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New Paltz, NY 12561
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Drainage Analysis

Prepared for Twin Pond Enterprises, Inc.
1100 US Route 9W
Town of Marlborough, Ulster County, New York

August 13, 2018
Revised April 15, 2019

I. Introduction

This drainage report has been prepared in support of the Twin Pond Enterprises site improvements in the Town Marlborough, Ulster County. The report describes existing and proposed site conditions and gives a comparison of pre- and post- development stormwater runoff rates at the existing NYSDOT maintained 36"Ø cmp culvert connected to a 3' x 2' box culvert which crosses beneath US Route 9W. The purpose of this report is to demonstrate that post-development flow rates will not exacerbate runoff overtopping Route 9W during the 10-year storm event.

All drainage calculations were completed using HydroCad 10.0. The software utilizes the principals of TR-55 and TR-20 to generate unit hydrographs. Rainfall events and types were obtained from the Northeast Regional Climate Center, which provides local, specific rainfall events for a particular location. The Type II rainfall depth for the 10-year event is 4.65 inches, which is the specific rainfall event analyzed in this report.

II. Soil Conditions & Ground Cover

The drainage area of the NYSDOT culvert consists of several different soil types listed in the table below. Ground cover at the site consists of orchards, woods, residential areas, grass and impervious surfaces (roads, buildings, and driveways).

Map Unit	*Soil Names*	*Hydrologic Group*	*Description*
MgB	Mardin-Nassau	C	Deep, well-drained Mardin, shallow, excessively drained Nassau
Cd	Canandaigua	D	Deep, nearly level, poorly drained
BnC	Bath-Nassau	C	Deep, well-drained Bath, shallow, excessively drained Nassau
VoA	Volusia	C	Deep, somewhat poorly drained
BOD	Bath-Nassau-Rock	C	Deep, well-drained Bath, shallow, excessively drained Nassau, small areas of exposed bedrock

III. Pre-Development Drainage Conditions

As indicated above, the design point for this analysis is the existing 36"Ø cmp culvert connected to a 3' x 2' box culvert which spans beneath Route 9W. This culvert is located east of the Twin Pond site in the NYSDOT Right of Way and conveys runoff from the western side of Route 9W (which includes the entire Twin Pond site) to the eastern side. Runoff from the drainage area enters this culvert via a catch basin and road adjacent ditch, both located on the west side of Route 9w. Runoff then enters an unnamed stream which discharges to the Hudson River approximately ½ mile east of the site.

The pre-development drainage area is approximately 36 acres in size according to USGS Streamstats application and our delineation using LIDAR topography and aerial imagery. The drainage area is comprised of approximately 88% type C soils and 12% type D soils. The pre-development subcatchment 'PRE' consists of the project site, orchards, woods, residential areas and roadways with an impervious surface area of 14.95% of the total area.

The pre-development watershed area is shown on the Drainage Map and detailed in the HydroCAD analysis. Pertinent information relating to the watershed is summarized in the table below.

Sub catch	**Area (acre)**	**Cover Condition**	**Curve Number**	**Soil Groups**	**Time of Conc. (min)**
PRE	36.0	Orchards, Woods, Grass, Residential Areas, Impervious Surfaces	77	C & D	68.0

As noted above, HydroCAD was utilized to determine the flow rate at the existing culvert during the 10-year storm event. Below is a table showing pre-development flow rates discharging from the existing culvert during the noted frequency storm event.

Subcatchment	PRE Development Runoff Rate – 10 Year Storm Event (cfs)
PRE	40.46

Evaluation of the pre-development HydroCAD model indicates that runoff does overtop the roadway, which was modeled as an overflow weir, by approximately 0.07'.

IV. Post-Development Drainage Conditions

Post-development conditions include the same subcatchment area (36 acres) as the existing subcatchment (PRE). The proposed subcatchment (POST) consists primarily of the same ground cover as existing conditions with the addition of 0.2 acres of impervious surface to account for the proposed improvements to the Twin Pond Site. The time of concentration for the POST subcatchment was altered to include the proposed stormwater conveyance structures which bypass the Route 9W road adjacent ditch and discharge adjacent to the NYSDOT catch basin.

The existing NYSDOT catch basin is proposed to be modified by increasing the size of the inlet on the south side of the catch basin from a trapezoidal shape with a bottom width of 12", a top width of 24" and a height of 8" to a rectangular shape with a width of 30" and a height of 22". The purpose of increasing the size of this opening is to allow runoff to discharge the site without overtopping the road, which is shown in the attached post-development HydroCad calculations. An aluminum grate will be installed over this opening for safety purposes. Rip-rap (D_{50}=6") will be installed around the proposed inlet of the catch basin to prevent sediment from being transported into the pipe / box culvert. Additionally, the existing pipe and box culvert will be cleaned of sediment as part of the proposed improvements to allow for the culvert to utilize its full capacity.

The post-development watershed area is shown on the Drainage Map and detailed in the HydroCAD analysis. Pertinent information relating to the watershed is summarized in the table below.

Sub catch	Area (acre)	Cover Condition	Curve Number	Soil Groups	Time of Conc. (min)
POST	36.00	Orchards, Woods, Grass, Residential Areas, Impervious Surfaces	77	C & D	66.4

HydroCAD was utilized to determine the flow rate at the existing culvert during the 10-year storm event in post development conditions to compare with pre-development conditions. This information is presented in the table below.

Subcatchment	HydroCAD POST Development Runoff Rates – 10 Year Storm Event (cfs)
POST	41.20

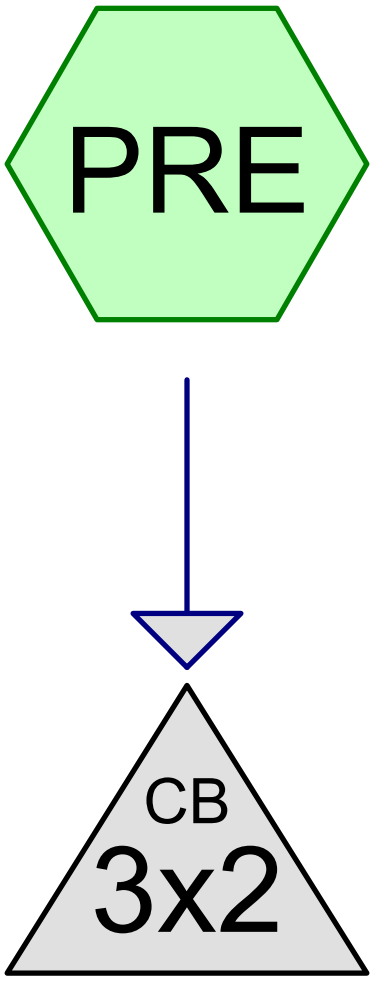
As shown above, there is a slight increase in the runoff rate in post-development conditions during the 10-year storm event, however, the post-development calculations also show that runoff will no longer overtop the roadway after the catch basin has been improved.

V. Results & Conclusion

The following table shows the pre-and post-development runoff rates and road overtopping height for the analyzed storm at the NYSDOT culvert.

	10-year Storm Event (cfs)	Road Overtopping
Pre-Development	40.46	0.07’
Post-Development	41.20	0.00’

As shown above and in the attached calculations, the existing NYSDOT culvert, with improved catch basin inlet, has enough capacity to convey the stormwater runoff generated by the proposed development at the Twin Pond Enterprises Site during the 10-year storm event. The calculations show that the rate of runoff generated from the post-development drainage area during the 10-year storm event will slightly increase (0.74 cfs) from pre-development conditions. The calculations show that the existing overtopping of the roadway will be mitigated as a result of proposed development.



Subcat Reach Pond Link

Routing Diagram for PRE
Prepared by {enter your company name here}, Printed 4/15/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.500	79	1 acre lots, 20% imp, HSG C (PRE)
12.030	77	2 acre lots, 12% imp, HSG C (PRE)
0.600	74	>75% Grass cover, Good, HSG C (PRE)
0.240	80	>75% Grass cover, Good, HSG D (PRE)
3.440	98	Paved parking, HSG C (PRE)
7.300	70	Woods, Good, HSG C (PRE)
3.350	77	Woods, Good, HSG D (PRE)
5.740	72	Woods/grass comb., Good, HSG C (PRE)
0.800	79	Woods/grass comb., Good, HSG D (PRE)
36.000	**77**	**TOTAL AREA**

Summary for Subcatchment PRE:

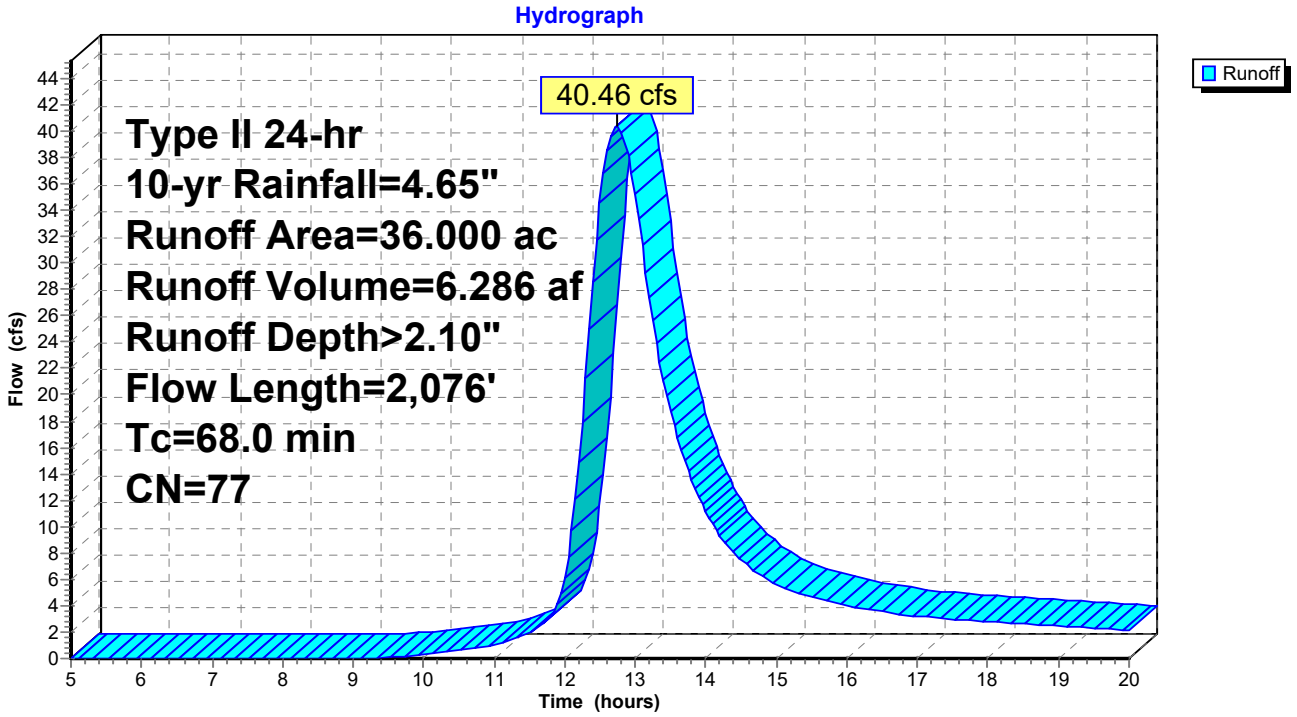
Runoff = 40.46 cfs @ 12.74 hrs, Volume= 6.286 af, Depth> 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.65"

Area (ac)	CN	Description
7.300	70	Woods, Good, HSG C
3.350	77	Woods, Good, HSG D
5.740	72	Woods/grass comb., Good, HSG C
0.800	79	Woods/grass comb., Good, HSG D
3.440	98	Paved parking, HSG C
12.030	77	2 acre lots, 12% imp, HSG C
2.500	79	1 acre lots, 20% imp, HSG C
0.600	74	>75% Grass cover, Good, HSG C
0.240	80	>75% Grass cover, Good, HSG D
36.000	77	Weighted Average
30.616		85.05% Pervious Area
5.384		14.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.5	150	0.0100	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.15"
2.5	78	0.0110	0.52		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.5	198	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.5	632	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	580	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	191	0.0400	10.53	12.92	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
2.2	247	0.0150	1.84		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
68.0	2,076	Total			

Subcatchment PRE:



Summary for Pond 3x2:

[95] Warning: Outlet Device #4 rise exceeded
[58] Hint: Peaked 0.07' above defined flood level

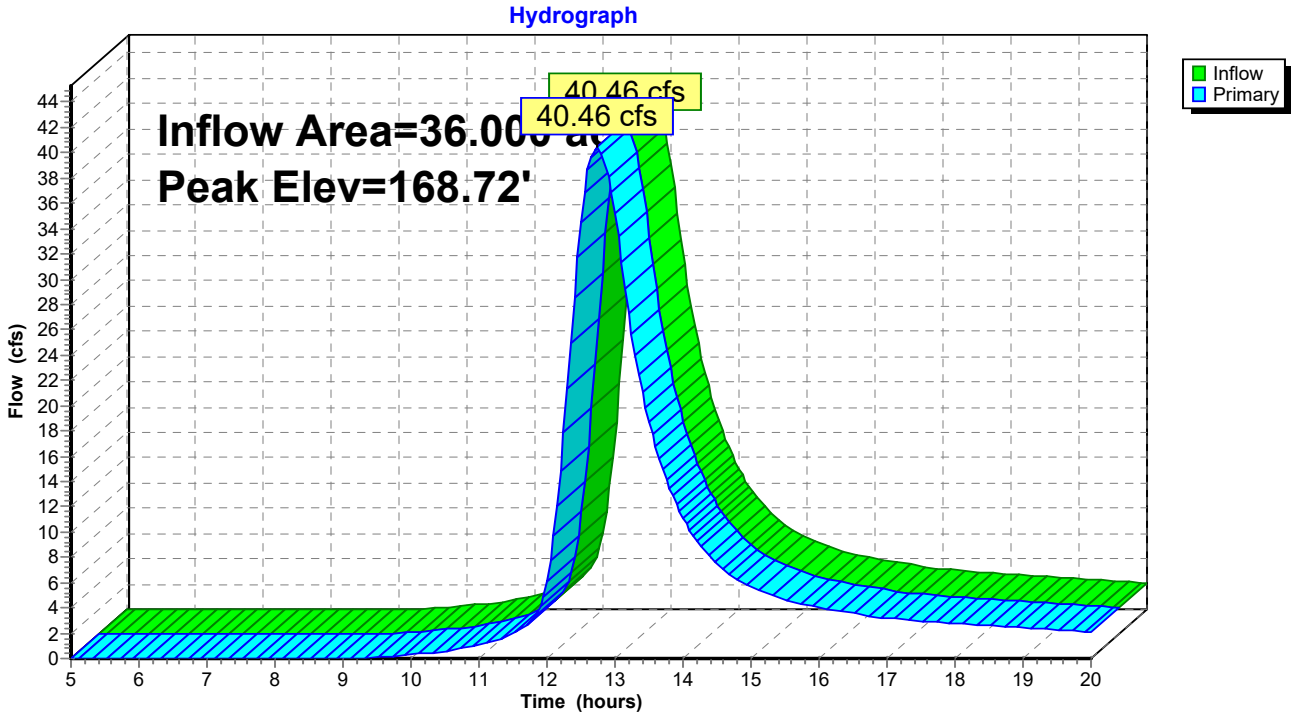
Inflow Area = 36.000 ac, 14.95% Impervious, Inflow Depth > 2.10" for 10-yr event
Inflow = 40.46 cfs @ 12.74 hrs, Volume= 6.286 af
Outflow = 40.46 cfs @ 12.74 hrs, Volume= 6.286 af, Atten= 0%, Lag= 0.0 min
Primary = 40.46 cfs @ 12.74 hrs, Volume= 6.286 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 168.72' @ 12.74 hrs
Flood Elev= 168.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	164.38'	**36.0" W x 24.0" H Box Culvert** L= 60.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 164.38' / 163.90' S= 0.0080 '/' Cc= 0.900 n= 0.024, Flow Area= 6.00 sf
#2	Primary	168.65'	**370.0' long x 24.0' 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
#3	Device 1	168.13'	**30.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	166.50'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.67 Width (feet) 1.00 2.00

Primary OutFlow Max=39.80 cfs @ 12.74 hrs HW=168.72' (Free Discharge)
- **1=Culvert** (Passes 21.51 cfs of 43.23 cfs potential flow)
  - **3=Orifice/Grate** (Weir Controls 14.81 cfs @ 2.51 fps)
  - **4=Custom Weir/Orifice** (Orifice Controls 6.70 cfs @ 6.67 fps)
- **2=Broad-Crested Rectangular Weir** (Weir Controls 18.28 cfs @ 0.71 fps)

Pond 3x2:


Hydrograph
Inflow Area=36.000 ac
Peak Elev=168.72'
40.46 cfs
40.46 cfs
Inflow
Primary
Flow (cfs)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
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42
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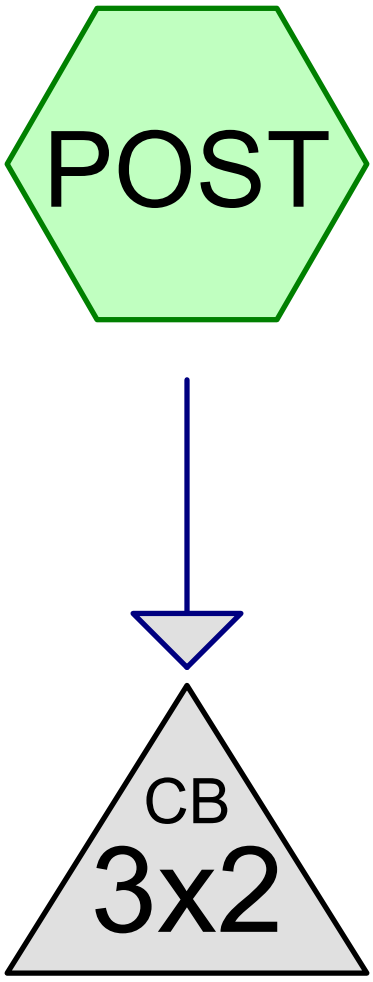
20
Time (hours)



Subcat Reach Pond Link

Routing Diagram for POST
Prepared by {enter your company name here}, Printed 4/15/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.500	79	1 acre lots, 20% imp, HSG C (POST)
12.030	77	2 acre lots, 12% imp, HSG C (POST)
0.600	74	>75% Grass cover, Good, HSG C (POST)
0.144	80	>75% Grass cover, Good, HSG D (POST)
3.636	98	Paved parking, HSG C (POST)
7.300	70	Woods, Good, HSG C (POST)
3.250	77	Woods, Good, HSG D (POST)
5.740	72	Woods/grass comb., Good, HSG C (POST)
0.800	79	Woods/grass comb., Good, HSG D (POST)
36.000	**77**	**TOTAL AREA**

Summary for Subcatchment POST:

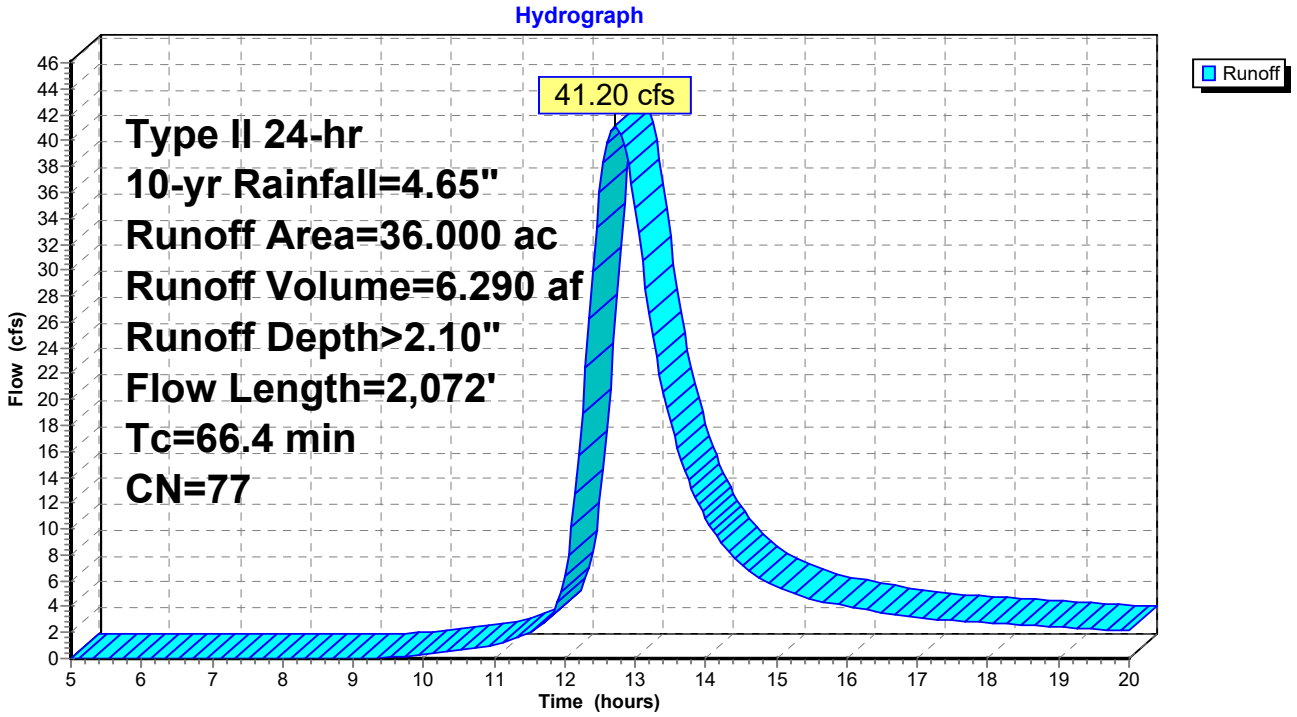
Runoff = 41.20 cfs @ 12.73 hrs, Volume= 6.290 af, Depth> 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.65"

Area (ac)	CN	Description
7.300	70	Woods, Good, HSG C
3.250	77	Woods, Good, HSG D
5.740	72	Woods/grass comb., Good, HSG C
0.800	79	Woods/grass comb., Good, HSG D
3.636	98	Paved parking, HSG C
12.030	77	2 acre lots, 12% imp, HSG C
2.500	79	1 acre lots, 20% imp, HSG C
0.600	74	>75% Grass cover, Good, HSG C
0.144	80	>75% Grass cover, Good, HSG D
36.000	77	Weighted Average
30.420		84.50% Pervious Area
5.580		15.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.5	150	0.0100	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.15"
2.5	78	0.0110	0.52		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.5	198	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.5	632	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	580	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	424	0.0160	8.15	14.39	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.0	10	0.0300	4.67	18.67	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.040 Mountain streams
66.4	2,072	Total			

Subcatchment POST:



Summary for Pond 3x2:

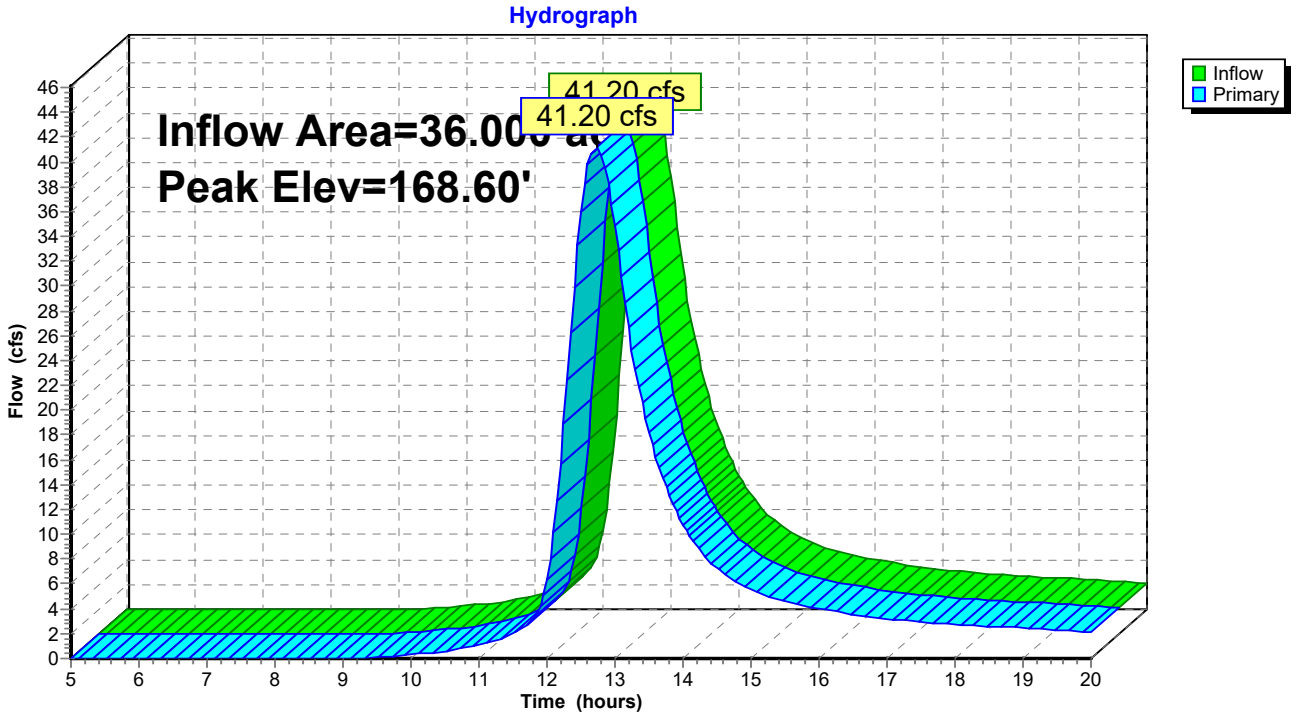
Inflow Area = 36.000 ac, 15.50% Impervious, Inflow Depth > 2.10" for 10-yr event
Inflow = 41.20 cfs @ 12.73 hrs, Volume= 6.290 af
Outflow = 41.20 cfs @ 12.73 hrs, Volume= 6.290 af, Atten= 0%, Lag= 0.0 min
Primary = 41.20 cfs @ 12.73 hrs, Volume= 6.290 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 168.60' @ 12.73 hrs
Flood Elev= 168.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	164.38'	**36.0" W x 24.0" H Box Culvert** L= 60.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 164.38' / 163.90' S= 0.0080 '/' Cc= 0.900 n= 0.024, Flow Area= 6.00 sf
#2	Primary	168.65'	**370.0' long x 24.0' 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
#3	Device 1	168.13'	**30.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	165.70'	**30.0" W x 22.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=41.11 cfs @ 12.73 hrs HW=168.59' (Free Discharge)
- **1=Culvert** (Passes 41.11 cfs of 42.26 cfs potential flow)
  - **3=Orifice/Grate** (Weir Controls 10.36 cfs @ 2.23 fps)
  - **4=Orifice/Grate** (Orifice Controls 30.75 cfs @ 6.71 fps)
- **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3x2:


Hydrograph
Inflow Area=36.000 ac
Peak Elev=168.60'
41.20 cfs
41.20 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0
2
4
6
8
10
12
14
16
18
20
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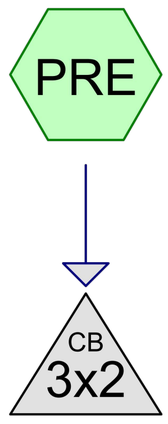
HYDROCAD ROUTING DIAGRAM



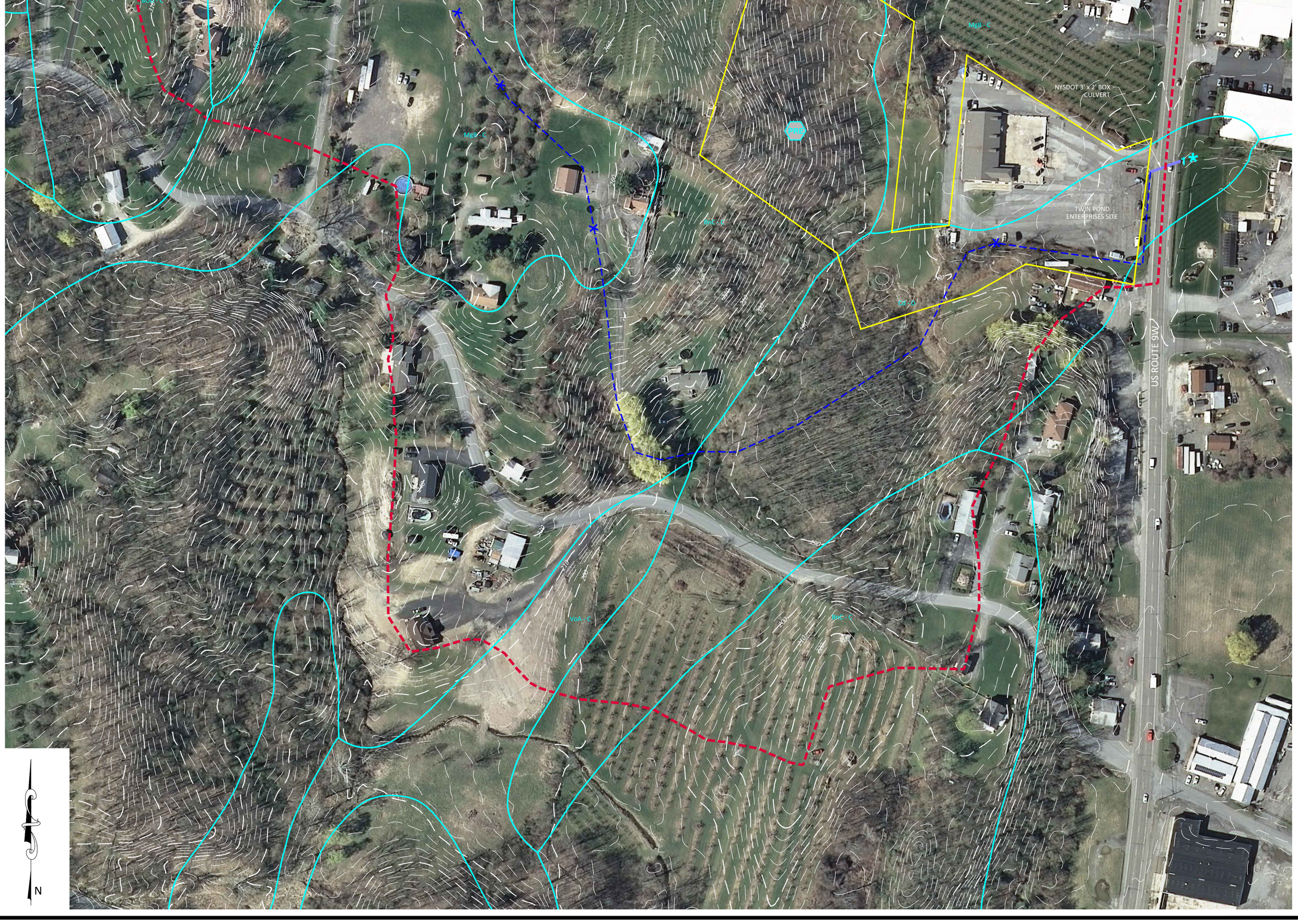
LEGEND

- SUBCATCHMENT BOUNDARY
- TIME OF CONCENTRATION / REACH SEGMENT
- SOIL TYPE DESIGNATION
- SOIL TYPE BOUNDARY
- SUBCATCHMENT
- STORMWATER DISCHARGE POINT - SDP
- EXISTING PROPERTY LINE
- EXISTING CONTOUR (LIDAR)

SUBCATCHMENT AREA SUMMARY

SUBCATCHMENT PRE	SOIL TYPE	CN	AREA (AC)
WOODS, GOOD	C	70	7.30
WOODS, GOOD	D	77	3.35
WOODS/GRASS COMB., GOOD	C	72	5.74
WOODS/GRASS COMB., GOOD	D	79	0.80
PAVEMENT, BUILDING, IMPERVIOUS	C	98	3.44
2 ACRE LOTS	C	77	12.03
1 ACRE LOTS	C	79	2.50
>75% GRASS COVER	C	74	0.60
>75% GRASS COVER	D	80	0.24

Total= 36.00



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REV	DATE	DESCRIPTION
1	04/15/19	REVISIONS PER TOWN ENGINEER AND DOT

PRE-DEVELOPMENT DRAINAGE MAP

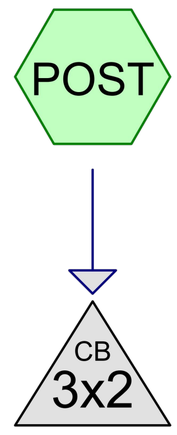
TWIN POND ENTERPRISES, INC.

1100 US ROUTE 9W

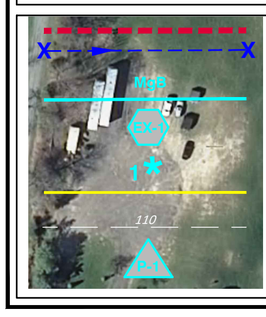
TOWN OF MARLBOROUGH, ULSTER COUNTY, NEW YORK

DRAWN BY	CHECKED BY
MLT	AVW
DATE	SCALE
08/13/18	1"=100'
PROJECT NO.	
17003	
SHEET NO.	
DM-PRE	

HYDROCAD ROUTING DIAGRAM



LEGEND

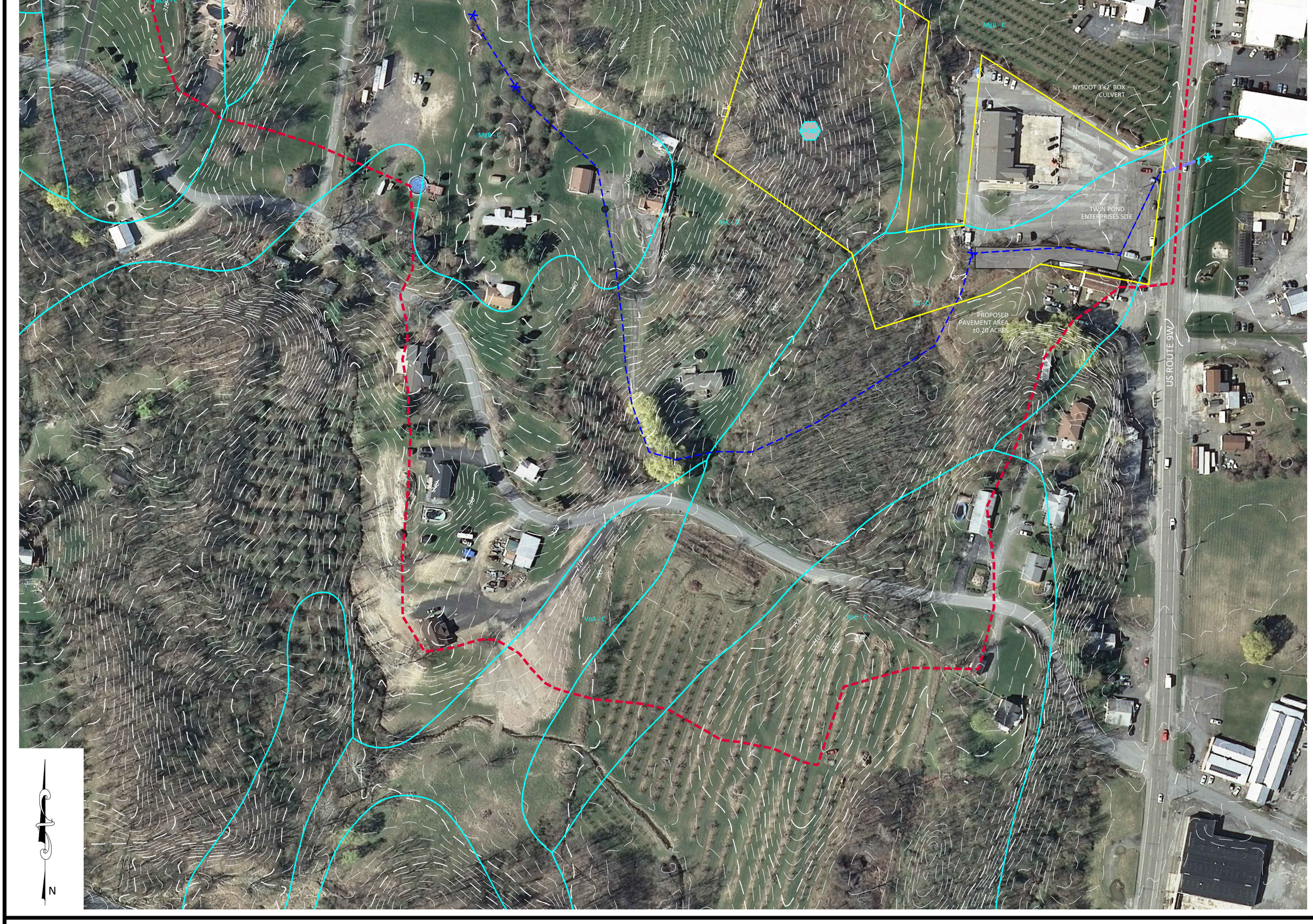


- SUBCATCHMENT BOUNDARY
- TIME OF CONCENTRATION / REACH SEGMENT
- SOIL TYPE DESIGNATION
- SOIL TYPE BOUNDARY
- SUBCATCHMENT
- STORMWATER DISCHARGE POINT - SDP
- EXISTING PROPERTY LINE
- EXISTING CONTOUR (LIDAR)
- STORMWATER MANAGEMENT POND

SUBCATCHMENT AREA SUMMARY

SUBCATCHMENT - POST	SOIL TYPE	CN	AREA (AC)
WOODS, GOOD	C	70	7.30
WOODS, GOOD	D	77	3.25
WOODS/GRASS COMB., GOOD	C	72	5.74
WOODS/GRASS COMB., GOOD	D	79	0.80
PAVEMENT, BUILDING, IMPERVIOUS	C	98	3.64
2 ACRE LOTS	C	77	12.03
1 ACRE LOTS	C	79	2.50
>75% GRASS COVER	C	74	0.60
>75% GRASS COVER	D	80	0.14

Total= 36.00



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REV	DATE	DESCRIPTION
1	04/15/19	REVISIONS PER TOWN ENGINEER AND DOT

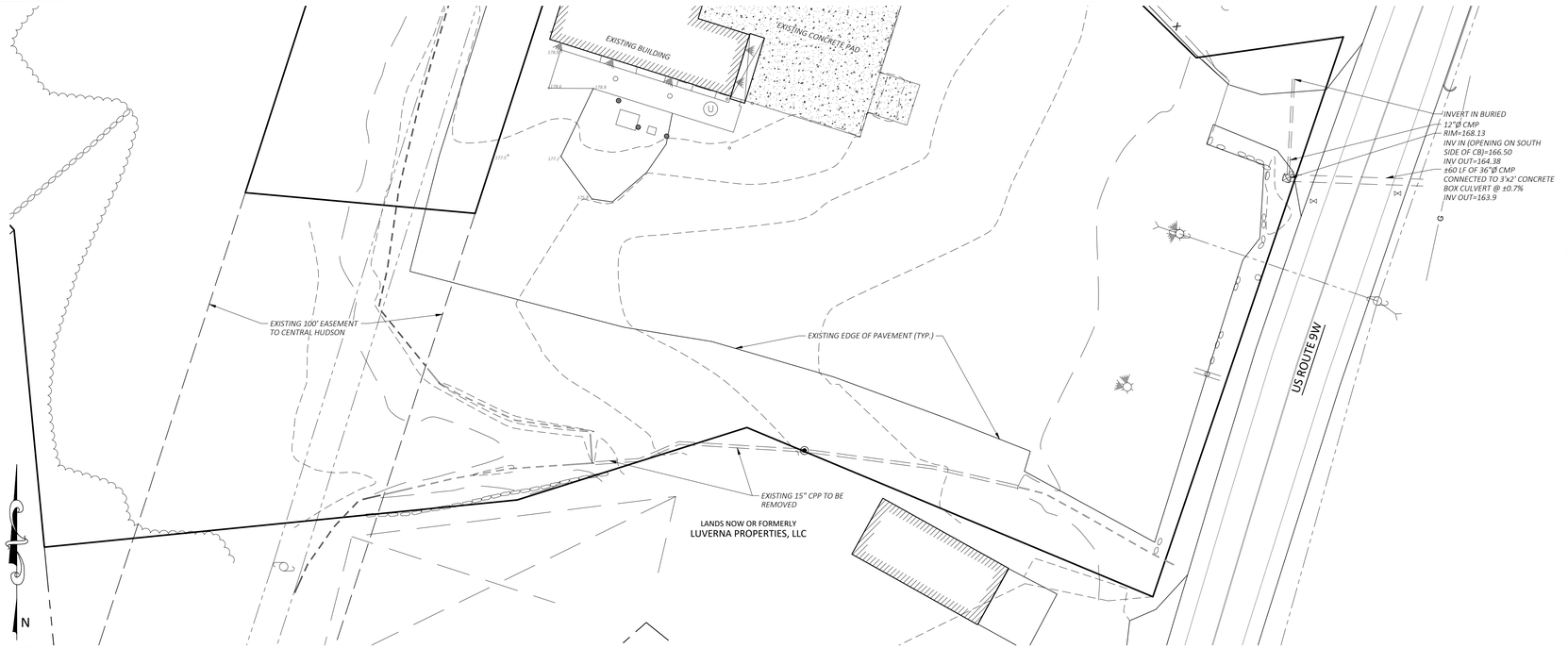
POST-DEVELOPMENT DRAINAGE MAP

TWIN POND ENTERPRISES, INC.

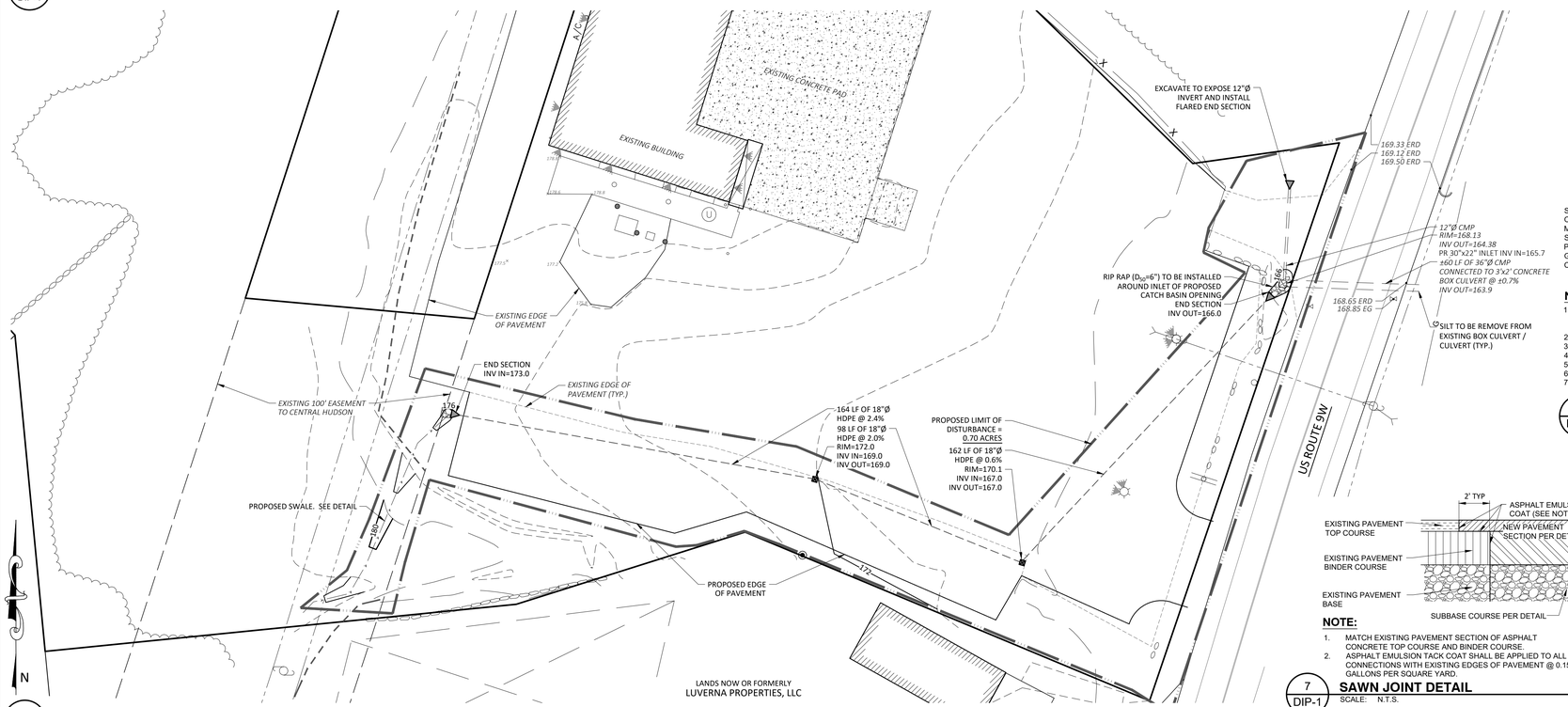
1100 US ROUTE 9W

TOWN OF MARLBOROUGH, ULSTER COUNTY, NEW YORK

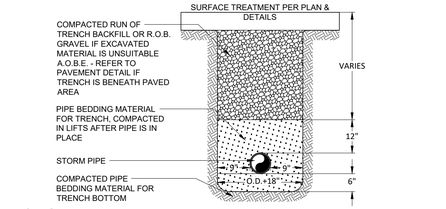
DRAWN BY	CHECKED BY
MLT	AVW
DATE	SCALE
08/13/18	1"=100'
PROJECT NO.	
17003	
SHEET NO.	
DM-POST	



1 DIP-1 **EXISTING CONDITIONS & DEMOLITION PLAN**
SCALE: 1:=30'

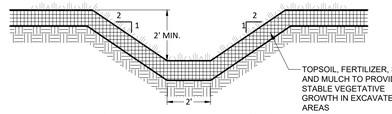


2 DIP-1 **PROPOSED CONDITIONS PLAN**
SCALE: 1"=30'



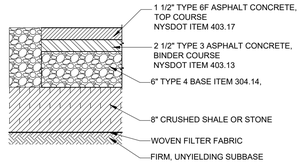
NOTES:
1. PIPE BEDDING SHALL BE PEA GRAVEL (3/8 INCH STONE).
2. ALL STORMWATER PIPING SHALL BE CORRUGATED, SMOOTH LINED, HIGH DENSITY POLYETHYLENE.

3 DIP-1 **STORMWATER TRENCH DETAIL**
SCALE: N.T.S.



GRASS LINED SWALE SECTION

4 DIP-1 **SWALE DETAILS**
SCALE: N.T.S.

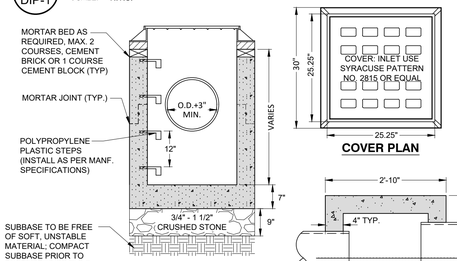


NOTES:
1. PAVEMENT AND SHOULDER CROSS SLOPE SHALL BE MIN. 1/4" PER FOOT.
2. ASPHALT EMULSION TACK COAT SHALL BE APPLIED TO ALL CONNECTIONS WITH EXISTING EDGES OF PAVEMENT @ 0.15 GALLONS PER SQUARE YARD.
3. ALL BACKFILL MATERIAL BENEATH ROAD AND SHOULDER SHALL BE COMPACTED IN MAX. 6" LIFTS.
4. ALL PAVEMENT SHALL BE COMPACTED IN MAX. 3" LIFTS.
5. ALL MATERIALS SHALL BE COMPACTED TO 97% STANDARD PROCTOR DENSITY.

NOTE:
1. MATCH EXISTING PAVEMENT SECTION OF ASPHALT CONCRETE TOP COURSE AND BINDER COURSE.
2. ASPHALT EMULSION TACK COAT SHALL BE APPLIED TO ALL CONNECTIONS WITH EXISTING EDGES OF PAVEMENT @ 0.15 GALLONS PER SQUARE YARD.

7 DIP-1 **SAWN JOINT DETAIL**
SCALE: N.T.S.

5 DIP-1 **PARKING LOT PAVEMENT DETAIL**
SCALE: N.T.S.

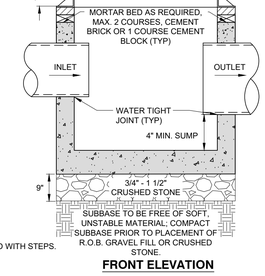


END ELEVATION

COVER PLAN

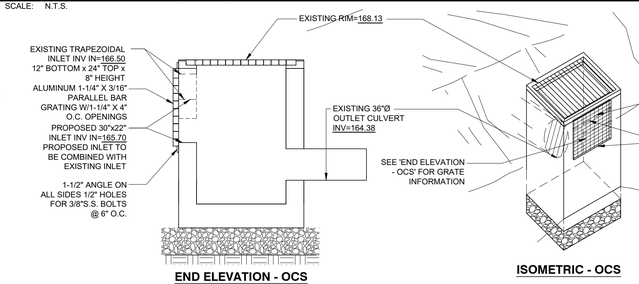
PLAN

NOTES:
1. CATCH BASIN SHALL BE PRE CAST REINFORCED CONCRETE CONFORMING TO ASTM C-478 AND SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI.
2. CATCH BASIN, TOP, FRAME, AND GRATE SHALL BE DESIGNED FOR H-20 VEHICULAR LOADING AND 30% IMPACT.
3. CATCH BASINS HAVING A DEPTH GREATER THAN 48" FROM FINISHED SURFACE TO THE TOP OF THE CONCRETE BASE SHALL BE PROVIDED WITH STEPS.
4. BACK FILL USING SELECT MATERIAL, COMPACTED IN 6" LIFTS.
5. FRAMES AND GRATES SHALL BE SET IN A FULL BED OF MORTAR.
6. EXCAVATION FOR CATCH BASINS SHALL BE IN ACCORDANCE WITH THE LOCAL MUNICIPALITY'S REQUIREMENTS.
7. ALL CATCH BASINS SHALL BE MANUFACTURED BY WOODARD'S CONCRETE PRODUCTS INC., MODEL NUMBER: CB-30-30, OR APPROVED EQUAL.



FRONT ELEVATION

6 DIP-1 **PRECAST CATCH BASIN (30"x30")**
SCALE: N.T.S.



END ELEVATION - OCS

ISOMETRIC - OCS

NOTES:
1. SAWCUT EXISTING MANHOLE TO CREATE OPENING.
2. GRATE TO BE INSTALLED OVER OPENING. GRATE TO BE ALUMINUM 1-1/4" X 3/16" PARALLEL BAR GRATING WITH 1-1/4" X 4" OC OPENINGS
3. 1-1/2" ANGLE ON ALL SIDES 1/2" HOLES FOR 3/8" S.S. BOLTS AT 6" O.C.

8 DIP-1 **MODIFICATION TO EXISTING NYSDOT CATCH BASIN**
SCALE: N.T.S.

LEGEND

- EXISTING PROPERTY LINE
- ADJACENT PROPERTY LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING FOG LINE
- EXISTING CENTERLINE STRIPING
- 110 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING BUILDING
- EXISTING BUILDING DECK/OVERHANG
- EXISTING CONCRETE
- EXISTING STREAM / DITCH
- EXISTING TREE LINE
- EXISTING STONE WALL
- X EXISTING CHAIN LINK FENCE
- EXISTING BOLLARD
- UTILITY POLE & OVERHEAD LINE
- UTILITY POLE WITH GUY WIRE
- EXISTING POLE OR BUILDING MOUNTED LIGHT
- EXISTING SIGN
- EXISTING DRAINAGE CULVERT
- EXISTING DRAINAGE CATCH BASIN
- EXISTING SEPTIC LEACH FIELDS
- EXISTING HYDRANT
- EXISTING WATER VALVE
- U EXISTING UTILITY MANHOLE
- G EXISTING GAS MAIN
- PROPOSED DRAINAGE CULVERT
- PROPOSED END SECTION WITH RIP-RAP OUTLET PROTECTION
- PROPOSED CATCH BASIN
- PROPOSED SWALE
- 180 PROPOSED 10 FT CONTOUR
- 178 PROPOSED 2 FT CONTOUR
- PROPOSED EDGE OF PAVEMENT
- PROPOSED LIMIT OF DISTURBANCE

SURVEY NOTES

1. ALL SITE FEATURES INCLUDING PROPERTY BOUNDARY LINES, STRUCTURE LOCATIONS, TOPOGRAPHY, AND PROPOSED SITE LAYOUT TAKEN FROM MAP TITLED 'MAP OF SITEPLAN OF LAND OF TWIN POND ENTERPRISES, INC.' PREPARED BY BROOKS & BROOKS LAND SURVEYORS, P.C.' DATED 01 NOVEMBER 2016.

DRAINAGE INFORMATION

1. THE PROPOSED DRAINAGE SYSTEM HAS BEEN SIZED BASED ON USGS STREAMSTATS INFORMATION FOR THE PROJECT AREA. THE DRAINAGE AREA TO THE SITE IS APPROXIMATELY 25 ACRES IN SIZE. THE 25 YEAR PEAK FLOOD EVENT FOR THE SITE IS 10.1 CFS.
2. USING MANNINGS EQUATION
   $Q=(1.49/n)\ A\ R^{\frac{2}{3}}\sqrt{S}$
   $A=18"Ø\ PIPE$

0 1 2 3
ORIGINAL SIZE IN INCHES

STATE OF NEW YORK · ANDREW V. WILLINGHAM · 083984 · PROFESSIONAL ENGINEER

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REV	DATE	DESCRIPTION
1	04/15/19	REVISIONS PER TOWN ENGINEER AND DOT

DRAINAGE IMPROVEMENT PLAN

TWIN POND ENTERPRISES, INC.

2007 ROUTE 9W

TOWN OF MARLBOROUGH, ULSTER COUNTY, NEW YORK

DRAWN BY	CHECKED BY
MLT	AVW
DATE	SCALE
03/22/18	AS NOTED
PROJECT NO.	
17047	
SHEET NO.	
DP-1	