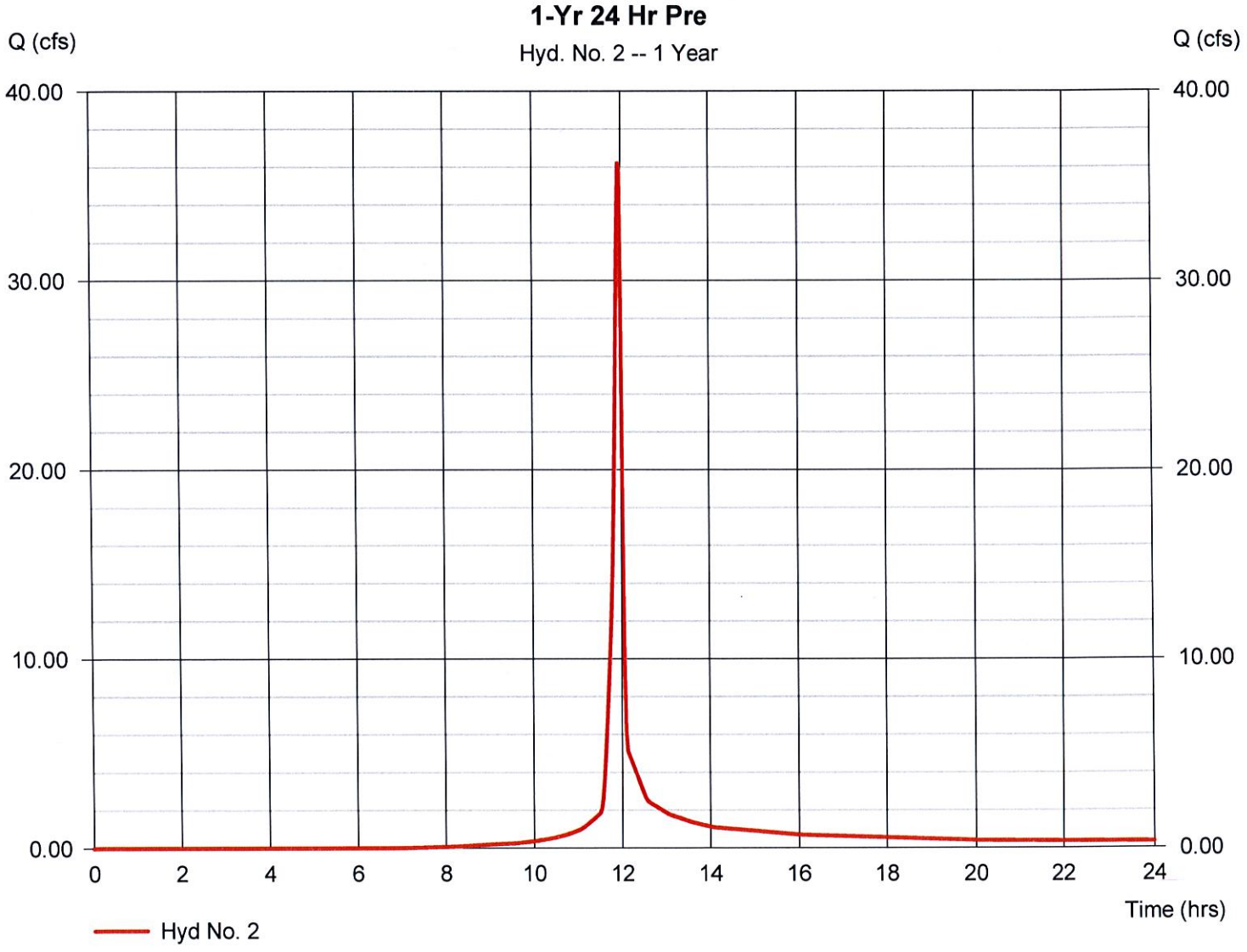
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 2

1-Yr 24 Hr Pre

Hydrograph type	= SCS Runoff	Peak discharge	= 36.28 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 73,831 cuft
Drainage area	= 9.650 ac	Curve number	= 84*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(4.560 x 68) + (5.090 x 98)] / 9.650



Hydrograph Report

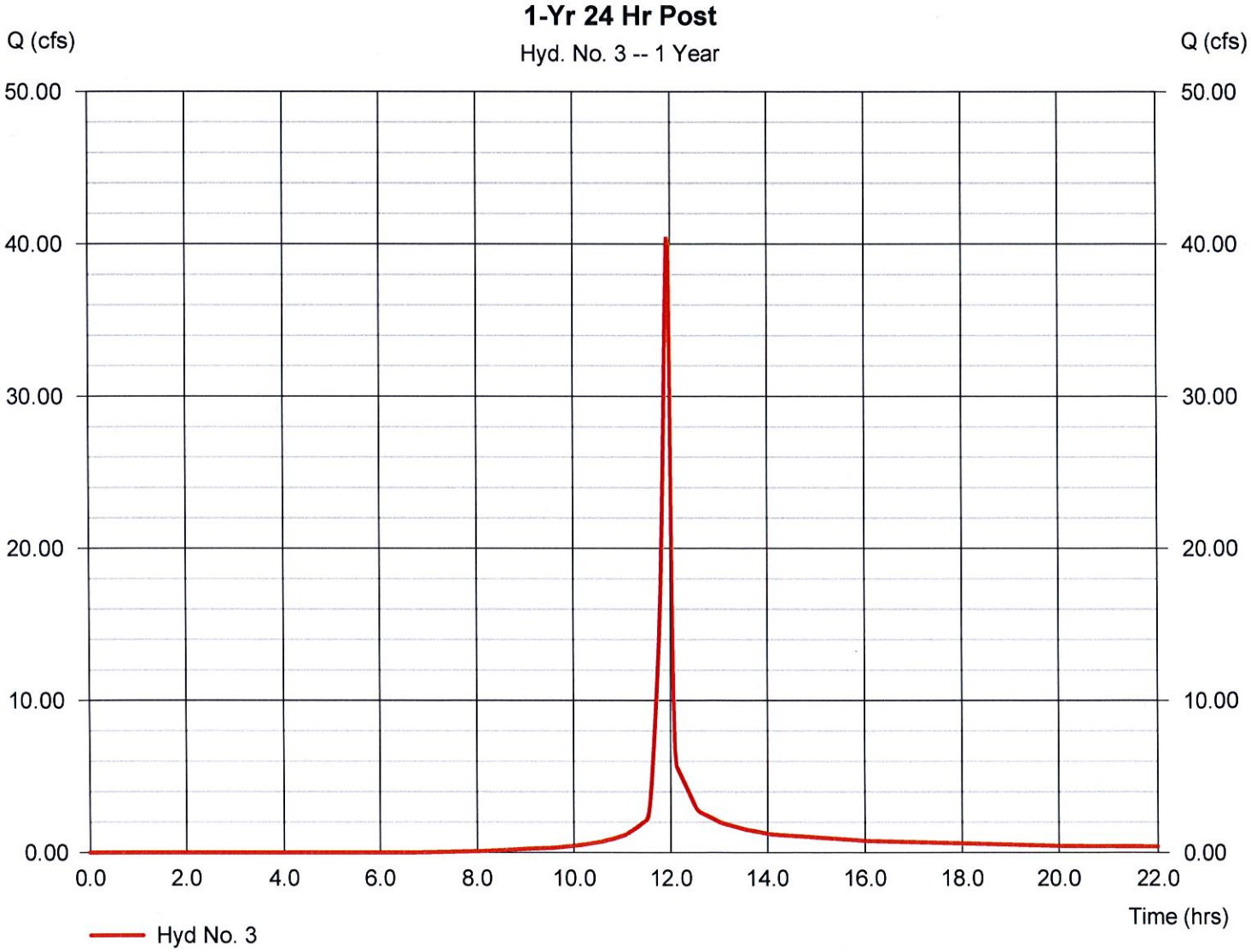
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 3

1-Yr 24 Hr Post

Hydrograph type	= SCS Runoff	Peak discharge	= 40.47 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 82,653 cuft
Drainage area	= 10.410 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(6.060 x 98) + (4.350 x 68)] / 10.410



Hydrograph Report

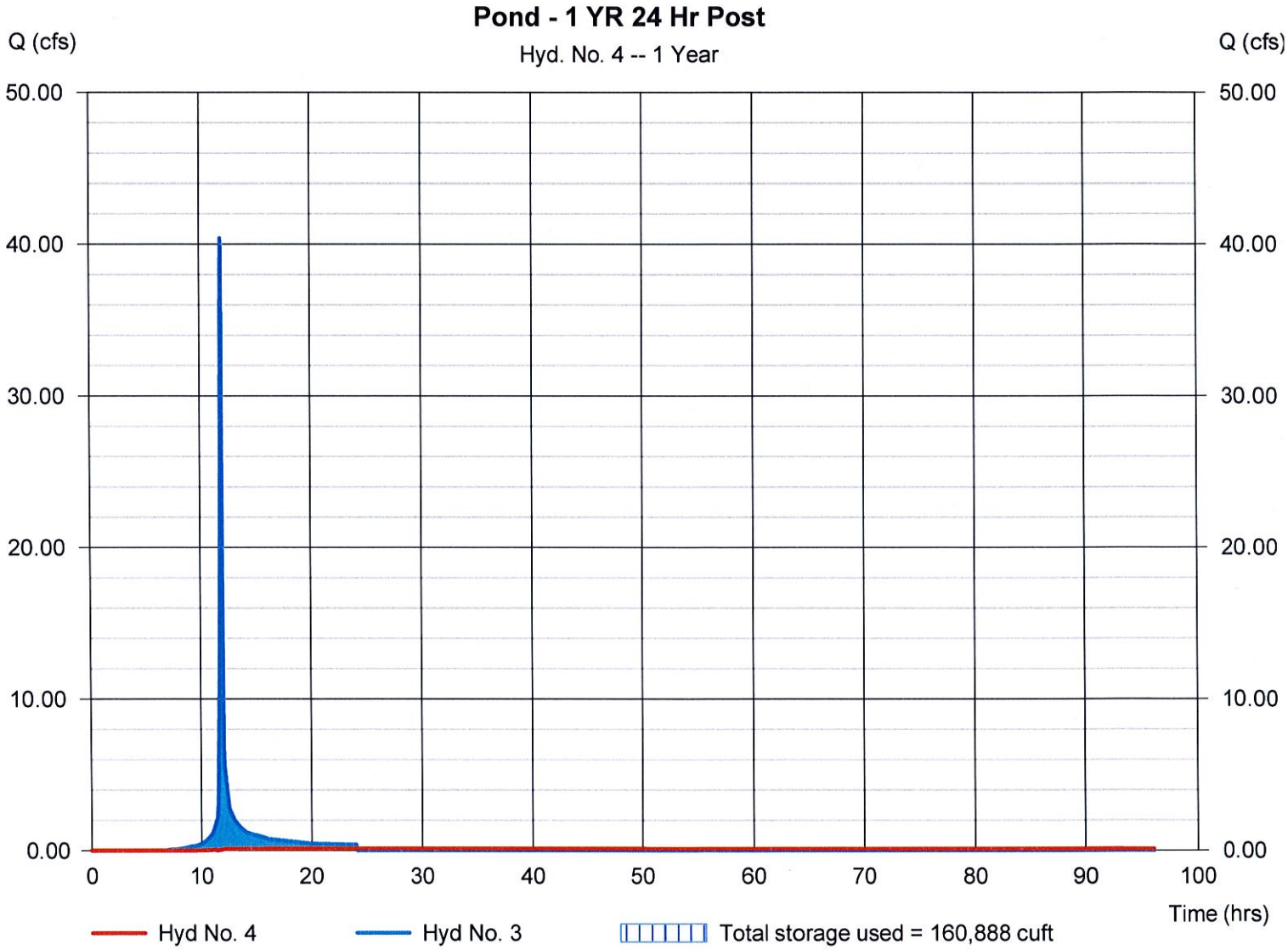
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 4

Pond - 1 YR 24 Hr Post

Hydrograph type	= Reservoir	Peak discharge	= 0.132 cfs
Storm frequency	= 1 yrs	Time to peak	= 24.07 hrs
Time interval	= 2 min	Hyd. volume	= 36,106 cuft
Inflow hyd. No.	= 3 - 1-Yr 24 Hr Post	Max. Elevation	= 42.81 ft
Reservoir name	= SW Pond #1	Max. Storage	= 160,888 cuft

Storage Indication method used. Wet pond routing start elevation = 40.20 ft.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Pond No. 1 - SW Pond #1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 34.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	34.00	7,118	0	0
1.00	35.00	8,962	8,022	8,022
2.00	36.00	10,918	9,923	17,944
3.00	37.00	12,988	11,937	29,881
4.00	38.00	15,171	14,064	43,945
5.00	39.00	17,467	16,304	60,249
5.70	39.70	19,141	12,807	73,056
6.20	40.20	24,331	10,841	83,897
6.70	40.70	27,906	13,048	96,945
7.00	41.00	28,566	8,470	105,415
8.00	42.00	30,804	29,675	135,090
9.00	43.00	33,097	31,941	167,030
10.00	44.00	35,448	34,262	201,293

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 2.50	0.00	0.00	0.00
Span (in)	= 2.50	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 40.20	0.00	0.00	0.00
Length (ft)	= 35.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[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.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	34.00	0.00	---	---	---	---	---	---	---	---	---	0.000
0.10	802	34.10	0.00	---	---	---	---	---	---	---	---	---	0.000
0.20	1,604	34.20	0.00	---	---	---	---	---	---	---	---	---	0.000
0.30	2,406	34.30	0.00	---	---	---	---	---	---	---	---	---	0.000
0.40	3,209	34.40	0.00	---	---	---	---	---	---	---	---	---	0.000
0.50	4,011	34.50	0.00	---	---	---	---	---	---	---	---	---	0.000
0.60	4,813	34.60	0.00	---	---	---	---	---	---	---	---	---	0.000
0.70	5,615	34.70	0.00	---	---	---	---	---	---	---	---	---	0.000
0.80	6,417	34.80	0.00	---	---	---	---	---	---	---	---	---	0.000
0.90	7,219	34.90	0.00	---	---	---	---	---	---	---	---	---	0.000
1.00	8,022	35.00	0.00	---	---	---	---	---	---	---	---	---	0.000
1.10	9,014	35.10	0.00	---	---	---	---	---	---	---	---	---	0.000
1.20	10,006	35.20	0.00	---	---	---	---	---	---	---	---	---	0.000
1.30	10,998	35.30	0.00	---	---	---	---	---	---	---	---	---	0.000
1.40	11,991	35.40	0.00	---	---	---	---	---	---	---	---	---	0.000
1.50	12,983	35.50	0.00	---	---	---	---	---	---	---	---	---	0.000
1.60	13,975	35.60	0.00	---	---	---	---	---	---	---	---	---	0.000
1.70	14,968	35.70	0.00	---	---	---	---	---	---	---	---	---	0.000
1.80	15,960	35.80	0.00	---	---	---	---	---	---	---	---	---	0.000
1.90	16,952	35.90	0.00	---	---	---	---	---	---	---	---	---	0.000
2.00	17,944	36.00	0.00	---	---	---	---	---	---	---	---	---	0.000
2.10	19,138	36.10	0.00	---	---	---	---	---	---	---	---	---	0.000
2.20	20,332	36.20	0.00	---	---	---	---	---	---	---	---	---	0.000
2.30	21,526	36.30	0.00	---	---	---	---	---	---	---	---	---	0.000
2.40	22,719	36.40	0.00	---	---	---	---	---	---	---	---	---	0.000
2.50	23,913	36.50	0.00	---	---	---	---	---	---	---	---	---	0.000
2.60	25,107	36.60	0.00	---	---	---	---	---	---	---	---	---	0.000
2.70	26,300	36.70	0.00	---	---	---	---	---	---	---	---	---	0.000
2.80	27,494	36.80	0.00	---	---	---	---	---	---	---	---	---	0.000
2.90	28,688	36.90	0.00	---	---	---	---	---	---	---	---	---	0.000

Continues on next page...

SW Pond #1

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.00	29,881	37.00	0.00	---	---	---	---	---	---	---	---	---	0.000
3.10	31,288	37.10	0.00	---	---	---	---	---	---	---	---	---	0.000
3.20	32,694	37.20	0.00	---	---	---	---	---	---	---	---	---	0.000
3.30	34,100	37.30	0.00	---	---	---	---	---	---	---	---	---	0.000
3.40	35,507	37.40	0.00	---	---	---	---	---	---	---	---	---	0.000
3.50	36,913	37.50	0.00	---	---	---	---	---	---	---	---	---	0.000
3.60	38,320	37.60	0.00	---	---	---	---	---	---	---	---	---	0.000
3.70	39,726	37.70	0.00	---	---	---	---	---	---	---	---	---	0.000
3.80	41,132	37.80	0.00	---	---	---	---	---	---	---	---	---	0.000
3.90	42,539	37.90	0.00	---	---	---	---	---	---	---	---	---	0.000
4.00	43,945	38.00	0.00	---	---	---	---	---	---	---	---	---	0.000
4.10	45,576	38.10	0.00	---	---	---	---	---	---	---	---	---	0.000
4.20	47,206	38.20	0.00	---	---	---	---	---	---	---	---	---	0.000
4.30	48,836	38.30	0.00	---	---	---	---	---	---	---	---	---	0.000
4.40	50,467	38.40	0.00	---	---	---	---	---	---	---	---	---	0.000
4.50	52,097	38.50	0.00	---	---	---	---	---	---	---	---	---	0.000
4.60	53,728	38.60	0.00	---	---	---	---	---	---	---	---	---	0.000
4.70	55,358	38.70	0.00	---	---	---	---	---	---	---	---	---	0.000
4.80	56,988	38.80	0.00	---	---	---	---	---	---	---	---	---	0.000
4.90	58,619	38.90	0.00	---	---	---	---	---	---	---	---	---	0.000
5.00	60,249	39.00	0.00	---	---	---	---	---	---	---	---	---	0.000
5.07	61,530	39.07	0.00	---	---	---	---	---	---	---	---	---	0.000
5.14	62,811	39.14	0.00	---	---	---	---	---	---	---	---	---	0.000
5.21	64,091	39.21	0.00	---	---	---	---	---	---	---	---	---	0.000
5.28	65,372	39.28	0.00	---	---	---	---	---	---	---	---	---	0.000
5.35	66,653	39.35	0.00	---	---	---	---	---	---	---	---	---	0.000
5.42	67,933	39.42	0.00	---	---	---	---	---	---	---	---	---	0.000
5.49	69,214	39.49	0.00	---	---	---	---	---	---	---	---	---	0.000
5.56	70,495	39.56	0.00	---	---	---	---	---	---	---	---	---	0.000
5.63	71,776	39.63	0.00	---	---	---	---	---	---	---	---	---	0.000
5.70	73,056	39.70	0.00	---	---	---	---	---	---	---	---	---	0.000
5.75	74,140	39.75	0.00	---	---	---	---	---	---	---	---	---	0.000
5.80	75,224	39.80	0.00	---	---	---	---	---	---	---	---	---	0.000
5.85	76,309	39.85	0.00	---	---	---	---	---	---	---	---	---	0.000
5.90	77,393	39.90	0.00	---	---	---	---	---	---	---	---	---	0.000
5.95	78,477	39.95	0.00	---	---	---	---	---	---	---	---	---	0.000
6.00	79,561	40.00	0.00	---	---	---	---	---	---	---	---	---	0.000
6.05	80,645	40.05	0.00	---	---	---	---	---	---	---	---	---	0.000
6.10	81,729	40.10	0.00	---	---	---	---	---	---	---	---	---	0.000
6.15	82,813	40.15	0.00	---	---	---	---	---	---	---	---	---	0.000
6.20	83,897	40.20	0.00	---	---	---	---	---	---	---	---	---	0.000
6.25	85,202	40.25	0.00 ic	---	---	---	---	---	---	---	---	---	0.005
6.30	86,507	40.30	0.02 ic	---	---	---	---	---	---	---	---	---	0.017
6.35	87,812	40.35	0.03 ic	---	---	---	---	---	---	---	---	---	0.035
6.40	89,116	40.40	0.05 ic	---	---	---	---	---	---	---	---	---	0.051
6.45	90,421	40.45	0.02 oc	---	---	---	---	---	---	---	---	---	0.017
6.50	91,726	40.50	0.03 oc	---	---	---	---	---	---	---	---	---	0.026
6.55	93,031	40.55	0.03 oc	---	---	---	---	---	---	---	---	---	0.032
6.60	94,335	40.60	0.04 oc	---	---	---	---	---	---	---	---	---	0.037
6.65	95,640	40.65	0.04 oc	---	---	---	---	---	---	---	---	---	0.042
6.70	96,945	40.70	0.05 oc	---	---	---	---	---	---	---	---	---	0.046
6.73	97,792	40.73	0.05 oc	---	---	---	---	---	---	---	---	---	0.048
6.76	98,639	40.76	0.05 oc	---	---	---	---	---	---	---	---	---	0.051
6.79	99,486	40.79	0.05 oc	---	---	---	---	---	---	---	---	---	0.053
6.82	100,333	40.82	0.05 oc	---	---	---	---	---	---	---	---	---	0.055
6.85	101,180	40.85	0.06 oc	---	---	---	---	---	---	---	---	---	0.057
6.88	102,027	40.88	0.06 oc	---	---	---	---	---	---	---	---	---	0.059
6.91	102,874	40.91	0.06 oc	---	---	---	---	---	---	---	---	---	0.061
6.94	103,721	40.94	0.06 oc	---	---	---	---	---	---	---	---	---	0.062
6.97	104,568	40.97	0.06 oc	---	---	---	---	---	---	---	---	---	0.064
7.00	105,415	41.00	0.07 oc	---	---	---	---	---	---	---	---	---	0.066
7.10	108,382	41.10	0.07 oc	---	---	---	---	---	---	---	---	---	0.071
7.20	111,350	41.20	0.08 oc	---	---	---	---	---	---	---	---	---	0.076
7.30	114,317	41.30	0.08 oc	---	---	---	---	---	---	---	---	---	0.081
7.40	117,285	41.40	0.09 oc	---	---	---	---	---	---	---	---	---	0.085
7.50	120,252	41.50	0.09 oc	---	---	---	---	---	---	---	---	---	0.089
7.60	123,220	41.60	0.09 oc	---	---	---	---	---	---	---	---	---	0.093
7.70	126,187	41.70	0.10 oc	---	---	---	---	---	---	---	---	---	0.097
7.80	129,155	41.80	0.10 oc	---	---	---	---	---	---	---	---	---	0.101
7.90	132,122	41.90	0.10 oc	---	---	---	---	---	---	---	---	---	0.104
8.00	135,090	42.00	0.11 oc	---	---	---	---	---	---	---	---	---	0.108
8.10	138,284	42.10	0.11 oc	---	---	---	---	---	---	---	---	---	0.111

Continues on next page...

SW Pond #1

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
8.20	141,478	42.20	0.11 oc	---	---	---	---	---	---	---	---	---	0.114
8.30	144,672	42.30	0.12 oc	---	---	---	---	---	---	---	---	---	0.118
8.40	147,866	42.40	0.12 oc	---	---	---	---	---	---	---	---	---	0.121
8.50	151,060	42.50	0.12 oc	---	---	---	---	---	---	---	---	---	0.124
8.60	154,254	42.60	0.13 oc	---	---	---	---	---	---	---	---	---	0.127
8.70	157,448	42.70	0.13 oc	---	---	---	---	---	---	---	---	---	0.129
8.80	160,642	42.80	0.13 oc	---	---	---	---	---	---	---	---	---	0.132
8.90	163,836	42.90	0.13 oc	---	---	---	---	---	---	---	---	---	0.135
9.00	167,030	43.00	0.14 oc	---	---	---	---	---	---	---	---	---	0.138
9.10	170,456	43.10	0.14 oc	---	---	---	---	---	---	---	---	---	0.140
9.20	173,883	43.20	0.14 oc	---	---	---	---	---	---	---	---	---	0.143
9.30	177,309	43.30	0.15 oc	---	---	---	---	---	---	---	---	---	0.145
9.40	180,735	43.40	0.15 oc	---	---	---	---	---	---	---	---	---	0.148
9.50	184,161	43.50	0.15 oc	---	---	---	---	---	---	---	---	---	0.150
9.60	187,588	43.60	0.15 oc	---	---	---	---	---	---	---	---	---	0.153
9.70	191,014	43.70	0.16 oc	---	---	---	---	---	---	---	---	---	0.155
9.80	194,440	43.80	0.16 oc	---	---	---	---	---	---	---	---	---	0.157
9.90	197,866	43.90	0.16 oc	---	---	---	---	---	---	---	---	---	0.160
10.00	201,293	44.00	0.16 oc	---	---	---	---	---	---	---	---	---	0.162

...End

Hydrograph Report

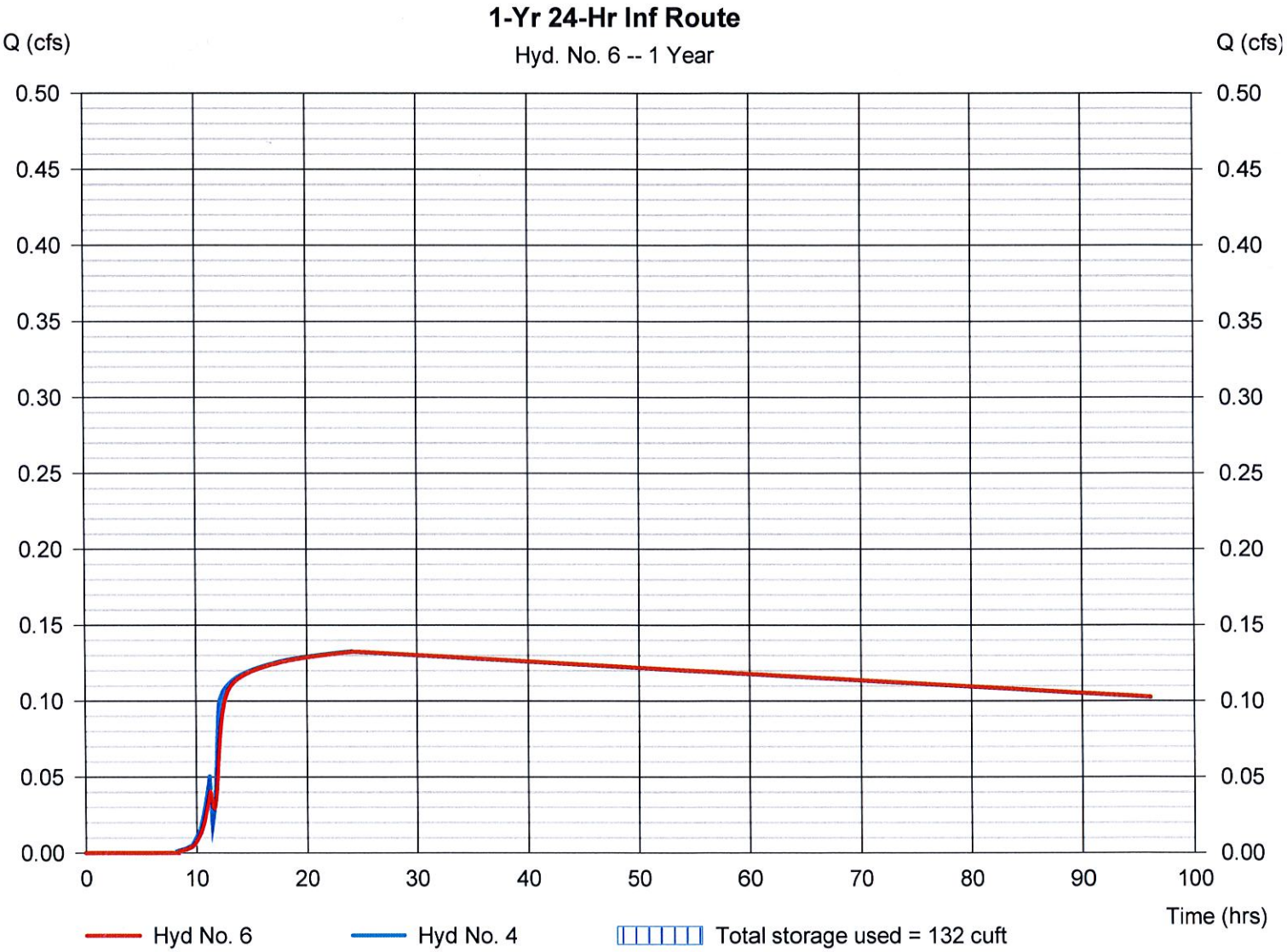
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 6

1-Yr 24-Hr Inf Route

Hydrograph type	= Reservoir	Peak discharge	= 0.132 cfs
Storm frequency	= 1 yrs	Time to peak	= 24.37 hrs
Time interval	= 2 min	Hyd. volume	= 36,004 cuft
Inflow hyd. No.	= 4 - Pond - 1 YR 24 Hr Post	Max. Elevation	= 40.33 ft
Reservoir name	= Infiltration Basin	Max. Storage	= 132 cuft

Storage Indication method used. Outflow includes exfiltration.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Pond No. 2 - Infiltration Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 40.20 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	40.20	894	0	0
0.80	41.00	1,207	837	837
1.80	42.00	1,657	1,426	2,263
2.80	43.00	2,163	1,904	4,167
3.80	44.00	2,725	2,438	6,606

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[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.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 30.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	40.20	---	---	---	---	---	---	---	---	0.000	---	0.000
0.08	84	40.28	---	---	---	---	---	---	---	---	0.084	---	0.084
0.16	167	40.36	---	---	---	---	---	---	---	---	0.168	---	0.168
0.24	251	40.44	---	---	---	---	---	---	---	---	0.251	---	0.251
0.32	335	40.52	---	---	---	---	---	---	---	---	0.335	---	0.335
0.40	419	40.60	---	---	---	---	---	---	---	---	0.419	---	0.419
0.48	502	40.68	---	---	---	---	---	---	---	---	0.503	---	0.503
0.56	586	40.76	---	---	---	---	---	---	---	---	0.587	---	0.587
0.64	670	40.84	---	---	---	---	---	---	---	---	0.671	---	0.671
0.72	753	40.92	---	---	---	---	---	---	---	---	0.754	---	0.754
0.80	837	41.00	---	---	---	---	---	---	---	---	0.838	---	0.838
0.90	980	41.10	---	---	---	---	---	---	---	---	0.869	---	0.869
1.00	1,122	41.20	---	---	---	---	---	---	---	---	0.901	---	0.901
1.10	1,265	41.30	---	---	---	---	---	---	---	---	0.932	---	0.932
1.20	1,408	41.40	---	---	---	---	---	---	---	---	0.963	---	0.963
1.30	1,550	41.50	---	---	---	---	---	---	---	---	0.994	---	0.994
1.40	1,693	41.60	---	---	---	---	---	---	---	---	1.026	---	1.026
1.50	1,835	41.70	---	---	---	---	---	---	---	---	1.057	---	1.057
1.60	1,978	41.80	---	---	---	---	---	---	---	---	1.088	---	1.088
1.70	2,121	41.90	---	---	---	---	---	---	---	---	1.119	---	1.119
1.80	2,263	42.00	---	---	---	---	---	---	---	---	1.151	---	1.151
1.90	2,454	42.10	---	---	---	---	---	---	---	---	1.186	---	1.186
2.00	2,644	42.20	---	---	---	---	---	---	---	---	1.221	---	1.221
2.10	2,834	42.30	---	---	---	---	---	---	---	---	1.256	---	1.256
2.20	3,025	42.40	---	---	---	---	---	---	---	---	1.291	---	1.291
2.30	3,215	42.50	---	---	---	---	---	---	---	---	1.326	---	1.326
2.40	3,406	42.60	---	---	---	---	---	---	---	---	1.362	---	1.362
2.50	3,596	42.70	---	---	---	---	---	---	---	---	1.397	---	1.397
2.60	3,786	42.80	---	---	---	---	---	---	---	---	1.432	---	1.432
2.70	3,977	42.90	---	---	---	---	---	---	---	---	1.467	---	1.467
2.80	4,167	43.00	---	---	---	---	---	---	---	---	1.502	---	1.502
2.90	4,411	43.10	---	---	---	---	---	---	---	---	1.541	---	1.541
3.00	4,655	43.20	---	---	---	---	---	---	---	---	1.580	---	1.580
3.10	4,899	43.30	---	---	---	---	---	---	---	---	1.619	---	1.619
3.20	5,143	43.40	---	---	---	---	---	---	---	---	1.658	---	1.658
3.30	5,386	43.50	---	---	---	---	---	---	---	---	1.697	---	1.697
3.40	5,630	43.60	---	---	---	---	---	---	---	---	1.736	---	1.736
3.50	5,874	43.70	---	---	---	---	---	---	---	---	1.775	---	1.775

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Infiltration Basin

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.60	6,118	43.80	---	---	---	---	---	---	---	---	1.814	---	1.814
3.70	6,362	43.90	---	---	---	---	---	---	---	---	1.853	---	1.853
3.80	6,606	44.00	---	---	---	---	---	---	---	---	1.892	---	1.892

...End

Hydrograph Report

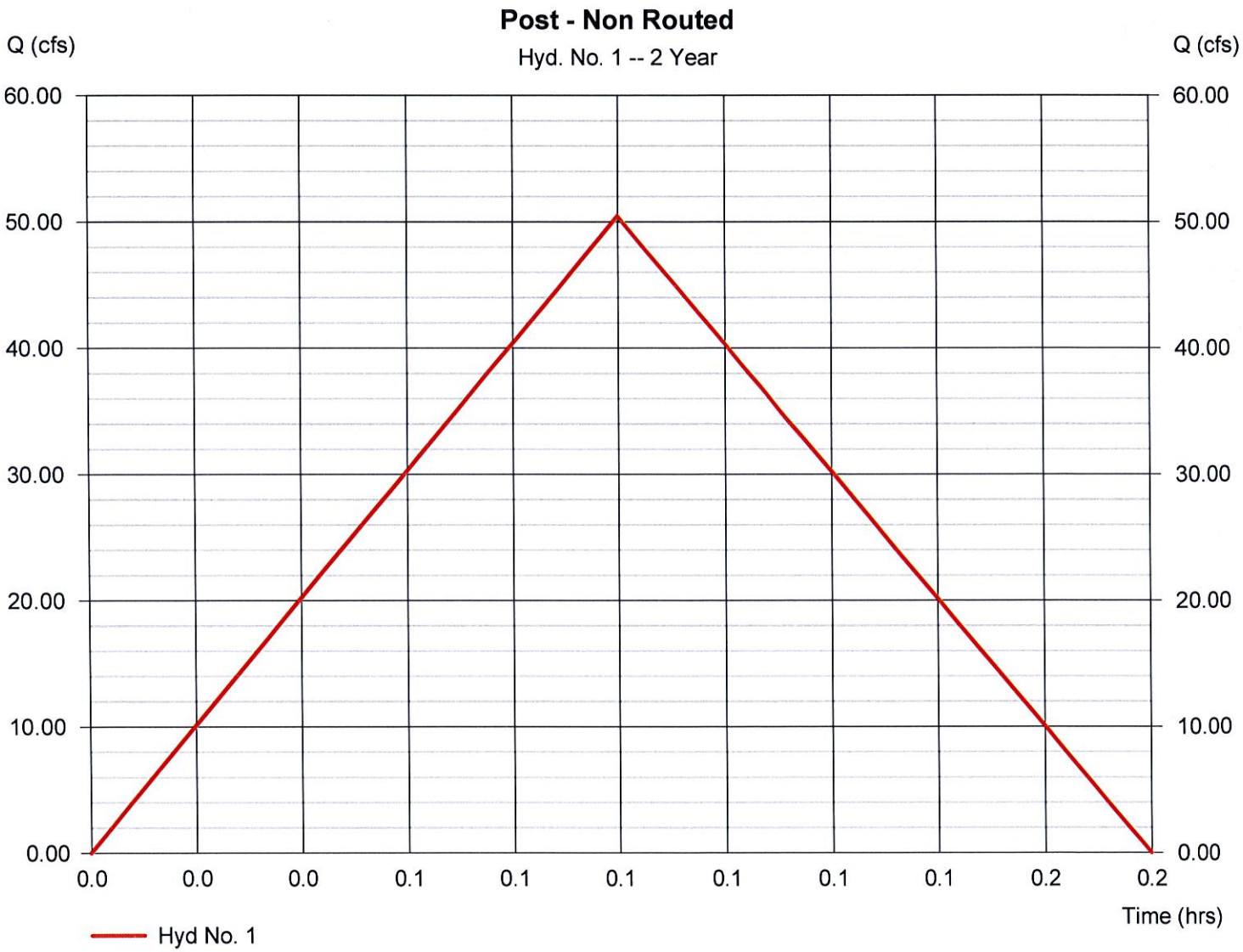
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 1

Post - Non Routed

Hydrograph type	= Rational	Peak discharge	= 50.43 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 15,130 cuft
Drainage area	= 10.410 ac	Runoff coeff.	= 0.65*
Intensity	= 7.453 in/hr	Tc by User	= 5.00 min
IDF Curve	= City of Wilmington (NOAA).IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(6.060 x 0.90) + (4.350 x 0.30)] / 10.410



Hydrograph Report

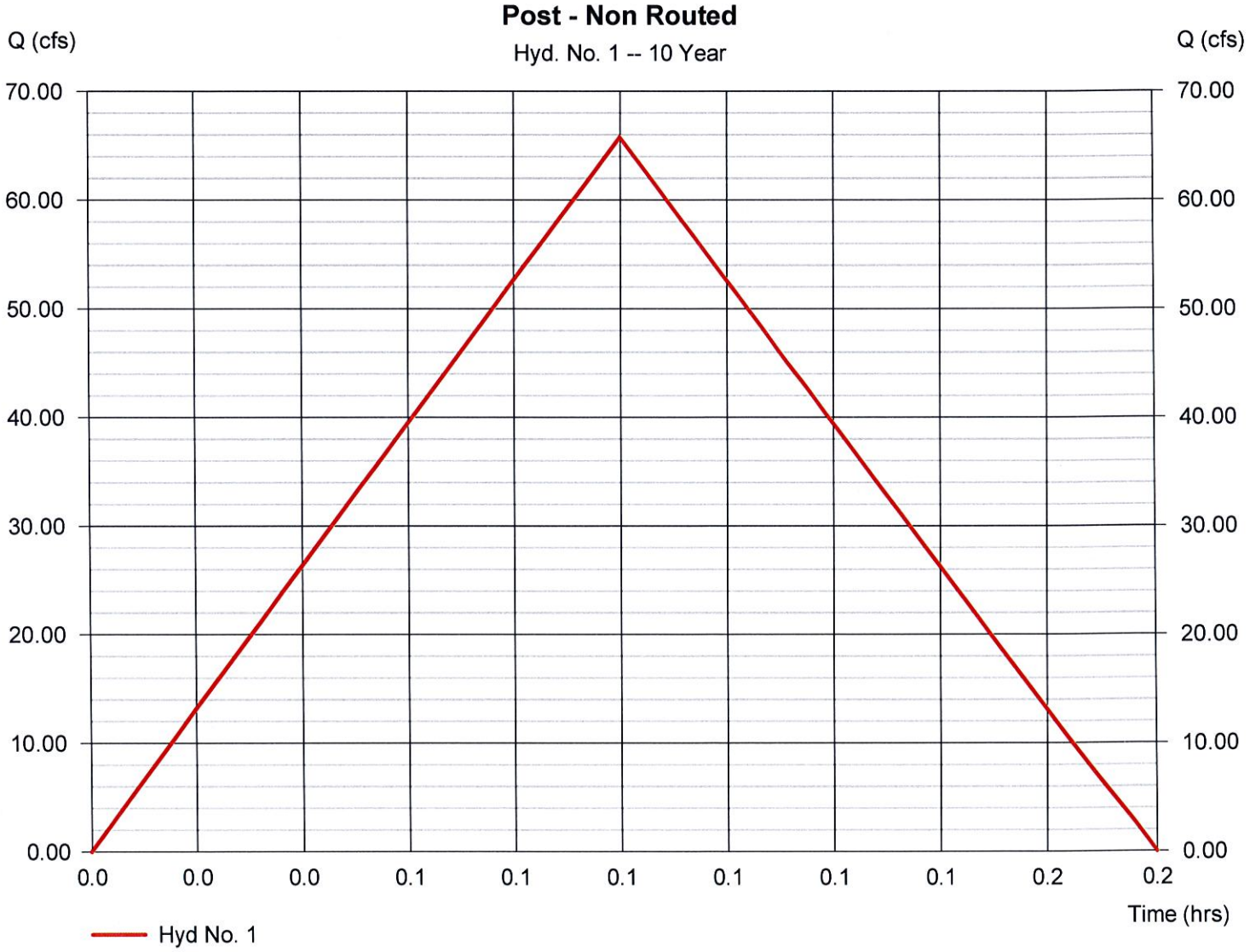
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 1

Post - Non Routed

Hydrograph type	= Rational	Peak discharge	= 65.75 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 19,725 cuft
Drainage area	= 10.410 ac	Runoff coeff.	= 0.65*
Intensity	= 9.717 in/hr	Tc by User	= 5.00 min
IDF Curve	= City of Wilmington (NOAA).IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(6.060 x 0.90) + (4.350 x 0.30)] / 10.410



Hydrograph Report

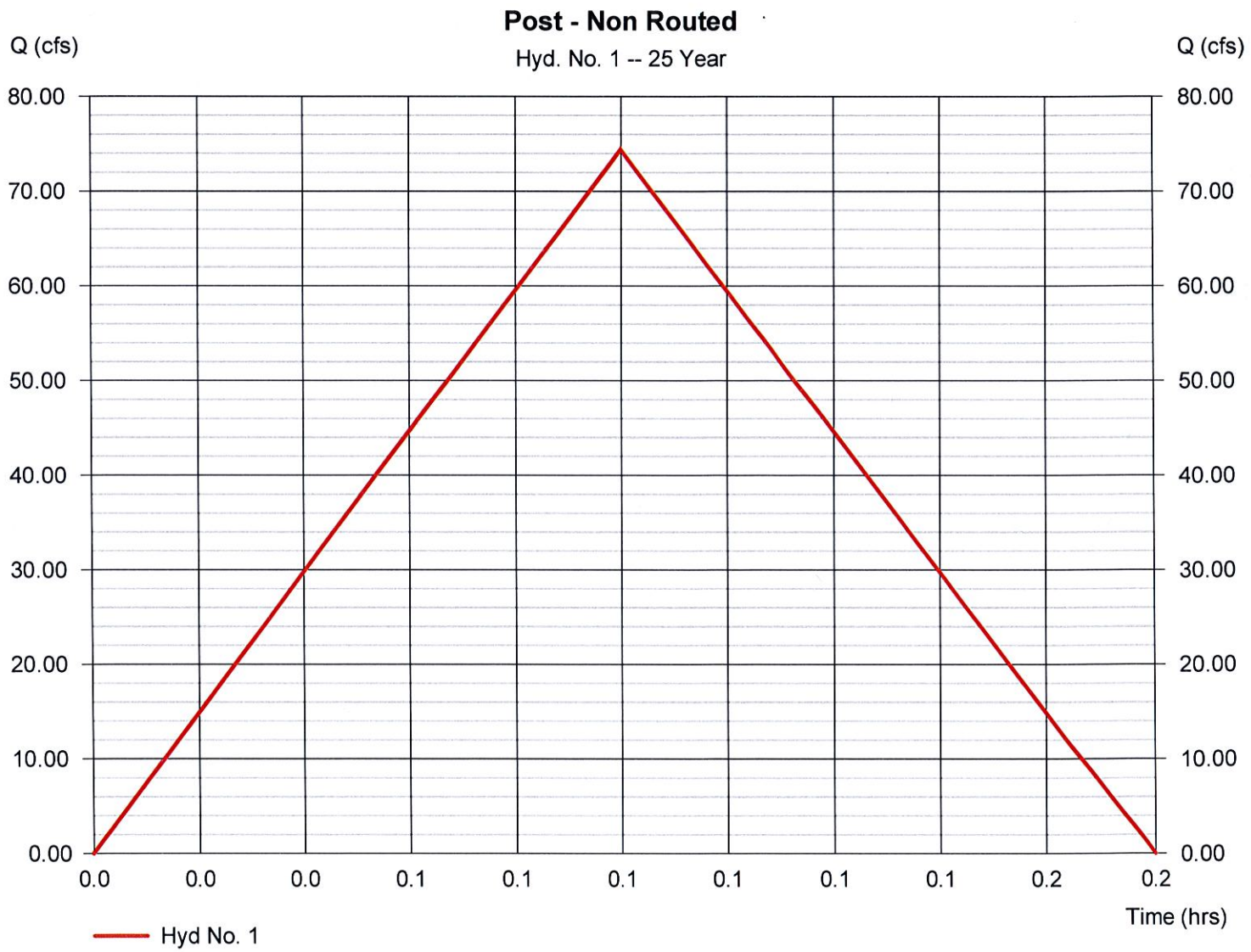
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 1

Post - Non Routed

Hydrograph type	= Rational	Peak discharge	= 74.40 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 22,321 cuft
Drainage area	= 10.410 ac	Runoff coeff.	= 0.65*
Intensity	= 10.996 in/hr	Tc by User	= 5.00 min
IDF Curve	= City of Wilmington (NOAA).IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(6.060 x 0.90) + (4.350 x 0.30)] / 10.410



Hydrograph Report

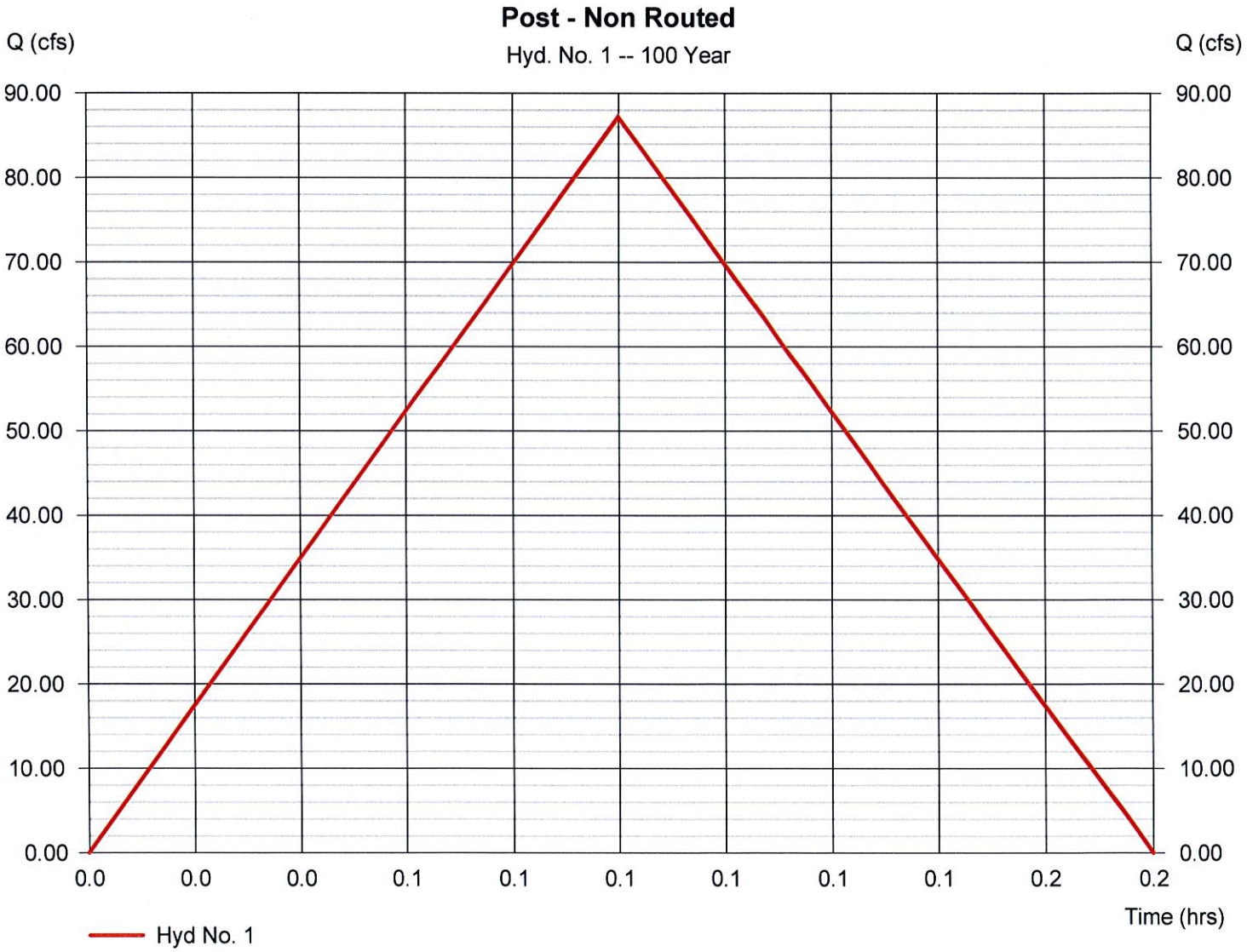
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 1

Post - Non Routed

Hydrograph type	= Rational	Peak discharge	= 87.19 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 26,158 cuft
Drainage area	= 10.410 ac	Runoff coeff.	= 0.65*
Intensity	= 12.886 in/hr	Tc by User	= 5.00 min
IDF Curve	= City of Wilmington (NOAA).IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(6.060 x 0.90) + (4.350 x 0.30)] / 10.410



Hydrograph Report

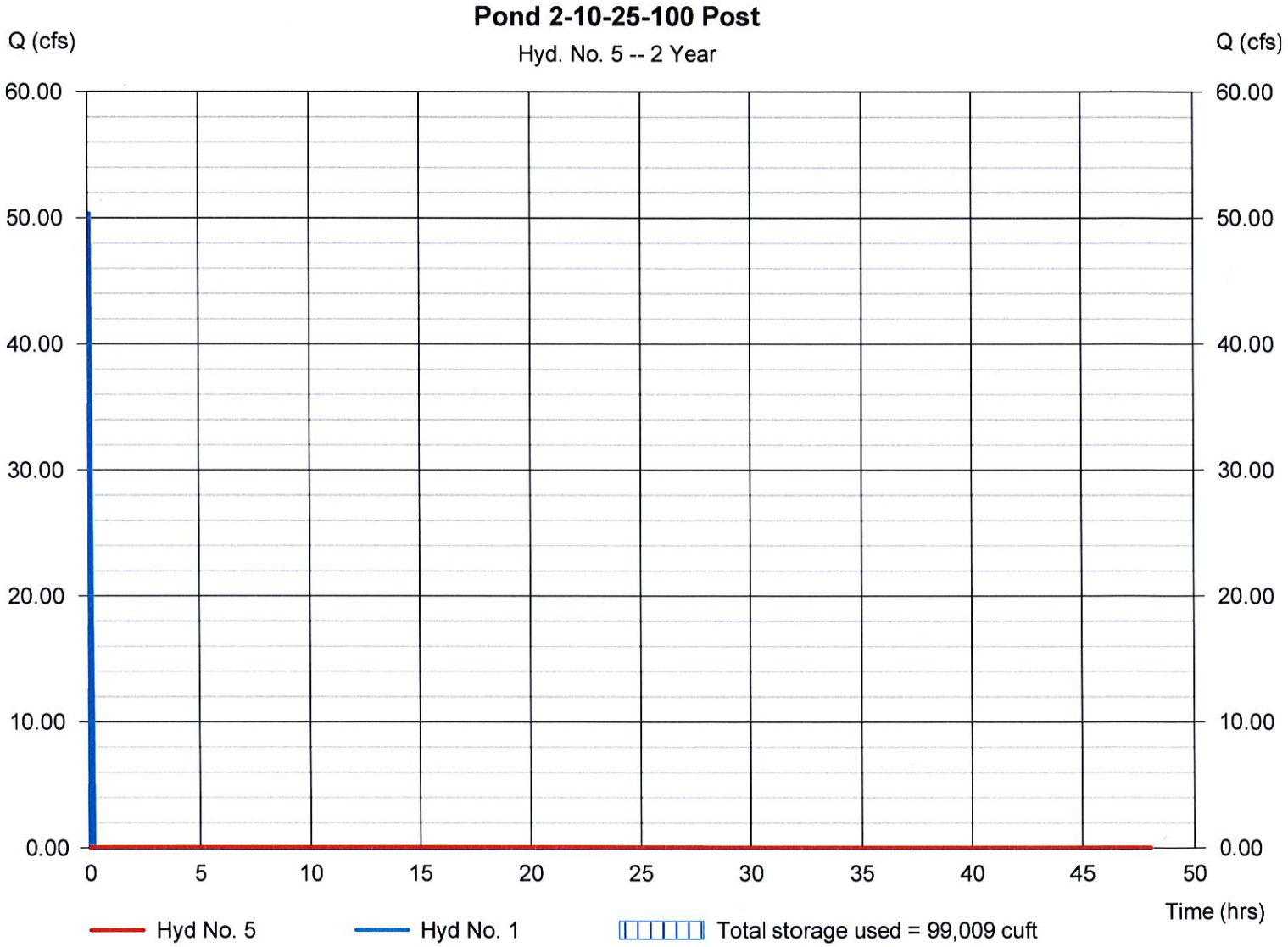
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 5

Pond 2-10-25-100 Post

Hydrograph type	= Reservoir	Peak discharge	= 0.052 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 6,895 cuft
Inflow hyd. No.	= 1 - Post - Non Routed	Max. Elevation	= 40.77 ft
Reservoir name	= SW Pond #1	Max. Storage	= 99,009 cuft

Storage Indication method used. Wet pond routing start elevation = 40.20 ft.



Hydrograph Report

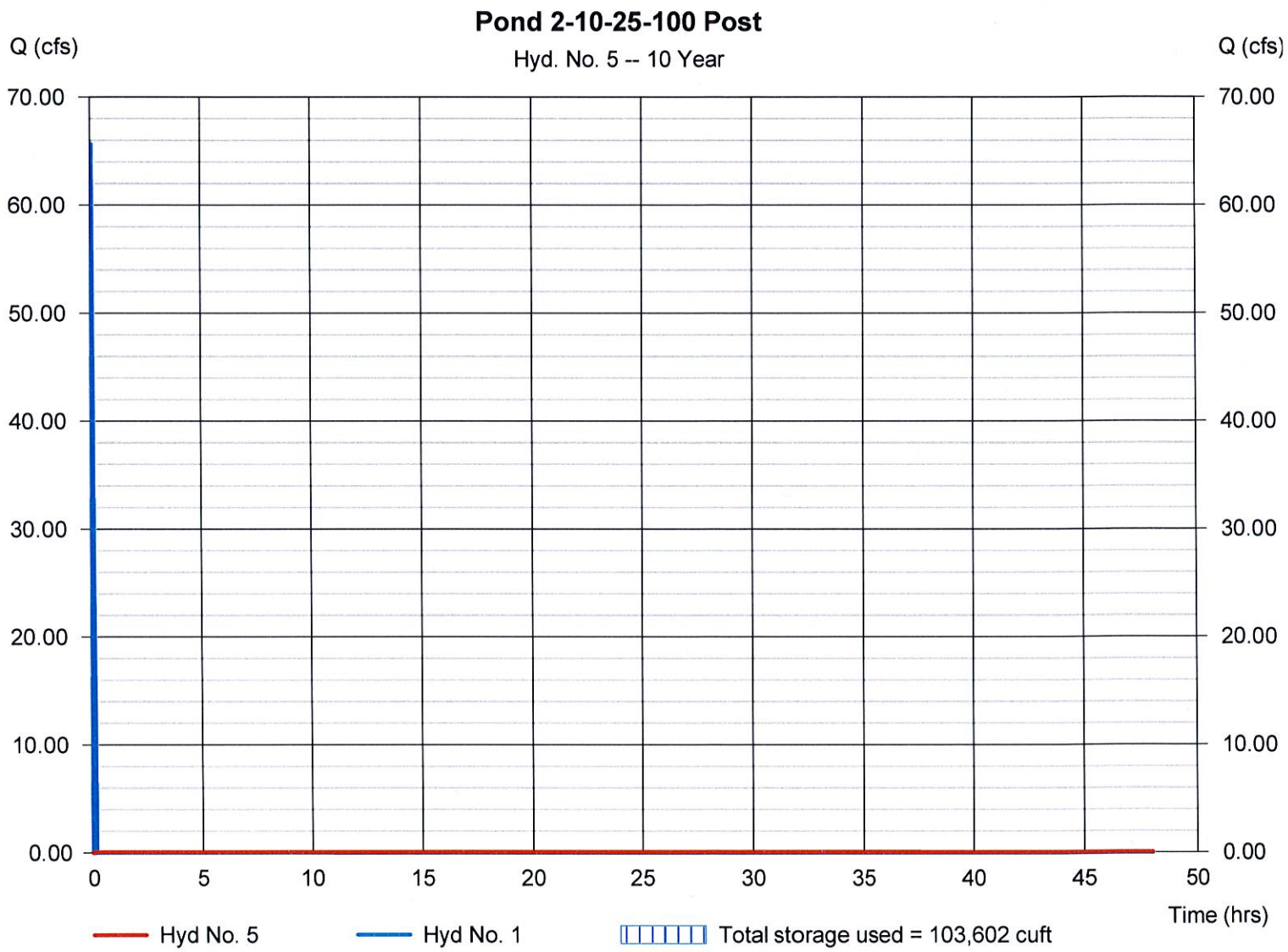
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 5

Pond 2-10-25-100 Post

Hydrograph type	= Reservoir	Peak discharge	= 0.062 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 8,780 cuft
Inflow hyd. No.	= 1 - Post - Non Routed	Max. Elevation	= 40.94 ft
Reservoir name	= SW Pond #1	Max. Storage	= 103,602 cuft

Storage Indication method used. Wet pond routing start elevation = 40.20 ft.



Hydrograph Report

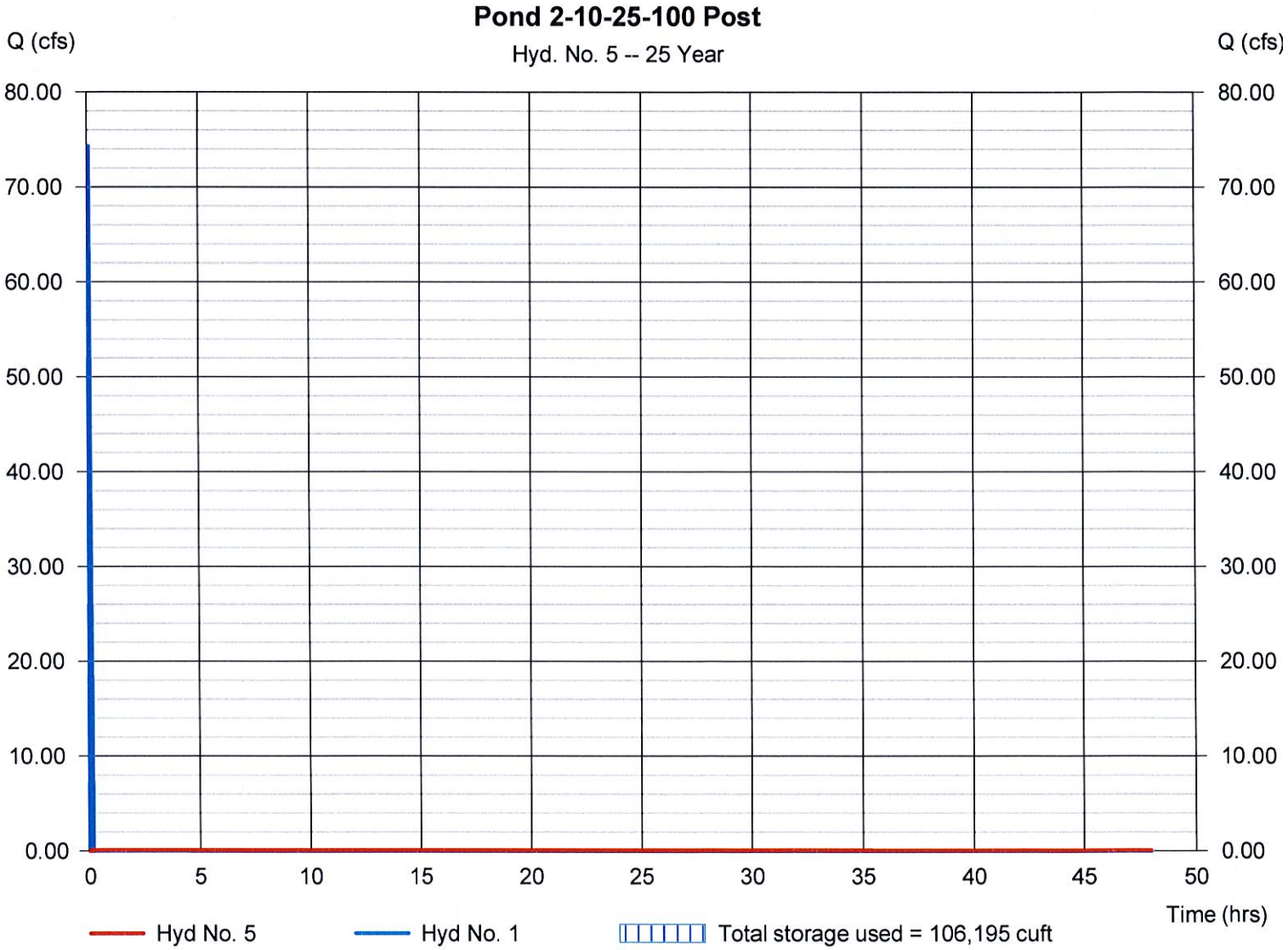
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 5

Pond 2-10-25-100 Post

Hydrograph type	= Reservoir	Peak discharge	= 0.067 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 9,689 cuft
Inflow hyd. No.	= 1 - Post - Non Routed	Max. Elevation	= 41.03 ft
Reservoir name	= SW Pond #1	Max. Storage	= 106,195 cuft

Storage Indication method used. Wet pond routing start elevation = 40.20 ft.



Hydrograph Report

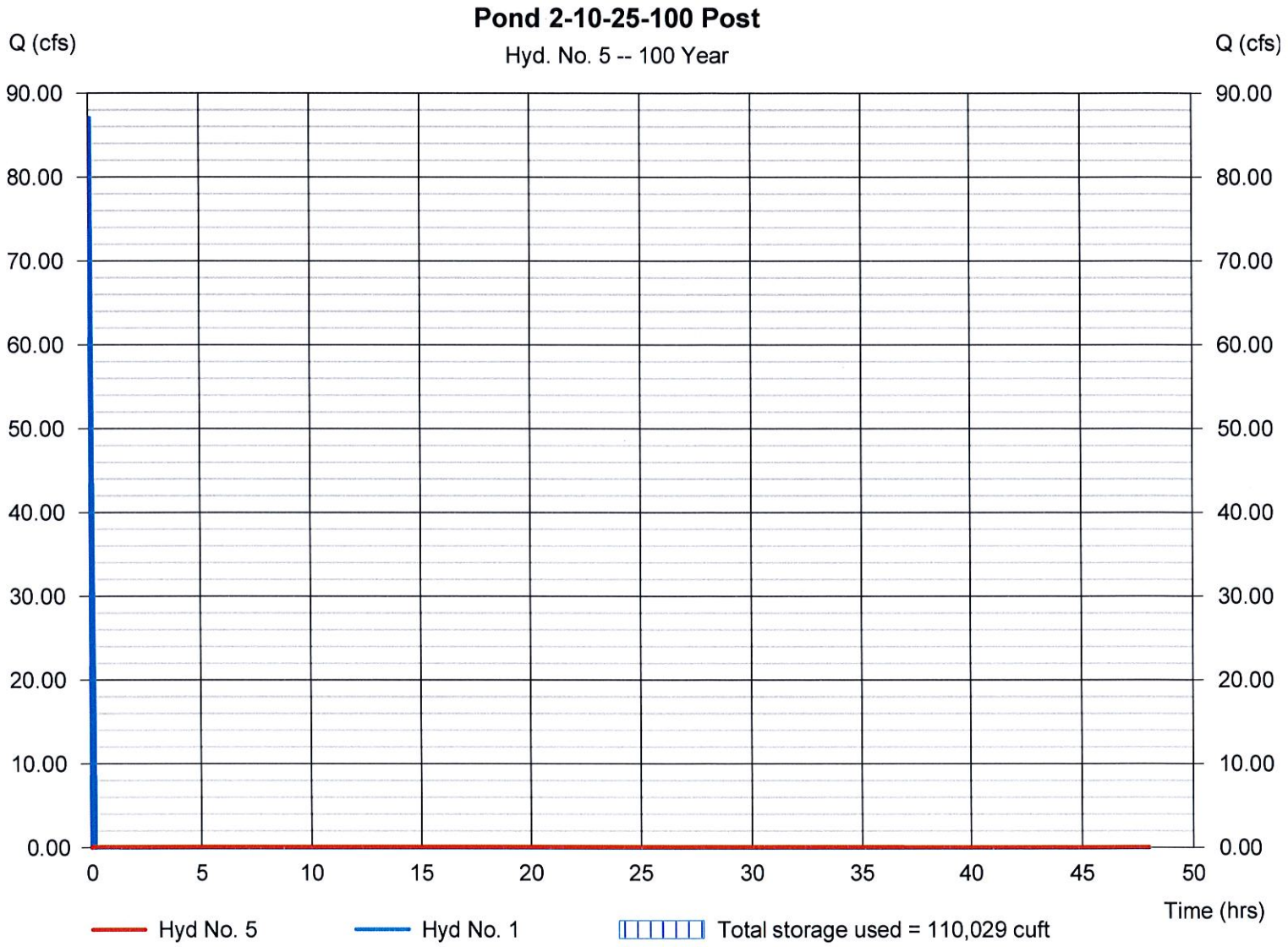
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 5

Pond 2-10-25-100 Post

Hydrograph type	= Reservoir	Peak discharge	= 0.074 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 10,891 cuft
Inflow hyd. No.	= 1 - Post - Non Routed	Max. Elevation	= 41.16 ft
Reservoir name	= SW Pond #1	Max. Storage	= 110,029 cuft

Storage Indication method used. Wet pond routing start elevation = 40.20 ft.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Pond No. 1 - SW Pond #1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 34.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	34.00	7,118	0	0
1.00	35.00	8,962	8,022	8,022
2.00	36.00	10,918	9,923	17,944
3.00	37.00	12,988	11,937	29,881
4.00	38.00	15,171	14,064	43,945
5.00	39.00	17,467	16,304	60,249
5.70	39.70	19,141	12,807	73,056
6.20	40.20	24,331	10,841	83,897
6.70	40.70	27,906	13,048	96,945
7.00	41.00	28,566	8,470	105,415
8.00	42.00	30,804	29,675	135,090
9.00	43.00	33,097	31,941	167,030
10.00	44.00	35,448	34,262	201,293

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 2.50	0.00	0.00	0.00
Span (in)	= 2.50	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 40.20	0.00	0.00	0.00
Length (ft)	= 35.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[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.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	34.00	0.00	---	---	---	---	---	---	---	---	---	0.000
0.10	802	34.10	0.00	---	---	---	---	---	---	---	---	---	0.000
0.20	1,604	34.20	0.00	---	---	---	---	---	---	---	---	---	0.000
0.30	2,406	34.30	0.00	---	---	---	---	---	---	---	---	---	0.000
0.40	3,209	34.40	0.00	---	---	---	---	---	---	---	---	---	0.000
0.50	4,011	34.50	0.00	---	---	---	---	---	---	---	---	---	0.000
0.60	4,813	34.60	0.00	---	---	---	---	---	---	---	---	---	0.000
0.70	5,615	34.70	0.00	---	---	---	---	---	---	---	---	---	0.000
0.80	6,417	34.80	0.00	---	---	---	---	---	---	---	---	---	0.000
0.90	7,219	34.90	0.00	---	---	---	---	---	---	---	---	---	0.000
1.00	8,022	35.00	0.00	---	---	---	---	---	---	---	---	---	0.000
1.10	9,014	35.10	0.00	---	---	---	---	---	---	---	---	---	0.000
1.20	10,006	35.20	0.00	---	---	---	---	---	---	---	---	---	0.000
1.30	10,998	35.30	0.00	---	---	---	---	---	---	---	---	---	0.000
1.40	11,991	35.40	0.00	---	---	---	---	---	---	---	---	---	0.000
1.50	12,983	35.50	0.00	---	---	---	---	---	---	---	---	---	0.000
1.60	13,975	35.60	0.00	---	---	---	---	---	---	---	---	---	0.000
1.70	14,968	35.70	0.00	---	---	---	---	---	---	---	---	---	0.000
1.80	15,960	35.80	0.00	---	---	---	---	---	---	---	---	---	0.000
1.90	16,952	35.90	0.00	---	---	---	---	---	---	---	---	---	0.000
2.00	17,944	36.00	0.00	---	---	---	---	---	---	---	---	---	0.000
2.10	19,138	36.10	0.00	---	---	---	---	---	---	---	---	---	0.000
2.20	20,332	36.20	0.00	---	---	---	---	---	---	---	---	---	0.000
2.30	21,526	36.30	0.00	---	---	---	---	---	---	---	---	---	0.000
2.40	22,719	36.40	0.00	---	---	---	---	---	---	---	---	---	0.000
2.50	23,913	36.50	0.00	---	---	---	---	---	---	---	---	---	0.000
2.60	25,107	36.60	0.00	---	---	---	---	---	---	---	---	---	0.000
2.70	26,300	36.70	0.00	---	---	---	---	---	---	---	---	---	0.000
2.80	27,494	36.80	0.00	---	---	---	---	---	---	---	---	---	0.000
2.90	28,688	36.90	0.00	---	---	---	---	---	---	---	---	---	0.000

Continues on next page...

SW Pond #1

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.00	29,881	37.00	0.00	---	---	---	---	---	---	---	---	---	0.000
3.10	31,288	37.10	0.00	---	---	---	---	---	---	---	---	---	0.000
3.20	32,694	37.20	0.00	---	---	---	---	---	---	---	---	---	0.000
3.30	34,100	37.30	0.00	---	---	---	---	---	---	---	---	---	0.000
3.40	35,507	37.40	0.00	---	---	---	---	---	---	---	---	---	0.000
3.50	36,913	37.50	0.00	---	---	---	---	---	---	---	---	---	0.000
3.60	38,320	37.60	0.00	---	---	---	---	---	---	---	---	---	0.000
3.70	39,726	37.70	0.00	---	---	---	---	---	---	---	---	---	0.000
3.80	41,132	37.80	0.00	---	---	---	---	---	---	---	---	---	0.000
3.90	42,539	37.90	0.00	---	---	---	---	---	---	---	---	---	0.000
4.00	43,945	38.00	0.00	---	---	---	---	---	---	---	---	---	0.000
4.10	45,576	38.10	0.00	---	---	---	---	---	---	---	---	---	0.000
4.20	47,206	38.20	0.00	---	---	---	---	---	---	---	---	---	0.000
4.30	48,836	38.30	0.00	---	---	---	---	---	---	---	---	---	0.000
4.40	50,467	38.40	0.00	---	---	---	---	---	---	---	---	---	0.000
4.50	52,097	38.50	0.00	---	---	---	---	---	---	---	---	---	0.000
4.60	53,728	38.60	0.00	---	---	---	---	---	---	---	---	---	0.000
4.70	55,358	38.70	0.00	---	---	---	---	---	---	---	---	---	0.000
4.80	56,988	38.80	0.00	---	---	---	---	---	---	---	---	---	0.000
4.90	58,619	38.90	0.00	---	---	---	---	---	---	---	---	---	0.000
5.00	60,249	39.00	0.00	---	---	---	---	---	---	---	---	---	0.000
5.07	61,530	39.07	0.00	---	---	---	---	---	---	---	---	---	0.000
5.14	62,811	39.14	0.00	---	---	---	---	---	---	---	---	---	0.000
5.21	64,091	39.21	0.00	---	---	---	---	---	---	---	---	---	0.000
5.28	65,372	39.28	0.00	---	---	---	---	---	---	---	---	---	0.000
5.35	66,653	39.35	0.00	---	---	---	---	---	---	---	---	---	0.000
5.42	67,933	39.42	0.00	---	---	---	---	---	---	---	---	---	0.000
5.49	69,214	39.49	0.00	---	---	---	---	---	---	---	---	---	0.000
5.56	70,495	39.56	0.00	---	---	---	---	---	---	---	---	---	0.000
5.63	71,776	39.63	0.00	---	---	---	---	---	---	---	---	---	0.000
5.70	73,056	39.70	0.00	---	---	---	---	---	---	---	---	---	0.000
5.75	74,140	39.75	0.00	---	---	---	---	---	---	---	---	---	0.000
5.80	75,224	39.80	0.00	---	---	---	---	---	---	---	---	---	0.000
5.85	76,309	39.85	0.00	---	---	---	---	---	---	---	---	---	0.000
5.90	77,393	39.90	0.00	---	---	---	---	---	---	---	---	---	0.000
5.95	78,477	39.95	0.00	---	---	---	---	---	---	---	---	---	0.000
6.00	79,561	40.00	0.00	---	---	---	---	---	---	---	---	---	0.000
6.05	80,645	40.05	0.00	---	---	---	---	---	---	---	---	---	0.000
6.10	81,729	40.10	0.00	---	---	---	---	---	---	---	---	---	0.000
6.15	82,813	40.15	0.00	---	---	---	---	---	---	---	---	---	0.000
6.20	83,897	40.20	0.00	---	---	---	---	---	---	---	---	---	0.000
6.25	85,202	40.25	0.00 ic	---	---	---	---	---	---	---	---	---	0.005
6.30	86,507	40.30	0.02 ic	---	---	---	---	---	---	---	---	---	0.017
6.35	87,812	40.35	0.03 ic	---	---	---	---	---	---	---	---	---	0.035
6.40	89,116	40.40	0.05 ic	---	---	---	---	---	---	---	---	---	0.051
6.45	90,421	40.45	0.02 oc	---	---	---	---	---	---	---	---	---	0.017
6.50	91,726	40.50	0.03 oc	---	---	---	---	---	---	---	---	---	0.026
6.55	93,031	40.55	0.03 oc	---	---	---	---	---	---	---	---	---	0.032
6.60	94,335	40.60	0.04 oc	---	---	---	---	---	---	---	---	---	0.037
6.65	95,640	40.65	0.04 oc	---	---	---	---	---	---	---	---	---	0.042
6.70	96,945	40.70	0.05 oc	---	---	---	---	---	---	---	---	---	0.046
6.73	97,792	40.73	0.05 oc	---	---	---	---	---	---	---	---	---	0.048
6.76	98,639	40.76	0.05 oc	---	---	---	---	---	---	---	---	---	0.051
6.79	99,486	40.79	0.05 oc	---	---	---	---	---	---	---	---	---	0.053
6.82	100,333	40.82	0.05 oc	---	---	---	---	---	---	---	---	---	0.055
6.85	101,180	40.85	0.06 oc	---	---	---	---	---	---	---	---	---	0.057
6.88	102,027	40.88	0.06 oc	---	---	---	---	---	---	---	---	---	0.059
6.91	102,874	40.91	0.06 oc	---	---	---	---	---	---	---	---	---	0.061
6.94	103,721	40.94	0.06 oc	---	---	---	---	---	---	---	---	---	0.062
6.97	104,568	40.97	0.06 oc	---	---	---	---	---	---	---	---	---	0.064
7.00	105,415	41.00	0.07 oc	---	---	---	---	---	---	---	---	---	0.066
7.10	108,382	41.10	0.07 oc	---	---	---	---	---	---	---	---	---	0.071
7.20	111,350	41.20	0.08 oc	---	---	---	---	---	---	---	---	---	0.076
7.30	114,317	41.30	0.08 oc	---	---	---	---	---	---	---	---	---	0.081
7.40	117,285	41.40	0.09 oc	---	---	---	---	---	---	---	---	---	0.085
7.50	120,252	41.50	0.09 oc	---	---	---	---	---	---	---	---	---	0.089
7.60	123,220	41.60	0.09 oc	---	---	---	---	---	---	---	---	---	0.093
7.70	126,187	41.70	0.10 oc	---	---	---	---	---	---	---	---	---	0.097
7.80	129,155	41.80	0.10 oc	---	---	---	---	---	---	---	---	---	0.101
7.90	132,122	41.90	0.10 oc	---	---	---	---	---	---	---	---	---	0.104
8.00	135,090	42.00	0.11 oc	---	---	---	---	---	---	---	---	---	0.108
8.10	138,284	42.10	0.11 oc	---	---	---	---	---	---	---	---	---	0.111

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SW Pond #1

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
8.20	141,478	42.20	0.11 oc	---	---	---	---	---	---	---	---	---	0.114
8.30	144,672	42.30	0.12 oc	---	---	---	---	---	---	---	---	---	0.118
8.40	147,866	42.40	0.12 oc	---	---	---	---	---	---	---	---	---	0.121
8.50	151,060	42.50	0.12 oc	---	---	---	---	---	---	---	---	---	0.124
8.60	154,254	42.60	0.13 oc	---	---	---	---	---	---	---	---	---	0.127
8.70	157,448	42.70	0.13 oc	---	---	---	---	---	---	---	---	---	0.129
8.80	160,642	42.80	0.13 oc	---	---	---	---	---	---	---	---	---	0.132
8.90	163,836	42.90	0.13 oc	---	---	---	---	---	---	---	---	---	0.135
9.00	167,030	43.00	0.14 oc	---	---	---	---	---	---	---	---	---	0.138
9.10	170,456	43.10	0.14 oc	---	---	---	---	---	---	---	---	---	0.140
9.20	173,883	43.20	0.14 oc	---	---	---	---	---	---	---	---	---	0.143
9.30	177,309	43.30	0.15 oc	---	---	---	---	---	---	---	---	---	0.145
9.40	180,735	43.40	0.15 oc	---	---	---	---	---	---	---	---	---	0.148
9.50	184,161	43.50	0.15 oc	---	---	---	---	---	---	---	---	---	0.150
9.60	187,588	43.60	0.15 oc	---	---	---	---	---	---	---	---	---	0.153
9.70	191,014	43.70	0.16 oc	---	---	---	---	---	---	---	---	---	0.155
9.80	194,440	43.80	0.16 oc	---	---	---	---	---	---	---	---	---	0.157
9.90	197,866	43.90	0.16 oc	---	---	---	---	---	---	---	---	---	0.160
10.00	201,293	44.00	0.16 oc	---	---	---	---	---	---	---	---	---	0.162

...End

Hydrograph Report

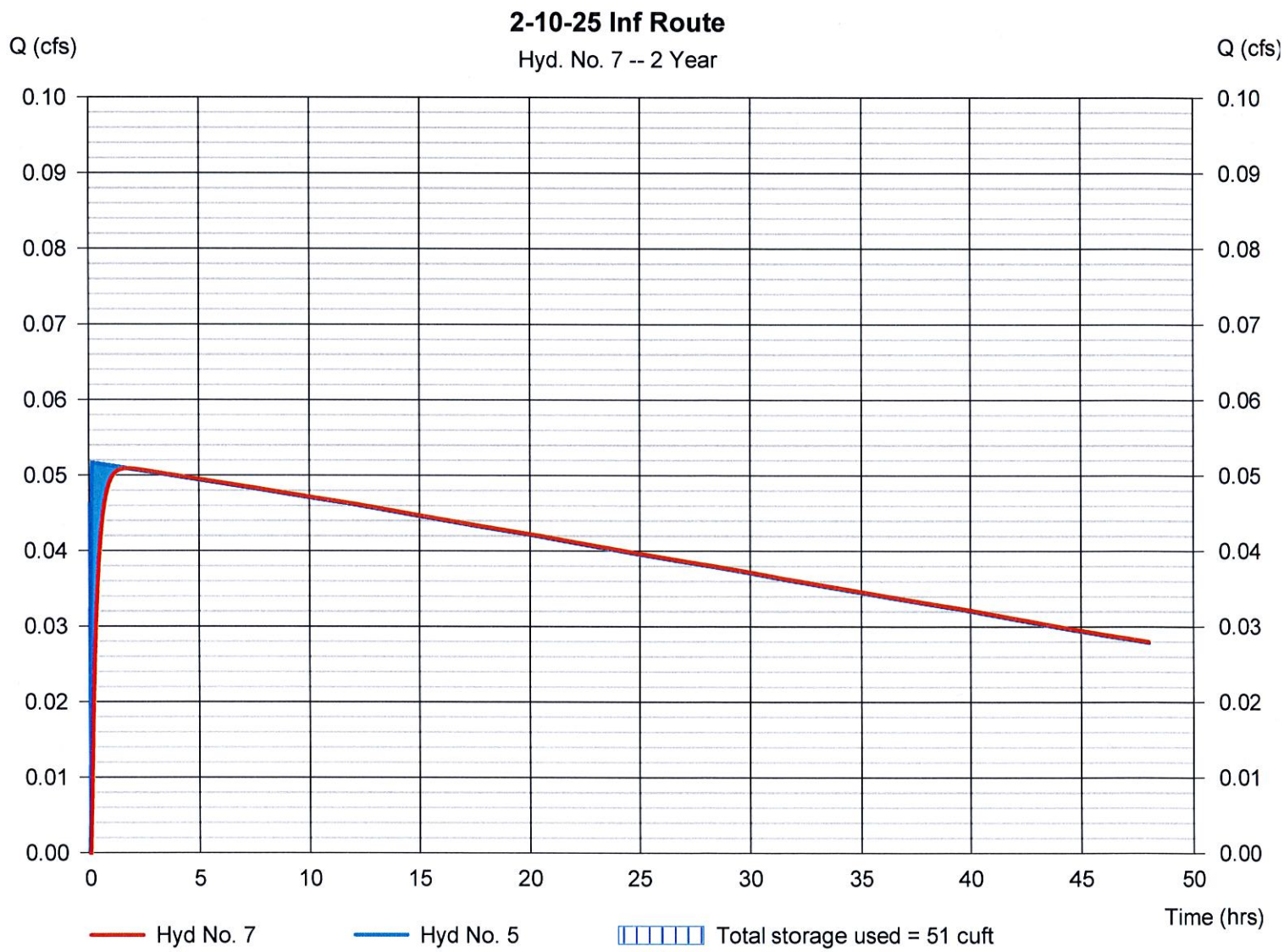
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 7

2-10-25 Inf Route

Hydrograph type	= Reservoir	Peak discharge	= 0.051 cfs
Storm frequency	= 2 yrs	Time to peak	= 1.73 hrs
Time interval	= 1 min	Hyd. volume	= 6,867 cuft
Inflow hyd. No.	= 5 - Pond 2-10-25-100 Post	Max. Elevation	= 40.25 ft
Reservoir name	= Infiltration Basin	Max. Storage	= 51 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

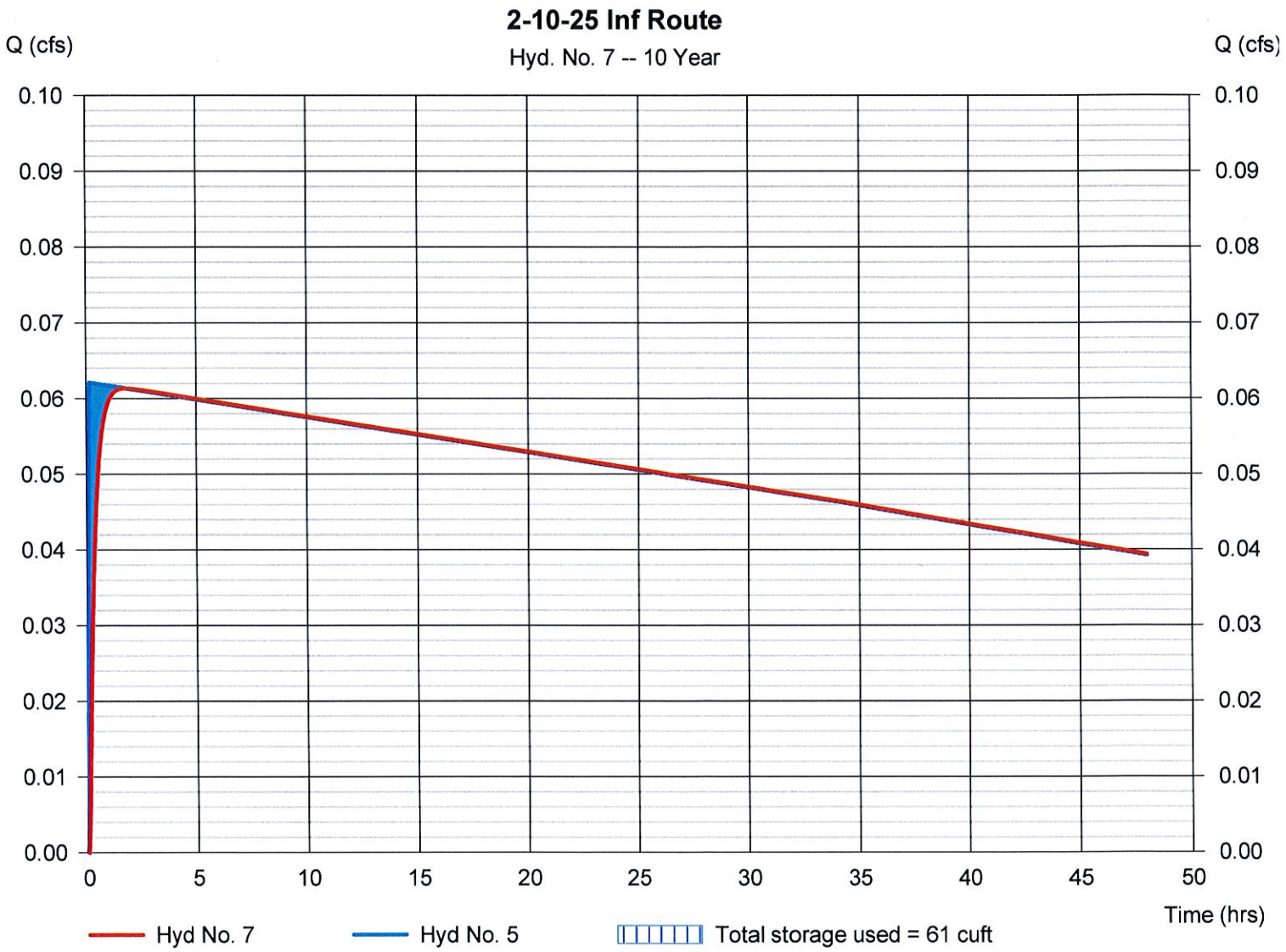
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 7

2-10-25 Inf Route

Hydrograph type	= Reservoir	Peak discharge	= 0.061 cfs
Storm frequency	= 10 yrs	Time to peak	= 1.78 hrs
Time interval	= 1 min	Hyd. volume	= 8,741 cuft
Inflow hyd. No.	= 5 - Pond 2-10-25-100 Post	Max. Elevation	= 40.26 ft
Reservoir name	= Infiltration Basin	Max. Storage	= 61 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

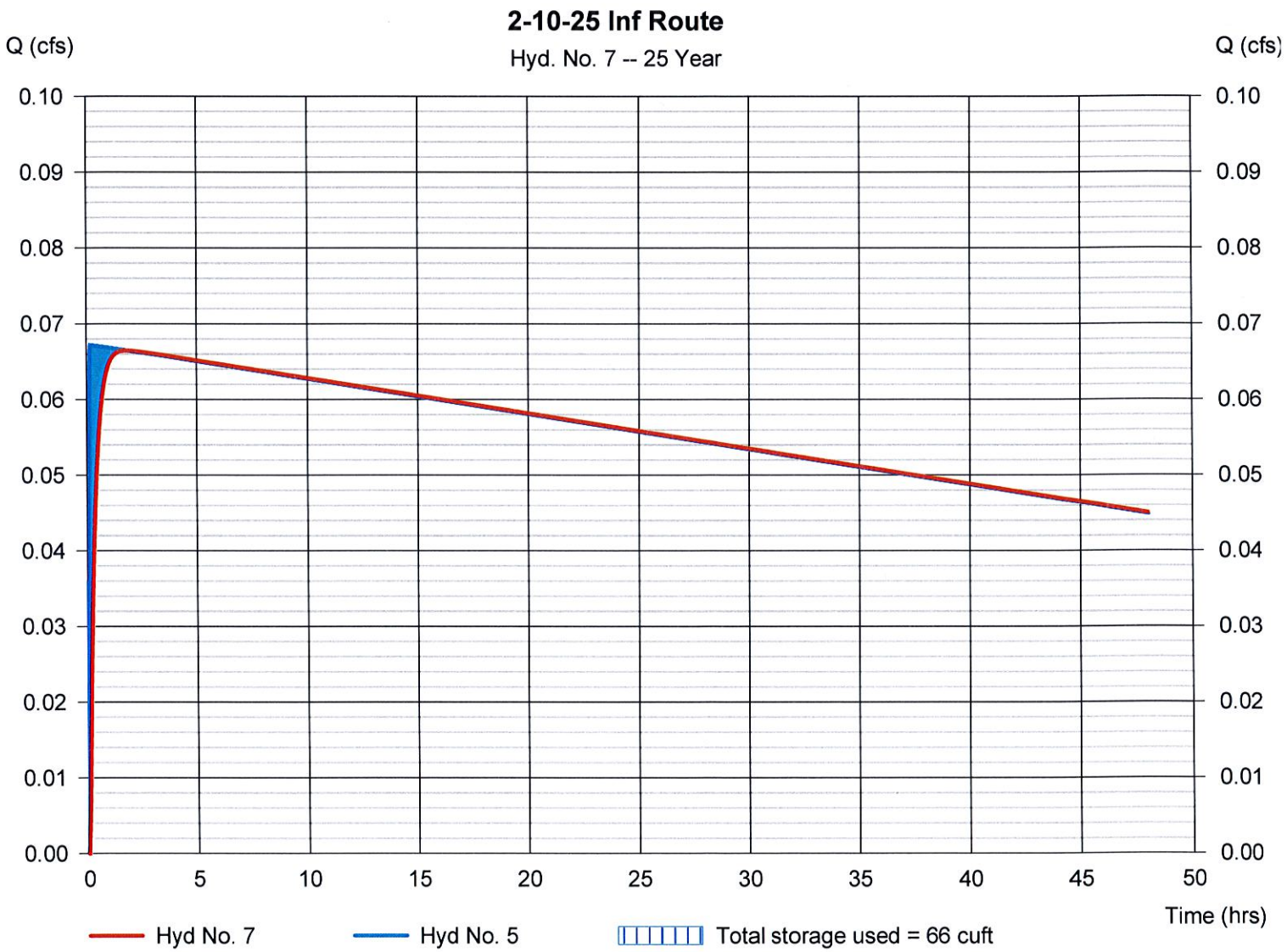
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 7

2-10-25 Inf Route

Hydrograph type	= Reservoir	Peak discharge	= 0.066 cfs
Storm frequency	= 25 yrs	Time to peak	= 1.83 hrs
Time interval	= 1 min	Hyd. volume	= 9,644 cuft
Inflow hyd. No.	= 5 - Pond 2-10-25-100 Post	Max. Elevation	= 40.26 ft
Reservoir name	= Infiltration Basin	Max. Storage	= 66 cuft

Storage Indication method used. Outflow includes exfiltration.



Hydrograph Report

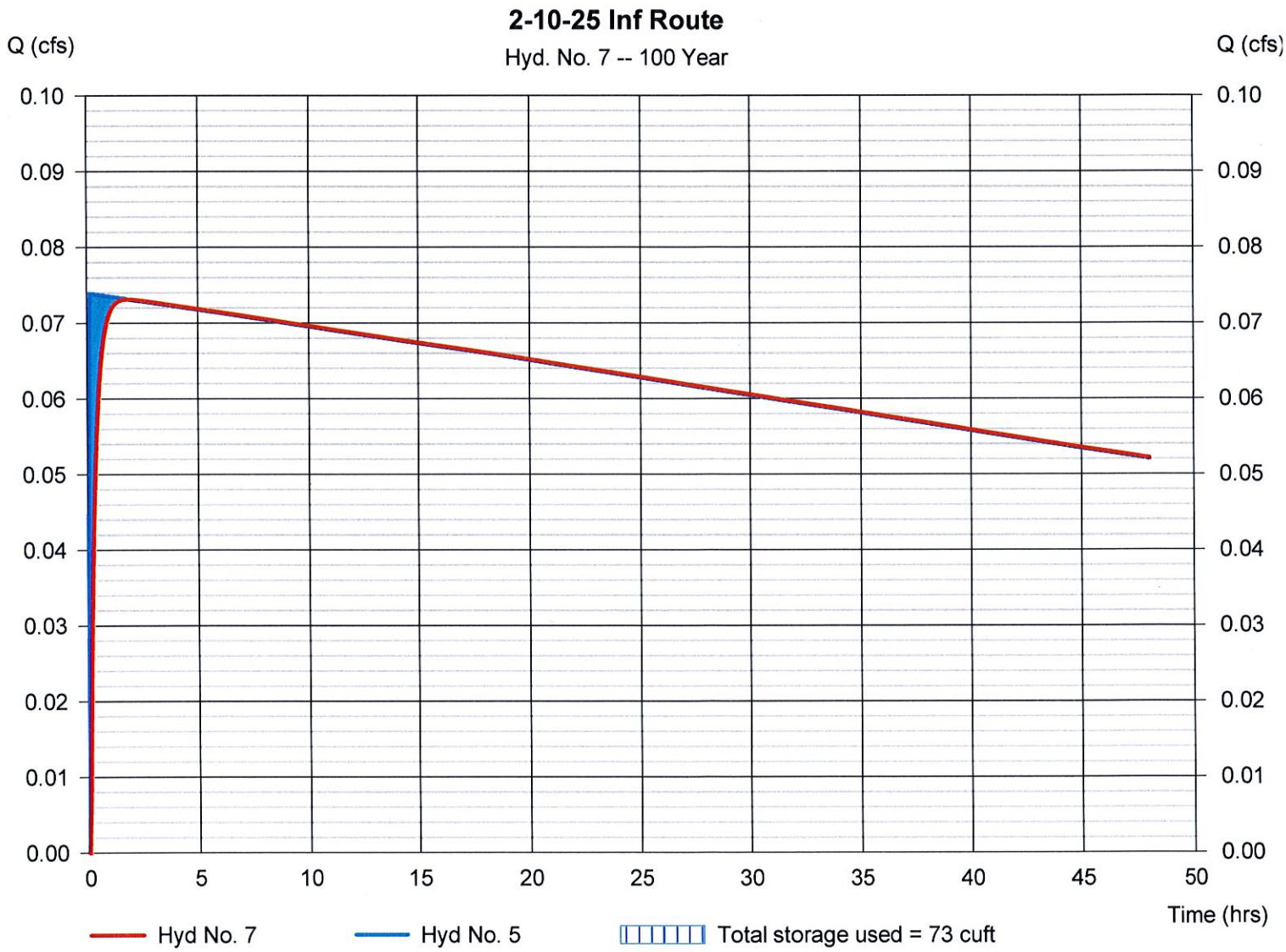
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Hyd. No. 7

2-10-25 Inf Route

Hydrograph type	= Reservoir	Peak discharge	= 0.073 cfs
Storm frequency	= 100 yrs	Time to peak	= 1.85 hrs
Time interval	= 1 min	Hyd. volume	= 10,838 cuft
Inflow hyd. No.	= 5 - Pond 2-10-25-100 Post	Max. Elevation	= 40.27 ft
Reservoir name	= Infiltration Basin	Max. Storage	= 73 cuft

Storage Indication method used. Outflow includes exfiltration.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 Tuesday, 09 / 15 / 2015

Pond No. 2 - Infiltration Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 40.20 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	40.20	894	0	0
0.80	41.00	1,207	837	837
1.80	42.00	1,657	1,426	2,263
2.80	43.00	2,163	1,904	4,167
3.80	44.00	2,725	2,438	6,606

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[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.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 30.000 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	40.20	---	---	---	---	---	---	---	---	0.000	---	0.000
0.08	84	40.28	---	---	---	---	---	---	---	---	0.084	---	0.084
0.16	167	40.36	---	---	---	---	---	---	---	---	0.168	---	0.168
0.24	251	40.44	---	---	---	---	---	---	---	---	0.251	---	0.251
0.32	335	40.52	---	---	---	---	---	---	---	---	0.335	---	0.335
0.40	419	40.60	---	---	---	---	---	---	---	---	0.419	---	0.419
0.48	502	40.68	---	---	---	---	---	---	---	---	0.503	---	0.503
0.56	586	40.76	---	---	---	---	---	---	---	---	0.587	---	0.587
0.64	670	40.84	---	---	---	---	---	---	---	---	0.671	---	0.671
0.72	753	40.92	---	---	---	---	---	---	---	---	0.754	---	0.754
0.80	837	41.00	---	---	---	---	---	---	---	---	0.838	---	0.838
0.90	980	41.10	---	---	---	---	---	---	---	---	0.869	---	0.869
1.00	1,122	41.20	---	---	---	---	---	---	---	---	0.901	---	0.901
1.10	1,265	41.30	---	---	---	---	---	---	---	---	0.932	---	0.932
1.20	1,408	41.40	---	---	---	---	---	---	---	---	0.963	---	0.963
1.30	1,550	41.50	---	---	---	---	---	---	---	---	0.994	---	0.994
1.40	1,693	41.60	---	---	---	---	---	---	---	---	1.026	---	1.026
1.50	1,835	41.70	---	---	---	---	---	---	---	---	1.057	---	1.057
1.60	1,978	41.80	---	---	---	---	---	---	---	---	1.088	---	1.088
1.70	2,121	41.90	---	---	---	---	---	---	---	---	1.119	---	1.119
1.80	2,263	42.00	---	---	---	---	---	---	---	---	1.151	---	1.151
1.90	2,454	42.10	---	---	---	---	---	---	---	---	1.186	---	1.186
2.00	2,644	42.20	---	---	---	---	---	---	---	---	1.221	---	1.221
2.10	2,834	42.30	---	---	---	---	---	---	---	---	1.256	---	1.256
2.20	3,025	42.40	---	---	---	---	---	---	---	---	1.291	---	1.291
2.30	3,215	42.50	---	---	---	---	---	---	---	---	1.326	---	1.326
2.40	3,406	42.60	---	---	---	---	---	---	---	---	1.362	---	1.362
2.50	3,596	42.70	---	---	---	---	---	---	---	---	1.397	---	1.397
2.60	3,786	42.80	---	---	---	---	---	---	---	---	1.432	---	1.432
2.70	3,977	42.90	---	---	---	---	---	---	---	---	1.467	---	1.467
2.80	4,167	43.00	---	---	---	---	---	---	---	---	1.502	---	1.502
2.90	4,411	43.10	---	---	---	---	---	---	---	---	1.541	---	1.541
3.00	4,655	43.20	---	---	---	---	---	---	---	---	1.580	---	1.580
3.10	4,899	43.30	---	---	---	---	---	---	---	---	1.619	---	1.619
3.20	5,143	43.40	---	---	---	---	---	---	---	---	1.658	---	1.658
3.30	5,386	43.50	---	---	---	---	---	---	---	---	1.697	---	1.697
3.40	5,630	43.60	---	---	---	---	---	---	---	---	1.736	---	1.736
3.50	5,874	43.70	---	---	---	---	---	---	---	---	1.775	---	1.775

Continues on next page...

Infiltration Basin

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.60	6,118	43.80	---	---	---	---	---	---	---	---	1.814	---	1.814
3.70	6,362	43.90	---	---	---	---	---	---	---	---	1.853	---	1.853
3.80	6,606	44.00	---	---	---	---	---	---	---	---	1.892	---	1.892

...End

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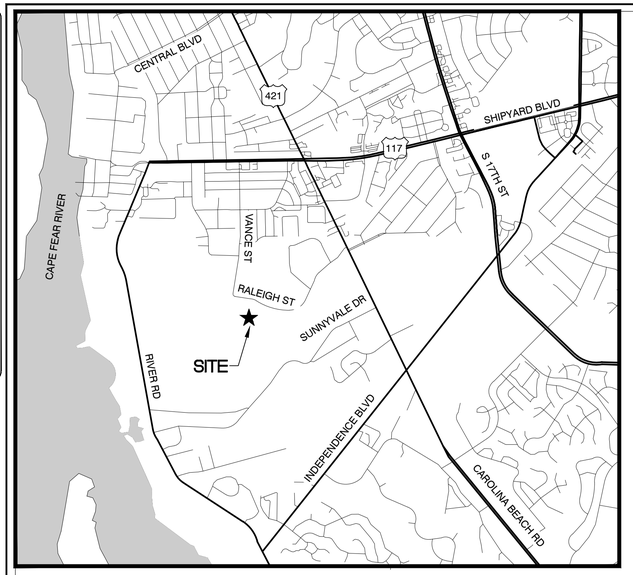
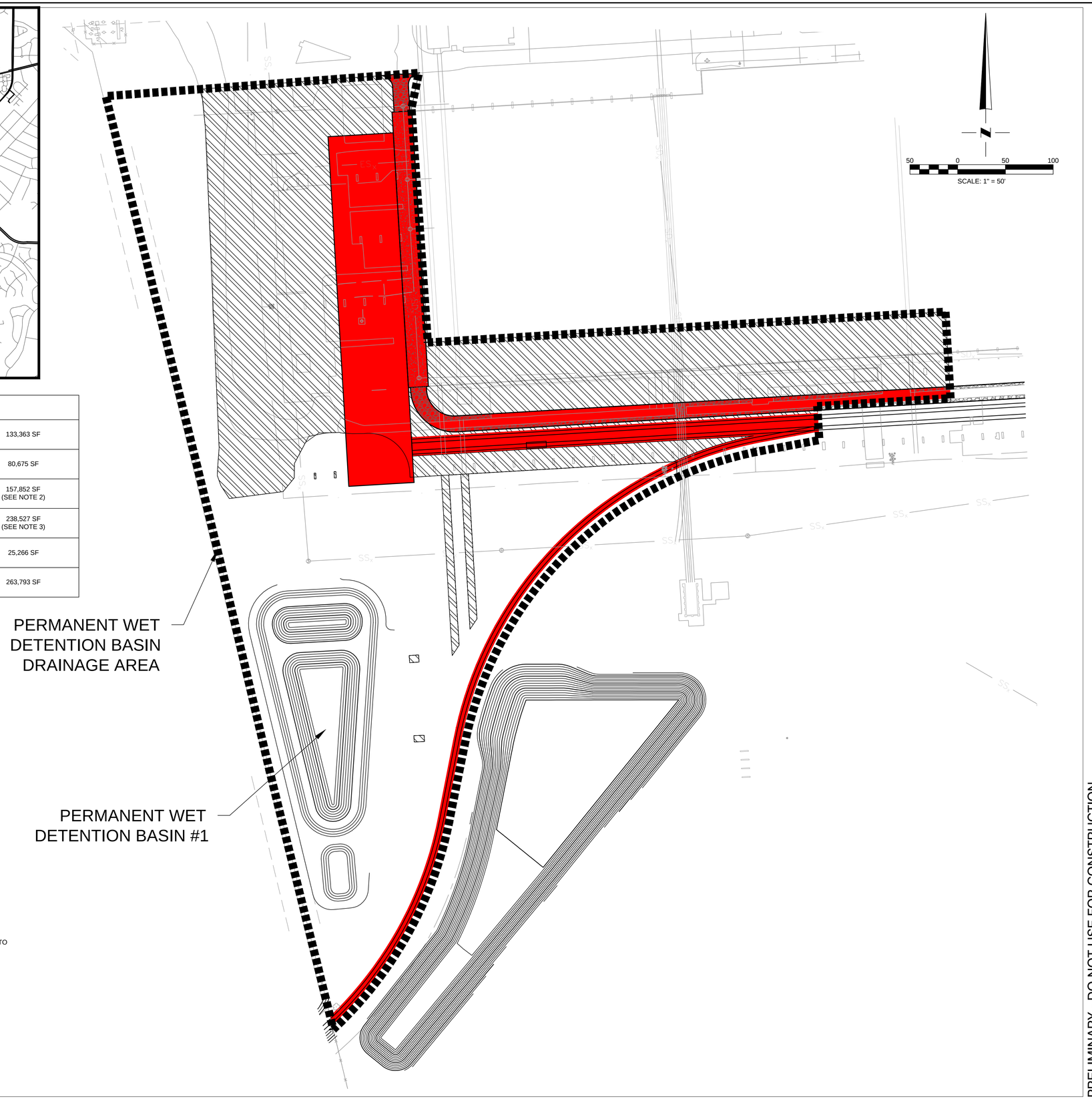


IMPERVIOUS AREA - VERTEX PROPERTY

TOTAL PROPOSED IMPERVIOUS AREA FOR PHASE 1	NOT SHOWN	133,363 SF
PROPOSED IMPERVIOUS AREA TO WET DETENTION BASIN #1		80,675 SF
EXISTING IMPERVIOUS AREA WET DETENTION BASIN #1		157,852 SF (SEE NOTE 2)
TOTAL EXISTING AND PROPOSED IMPERVIOUS AREA TO WET DETENTION BASIN #1	NOT SHOWN	238,527 SF (SEE NOTE 3)
FUTURE IMPERVIOUS AREA TO WET DETENTION BASIN #1	NOT SHOWN	25,266 SF
TOTAL IMPERVIOUS ARE ACCOMMODATED IN WET DETENTION BASIN #1 IMPERVIOUS AREA	NOT SHOWN	263,793 SF



NOTES:

1. TOTAL IMPERVIOUS AREA REQUIRED TO BE TREATED IN WET DETENTION BASIN #1. SEE OVERALL IMPERVIOUS AREA PLAN.
2. EXISTING IMPERVIOUS AREA BEING CAPTURED AND TREATED IN LIEU OF PROPOSED IMPERVIOUS AREA THAT CHANGE BE CONVEYED TO WET DETENTION BASIN #1.
3. IN ADDITION TO A FUTURE IMPERVIOUS ALLOCATION, THE POND WILL TREAT 114,119 SF OF IMPERVIOUS SURFACE AREA NOT REQUIRED TO BE TREATED. THIS AMOUNT OF OVERTREATMENT TO BE APPLIED TO FUTURE PHASES OF THE VERTEX PROJECT TO OFFSET FOR NEW IMPERVIOUS SURFACE AREA THAT CANNOT BE CONVEYED TO THE WET DETENTION BASIN.

PRELIMINARY - DO NOT USE FOR CONSTRUCTION

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NC LICENSE NO.F-0374

PROFESSIONAL SEAL

REVISION RECORD

NO.	DATE	DESCRIPTION	BY

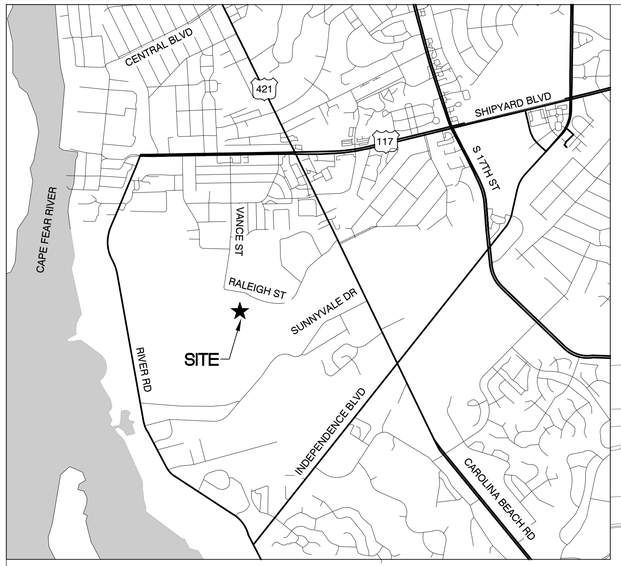
PROJECT NAME: RAIL AND SITE IMPROVEMENTS FOR VERTEX RAILCAR CORPORATION 202 RALEIGH STREET WILMINGTON, NORTH CAROLINA 28412

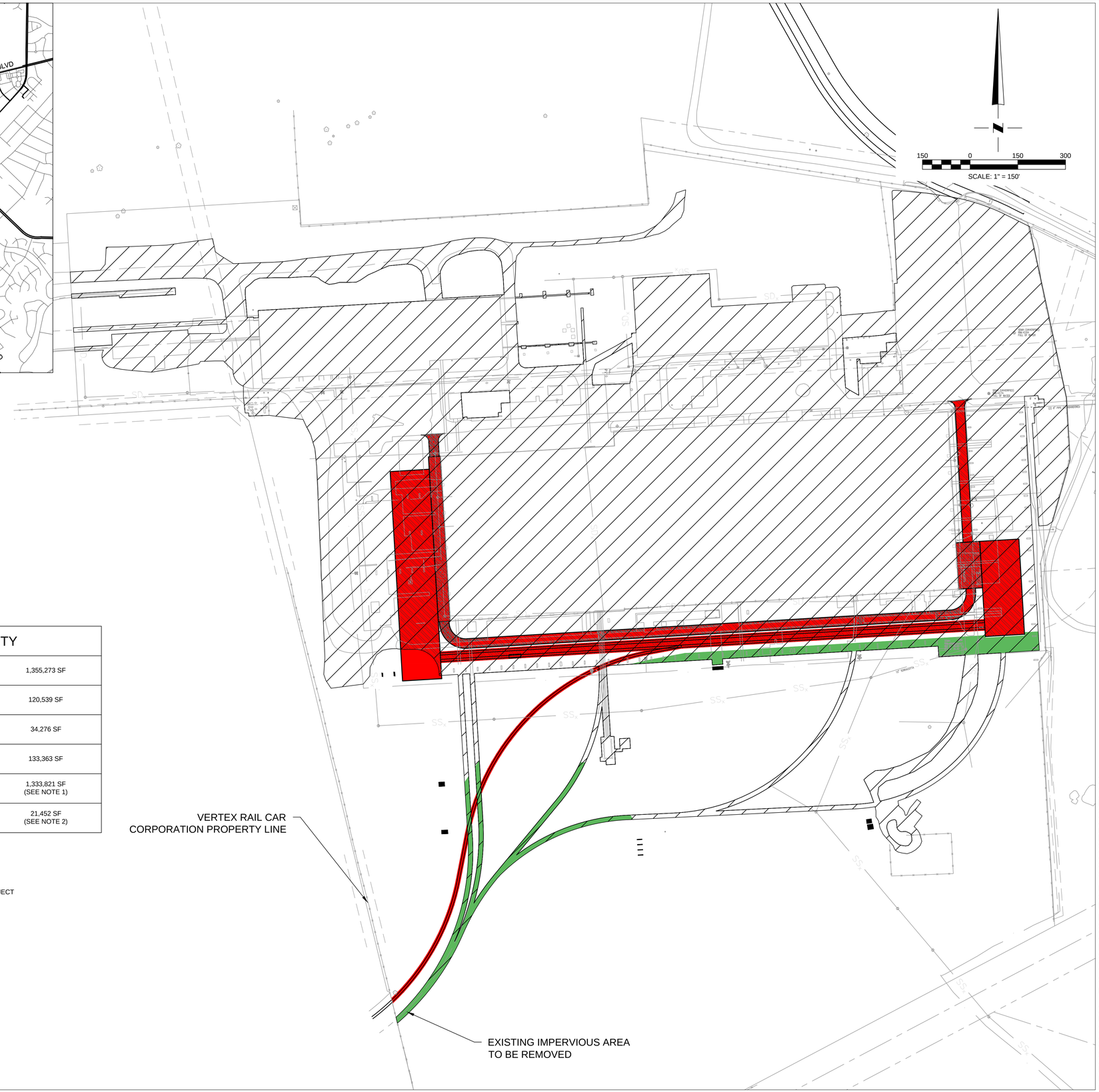
DRAWING TITLE: IMPERVIOUS AREA PLAN - WET DETENTION BASIN 1

PROJ. MGR.:	DLF
DESIGN BY:	DED
DRAWN BY:	TJC
PROJ. DATE:	AUGUST 2015

DRAWING NUMBER: 1

WKD PROJ. NO.: 20150016.00.WL





IMPERVIOUS AREA - VERTEX PROPERTY

EXISTING IMPERVIOUS AREA		1,355,273 SF
EXISTING IMPERVIOUS AREA TO BE REMOVED AND REPLACED WITH PROPOSED IMPERVIOUS		120,539 SF
EXISTING IMPERVIOUS AREA TO BE REMOVED		34,276 SF
PROPOSED PHASE 1 IMPERVIOUS AREA		133,363 SF
TOTAL IMPRERVIOUS AREA AFTER PHASE 1 CONSTRUCTION	NOTE SHOWN	1,333,821 SF (SEE NOTE 1)
NET DECREASE IN IMPERVIOUS AREA	NOT SHOWN	21,452 SF (SEE NOTE 2)

NOTES:

1. RESULTS IN NO NET CHANGE IN AMOUNT OF IMPERVIOUS AREA.
2. NET DECREASE IN IMPERVIOUS AREA TO BE APPLIED TO FUTURE PHASES OF THE VERTEX PROJECT TO MAINTAIN A NET ZERO IN CREASE IN IMPERVIOUS SURFACE AREA.

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REVISION RECORD

NO.	DATE	DESCRIPTION	BY

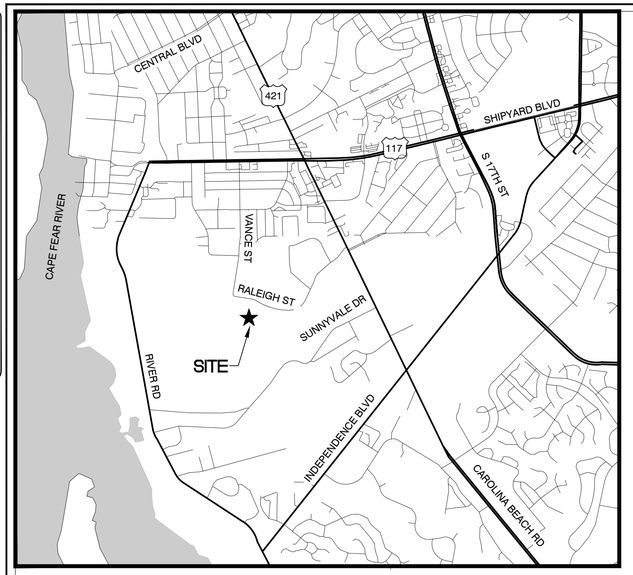
PROJECT NAME: RAIL AND SITE IMPROVEMENTS FOR VERTEX RAILCAR CORPORATION 202 RALEIGH STREET WILMINGTON, NORTH CAROLINA 28412

DRAWING TITLE: OVERALL IMPERVIOUS AREA PLAN

PROJ. MGR.:	DLF
DESIGN BY:	DED
DRAWN BY:	TJC
PROJ. DATE:	AUGUST 2015

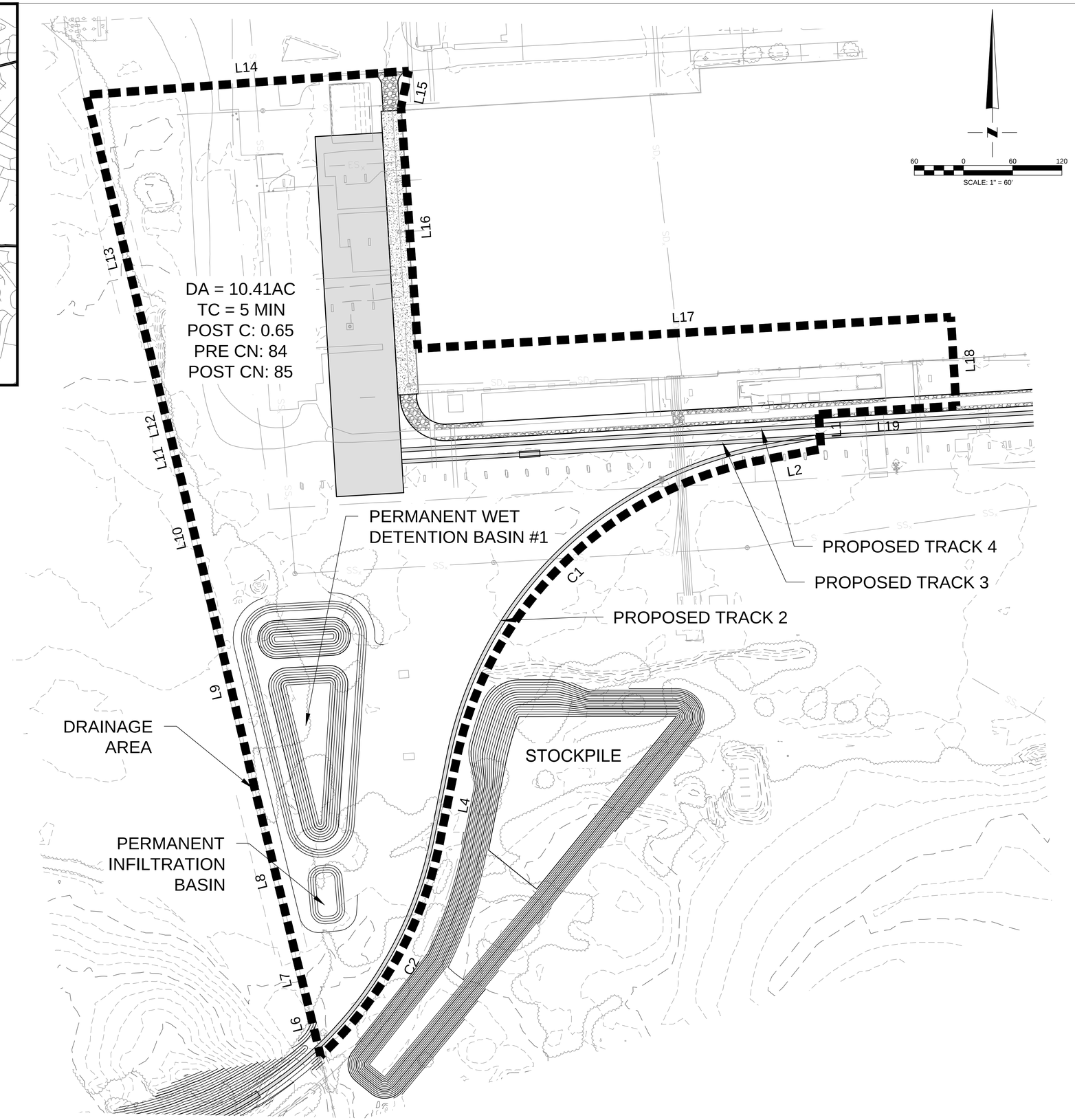
DRAWING NUMBER: 1

WKD PROJ. NO.: 20150016.00.WL



Curve Table				
CURVE #	ARC LENGTH	RADIUS	CHORD BRG.	CHORD LENGTH
C1	556.63'	468.49'	S45°24'19.29"W	524.46'
C2	303.34'	488.19'	S29°10'04.42"W	298.48'

LINE TABLE		
LINE #	LENGTH	DIRECTION
L1	42.66'	S03°24'14.76"E
L2	73.00'	S79°26'35.24"W
L4	100.00'	S11°22'03.33"W
L6	88.88'	N13°48'10.95"W
L7	22.56'	N14°07'58.32"W
L8	224.98'	N13°50'10.04"W
L9	249.98'	N13°14'35.79"W
L10	135.98'	N13°35'19.86"W
L11	63.00'	N13°51'54.92"W
L12	19.23'	N13°51'54.92"W
L13	401.95'	N13°51'54.92"W
L14	394.29'	N85°45'14.02"E
L15	45.49'	S11°50'56.37"W
L16	294.82'	S04°00'12.22"E
L17	651.33'	N86°35'51.48"E
L18	108.84'	S03°23'34.31"E
L19	167.73'	S86°35'48.11"W



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REVISION RECORD

NO.	DATE	DESCRIPTION	BY

PROJECT NAME: RAIL AND SITE IMPROVEMENTS FOR VERTEX RAILCAR CORPORATION 202 RALEIGH STREET WILMINGTON, NORTH CAROLINA 28412

DRAWING TITLE: STORM WATER DRAINAGE AREA PLAN - PERMANENT WET DETENTION BASIN #1

PROJ. MGR.:	DLF
DESIGN BY:	DED
DRAWN BY:	TJC
PROJ. DATE:	AUGUST 2015
DRAWING NUMBER:	1
WKD PROJ. NO.:	20150016.00.WL

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