

**McChord Engineering Associates, Inc.**  
Civil Engineers and Land Planners

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## STORMWATER MANAGEMENT REPORT

Prepared For

PROPOSED SITE DEVELOPMENT

105 NOD HILL ROAD, WILTON, CT

November 10, 2020

*Revised: January 7, 2021*

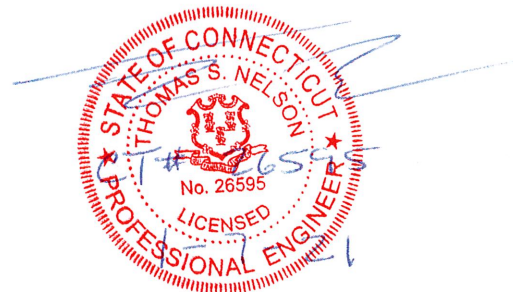


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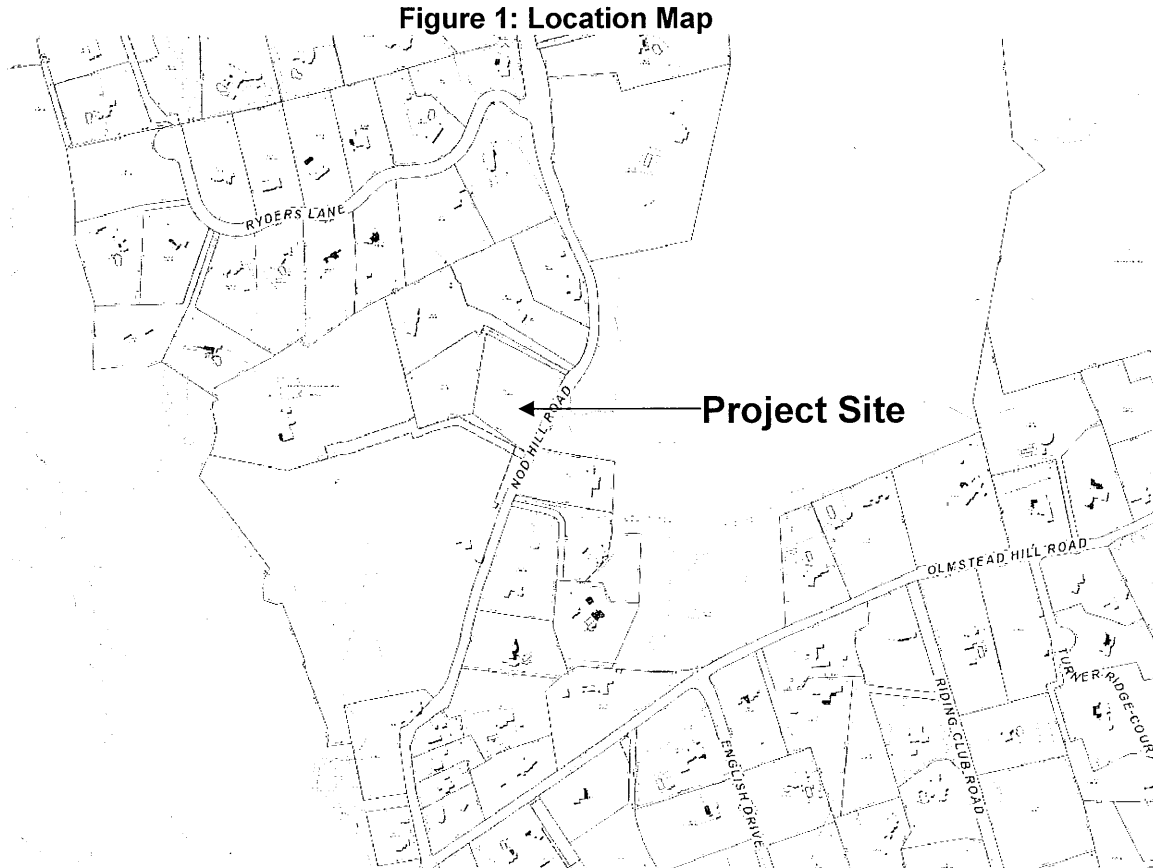
Appendix A: Drainage Basin Maps

Appendix B: Peak Flow Computations

Appendix C: Stormwater Facilities Maintenance Plan

## 1. INTRODUCTION

McChord Engineering Associates, Inc. has been commissioned by Sandra Chen-Davis to perform stormwater management computations for the proposed development at 105 Nod Hill Road in Wilton, Connecticut. The property consists of 2.29-acres and is located on the west side of Nod Hill Road. The property is located within the Comstock Brook subregional watershed basin and the Second Taxing District City of Norwalk public water supply watershed. Figure 1 shows the location of the property on the Wilton GIS Service.



The property is currently vacant and undeveloped. The edges of the property are adjacent residences, a common driveway and Nod Hill Road. There is a watercourse that runs parallel to the common driveway just east of the property. The watercourse conveys to a headwall at Nod Hill Road and discharges to the pond across the street. Topography on the site consists of gradual then steep slopes that drain east towards the watercourse and headwall.

The proposed development consists of constructing a new single-family residence with associated driveway and hardscape on the property. A stormwater management system will be installed to control runoff from the proposed development. The property will be served by a septic system and private well.

## **2. SCOPE OF STUDY**

This stormwater management report contains studies comparing peak rate of runoff between the existing conditions and the proposed development to ensure that the proposed development will have no adverse impact on adjoining property owners or downstream drainage systems. The site will be developed with its own on-site stormwater management system capable of controlling the increase in peak runoff.

## **3. ANALYSIS METHODOLOGY**

Runoff was modeled with HydroCAD 8.50 software produced by HydroCAD Software Solutions LLC. This software uses the NRCS TR-20 method for analyzing stormwater runoff. Soil characteristics, cover conditions, slope, time of concentration, and historical rainfall data are all parameters that are utilized by this method. The analysis considered the 2, 5, 10 and 25-year storm events. Precipitation depth for each storm event was taken from the National Oceanic and Atmospheric Administration's (NOAA) Atlas 14 Point Precipitation Frequency Estimates specific to the subject property.

## **4. STORMWATER MANAGEMENT STRATEGY**

Currently, the property is undeveloped. Runoff from the property sheet flows east to the headwall at Nod Hill Road following the topography.

The proposed stormwater management system maintains existing drainage patterns on the site. Runoff from the proposed residence will be captured by roof leaders and conveyed to an underground detention system. Runoff from the upper section of the new driveway will be captured by driveway drains and conveyed to an underground detention system. The detention system will consist of twenty-one (21) units of 24" high x 48" wide x 96" long precast concrete galleries surrounded by crushed stone with a storage capacity of approximately 1,394 cubic feet below the high level overflow pipe invert. During typical storm events stormwater will infiltrate into the underlying soils. A high level overflow pipe discharging to a rip rap outlet will be installed to provide relief during extreme storm events. Runoff from the lower section of driveway will be captured by a series of driveway drains/drywells, conveyed via 15" drainage piping and discharged adjacent to the existing headwall at Nod Hill Road by a flared end with rip rap outlet protection. The drywells are not anticipated to have any infiltration capacity, but will provide additional storage of runoff. Runoff from the remainder of the property will continue to sheet flow east conforming to existing conditions.

Detailed information on the size and configuration of the proposed stormwater management measures is available on the most recent revision of the "Septic System/Site Development Plan" prepared by this office. A Stormwater Facilities Maintenance Plan is also included in Appendix C.

## 5. ANALYSIS & RESULTS

Runoff from the property was analyzed under existing and proposed conditions. Runoff from offsite areas will not be captured by the proposed stormwater management system and was therefore not factored into the analysis. The existing conditions analysis modeled the entire site as a whole. The proposed conditions analysis divided the property into area that is detained through the proposed detention systems and undetained areas. Existing and proposed Drainage Basin Maps have been provided in Appendix A.

Using the NRCS TR-20 method, the peak rate of runoff for the 2, 5, 10 and 25-year storm event was computed for the site. Soils on the property were determined using the NRCS Web Soil Survey. Cover conditions were derived from site observations and the "Septic System/Site Development Plan" prepared by this office, dated January 7, 2021. Soil testing was conducted on the property in the area of the proposed stormwater management system. Deep test pits and percolation tests were performed and confirmed suitable infiltration rates. The resulting peak flow rates under both the existing and proposed conditions are summarized in Table 1. For detailed computations see Appendix B.

**Table 1: Peak Flows**

Storm Event	Existing		Proposed	
	Rate (cfs)	Volume (ft <sup>3</sup> )	Rate (cfs)	Volume (ft <sup>3</sup> )
<b>2-year</b>	0.89	4,778	0.80	4,400
<b>5-year</b>	1.95	8,557	1.81	7,870
<b>10-year</b>	3.10	12,621	2.82	11,569
<b>25-year</b>	5.21	20,072	4.66	19,077

The analysis shows that there is no increase in the peak rate or volume of runoff from the property during any of the analyzed storm events.

## 6. CONCLUSIONS

Based on our analysis, McChord Engineering Associates, Inc. has demonstrated that the proposed stormwater management system will adequately control any increase in runoff from the proposed development at 105 Nod Hill Road in Wilton, Connecticut. It is the opinion of this office and the conclusion of this report that the proposed site development will have no adverse impacts to the adjoining property owners or any downstream drainage systems.

**APPENDIX A:**  
**DRAINAGE BASIN MAPS**

file: 1102b-drain

LEGEND

2

BASIN ID



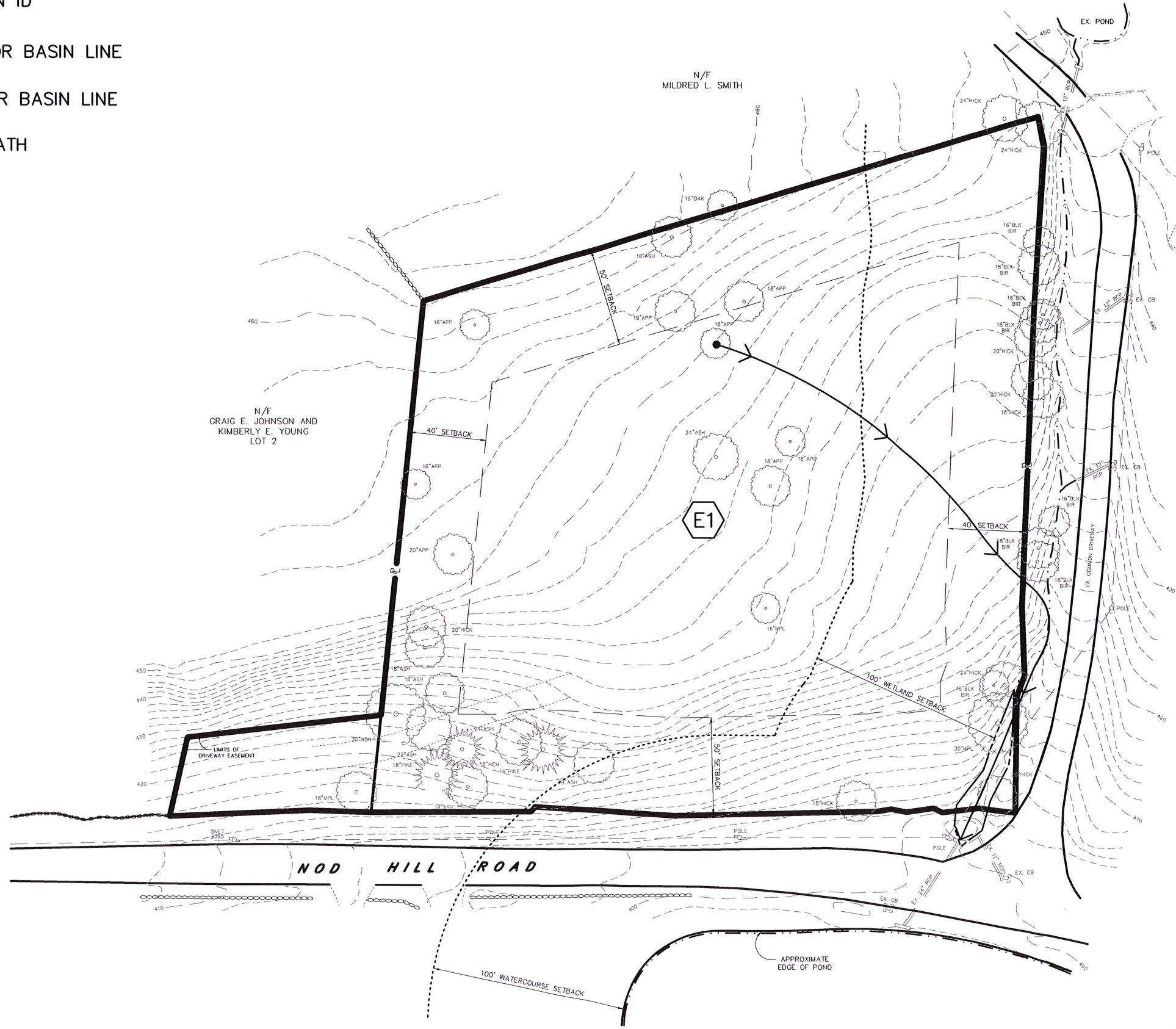
MAJOR BASIN LINE



MINOR BASIN LINE

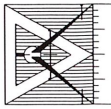


Tc PATH



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EXISTING CONDITIONS  
DRAINAGE MAP  
105 NOD HILL ROAD  
WILTON, CONNECTICUT

JOB No. 1102B-1

SCALE: 1" = 60'

DATE: 1-7-21

DWG. No.

SK-1



# LEGEND

2

BASIN ID



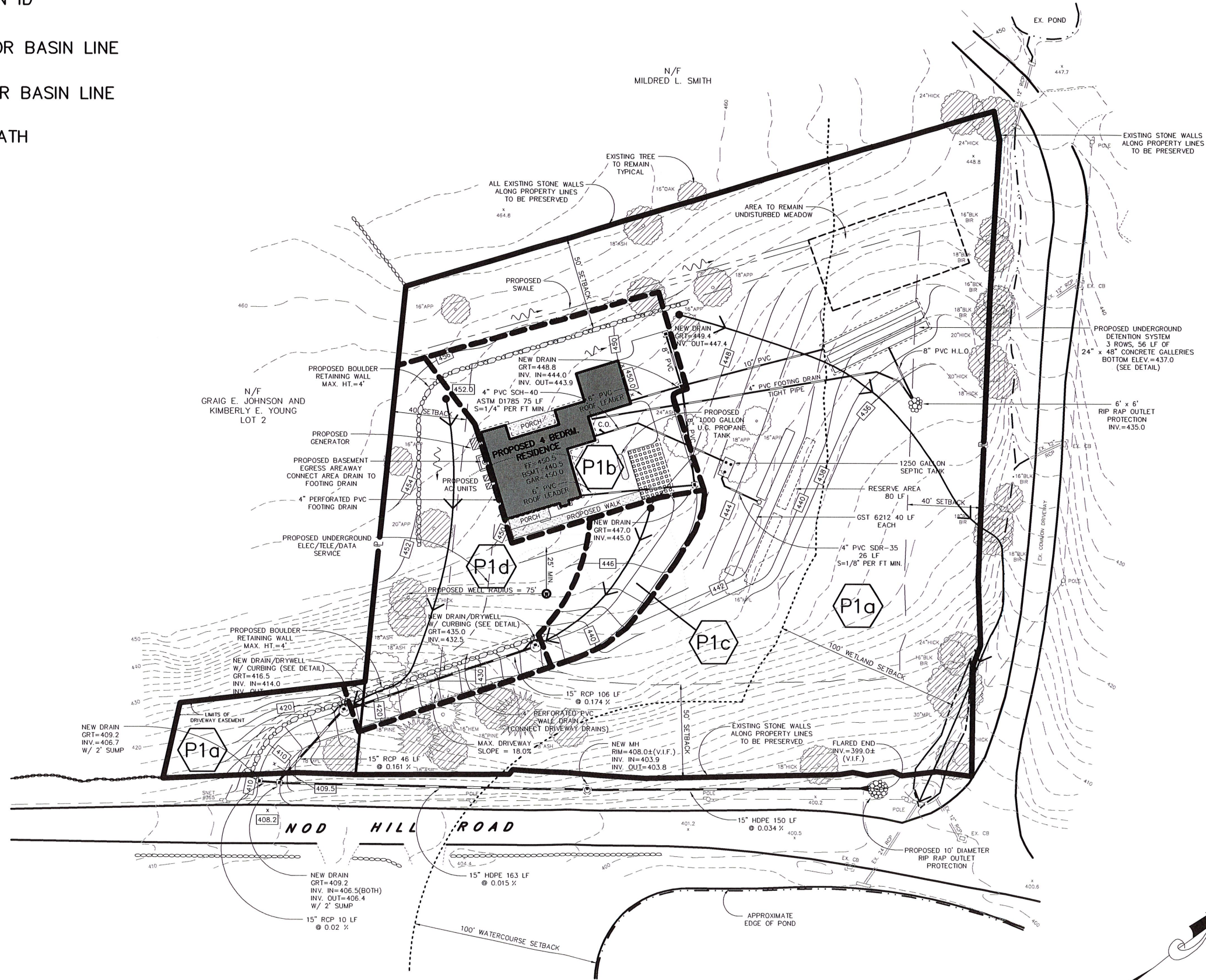
MAJOR BASIN LINE



MINOR BASIN LINE



Tc PATH



DWG. No.

SK-2

JOB No. 1102B-1

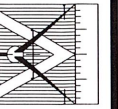
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DATE: 1-7-21

PROPOSED CONDITIONS  
DRAINAGE MAP  
105 NOD HILL ROAD  
WILTON, CONNECTICUT

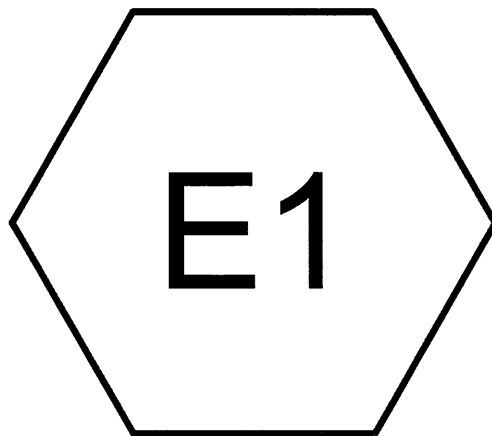
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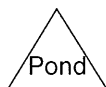
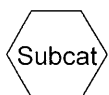




**APPENDIX B:**  
**PEAK FLOW COMPUTATIONS**



# Entire Area of Study



## Existing Conditions - 105 Nod Hill Road

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### Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
67,164	61	Meadow, non-grazed, HSG B (E1)
37,000	61	Woods/grass comb., Good, HSG B (E1)

**Existing Conditions - 105 Nod Hill Road**

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Type III 24-hr 25-yr Rainfall=6.45"

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**Summary for Subcatchment E1: Entire Area of Study**

Runoff = 5.21 cfs @ 12.17 hrs, Volume= 20,072 cf, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Type III 24-hr 25-yr Rainfall=6.45"

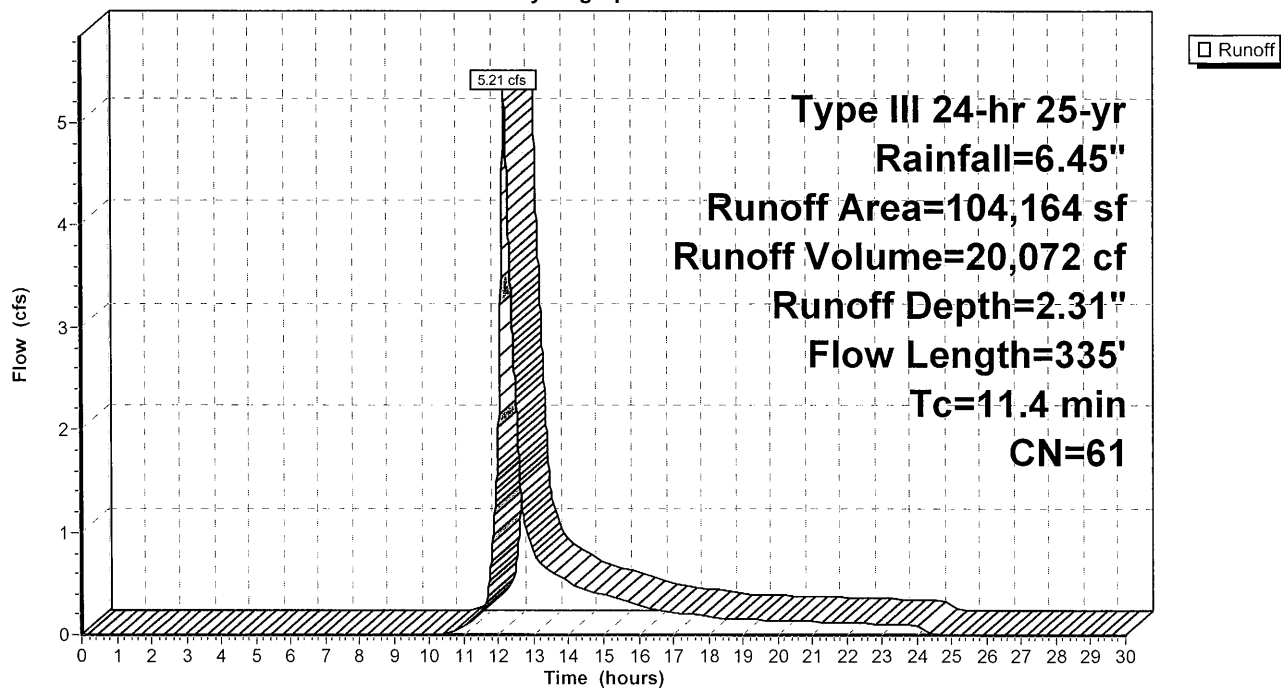
Area (sf)	CN	Description
* 67,164	61	Meadow, non-grazed, HSG B
* 37,000	61	Woods/grass comb., Good, HSG B
104,164	61	Weighted Average
104,164		Pervious Area

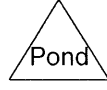
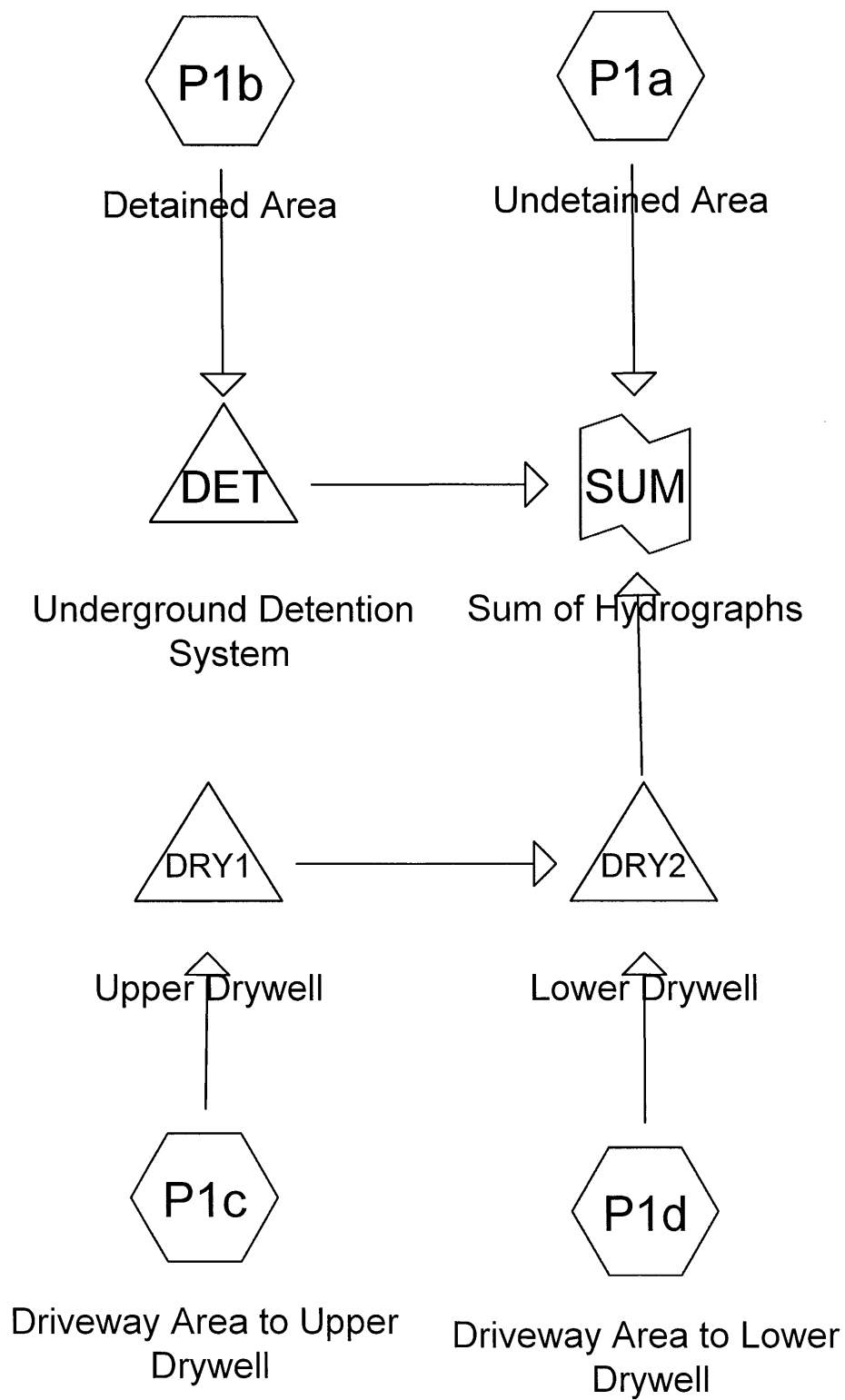
  

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	110	0.1270	0.26		<b>Sheet Flow, AB</b>
					Grass: Dense n= 0.240 P2= 3.45"
3.8	40	0.0800	0.18		<b>Sheet Flow, BC</b>
					Grass: Dense n= 0.240 P2= 3.45"
0.2	55	0.0670	4.17		<b>Shallow Concentrated Flow, CD</b>
					Unpaved Kv= 16.1 fps
0.0	20	0.5000	11.38		<b>Shallow Concentrated Flow, DE</b>
					Unpaved Kv= 16.1 fps
0.3	110	0.1330	5.47		<b>Shallow Concentrated Flow, EF</b>
					Grassed Waterway Kv= 15.0 fps
11.4	335	Total			

**Subcatchment E1: Entire Area of Study**

Hydrograph







## Proposed Conditions - 105 Nod Hill Road - REV1

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### Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
68,102	61	>75% Grass cover, Good, HSG B (P1a,P1b,P1c,P1d)
27,120	61	Meadow, non-grazed, HSG B (P1a)
500	85	Proposed Paver Parking Area (P1b)
2,740	98	Driveway (P1c,P1d)
2,252	98	Proposed Driveway (P1a,P1b)
363	98	Proposed Hardscape (P1b)
3,087	98	Proposed Residence (P1b)

**Proposed Conditions - 105 Nod Hill Road - REV1**

Type III 24-hr 25-yr Rainfall=6.45"

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**Summary for Subcatchment P1a: Undetained Area**

Runoff = 3.78 cfs @ 12.17 hrs, Volume= 14,559 cf, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=6.45"

Area (sf)	CN	Description
* 750	98	Proposed Driveway
* 27,120	61	Meadow, non-grazed, HSG B
47,682	61	>75% Grass cover, Good, HSG B
75,552	61	Weighted Average
74,802		Pervious Area
750		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	120	0.1100	0.25		<b>Sheet Flow, AB</b>
					Grass: Dense n= 0.240 P2= 3.45"
2.8	30	0.1000	0.18		<b>Sheet Flow, BC</b>
					Grass: Dense n= 0.240 P2= 3.45"
0.2	70	0.1000	5.09		<b>Shallow Concentrated Flow, CD</b>
					Unpaved Kv= 16.1 fps
0.0	15	0.6700	13.18		<b>Shallow Concentrated Flow, DE</b>
					Unpaved Kv= 16.1 fps
0.4	125	0.1330	5.47		<b>Shallow Concentrated Flow, EF</b>
					Grassed Waterway Kv= 15.0 fps
11.4	360	Total			

# Proposed Conditions - 105 Nod Hill Road - REV1

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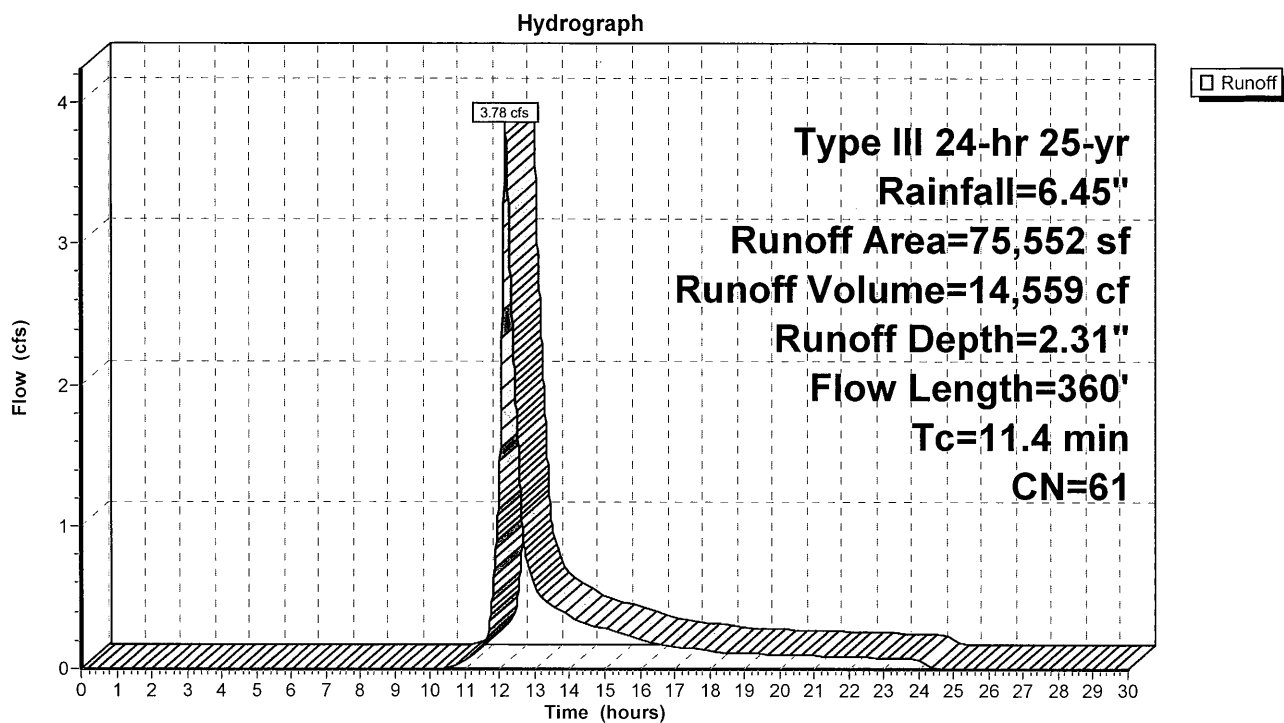
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Type III 24-hr 25-yr Rainfall=6.45"

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## Subcatchment P1a: Undetained Area



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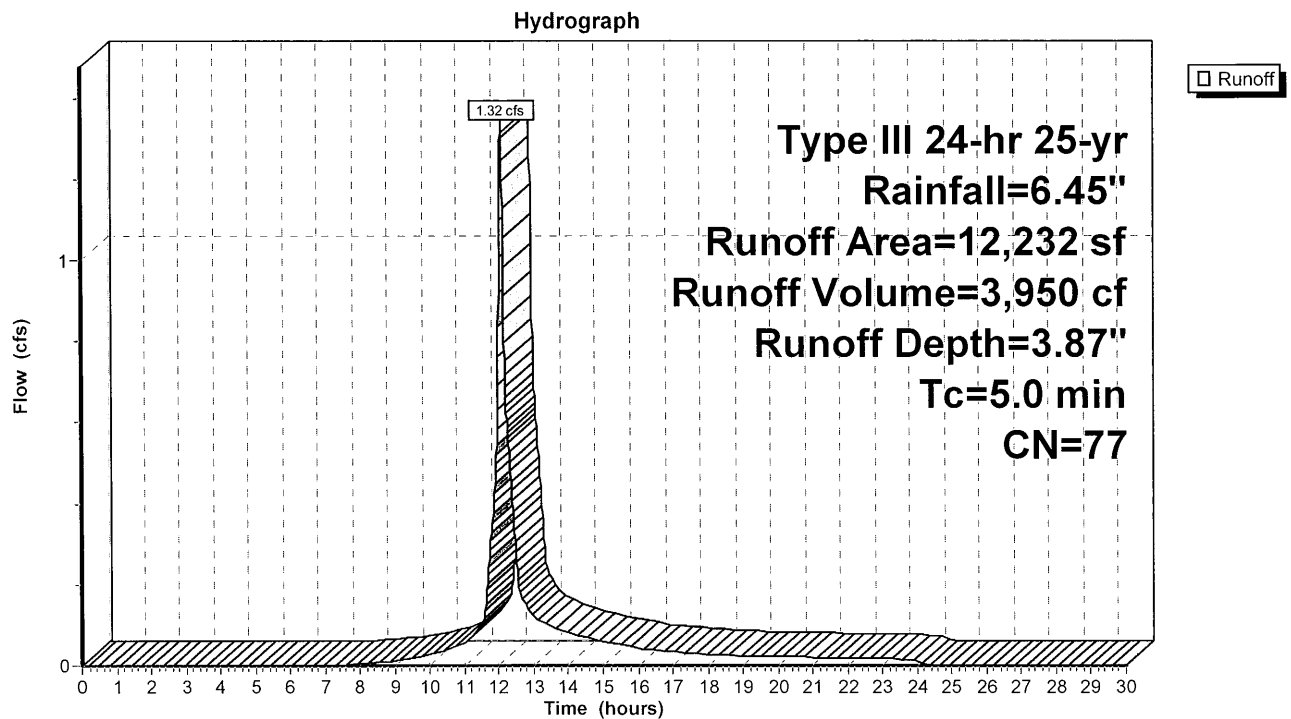
**Summary for Subcatchment P1b: Detained Area**

Runoff = 1.32 cfs @ 12.07 hrs, Volume= 3,950 cf, Depth= 3.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=6.45"

	Area (sf)	CN	Description
*	3,087	98	Proposed Residence
*	1,502	98	Proposed Driveway
*	500	85	Proposed Paver Parking Area
*	363	98	Proposed Hardscape
	6,780	61	>75% Grass cover, Good, HSG B
	12,232	77	Weighted Average
	7,280		Pervious Area
	4,952		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, min

**Subcatchment P1b: Detained Area**

**Proposed Conditions - 105 Nod Hill Road - REV1**

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Type III 24-hr 25-yr Rainfall=6.45"

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**Summary for Subcatchment P1c: Driveway Area to Upper Drywell**

Runoff = 0.39 cfs @ 12.10 hrs, Volume= 1,231 cf, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

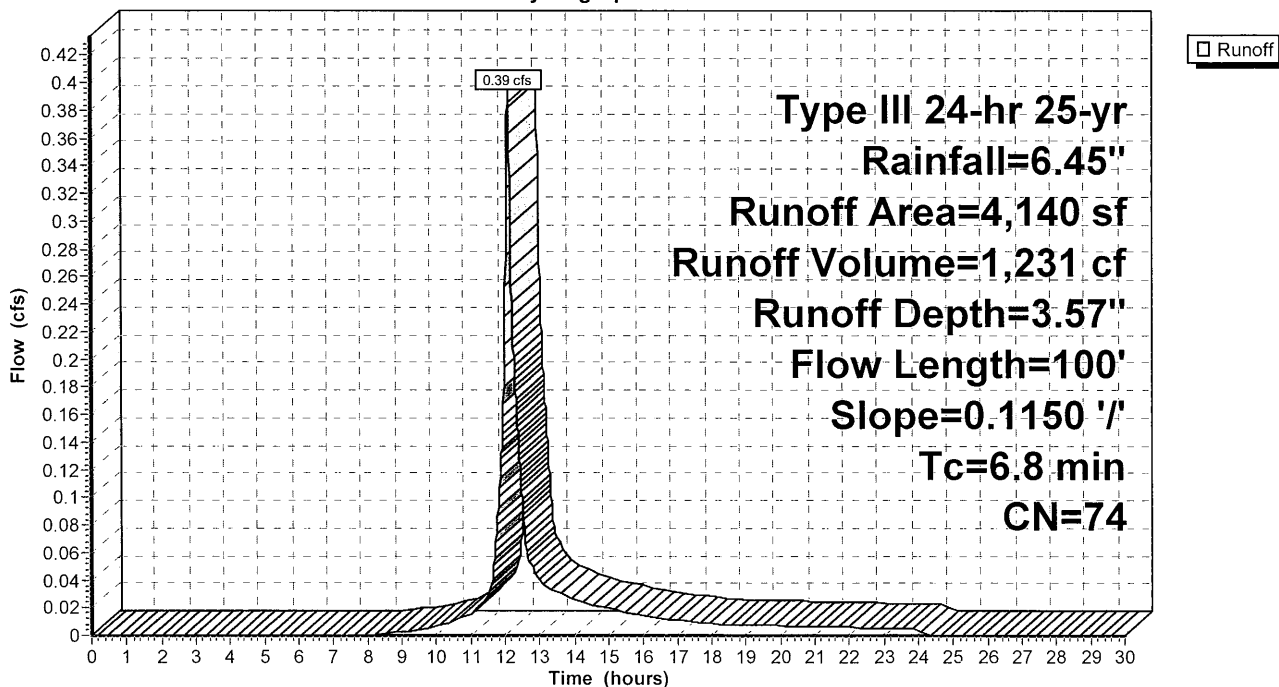
Type III 24-hr 25-yr Rainfall=6.45"

	Area (sf)	CN	Description
*	1,500	98	Driveway
	2,640	61	>75% Grass cover, Good, HSG B
	4,140	74	Weighted Average
	2,640		Pervious Area
	1,500		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.1150	0.24		Sheet Flow, AB
					Grass: Dense n= 0.240 P2= 3.45"

**Subcatchment P1c: Driveway Area to Upper Drywell**

Hydrograph





**Proposed Conditions - 105 Nod Hill Road - REV1**

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Type III 24-hr 25-yr Rainfall=6.45"

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**Summary for Subcatchment P1d: Driveway Area to Lower Drywell**

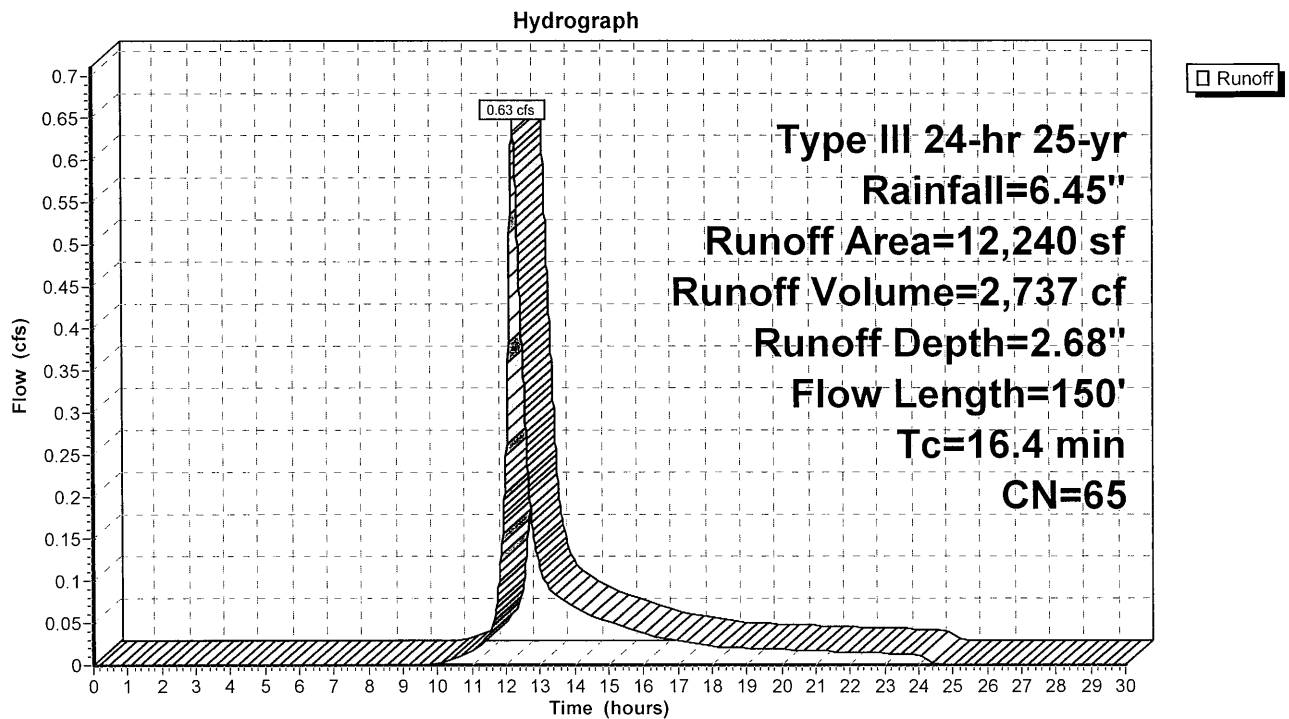
Runoff = 0.63 cfs @ 12.23 hrs, Volume= 2,737 cf, Depth= 2.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-yr Rainfall=6.45"

Area (sf)	CN	Description
* 1,240	98	Driveway
11,000	61	>75% Grass cover, Good, HSG B
12,240	65	Weighted Average
11,000		Pervious Area
1,240		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0200	0.12		<b>Sheet Flow, AB</b>
					Grass: Dense n= 0.240 P2= 3.45"
2.7	50	0.2800	0.30		<b>Sheet Flow, BC</b>
					Grass: Dense n= 0.240 P2= 3.45"
16.4	150	Total			

**Subcatchment P1d: Driveway Area to Lower Drywell**

**Proposed Conditions - 105 Nod Hill Road - REV1**

Type III 24-hr 25-yr Rainfall=6.45"

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**Summary for Pond DET: Underground Detention System**

Inflow Area = 12,232 sf, 40.48% Impervious, Inflow Depth = 3.87" for 25-yr event  
 Inflow = 1.32 cfs @ 12.07 hrs, Volume= 3,950 cf  
 Outflow = 0.42 cfs @ 12.39 hrs, Volume= 3,950 cf, Atten= 68%, Lag= 18.7 min  
 Discarded = 0.05 cfs @ 10.84 hrs, Volume= 3,178 cf  
 Primary = 0.37 cfs @ 12.39 hrs, Volume= 772 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs  
 Peak Elev= 439.05' @ 12.39 hrs Surf.Area= 1,044 sf Storage= 1,483 cf

Plug-Flow detention time= 241.9 min calculated for 3,949 cf (100% of inflow)  
 Center-of-Mass det. time= 241.9 min ( 1,059.5 - 817.6 )

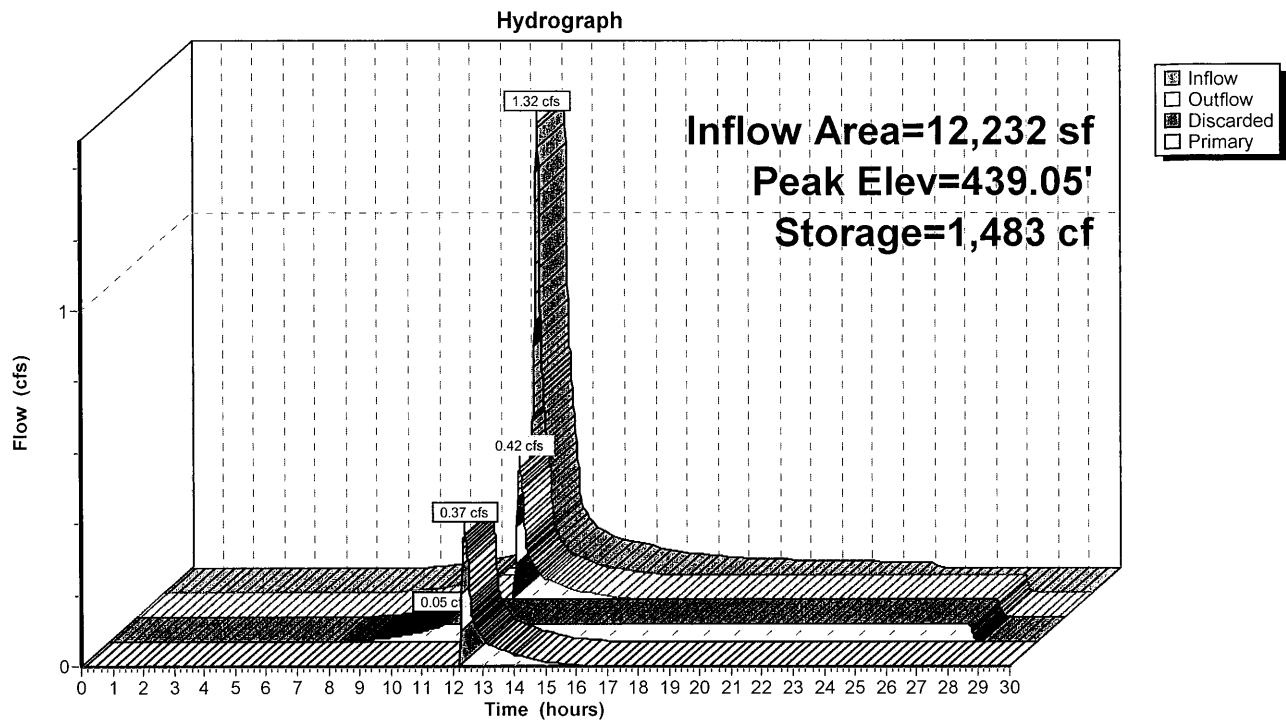
Volume	Invert	Avail.Storage	Storage Description
#1	436.50'	554 cf	<b>6.00'W x 58.00'L x 2.60'H Gravel Bed</b> x 3 2,714 cf Overall - 1,331 cf Embedded = 1,384 cf x 40.0% Voids
#2	437.00'	951 cf	<b>48.0"W x 24.0"H x 56.00'L Galley 4x8x2</b> x 3 Inside #1
		1,505 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	436.50'	<b>2.000 in/hr Exfiltration over Surface area</b>
#2	Primary	438.70'	<b>8.0" Vert. High Level Overflow Pipe</b> C= 0.600

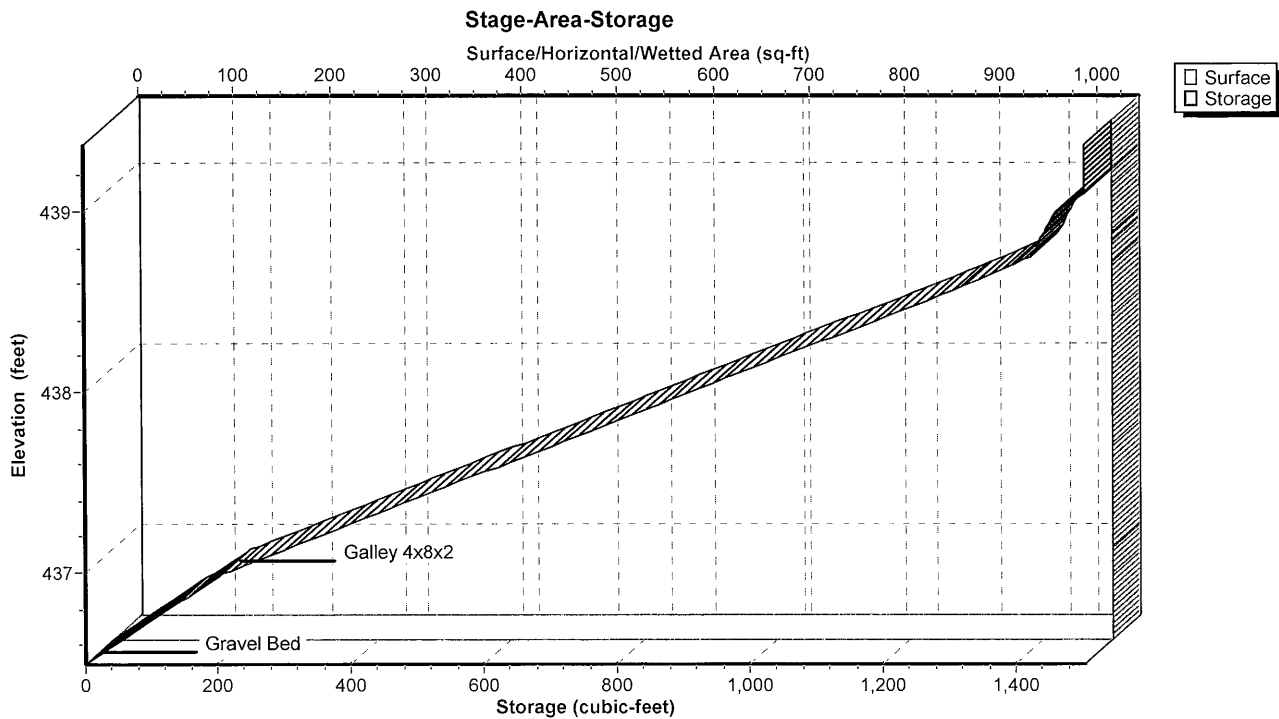
**Discarded OutFlow** Max=0.05 cfs @ 10.84 hrs HW=436.53' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.05 cfs)

**Primary OutFlow** Max=0.37 cfs @ 12.39 hrs HW=439.05' (Free Discharge)  
 ↑2=High Level Overflow Pipe (Orifice Controls 0.37 cfs @ 2.01 fps)

## Pond DET: Underground Detention System



## Pond DET: Underground Detention System



**Proposed Conditions - 105 Nod Hill Road - REV1**

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Type III 24-hr 25-yr Rainfall=6.45"

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**Summary for Pond DRY1: Upper Drywell**

Inflow Area = 4,140 sf, 36.23% Impervious, Inflow Depth = 3.57" for 25-yr event  
 Inflow = 0.39 cfs @ 12.10 hrs, Volume= 1,231 cf  
 Outflow = 0.39 cfs @ 12.10 hrs, Volume= 1,118 cf, Atten= 0%, Lag= 0.2 min  
 Primary = 0.39 cfs @ 12.10 hrs, Volume= 1,118 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 432.79' @ 12.10 hrs Surf.Area= 50 sf Storage= 123 cf

Plug-Flow detention time= 65.0 min calculated for 1,117 cf (91% of inflow)

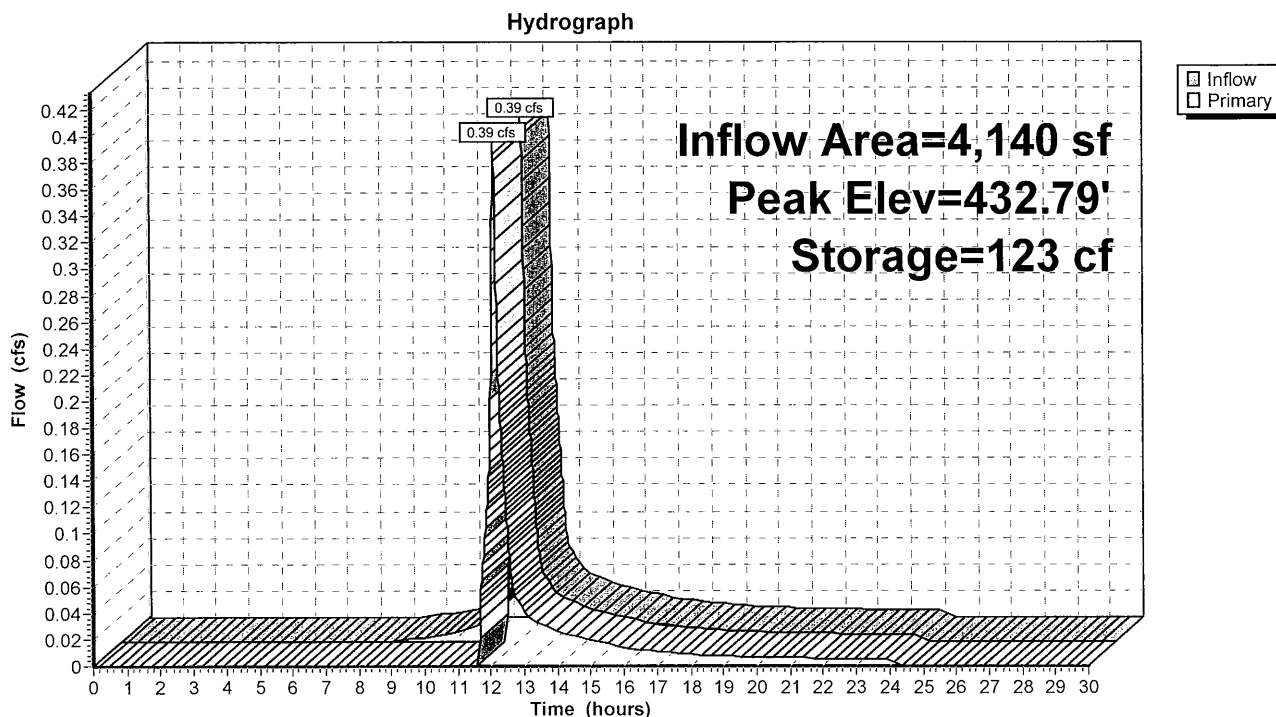
Center-of-Mass det. time= 19.6 min ( 845.9 - 826.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	429.00'	55 cf	<b>8.00'D x 5.00'H Vertical Cone/Cylinder</b> 251 cf Overall - 113 cf Embedded = 138 cf x 40.0% Voids
#2	430.00'	113 cf	<b>6.00'D x 4.00'H Vertical Cone/Cylinder</b> Inside #1
		168 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	<b>15.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.38 cfs @ 12.10 hrs HW=432.79' (Free Discharge)

1=Orifice/Grate (Orifice Controls 0.38 cfs @ 1.82 fps)

**Pond DRY1: Upper Drywell**

# Proposed Conditions - 105 Nod Hill Road - REV1

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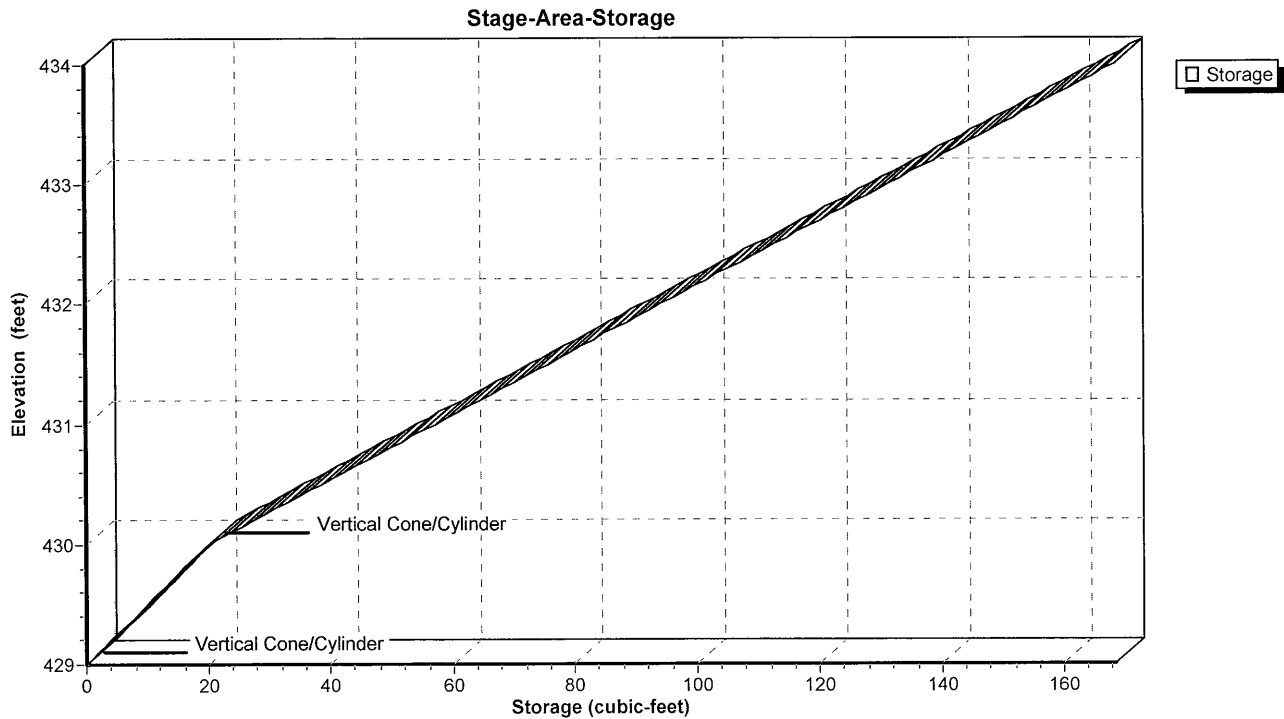
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Type III 24-hr 25-yr Rainfall=6.45"

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## Pond DRY1: Upper Drywell





**Proposed Conditions - 105 Nod Hill Road - REV1**

Type III 24-hr 25-yr Rainfall=6.45"

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**Summary for Pond DRY2: Lower Drywell**

Inflow Area = 16,380 sf, 16.73% Impervious, Inflow Depth = 2.82" for 25-yr event  
 Inflow = 0.88 cfs @ 12.18 hrs, Volume= 3,855 cf  
 Outflow = 0.88 cfs @ 12.19 hrs, Volume= 3,746 cf, Atten= 0%, Lag= 0.1 min  
 Primary = 0.88 cfs @ 12.19 hrs, Volume= 3,746 cf

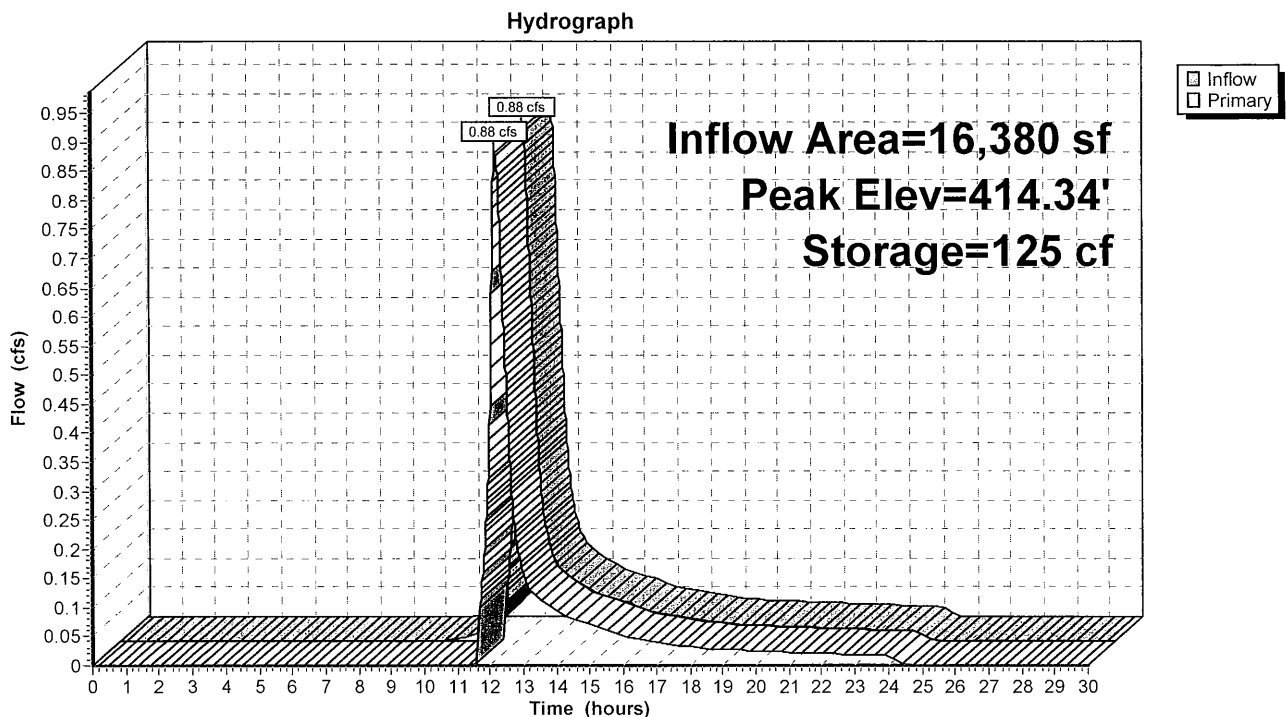
Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs  
 Peak Elev= 414.34' @ 12.19 hrs Surf.Area= 50 sf Storage= 125 cf

Plug-Flow detention time= 22.0 min calculated for 3,745 cf (97% of inflow)  
 Center-of-Mass det. time= 6.1 min ( 859.1 - 853.0 )

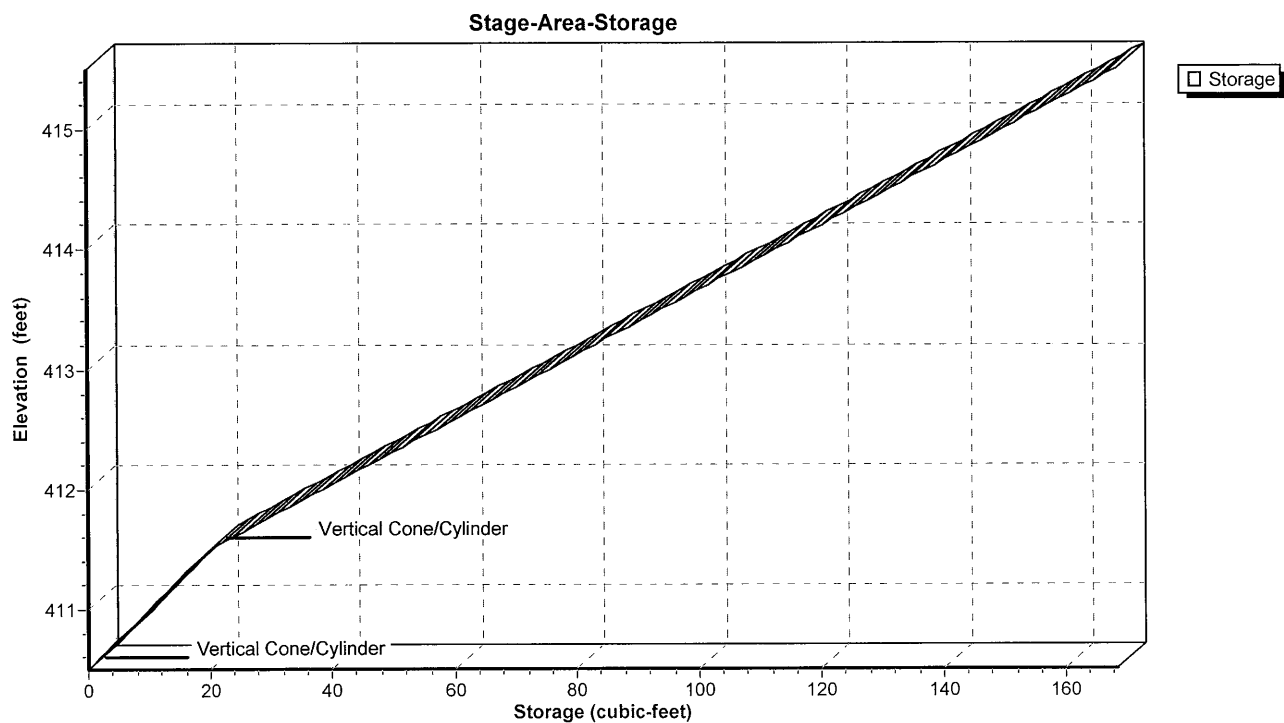
Volume	Invert	Avail.Storage	Storage Description
#1	410.50'	55 cf	<b>8.00'D x 5.00'H Vertical Cone/Cylinder</b> 251 cf Overall - 113 cf Embedded = 138 cf x 40.0% Voids
#2	411.50'	113 cf	<b>6.00'D x 4.00'H Vertical Cone/Cylinder</b> Inside #1
		168 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	413.90'	<b>15.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.88 cfs @ 12.19 hrs HW=414.34' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 0.88 cfs @ 2.26 fps)

**Pond DRY2: Lower Drywell**

**Pond DRY2: Lower Drywell**



## Proposed Conditions - 105 Nod Hill Road - REV1

Prepared by McChord Engineering Associates, Inc.

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Type III 24-hr 25-yr Rainfall=6.45"

Printed 1/7/2021

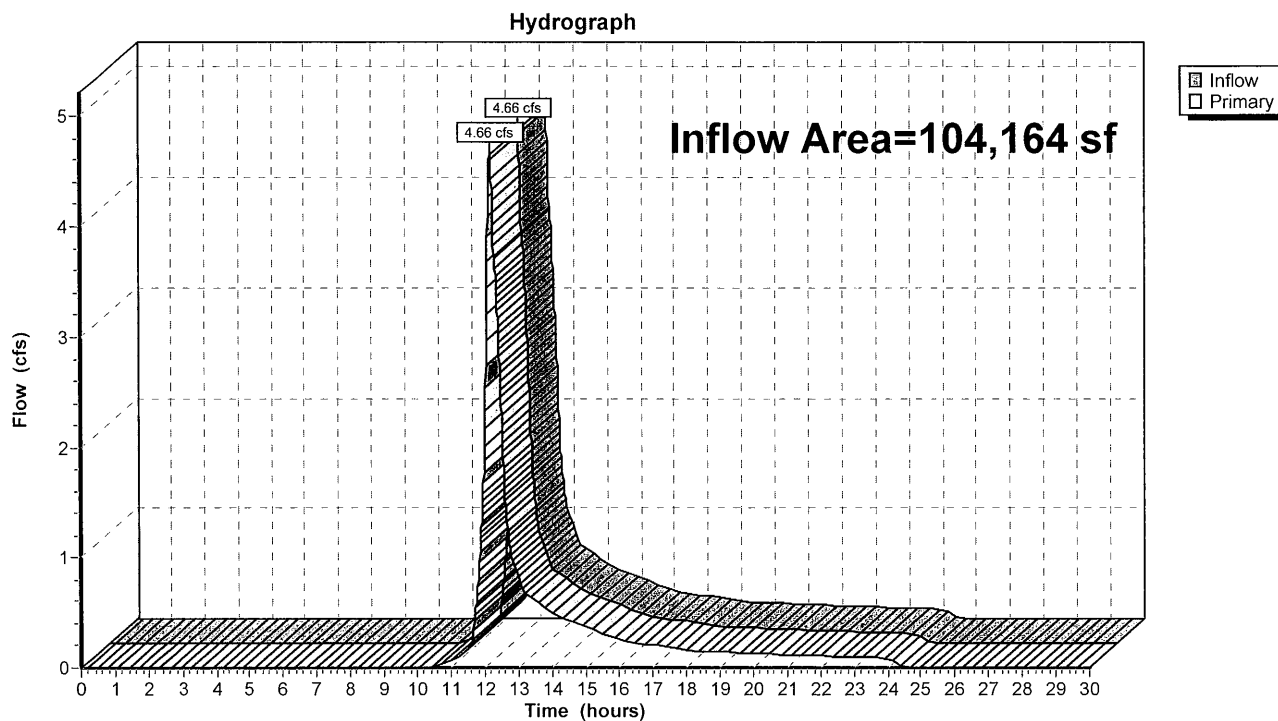
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### Summary for Link SUM: Sum of Hydrographs

Inflow Area = 104,164 sf, 8.10% Impervious, Inflow Depth = 2.20" for 25-yr event  
Inflow = 4.66 cfs @ 12.17 hrs, Volume= 19,077 cf  
Primary = 4.66 cfs @ 12.17 hrs, Volume= 19,077 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

### Link SUM: Sum of Hydrographs



**APPENDIX C:**  
**STORMWATER FACILITIES MAINTENANCE PLAN**

# **Stormwater Facilities Maintenance Plan**

**105 Nod Hill Road, Wilton, CT**

**Map 92, Lot 1-1**

## **Scope:**

The purpose of the Stormwater Facilities Maintenance Plan is to insure that the proposed stormwater components installed for the 105 Nod Hill Road are maintained in operational condition throughout the life of the home. The service procedures associated with this plan shall be performed as required by the parties legally responsible for their maintenance. This shall include the stormwater components that are proposed to be installed on the shoulder of Nod Hill Road within the town Right-Of-Way.

## **Description of Stormwater Facilities:**

The proposed stormwater facilities are designed to collect, convey, detain and treat the runoff from the site in order to minimize adverse impacts to the adjoining lagoon. A description of the stormwater facilities are as follows:

1. **Roof Leaders/Gutters:** Roof leaders (also known as downspouts) from the house will convey roof runoff collected by the roof gutters on the proposed residence to the underground detention chambers.
2. **Driveway Drains & Drywells:** Driveway drains and drywells will collect runoff from the driveway and convey it to either the proposed drainage pipe system or to the underground detention chambers. Both are equipped with a sump designed to capture sediment and debris from the runoff.
3. **Manholes:** Manholes will collect runoff routed to it from the drains and convey the runoff through drainage pipes.
4. **Underground Detention Chambers:** The underground detention system consist of a series of concrete chambers which provide water quality storage volume for the stormwater runoff. Stormwater in the underground detention system is designed to infiltrate into the underlying soils. The detention chambers are designed to overflow to a high level over flow pipe during extreme storm events.

## **Recommended Frequency of Service:**

All of the stormwater components installed for this property should be checked periodically and kept in full working order. Ultimately the frequency of inspection and service cleaning depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, trash, etc.); however it is recommended that each facility be inspected and cleaned a minimum of two times a year. The guidelines for the timing of service include early spring after the winter season and late fall after the leaves have fallen from the trees.

## **Service Procedures:**

Service can be performed by the homeowner, landscape contractor or handyman since no specialized equipment is required. Specific service procedures for the stormwater facilities are as follows:

1. **Roof Leaders/Gutters:** Roof gutters shall be inspected twice a year during the spring and fall service inspections to ensure that roof leaders are kept free of leaves and debris that could clog the detention chambers. At a minimum, leaves should be cleaned from the gutters during the fall service inspection.
2. **Driveway Drains & Drywells:** Driveway drains and drywells shall be inspected and cleaned twice a year during the spring and fall service inspections. The cleaning shall include both removal of sediment from the sumps and removal of any trash and/or debris from the grate.
3. **Manholes:** All manholes shall be inspected and cleaned twice a year during the spring and fall service inspections. The cleaning shall include both removal of sediment and insuring that storm water can still effectively be routed through the inlet and outlet pipes.
4. **Underground Detention Chambers:** Functionality of the underground detention chambers ultimately depends on keeping sediment and debris out of the chambers. This is accomplished through proper maintenance of the roof leaders, gutters and driveway drains. These components should be maintained as described above, but more frequent maintenance may be required if excessive accumulation of debris is observed.