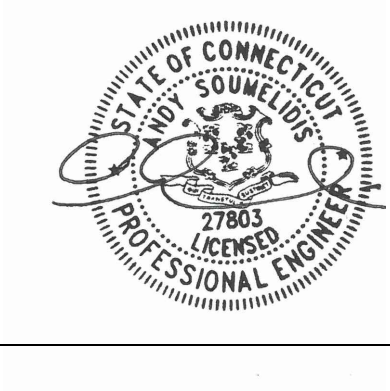
LANDTECH

Civil / Site Engineering · Site Planning
Environmental Science & Engineering
Landscape Architecture · Land Surveying
Permit Coordination & Management
Construction Management & Financing

STORMWATER MANAGEMENT **REPORT** for **134 Cross Highway.** Westport, CT July 19, 2024	

***Narrative**:*

Wakeman Town Farm located at 134 Cross Highway, Westport, CT propose to renovate an existing barn on an existing developed property. Improvements are limited to the areas related to the construction of the above-listed structures and lawn areas as shown on the site plans prepared by LANDTECH.

The property is 2.21± acres in size, it is located to the south of Cross Highway. There are wetlands located on the site adjacent to Deadman's brook along the western property line.

The NRCS soils map indicates the upland soils in the vicinity of the proposed improvements to be Woodbridge fine sandy loam, a moderately-drained soil in Hydrologic Soil Group C/D. Deep test results confirm the hydrologic rating of this area. Based on field observation, a conservative infiltration rate of 4.5"/hour (observed infiltration rate of 1" in 10 min.) was utilized in the design for the proposed drainage system. It is assumed that the underlying soils will allow the detained storm water to infiltrate within 72 hours, per CT DEEP guidance (requires a 0.17"/hour infiltration rate).

For the purposes of modeling the pre and post development conditions we have analyzed one (1) drainage subareas in the pre-development conditions (Subareas 1) and one (1) subarea in the post-development conditions (Subareas 1). Subarea 1 in the existing condition consists of the existing barn and a portion of the surrounding driveway that will be removed for the renovation. Flows from the existing subarea flow west across the developed property and ultimately discharge to Dead Man's Brook. In the proposed condition the flows are captured by a series of roof leader and conveyance piping and directed to and underground infiltration system. Overflows from this infiltration system discharge via a 6" overflow grate at grade and follow the historic flow path west to Dead Man's Brook.

The proposed drainage is are only intended to capture runoff from the proposed renovated barn. The proposed drainage systems are sized based on the required water quality volume as well as runoff control for the 25-year storm event.

Table 1 summarizes the required and proposed water quality volumes (WQV) and runoff control for the 25-year storm event.

TABLE 1 – WQV & 25 YEAR STORM		
	PRE-DEV/ REQUIRED	POST DEV PROVIDED
PEAK RATE STORMWATER RUNOFF FROM POC-1 (cfs)	0.19	0.05
WATER QUALITY (cf)	143.85	262.00

It is our professional opinion that upon construction of the proposed improvements, stormwater discharge from the site will comply with the applicable rules and regulations of the Town of Westport.

***Exhibits**:*

- NRCS Soils Report
- Watershed Maps
- MS4 Impervious Cover Reduction Worksheet
- Water Quality Volume Calculations
- Stormwater Runoff Computations

Exhibits

NRCS Soils Report
Watershed Maps
MS4 Impervious Cover Reduction Worksheet
Water Quality Volume Calculations
Stormwater Runoff Computations

NRCS Soils Report

Hydrologic Soil Group—State of Connecticut, Western Part

Map Scale: 1:1,070 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut, Western Part
Survey Area Data: Version 1, Sep 15, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 21, 2022—Oct 27, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
45B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	1.9	78.7%
84B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes	C	0.1	2.3%
306	Udorthents-Urban land complex	B	0.5	19.0%
Totals for Area of Interest			**2.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

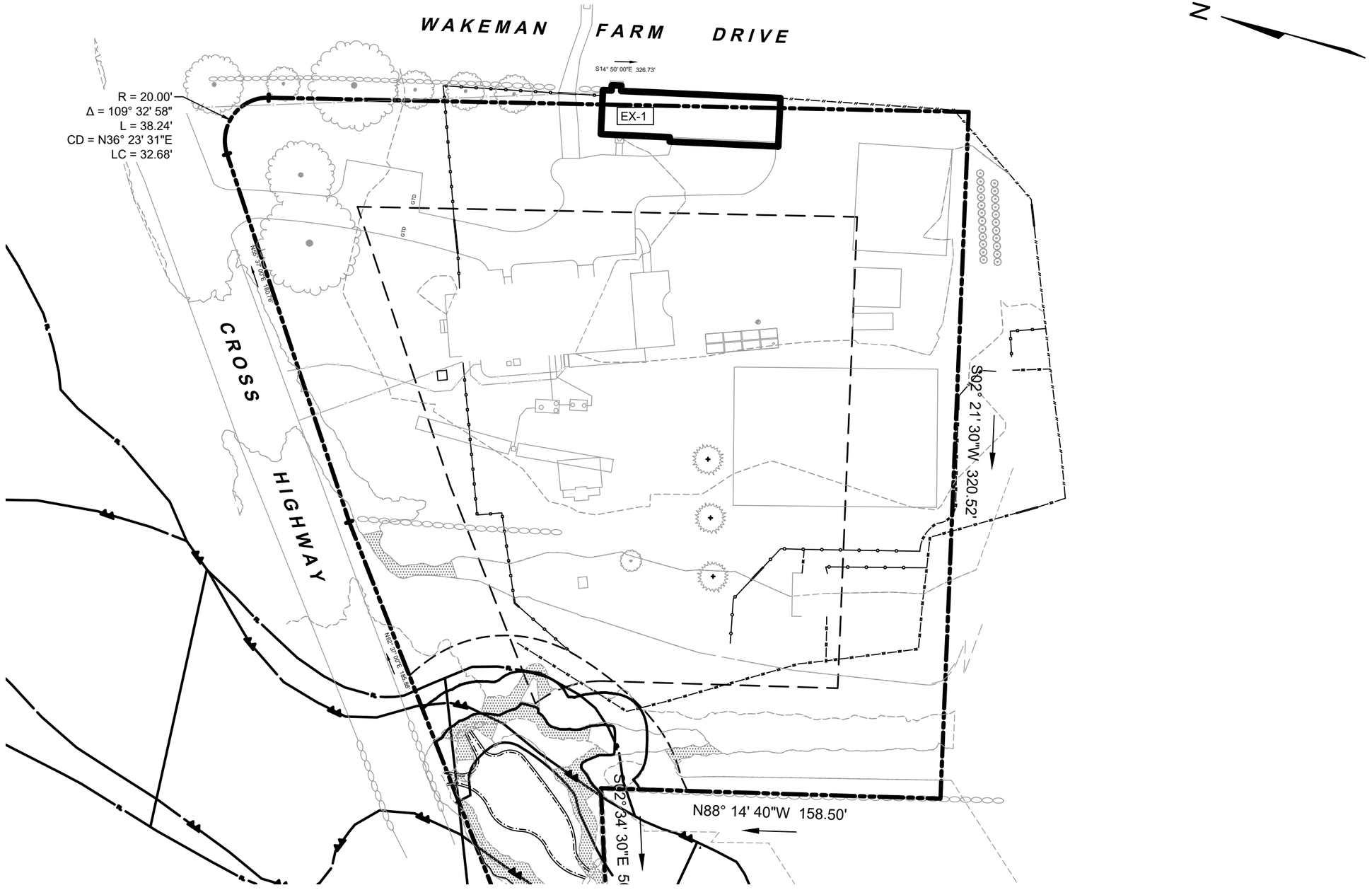
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Watershed Maps



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REVISION DATE	ISSUE

PREPARED FOR: WAKEMAN TOWN FARM

PROJECT LOCATION: 134 CROSS HIGHWAY WESTPORT, CT

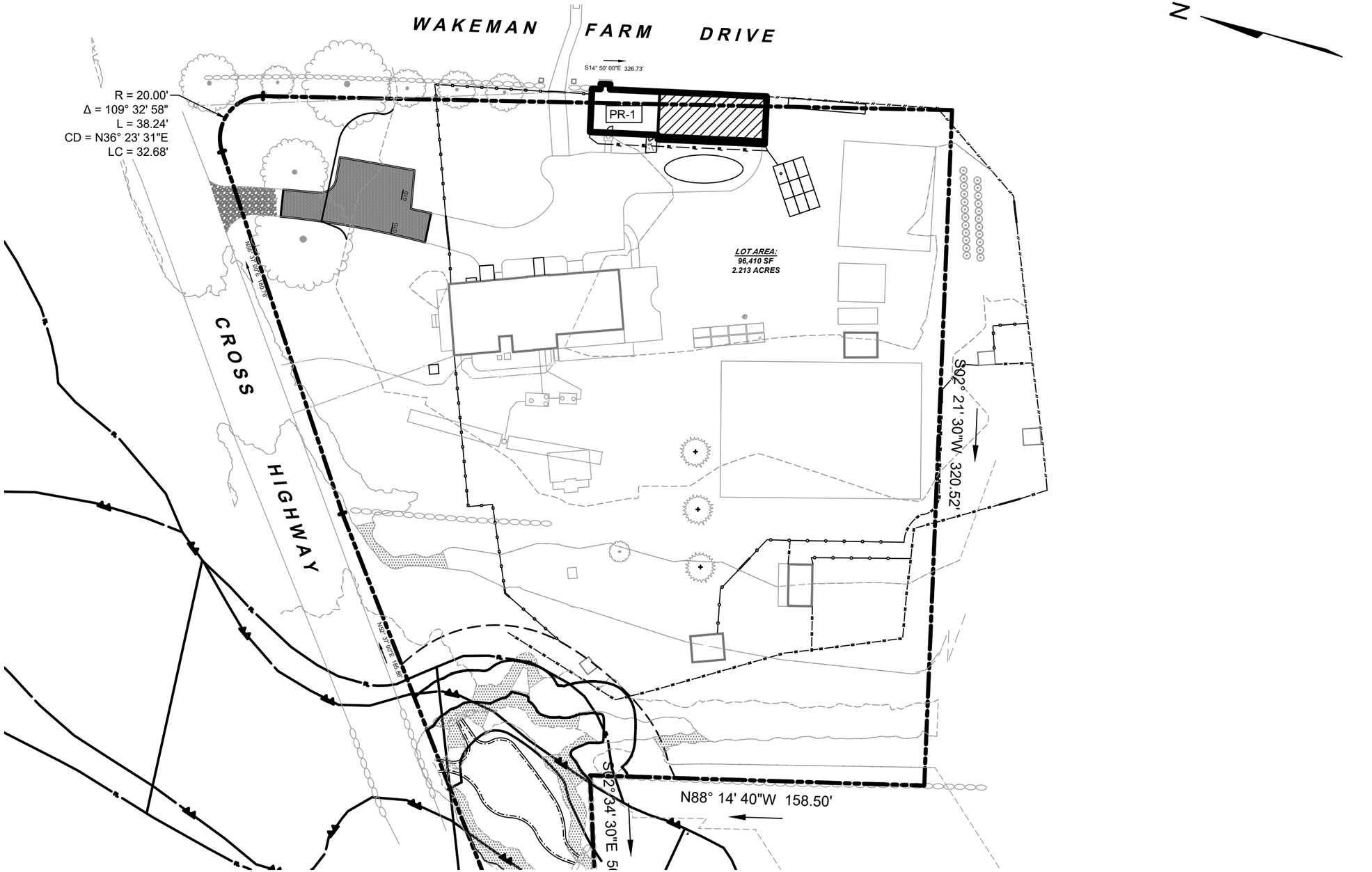
TITLE: SITE IMPROVEMENTS FOR A PROPOSED BARD ADDITION EXISTING WATERSHED MAP

PROJECT No.	24084-01
SCALE 1" =	DATE 7/19/2024
DESIGNED BY: RW	CHECKED BY: AS

EX-WS

LANDTECH

T:\1. ACTIVE PROJECTS\24084-01 WAKEMAN TOWN FARM - BARN - 134 CROSS HGWY, , WESTPORT\DRAWINGS\WAKEMAN TOWN FARM SITE PLAN.DWG



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REVISION DATE	ISSUE

PREPARED FOR: WAKEMAN TOWN FARM
PROJECT LOCATION: 134 CROSS HIGHWAY, WESTPORT, CT
TITLE: SITE IMPROVEMENTS FOR A PROPOSED BARD ADDITION
PROPOSED WATERSHED MAP

PROJECT No.	24084-01
SCALE: 1" =	DATE: 7/19/2024
DESIGNED BY: RW	CHECKED BY: AS

PR-WS

LANDTECH

T:\1 ACTIVE PROJECTS\24084-01 WAKEMAN TOWN FARM - BARN - 134 CROSS HGWY. - WESTPORT\DRAWINGS\WAKEMAN TOWN FARM SITE PLAN.DWG

MS4 Impervious Cover Reduction Worksheet

Project: **134 Cross Highway** By: **BW** Date: **7/19/2024**
Westport, CT Checked: **AS** Revised:

MS4 Impervious Cover Reduction Worksheet

GIS ID #: F13023000
Lot Area: 96,410 SF

Existing Conditions		
	Area (SF)	
Impervious Items	**Disconnected**	**Connected**
Residence	2,604	0
Driveway	6,082	0
Barns	641	0
Porch	501	0
Grill Area	77	0
Totals	**9,905 SF**	**0 SF**

Proposed Conditions		
	Area (SF)	
Impervious Items	**Disconnected**	**Connected**
Residence	2,604	0
Driveway	6,082	0
Barns	641	0
Porch	501	0
Grill Area	77	0
Barn Addition	100	0
Totals	**9,828 SF**	**0 SF**

Connected Impervious Area Reduction

Existing Connected Impervious Cover	0 SF
Proposed Connected Impervious Cover	0 SF
Reduction	0 SF
Percent Reduction	**0.0%**

Water Quality Volume Calculations

Project:	**134 Cross Highway**	By:	**BW**	Date:	**7/19/2024**
	Westport, CT	Checked:	**AS**	Revised:	

1. Water Quality Volume

a. Compute volumetric runoff coefficient, R R = 0.05+0.009(*I*)

	Proposed	
Total Drainage Area, *A*	0.042	acres
Total Impervious Area	0.042	acres
Percentage of Impervious Area, *I*	100.0%	
Runoff Coefficient, *R*	0.950	

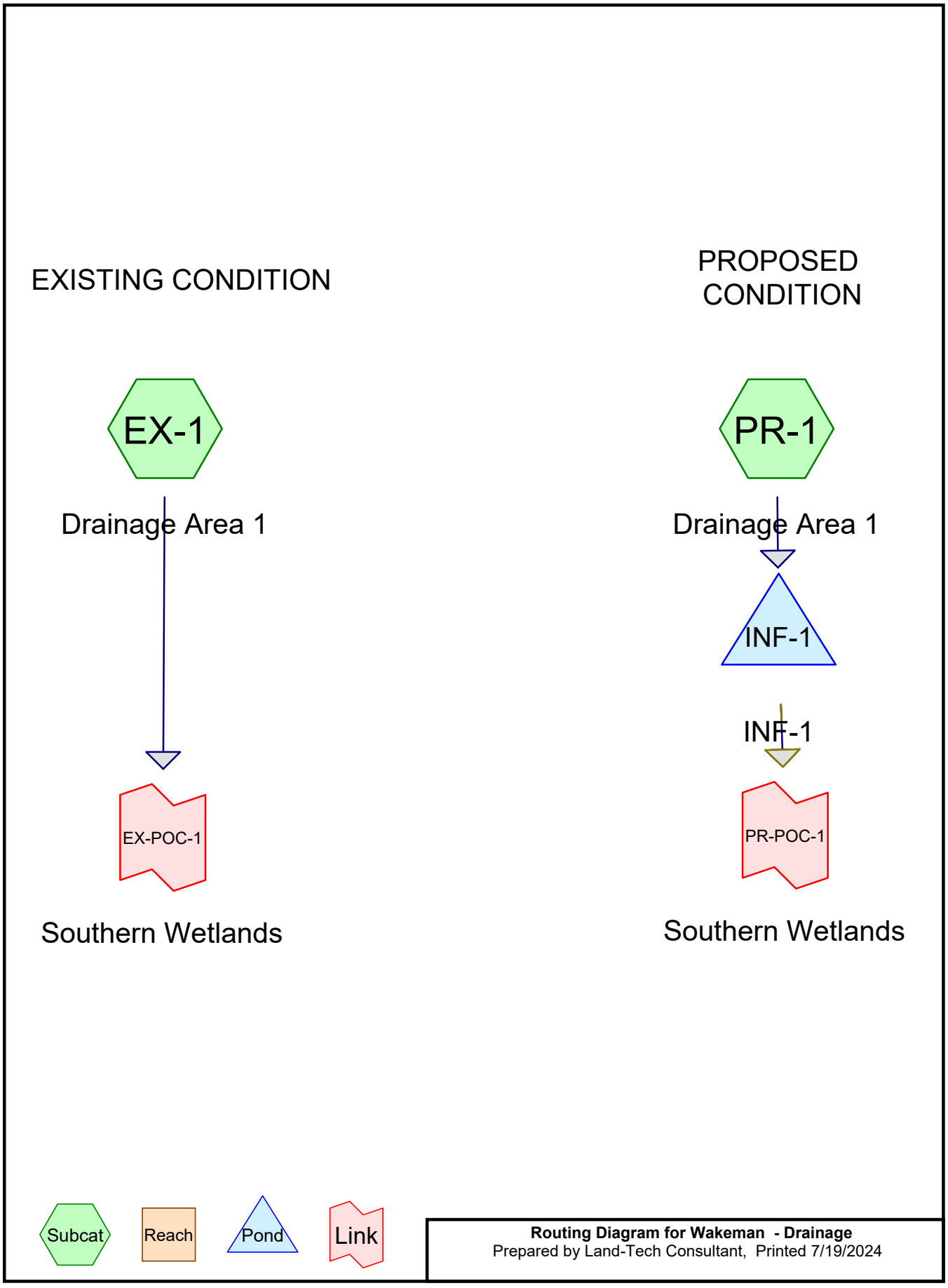
b. Compute water quality volume, WQV WQV = [(1")(*R*)(*A*)]/12

Total Project Area, *A*	0.042	acres
Runoff Coefficient, *R*	0.950	
Water Quality Volume, *WQV*	0.003	acre-foot
Water Quality Volume, *WQV*	**143.85**	**cf**

WQV in UG Drainage System	262.00	cf	*Provided*
Total WQV:	**262.00**	**cf**	***Provided***

Water Quality Volume provided > required

Stormwater Runoff Computations


EXISTING CONDITION
PROPOSED CONDITION
EX-1
PR-1
Drainage Area 1
Drainage Area 1
INF-1
INF-1
EX-POC-1
PR-POC-1
Southern Wetlands
Southern Wetlands
Subcat
Reach
Pond
Link
Routing Diagram for Wakeman - Drainage
Prepared by Land-Tech Consultant, Printed 7/19/2024

Summary for Subcatchment EX-1: Drainage Area 1

[49] Hint: Tc<2dt may require smaller dt

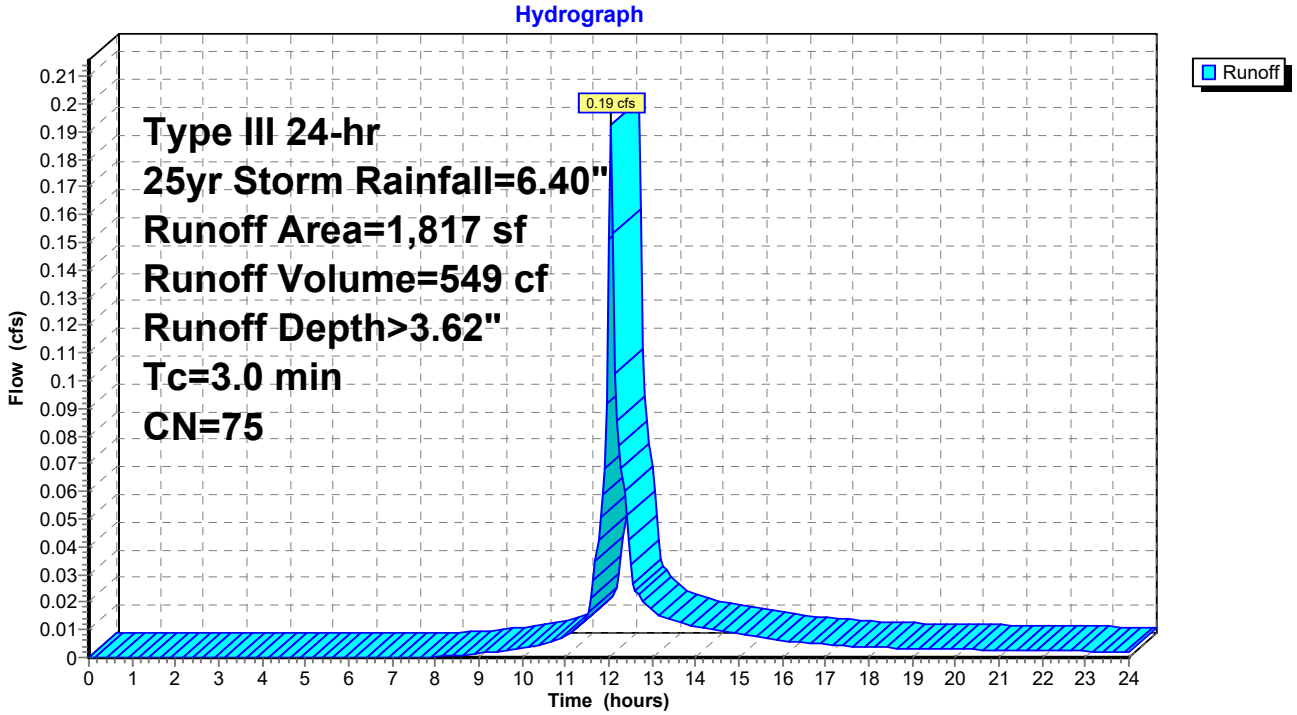
Runoff = 0.19 cfs @ 12.05 hrs, Volume= 549 cf, Depth> 3.62"
Routed to Link EX-POC-1 : Southern Wetlands

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 25yr Storm Rainfall=6.40"

	Area (sf)	CN	Description
*	671	98	Exisitng Barn to remain
*	1,043	61	Barn to be rebuilt
*	103	61	Portion of Driveway to be removed
	1,817	75	Weighted Average
	1,146		63.07% Pervious Area
	671		36.93% Impervious Area

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

Subcatchment EX-1: Drainage Area 1



Summary for Subcatchment PR-1: Drainage Area 1

[49] Hint: Tc<2dt may require smaller dt

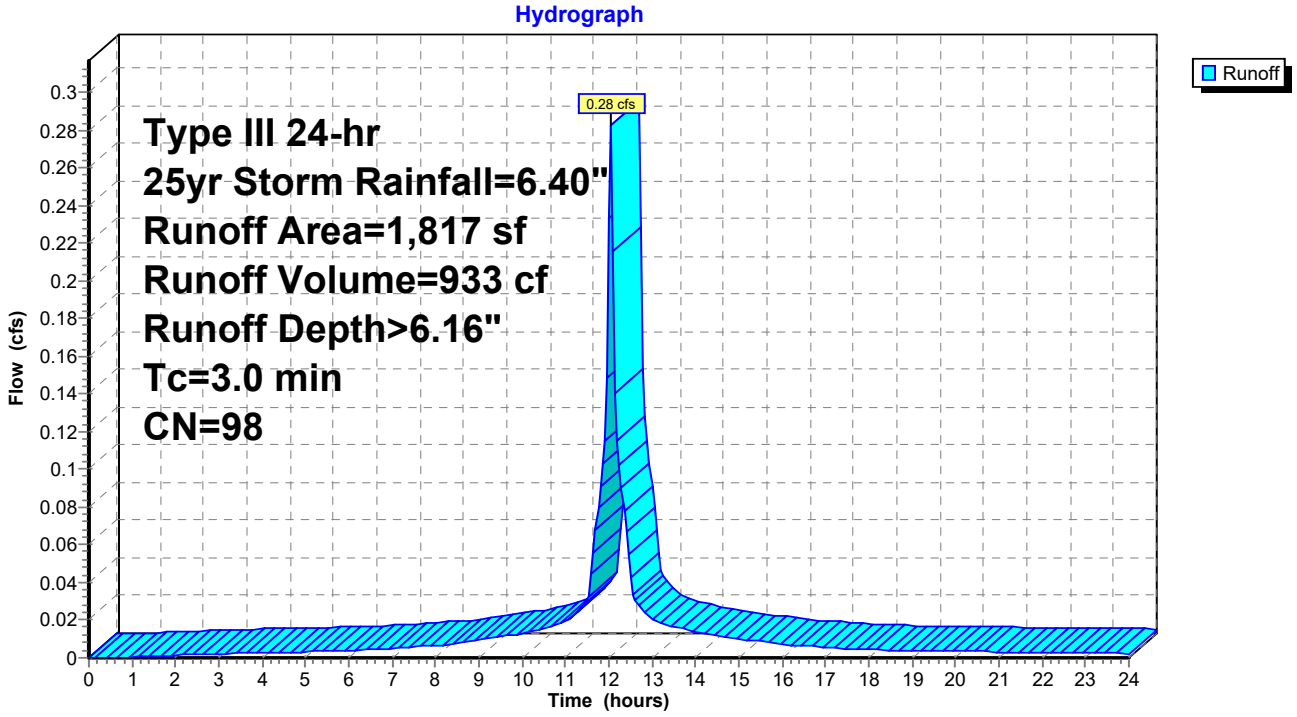
Runoff = 0.28 cfs @ 12.05 hrs, Volume= 933 cf, Depth> 6.16"
Routed to Pond INF-1 : INF-1

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 25yr Storm Rainfall=6.40"

	Area (sf)	CN	Description
*	671	98	Exisitng Barn to remain
*	1,043	98	Barn to be rebuiilt
*	103	98	Barn Addition
	1,817	98	Weighted Average
	1,817		100.00% Impervious Area

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

Subcatchment PR-1: Drainage Area 1



Summary for Pond INF-1: INF-1

[92] Warning: Device #1 is above defined storage
[93] Warning: Storage range exceeded by 0.50'

Inflow Area = 1,817 sf,100.00% Impervious, Inflow Depth > 6.16" for 25yr Storm event
Inflow = 0.28 cfs @ 12.05 hrs, Volume= 933 cf
Outflow = 0.09 cfs @ 12.37 hrs, Volume= 937 cf, Atten= 70%, Lag= 19.2 min
Discarded = 0.03 cfs @ 11.55 hrs, Volume= 913 cf
Primary = 0.05 cfs @ 12.37 hrs, Volume= 25 cf
Routed to Link PR-POC-1 : Southern Wetlands

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 206.35' @ 12.35 hrs Surf.Area= 300 sf Storage= 262 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 49.4 min (790.7 - 741.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	204.30'	134 cf	**12.00'W x 25.00'L x 1.54'H Field A** 462 cf Overall - 128 cf Embedded = 334 cf x 40.0% Voids
#2A	204.30'	128 cf	**Cultec C-100HD** x 9 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 3 rows
		262 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	206.30'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	204.30'	**4.500 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 11.55 hrs HW=204.32' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.05 cfs @ 12.37 hrs HW=206.34' (Free Discharge)
1=Orifice/Grate (Weir Controls 0.05 cfs @ 0.68 fps)

Pond INF-1: INF-1 - Chamber Wizard Field A

Chamber Model = Cultec C-100HD (Cultec 100HD)
Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf
Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap
Row Length Adjustment= +0.50' x 1.86 sf x 3 rows

36.0" Wide + 6.0" Spacing = 42.0" C-C Row Spacing

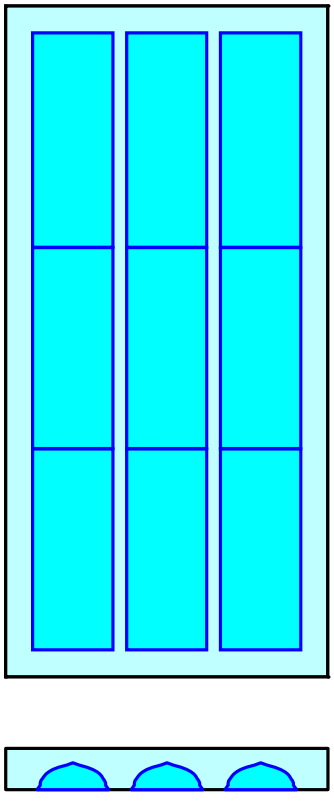
3 Chambers/Row x 7.50' Long +0.50' Row Adjustment = 23.00' Row Length +12.0" End Stone x 2 = 25.00' Base Length
3 Rows x 36.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 12.00' Base Width
12.5" Chamber Height + 6.0" Stone Cover = 1.54' Field Height

9 Chambers x 14.0 cf +0.50' Row Adjustment x 1.86 sf x 3 Rows = 128.4 cf Chamber Storage

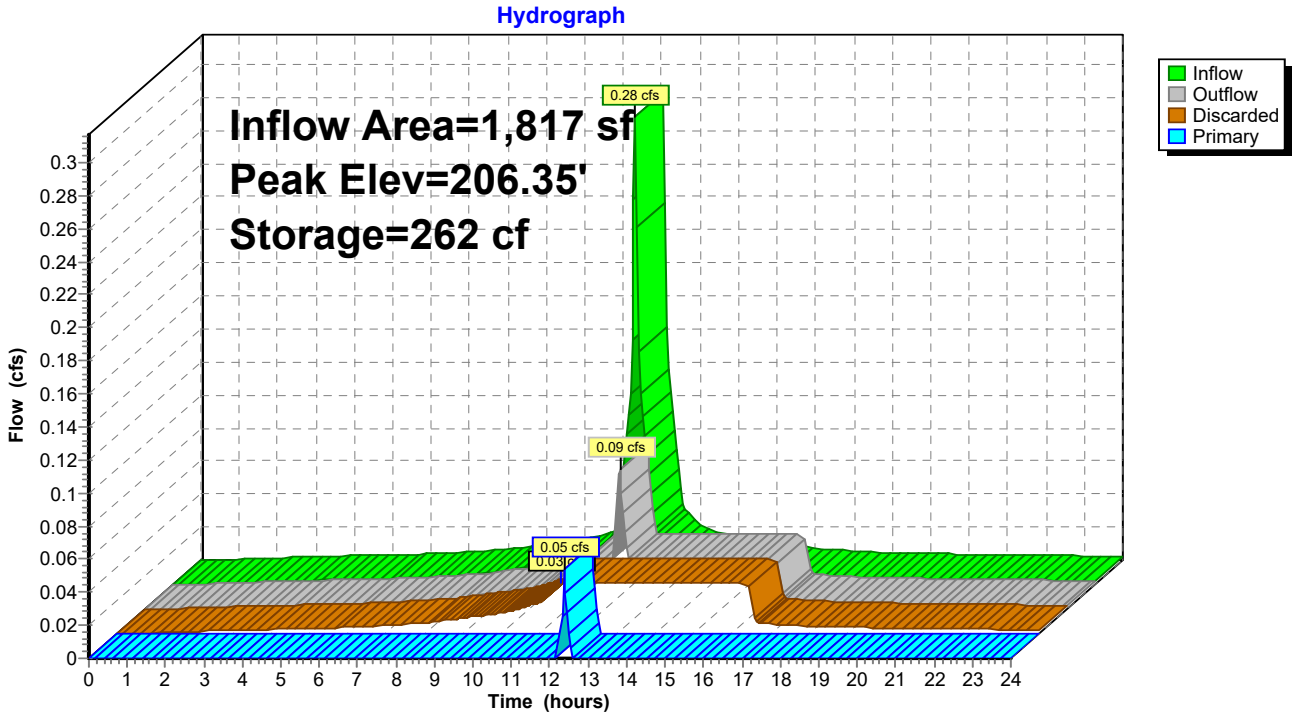
462.5 cf Field - 128.4 cf Chambers = 334.1 cf Stone x 40.0% Voids = 133.6 cf Stone Storage

Chamber Storage + Stone Storage = 262.1 cf = 0.006 af
Overall Storage Efficiency = 56.7%
Overall System Size = 25.00' x 12.00' x 1.54'

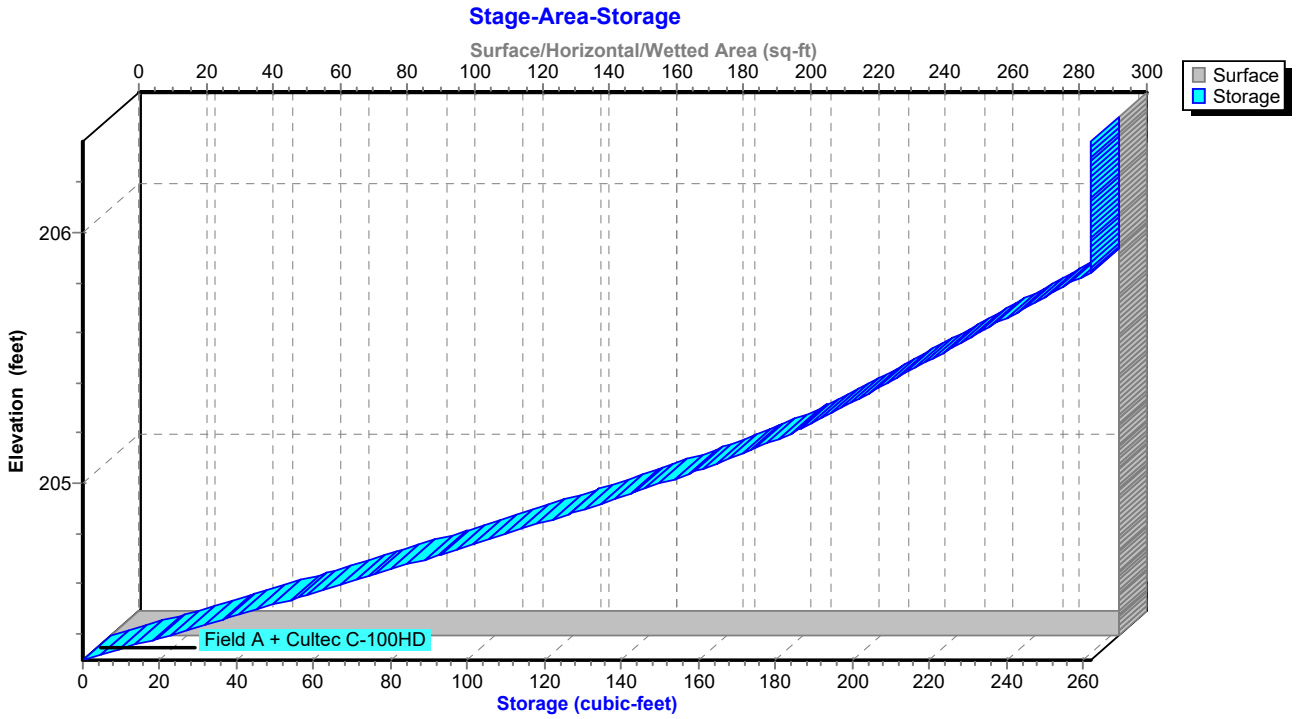
9 Chambers
17.1 cy Field
12.4 cy Stone



Pond INF-1: INF-1



Pond INF-1: INF-1



Stage-Area-Storage for Pond INF-1: INF-1

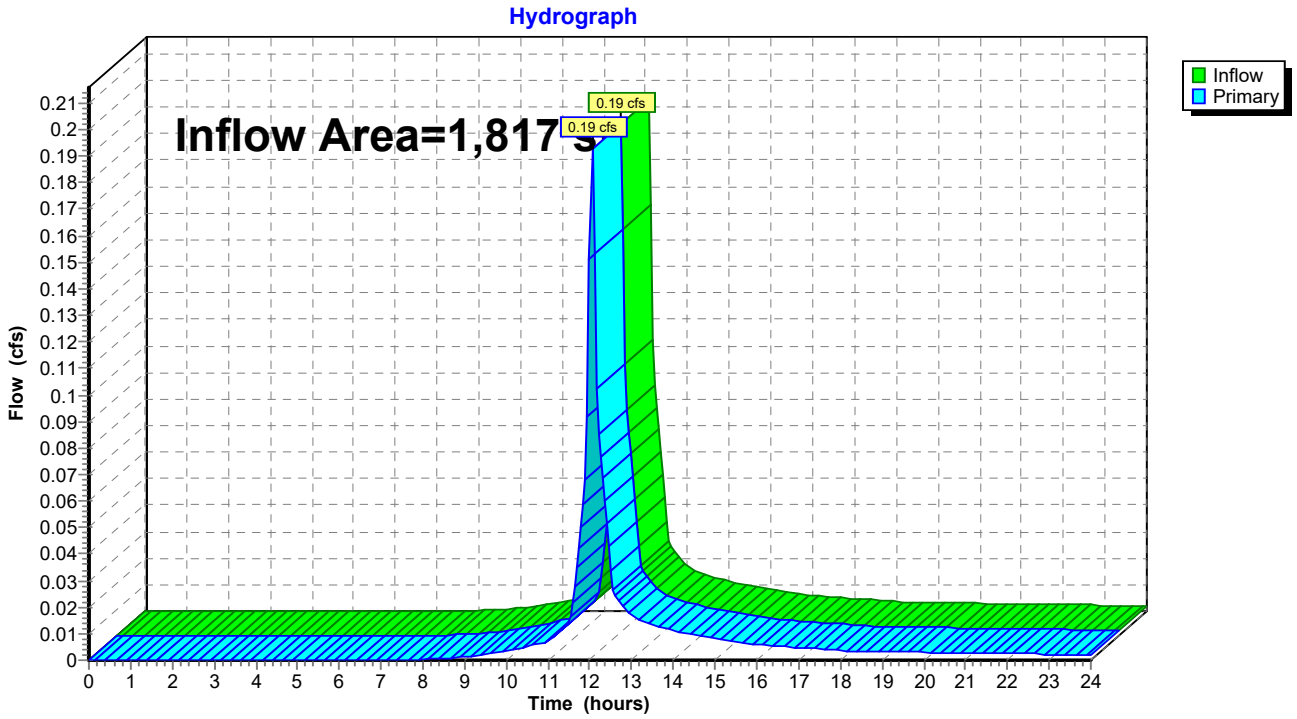
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
204.30	**300**	0	205.34	300	202
204.32	300	5	205.36	300	204
204.34	300	9	205.38	300	207
204.36	300	14	205.40	300	209
204.38	300	18	205.42	300	211
204.40	300	23	205.44	300	214
204.42	300	27	205.46	300	216
204.44	300	32	205.48	300	219
204.46	300	36	205.50	300	221
204.48	300	41	205.52	300	223
204.50	300	45	205.54	300	226
204.52	300	49	205.56	300	228
204.54	300	54	205.58	300	231
204.56	300	58	205.60	300	233
204.58	300	63	205.62	300	235
204.60	300	67	205.64	300	238
204.62	300	71	205.66	300	240
204.64	300	76	205.68	300	243
204.66	300	80	205.70	300	245
204.68	300	84	205.72	300	247
204.70	300	89	205.74	300	250
204.72	300	93	205.76	300	252
204.74	300	97	205.78	300	255
204.76	300	102	205.80	300	257
204.78	300	106	205.82	300	259
204.80	300	110	205.84	300	**262**
204.82	300	114	205.86	300	**262**
204.84	300	118	205.88	300	262
204.86	300	122	205.90	300	262
204.88	300	126	205.92	300	262
204.90	300	130	205.94	300	262
204.92	300	134	205.96	300	262
204.94	300	138	205.98	300	262
204.96	300	142	206.00	300	262
204.98	300	146	206.02	300	262
205.00	300	150	206.04	300	262
205.02	300	154	206.06	300	262
205.04	300	157	206.08	300	262
205.06	300	161	206.10	300	262
205.08	300	165	206.12	300	262
205.10	300	168	206.14	300	262
205.12	300	171	206.16	300	262
205.14	300	175	206.18	300	262
205.16	300	178	206.20	300	262
205.18	300	181	206.22	300	262
205.20	300	184	206.24	300	262
205.22	300	187	206.26	300	262
205.24	300	189	206.28	300	262
205.26	300	192	206.30	300	262
205.28	300	195	206.32	300	262
205.30	300	197	206.34	300	262
205.32	300	199	206.36	300	262

Summary for Link EX-POC-1: Southern Wetlands

Inflow Area = 1,817 sf, 36.93% Impervious, Inflow Depth > 3.62" for 25yr Storm event
Inflow = 0.19 cfs @ 12.05 hrs, Volume= 549 cf
Primary = 0.19 cfs @ 12.05 hrs, Volume= 549 cf, Atten= 0%, Lag= 0.0 min

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

Link EX-POC-1: Southern Wetlands



Summary for Link PR-POC-1: Southern Wetlands

Inflow Area = 1,817 sf,100.00% Impervious, Inflow Depth = 0.16" for 25yr Storm event
Inflow = 0.05 cfs @ 12.37 hrs, Volume= 25 cf
Primary = 0.05 cfs @ 12.37 hrs, Volume= 25 cf, Atten= 0%, Lag= 0.0 min

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

Link PR-POC-1: Southern Wetlands