

DRAINAGE ANALYSIS

LOCATED AT
1 WYNFROMERE LANE
WESTPORT, CONNECTICUT

PREPARED FOR
ROBER & VALERIE NEWMAN

June 13, 2024



Jim Kousidis, P.E.
CT License No. 26830

1. EXISTING CONDITIONS

This 44,407-sq. ft. residential property is currently developed with a single-family residence, attached garage and driveway. Test pits at the site indicate highly pervious soils that are adequate to accept a subsurface storm drain system. The topography of the property slopes away from the residence in all directions. According to the Web Soil Survey website (map and soil table attached) the soils in the subject area consist of Udorthents-Urban land complex, a well-drained soil with a Hydrologic Soil Group "B".

2. PROPOSED CONDITIONS

A new development is being proposed for the subject property. The owner is proposing to demolish the rear deck, and construct a new inground pool and spa, with attached patio and deck, with associated site improvements. Additions are currently under construction including a covered porch in the front of the residence, and covered patio to the rear of the residence. The additions under construction were not accounted for in the existing conditions, and stormwater detention has been provided to mitigate the increase in stormwater runoff associated with them. The total proposed impervious surface is 2,389-sq.ft. A stormwater retention system will be installed to satisfy the Town of Westport's requirements of zero increase in runoff for a 24-hour, type III rainfall, 25-year storm event. A portion of the roof area, the patio slot drain, and the pool overflow must be directed to the proposed retention system.

3. DRAINAGE

Under existing conditions, the peak runoff from the site is 3.16 cfs for the 25-year storm. The Town's requirement for zero increase in runoff is satisfied by collecting a portion of the roof area, the patio slot drain, and the pool overflow. The runoff from the impervious surface directed to the drainage system generates a peak 25-year flow of 0.15 cfs. The overall post conditions runoff is 3.15 cfs. The subsurface drainage system consists of 40 LF of 18" high precast concrete galleries surrounded by 1 foot of clean crushed stone. In addition to the above, the drainage system was checked for the capacity to hold the first flush from all the new impervious surfaces. The runoff volume from 1" of rainfall is (2,389 sq. ft. x 1"/12"/ft. = 199.08 cu. ft.). The holding capacity of the concrete galleries is 232 cu.ft. which well exceeds the 1" minimum requirement of pure storage volume.

4. CONCLUSION

The proposed development will increase the amount of impervious area to this site, resulting in higher peak runoff rates. However, with the installation of the proposed stormwater retention systems, the original flow patterns will be maintained and there will be no increase in peak runoff for the 25-year storm event. In addition to controlling stormwater peak runoff, the proposed design incorporates stormwater treatment to control pollution and provide groundwater recharge capacity. The implementation of these techniques and the overall site design layout will result in a finished project that will minimize sediment and erosion impacts during construction and will have no adverse impacts to adjoining properties upon completion.

EXISTING DRAINAGE CONDITIONS

EXHIBIT "A"

1 WYNFROMERE LANE, WESTPORT, CT

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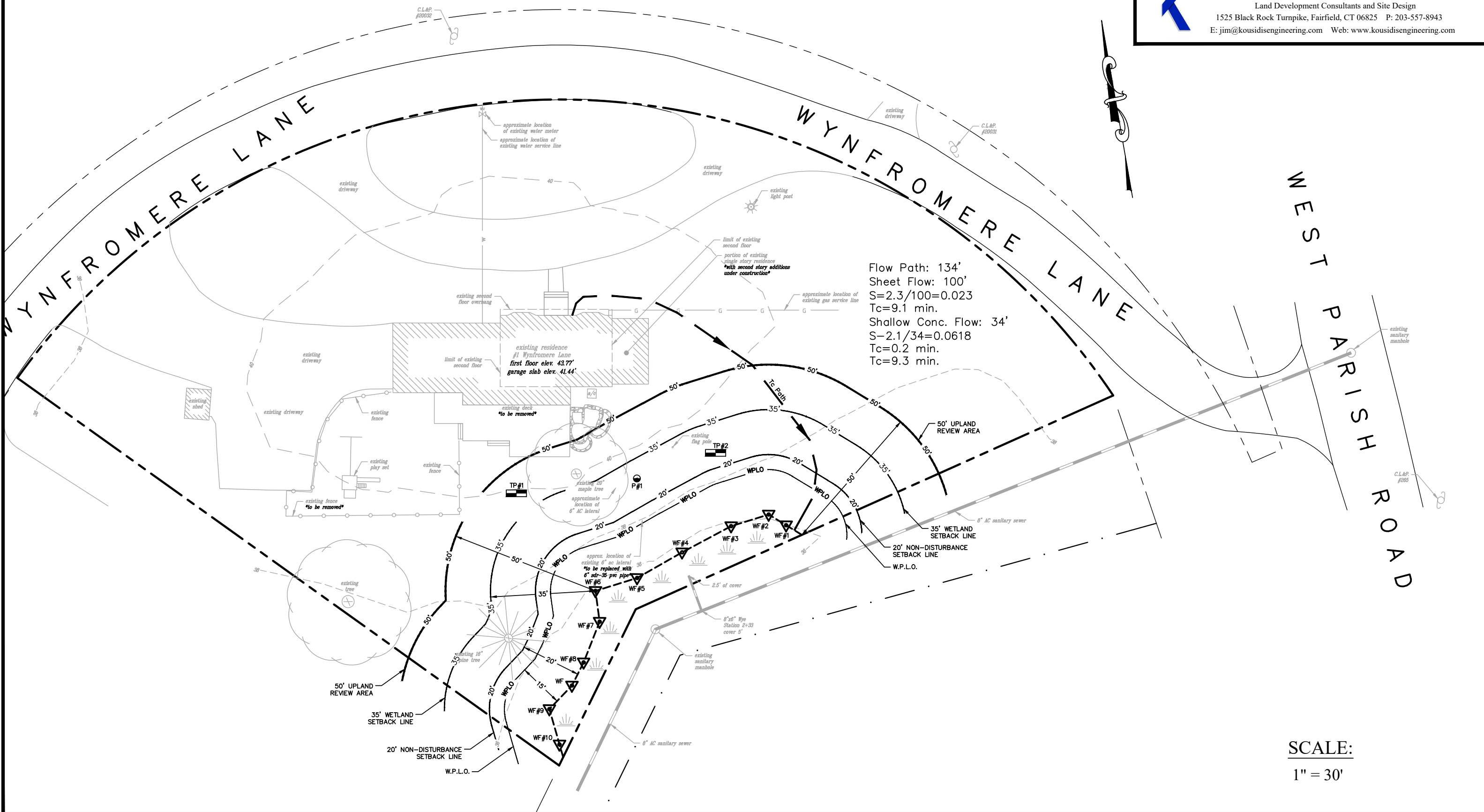


KOUSIDIS ENGINEERING, LLC

Land Development Consultants and Site Design

1525 Black Rock Turnpike, Fairfield, CT 06825 P: 203-557-8943

E: jim@kousidisengineering.com Web: www.kousidisengineering.com



Flow Path: 134'
Sheet Flow: 100'
 $S=2.3/100=0.023$
 $T_c=9.1$ min.
Shallow Conc. Flow: 34'
 $S=2.1/34=0.0618$
 $T_c=0.2$ min.
 $T_c=9.3$ min.

SCALE:
1" = 30'

PROPOSED DRAINAGE CONDITIONS

EXHIBIT "B"

1 WYNFROMERE LANE, WESTPORT, CT

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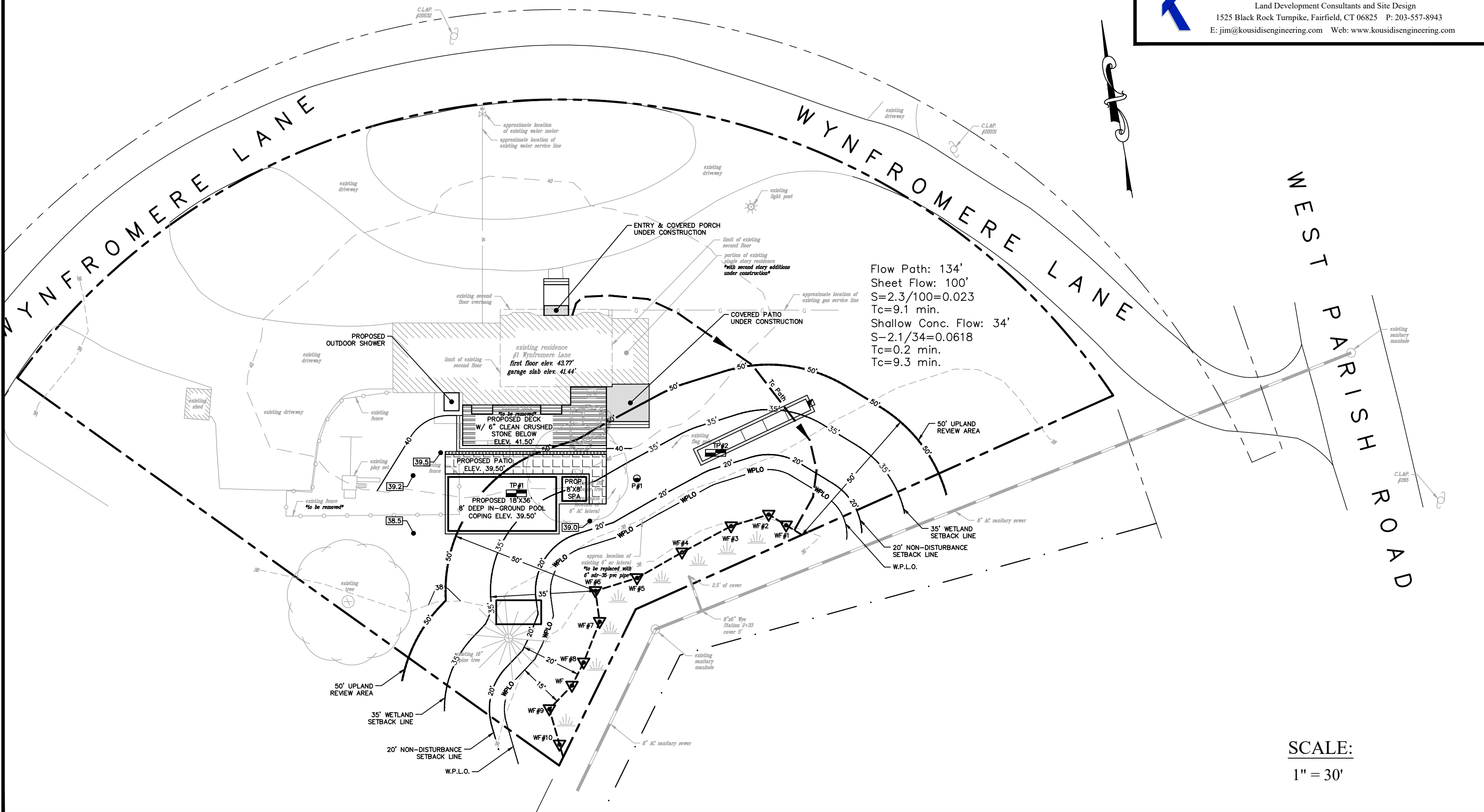


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SCALE:
1" = 30'

EXISTING DIRECTLY CONNECTED IMPERVIOUS AREA

EXHIBIT "C"

1 WYNFROMERE LANE, WESTPORT, CT

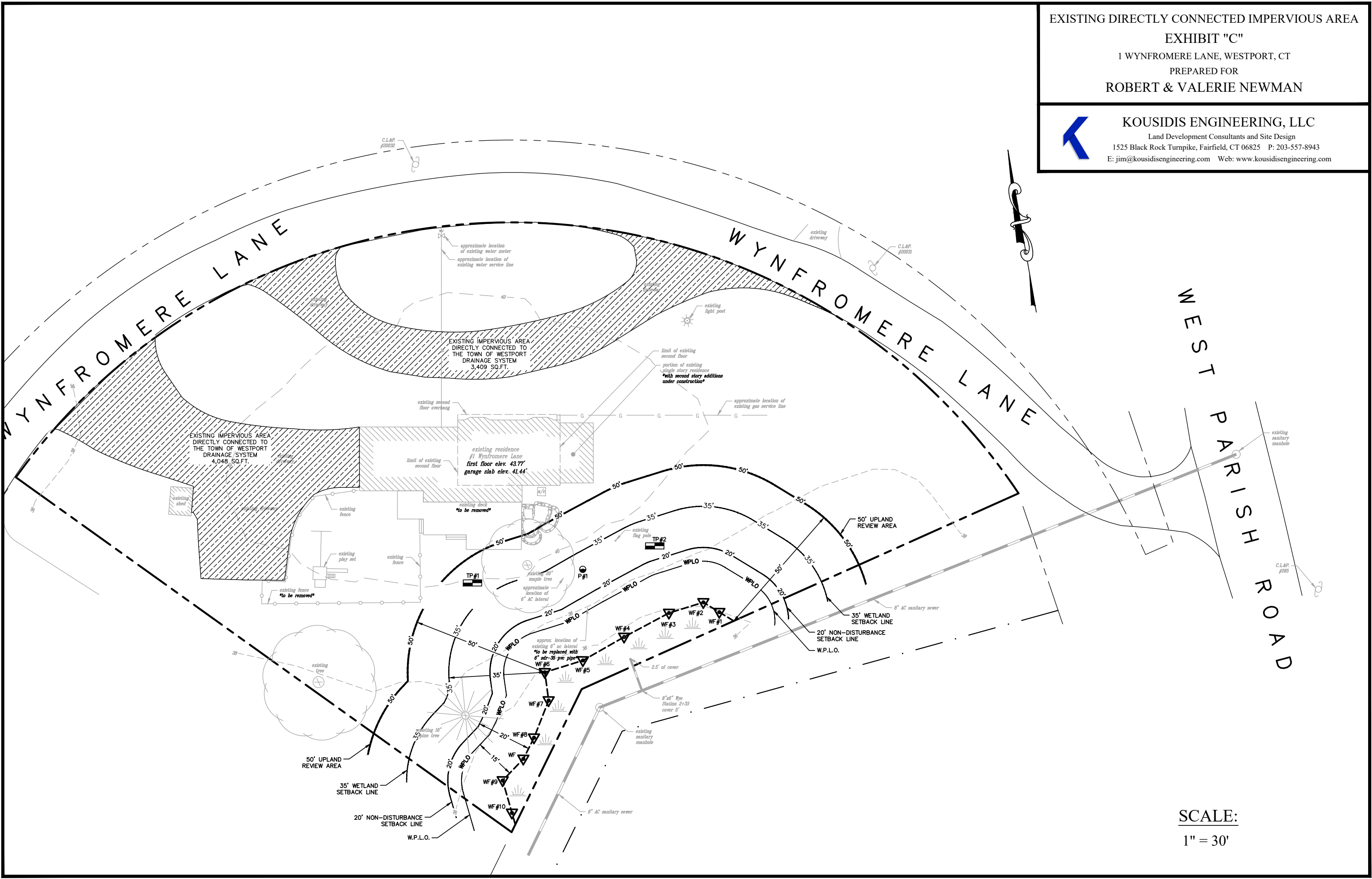
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SCALE:
1" = 30'

PROPOSED DIRECTLY CONNECTED IMPERVIOUS AREA

EXHIBIT "D"

1 WYNFROMERE LANE, WESTPORT, CT

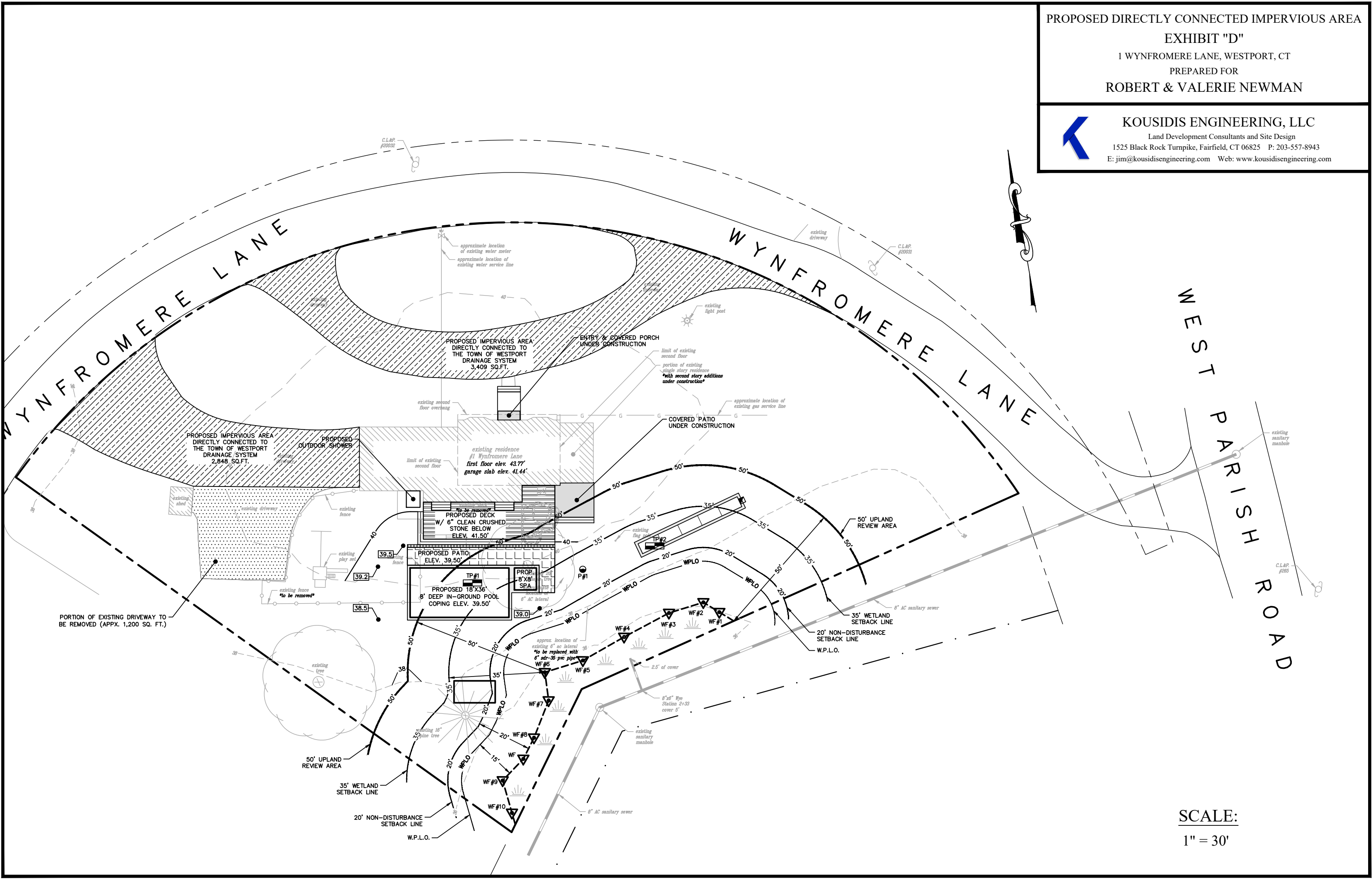
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SCALE:
1" = 30'



Kousidis Engineering, LLC
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Date: 6/13/2024
 Revised: -

MS4 Impervious Cover Tracking Worksheet	
Address:	1 Wynfromere Lane
GIS ID #:	F08-025-000
Lot Area:	44,407 SF

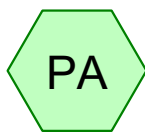
Existing Conditions		
Impervious Area	Disconnected	Connected
Item	Area (SF)	
Building	2407	0
Driveway	0	7457
Patio/Walks	0	0
Pool	0	0
Coping & Equip. Pad	0	0
Deck	651	0
Totals	3058	7457

Proposed Conditions		
Impervious Area	Disconnected	Connected
Item	Area (SF)	
Building	2609	0
Driveway	0	6257
Patio/Walks	500	0
Pool	712	0
Coping & Equip. Pad	225	0
Deck	750	0
Totals	4796	6257

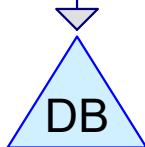
Connected Impervious Area Reduction		
Existing Connected Impervious	7457	SF
Proposed Connected Impervious	6257	SF
Reduction	-1200	SF
Percent Reduction	-16%	



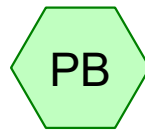
Existing Conditions
Runoff



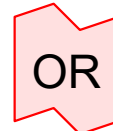
Impervious Area to
Detention System



18" High Precast
Concrete Galleries



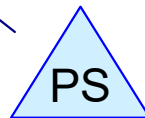
Proposed Bypass Area



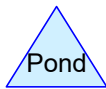
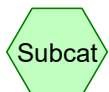
Overall Runoff



Pool Surface Area



Pool Storage Below
Overflow



Routing Diagram for 1WynfromereLn(06-12-24)_Exist&PropConditions
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1WynfromereLn(06-12-24)_Exist&PropConditions

Type III 24-hr 25 yr Rainfall=6.40"

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Page 2

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PA: Impervious Area to Runoff Area=975 sf 100.00% Impervious Runoff Depth>6.16"
Tc=3.0 min CN=98 Runoff=0.15 cfs 501 cf

Subcatchment PB: Proposed Bypass Area Runoff Area=42,720 sf 21.98% Impervious Runoff Depth>3.12"
Flow Length=134' Tc=9.3 min CN=70 Runoff=3.15 cfs 11,109 cf

Subcatchment PSA: Pool Surface Area Runoff Area=712 sf 100.00% Impervious Runoff Depth>6.16"
Tc=3.0 min CN=98 Runoff=0.11 cfs 366 cf

Subcatchment XC: Existing Conditions Runoff Area=44,407 sf 19.56% Impervious Runoff Depth>3.02"
Flow Length=134' Tc=9.3 min CN=69 Runoff=3.16 cfs 11,187 cf

Pond DB: 18" High Precast Concrete Galleries Peak Elev=37.65' Storage=197 cf Inflow=0.15 cfs 631 cf
Discarded=0.02 cfs 630 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 630 cf

Pond PS: Pool Storage Below Overflow Peak Elev=39.50' Storage=235 cf Inflow=0.11 cfs 366 cf
Outflow=0.03 cfs 131 cf

Link OR: Overall Runoff Inflow=3.15 cfs 11,109 cf
Primary=3.15 cfs 11,109 cf

Summary for Subcatchment PA: Impervious Area to Detention System

Runoff = 0.15 cfs @ 12.05 hrs, Volume= 501 cf, Depth> 6.16"

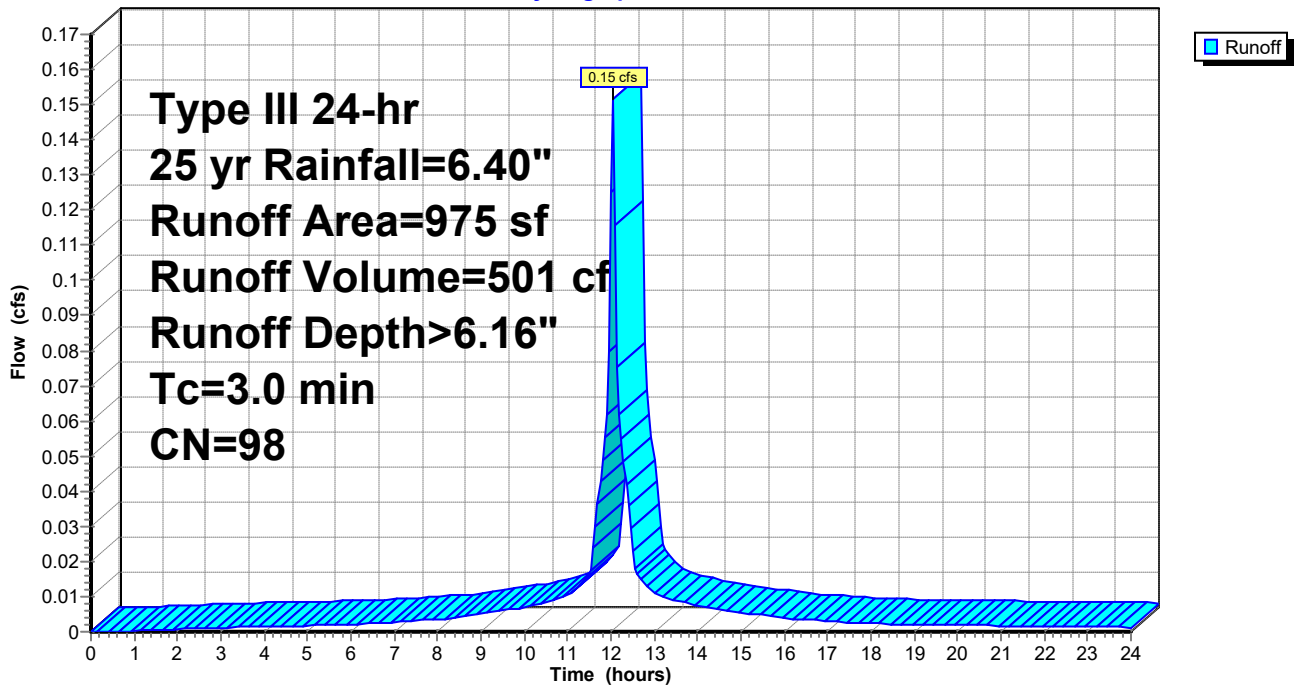
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	450	98	Building
*	450	98	Patio/Walkway
*	75	98	Pool Coping
	975	98	Weighted Average
	975		100.00% Impervious Area

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

Subcatchment PA: Impervious Area to Detention System

Hydrograph



Summary for Subcatchment PB: Proposed Bypass Area

Runoff = 3.15 cfs @ 12.14 hrs, Volume= 11,109 cf, Depth> 3.12"

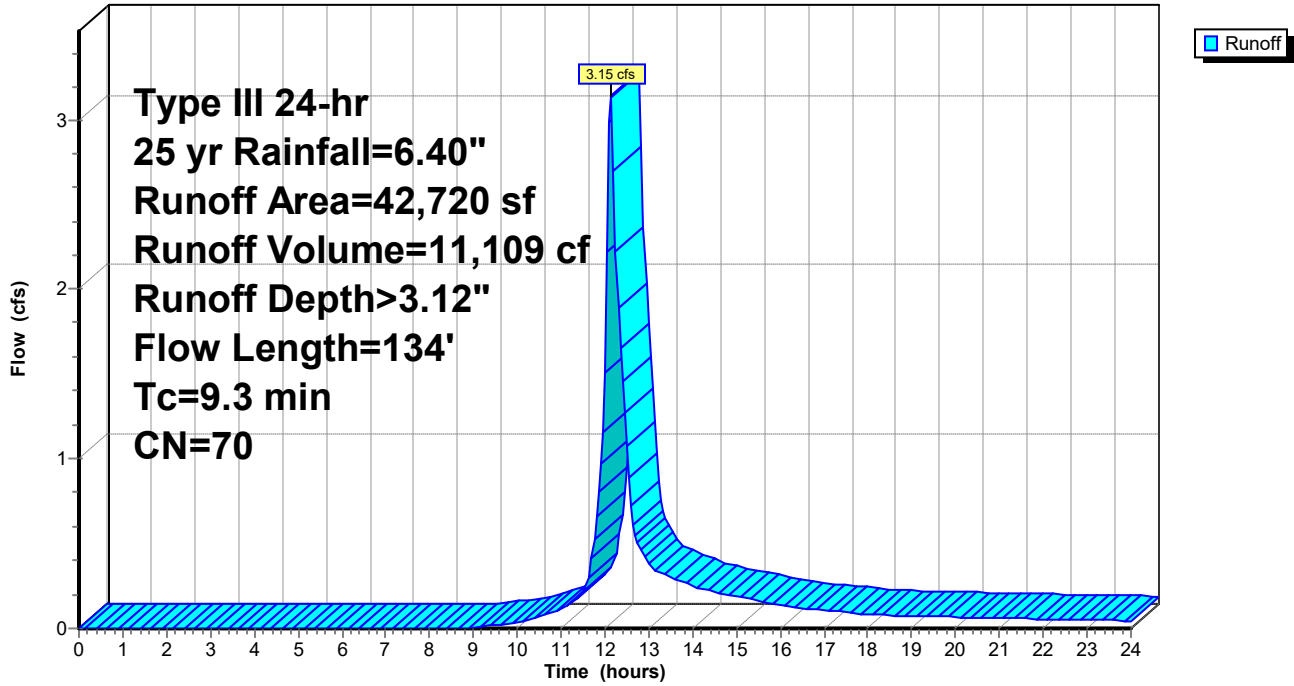
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 yr Rainfall=6.40"

Area (sf)	CN	Description
* 2,159	98	Building
* 6,257	98	Driveway
* 24	98	Roadway
* 50	98	Patio/Walkway
* 750	98	Deck
* 150	98	Pool Coping/Equipment
* 1,136	89	<50% Grass cover, Poor, HSG D (Wetlands)
32,194	61	>75% Grass cover, Good, HSG B
42,720	70	Weighted Average
33,330		78.02% Pervious Area
9,390		21.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0230	0.18		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.30"
0.2	34	0.0618	3.73		Shallow Concentrated Flow, Shallow Conc. Flow Grassed Waterway Kv= 15.0 fps
9.3	134	Total			

Subcatchment PB: Proposed Bypass Area

Hydrograph



Summary for Subcatchment PSA: Pool Surface Area

Runoff = 0.11 cfs @ 12.05 hrs, Volume= 366 cf, Depth> 6.16"

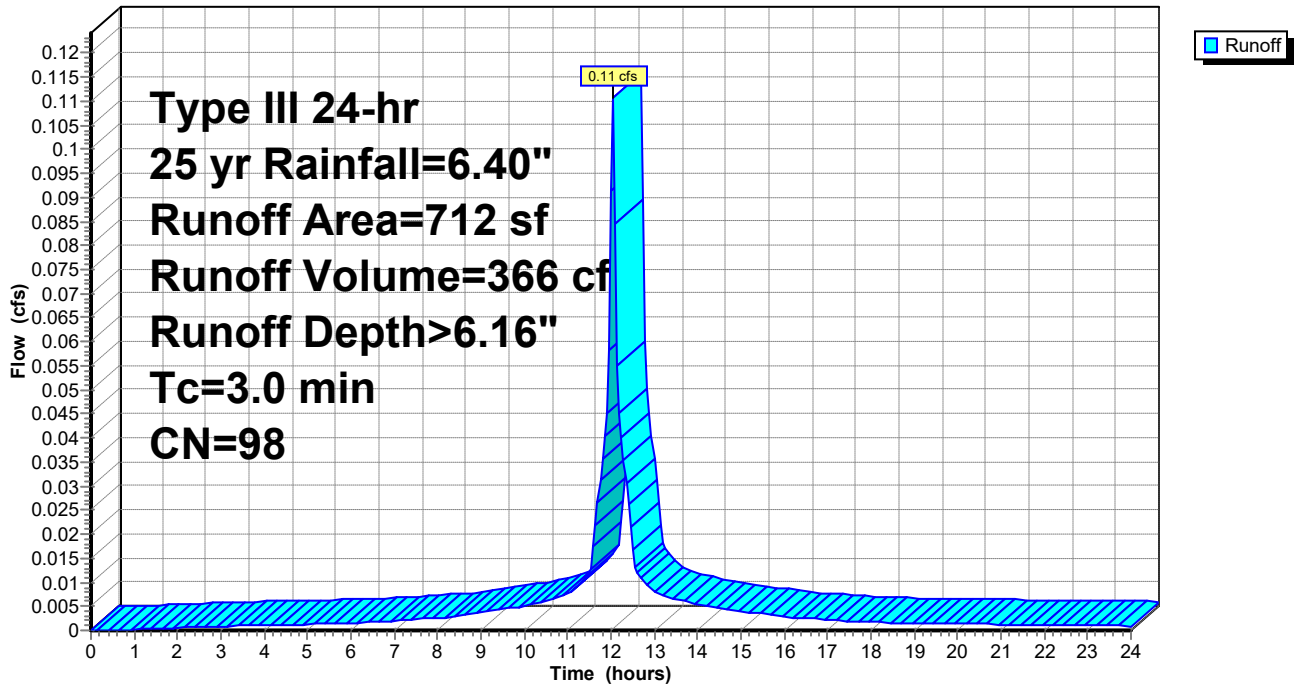
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 yr Rainfall=6.40"

Area (sf)	CN	Description
* 712	98	Pool
712		100.00% Impervious Area

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

Subcatchment PSA: Pool Surface Area

Hydrograph



Summary for Subcatchment XC: Existing Conditions Runoff

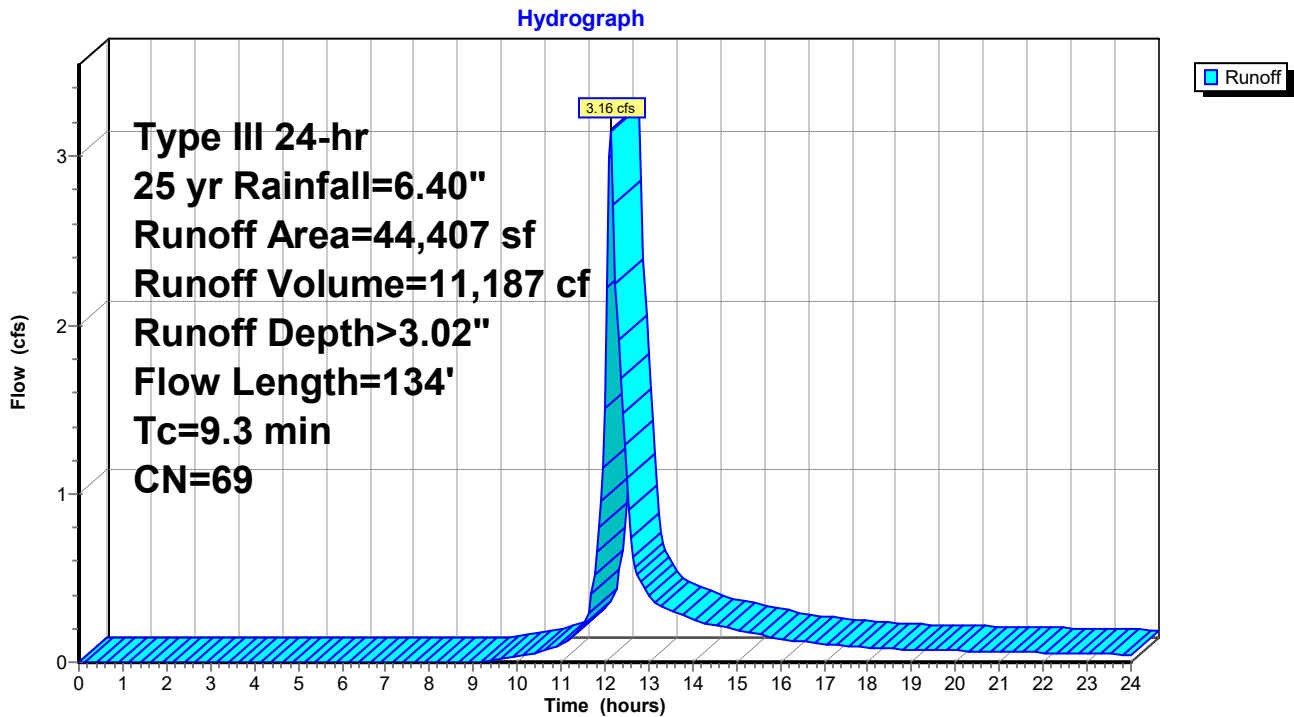
Runoff = 3.16 cfs @ 12.14 hrs, Volume= 11,187 cf, Depth> 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	2,407	98	Building
*	6,257	98	Driveway
*	24	98	Roadway
*	1,136	89	<50% Grass cover, Poor, HSG D (Wetlands)
	34,583	61	>75% Grass cover, Good, HSG B
	44,407	69	Weighted Average
	35,719		80.44% Pervious Area
	8,688		19.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0230	0.18		Sheet Flow, Sheet Flow
					Grass: Short n= 0.150 P2= 3.30"
0.2	34	0.0618	3.73		Shallow Concentrated Flow, Shallow Conc. Flow
					Grassed Waterway Kv= 15.0 fps
9.3	134	Total			

Subcatchment XC: Existing Conditions Runoff



Summary for Pond DB: 18" High Precast Concrete Galleries

Inflow Area = 1,687 sf, 100.00% Impervious, Inflow Depth > 4.49" for 25 yr event
 Inflow = 0.15 cfs @ 12.05 hrs, Volume= 631 cf
 Outflow = 0.02 cfs @ 13.19 hrs, Volume= 630 cf, Atten= 89%, Lag= 68.3 min
 Discarded = 0.02 cfs @ 13.19 hrs, Volume= 630 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 37.65' @ 13.19 hrs Surf.Area= 256 sf Storage= 197 cf

Plug-Flow detention time= 97.1 min calculated for 630 cf (100% of inflow)
 Center-of-Mass det. time= 95.9 min (876.3 - 780.4)

Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	55 cf	6.00'W x 42.00'L x 1.50'H Stone Bed 378 cf Overall - 240 cf Embedded = 138 cf x 40.0% Voids
#2	36.50'	161 cf	Concrete Galley 4x8x1.5 x 5 Inside #1 Inside= 42.0"W x 15.0"H => 4.29 sf x 7.50'L = 32.2 cf Outside= 48.0"W x 18.0"H => 6.00 sf x 8.00'L = 48.0 cf
#3	36.50'	16 cf	2.00'W x 2.00'L x 4.00'H Yard Drain
		232 cf	Total Available Storage

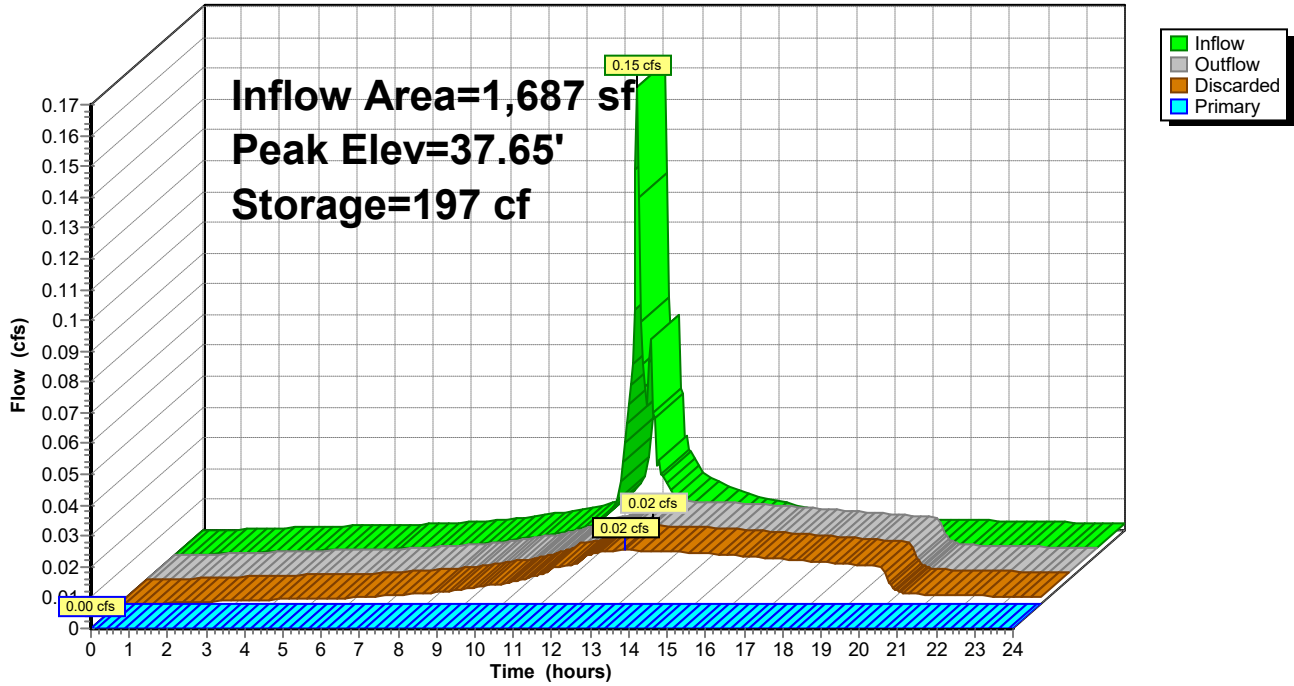
Device	Routing	Invert	Outlet Devices
#1	Primary	39.00'	8.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#2	Discarded	36.50'	2.000 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.02 cfs @ 13.19 hrs HW=37.65' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=36.50' (Free Discharge)
 ↑**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond DB: 18" High Precast Concrete Galleries

Hydrograph



1WynfromereLn(06-12-24)_Exist&PropConditions

Type III 24-hr 25 yr Rainfall=6.40"

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Stage-Area-Storage for Pond DB: 18" High Precast Concrete Galleries

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
36.50	256	0	39.10	421	226
36.55	261	9	39.15	421	227
36.60	266	17	39.20	422	227
36.65	272	26	39.25	422	227
36.70	277	34	39.30	422	227
36.75	282	43	39.35	423	227
36.80	287	52	39.40	423	228
36.85	292	60	39.45	424	228
36.90	298	69	39.50	424	228
36.95	303	77	39.55	424	228
37.00	308	86	39.60	425	228
37.05	313	95	39.65	425	229
37.10	318	103	39.70	426	229
37.15	324	112	39.75	426	229
37.20	329	120	39.80	426	229
37.25	334	129	39.85	427	229
37.30	339	138	39.90	427	230
37.35	344	146	39.95	428	230
37.40	350	155	40.00	428	230
37.45	355	163	40.05	428	230
37.50	360	172	40.10	429	230
37.55	365	181	40.15	429	231
37.60	370	189	40.20	430	231
37.65	376	197	40.25	430	231
37.70	381	204	40.30	430	231
37.75	386	212	40.35	431	231
37.80	391	214	40.40	431	232
37.85	396	216	40.45	432	232
37.90	402	218	40.50	432	232
37.95	407	220			
38.00	412	222			
38.05	412	222			
38.10	413	222			
38.15	413	223			
38.20	414	223			
38.25	414	223			
38.30	414	223			
38.35	415	223			
38.40	415	224			
38.45	416	224			
38.50	416	224			
38.55	416	224			
38.60	417	224			
38.65	417	225			
38.70	418	225			
38.75	418	225			
38.80	418	225			
38.85	419	225			
38.90	419	226			
38.95	420	226			
39.00	420	226			
39.05	420	226			

Summary for Pond PS: Pool Storage Below Overflow

Inflow Area = 712 sf, 100.00% Impervious, Inflow Depth > 6.16" for 25 yr event
 Inflow = 0.11 cfs @ 12.05 hrs, Volume= 366 cf
 Outflow = 0.03 cfs @ 12.40 hrs, Volume= 131 cf, Atten= 69%, Lag= 21.0 min
 Primary = 0.03 cfs @ 12.40 hrs, Volume= 131 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 39.50' @ 12.40 hrs Surf.Area= 712 sf Storage= 235 cf

Plug-Flow detention time= 364.0 min calculated for 131 cf (36% of inflow)
 Center-of-Mass det. time= 189.1 min (930.4 - 741.3)

Volume	Invert	Avail.Storage	Storage Description
#1	39.17'	712 cf	Pool Storage (Prismatic) Listed below (Recalc)

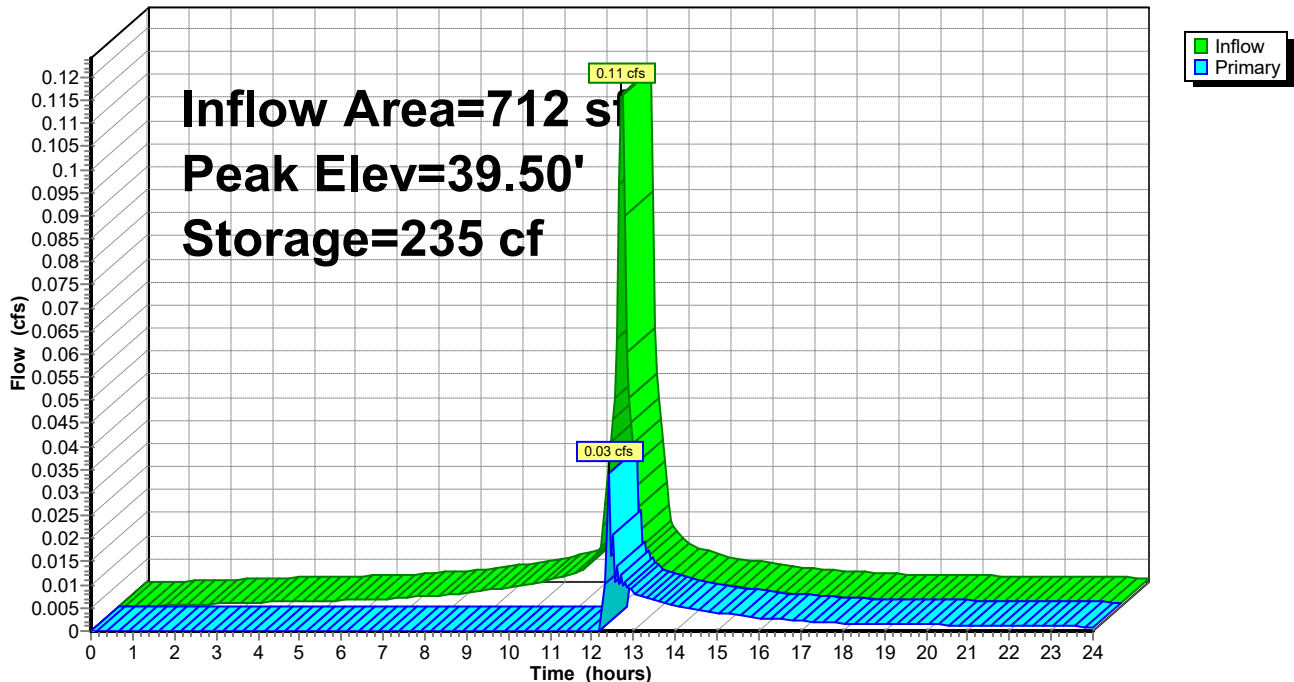
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
39.17	712	0	0
40.17	712	712	712

Device	Routing	Invert	Outlet Devices
#1	Primary	39.50'	140.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.01 cfs @ 12.40 hrs HW=39.50' (Free Discharge)
 ↑1=Sharp-Crested Rectangular Weir (Weir Controls 0.01 cfs @ 0.09 fps)

Pond PS: Pool Storage Below Overflow

Hydrograph



Stage-Area-Storage for Pond PS: Pool Storage Below Overflow

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
39.17	712	0	39.69	712	370
39.18	712	7	39.70	712	377
39.19	712	14	39.71	712	384
39.20	712	21	39.72	712	392
39.21	712	28	39.73	712	399
39.22	712	36	39.74	712	406
39.23	712	43	39.75	712	413
39.24	712	50	39.76	712	420
39.25	712	57	39.77	712	427
39.26	712	64	39.78	712	434
39.27	712	71	39.79	712	441
39.28	712	78	39.80	712	449
39.29	712	85	39.81	712	456
39.30	712	93	39.82	712	463
39.31	712	100	39.83	712	470
39.32	712	107	39.84	712	477
39.33	712	114	39.85	712	484
39.34	712	121	39.86	712	491
39.35	712	128	39.87	712	498
39.36	712	135	39.88	712	506
39.37	712	142	39.89	712	513
39.38	712	150	39.90	712	520
39.39	712	157	39.91	712	527
39.40	712	164	39.92	712	534
39.41	712	171	39.93	712	541
39.42	712	178	39.94	712	548
39.43	712	185	39.95	712	555
39.44	712	192	39.96	712	562
39.45	712	199	39.97	712	570
39.46	712	206	39.98	712	577
39.47	712	214	39.99	712	584
39.48	712	221	40.00	712	591
39.49	712	228	40.01	712	598
39.50	712	235	40.02	712	605
39.51	712	242	40.03	712	612
39.52	712	249	40.04	712	619
39.53	712	256	40.05	712	627
39.54	712	263	40.06	712	634
39.55	712	271	40.07	712	641
39.56	712	278	40.08	712	648
39.57	712	285	40.09	712	655
39.58	712	292	40.10	712	662
39.59	712	299	40.11	712	669
39.60	712	306	40.12	712	676
39.61	712	313	40.13	712	684
39.62	712	320	40.14	712	691
39.63	712	328	40.15	712	698
39.64	712	335	40.16	712	705
39.65	712	342	40.17	712	712
39.66	712	349			
39.67	712	356			
39.68	712	363			

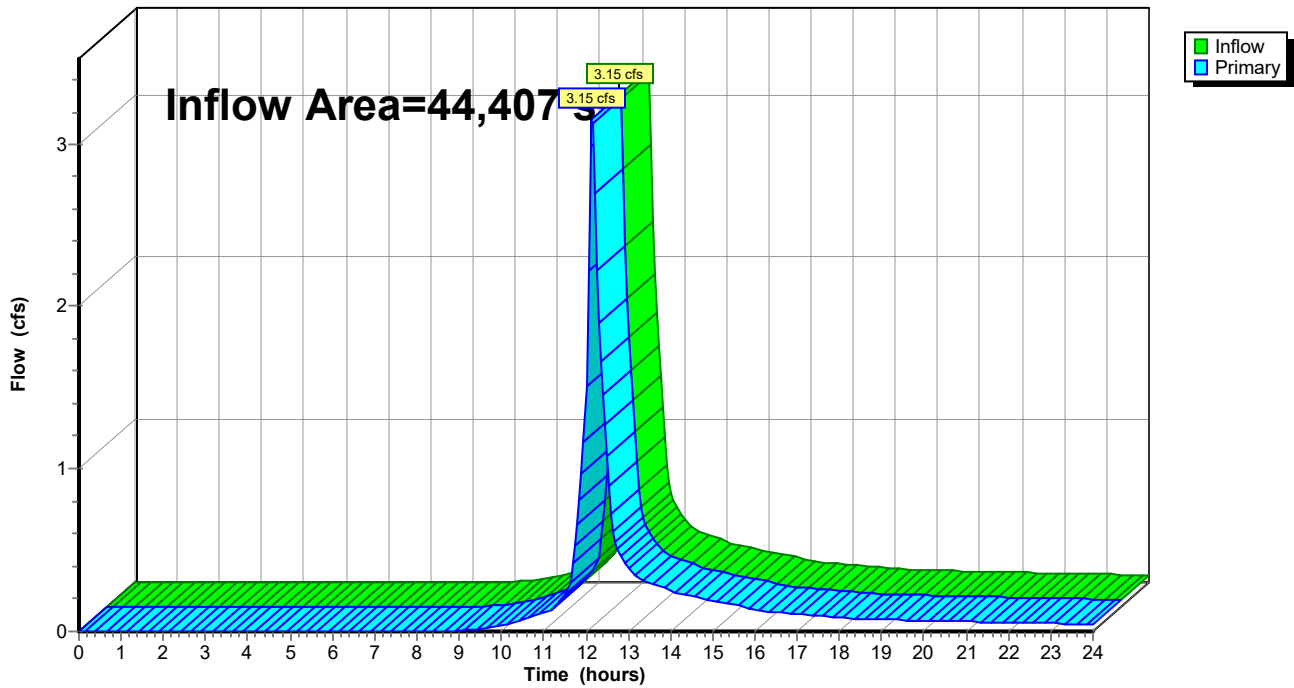
Summary for Link OR: Overall Runoff

Inflow Area = 44,407 sf, 24.94% Impervious, Inflow Depth > 3.00" for 25 yr event
Inflow = 3.15 cfs @ 12.14 hrs, Volume= 11,109 cf
Primary = 3.15 cfs @ 12.14 hrs, Volume= 11,109 cf, Atten= 0%, Lag= 0.0 min

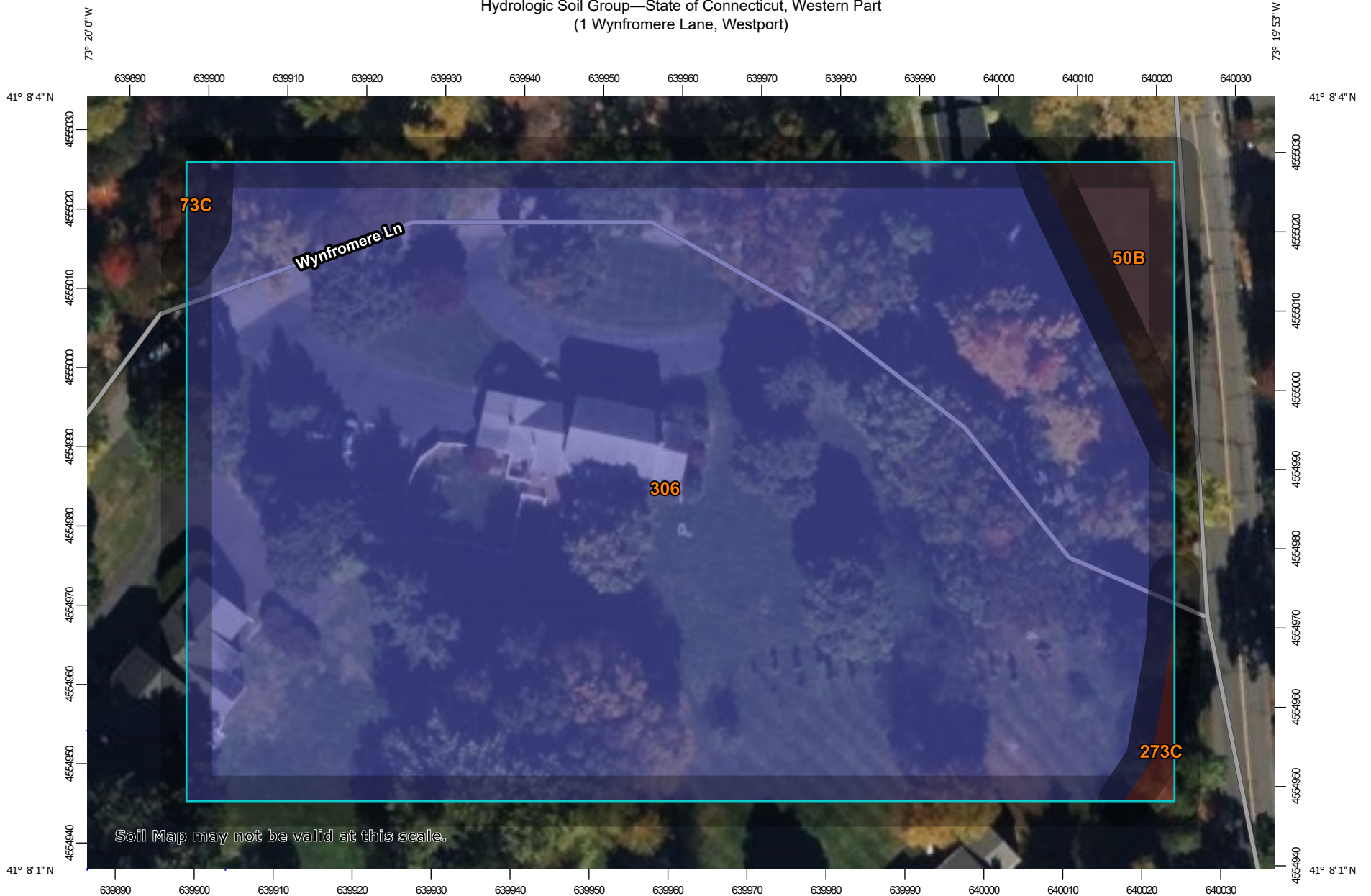
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link OR: Overall Runoff

Hydrograph

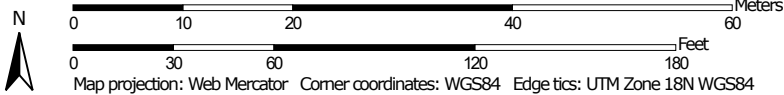


Hydrologic Soil Group—State of Connecticut, Western Part
(1 Wynfromere Lane, Westport)



Soil Map may not be valid at this scale.

Map Scale: 1:688 if printed on A landscape (11" x 8.5") sheet.



Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
50B	Sutton fine sandy loam, 3 to 8 percent slopes	B/D	0.1	3.1%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	B	0.0	0.3%
273C	Urban land-Charlton- Chatfield complex, rocky, 3 to 15 percent slopes	D	0.0	0.5%
306	Udorthents-Urban land complex	B	2.4	96.1%
Totals for Area of Interest			2.5	100.0%