Final Stormwater Management Plan

prepared for

Residences, Reserve and Reunion at Blackwell

Lee's Summit, MO 64081

March 3, 2023

prepared by

14920 W 107th ST
Lenexa, Kansas
(913) 492-5158
Schlagel & Associates Project 20-205

for

Griffin Riley Property Group
21 SE 29th Terrace
Lee's Summit, Missouri 64082

Executive Summary

March 3, 2023

Gene Williams, P.E.
220 SE Green Street
Lee's Summit, MO 64063

RE: Residences at Blackwell
Blue Parkway & Blackwell Road
Lee's Summit, MO 64081

Dear Gene Williams,

We are submitting the enclosed final stormwater management study in support of the site development plans for the multi-phase development Blackwell. Included are The Residences at Blackwell, a proposed Multi-family development, Reunion at Blackwell proposed townhomes, and Blackwell Reserve proposed single family homes. This report has been prepared to address permitting requirements and provides final design calculations for the required storm water detention and BMP facilities. We have modeled the existing site conditions as they existed at the time this report was prepared.

The proposed site is a 62.40-acre mixed use parcel located in Lee's Summit, MO at the intersection of Blue Parkway and Blackwell Road. The proposed development has been analyzed and designed to meet the APWA Comprehensive Control Strategy, which entails limiting post-development peak discharge rates from the site for the 2-Year, 10-Year, and 100-Year design storm events. One Extended Dry Detention Basin (EDDB) and three Extended Wet Detention Basins (EWDB) have been designed to detain the mentioned events as well as provided 40-hour detention of runoff from the local 90% mean annual event. All elements of the enclosed drainage system will be designed and constructed in accordance with all City of Lee's Summit, Missouri, requirements.

Sincerely,

Schlagel & Associates, P.A.

Michael Moore, E.I.T.
Design Engineer

Mark Breuer, P.E.
Project Engineer

03.07.2023

TABLE OF CONTENTS

Page No.

* * * * *

LIST OF TABLES

Table No. **Page No.**

* * * * *

LIST OF FIGURES

Figure No. **Page No.**

* * * * *

1.0 GENERAL INFORMATION

Griffin Riley Property Group is proposing to develop the 62.40 acres of land located in Section 11, Township 47 North, Range 31 West, Jackson County, Missouri. The property is located at the intersection of Blue Parkway and Blackwell Road. The proposed development consists of single-family lots, townhomes, apartments, and commercial use along with associated infrastructure.

1.1 OBJECTIVE

The intent of this report is to provide information pertaining to the existing and proposed watersheds, identifying and addressing any downstream drainage issues, determine and address any detention requirements, provide 40-hour extended detention of runoff from the local 90% mean annual event, and address permitting requirements. This study provides the final design calculations for the development of the facilities and associated infrastructure.

1.2 METHODOLOGY

The following were utilized in the assessment, preparation and analysis of watersheds in this design concept plan: *Section 5600, 2011, Storm Drainage Systems & Facilities* of the Standard Specifications & Design Criteria of the Kansas City Metropolitan Chapter of the American Public Works Association; *City of Lee's Summit, Missouri Design Criteria (2011 Revision), Storm Drainage Systems & Facilities,* prepared by the City of Lee's Summit, Missouri, Public Works Department.

Watersheds for the site were defined according to soil cover and type, tributary area, and runoff times of concentration. Soil cover was determined from inspection of the site and aerial photography. A soil survey for the project area was obtained from the United States Department of Agriculture, Natural Resources Conservation Service (NRCS), website and was utilized in determining soil type. The entire NRCS Soil Resource Report can be found in Appendix B. Watershed size was determined from both aerial topography and topographical survey, and by the proposed grading plan.

Times of concentration were compiled according to *NRCS TR-55 Urban Hydrology for Small Watersheds (1986)* methodology for sheet flow, shallow concentrated flow, and channel flow. For this report, sheet flow travel lengths were modeled at a total distance of 100'. Travel times for channel flows were determined using the length and velocity of the open channel. *HydroCAD-10* was utilized to model the runoff. All storm events were modeled using *SCS 24-hour Type II* distributions and were modeled for 2-Year, 10-Year, and 100-Year storm events.

* * * * *

2.0 EXISTING CONDITIONS ANALYSIS

The site lies within the East Fork Little Blue River Watershed. The existing site contains 4 watersheds which have release points located in the southwest, northwest, northern boundary, and eastern boundary of the site. Offsite stormwater comes into the site from south and drains to the release point located along the eastern boundary.

2.1 TRIBUTARY AREAS

The existing drainage tributary map is provided in Appendix A, Figure A.1. The site release points have been identified as Release Point 1(RP-1), Release Point 2 (RP-2), Release Point 3 (RP-3), and Release Point 4 (RP-4). The area has been delineated according to the existing topography and an annotation callout of EX DA-1, EX DA-2, EX DA-3, EX DA-4, and EX OFF DA-4, on Figure A.2, have been provided for the watersheds that drain to the release points RP-1 – RP-4 respectively.

2.2 CURVE NUMBER AND TIME OF CONCENTRATION

The existing curve numbers and time of concentrations for each area have been established based on the procedures outlined in *NRCS TR-55 Urban Hydrology for Small Watersheds (1986)*. Existing curve numbers were based upon aerial photography, site inspection, and the soil types present on site.

The NRCS Soil Resource Report indicated that a Hydrologic Soil Group (HSG) of C and D were present on site. A current aerial photograph can be found in Appendix A; it depicts the existing cover conditions. Table 2-1 found in section 2.3 Existing Flow Rates summarizes the curve numbers for each of the watershed areas.

Cover types for existing conditions were considered to be “pasture/grassland” in fair condition for the on-site area, and “Woods/grass combo” in fair condition for the off-site area. Procedures outlined in *NRCS TR-55 Urban Hydrology for Small Watersheds* recommends utilizing curve numbers 79 and 84 for HSG C and D for pasture/grassland, and 76 and 82 for the Woods/Grass combination.

Time of concentration flow paths were based upon sheet flow and shallow concentrated flow for the existing conditions. Sheet flow lengths were limited to where a grade break occurred. Flow was then considered shallow concentrated flow until a channel was visible either from the USGS topographic map or the aerial photograph, and then from that point was considered channel flow determined by the length of the channel and the velocity of flow.

2.3 EXISTING FLOW RATES

Existing flow rates were determined for the 2-Year, 10-Year, and 100-Year design storms. Offsite runoff is included in the calculations for Table 2-1 below for existing site conditions. Appropriate runoff coefficient curve numbers were based upon aerial photography, site inspection, and the soil types present on site. Detailed calculations with composite curve numbers and time of concentration can be found in the HydroCAD Model Output in Appendix B.

Table 2-1 - Existing Flow Rates

Drainage Sub-Basin	Area (Acres)	CN	Storm Event	Runoff (CFS)
EX DA-1	9.52	79	2-YR	14.34
			10-YR	28.81
			100-YR	48.20
EX DA-2	4.28	80	2-YR	7.26
			10-YR	14.09
			100-YR	23.62
EX DA-3	29.35	80	2-YR	36.97
			10-YR	72.33
			100-YR	121.81
EX DA-4	19.25	82	2-YR	31.44
			10-YR	64.09
			100-YR	110.52
EX OFF DA-4	4.58	92	2-YR	11.43
			10-YR	18.56
			100-YR	27.98

2.4 DOWNSTREAM DRAINAGE ISSUES

The existing downstream drainage system has been reviewed with this development plan. FEMA flood maps have been checked and currently no immediate downstream issues appear to be present. A FEMA FIRMette is included in Appendix A. The project lies outside of the identified FEMA floodplain per map numbers 29095C0437G, 29095C0439G, 29095C0441G, and 29095C0445G.

2.5 AGENCY REVIEW

Permitting requirements of the following agencies were reviewed as part of the existing conditions analysis.

2.5.1 Corps of Engineers Review

The National Wetlands Inventory (NWI) map was reviewed for the site and there are no identified wetlands located within the project site. The NWI map can be found in Appendix A. A jurisdictional determination is being prepared by others, and any required wetland permitting or mitigation will be completed prior to land disturbance of the wetlands.

2.5.2 FEMA Requirements

No FEMA identified floodplain is located on the proposed property per Flood Insurance Rate Map Panel Nos. 29095C0437G, 29095C0439G, 29095C0441G, and 29095C0445G. There is currently no work proposed in the regulated floodplain. Please see the attached FEMA FIRMette in Appendix A.

2.5.3 Missouri Department of Natural Resources

All land disturbance activities will be permitted in accordance with the City of Lee's Summit, MO specifications as well as the Missouri Department of Water Pollution Control general permit under the National Pollution Discharge Elimination System (NPDES) and an authorized Notice of Intent (NOI) application form. The disturbance of the site is greater than one acre; therefore, NPDES and NOI applications are required with the future permitting of the site in compliance with local, state and federal guidelines.

* * * * *

3.0 PROPOSED CONDITIONS ANALYSIS

With the proposed development, the site watershed will be divided into four sub-basins for analysis. These sub-basins correspond to: Release Points 1-4. Stormwater runoff will be conveyed through the site via open sheet flow, shallow concentrated flow, enclosed storm sewer, one extended dry detention basin, and three extended wet detention basins. All detention facilities have been designed to detain the 2-Year, 10-Year, and 100-Year storm events.

All components of the overland and enclosed storm sewer systems will meet or exceed the specifications provided in *Section 5600 – Storm Drainage Systems & Facilities* of the *Standard Specifications and Design Criteria* compiled by the Kansas City Metropolitan Chapter of the American Public Works Association.

3.1 TRIBUTARY AREAS

RP-1 will be divided into two sub-catchments, Onsite 1 and Onsite 2. Onsite 1 will bypass the proposed extended dry detention basin, while Onsite 2 will be collected by the extended dry detention basin and then released to two existing 24” pipes located under Blue Parkway. RP-2 sub-catchment existing flows are proposed to be routed to the detention facility located in the northeast corner of the site. RP-3 will also be divided into two sub-catchments, Onsite 3 and Onsite 4. Onsite 3 will be collected by a proposed extended wet detention basin. It will then be routed downstream to a second proposed extended wet detention basin that will collect Onsite 4 and then be released via storm sewer to an existing area inlet located directly north of our proposed site. Final design of this basin has been designed to ensure the downstream storm sewer system does not exceed the 100-year storm event. RP-4 sub-catchment, Onsite 5, will be collected by an extended wet detention basin. The proposed extended wet detention basin will also collect the off-site area, EX OFF, from the south. Stormwater runoff will be released into the existing swale and continue to flow to the northeast.

3.2 CURVE NUMBER AND TIME OF CONCENTRATION

Curve numbers for the proposed development were developed in a similar manner as the existing conditions. Hydrologic Soil Group (HSG) of D was utilized for post-development conditions. Cover types for the proposed conditions were considered to be 1/8 acre lots, Multi-Family, Single Family lots, and urban commercial in good condition.

Time of concentration was established in a similar manner as the existing conditions. Shallow concentrated flow lengths were shortened and considered paved. Detailed calculations with composite curve numbers and time of concentration can be found in the HydroCAD Model Output in Appendix B. Appendix A, Figure A.2 depicts the proposed drainage conditions.

3.3 PROPOSED FLOW RATES

Proposed flow rates were determined for the 2-Year, 10-Year, and 100-Year design storms for un-detained condition. Detailed calculations can be found in the HydroCAD Model Output Report in Appendix B.

Table 3-1 – HydroCAD Runoff Conditions

Drainage Sub-Basin	Drainage Area (Acres)	Storm Event	Peak Discharge (CFS)
*OnSite 1	0.7	2-YR	3.15
		10-YR	4.91
		100-YR	7.23
*OnSite 2	4.93	2-YR	21.75
		10-YR	34.23
		100-YR	50.65
*OnSite 3	12.00	2-YR	43.73
		10-YR	74.03
		100-YR	114.13
*OnSite 4	23.79	2-YR	73.39
		10-YR	134.19
		100-YR	206.65
OnSite 5	19.08	2-YR	75.92
		10-YR	128.33
		100-YR	197.63
EX OFF	6.94	2-YR	27.62
		10-YR	46.68
		100-YR	71.89

3.4 DETENTION ANALYSIS

The runoff hydrographs utilized to determine the peak flow volumes for each tributary area were determined using *TR-55* methodology and *HydroCAD-10*. For the 2-Year, 10-Year, and 100-Year storm events, the complete hydrograph routing and model output can be found in the HydroCAD Model Output Report in Appendix B.

The site will need to provide detention that meets the requirement under the Comprehensive Control release rates under Section 5608.4C1a and 5608.4C1b of the APWA. This entails limiting post-development peak discharge rates from the site for the 2-Year, 10-Year, and 100-Year design storm events, as well as providing 40-Hour extended detention of runoff from the local 90% mean annual event. The post-development peak discharge rates from the site shall not exceed the following:

- 50% storm peak rate less than or equal to 0.5 cfs per site acre
- 10% storm peak rate less than or equal to 2.0 cfs per site acre
- 1% storm peak rate less than or equal to 3.0 cfs per site acre

For Release Points 1, 3, and 4, HydroCAD output represents the design release rate. For Release Point 2, we propose to route all existing flows to the proposed detention facility located in the northeast corner of the site.

Table 3-1 – HydroCAD Runoff Conditions are shown in Table 3-3.B - Required & Proposed Runoff Comparison. The proposed post-development design release rates are shown next to the allowable release rates for comparison.

Table 3-2.B – Allowable Release Rate Calculations

	Allowable Release Rate (CFS) Calculations				
Release Point	Area (Acres)	Storm Event	Allowable On-Site Release Rate (CFS) (A)	Allowable Off-Site Release Rate (CFS) (B)	Allowable Release Rate (CFS) (A+B)
RP-1	5.63	2-YR	2.82	0.00	2.82
		10-YR	11.26	0.00	11.26
		100-YR	16.89	0.00	16.89
RP-3	35.79	2-YR	17.90	0.00	17.90
		10-YR	71.58	0.00	71.58
		100-YR	107.37	0.00	107.37
RP-4	24.30	2-YR	9.53	27.62	37.15
		10-YR	38.12	46.68	84.80
		100-YR	57.18	71.89	129.07

Table 3-3.B - Required & Proposed Runoff Comparison

Site Release Information (cubic feet per second) (w/ EDDB)				
Area	Drainage Area	Storm Event	Allowable Release Rate (CFS)	Design Release Rate (CFS)
RP-1	5.51	2-YR	2.82	2.67
		10-YR	11.26	4.05
		100-YR	16.89	15.22
RP-3	36.31	2-YR	17.90	17.52
		10-YR	71.58	69.83
		100-YR	107.37	87.33
RP-4	24.30	2-YR	37.15	17.00
		10-YR	84.80	30.96
		100-YR	129.07	41.22

Please note: Site release rates are not a direct addition of sub-basin runoff due to differences in the time peak as well as storage effects within the basins.

Proposed stormwater drainage structures will be located throughout the site to capture and convey proposed stormwater runoff to both dry detention basins. The Water Quality volume for all proposed basins will be released over 40 hours. Water quality outlet structures have been provided for each basin and have been designed to meet the allowable release rates provided in Table 3-2 for the 2, 10, and 100 year storm events. The water quality storm event will be controlled by a 15” riser pipe with 1” diameter orifices evenly spaced across the pipe for the extended dry detention basin, and V-notch weirs will be utilized for all proposed extended wet detention basins.

Emergency spillways will be provided for each basin per Section 5600 of the Design and Construction Manual. Each emergency spillway will be set at least 0.5 feet above the 100-year water surface elevation and designed to carry the 100-year storm event

assuming a 100% clogged condition. An additional 1 foot of freeboard will be provided from the water surface elevation in the spillway and the top of dam. Final emergency spillway details will be provided with the subsequent Final Stormwater Management Report and construction documents for EDDB-1, EWDB-2, EWDB-3. For EWDB-1 the primary discharge device was removed from the HydroCAD model to simulate a clogged condition. The water surface elevation was set equal to the peak 1% storm water surface elevation, then with no method of primary discharge a second 1% (Back to back) storm was simulated lacking the method of primary discharge and the storage available to the first storm the emergency spillway was utilized. Table 3-4 summarizes the results of this analysis.

Table 3-4 – Emergency Spillway Analysis

	Storm Event	Inflow to Basin (CFS)	Emergency Spillway Elevation (FT)	Emergency Spillway Length (FT)	Clogged Surface Elevation
EWDB-1	100 Year	269.52	999.70	14.00	1001.37
EWDB-2	100 Year	114.13	995.31	150.00	998.08
EWDB-3	100 Year	328.69	992.10	110.00	992.83

Note: Spillways for the remaining basins will be analyzed with those phases.

Installing drain works per APWA 5608.4G has been determined to be not applicable in the case of EWDB #1. The permanent pool elevation is designed to be 994.80’. Due to the topography of the site the outflow from the primary spillway will be set at the lowest practical elevation of the adjacent receiving ground, 994.00’. This would only allow for draining of 0.80’ of water without the use of mechanical pumps.

Additionally, erosion control procedures will be designed and implemented at the outlets to reduce impact on the site downstream.

* * * * *

4.0 SUMMARY AND RECOMMENDATIONS

The proposed drainage site is a 62.40-acre mixed use parcel of land located in Lee's Summit, MO at the intersection of Blue Parkway and Blackwell Road. The proposed development has been analyzed and designed to meet the APWA Comprehensive Control Strategy, which entails limiting post-development peak discharge rates from the site for the 2-Year, 10-Year, and 100-Year design storm events. One extended dry detention basin and three extended wet detention basins have been designed to detain the mentioned events as well as provided 40-hour detention of runoff from the local 90% mean annual event. All elements of the enclosed drainage system will be designed and constructed in accordance with all City of Lee's Summit, Missouri, requirements.

* * * *

APPENDIX A

-Existing Site Aerial Photograph

-Existing Drainage Map

-Proposed Drainage Map

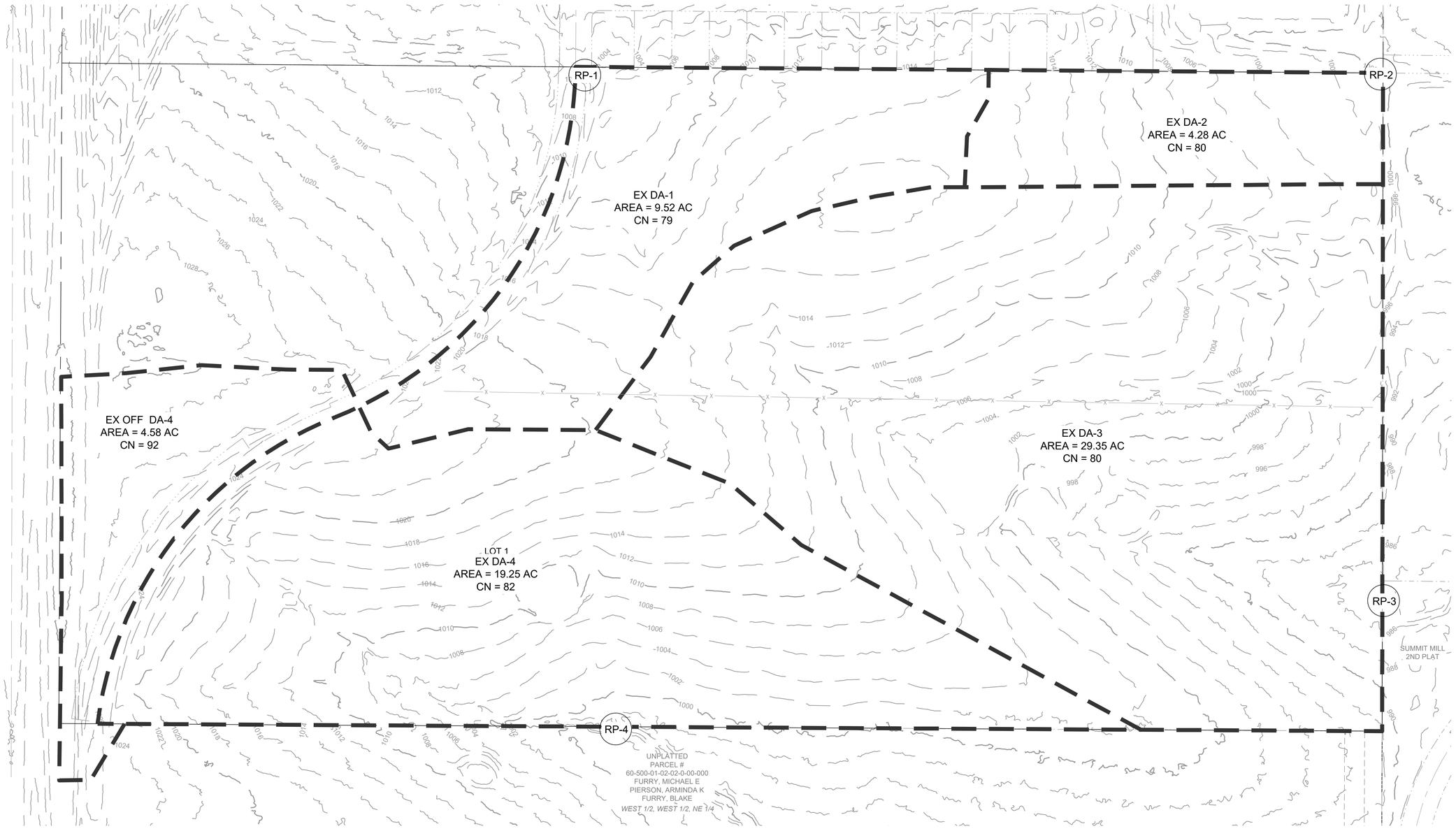
-EDDB Water Quality Design

-EWDB Water Quality Design

-FEMA FIRMette

-National Wetlands Inventory


Google Earth
Imagery date: 2/21/20–newer
300 m
Camera: 3,003 m 38°54'21"N 94°18'38"W 302 m



LEGEND:

- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPOSED WATERSHED

SCALE: 1" = 100'

SCHLAGEL

ENGINEERS PLANNERS SURVEYORS LANDSCAPE ARCHITECTS
14920 W. 107th Street • Lenexa, Kansas 66215
(913) 492-5158 • Fax (913) 492-8400
WWW.SCHLAGELASSOCIATES.COM
Missouri State Certificates of Authority
#E2000003800-F #LA2001005237 #LS2000088859-F

PREPARED BY:

SCHLAGEL & ASSOCIATES, P.A.

BLACKWELL
HYDRO MAPS

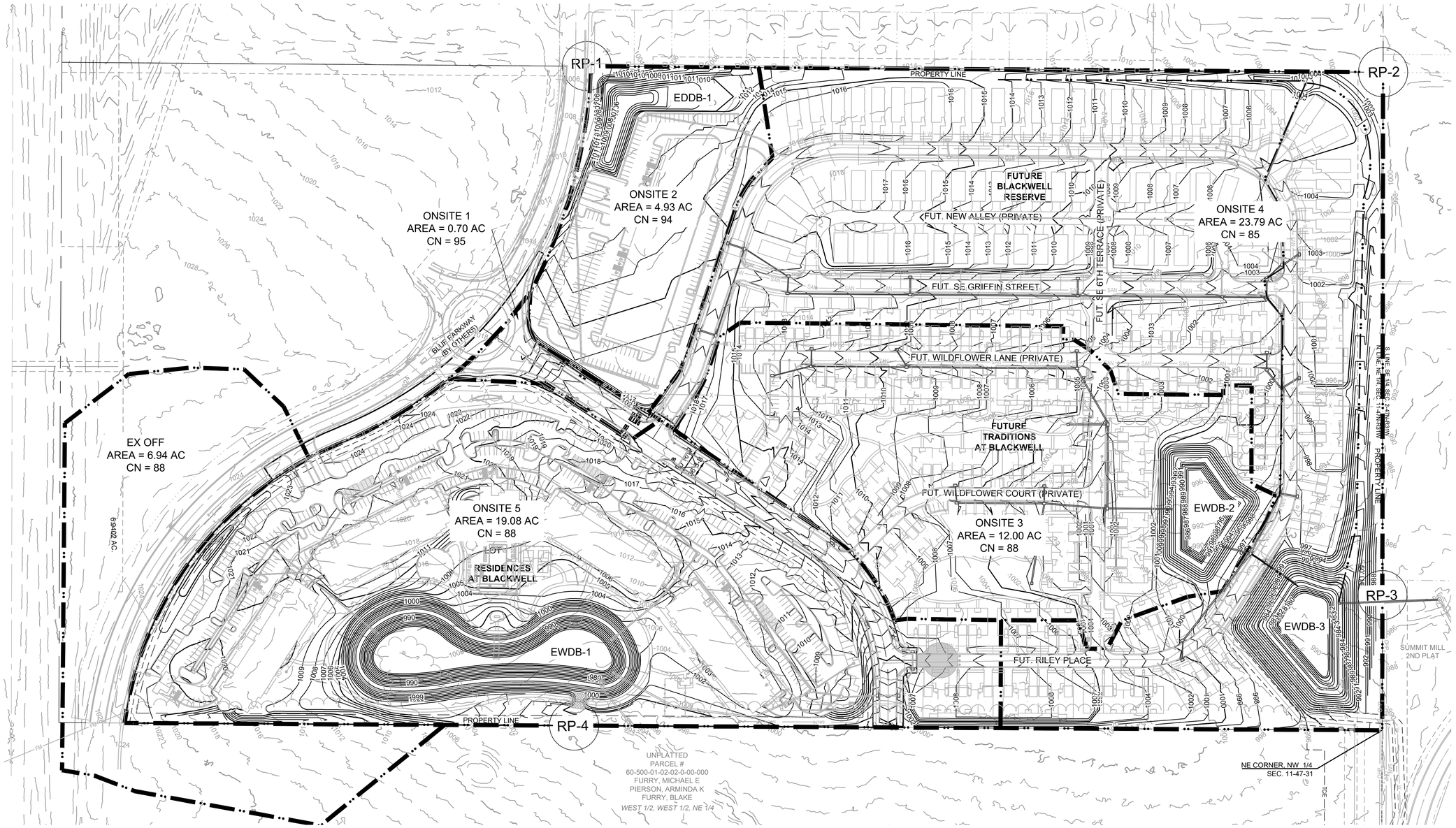
LEES SUMMIT, MO

REVISION DATE	DESCRIPTION
A	
A	
A	
A	
A	
A	
A	
A	

DRAWN BY:	MWM
CHECKED BY:	MAB
DATE PREPARED:	3/3/23
PROJ. NUMBER:	22-102

EXISTING
DRAINAGE MAP

SHEET
A.1



LEGEND:

- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPOSED WATERSHED

SCALE: 1" = 100'

SCHLAGEL
ENGINEERS PLANNERS SURVEYORS LANDSCAPE ARCHITECTS
14920 PONTIAC STREET • OVERLAND PARK, KANSAS 66215
(913) 492-5158 • Fax (913) 492-8400
WWW.SCHLAGELASSOCIATES.COM
Missouri State Certificates of Authority
#E2000003800-F #LAC2001005237 #LS2000008859-F

PREPARED BY:

SCHLAGEL & ASSOCIATES, P.A.

BLACKWELL HYDRO MAPS

LEES SUMMIT, MO

REVISION DATE	DESCRIPTION
1	
2	
3	
4	
5	
6	

DRAWN BY:	MWM
CHECKED BY:	MAB
DATE PREPARED:	3/3/23
PROJ. NUMBER:	22-102

PROPOSED
DRAINAGE MAP

SHEET
A.2

Extended Wet Detention Basin - EWDB#1

Project: 22-102 Residences at Blackwell
3/3/2023 15:05

Water Quality Volume Calculation

WQV = P * Weighted RV

WQV - Water Quality Volume (watershed-inches)
P - Rainfall Event (1.37 inches in Kansas City)
RV - Volumetric Runoff Coefficient

RV = 0.05 + 0.009(I)

I - Percent Site Imperviousness (%)

I. Determine Weighted RV & Weighted Rational C Coefficient

Cover Type	% Impervious	Area (Ac.)	Total Impervious Area (Ac.)	Rational Runoff Coefficient	RV	C * Area	RV * Area
Multifamily (Apartments)	60	24.30	14.58	0.66	0.59	16.038	14.337
			0.00		0.05	0	0
Total		**24.3**	**14.58**			**16.038**	**14.337**

Rv = Sum(Rv*A)/Total Area = 14.33 / 24.3 = 0.590

C = Sum(C*A)/Total Area = 16.03 / 24.3 = 0.660

II. Determine Water Quality Volume

WQV = P * Rv = 1.37 * 0.59 = **0.808 in**

III. Determine Total Water Quality Volume

Total Watershed Area (AT) = 24.3 acres
WQV = 0.808 in

WQV = (24.3 * 0.808)/12 = **1.64 ac-ft**

Extended Wet Detention Basin - EWDB#1

Design Worksheet

Project: 22-102 Residences at Blackwell
FINAL STORMWATER MANAGEMENT PLAN
3/3/2023

I. Basin Water Quality Volume			
Tributary Area to EWDB, A_T	A_T =	24.30	acres
Water Qualtity Volume, WQ_V - See Attached Calculations	WQ_V =	1.637	ac-ft
IIa. Permanent Pool Volume - Method 1			
Average 14 Day Wet Season Rainfal, R_{14}	R_{14} =	2.2	in
Rational Runoff Coefficient, C	C =	0.660	
Permanent Pool Volume by Method 1, V_{P1} $V_{P1} = (C*A_T*R_{14})/12$	V_{P1} =	2.940	ac-ft
IIb. Permanent Pool Volume - Method 2			
Ratio of Basin Volume to Runoff Volume, $V_{B/R}$ (From Figure 12; $V_{B/R}$ should be >= 4.0)	$V_{B/R}$ =	4	
Mean Storm Depth, Sd	Sd =	0.6	in
Impervious Tributary Area, Ai	Ai =	14.58	acres
Permanent Pool Volume by Method 2, V_{P2} $V_{P2} = (V_{B/R}*Sd*Ai)/12$	V_{P2} =	2.916	ac-ft
IIc. Permanent Pool Design Volume			
Design Permanent Pool Volume, V_P (Larger of V_{P1} and V_{P2} plus 20%)	V_P =	3.528	ac-ft
Average Permanent Pool Depth, Z_P	Z_P =	6	ft
Permanent Pool Surface Area, A_P	A_P =	0.588	ac
IIId. Water Quality Outlet - V-Notch Weir			
Depth of Water Quality Volume Above Permanent Pool, Z_{WQ}	Z_{WQ} =	1.65	ft
Average Head of Water Quality Pool Volume Over Invert of V-Notch, H_{WQ} $H_{WQ} = 0.50 * Z_{WQ}$	H_{WQ} =	0.8	ft
Average Water Quality Pool Outflow Rate, Q_{WQ} $Q_{WQ} = (WQ_V * 43560)/(40*3600)$	Q_{WQ} =	0.50	cfs
V-Notch Weir Coefficient, Cv	Cv	2.62	
V-Notch Weir Angle $\Theta = 2*(180/\Pi)*\arctan(Q_{WQ}/(Cv*H_{QW}\text{^}5/2))$ - Not < 20 degrees	Θ =	0.6	deg
V-Notch Weir Top Width, WV $Wv = 2*Z_{WQ}*\tan(\Theta/2)$	Wv =	0.02	ft

Extended Wet Detention Basin - EWDB#2

Project: 22-097 Traditions at Blackwell
3/3/2023 15:05

Water Quality Volume Calculation

WQV = P * Weighted RV

WQV - Water Quality Volume (watershed-inches)
P - Rainfall Event (1.37 inches in Kansas City)
RV - Volumetric Runoff Coefficient

RV = 0.05 + 0.009(I)

I - Percent Site Imperviousness (%)

I. Determine Weighted RV & Weighted Rational C Coefficient

Cover Type	% Impervious	Area (Ac.)	Total Impervious Area (Ac.)	Rational Runoff Coefficient	RV	C * Area	RV * Area
Townhomes	60	12.00	7.20	0.66	0.59	7.92	7.08
			0.00		0.05	0	0
Total		**12**	**7.20**			**7.920**	**7.08**

Rv = Sum(Rv*A)/Total Area = 7.08 / 12 = 0.590

C = Sum(C*A)/Total Area = 7.92 / 12 = 0.660

II. Determine Water Quality Volume

WQV = P * Rv = 1.37 * 0.59 = **0.808 in**

III. Determine Total Water Quality Volume

Total Watershed Area (AT) = 12 acres
WQV = 0.808 in

WQV = (12 * 0.808)/12 = **0.81 ac-ft**

Extended Wet Detention Basin - EWDB#2

Design Worksheet

Traditions at Blackwell
PRELIMINARY STORMWATER MANAGEMENT PLAN
3/3/2023

I. Basin Water Quality Volume			
Tributary Area to EWDB, A_T	A_T =	12.00	acres
Water Qualtity Volume, WQ_V - See Attached Calculations	WQ_V =	0.808	ac-ft
IIa. Permanent Pool Volume - Method 1			
Average 14 Day Wet Season Rainfal, R_{14}	R_{14} =	2.2	in
Rational Runoff Coefficient, C	C =	0.660	
Permanent Pool Volume by Method 1, V_{P1} $V_{P1} = (C*A_T*R_{14})/12$	V_{P1} =	1.452	ac-ft
IIb. Permanent Pool Volume - Method 2			
Ratio of Basin Volume to Runoff Volume, $V_{B/R}$ (From Figure 12; $V_{B/R}$ should be >= 4.0)	$V_{B/R}$ =	4	
Mean Storm Depth, Sd	Sd =	0.6	in
Impervious Tributary Area, Ai	Ai =	7.20	acres
Permanent Pool Volume by Method 2, V_{P2} $V_{P2} = (V_{B/R}*Sd*Ai)/12$	V_{P2} =	1.440	ac-ft
IIc. Permanent Pool Design Volume			
Design Permanent Pool Volume, V_P (Larger of V_{P1} and V_{P2} plus 20%)	V_P =	1.742	ac-ft
Average Permanent Pool Depth, Z_P	Z_P =	6	ft
Permanent Pool Surface Area, A_P	A_P =	0.290	ac
IIId. Water Quality Outlet - V-Notch Weir			
Depth of Water Quality Volume Above Permanent Pool, Z_{WQ}	Z_{WQ} =	1.6	ft
Average Head of Water Quality Pool Volume Over Invert of V-Notch, H_{WQ} $H_{WQ} = 0.50 * Z_{WQ}$	H_{WQ} =	0.8	ft
Average Water Quality Pool Outflow Rate, Q_{WQ} $Q_{WQ} = (WQ_V * 43560)/(40*3600)$	Q_{WQ} =	0.24	cfs
V-Notch Weir Coefficient, Cv	Cv	2.62	
V-Notch Weir Angle $\Theta = 2*(180/\Pi)*\arctan(Q_{WQ}/(Cv*H_{QW}\text{^}5/2))$ - Not < 20 degrees	Θ =	20.0	deg
V-Notch Weir Top Width, WV $Wv = 2*Z_{WQ}*\tan(\Theta/2)$	Wv =	0.56	ft

Extended Wet Detention Basin - EWDB#3

Project: 22-093 Blackwell Reserve
3/3/2023 15:05

Water Quality Volume Calculation

WQV = P * Weighted RV

WQV - Water Quality Volume (watershed-inches)
P - Rainfall Event (1.37 inches in Kansas City)
RV - Volumetric Runoff Coefficient

RV = 0.05 + 0.009(I)

I - Percent Site Imperviousness (%)

I. Determine Weighted RV & Weighted Rational C Coefficient

Cover Type	% Impervious	Area (Ac.)	Total Impervious Area (Ac.)	Rational Runoff Coefficient	RV	C * Area	RV * Area
Single-Family Lots	35	11.25	3.94	0.51	0.365	5.7375	4.10625
Townhomes	60	12.54	7.52	0.66	0.59	8.2764	7.3986
			0.00		0.05	0	0
Total		**23.79**	**11.46**			**14.014**	**11.50485**

Rv = Sum(Rv*A)/Total Area = 11.5 / 23.79 = 0.484

C = Sum(C*A)/Total Area = 14.01 / 23.79 = 0.589

II. Determine Water Quality Volume

WQV = P * Rv = 1.37 * 0.48360(**0.663 in**

III. Determine Total Water Quality Volume

Total Watershed Area (AT) = 23.79 acres
WQV = 0.663 in

WQV = (23.79 * 0.662)/12 = **1.31 ac-ft**

Extended Wet Detention Basin - EWDB#3

Design Worksheet

Blackwell Reserve
PRELIMINARY STORMWATER MANAGEMENT PLAN
3/3/2023

I. Basin Water Quality Volume			
Tributary Area to EWDB, A_T	A_T =	23.79	acres
Water Qualtity Volume, WQ_V - See Attached Calculations	WQ_V =	1.313	ac-ft
IIa. Permanent Pool Volume - Method 1			
Average 14 Day Wet Season Rainfal, R_{14}	R_{14} =	2.2	in
Rational Runoff Coefficient, C	C =	0.589	
Permanent Pool Volume by Method 1, V_{P1} $V_{P1} = (C*A_T*R_{14})/12$	V_{P1} =	2.569	ac-ft
IIb. Permanent Pool Volume - Method 2			
Ratio of Basin Volume to Runoff Volume, $V_{B/R}$ (From Figure 12; $V_{B/R}$ should be >= 4.0)	$V_{B/R}$ =	4	
Mean Storm Depth, Sd	Sd =	0.6	in
Impervious Tributary Area, Ai	Ai =	11.46	acres
Permanent Pool Volume by Method 2, V_{P2} $V_{P2} = (V_{B/R}*Sd*Ai)/12$	V_{P2} =	2.292	ac-ft
IIc. Permanent Pool Design Volume			
Design Permanent Pool Volume, V_P (Larger of V_{P1} and V_{P2} plus 20%)	V_P =	3.083	ac-ft
Average Permanent Pool Depth, Z_P	Z_P =	6	ft
Permanent Pool Surface Area, A_P	A_P =	0.514	ac
IIId. Water Quality Outlet - V-Notch Weir			
Depth of Water Quality Volume Above Permanent Pool, Z_{WQ}	Z_{WQ} =	2.0	ft
Average Head of Water Quality Pool Volume Over Invert of V-Notch, H_{WQ} $H_{WQ} = 0.50 * Z_{WQ}$	H_{WQ} =	1.0	ft
Average Water Quality Pool Outflow Rate, Q_{WQ} $Q_{WQ} = (WQ_V * 43560)/(40*3600)$	Q_{WQ} =	0.40	cfs
V-Notch Weir Coefficient, Cv	Cv	2.62	
V-Notch Weir Angle $\Theta = 2*(180/\Pi)*\arctan(Q_{WQ}/(Cv*H_{QW}\text{^}5/2))$ - Not < 20 degrees	Θ =	20.0	deg
V-Notch Weir Top Width, WV $Wv = 2*Z_{WQ}*\tan(\Theta/2)$	Wv =	0.71	ft

Basin Volume - EWDB #1

Project #: Residences at Blackwell 22-102
Time: 3/3/2023 15:07
Work By: NCA

Volume computed using Conic Method For Reservoir Volumes

Volume = (1/3) * (EL2-EL1)*(Area1 + Area2 + (Area1*Area2)$^{0.5}$)

Elevation (ft)	Area (ft^2)	Area (AC)	Δ Volume (ft^3)	Total Volume (ft^3)	Total Volume (ac-ft)
984	23839	0.547	0	0	0.000
985	27090	0.622	25445	25445	0.584
986	30397	0.698	28725	54169	1.244
987	33763	0.775	32062	86231	1.980
988	37182	0.854	35455	121687	2.794
989	40663	0.933	38906	160592	3.687
990	44196	1.015	42413	203005	4.660
991	47790	1.097	45977	248982	5.716
992	51437	1.181	49597	298579	6.854
993	57646	1.323	54507	353086	8.106
994	64008	1.469	60793	413879	9.501
995	67904	1.559	65940	479819	11.015
996	71853	1.650	69862	549681	12.619
997	75863	1.742	73842	623523	14.314
998	79925	1.835	77877	701400	16.102
999	84048	1.929	81970	783370	17.984
1000	88224	2.025	86119	869489	19.961

Basin Volume - EWDB #2

Project #: Reunion at Blackwell 20-205
Time: 3/3/2023 15:07
Work By: NCA

Volume computed using Conic Method For Reservoir Volumes

Volume = (1/3) * (EL2-EL1)*(Area1 + Area2 + (Area1*Area2)$^{0.5}$)

Elevation (ft)	Area (ft^2)	Area (AC)	Δ Volume (ft^3)	Total Volume (ft^3)	Total Volume (ac-ft)
985	5081	0.117	0	0	0.000
986	6492	0.149	5772	5772	0.132
987	8025	0.184	7244	13016	0.299
988	9671	0.222	8834	21850	0.502
989	11418	0.262	10531	32381	0.743
990	13264	0.304	12328	44710	1.026
991	15211	0.349	14225	58935	1.353
992	20519	0.471	17797	76732	1.762
993	22818	0.524	21656	98388	2.259
994	25218	0.579	24006	122394	2.810
995	27718	0.636	26456	148849	3.417
996	30318	0.696	29005	177854	4.083
997	33019	0.758	31656	209510	4.810
998	35821	0.822	34407	243917	5.600

Basin Volume - EWDB #3

Project #: Reunion at Blackwell 20-205
Time: 3/3/2023 15:07
Work By: NCA

Volume computed using Conic Method For Reservoir Volumes

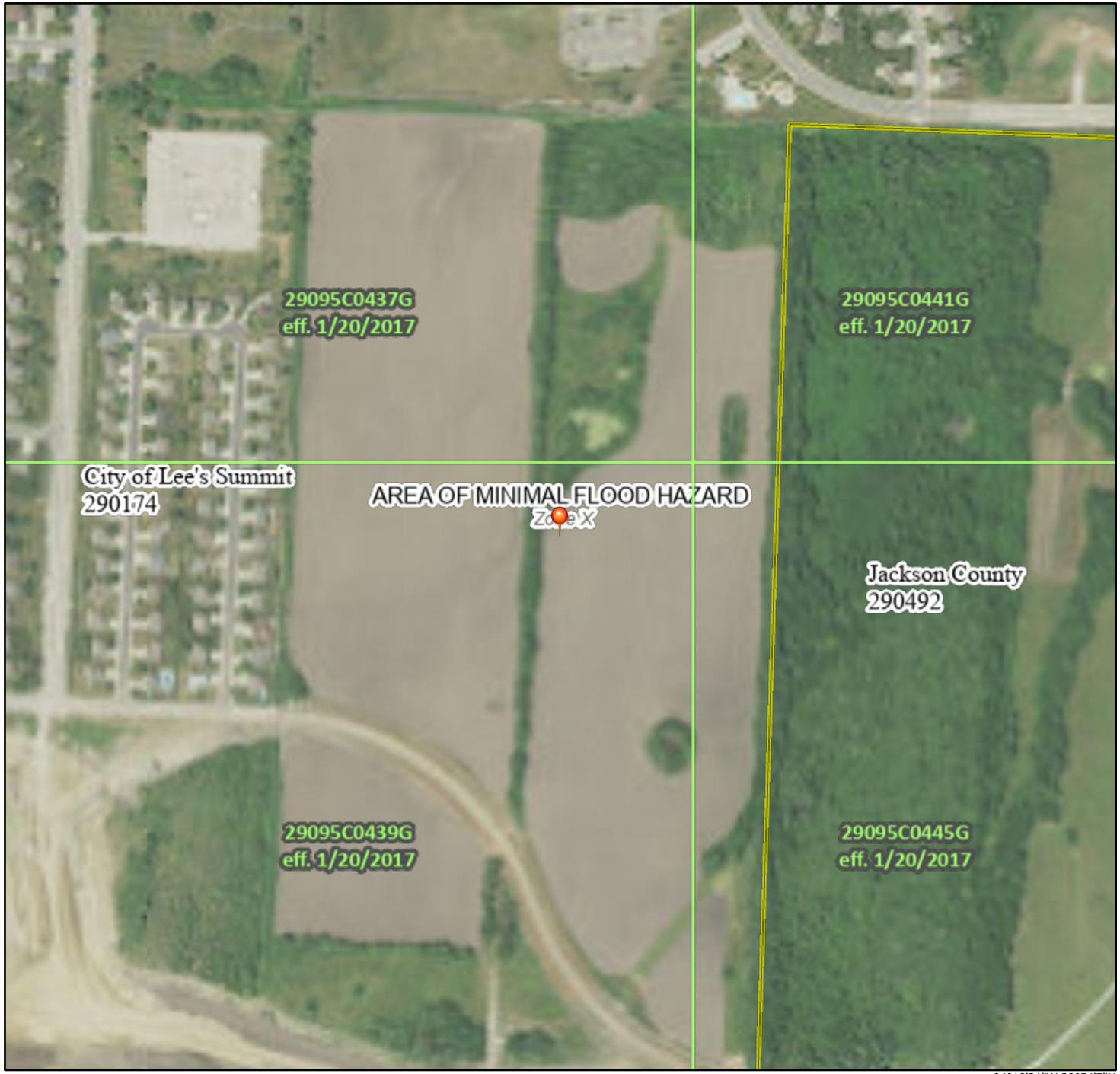
Volume = (1/3) * (EL2-EL1)*(Area1 + Area2 + (Area1*Area2)$^{0.5}$)

Elevation (ft)	Area (ft^2)	Area (AC)	Δ Volume (ft^3)	Total Volume (ft^3)	Total Volume (ac-ft)
979	11834	0.272	0	0	0.000
980	13795	0.317	12801	12801	0.294
981	15881	0.365	14824	27625	0.634
982	18093	0.415	16973	44598	1.024
983	20433	0.469	19249	63847	1.466
984	22904	0.526	21655	85502	1.963
985	29590	0.679	26173	111675	2.564
986	32444	0.745	31003	142678	3.275
987	35398	0.813	33907	176585	4.054
988	38453	0.883	36911	213496	4.901
989	42954	0.986	40679	254175	5.835
990	47178	1.083	45045	299220	6.869
991	52032	1.194	49580	348800	8.007

National Flood Hazard Layer FIRMette

FEMA

94°19'8"W 38°54'35"N



94°18'31"W 38°54'7"N

Feet 1:6,000

0 250 500 1,000 1,500 2,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

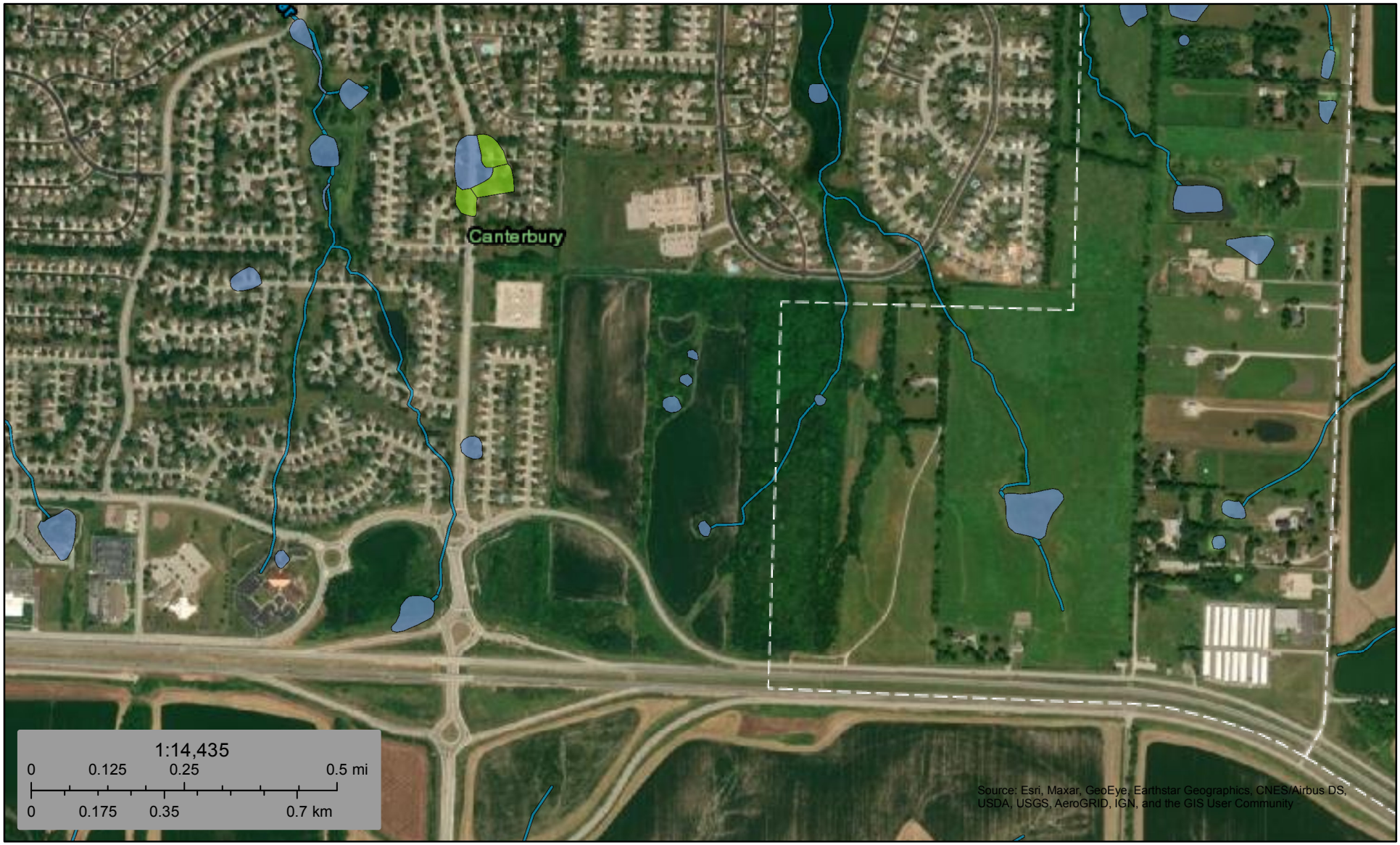
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/30/2021 at 10:56 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

U.S. Fish and Wildlife Service

National Wetlands Inventory

Wetland Inventory Map



July 30, 2021

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

APPENDIX B

-NRCS Soil Resource Report

-HydroCAD Model Output Report

- Wetland Delineation and Jurisdictional Assessment

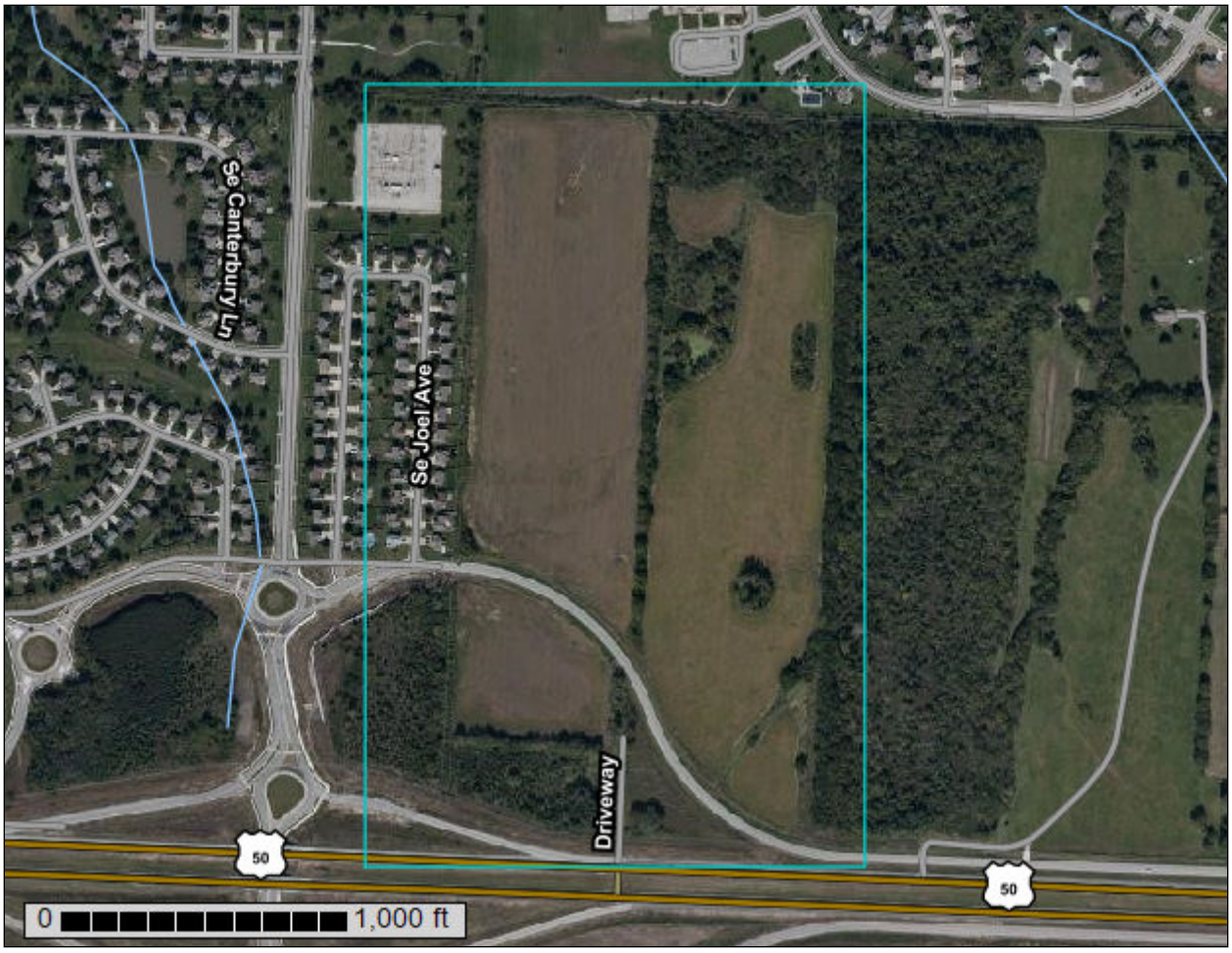
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Jackson County, Missouri



July 26, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:4,870 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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 1:24,000.

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: Jackson County, Missouri
Survey Area Data: Version 22, May 29, 2020

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

Date(s) aerial images were photographed: Sep 6, 2019—Nov 16, 2019

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10000	Arisburg silt loam, 1 to 5 percent slopes	50.5	46.1%
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	9.1	8.3%
10117	Sampsel silty clay loam, 5 to 9 percent slopes	27.1	24.8%
10128	Sharpsburg-Urban land complex, 2 to 5 percent slopes	5.9	5.4%
10180	Udarents-Urban land-Sampsel complex, 2 to 5 percent slopes	5.8	5.3%
10181	Udarents-Urban land-Sampsel complex, 5 to 9 percent slopes	9.2	8.4%
10183	Udarents-Urban land-Polo complex, 5 to 9 percent slopes	1.9	1.8%
Totals for Area of Interest		**109.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the

scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Jackson County, Missouri

10000—Arisburg silt loam, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2w22b
Elevation: 610 to 1,130 feet
Mean annual precipitation: 39 to 43 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Arisburg and similar soils: 87 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arisburg

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess

Typical profile

Ap - 0 to 6 inches: silt loam
A - 6 to 13 inches: silt loam
Bt - 13 to 19 inches: silty clay loam
Btg - 19 to 56 inches: silty clay loam
BCg - 56 to 79 inches: silty clay loam

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R107BY007MO - Loess Upland Prairie Amorpha canescens/ Andropogon gerardii-Zizia aurea Leadplant/Big Bluestem-Golden Zizia
Hydric soil rating: No

Minor Components

Greenton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R109XY002MO - Loess Upland Prairie
Hydric soil rating: No

Sharpsburg

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R109XY002MO - Loess Upland Prairie
Hydric soil rating: No

Haig

Percent of map unit: 3 percent
Landform: Flats
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: R109XY001MO - Claypan Summit Prairie
Hydric soil rating: Yes

10082—Arisburg-Urban land complex, 1 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2w7ld
Elevation: 750 to 1,130 feet
Mean annual precipitation: 39 to 45 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Arisburg and similar soils: 61 percent
Urban land: 30 percent
Minor components: 9 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arisburg

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess

Typical profile

Ap - 0 to 6 inches: silt loam
A - 6 to 13 inches: silt loam
Bt - 13 to 19 inches: silty clay loam
Btg - 19 to 56 inches: silty clay loam
BCg - 56 to 79 inches: silty clay loam

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R107BY007MO - Loess Upland Prairie Amorpha canescens/ Andropogon gerardii-Zizia aurea Leadplant/Big Bluestem-Golden Zizia
Hydric soil rating: No

Description of Urban Land

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Sampsel

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Concave
Ecological site: R109XY010MO - Interbedded Sedimentary Upland Savanna
Hydric soil rating: Yes

Greenton

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R109XY002MO - Loess Upland Prairie
Hydric soil rating: No

Sharpsburg

Percent of map unit: 3 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R109XY002MO - Loess Upland Prairie
Hydric soil rating: No

10117—Sampsel silty clay loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2qkzz
Elevation: 600 to 900 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Sampsel and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sampsel

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex, concave
Parent material: Residuum weathered from shale

Typical profile

Ap - 0 to 13 inches: silty clay loam
Bt - 13 to 80 inches: silty clay

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D
Ecological site: R109XY010MO - Interbedded Sedimentary Upland Savanna
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: No

10128—Sharpsburg-Urban land complex, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2ql09
Elevation: 1,000 to 1,300 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sharpsburg and similar soils: 60 percent
Urban land: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sharpsburg

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess

Typical profile

A - 0 to 17 inches: silt loam
Bt - 17 to 55 inches: silty clay loam
C - 55 to 60 inches: silty clay loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 35 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very high (about 12.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: R109XY002MO - Loess Upland Prairie
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

10180—Udarents-Urban land-Sampsel complex, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1n85h
Elevation: 600 to 900 feet
Mean annual precipitation: 33 to 43 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 175 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Udarents and similar soils: 41 percent
Urban land: 39 percent
Sampsel and similar soils: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udarents

Setting

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mine spoil or earthy fill

Typical profile

C1 - 0 to 5 inches: silt loam
C2 - 5 to 80 inches: silty clay loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R107BY002MO - Deep Loess Upland Prairie Amorpha canescens/Schizachyrium scoparium-Sporobolus heterolepis Leadplant/Little Bluestem-Prairie Dropseed
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Across-slope shape: Convex

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Sampsel

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Convex

Parent material: Residuum weathered from shale

Typical profile

Ap - 0 to 13 inches: silty clay loam
Bt - 13 to 80 inches: silty clay

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: R109XY010MO - Interbedded Sedimentary Upland Savanna
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: No

10181—Udarents-Urban land-Sampsel complex, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 1n85g
Elevation: 600 to 900 feet
Mean annual precipitation: 33 to 43 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 175 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Udarents and similar soils: 41 percent
Urban land: 39 percent
Sampsel and similar soils: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udarents

Setting

Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Parent material: Mine spoil or earthy fill

Typical profile

C1 - 0 to 5 inches: silt loam
C2 - 5 to 80 inches: silty clay loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R107BY002MO - Deep Loess Upland Prairie Amorpha canescens/Schizachyrium scoparium-Sporobolus heterolepis Leadplant/Little Bluestem-Prairie Dropseed
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Across-slope shape: Convex

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Sampsel

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from shale

Typical profile

Ap - 0 to 13 inches: silty clay loam
Bt - 13 to 80 inches: silty clay

Properties and qualities

Slope: 5 to 9 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D
Ecological site: R109XY010MO - Interbedded Sedimentary Upland Savanna
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: No

10183—Udarents-Urban land-Polo complex, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 1n85d
Elevation: 600 to 1,000 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 50 to 57 degrees F
Frost-free period: 175 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Udarents and similar soils: 41 percent
Urban land: 39 percent
Polo and similar soils: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udarents

Setting

Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mine spoil or earthy fill

Typical profile

C1 - 0 to 5 inches: silt loam
C2 - 5 to 80 inches: silty clay loam

Properties and qualities

Slope: 5 to 9 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R107BY002MO - Deep Loess Upland Prairie Amorpha canescens/Schizachyrium scoparium-Sporobolus heterolepis Leadplant/Little Bluestem-Prairie Dropseed
Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Across-slope shape: Convex

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Polo

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave, convex
Parent material: Loess over residuum

Typical profile

A - 0 to 12 inches: silt loam
BA - 12 to 29 inches: silty clay loam
Bt1 - 29 to 35 inches: silty clay loam
2Bt2 - 35 to 80 inches: silty clay

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R107BY007MO - Loess Upland Prairie Amorpha canescens/ Andropogon gerardii-Zizia aurea Leadplant/Big Bluestem-Golden Zizia
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.

Map Scale: 1:4,870 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N 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 1:24,000.

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: Jackson County, Missouri
Survey Area Data: Version 22, May 29, 2020

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

Date(s) aerial images were photographed: Sep 6, 2019—Nov 16, 2019

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10000	Arisburg silt loam, 1 to 5 percent slopes	C	50.5	46.1%
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	C	9.1	8.3%
10117	Sampsel silty clay loam, 5 to 9 percent slopes	C/D	27.1	24.8%
10128	Sharpsburg-Urban land complex, 2 to 5 percent slopes	D	5.9	5.4%
10180	Udarents-Urban land-Sampsel complex, 2 to 5 percent slopes	C	5.8	5.3%
10181	Udarents-Urban land-Sampsel complex, 5 to 9 percent slopes	C	9.2	8.4%
10183	Udarents-Urban land-Polo complex, 5 to 9 percent slopes	C	1.9	1.8%
Totals for Area of Interest			**109.5**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

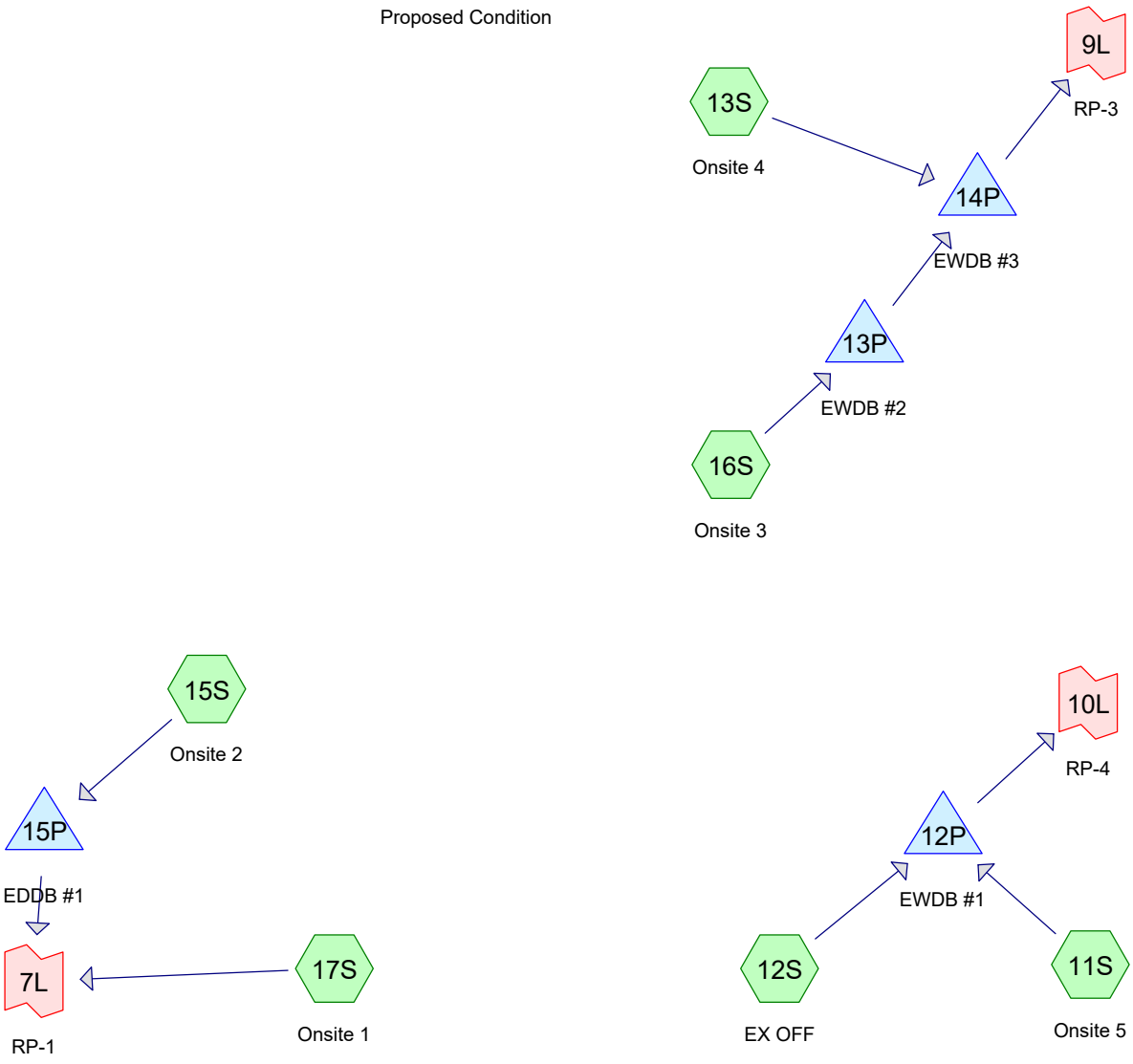
United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Proposed Condition



Subcat Reach Pond Link

Routing Diagram for 22-102-HYDRO-PRO
Prepared by Schlagel, Printed 3/3/2023

Summary for Subcatchment 11S: Onsite 5

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

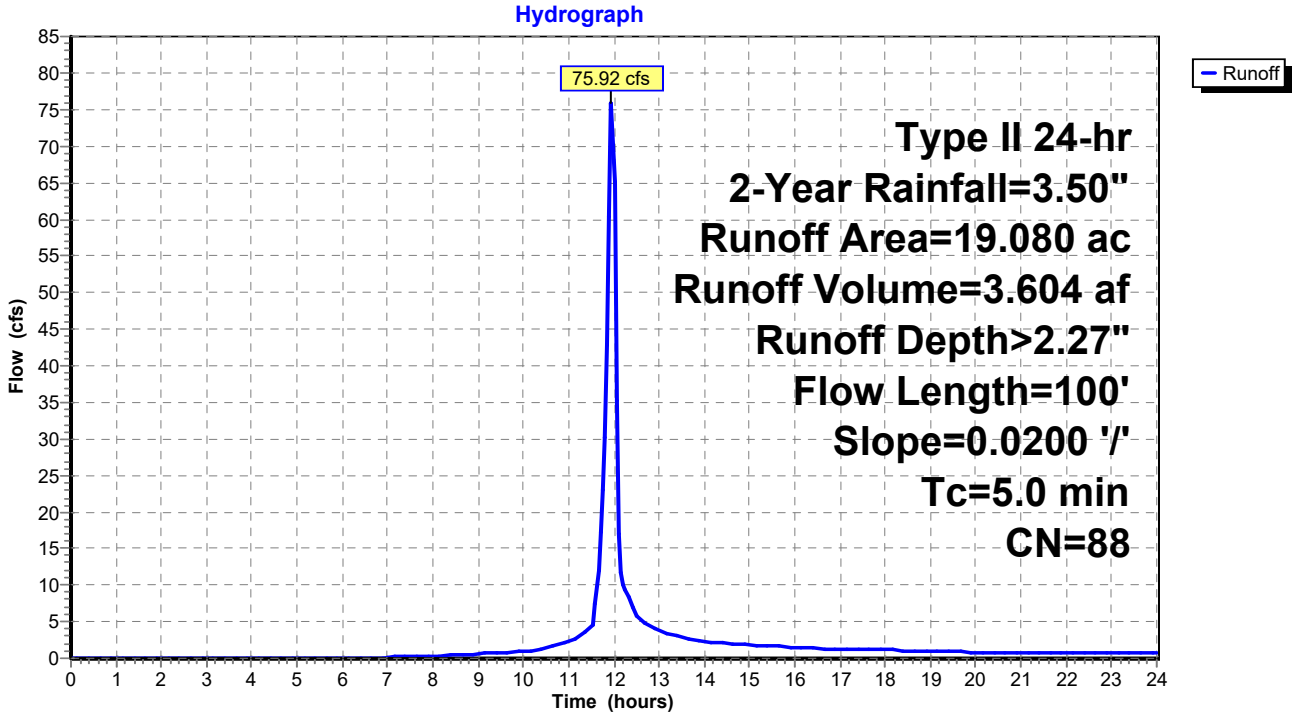
Runoff = 75.92 cfs @ 11.95 hrs, Volume= 3.604 af, Depth> 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	19.080	88	Apartments, 65% imp, HSG C
	6.678		35.00% Pervious Area
	12.402		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
3.9					**Direct Entry, Pipe flow**
5.0	100	Total			

Subcatchment 11S: Onsite 5



Summary for Subcatchment 12S: EX OFF

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

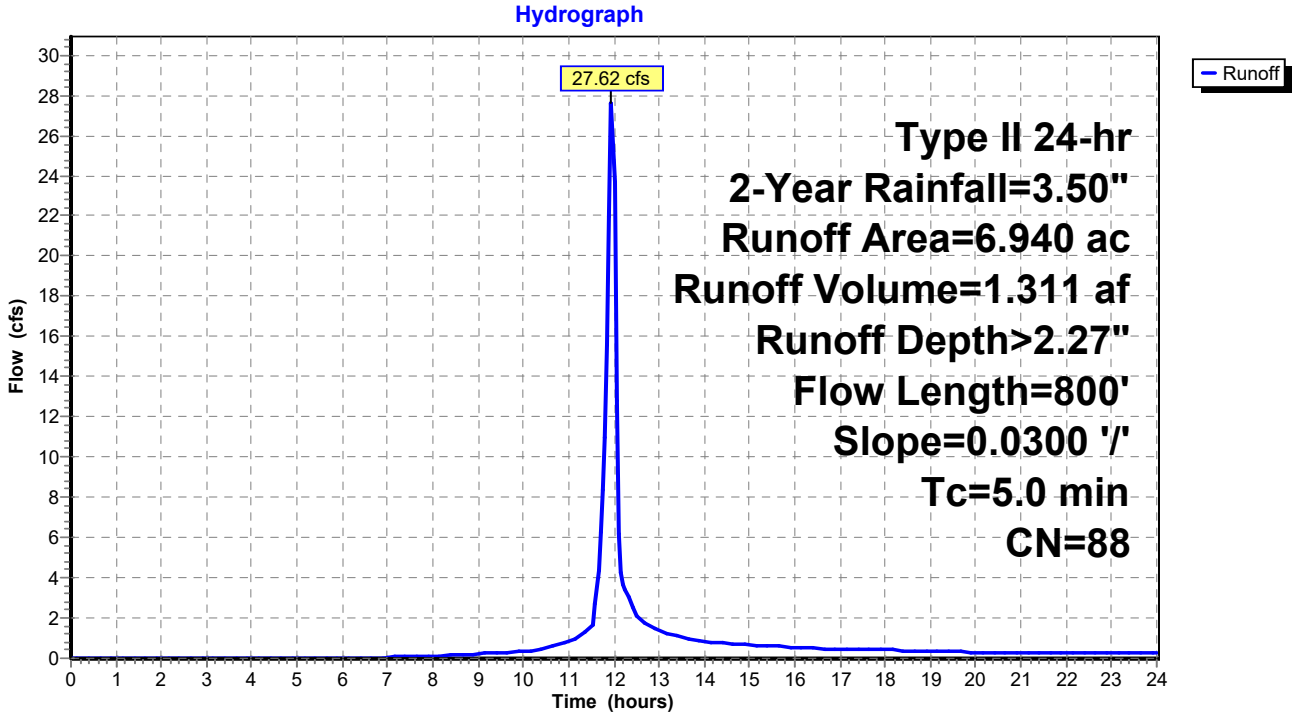
Runoff = 27.62 cfs @ 11.95 hrs, Volume= 1.311 af, Depth> 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	6.940	88	Future Multi-Family, 65% imp, HSG C
	2.429		35.00% Pervious Area
	4.511		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0300	1.72		**Sheet Flow, Sheet flow** Smooth surfaces n= 0.011 P2= 3.60"
4.0	700		2.92		**Direct Entry, Pipe flow**
5.0	800	Total			

Subcatchment 12S: EX OFF



Summary for Subcatchment 13S: Onsite 4

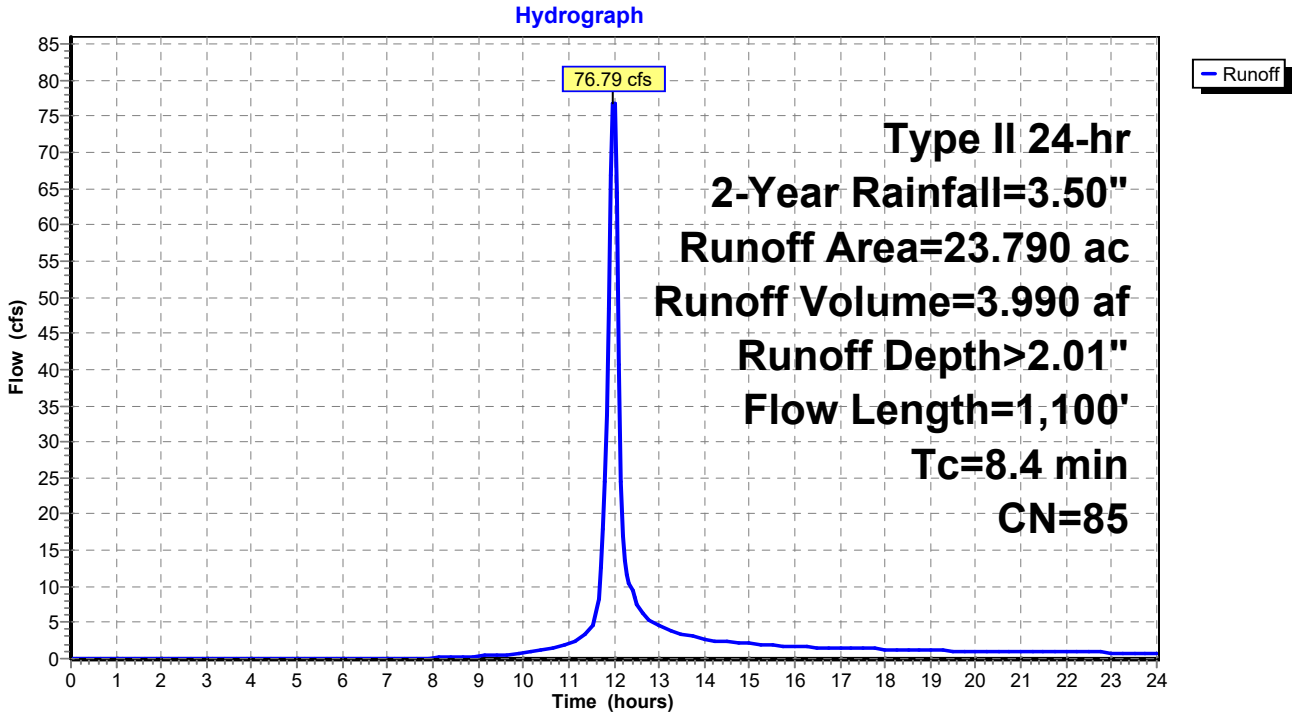
Runoff = 76.79 cfs @ 12.00 hrs, Volume= 3.990 af, Depth> 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	11.250	82	SINGLE FAMILY LOTS
*	12.540	88	1/8 acre lots, 65% imp, HSG D
	23.790	85	Weighted Average
	15.639		65.74% Pervious Area
	8.151		34.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0205	1.47		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
7.3	1,000	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.4	1,100	Total			

Subcatchment 13S: Onsite 4



Summary for Subcatchment 15S: Onsite 2

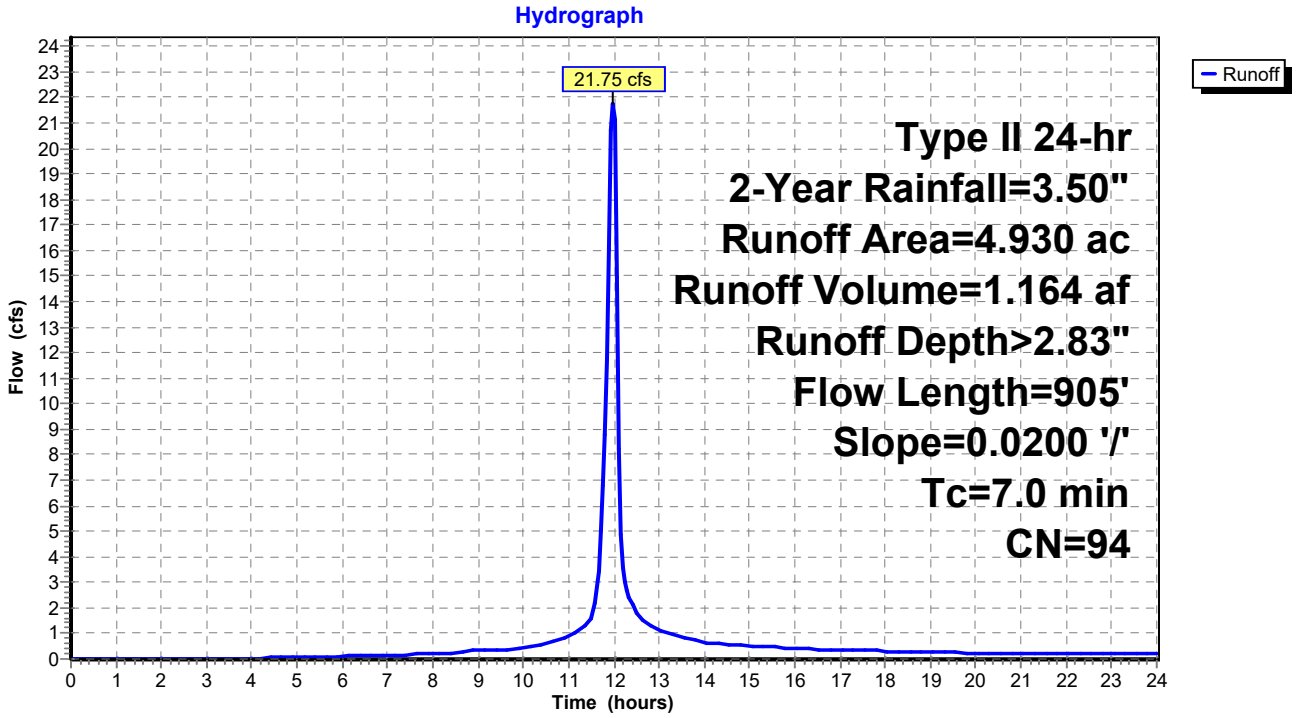
Runoff = 21.75 cfs @ 11.98 hrs, Volume= 1.164 af, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	4.930	94	Urban commercial, 85% imp, HSG D
	0.739		15.00% Pervious Area
	4.190		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
5.9	805	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.0	905	Total			

Subcatchment 15S: Onsite 2



Summary for Subcatchment 16S: Onsite 3

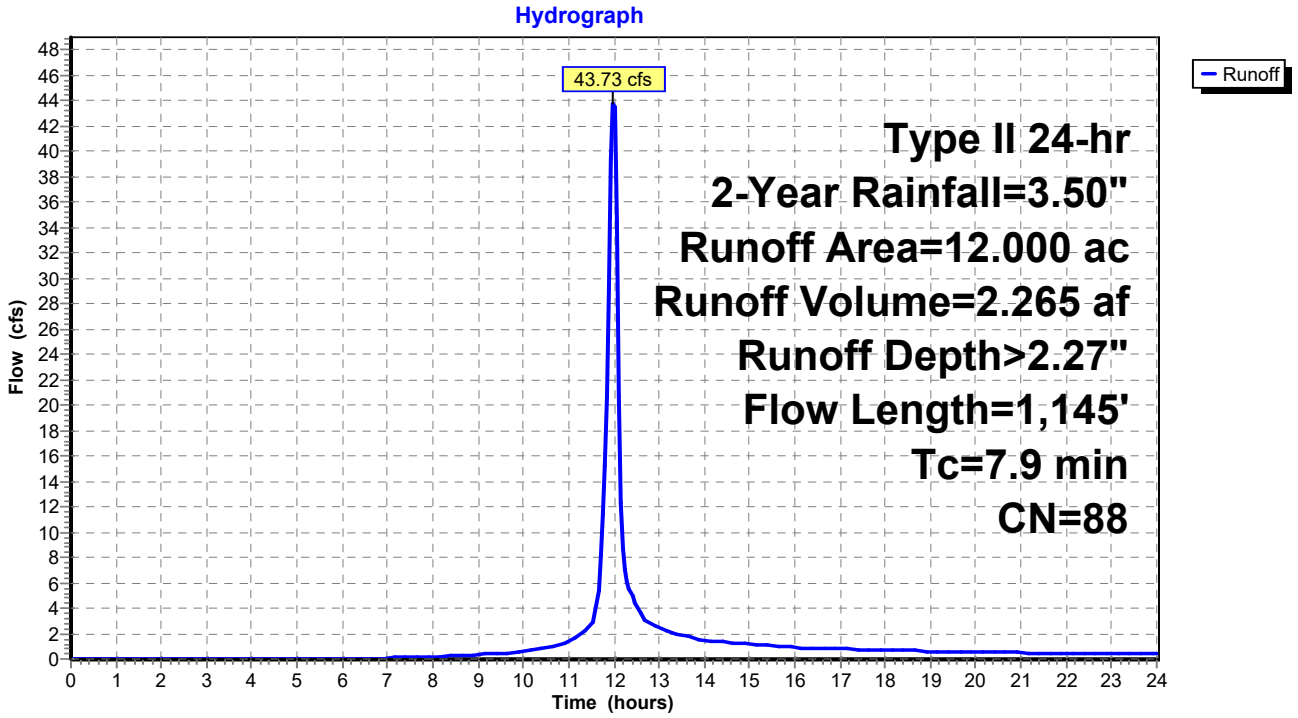
Runoff = 43.73 cfs @ 11.99 hrs, Volume= 2.265 af, Depth> 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	12.000	88	1/8 acre lots, 65% imp, HSG D
	4.200		35.00% Pervious Area
	7.800		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
6.8	1,045	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.9	1,145	Total			

Subcatchment 16S: Onsite 3



Summary for Subcatchment 17S: Onsite 1

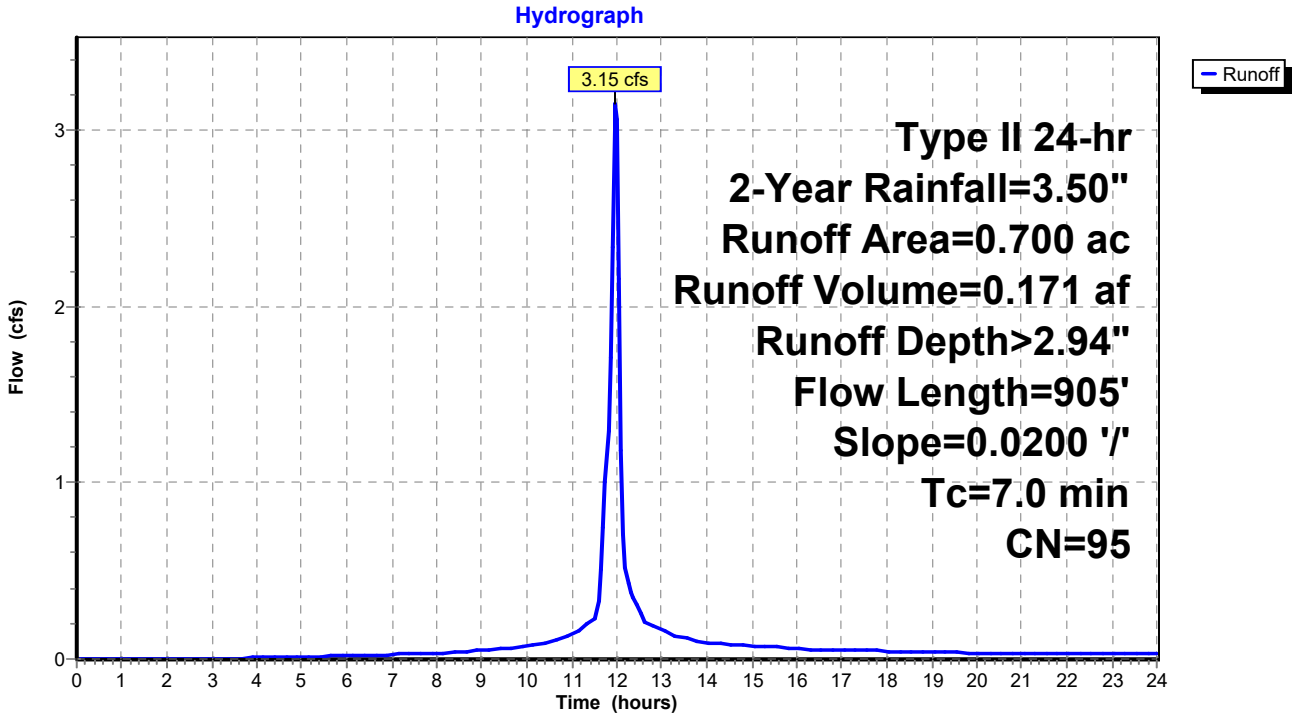
Runoff = 3.15 cfs @ 11.98 hrs, Volume= 0.171 af, Depth> 2.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

Area (ac)	CN	Description
0.700	95	Urban commercial, 85% imp, HSG D
0.105		15.00% Pervious Area
0.595		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
5.9	805	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.0	905	Total			

Subcatchment 17S: Onsite 1



Summary for Pond 12P: EWDB #1

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 2.27" for 2-Year event
Inflow = 103.54 cfs @ 11.95 hrs, Volume= 4.915 af
Outflow = 17.00 cfs @ 12.15 hrs, Volume= 3.911 af, Atten= 84%, Lag= 12.0 min
Primary = 17.00 cfs @ 12.15 hrs, Volume= 3.911 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 996.51' @ 12.15 hrs Surf.Area= 73,888 sf Storage= 106,853 cf

Plug-Flow detention time= 178.2 min calculated for 3.903 af (79% of inflow)
Center-of-Mass det. time= 96.8 min (903.7 - 806.9)

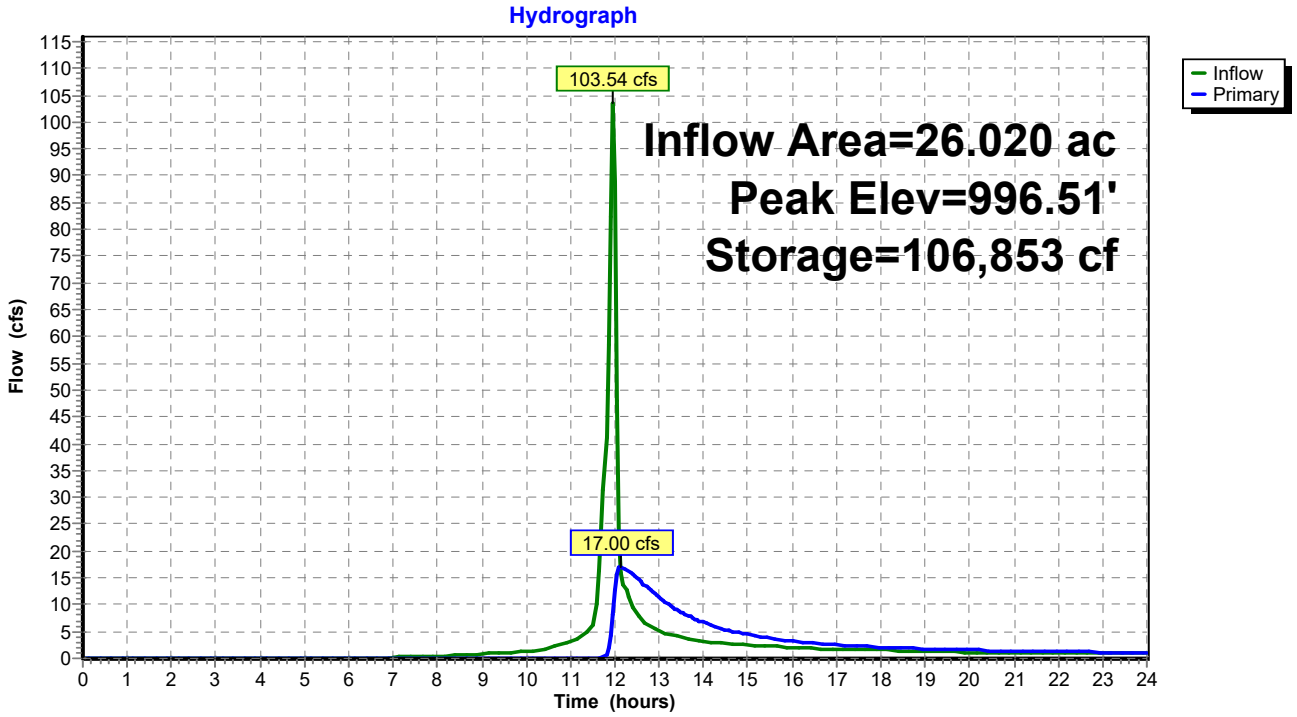
Volume	Invert	Avail.Storage	Storage Description
#1	995.00'	389,753 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
995.00	67,904	0	0
996.00	71,853	69,879	69,879
997.00	75,863	73,858	143,737
998.00	79,925	77,894	221,631
999.00	84,048	81,987	303,617
1,000.00	88,224	86,136	389,753

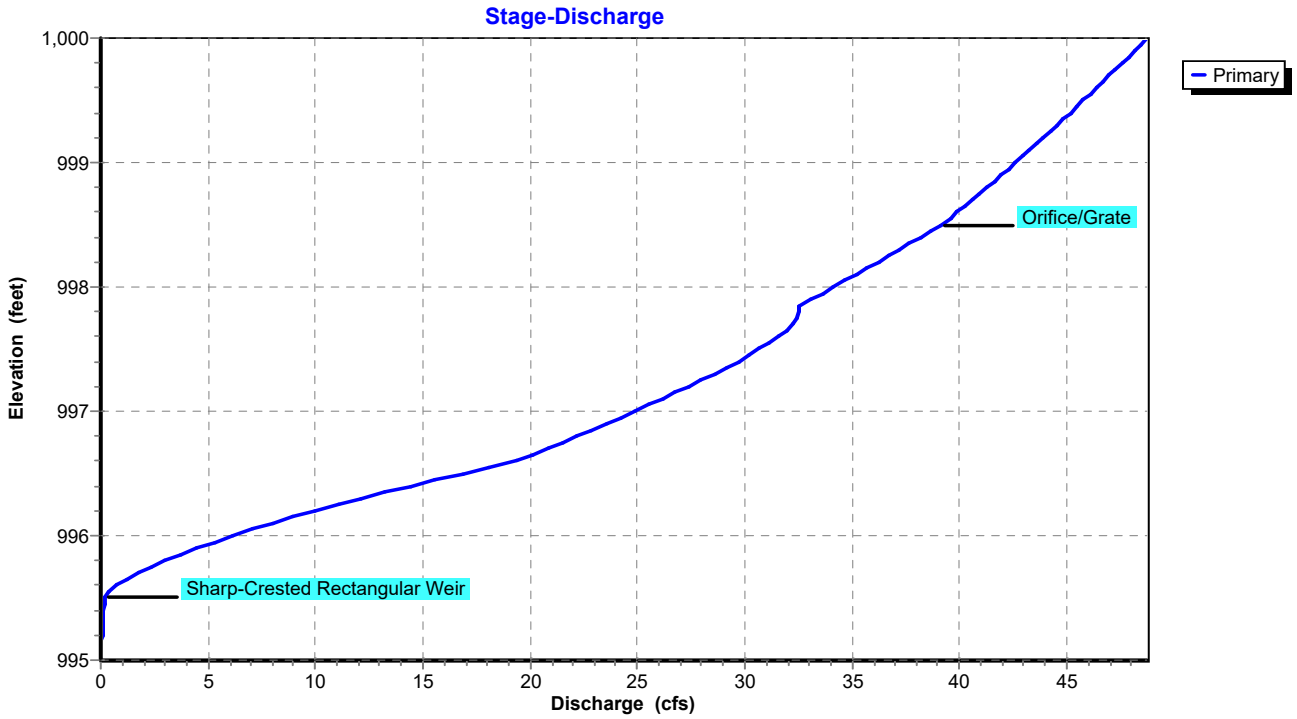
Device	Routing	Invert	Outlet Devices
#1	Primary	994.50'	**30.0" Round Culvert** L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 994.50' / 993.90' S= 0.0075 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	994.80'	**20.0 deg x 0.70' rise Sharp-Crested Vee/Trap Weir** Cv= 2.69 (C= 3.36)
#3	Device 1	995.50'	**5.0' long x 3.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height
#4	Device 1	998.50'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=16.99 cfs @ 12.15 hrs HW=996.51' (Free Discharge)
└**1=Culvert** (Passes 16.99 cfs of 18.18 cfs potential flow)
  ├**2=Sharp-Crested Vee/Trap Weir** (Orifice Controls 0.48 cfs @ 5.61 fps)
  ├**3=Sharp-Crested Rectangular Weir** (Weir Controls 16.51 cfs @ 3.42 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

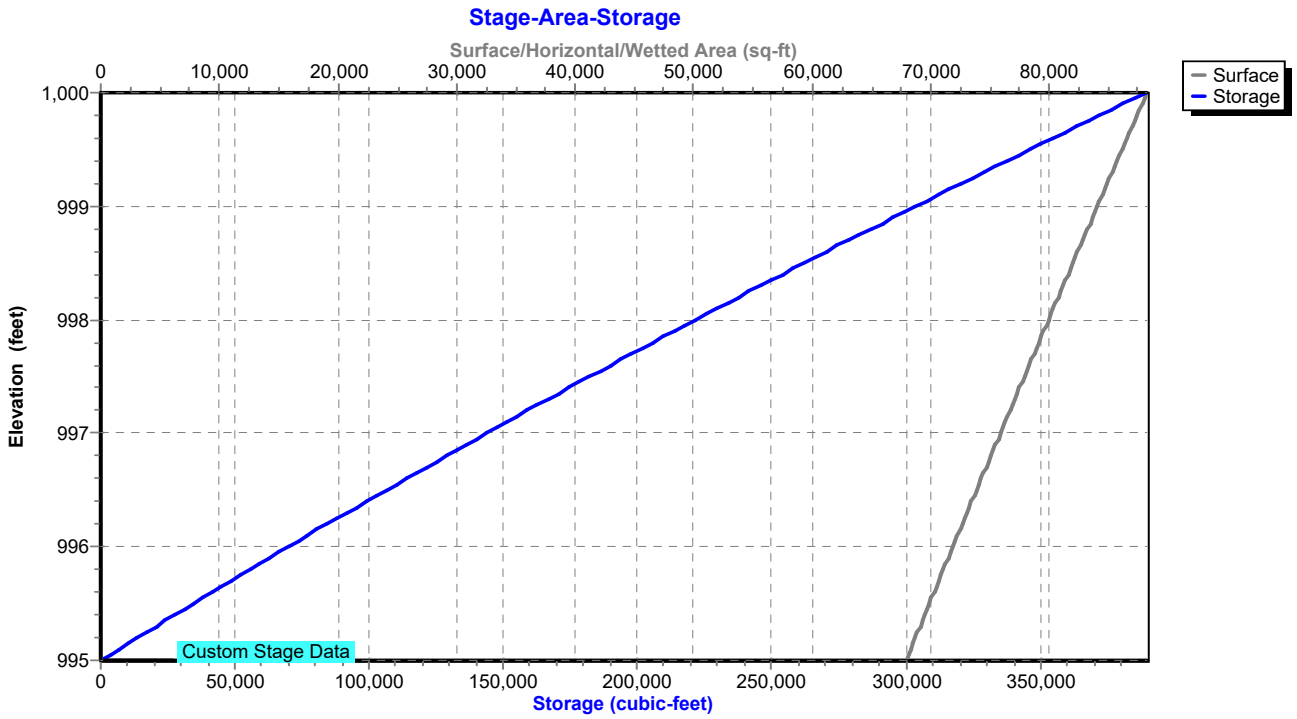
Pond 12P: EWDB #1



Pond 12P: EWDB #1



Pond 12P: EWDB #1



Summary for Pond 13P: EWDB #2

Inflow Area = 12.000 ac, 65.00% Impervious, Inflow Depth > 2.27" for 2-Year event
Inflow = 43.73 cfs @ 11.99 hrs, Volume= 2.265 af
Outflow = 3.94 cfs @ 12.53 hrs, Volume= 1.696 af, Atten= 91%, Lag= 32.3 min
Primary = 3.94 cfs @ 12.53 hrs, Volume= 1.696 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 994.33' @ 12.53 hrs Surf.Area= 26,049 sf Storage= 54,208 cf

Plug-Flow detention time= 245.8 min calculated for 1.696 af (75% of inflow)
Center-of-Mass det. time= 154.8 min (964.0 - 809.2)

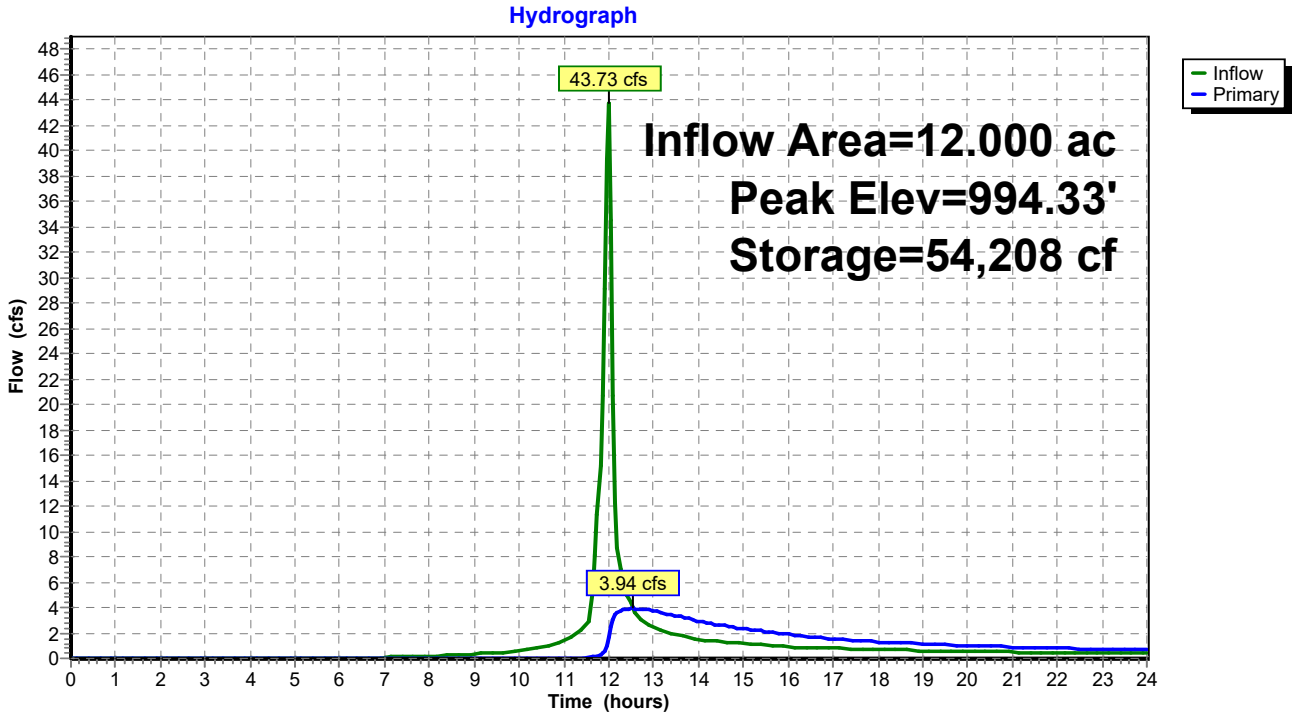
Volume	Invert	Avail.Storage	Storage Description
#1	992.00'	167,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
992.00	20,519	0	0
993.00	22,818	21,669	21,669
994.00	25,218	24,018	45,687
995.00	27,718	26,468	72,155
996.00	30,318	29,018	101,173
997.00	33,019	31,669	132,841
998.00	35,821	34,420	167,261

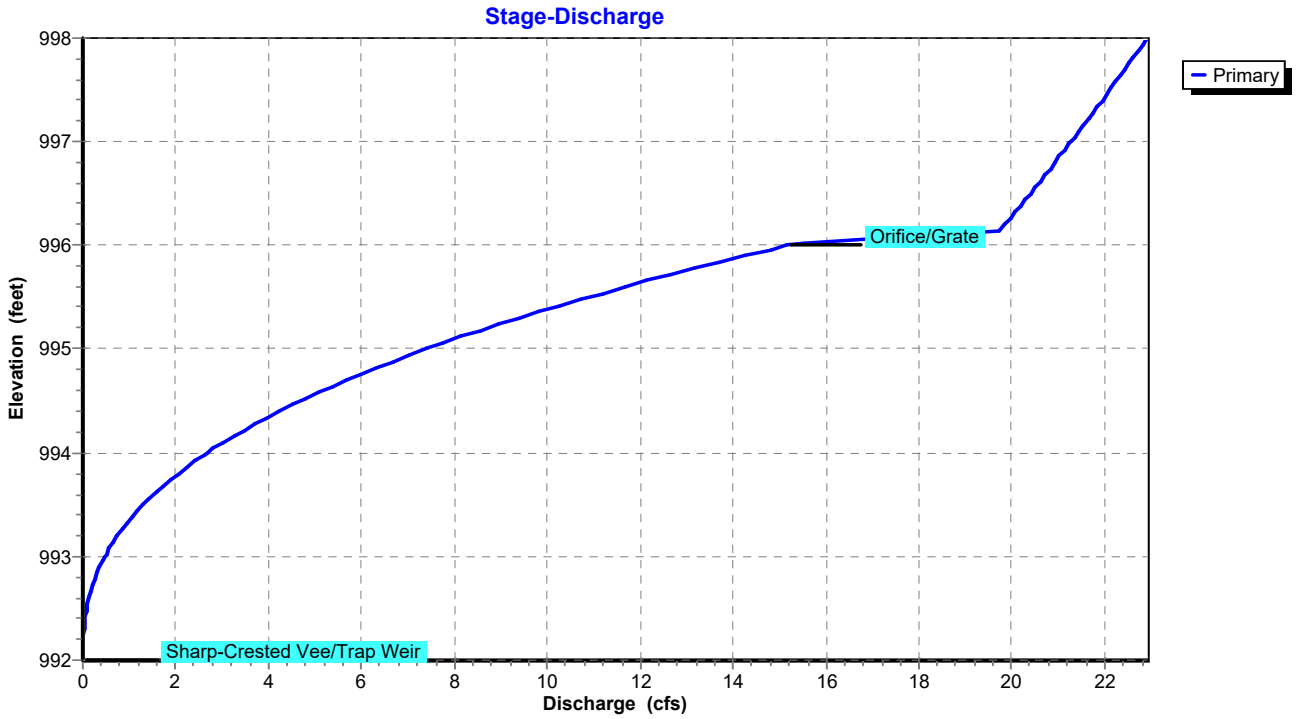
Device	Routing	Invert	Outlet Devices
#1	Primary	990.00'	**18.0" Round Culvert** L= 55.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 990.00' / 985.00' S= 0.0899 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Device 1	992.00'	**20.0 deg x 4.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.69 (C= 3.36)
#3	Device 1	996.00'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.94 cfs @ 12.53 hrs HW=994.33' (Free Discharge)
└**1=Culvert** (Passes 3.94 cfs of 16.10 cfs potential flow)
  ├**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 3.94 cfs @ 4.11 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

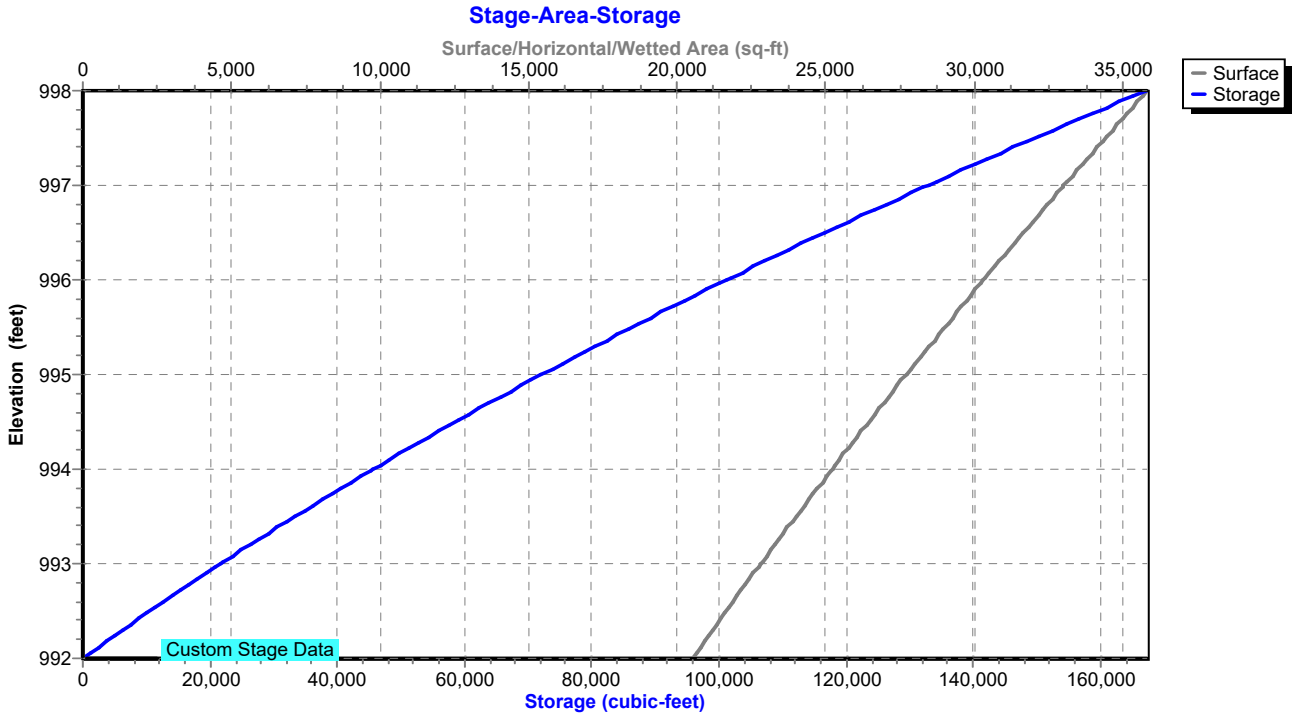
Pond 13P: EWDB #2



Pond 13P: EWDB #2



Pond 13P: EWDB #2



Summary for Pond 14P: EWDB #3

[79] Warning: Submerged Pond 13P Primary device # 1 OUTLET by 3.33'

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 1.91" for 2-Year event
Inflow = 78.46 cfs @ 12.00 hrs, Volume= 5.686 af
Outflow = 17.52 cfs @ 12.25 hrs, Volume= 4.561 af, Atten= 78%, Lag= 15.2 min
Primary = 17.52 cfs @ 12.25 hrs, Volume= 4.561 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 988.33' @ 12.25 hrs Surf.Area= 39,956 sf Storage= 83,938 cf

Plug-Flow detention time= 159.1 min calculated for 4.552 af (80% of inflow)
Center-of-Mass det. time= 74.0 min (937.0 - 863.1)

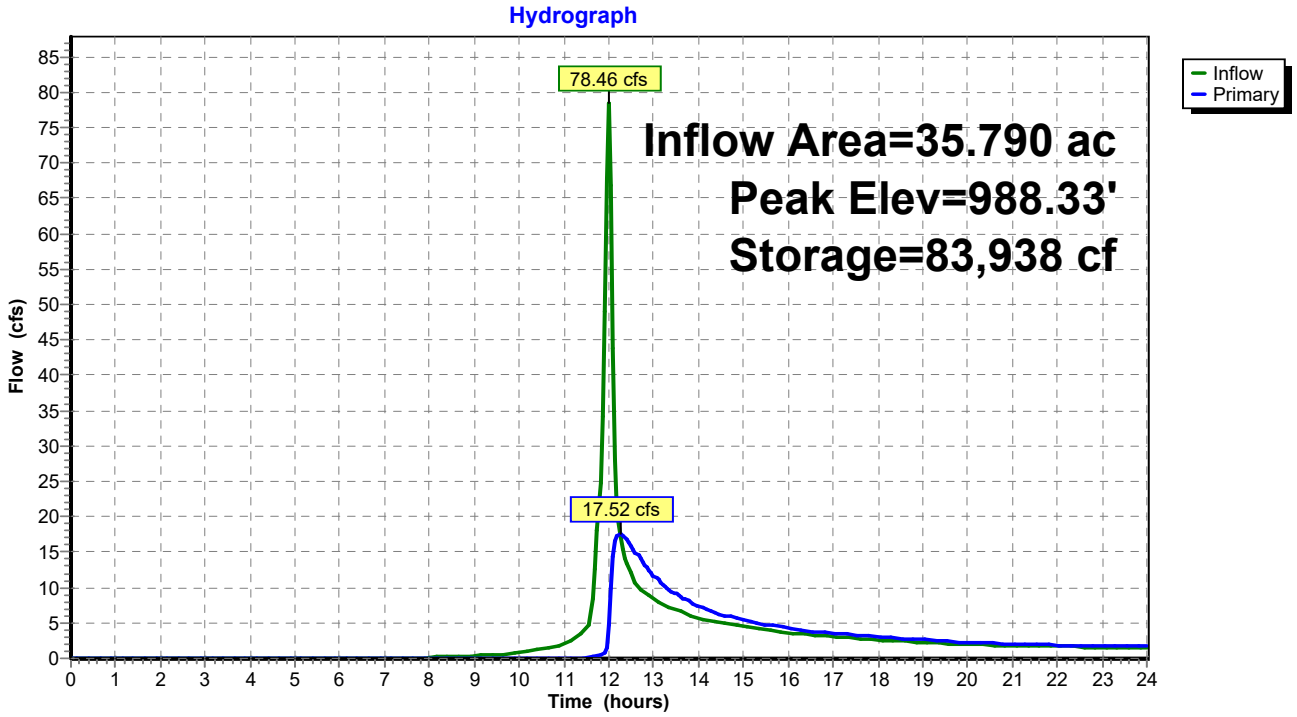
Volume	Invert	Avail.Storage	Storage Description
#1	986.00'	260,929 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
986.00	32,444	0	0
987.00	35,398	33,921	33,921
988.00	38,453	36,926	70,847
989.00	42,954	40,704	111,550
990.00	47,178	45,066	156,616
991.00	52,032	49,605	206,221
992.00	57,384	54,708	260,929

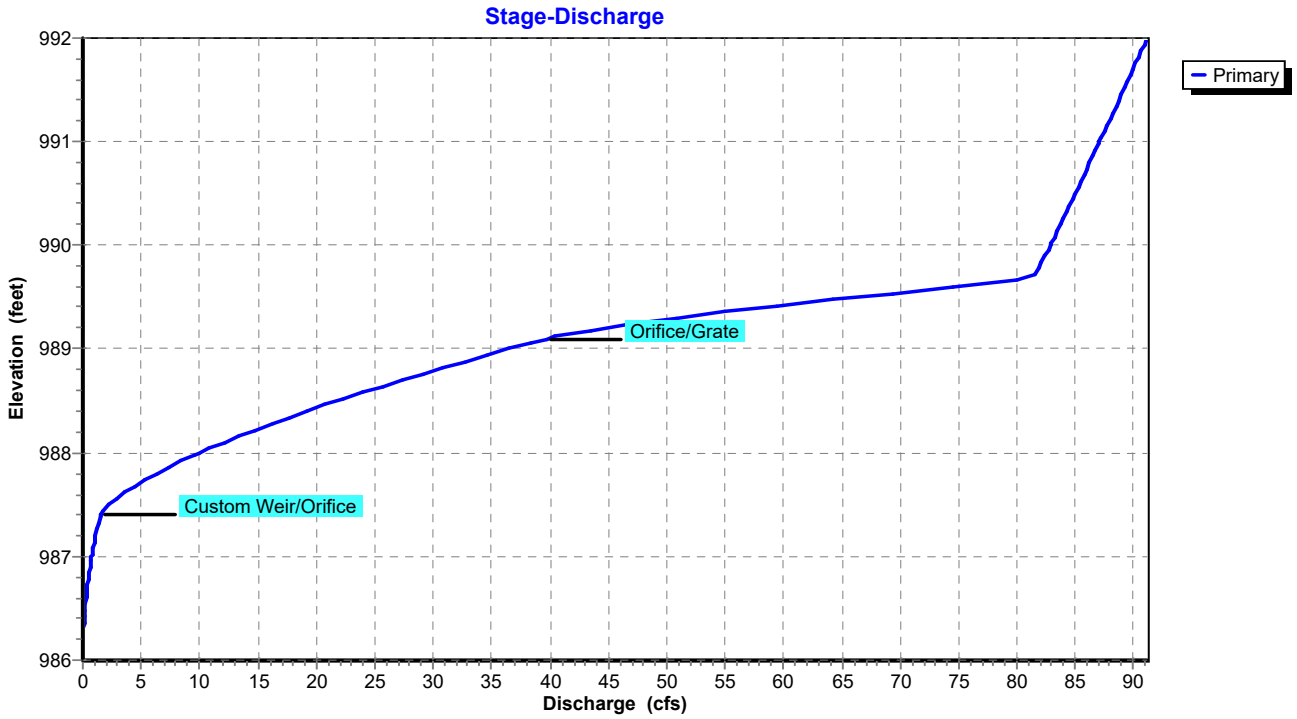
Device	Routing	Invert	Outlet Devices
#1	Primary	979.00'	**36.0" Round Culvert** L= 200.1' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 979.00' / 977.28' S= 0.0086 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Device 1	985.80'	**20.0 deg x 1.60' rise Sharp-Crested Vee/Trap Weir** Cv= 2.69 (C= 3.36)
#3	Device 1	987.40'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Elev. (feet) 987.40 989.10 Width (feet) 5.00 5.00
#4	Device 1	989.10'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=17.51 cfs @ 12.25 hrs HW=988.33' (Free Discharge)
└**1=Culvert** (Passes 17.51 cfs of 75.20 cfs potential flow)
  ├**2=Sharp-Crested Vee/Trap Weir** (Orifice Controls 2.74 cfs @ 6.06 fps)
  ├**3=Custom Weir/Orifice** (Weir Controls 14.77 cfs @ 3.16 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

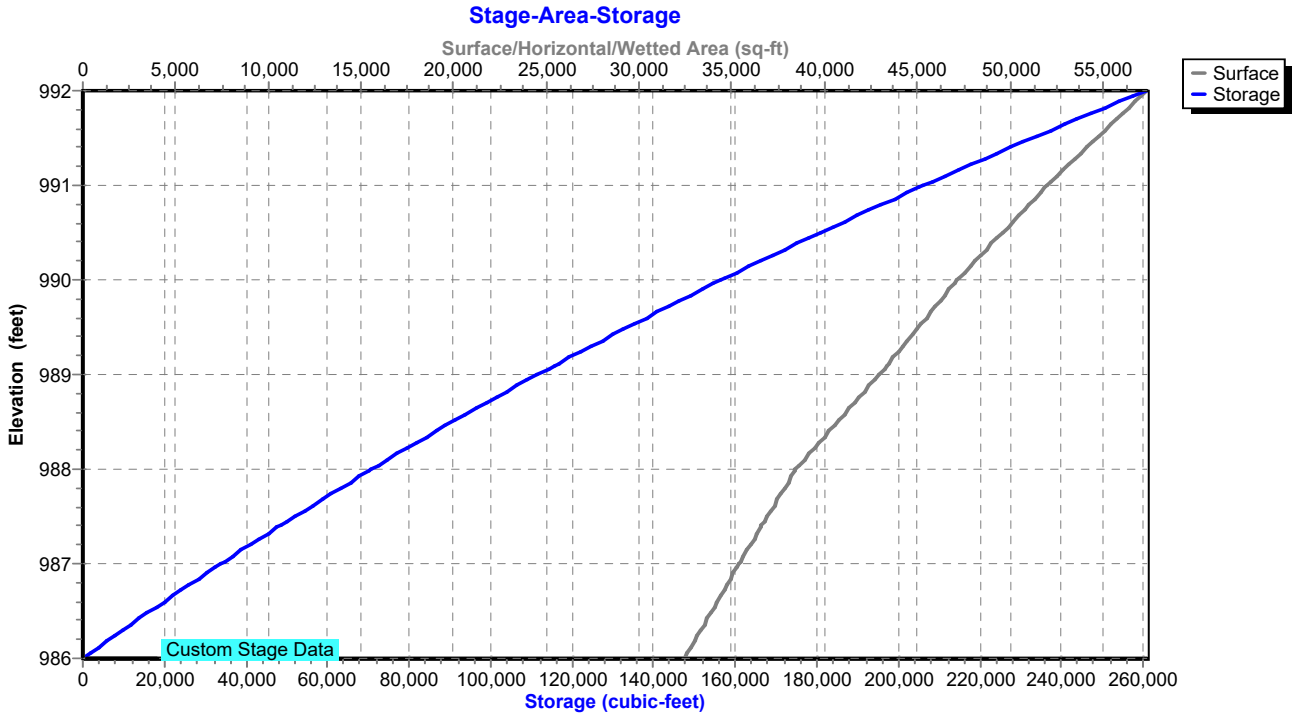
Pond 14P: EWDB #3



Pond 14P: EWDB #3



Pond 14P: EWDB #3



Summary for Pond 15P: EDDB #1

Inflow Area = 4.930 ac, 85.00% Impervious, Inflow Depth > 2.83" for 2-Year event
Inflow = 21.75 cfs @ 11.98 hrs, Volume= 1.164 af
Outflow = 3.67 cfs @ 12.21 hrs, Volume= 0.679 af, Atten= 83%, Lag= 13.7 min
Primary = 3.67 cfs @ 12.21 hrs, Volume= 0.679 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,007.81' @ 12.21 hrs Surf.Area= 13,874 sf Storage= 25,710 cf

Plug-Flow detention time= 193.1 min calculated for 0.677 af (58% of inflow)
Center-of-Mass det. time= 88.3 min (869.4 - 781.1)

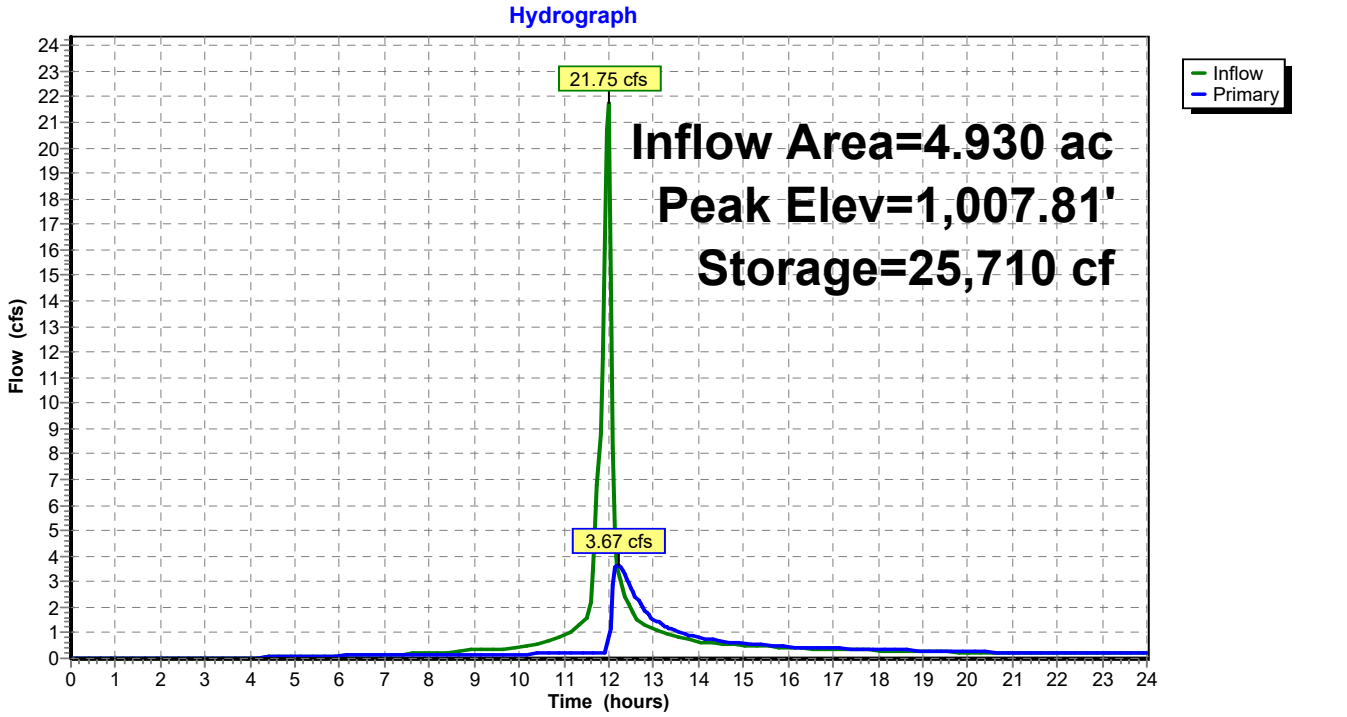
Volume	Invert	Avail.Storage	Storage Description
#1	1,004.00'	68,100 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,004.00	50	0	0
1,006.00	6,872	6,922	6,922
1,008.00	14,603	21,475	28,397
1,010.00	25,100	39,703	68,100

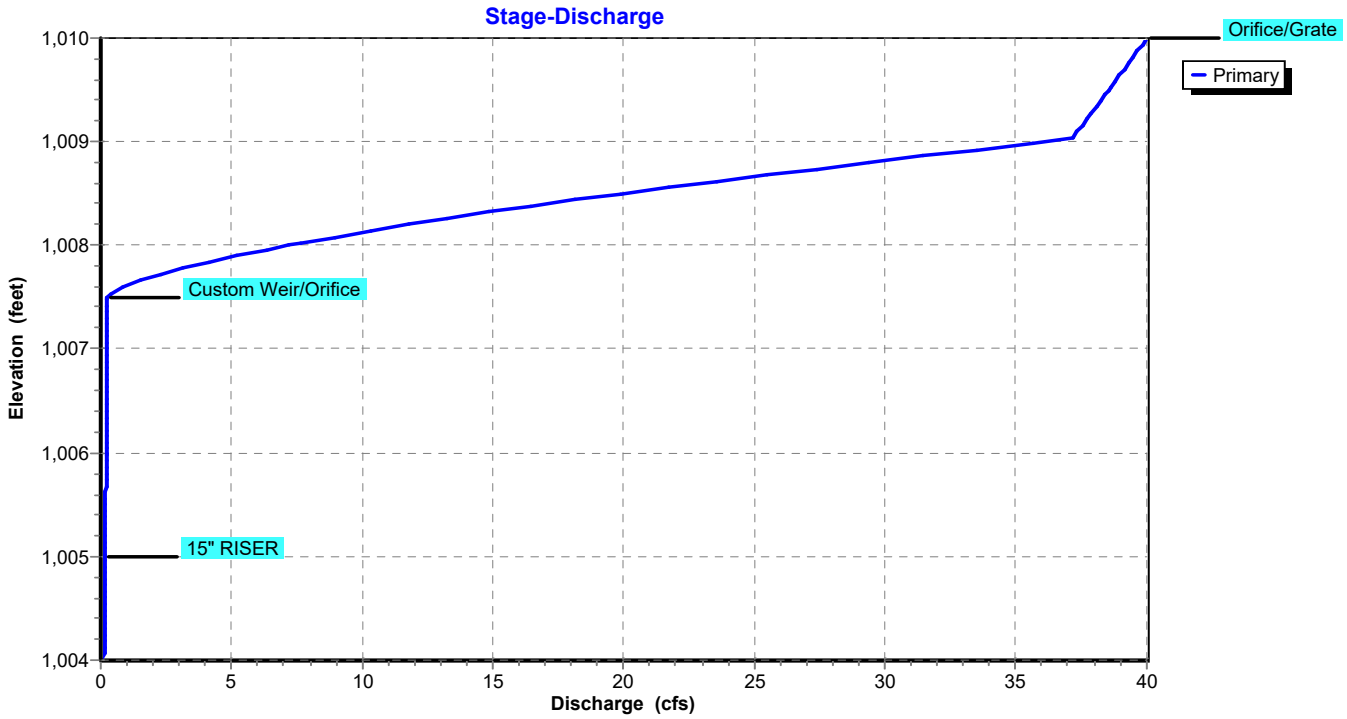
Device	Routing	Invert	Outlet Devices
#1	Primary	1,002.00'	**24.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 1,002.00' / 1,001.50' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	1,002.25'	**2.0" Vert. 2.0" ORIFICE** C= 0.600
#3	Device 1	1,007.50'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Elev. (feet) 1,007.50 1,009.50 Width (feet) 6.00 6.00
#4	Device 2	1,002.50'	**6.0" Round 6" PVC** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,002.50' / 1,002.25' S= 0.0083 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#5	Device 2	1,005.00'	**1.0" Vert. 15" RISER X 7.00 columns** X 9 rows with 4.0" cc spacing C= 0.600
#6	Device 1	1,010.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.65 cfs @ 12.21 hrs HW=1,007.81' (Free Discharge)
└**1=Culvert** (Passes 3.65 cfs of 33.18 cfs potential flow)
  ├**2=2.0" ORIFICE** (Orifice Controls 0.25 cfs @ 11.27 fps)
  │ ├**4=6" PVC** (Passes < 2.08 cfs potential flow)
  │ └**5=15" RISER** (Passes < 1.86 cfs potential flow)
  ├**3=Custom Weir/Orifice** (Weir Controls 3.40 cfs @ 1.83 fps)
  └**6=Orifice/Grate** (Controls 0.00 cfs)

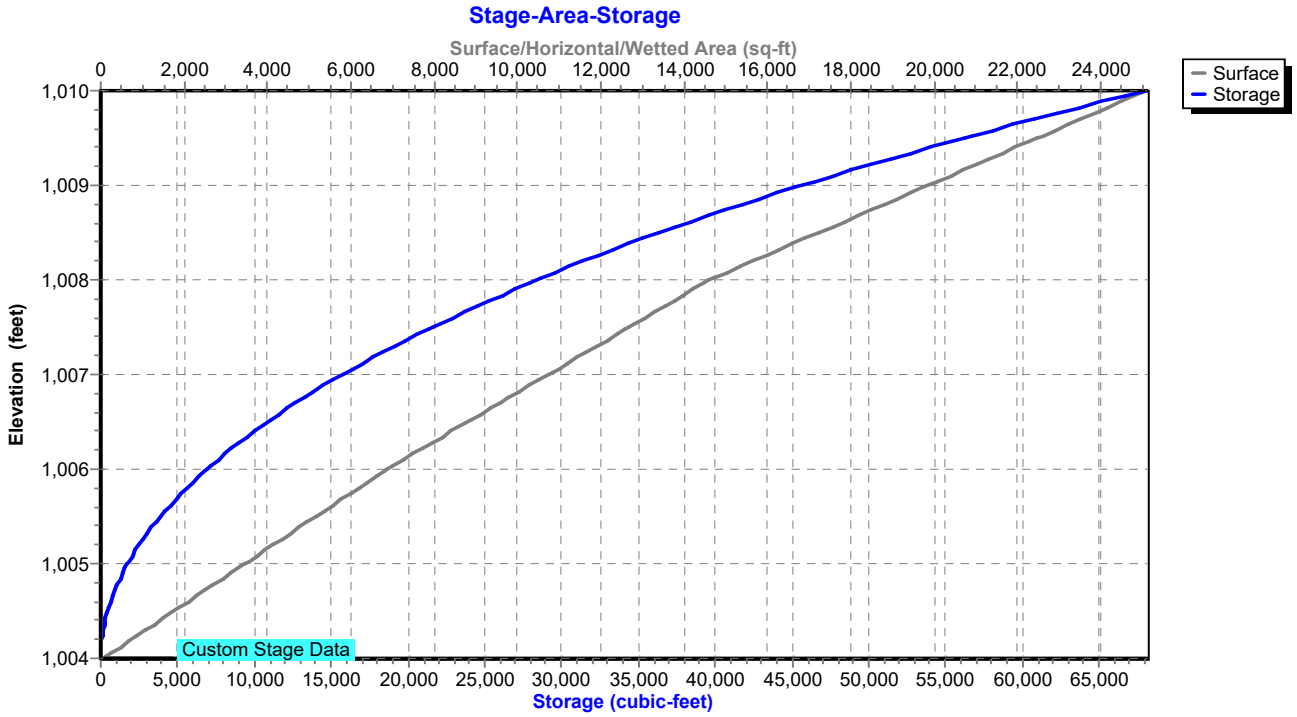
Pond 15P: EDDB #1



Pond 15P: EDDB #1



Pond 15P: EDDB #1

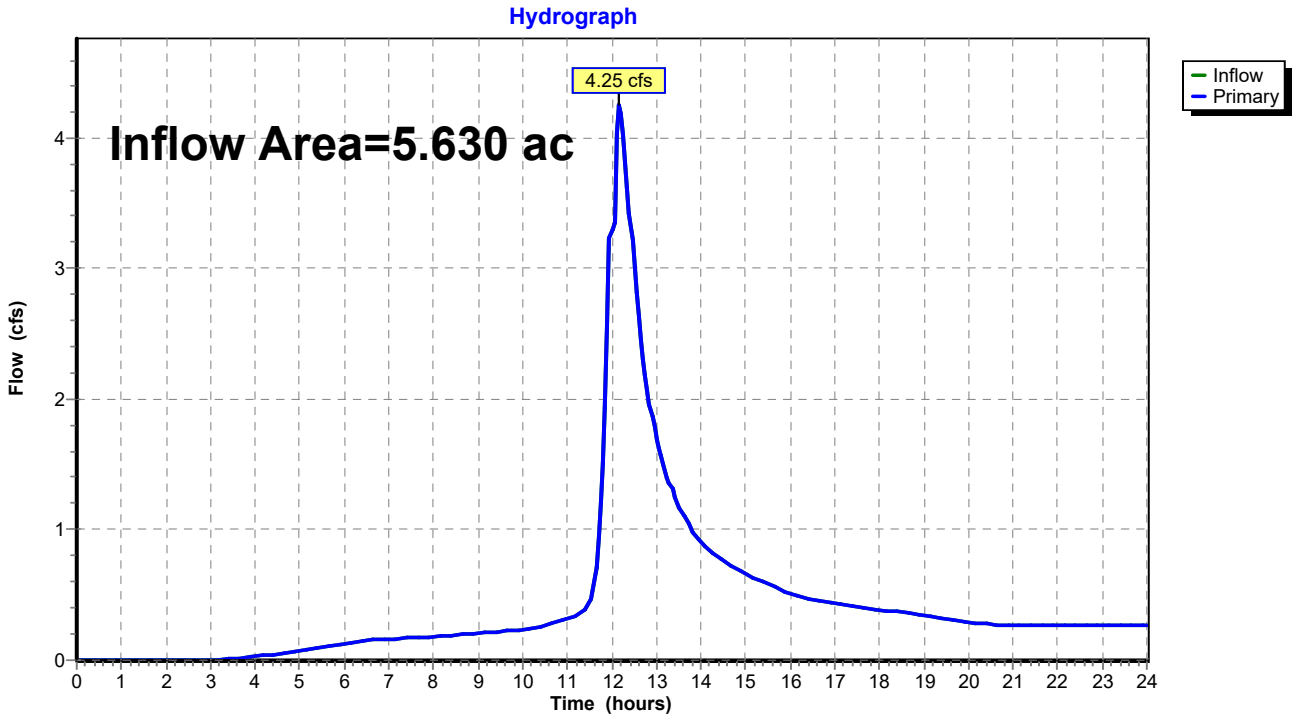


Summary for Link 7L: RP-1

Inflow Area = 5.630 ac, 85.00% Impervious, Inflow Depth > 1.81" for 2-Year event
Inflow = 4.25 cfs @ 12.16 hrs, Volume= 0.850 af
Primary = 4.25 cfs @ 12.16 hrs, Volume= 0.850 af, Atten= 0%, Lag= 0.0 min

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

Link 7L: RP-1

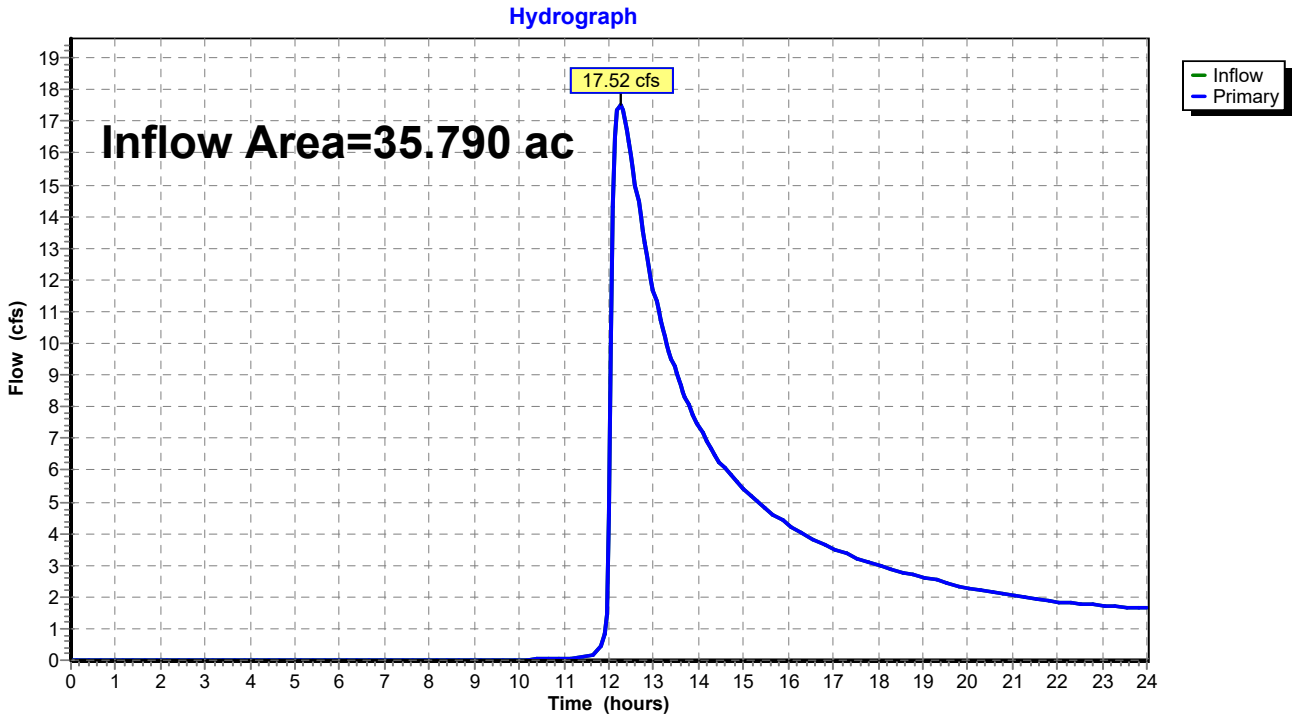


Summary for Link 9L: RP-3

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 1.53" for 2-Year event
Inflow = 17.52 cfs @ 12.25 hrs, Volume= 4.561 af
Primary = 17.52 cfs @ 12.25 hrs, Volume= 4.561 af, Atten= 0%, Lag= 0.0 min

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

Link 9L: RP-3

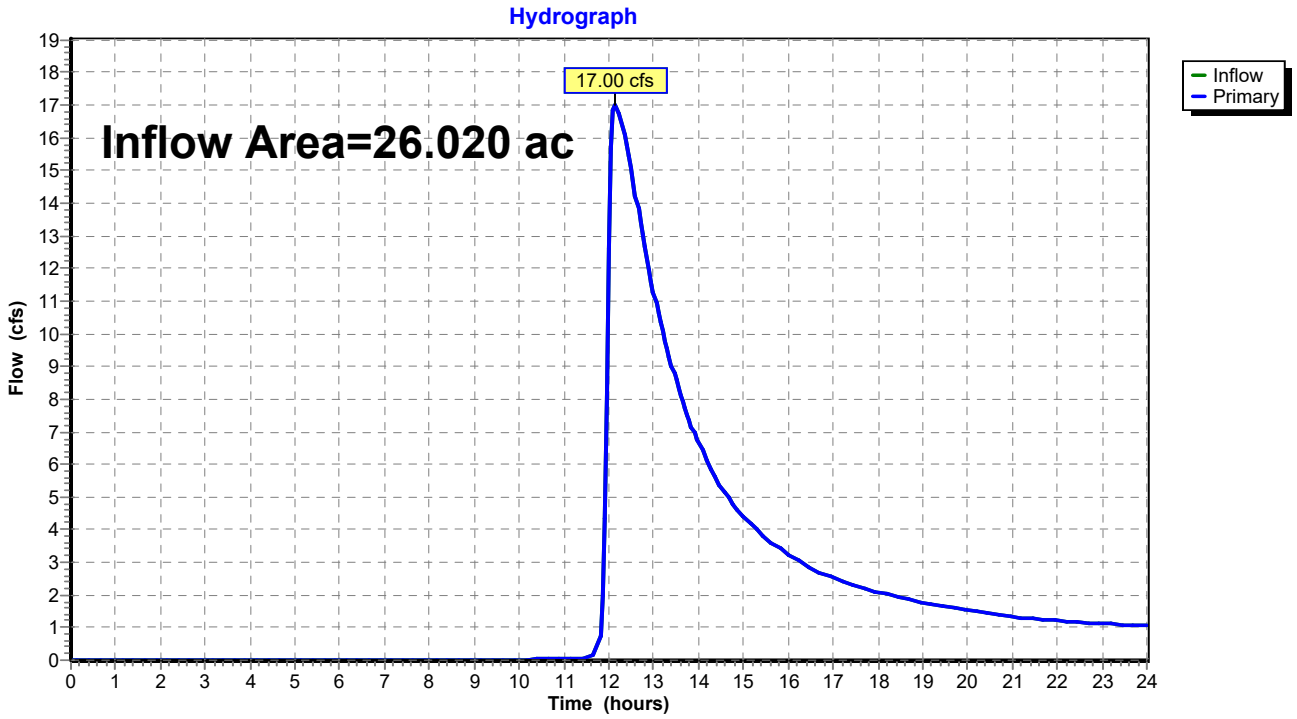


Summary for Link 10L: RP-4

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 1.80" for 2-Year event
Inflow = 17.00 cfs @ 12.15 hrs, Volume= 3.911 af
Primary = 17.00 cfs @ 12.15 hrs, Volume= 3.911 af, Atten= 0%, Lag= 0.0 min

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

Link 10L: RP-4



Summary for Subcatchment 11S: Onsite 5

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

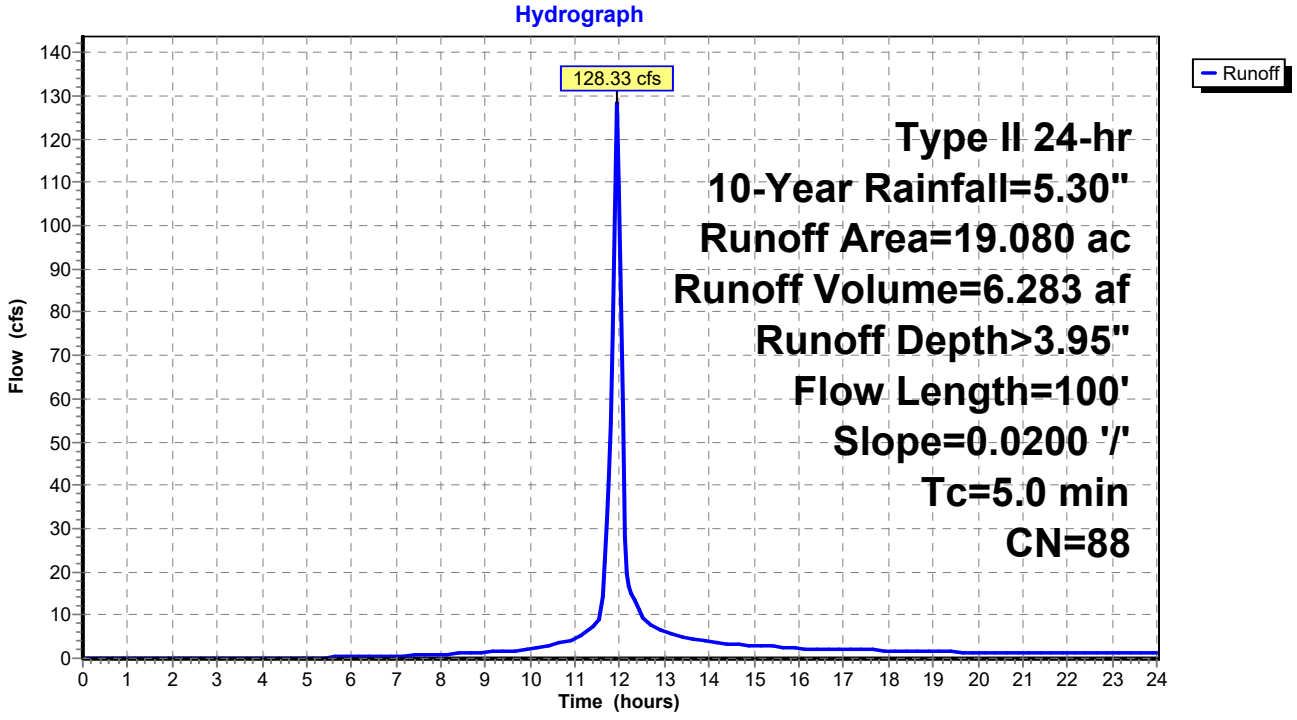
Runoff = 128.33 cfs @ 11.95 hrs, Volume= 6.283 af, Depth> 3.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	19.080	88	Apartments, 65% imp, HSG C
	6.678		35.00% Pervious Area
	12.402		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
3.9					**Direct Entry, Pipe flow**
5.0	100	Total			

Subcatchment 11S: Onsite 5



Summary for Subcatchment 12S: EX OFF

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

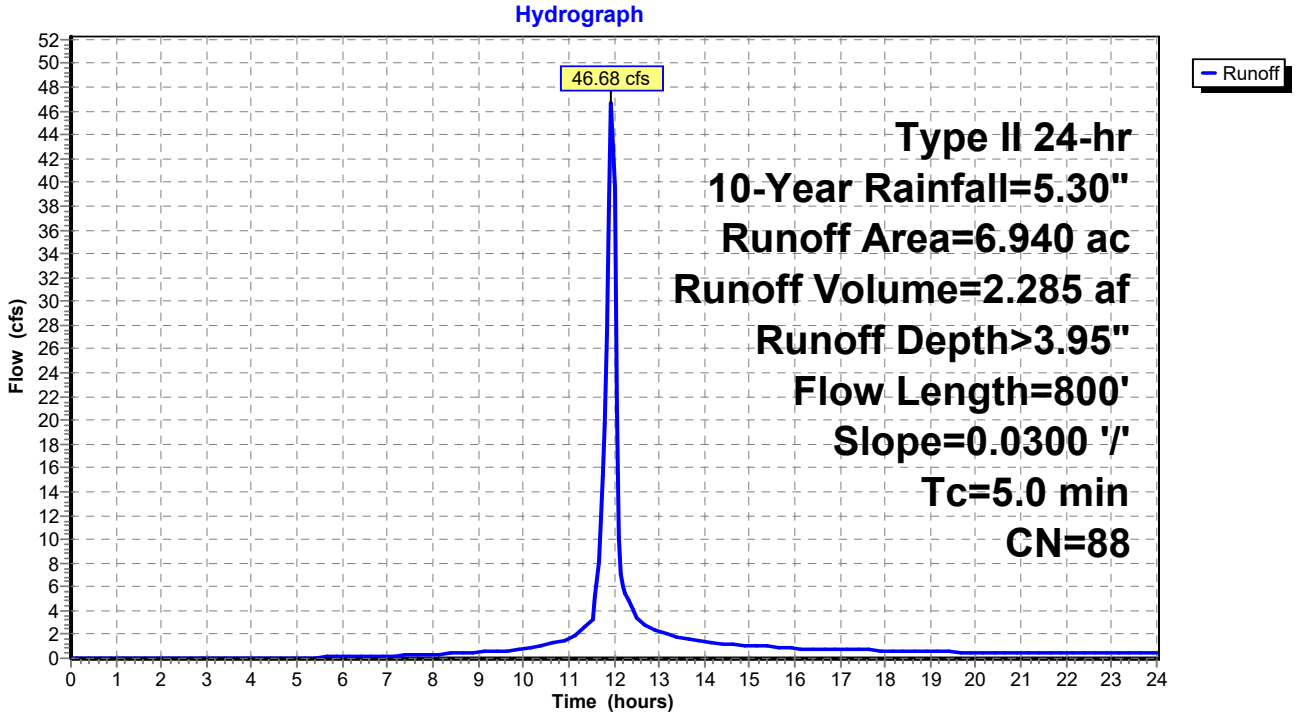
Runoff = 46.68 cfs @ 11.95 hrs, Volume= 2.285 af, Depth> 3.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	6.940	88	Future Multi-Family, 65% imp, HSG C
	2.429		35.00% Pervious Area
	4.511		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0300	1.72		**Sheet Flow, Sheet flow** Smooth surfaces n= 0.011 P2= 3.60"
4.0	700		2.92		**Direct Entry, Pipe flow**
5.0	800	Total			

Subcatchment 12S: EX OFF



Summary for Subcatchment 13S: Onsite 4

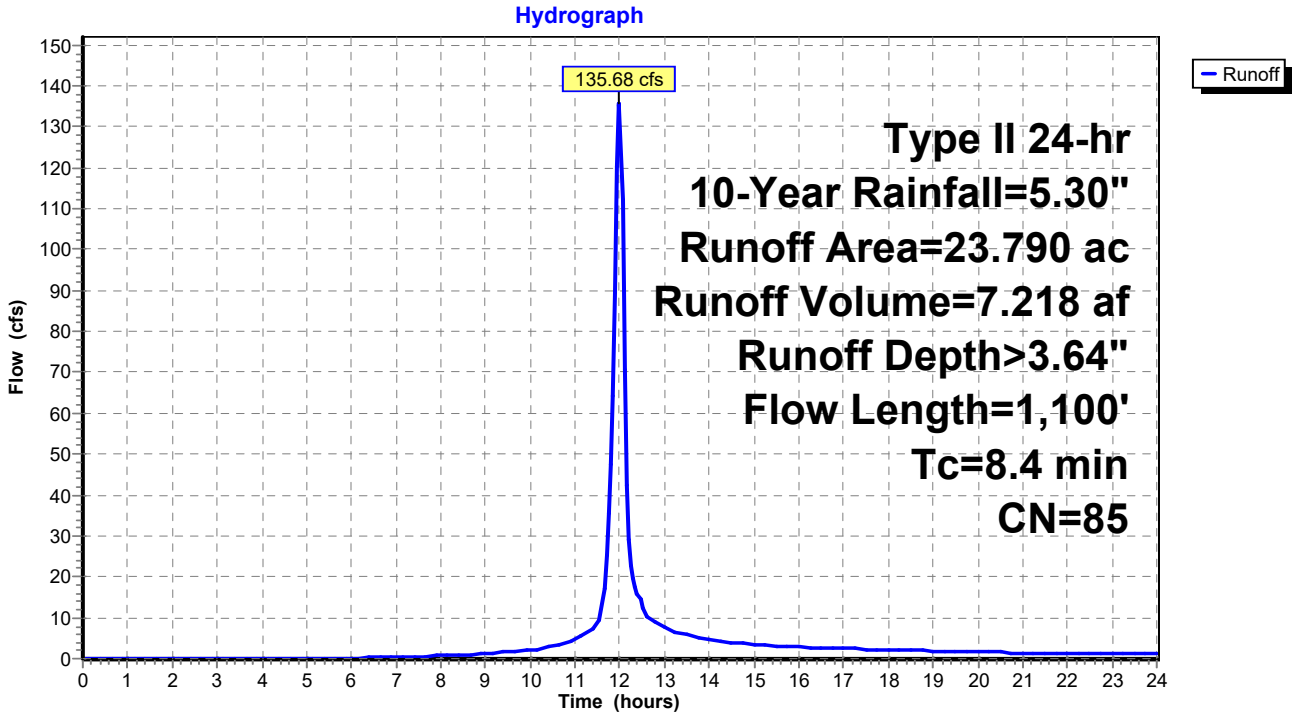
Runoff = 135.68 cfs @ 11.99 hrs, Volume= 7.218 af, Depth> 3.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	11.250	82	SINGLE FAMILY LOTS
*	12.540	88	1/8 acre lots, 65% imp, HSG D
	23.790	85	Weighted Average
	15.639		65.74% Pervious Area
	8.151		34.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0205	1.47		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
7.3	1,000	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.4	1,100	Total			

Subcatchment 13S: Onsite 4



Summary for Subcatchment 15S: Onsite 2

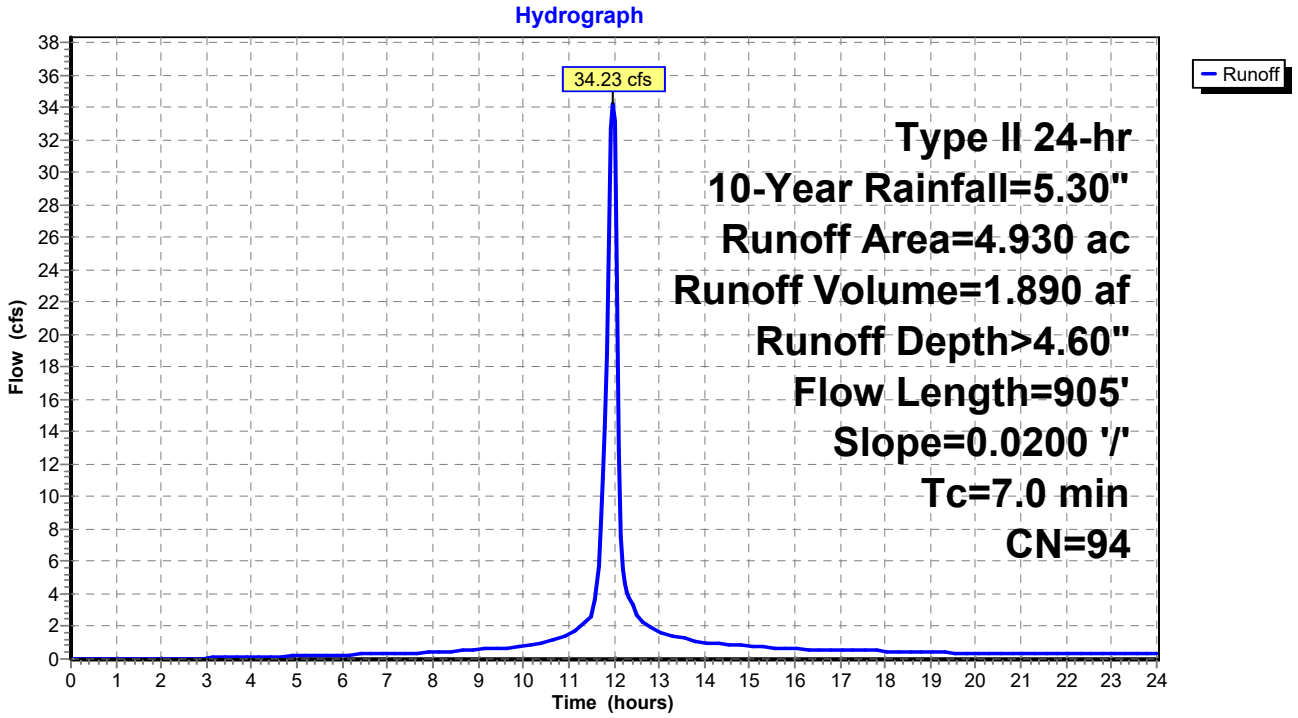
Runoff = 34.23 cfs @ 11.98 hrs, Volume= 1.890 af, Depth> 4.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	4.930	94	Urban commercial, 85% imp, HSG D
	0.739		15.00% Pervious Area
	4.190		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
5.9	805	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.0	905	Total			

Subcatchment 15S: Onsite 2



Summary for Subcatchment 16S: Onsite 3

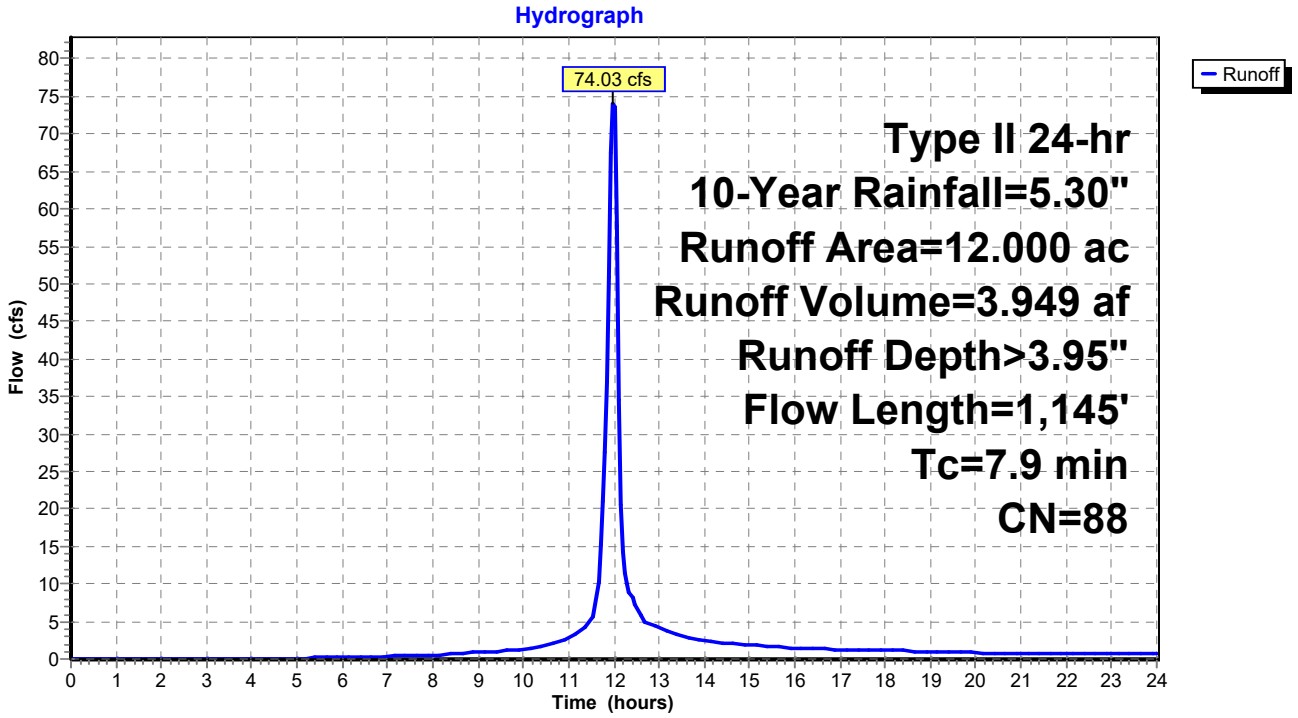
Runoff = 74.03 cfs @ 11.99 hrs, Volume= 3.949 af, Depth> 3.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	12.000	88	1/8 acre lots, 65% imp, HSG D
	4.200		35.00% Pervious Area
	7.800		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
6.8	1,045	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.9	1,145	Total			

Subcatchment 16S: Onsite 3



Summary for Subcatchment 17S: Onsite 1

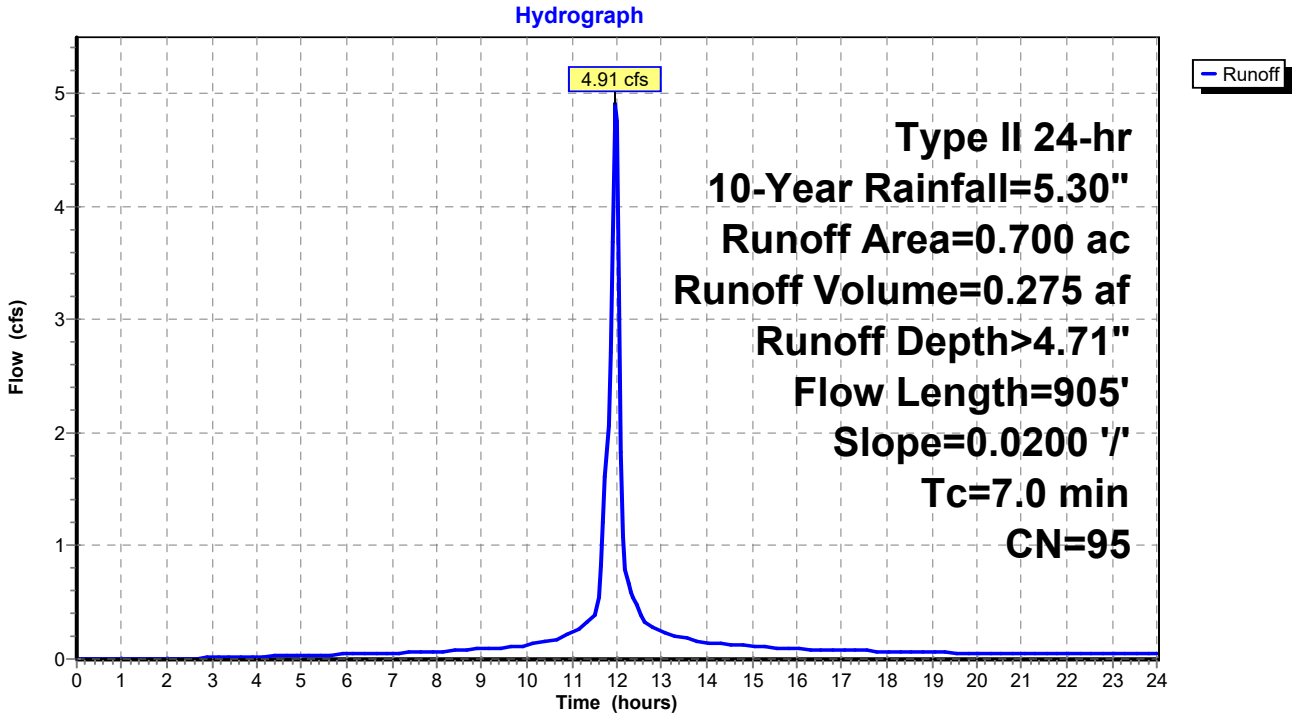
Runoff = 4.91 cfs @ 11.98 hrs, Volume= 0.275 af, Depth> 4.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

Area (ac)	CN	Description
0.700	95	Urban commercial, 85% imp, HSG D
0.105		15.00% Pervious Area
0.595		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
5.9	805	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.0	905	Total			

Subcatchment 17S: Onsite 1



Summary for Pond 12P: EWDB #1

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 3.95" for 10-Year event
Inflow = 175.01 cfs @ 11.95 hrs, Volume= 8.569 af
Outflow = 30.96 cfs @ 12.13 hrs, Volume= 7.474 af, Atten= 82%, Lag= 10.9 min
Primary = 30.96 cfs @ 12.13 hrs, Volume= 7.474 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 997.53' @ 12.13 hrs Surf.Area= 78,016 sf Storage= 184,513 cf

Plug-Flow detention time= 147.3 min calculated for 7.474 af (87% of inflow)
Center-of-Mass det. time= 86.7 min (877.9 - 791.2)

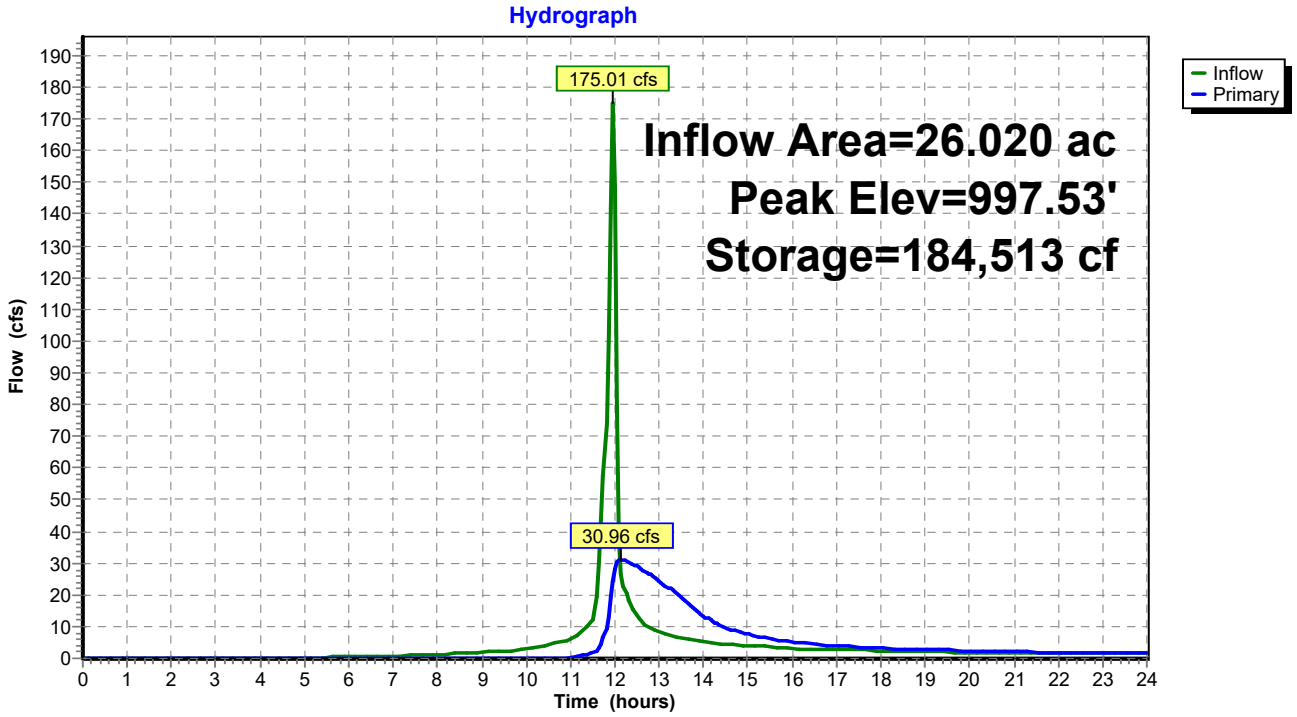
Volume	Invert	Avail.Storage	Storage Description
#1	995.00'	389,753 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
995.00	67,904	0	0
996.00	71,853	69,879	69,879
997.00	75,863	73,858	143,737
998.00	79,925	77,894	221,631
999.00	84,048	81,987	303,617
1,000.00	88,224	86,136	389,753

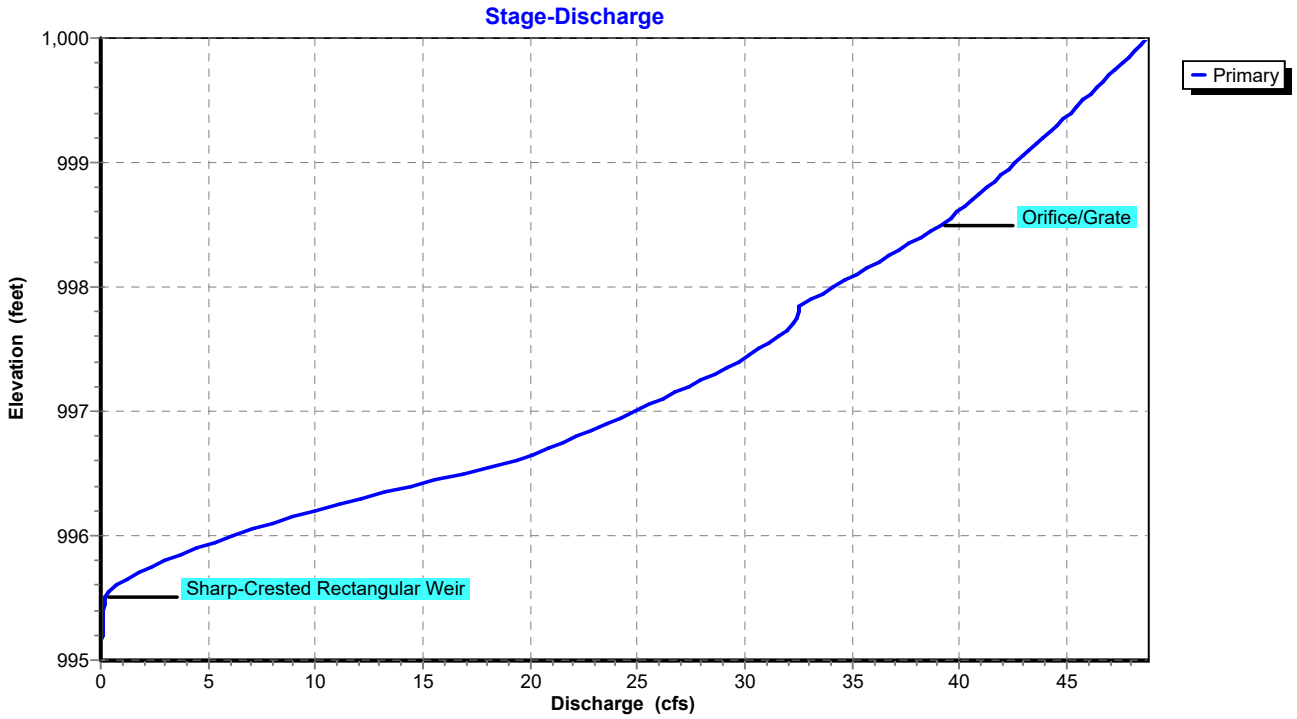
Device	Routing	Invert	Outlet Devices
#1	Primary	994.50'	**30.0" Round Culvert** L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 994.50' / 993.90' S= 0.0075 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	994.80'	**20.0 deg x 0.70' rise Sharp-Crested Vee/Trap Weir** Cv= 2.69 (C= 3.36)
#3	Device 1	995.50'	**5.0' long x 3.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height
#4	Device 1	998.50'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=30.95 cfs @ 12.13 hrs HW=997.53' (Free Discharge)
└**1=Culvert** (Barrel Controls 30.95 cfs @ 6.61 fps)
  ├**2=Sharp-Crested Vee/Trap Weir** (Passes < 0.65 cfs potential flow)
  ├**3=Sharp-Crested Rectangular Weir** (Passes < 46.98 cfs potential flow)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

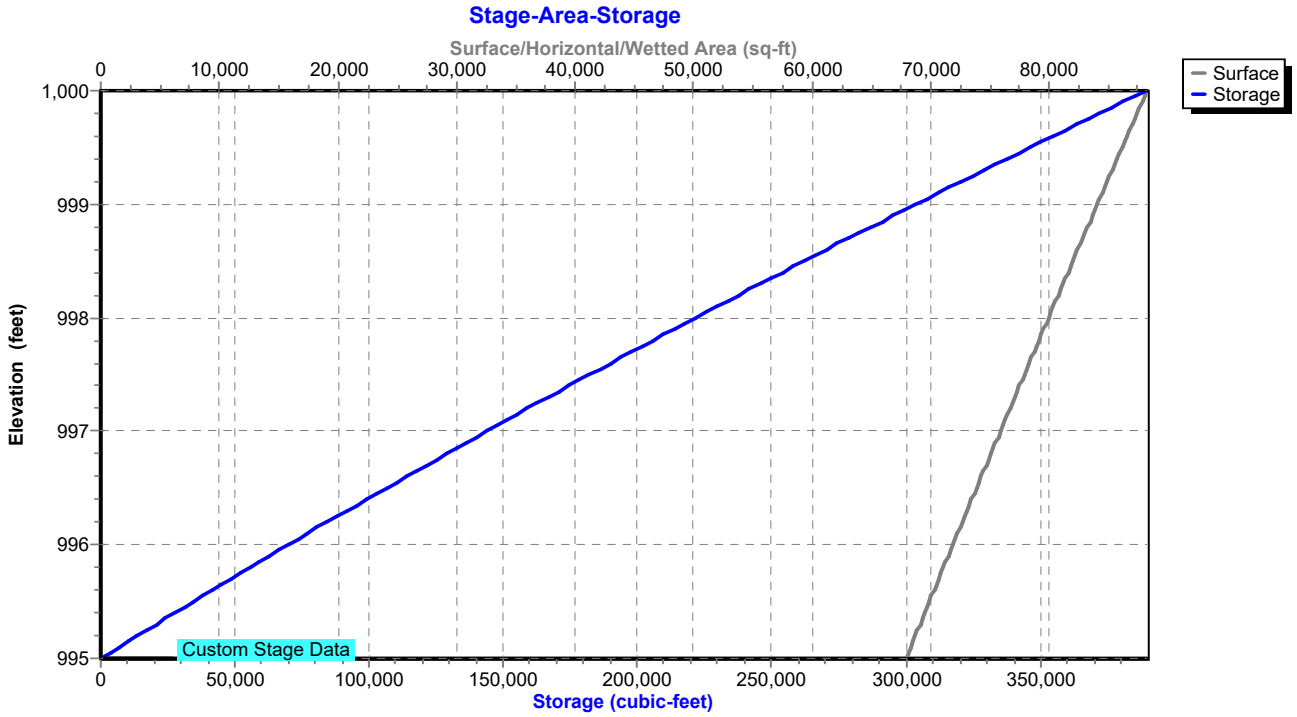
Pond 12P: EWDB #1



Pond 12P: EWDB #1



Pond 12P: EWDB #1



Summary for Pond 13P: EWDB #2

Inflow Area = 12.000 ac, 65.00% Impervious, Inflow Depth > 3.95" for 10-Year event
Inflow = 74.03 cfs @ 11.99 hrs, Volume= 3.949 af
Outflow = 11.91 cfs @ 12.25 hrs, Volume= 3.286 af, Atten= 84%, Lag= 15.6 min
Primary = 11.91 cfs @ 12.25 hrs, Volume= 3.286 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 995.63' @ 12.25 hrs Surf.Area= 29,356 sf Storage= 90,135 cf

Plug-Flow detention time= 194.9 min calculated for 3.279 af (83% of inflow)
Center-of-Mass det. time= 123.5 min (917.0 - 793.5)

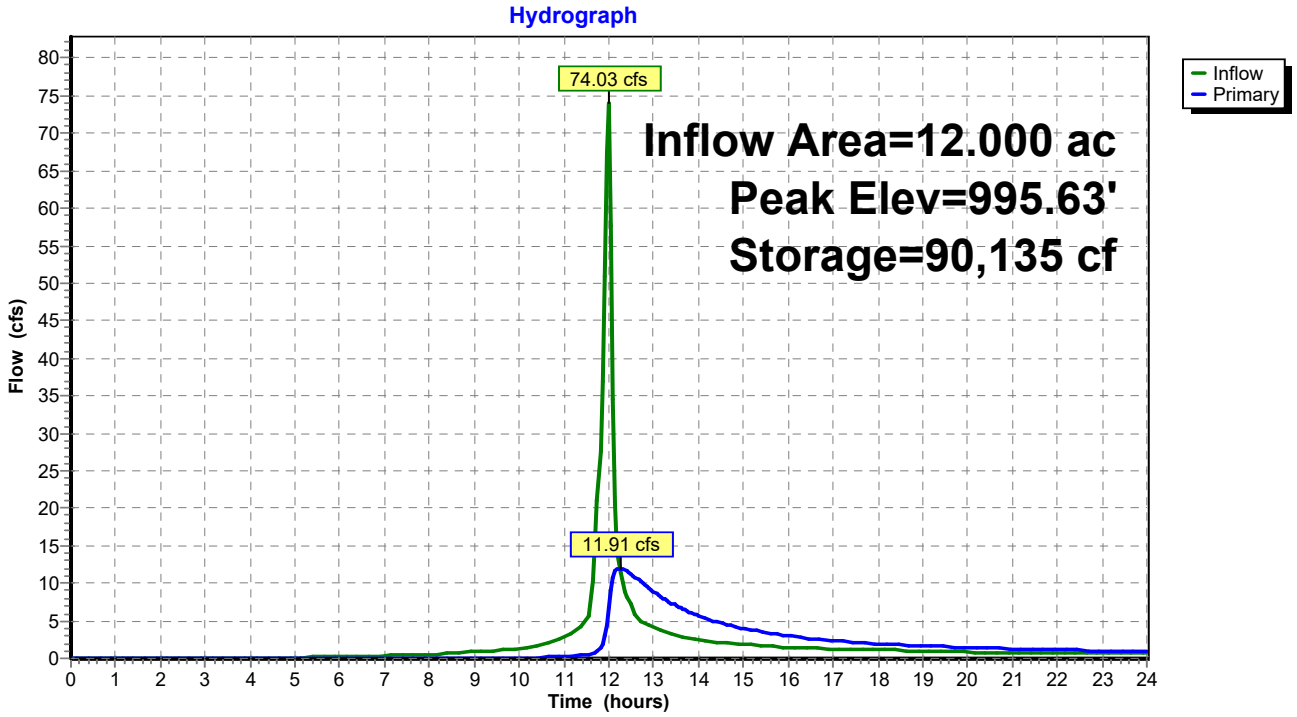
Volume	Invert	Avail.Storage	Storage Description
#1	992.00'	167,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
992.00	20,519	0	0
993.00	22,818	21,669	21,669
994.00	25,218	24,018	45,687
995.00	27,718	26,468	72,155
996.00	30,318	29,018	101,173
997.00	33,019	31,669	132,841
998.00	35,821	34,420	167,261

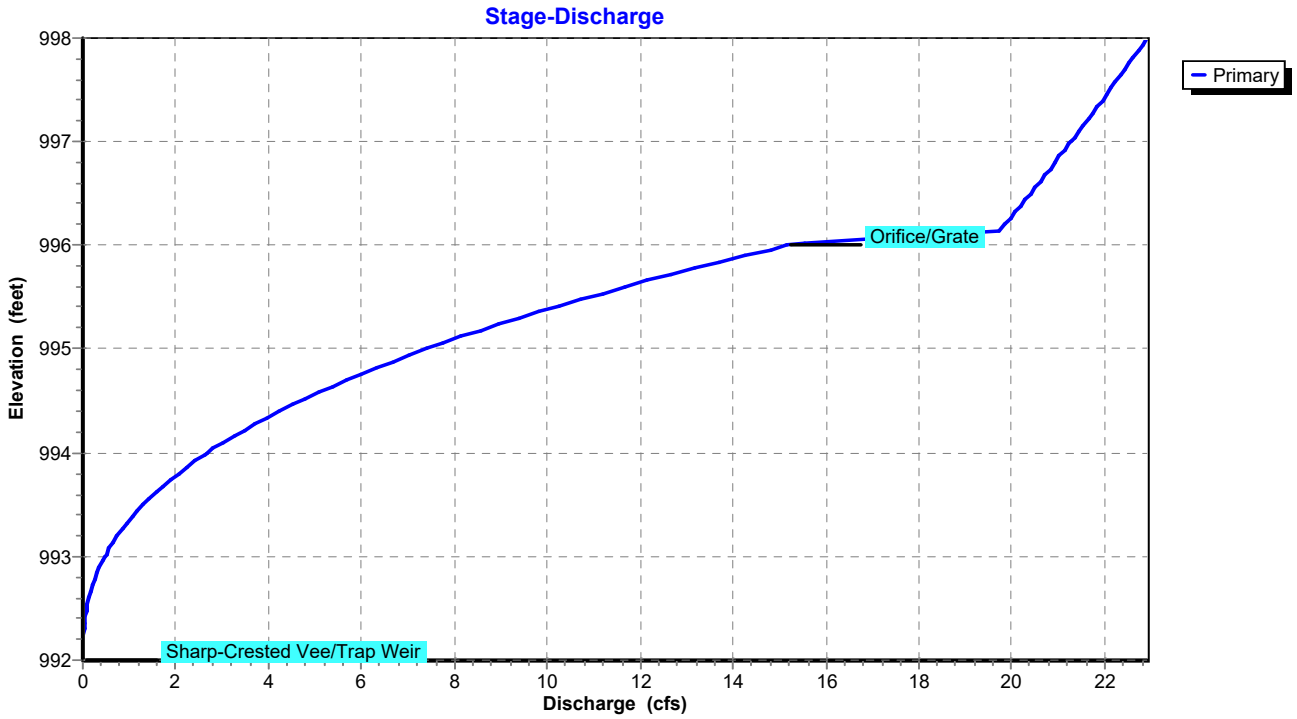
Device	Routing	Invert	Outlet Devices
#1	Primary	990.00'	**18.0" Round Culvert** L= 55.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 990.00' / 985.00' S= 0.0899 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Device 1	992.00'	**20.0 deg x 4.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.69 (C= 3.36)
#3	Device 1	996.00'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=11.91 cfs @ 12.25 hrs HW=995.63' (Free Discharge)
└**1=Culvert** (Passes 11.91 cfs of 18.80 cfs potential flow)
  ├**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 11.91 cfs @ 5.13 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

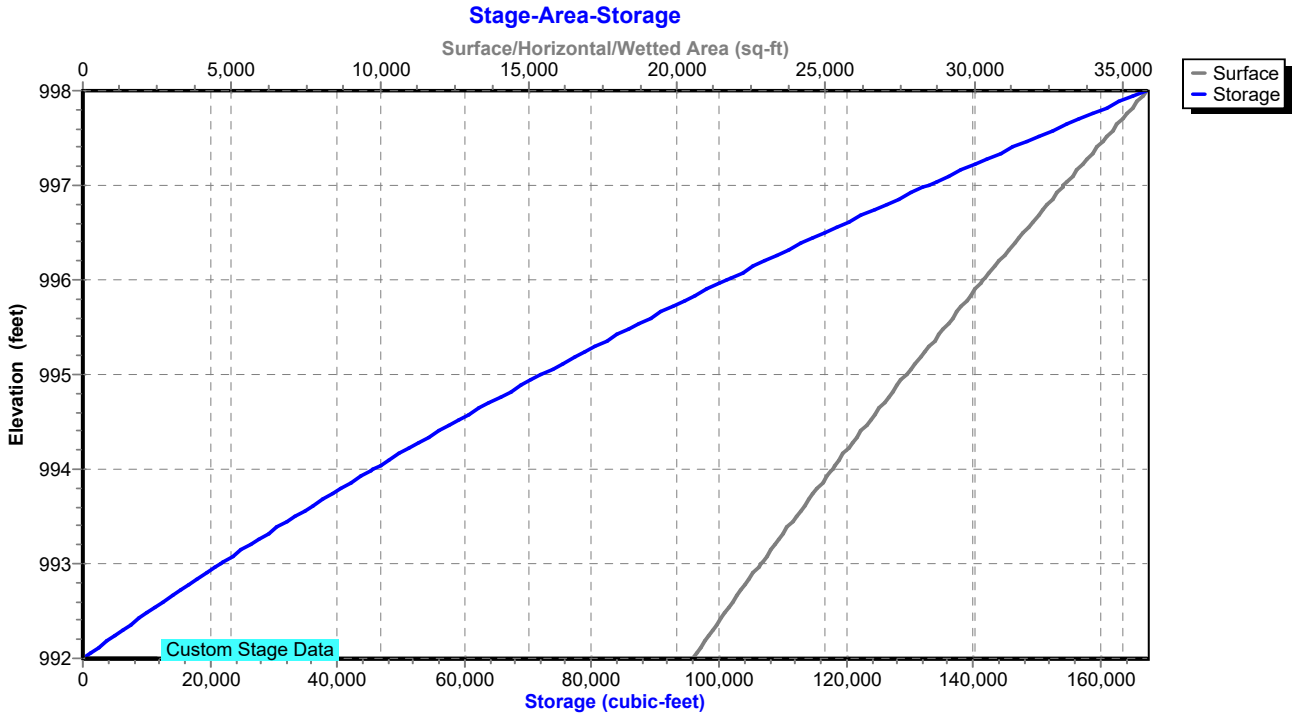
Pond 13P: EWDB #2



Pond 13P: EWDB #2



Pond 13P: EWDB #2



Summary for Pond 14P: EWDB #3

[79] Warning: Submerged Pond 13P Primary device # 1 OUTLET by 4.53'

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 3.52" for 10-Year event
Inflow = 142.24 cfs @ 12.00 hrs, Volume= 10.504 af
Outflow = 69.83 cfs @ 12.12 hrs, Volume= 9.298 af, Atten= 51%, Lag= 7.6 min
Primary = 69.83 cfs @ 12.12 hrs, Volume= 9.298 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 989.55' @ 12.12 hrs Surf.Area= 45,267 sf Storage= 135,700 cf

Plug-Flow detention time= 105.6 min calculated for 9.279 af (88% of inflow)
Center-of-Mass det. time= 50.4 min (889.4 - 839.0)

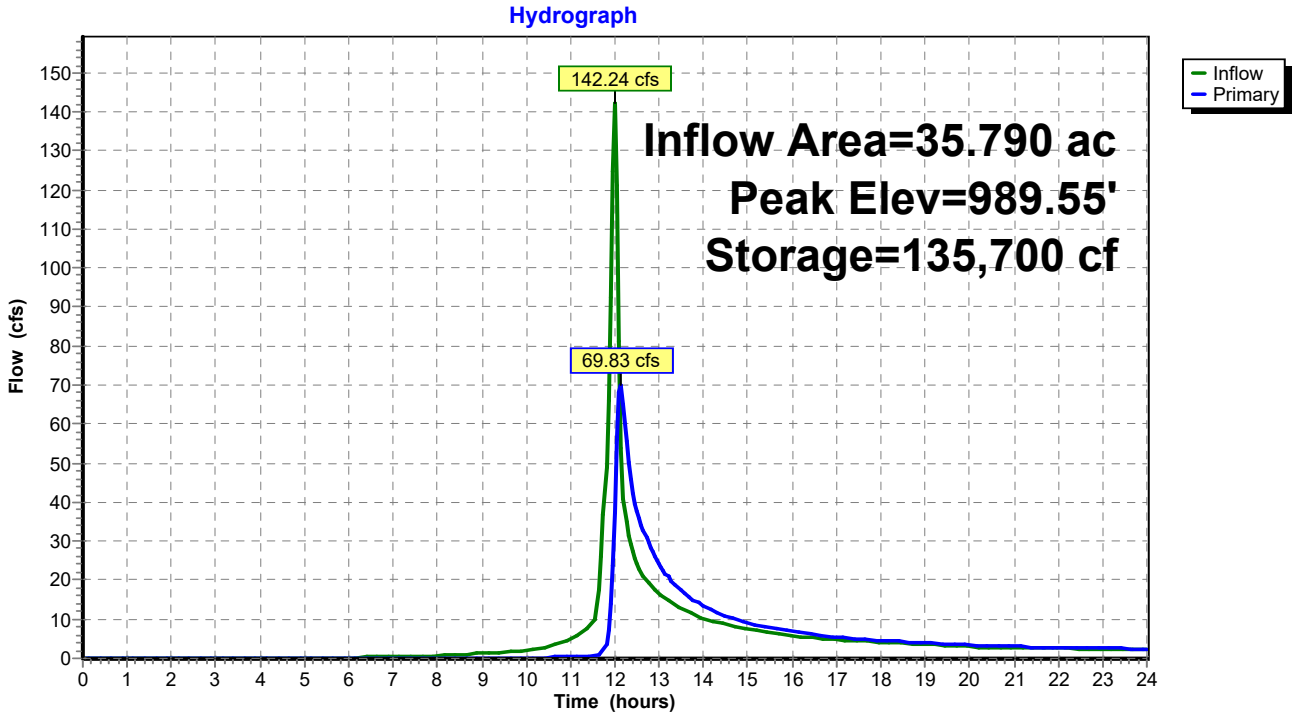
Volume	Invert	Avail.Storage	Storage Description
#1	986.00'	260,929 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
986.00	32,444	0	0
987.00	35,398	33,921	33,921
988.00	38,453	36,926	70,847
989.00	42,954	40,704	111,550
990.00	47,178	45,066	156,616
991.00	52,032	49,605	206,221
992.00	57,384	54,708	260,929

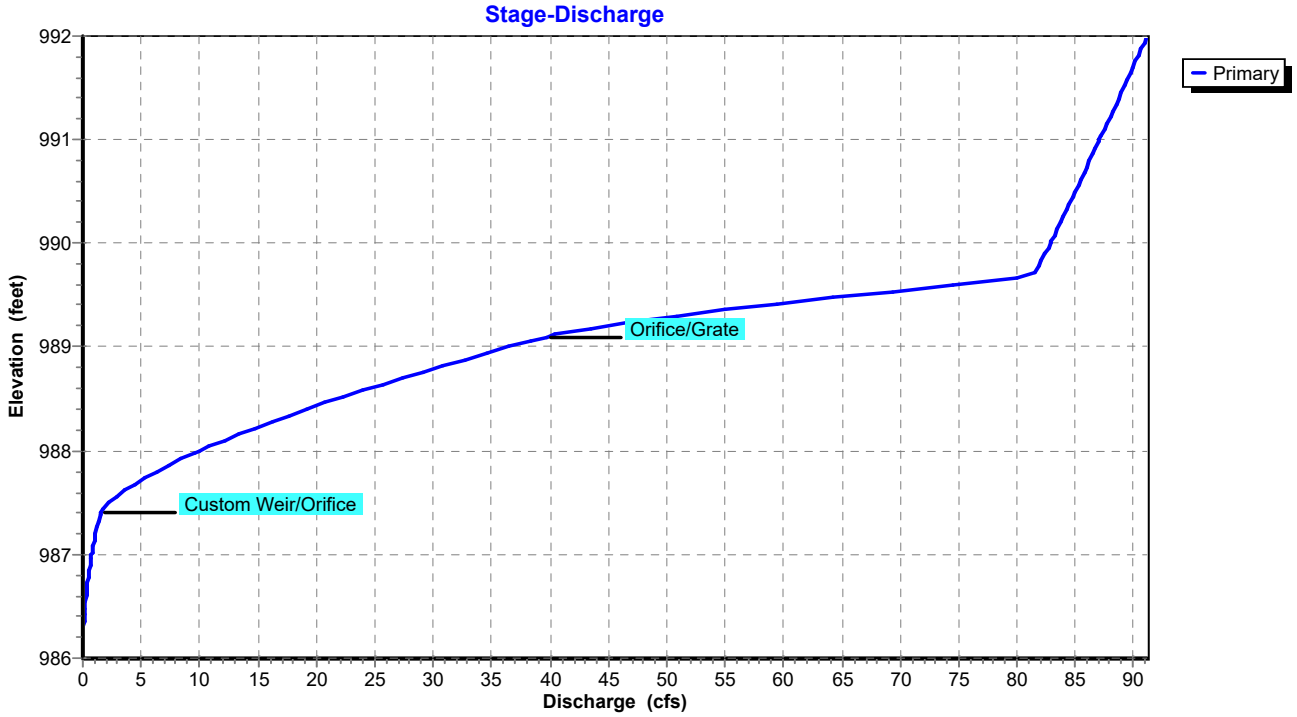
Device	Routing	Invert	Outlet Devices
#1	Primary	979.00'	**36.0" Round Culvert** L= 200.1' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 979.00' / 977.28' S= 0.0086 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Device 1	985.80'	**20.0 deg x 1.60' rise Sharp-Crested Vee/Trap Weir** Cv= 2.69 (C= 3.36)
#3	Device 1	987.40'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Elev. (feet) 987.40 989.10 Width (feet) 5.00 5.00
#4	Device 1	989.10'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=68.22 cfs @ 12.12 hrs HW=989.53' (Free Discharge)
└**1=Culvert** (Passes 68.22 cfs of 80.73 cfs potential flow)
  ├**2=Sharp-Crested Vee/Trap Weir** (Orifice Controls 3.70 cfs @ 8.21 fps)
  ├**3=Custom Weir/Orifice** (Orifice Controls 46.24 cfs @ 5.44 fps)
  └**4=Orifice/Grate** (Weir Controls 18.28 cfs @ 2.14 fps)

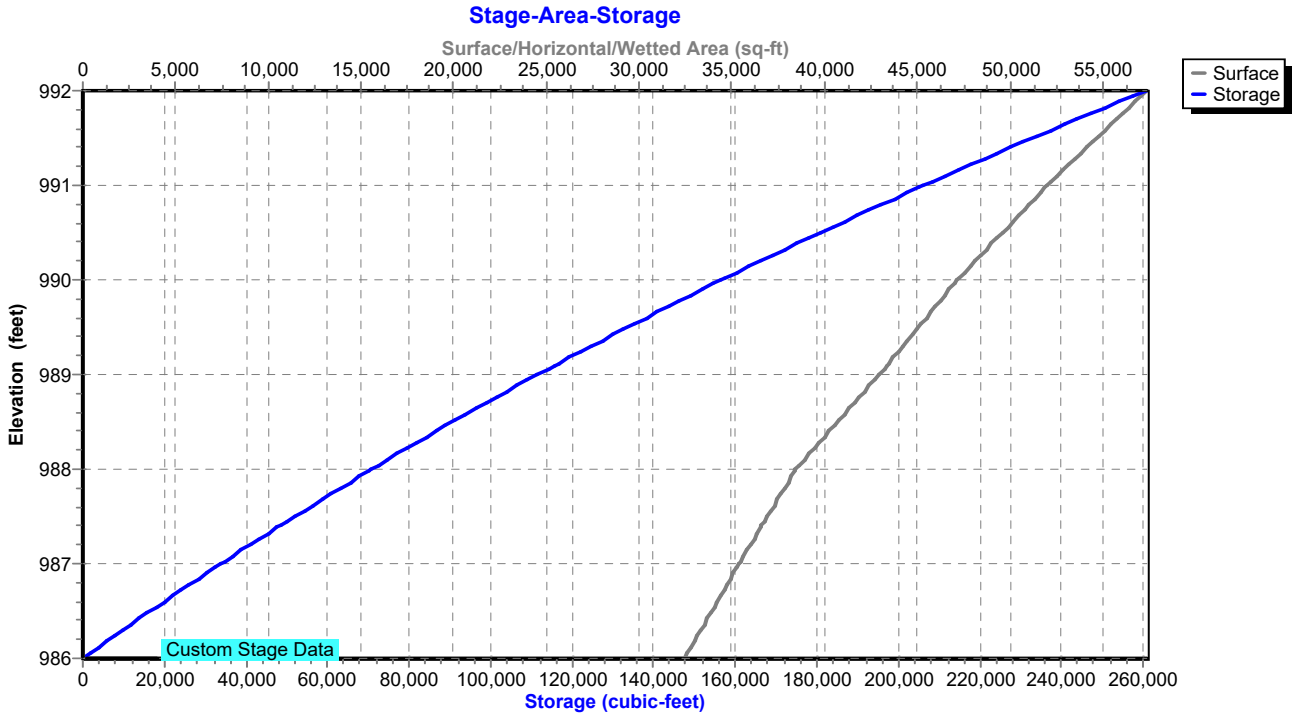
Pond 14P: EWDB #3



Pond 14P: EWDB #3



Pond 14P: EWDB #3



Summary for Pond 15P: EDDB #1

Inflow Area = 4.930 ac, 85.00% Impervious, Inflow Depth > 4.60" for 10-Year event
Inflow = 34.23 cfs @ 11.98 hrs, Volume= 1.890 af
Outflow = 18.02 cfs @ 12.08 hrs, Volume= 1.390 af, Atten= 47%, Lag= 6.0 min
Primary = 18.02 cfs @ 12.08 hrs, Volume= 1.390 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,008.44' @ 12.08 hrs Surf.Area= 16,886 sf Storage= 35,246 cf

Plug-Flow detention time= 147.1 min calculated for 1.390 af (74% of inflow)
Center-of-Mass det. time= 56.9 min (825.4 - 768.5)

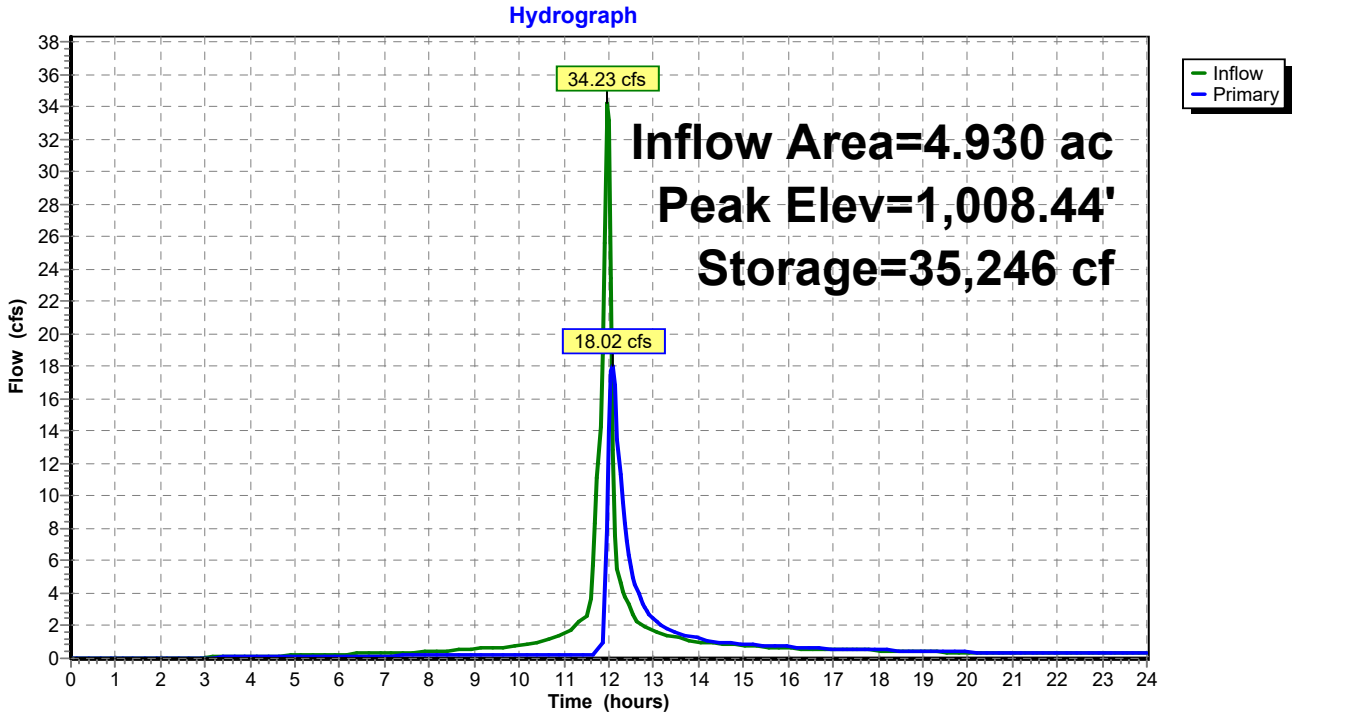
Volume	Invert	Avail.Storage	Storage Description
#1	1,004.00'	68,100 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,004.00	50	0	0
1,006.00	6,872	6,922	6,922
1,008.00	14,603	21,475	28,397
1,010.00	25,100	39,703	68,100

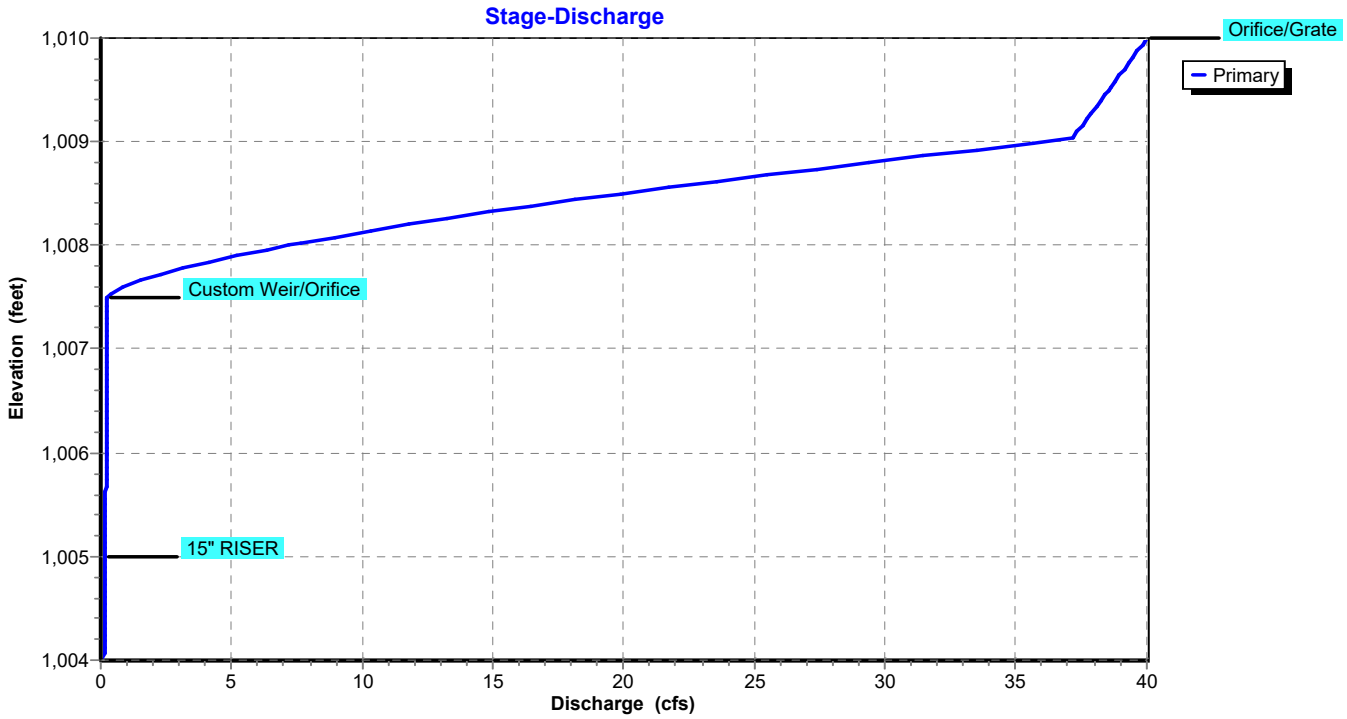
Device	Routing	Invert	Outlet Devices
#1	Primary	1,002.00'	**24.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 1,002.00' / 1,001.50' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	1,002.25'	**2.0" Vert. 2.0" ORIFICE** C= 0.600
#3	Device 1	1,007.50'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Elev. (feet) 1,007.50 1,009.50 Width (feet) 6.00 6.00
#4	Device 2	1,002.50'	**6.0" Round 6" PVC** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,002.50' / 1,002.25' S= 0.0083 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#5	Device 2	1,005.00'	**1.0" Vert. 15" RISER X 7.00 columns** X 9 rows with 4.0" cc spacing C= 0.600
#6	Device 1	1,010.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=17.76 cfs @ 12.08 hrs HW=1,008.43' (Free Discharge)
- **1=Culvert** (Passes 17.76 cfs of 35.23 cfs potential flow)
  - **2=2.0" ORIFICE** (Orifice Controls 0.26 cfs @ 11.88 fps)
    - **4=6" PVC** (Passes < 2.20 cfs potential flow)
    - **5=15" RISER** (Passes < 2.31 cfs potential flow)
  - **3=Custom Weir/Orifice** (Weir Controls 17.50 cfs @ 3.15 fps)
  - **6=Orifice/Grate** (Controls 0.00 cfs)

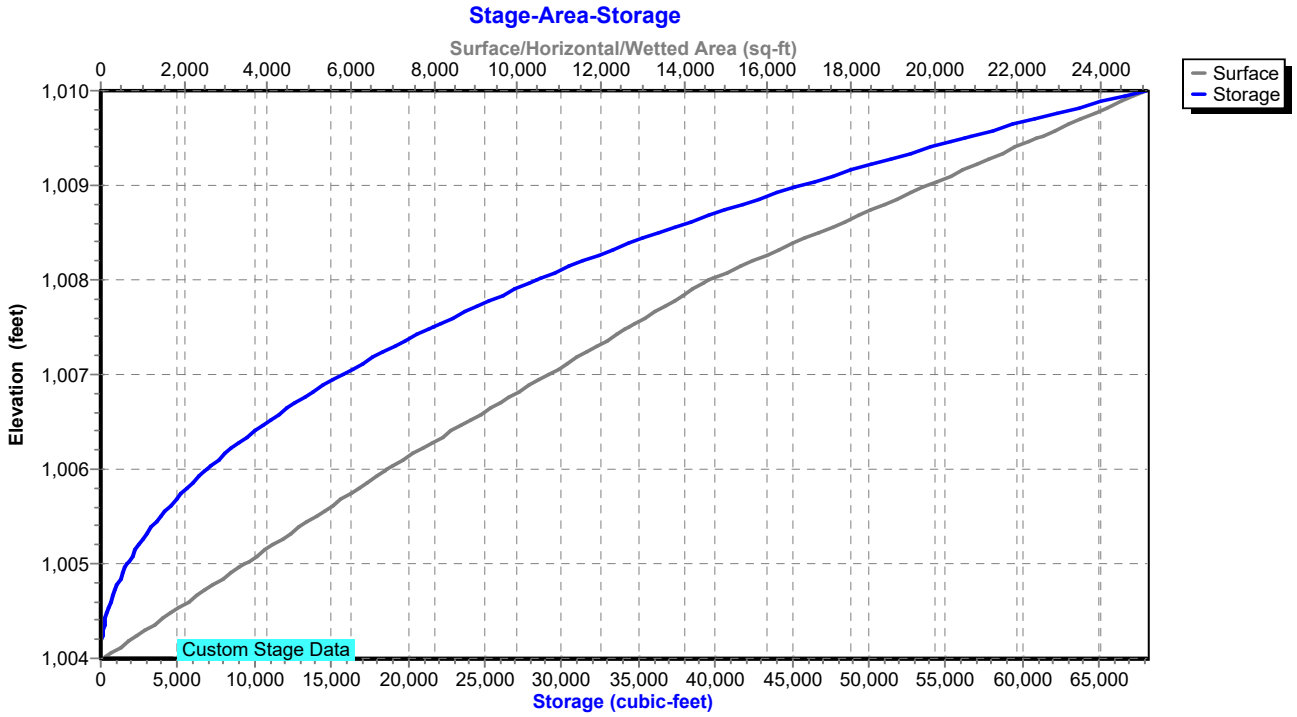
Pond 15P: EDDB #1



Pond 15P: EDDB #1



Pond 15P: EDDB #1

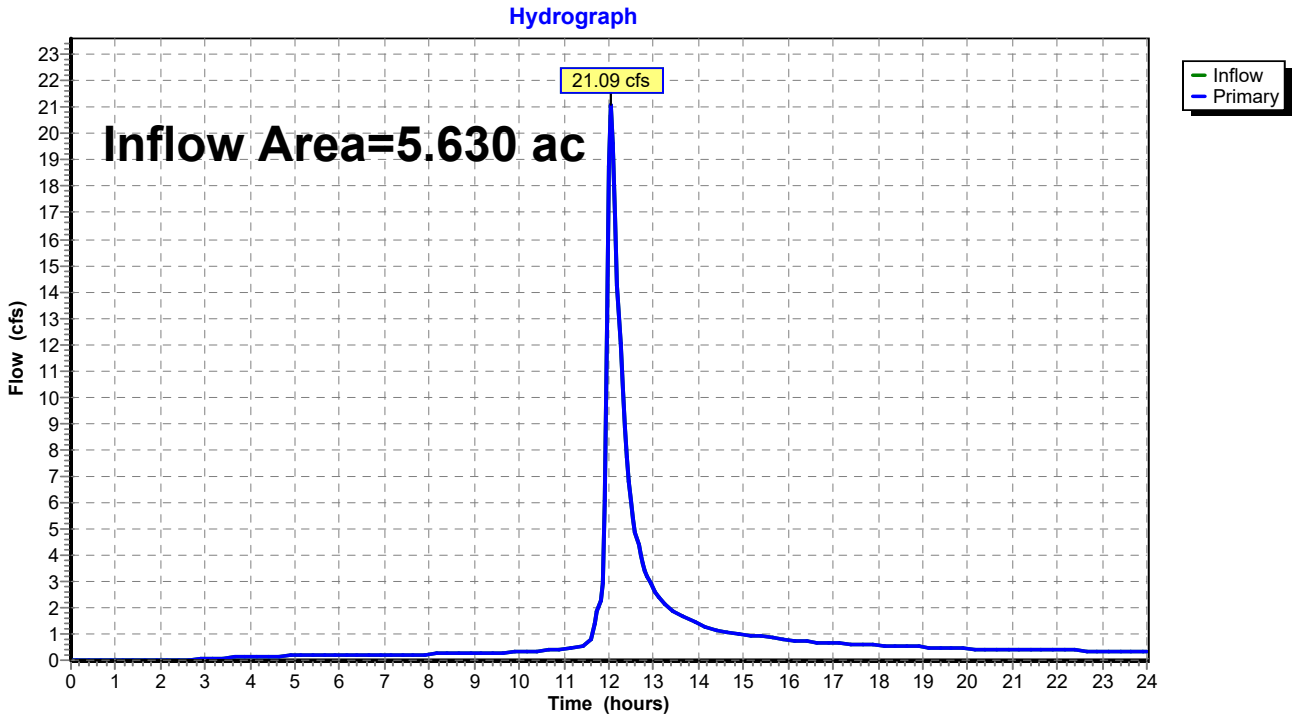


Summary for Link 7L: RP-1

Inflow Area = 5.630 ac, 85.00% Impervious, Inflow Depth > 3.55" for 10-Year event
Inflow = 21.09 cfs @ 12.06 hrs, Volume= 1.665 af
Primary = 21.09 cfs @ 12.06 hrs, Volume= 1.665 af, Atten= 0%, Lag= 0.0 min

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

Link 7L: RP-1

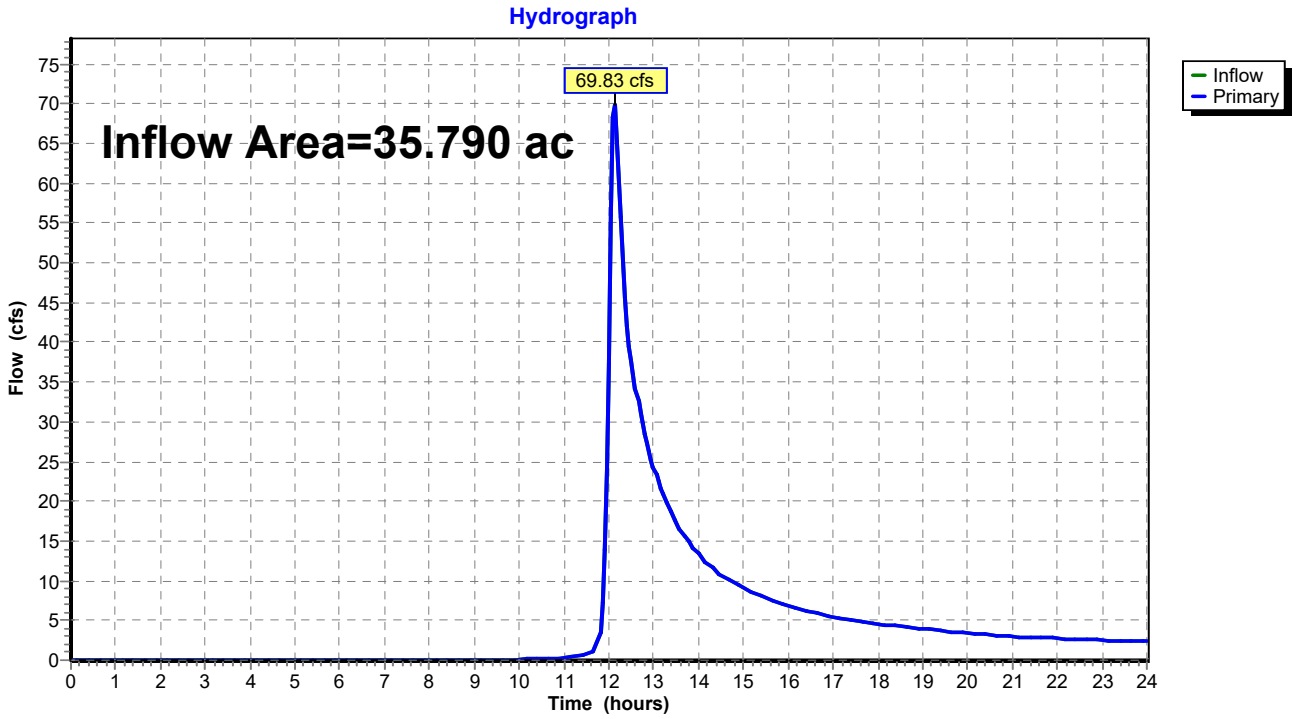


Summary for Link 9L: RP-3

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 3.12" for 10-Year event
Inflow = 69.83 cfs @ 12.12 hrs, Volume= 9.298 af
Primary = 69.83 cfs @ 12.12 hrs, Volume= 9.298 af, Atten= 0%, Lag= 0.0 min

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

Link 9L: RP-3

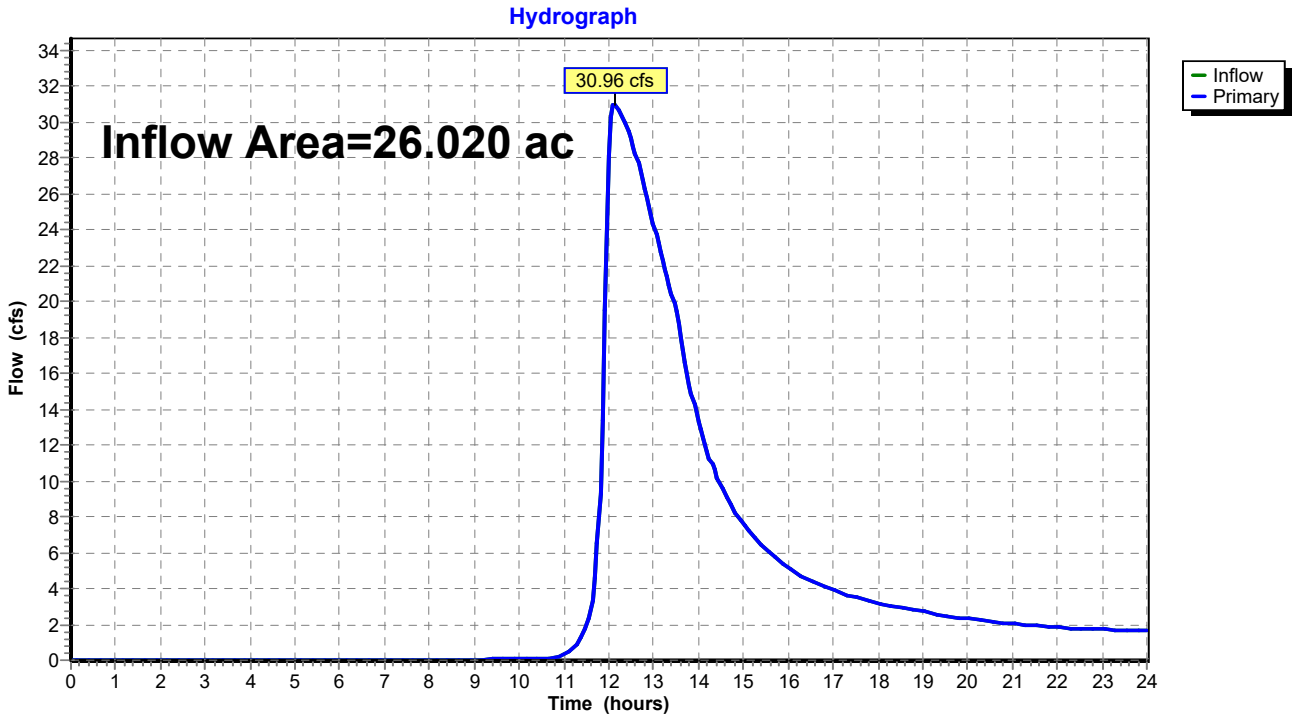


Summary for Link 10L: RP-4

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 3.45" for 10-Year event
Inflow = 30.96 cfs @ 12.13 hrs, Volume= 7.474 af
Primary = 30.96 cfs @ 12.13 hrs, Volume= 7.474 af, Atten= 0%, Lag= 0.0 min

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

Link 10L: RP-4



Summary for Subcatchment 11S: Onsite 5

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

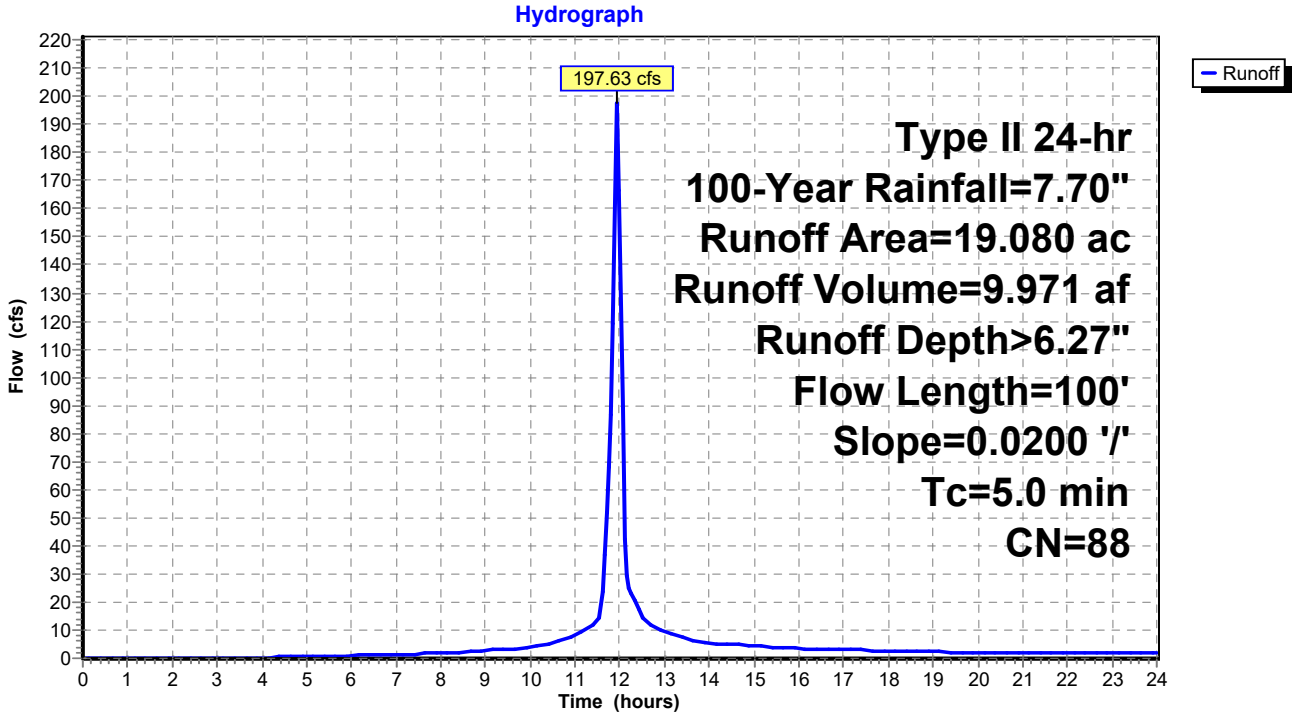
Runoff = 197.63 cfs @ 11.95 hrs, Volume= 9.971 af, Depth> 6.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	19.080	88	Apartments, 65% imp, HSG C
	6.678		35.00% Pervious Area
	12.402		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
3.9					**Direct Entry, Pipe flow**
5.0	100	Total			

Subcatchment 11S: Onsite 5



Summary for Subcatchment 12S: EX OFF

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

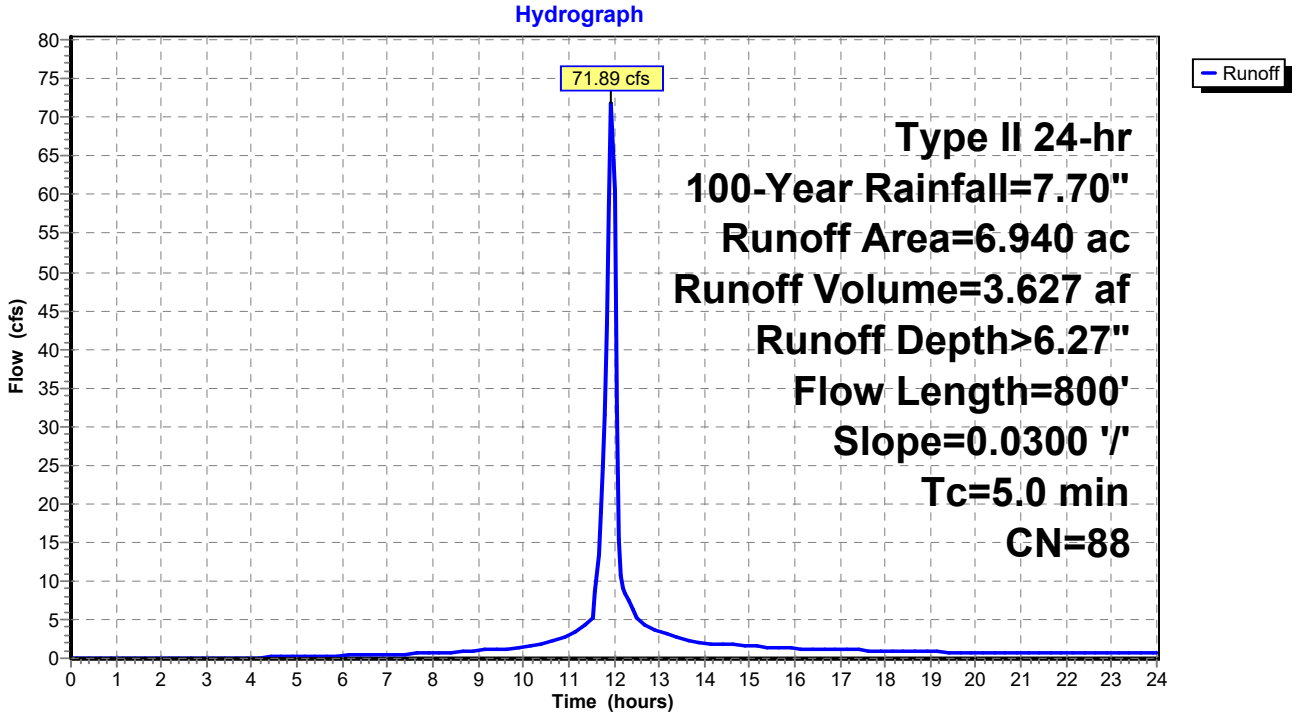
Runoff = 71.89 cfs @ 11.95 hrs, Volume= 3.627 af, Depth> 6.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	6.940	88	Future Multi-Family, 65% imp, HSG C
	2.429		35.00% Pervious Area
	4.511		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0300	1.72		**Sheet Flow, Sheet flow** Smooth surfaces n= 0.011 P2= 3.60"
4.0	700		2.92		**Direct Entry, Pipe flow**
5.0	800	Total			

Subcatchment 12S: EX OFF



Summary for Subcatchment 13S: Onsite 4

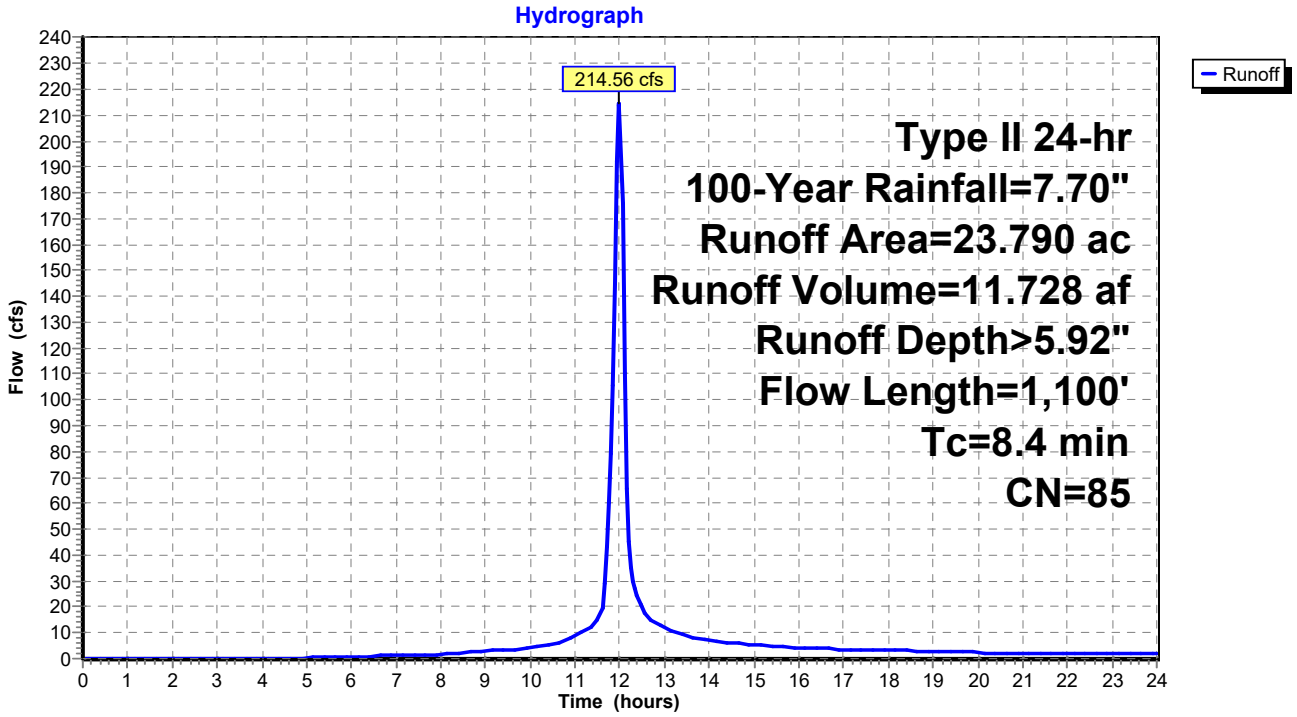
Runoff = 214.56 cfs @ 11.99 hrs, Volume= 11.728 af, Depth> 5.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	11.250	82	SINGLE FAMILY LOTS
*	12.540	88	1/8 acre lots, 65% imp, HSG D
	23.790	85	Weighted Average
	15.639		65.74% Pervious Area
	8.151		34.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0205	1.47		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
7.3	1,000	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.4	1,100	Total			

Subcatchment 13S: Onsite 4



Summary for Subcatchment 15S: Onsite 2

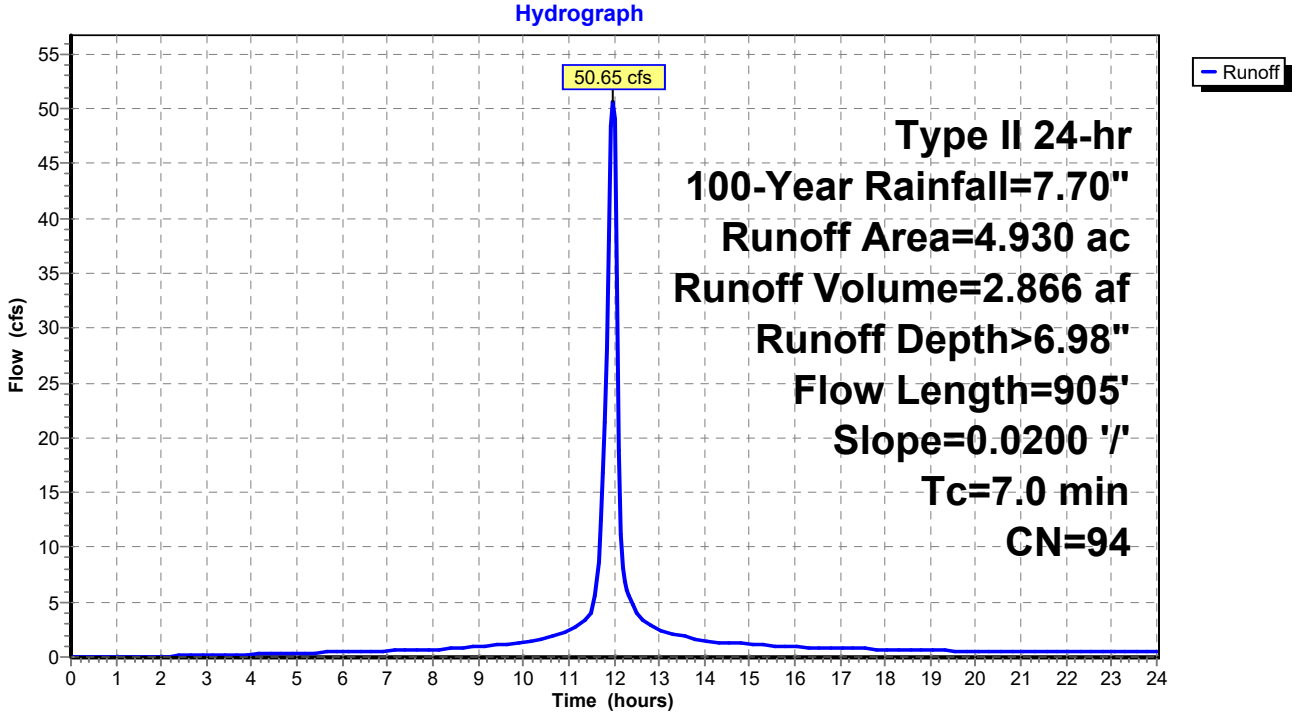
Runoff = 50.65 cfs @ 11.98 hrs, Volume= 2.866 af, Depth> 6.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	4.930	94	Urban commercial, 85% imp, HSG D
	0.739		15.00% Pervious Area
	4.190		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
5.9	805	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.0	905	Total			

Subcatchment 15S: Onsite 2



Summary for Subcatchment 16S: Onsite 3

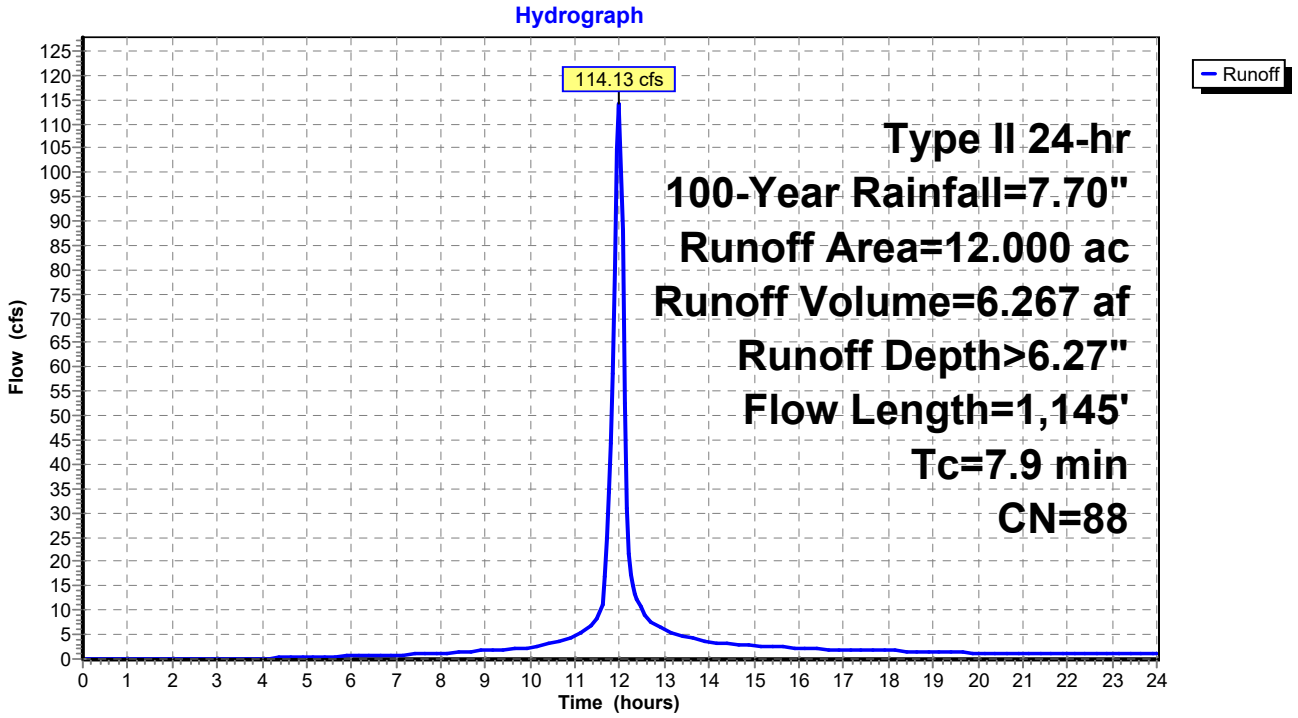
Runoff = 114.13 cfs @ 11.99 hrs, Volume= 6.267 af, Depth> 6.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	12.000	88	1/8 acre lots, 65% imp, HSG D
	4.200		35.00% Pervious Area
	7.800		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
6.8	1,045	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.9	1,145	Total			

Subcatchment 16S: Onsite 3



Summary for Subcatchment 17S: Onsite 1

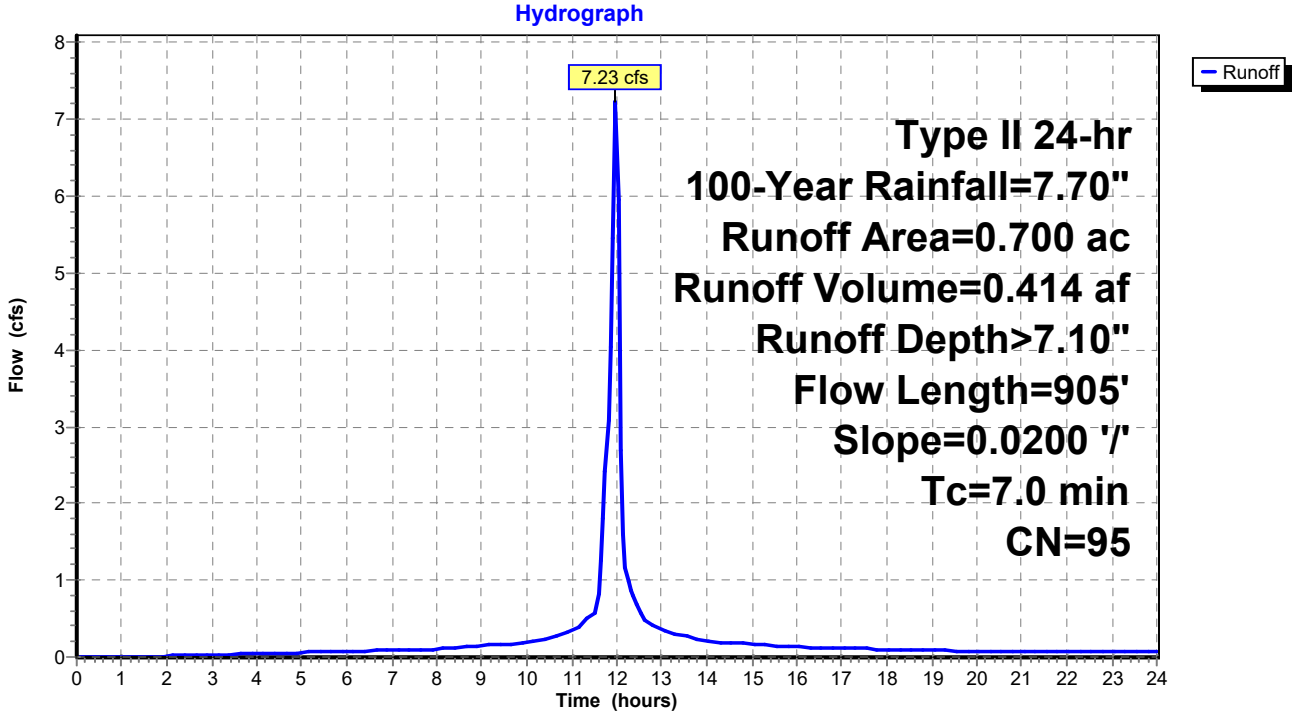
Runoff = 7.23 cfs @ 11.98 hrs, Volume= 0.414 af, Depth> 7.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

Area (ac)	CN	Description
0.700	95	Urban commercial, 85% imp, HSG D
0.105		15.00% Pervious Area
0.595		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
5.9	805	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.0	905	Total			

Subcatchment 17S: Onsite 1



Summary for Pond 12P: EWDB #1

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 6.27" for 100-Year event
Inflow = 269.52 cfs @ 11.95 hrs, Volume= 13.597 af
Outflow = 41.22 cfs @ 12.16 hrs, Volume= 12.400 af, Atten= 85%, Lag= 12.4 min
Primary = 41.22 cfs @ 12.16 hrs, Volume= 12.400 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 998.79' @ 12.16 hrs Surf.Area= 83,191 sf Storage= 286,236 cf

Plug-Flow detention time= 136.5 min calculated for 12.400 af (91% of inflow)
Center-of-Mass det. time= 90.3 min (868.9 - 778.6)

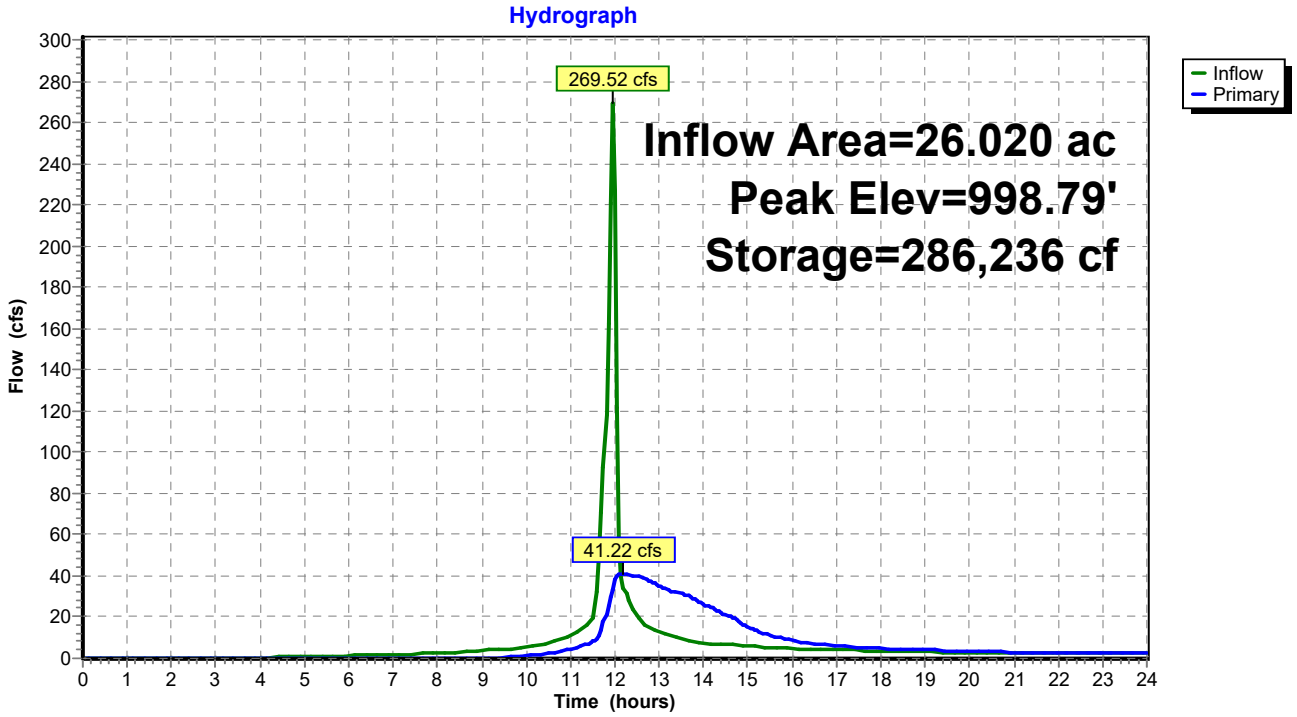
Volume	Invert	Avail.Storage	Storage Description
#1	995.00'	389,753 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
995.00	67,904	0	0
996.00	71,853	69,879	69,879
997.00	75,863	73,858	143,737
998.00	79,925	77,894	221,631
999.00	84,048	81,987	303,617
1,000.00	88,224	86,136	389,753

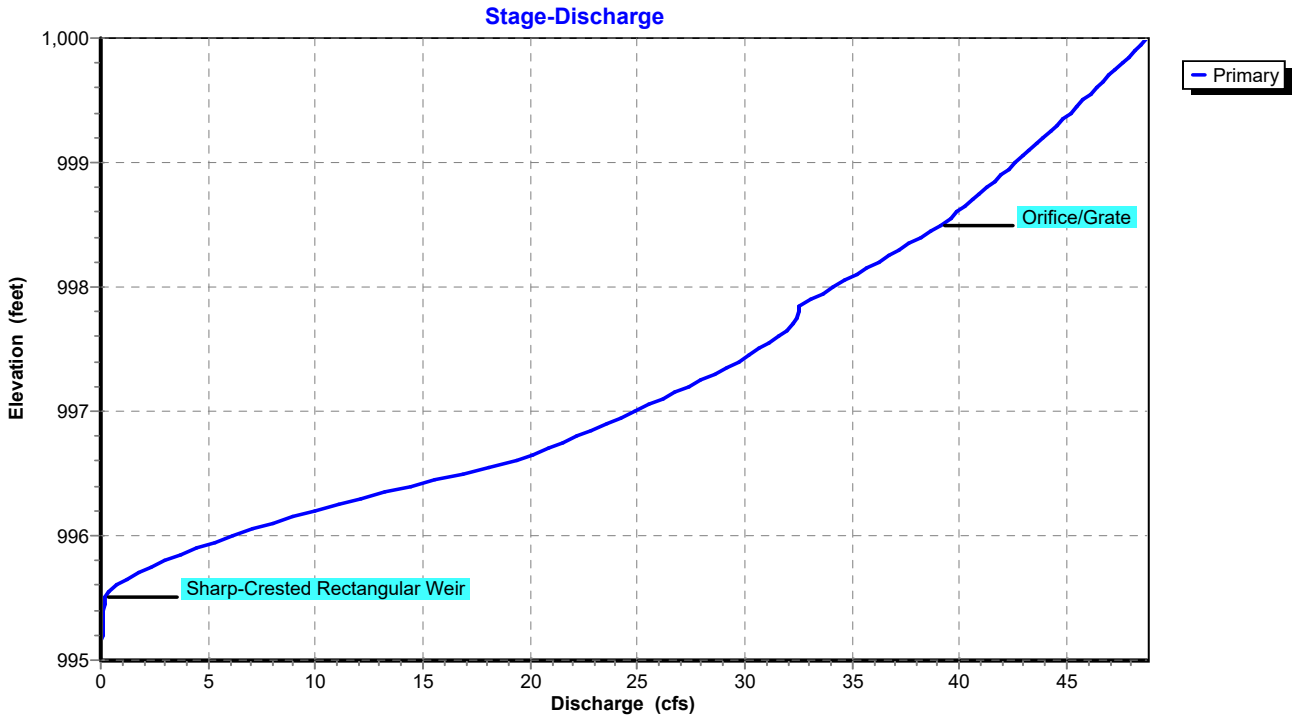
Device	Routing	Invert	Outlet Devices
#1	Primary	994.50'	**30.0" Round Culvert** L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 994.50' / 993.90' S= 0.0075 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	994.80'	**20.0 deg x 0.70' rise Sharp-Crested Vee/Trap Weir** Cv= 2.69 (C= 3.36)
#3	Device 1	995.50'	**5.0' long x 3.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height
#4	Device 1	998.50'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=41.21 cfs @ 12.16 hrs HW=998.79' (Free Discharge)
└**1=Culvert** (Inlet Controls 41.21 cfs @ 8.40 fps)
  ├**2=Sharp-Crested Vee/Trap Weir** (Passes < 0.82 cfs potential flow)
  ├**3=Sharp-Crested Rectangular Weir** (Passes < 94.84 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 10.23 cfs potential flow)

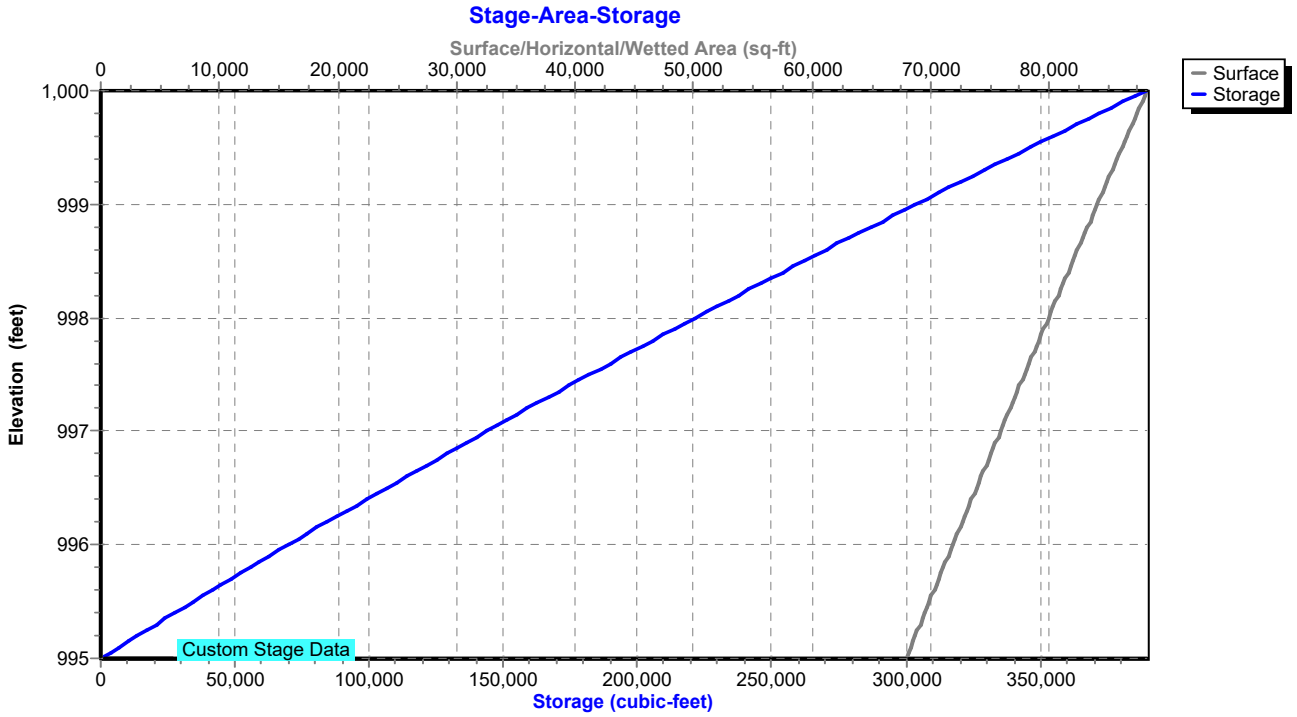
Pond 12P: EWDB #1



Pond 12P: EWDB #1



Pond 12P: EWDB #1



Summary for Pond 13P: EWDB #2

Inflow Area = 12.000 ac, 65.00% Impervious, Inflow Depth > 6.27" for 100-Year event
Inflow = 114.13 cfs @ 11.99 hrs, Volume= 6.267 af
Outflow = 21.47 cfs @ 12.21 hrs, Volume= 5.508 af, Atten= 81%, Lag= 13.4 min
Primary = 21.47 cfs @ 12.21 hrs, Volume= 5.508 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 997.12' @ 12.21 hrs Surf.Area= 33,342 sf Storage= 136,661 cf

Plug-Flow detention time= 163.1 min calculated for 5.508 af (88% of inflow)
Center-of-Mass det. time= 104.9 min (885.8 - 780.9)

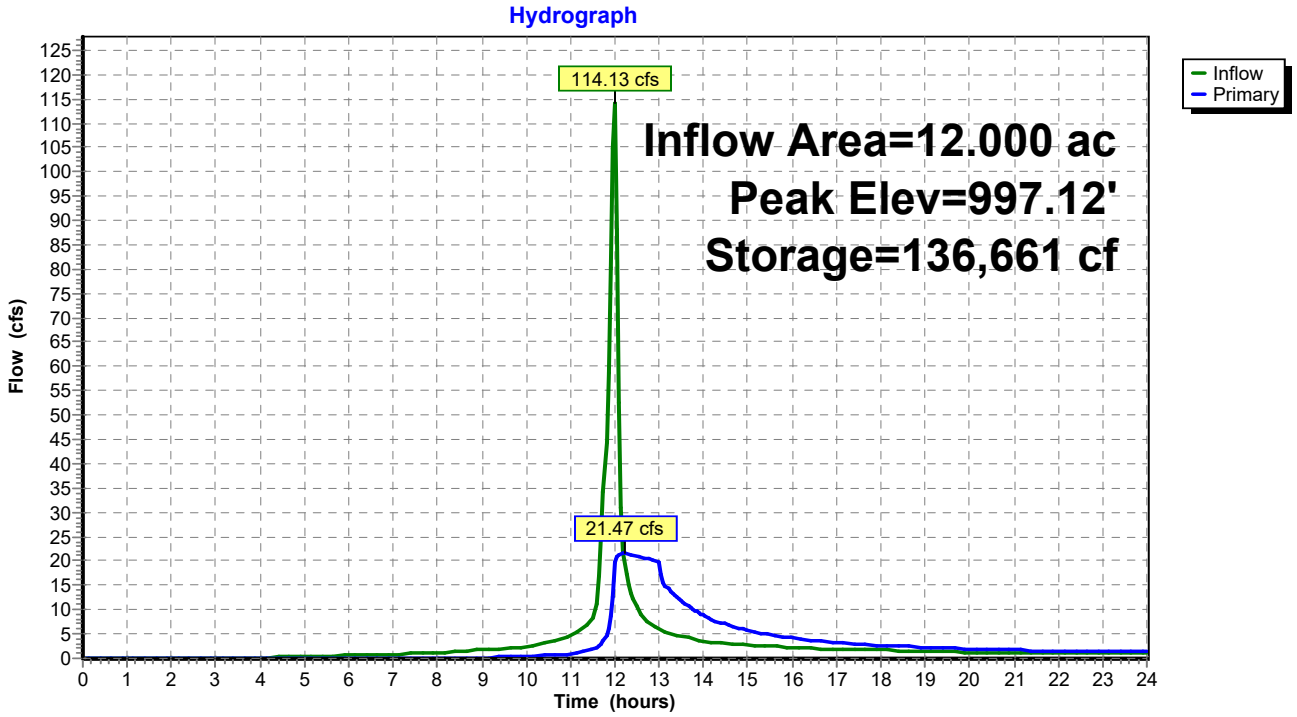
Volume	Invert	Avail.Storage	Storage Description
#1	992.00'	167,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
992.00	20,519	0	0
993.00	22,818	21,669	21,669
994.00	25,218	24,018	45,687
995.00	27,718	26,468	72,155
996.00	30,318	29,018	101,173
997.00	33,019	31,669	132,841
998.00	35,821	34,420	167,261

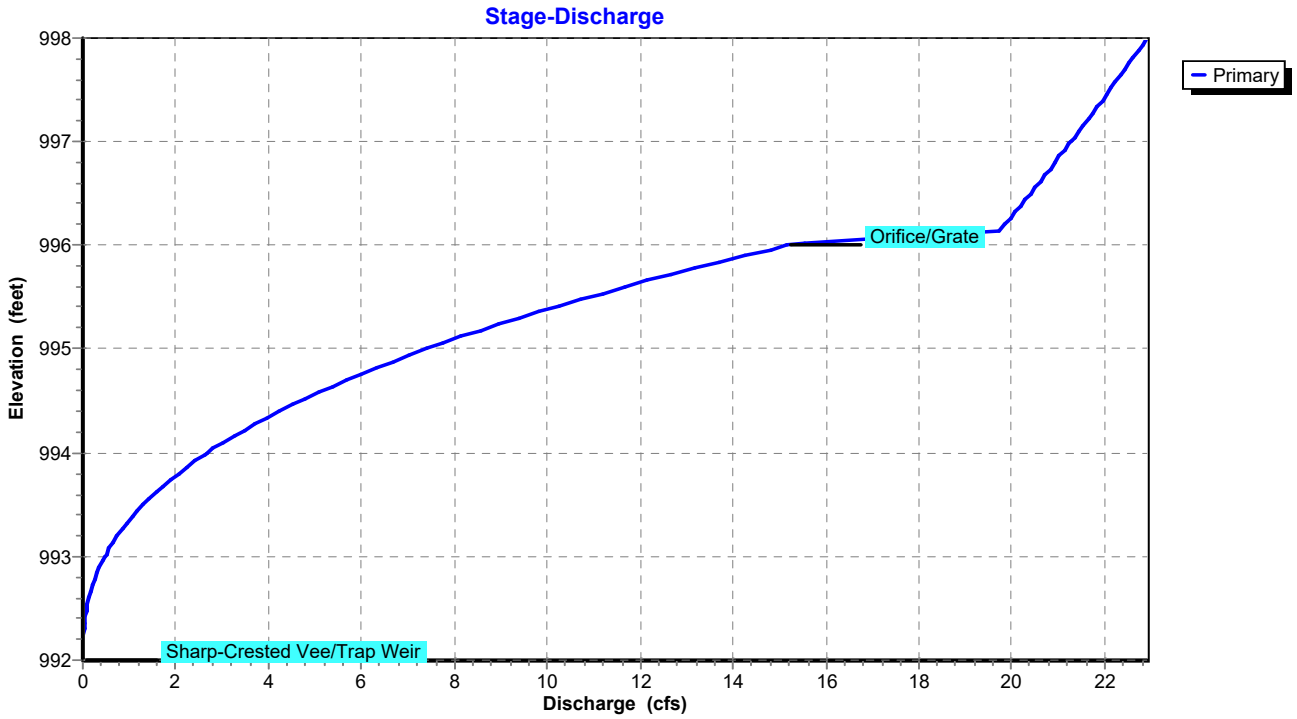
Device	Routing	Invert	Outlet Devices
#1	Primary	990.00'	**18.0" Round Culvert** L= 55.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 990.00' / 985.00' S= 0.0899 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Device 1	992.00'	**20.0 deg x 4.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.69 (C= 3.36)
#3	Device 1	996.00'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=21.46 cfs @ 12.21 hrs HW=997.11' (Free Discharge)
└**1=Culvert** (Inlet Controls 21.46 cfs @ 12.14 fps)
  ├**2=Sharp-Crested Vee/Trap Weir** (Passes < 21.84 cfs potential flow)
  └**3=Orifice/Grate** (Passes < 76.68 cfs potential flow)

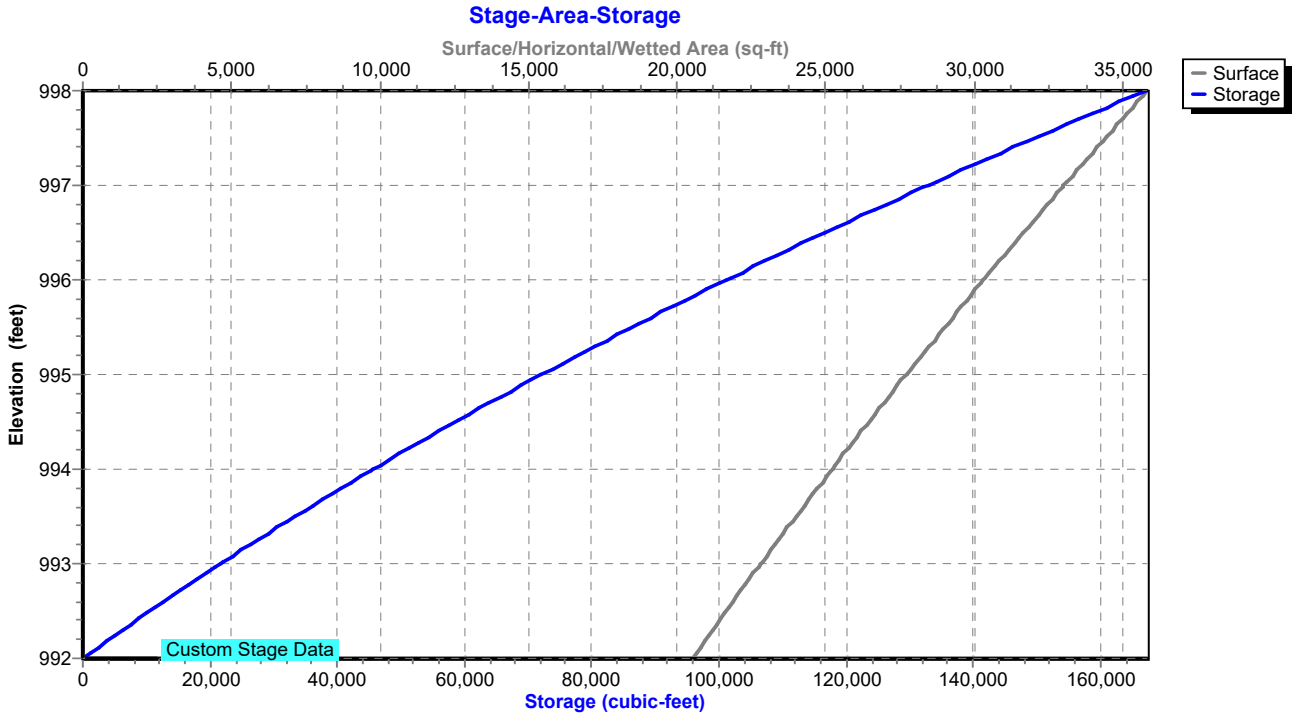
Pond 13P: EWDB #2



Pond 13P: EWDB #2



Pond 13P: EWDB #2



Summary for Pond 14P: EWDB #3

[79] Warning: Submerged Pond 13P Primary device # 1 INLET by 1.06'

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 5.78" for 100-Year event
Inflow = 234.06 cfs @ 12.00 hrs, Volume= 17.235 af
Outflow = 87.33 cfs @ 12.16 hrs, Volume= 15.953 af, Atten= 63%, Lag= 9.7 min
Primary = 87.33 cfs @ 12.16 hrs, Volume= 15.953 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 991.06' @ 12.16 hrs Surf.Area= 52,368 sf Storage= 209,495 cf

Plug-Flow detention time= 82.3 min calculated for 15.953 af (93% of inflow)
Center-of-Mass det. time= 43.1 min (863.6 - 820.5)

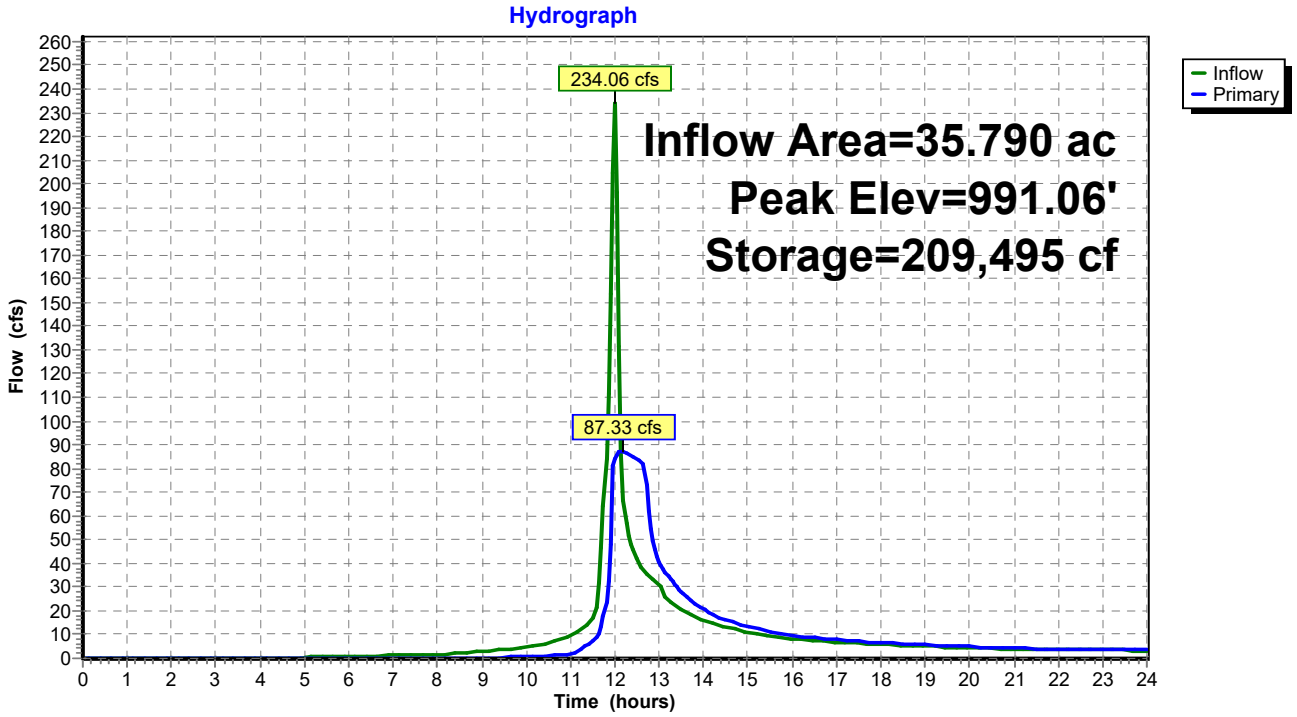
Volume	Invert	Avail.Storage	Storage Description
#1	986.00'	260,929 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
986.00	32,444	0	0
987.00	35,398	33,921	33,921
988.00	38,453	36,926	70,847
989.00	42,954	40,704	111,550
990.00	47,178	45,066	156,616
991.00	52,032	49,605	206,221
992.00	57,384	54,708	260,929

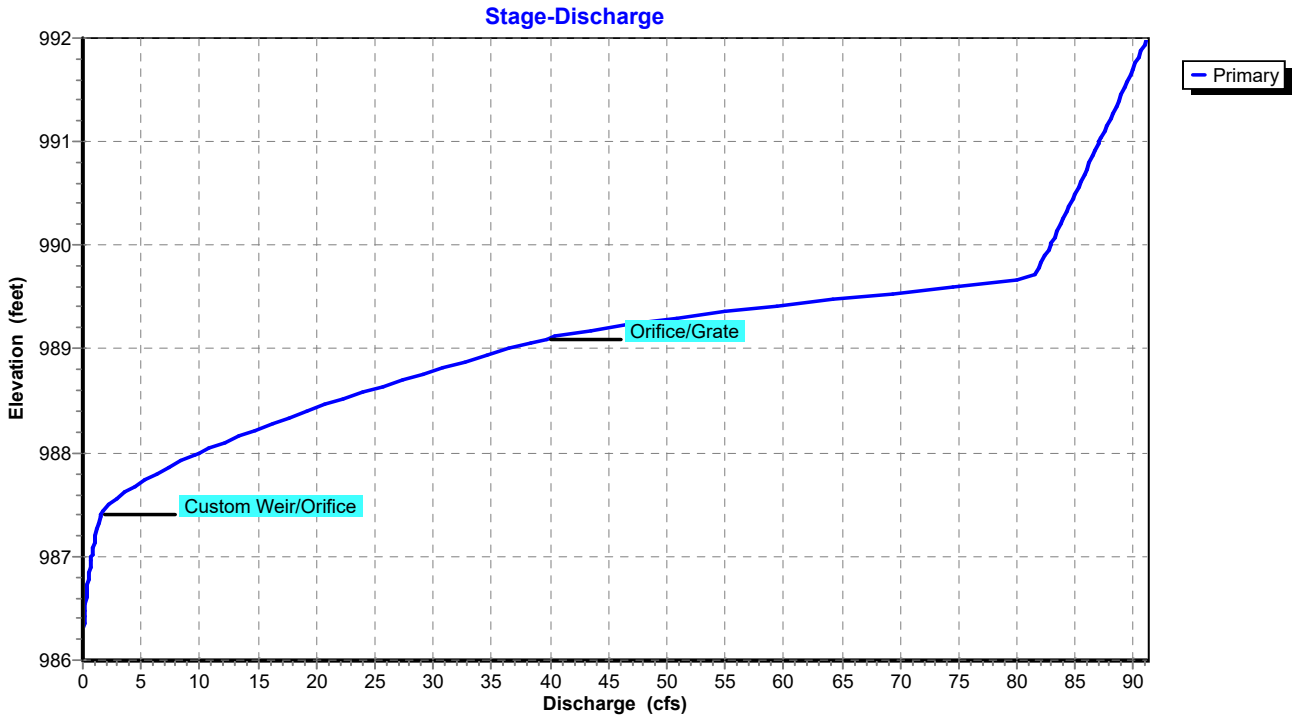
Device	Routing	Invert	Outlet Devices
#1	Primary	979.00'	**36.0" Round Culvert** L= 200.1' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 979.00' / 977.28' S= 0.0086 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Device 1	985.80'	**20.0 deg x 1.60' rise Sharp-Crested Vee/Trap Weir** Cv= 2.69 (C= 3.36)
#3	Device 1	987.40'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Elev. (feet) 987.40 989.10 Width (feet) 5.00 5.00
#4	Device 1	989.10'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=87.29 cfs @ 12.16 hrs HW=991.05' (Free Discharge)
└**1=Culvert** (Inlet Controls 87.29 cfs @ 12.35 fps)
  ├**2=Sharp-Crested Vee/Trap Weir** (Passes < 4.65 cfs potential flow)
  ├**3=Custom Weir/Orifice** (Passes < 69.65 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 168.29 cfs potential flow)

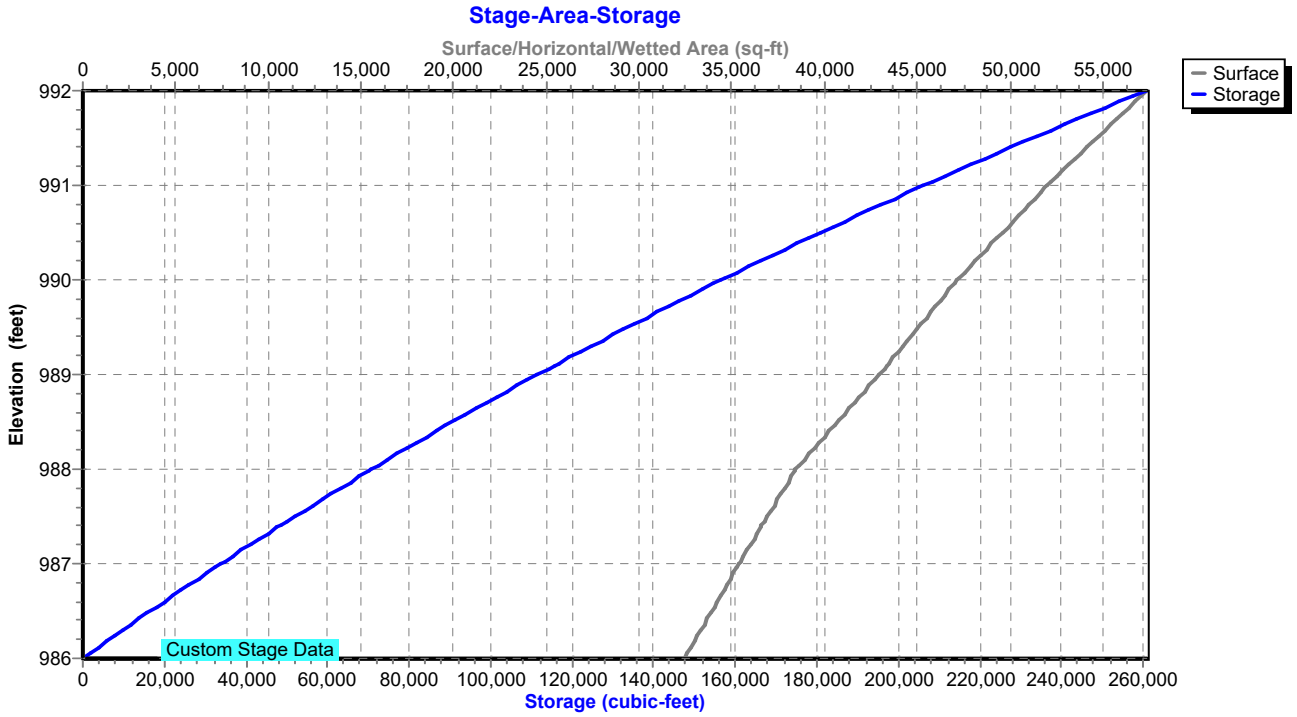
Pond 14P: EWDB #3



Pond 14P: EWDB #3



Pond 14P: EWDB #3



Summary for Pond 15P: EDDB #1

Inflow Area = 4.930 ac, 85.00% Impervious, Inflow Depth > 6.98" for 100-Year event
Inflow = 50.65 cfs @ 11.98 hrs, Volume= 2.866 af
Outflow = 34.12 cfs @ 12.05 hrs, Volume= 2.358 af, Atten= 33%, Lag= 4.7 min
Primary = 34.12 cfs @ 12.05 hrs, Volume= 2.358 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,008.94' @ 12.05 hrs Surf.Area= 19,520 sf Storage= 44,380 cf

Plug-Flow detention time= 125.6 min calculated for 2.358 af (82% of inflow)
Center-of-Mass det. time= 50.9 min (809.6 - 758.7)

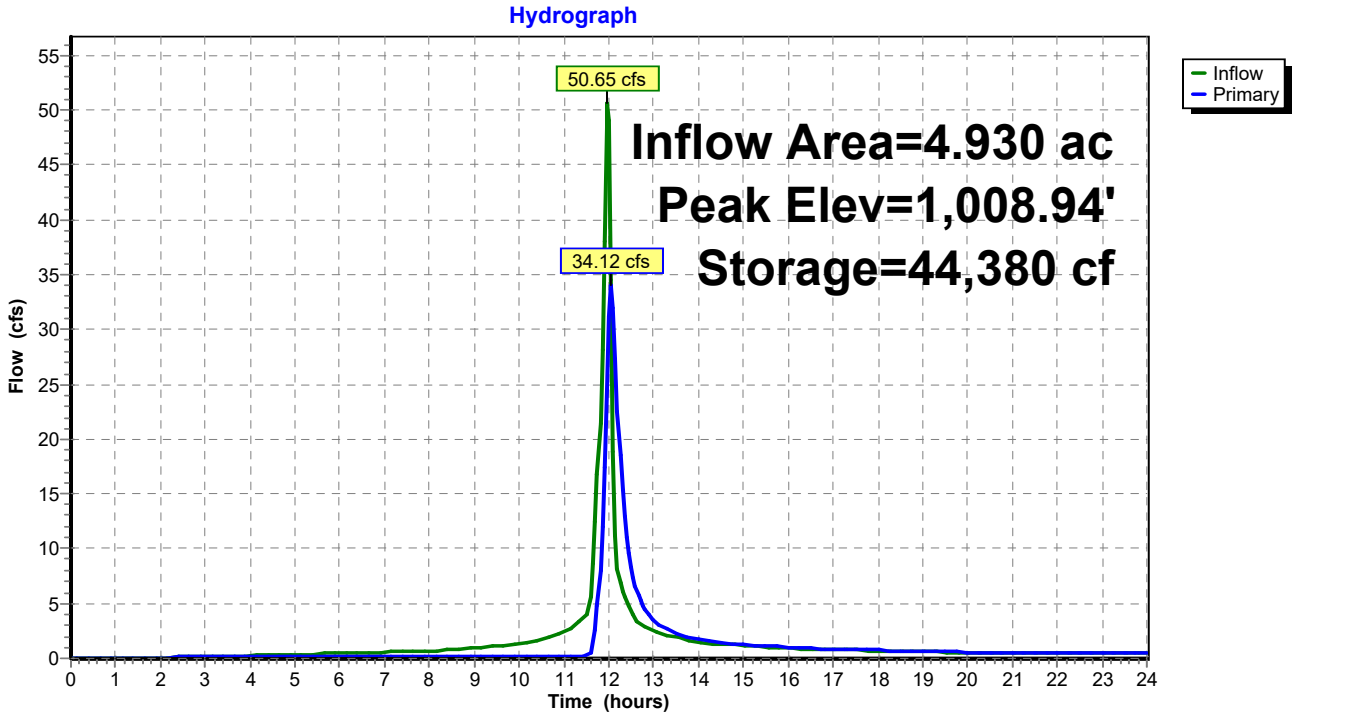
Volume	Invert	Avail.Storage	Storage Description
#1	1,004.00'	68,100 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,004.00	50	0	0
1,006.00	6,872	6,922	6,922
1,008.00	14,603	21,475	28,397
1,010.00	25,100	39,703	68,100

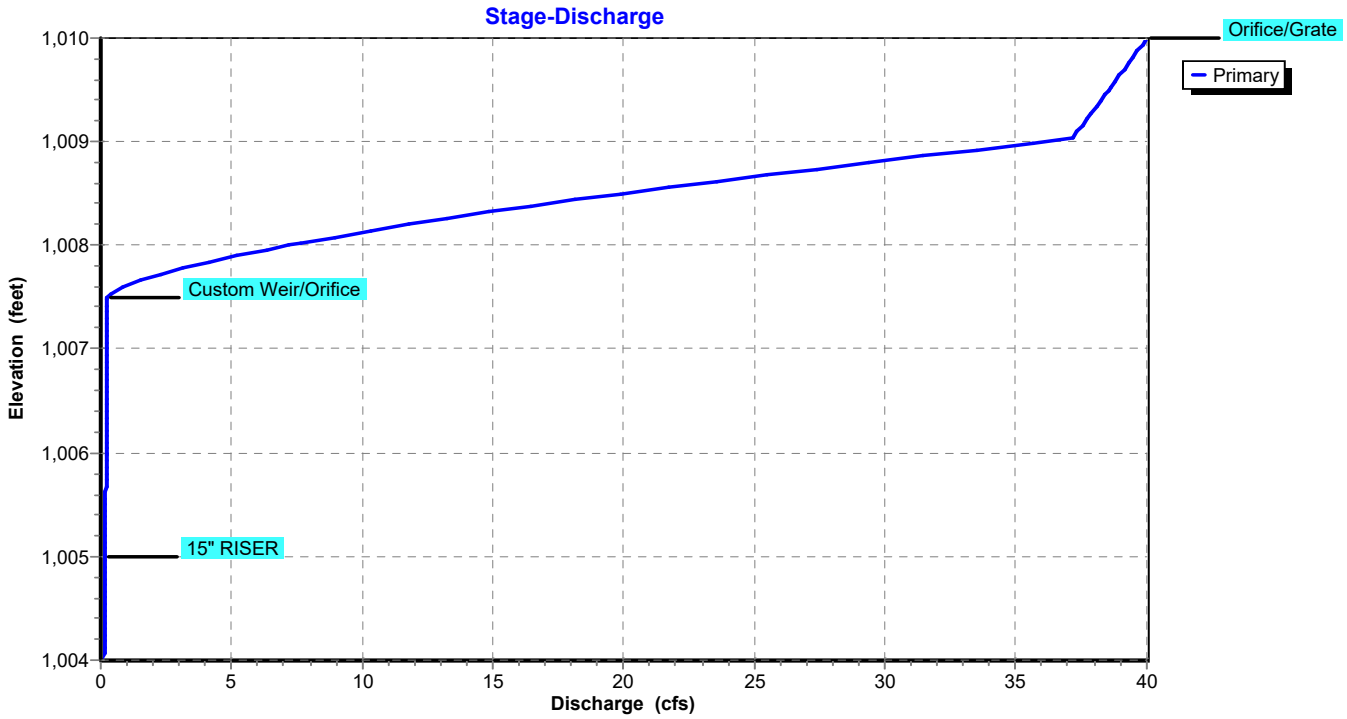
Device	Routing	Invert	Outlet Devices
#1	Primary	1,002.00'	**24.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 1,002.00' / 1,001.50' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	1,002.25'	**2.0" Vert. 2.0" ORIFICE** C= 0.600
#3	Device 1	1,007.50'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Elev. (feet) 1,007.50 1,009.50 Width (feet) 6.00 6.00
#4	Device 2	1,002.50'	**6.0" Round 6" PVC** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,002.50' / 1,002.25' S= 0.0083 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#5	Device 2	1,005.00'	**1.0" Vert. 15" RISER X 7.00 columns** X 9 rows with 4.0" cc spacing C= 0.600
#6	Device 1	1,010.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=33.90 cfs @ 12.05 hrs HW=1,008.93' (Free Discharge)
- **1=Culvert** (Passes 33.90 cfs of 36.84 cfs potential flow)
  - **2=2.0" ORIFICE** (Orifice Controls 0.27 cfs @ 12.37 fps)
    - **4=6" PVC** (Passes < 2.30 cfs potential flow)
    - **5=15" RISER** (Passes < 2.60 cfs potential flow)
  - **3=Custom Weir/Orifice** (Weir Controls 33.63 cfs @ 3.92 fps)
  - **6=Orifice/Grate** (Controls 0.00 cfs)

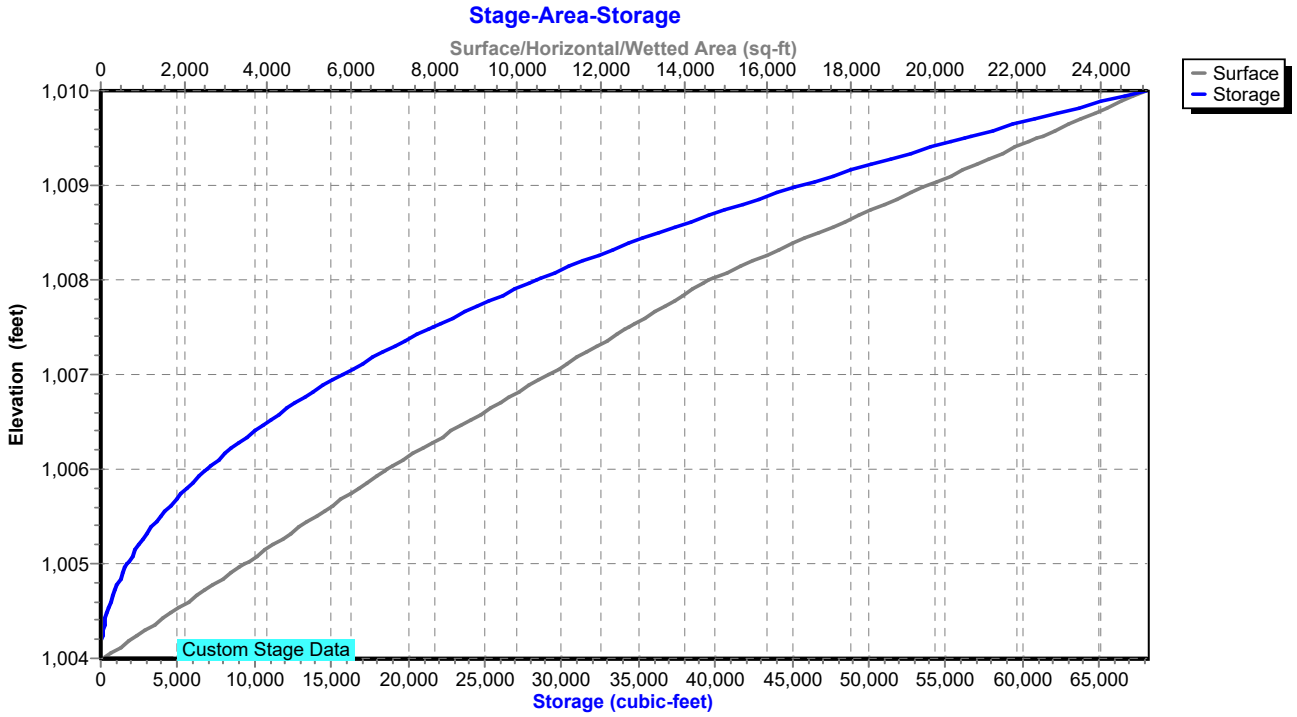
Pond 15P: EDDB #1



Pond 15P: EDDB #1



Pond 15P: EDDB #1

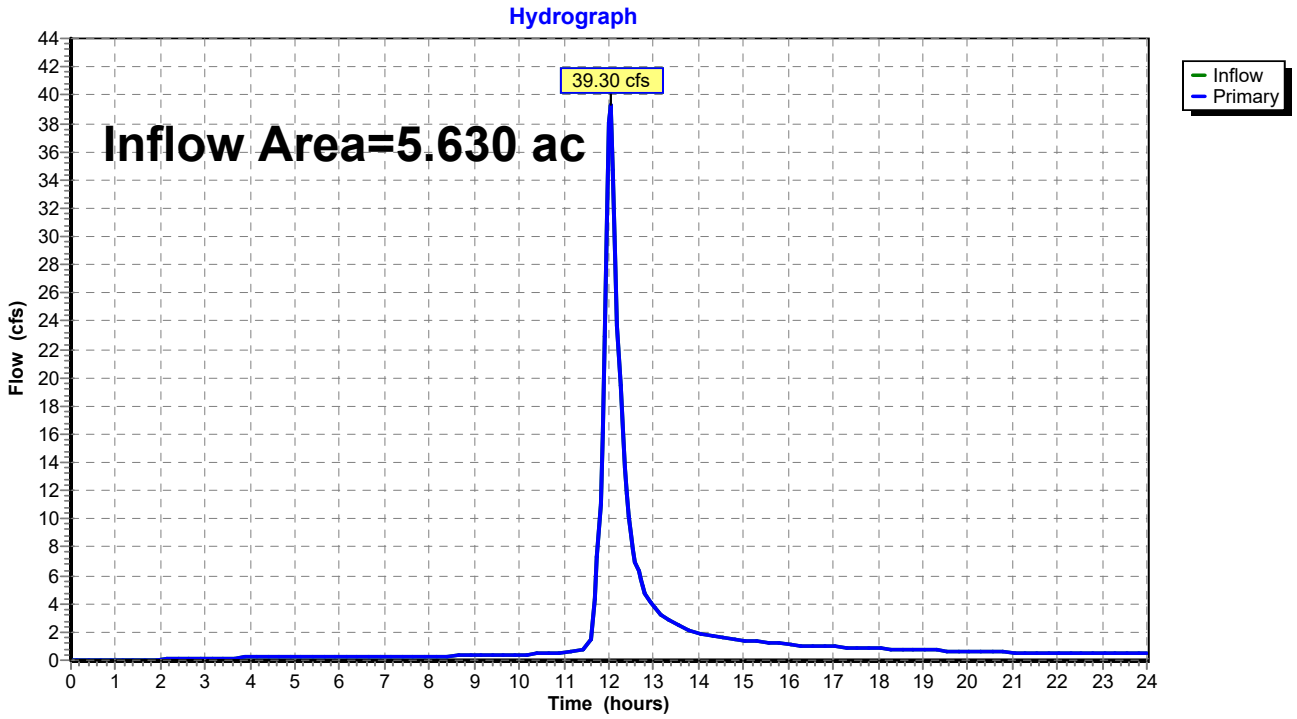


Summary for Link 7L: RP-1

Inflow Area = 5.630 ac, 85.00% Impervious, Inflow Depth > 5.91" for 100-Year event
Inflow = 39.30 cfs @ 12.03 hrs, Volume= 2.772 af
Primary = 39.30 cfs @ 12.03 hrs, Volume= 2.772 af, Atten= 0%, Lag= 0.0 min

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

Link 7L: RP-1

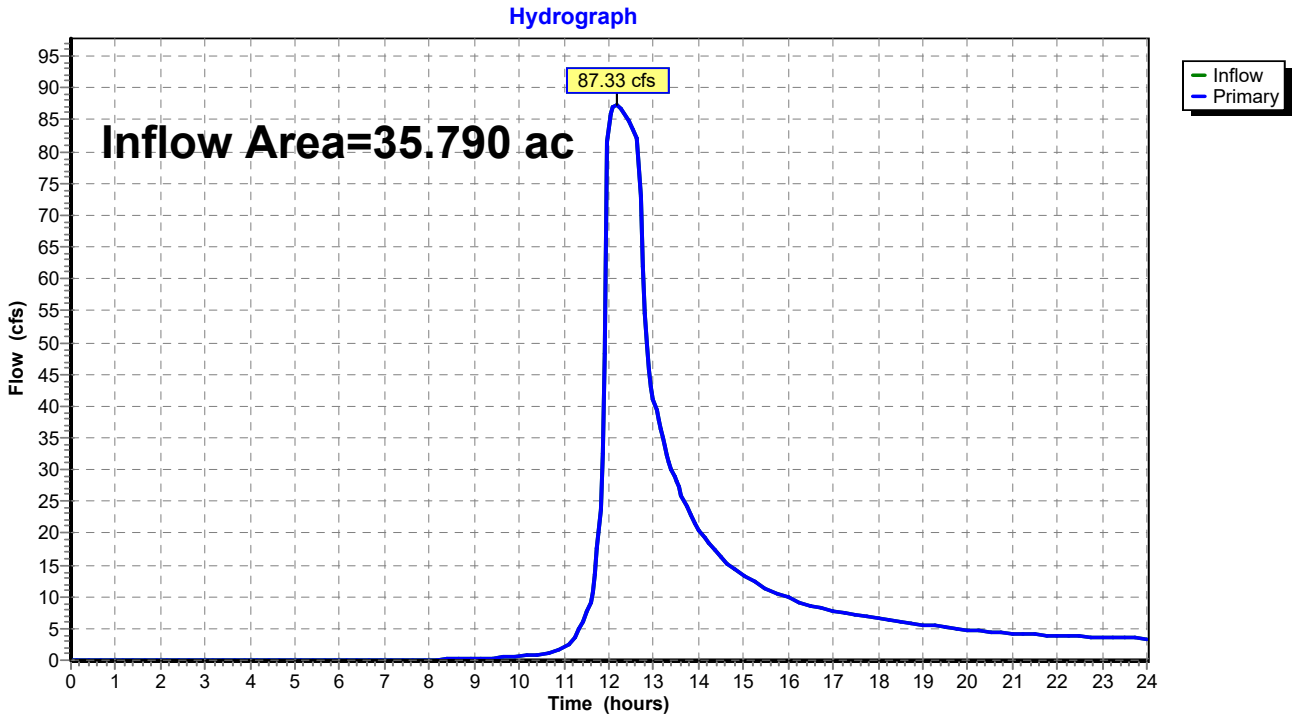


Summary for Link 9L: RP-3

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 5.35" for 100-Year event
Inflow = 87.33 cfs @ 12.16 hrs, Volume= 15.953 af
Primary = 87.33 cfs @ 12.16 hrs, Volume= 15.953 af, Atten= 0%, Lag= 0.0 min

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

Link 9L: RP-3

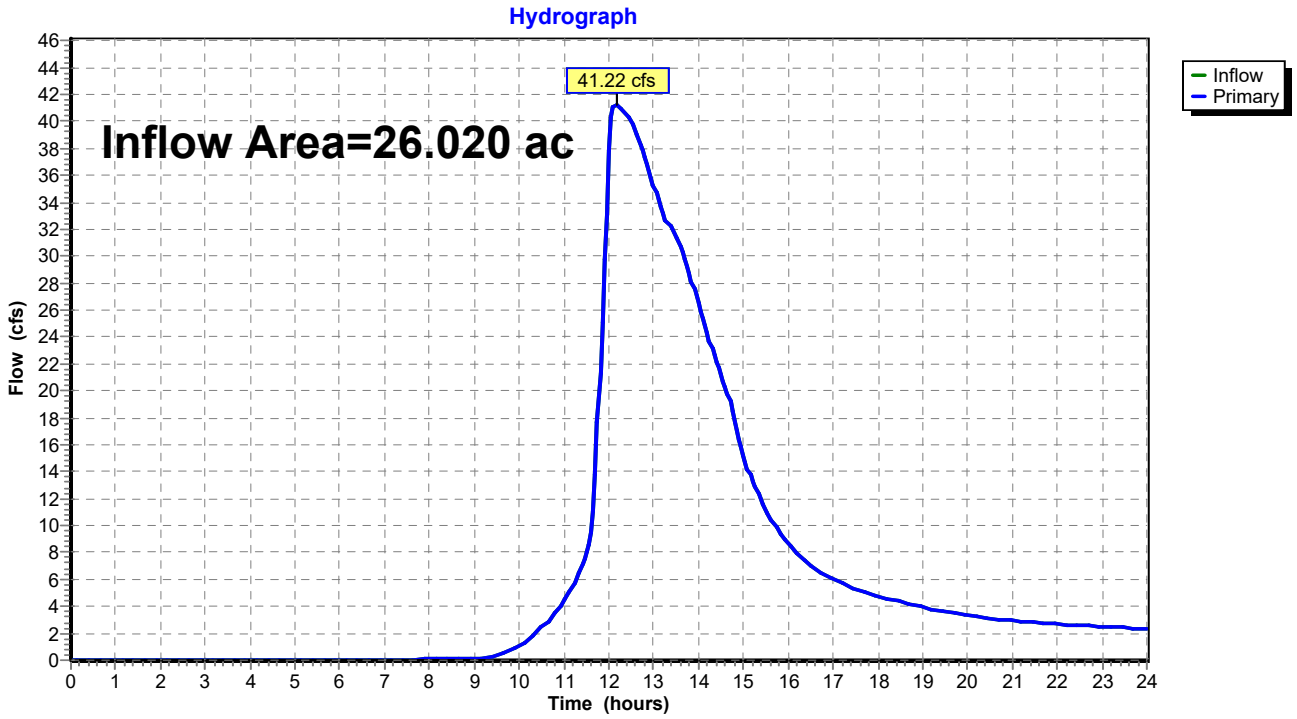


Summary for Link 10L: RP-4

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 5.72" for 100-Year event
Inflow = 41.22 cfs @ 12.16 hrs, Volume= 12.400 af
Primary = 41.22 cfs @ 12.16 hrs, Volume= 12.400 af, Atten= 0%, Lag= 0.0 min

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

Link 10L: RP-4



Summary for Subcatchment 11S: Onsite 5

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

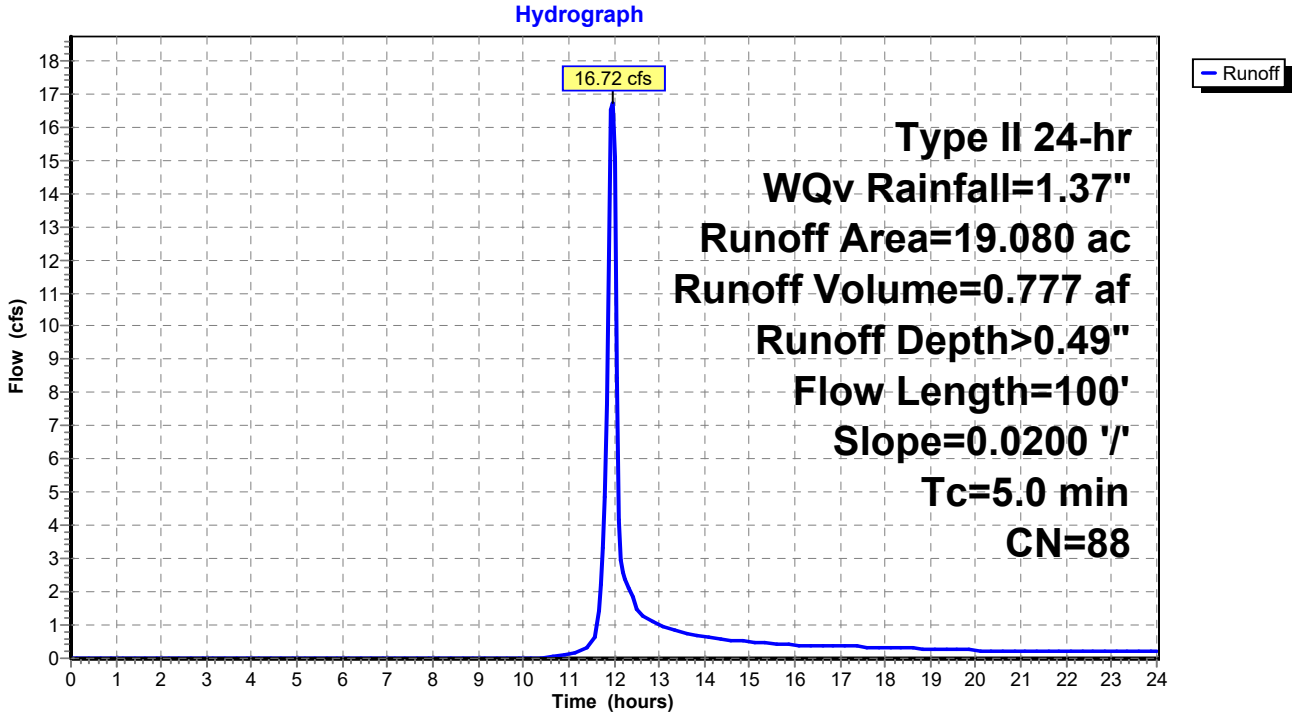
Runoff = 16.72 cfs @ 11.96 hrs, Volume= 0.777 af, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=1.37"

	Area (ac)	CN	Description
*	19.080	88	Apartments, 65% imp, HSG C
	6.678		35.00% Pervious Area
	12.402		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
3.9					**Direct Entry, Pipe flow**
5.0	100	Total			

Subcatchment 11S: Onsite 5



Summary for Subcatchment 12S: EX OFF

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

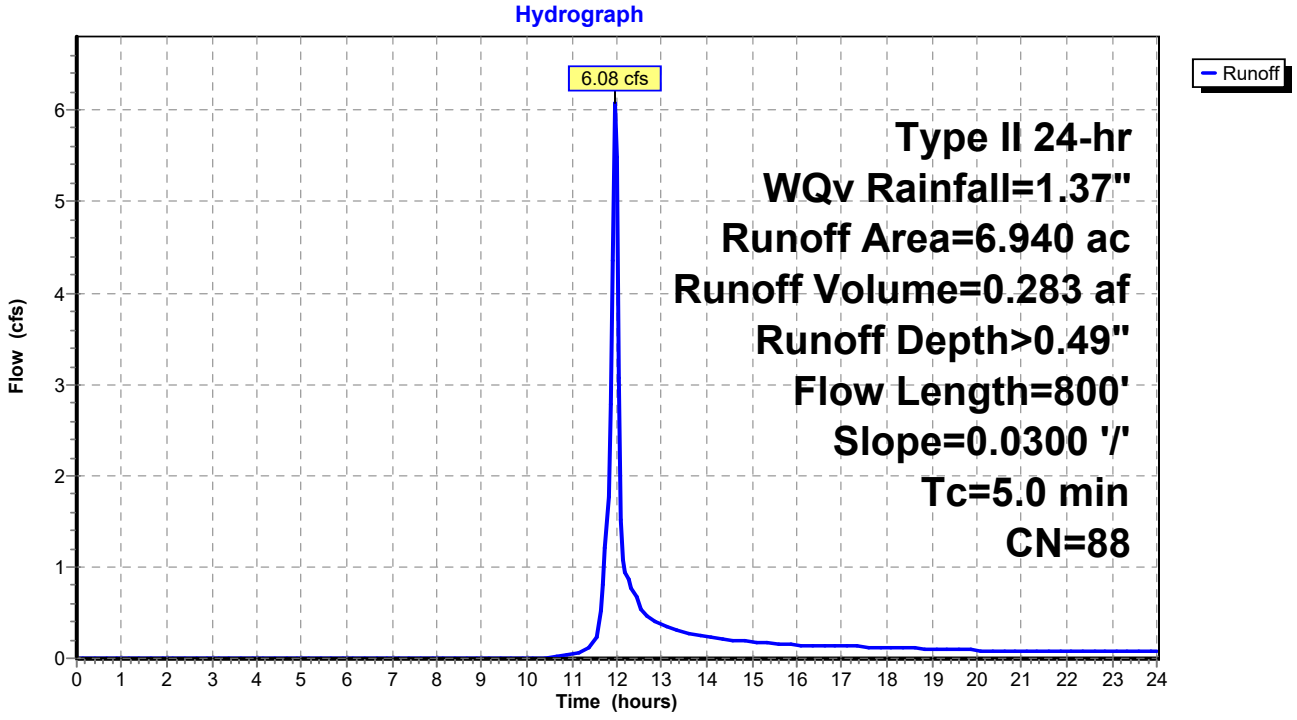
Runoff = 6.08 cfs @ 11.96 hrs, Volume= 0.283 af, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=1.37"

	Area (ac)	CN	Description
*	6.940	88	Future Multi-Family, 65% imp, HSG C
	2.429		35.00% Pervious Area
	4.511		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	100	0.0300	1.72		**Sheet Flow, Sheet flow** Smooth surfaces n= 0.011 P2= 3.60"
4.0	700		2.92		**Direct Entry, Pipe flow**
5.0	800	Total			

Subcatchment 12S: EX OFF



Summary for Subcatchment 13S: Onsite 4

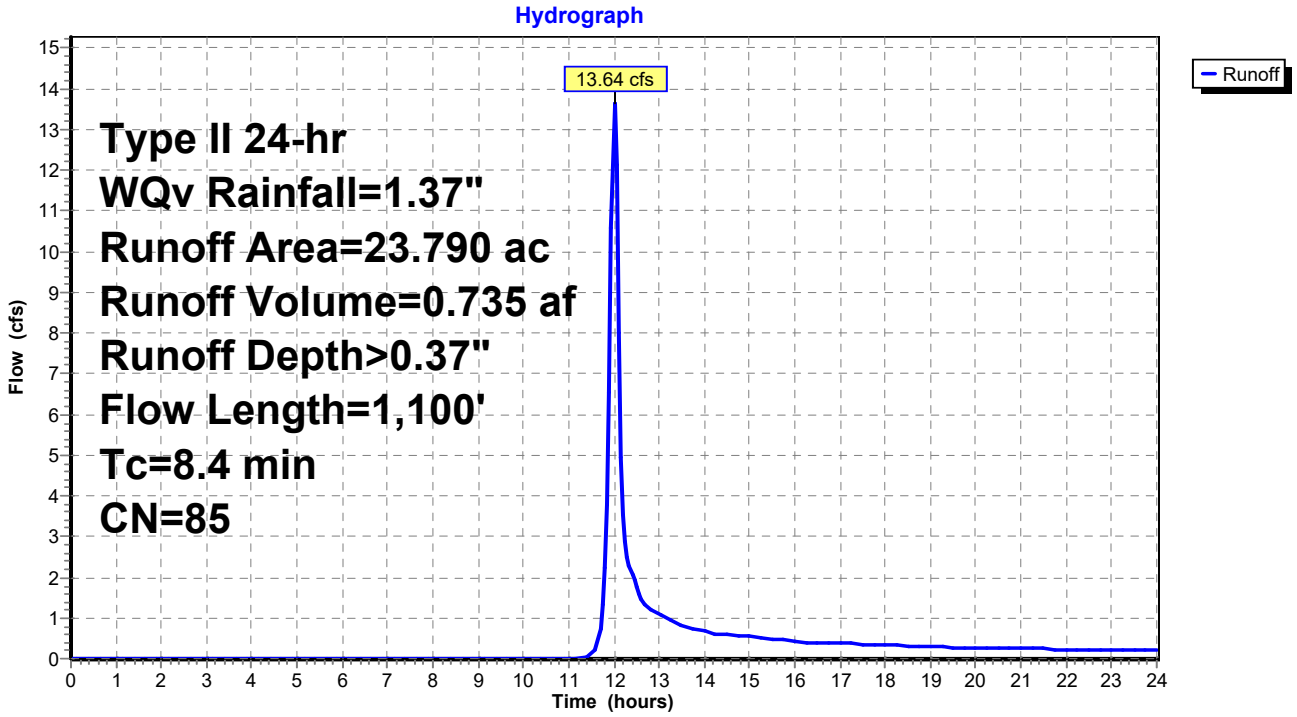
Runoff = 13.64 cfs @ 12.01 hrs, Volume= 0.735 af, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=1.37"

	Area (ac)	CN	Description
*	11.250	82	SINGLE FAMILY LOTS
*	12.540	88	1/8 acre lots, 65% imp, HSG D
	23.790	85	Weighted Average
	15.639		65.74% Pervious Area
	8.151		34.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0205	1.47		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
7.3	1,000	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.4	1,100	Total			

Subcatchment 13S: Onsite 4



Summary for Subcatchment 15S: Onsite 2

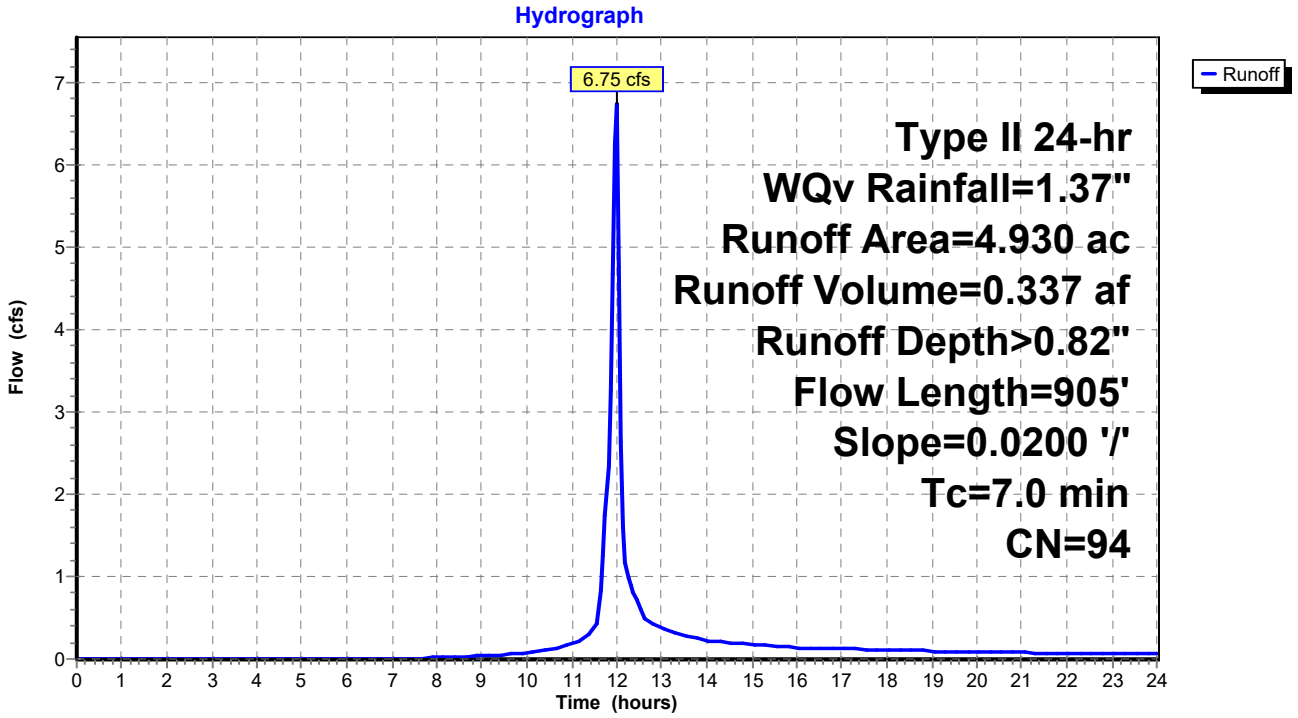
Runoff = 6.75 cfs @ 11.98 hrs, Volume= 0.337 af, Depth> 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=1.37"

	Area (ac)	CN	Description
*	4.930	94	Urban commercial, 85% imp, HSG D
	0.739		15.00% Pervious Area
	4.190		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
5.9	805	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.0	905	Total			

Subcatchment 15S: Onsite 2



Summary for Subcatchment 16S: Onsite 3

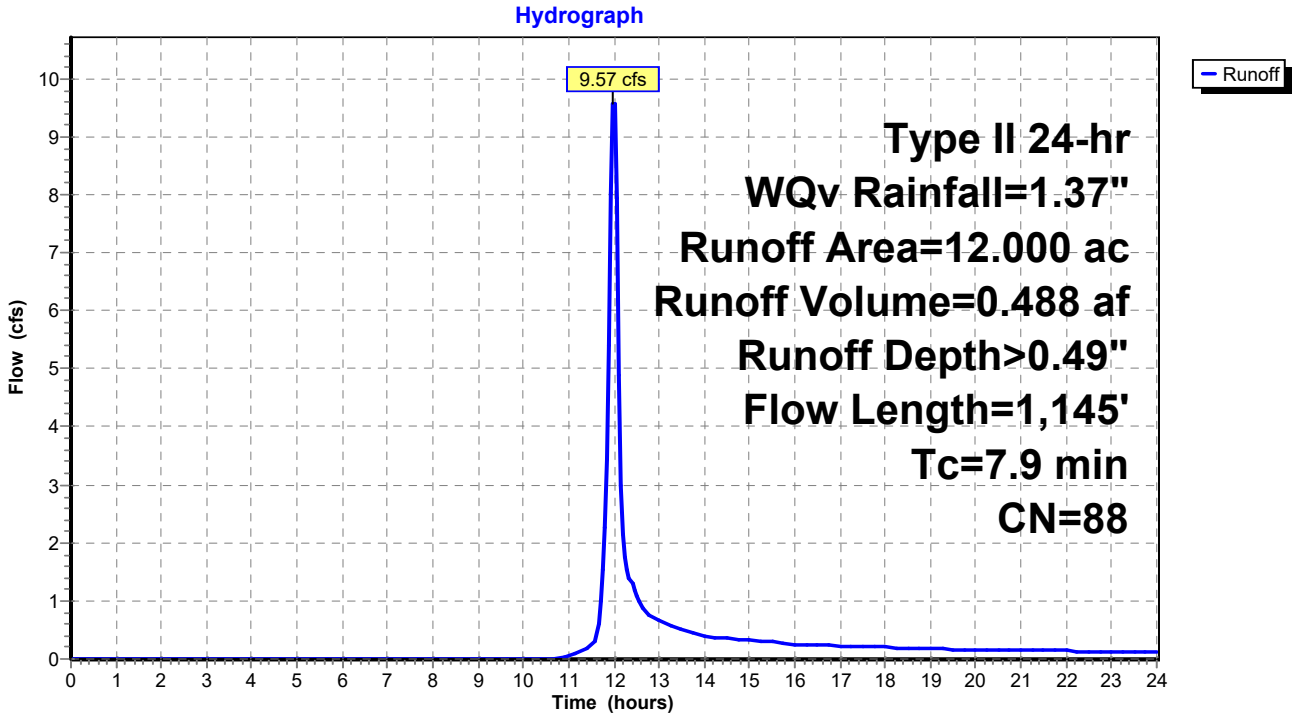
Runoff = 9.57 cfs @ 12.00 hrs, Volume= 0.488 af, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=1.37"

	Area (ac)	CN	Description
*	12.000	88	1/8 acre lots, 65% imp, HSG D
	4.200		35.00% Pervious Area
	7.800		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
6.8	1,045	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.9	1,145	Total			

Subcatchment 16S: Onsite 3



Summary for Subcatchment 17S: Onsite 1

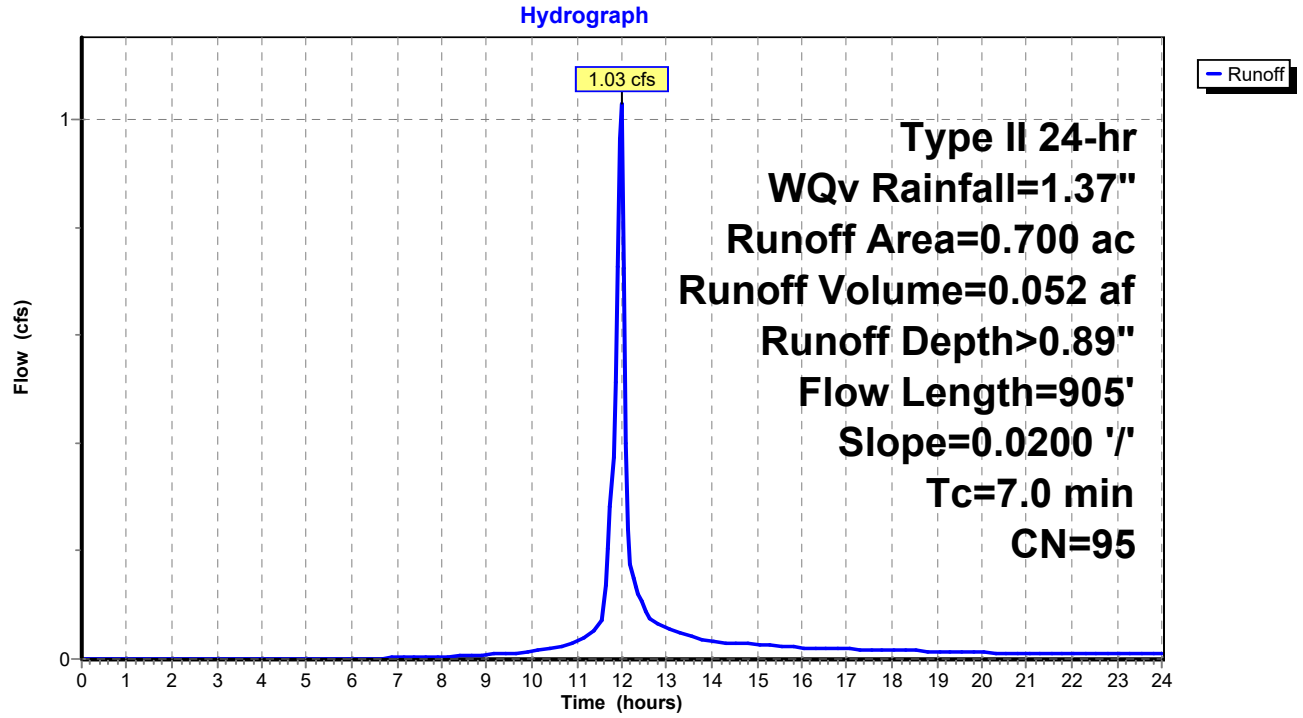
Runoff = 1.03 cfs @ 11.98 hrs, Volume= 0.052 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr WQv Rainfall=1.37"

Area (ac)	CN	Description
0.700	95	Urban commercial, 85% imp, HSG D
0.105		15.00% Pervious Area
0.595		85.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	100	0.0200	1.46		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.60"
5.9	805	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.0	905	Total			

Subcatchment 17S: Onsite 1



Summary for Pond 12P: EWDB #1

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 0.49" for WQv event
Inflow = 22.80 cfs @ 11.96 hrs, Volume= 1.060 af
Outflow = 0.30 cfs @ 21.52 hrs, Volume= 0.230 af, Atten= 99%, Lag= 573.6 min
Primary = 0.30 cfs @ 21.52 hrs, Volume= 0.230 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 995.53' @ 21.52 hrs Surf.Area= 69,979 sf Storage= 36,224 cf

Plug-Flow detention time= 431.7 min calculated for 0.230 af (22% of inflow)
Center-of-Mass det. time= 288.9 min (1,140.0 - 851.1)

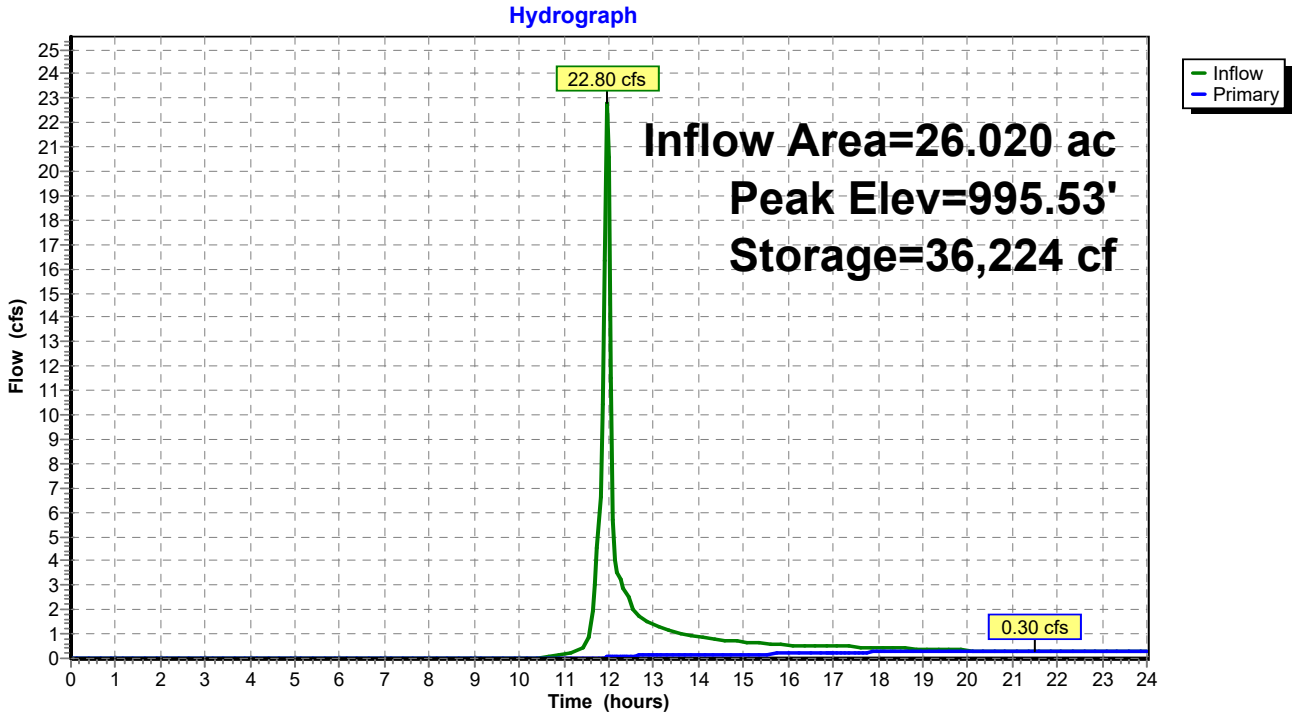
Volume	Invert	Avail.Storage	Storage Description
#1	995.00'	389,753 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
995.00	67,904	0	0
996.00	71,853	69,879	69,879
997.00	75,863	73,858	143,737
998.00	79,925	77,894	221,631
999.00	84,048	81,987	303,617
1,000.00	88,224	86,136	389,753

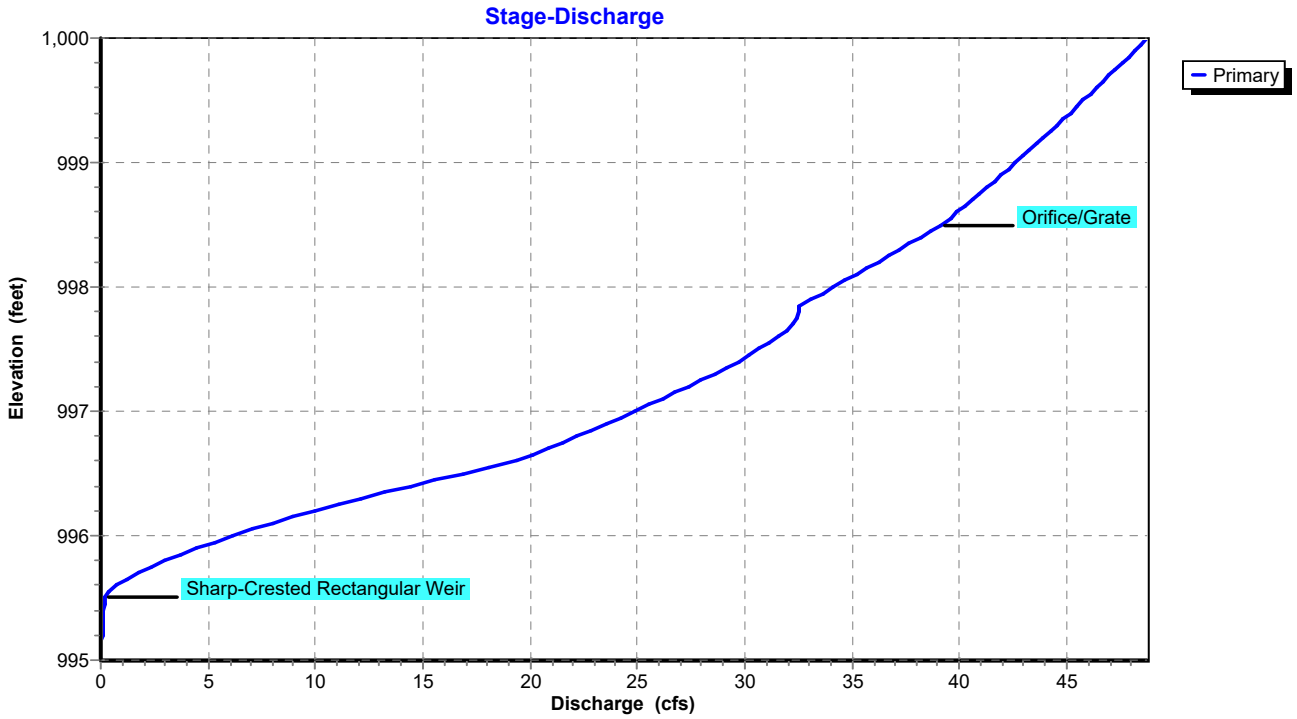
Device	Routing	Invert	Outlet Devices
#1	Primary	994.50'	**30.0" Round Culvert** L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 994.50' / 993.90' S= 0.0075 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	994.80'	**20.0 deg x 0.70' rise Sharp-Crested Vee/Trap Weir** Cv= 2.69 (C= 3.36)
#3	Device 1	995.50'	**5.0' long x 3.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height
#4	Device 1	998.50'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.28 cfs @ 21.52 hrs HW=995.53' (Free Discharge)
└**1=Culvert** (Passes 0.28 cfs of 6.00 cfs potential flow)
  ├**2=Sharp-Crested Vee/Trap Weir** (Orifice Controls 0.21 cfs @ 2.42 fps)
  ├**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.07 cfs @ 0.52 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

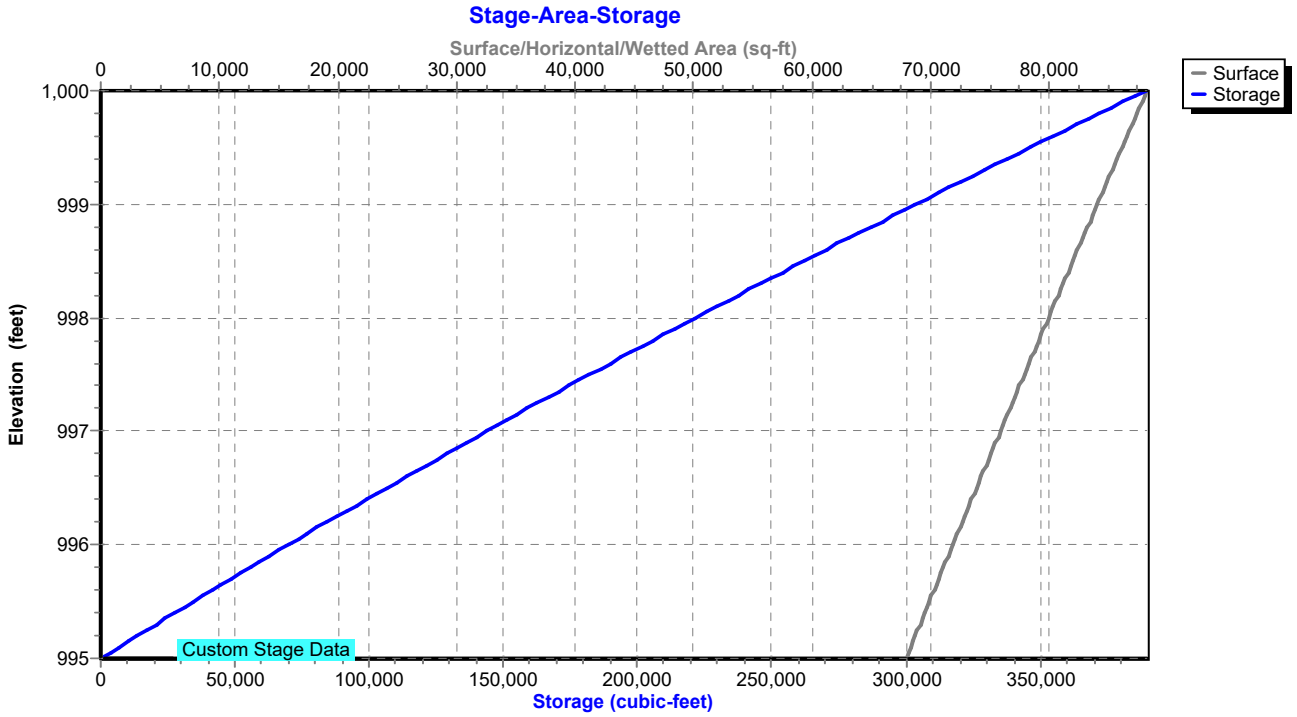
Pond 12P: EWDB #1



Pond 12P: EWDB #1



Pond 12P: EWDB #1



Summary for Pond 13P: EWDB #2

Inflow Area = 12.000 ac, 65.00% Impervious, Inflow Depth > 0.49" for WQv event
Inflow = 9.57 cfs @ 12.00 hrs, Volume= 0.488 af
Outflow = 0.19 cfs @ 18.47 hrs, Volume= 0.166 af, Atten= 98%, Lag= 388.5 min
Primary = 0.19 cfs @ 18.47 hrs, Volume= 0.166 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 992.69' @ 18.47 hrs Surf.Area= 22,108 sf Storage= 14,734 cf

Plug-Flow detention time= 389.9 min calculated for 0.165 af (34% of inflow)
Center-of-Mass det. time= 251.4 min (1,104.7 - 853.3)

Volume	Invert	Avail.Storage	Storage Description
#1	992.00'	167,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

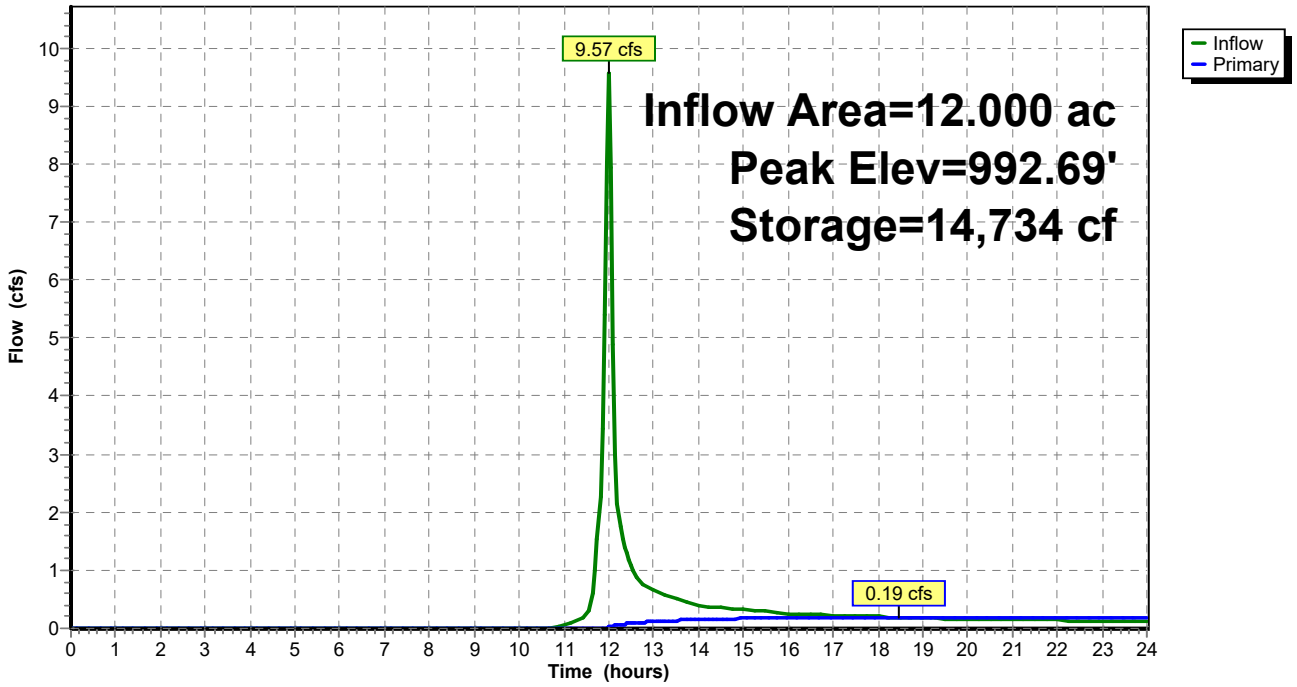
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
992.00	20,519	0	0
993.00	22,818	21,669	21,669
994.00	25,218	24,018	45,687
995.00	27,718	26,468	72,155
996.00	30,318	29,018	101,173
997.00	33,019	31,669	132,841
998.00	35,821	34,420	167,261

Device	Routing	Invert	Outlet Devices
#1	Primary	990.00'	**18.0" Round Culvert** L= 55.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 990.00' / 985.00' S= 0.0899 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Device 1	992.00'	**20.0 deg x 4.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.69 (C= 3.36)
#3	Device 1	996.00'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.19 cfs @ 18.47 hrs HW=992.69' (Free Discharge)
└**1=Culvert** (Passes 0.19 cfs of 11.86 cfs potential flow)
  ├**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.19 cfs @ 2.24 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

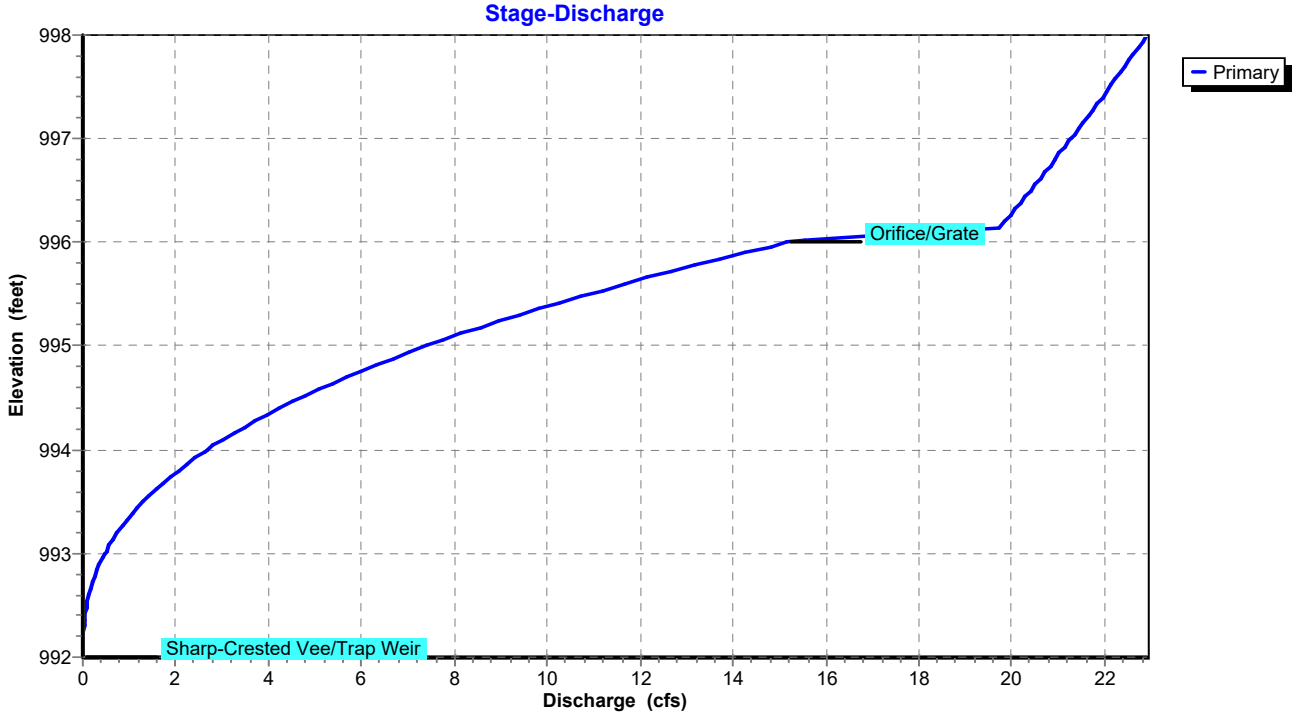
Pond 13P: EWDB #2

Hydrograph

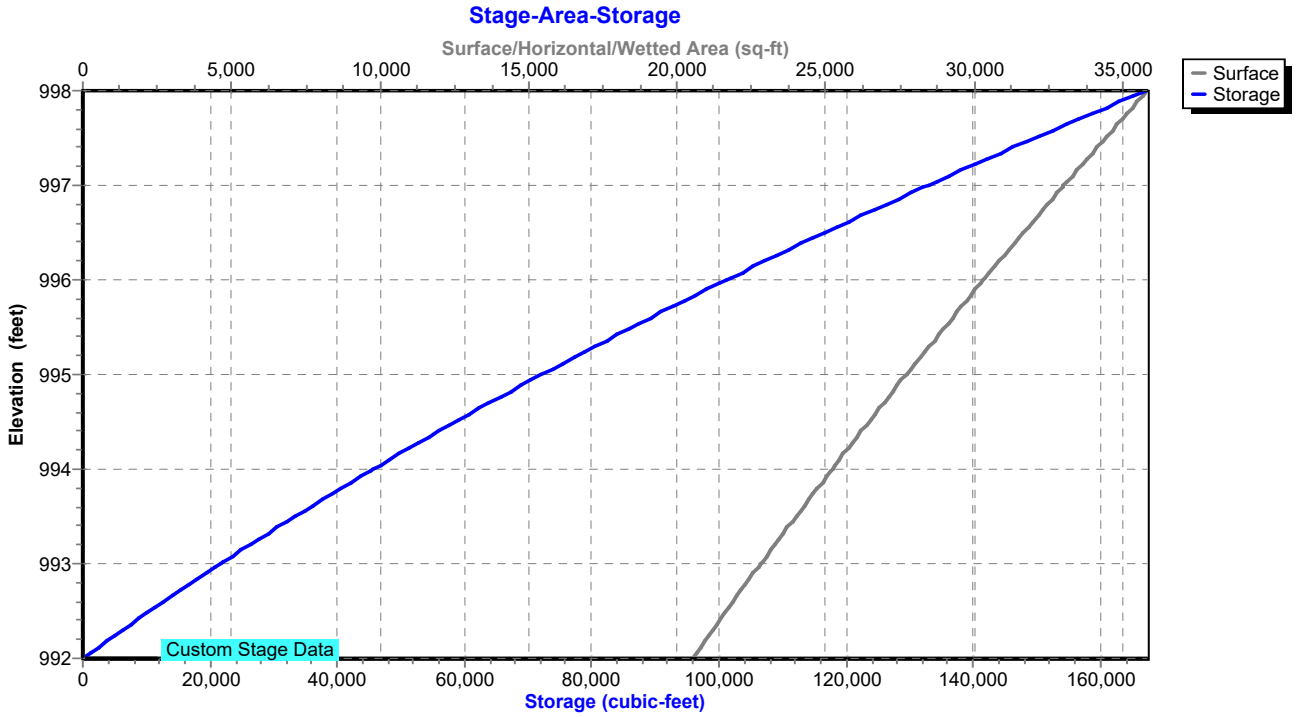


Pond 13P: EWDB #2

Stage-Discharge



Pond 13P: EWDB #2



Summary for Pond 14P: EWDB #3

[79] Warning: Submerged Pond 13P Primary device # 1 OUTLET by 1.74'

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 0.30" for WQv event
Inflow = 13.65 cfs @ 12.01 hrs, Volume= 0.901 af
Outflow = 0.40 cfs @ 22.69 hrs, Volume= 0.336 af, Atten= 97%, Lag= 640.6 min
Primary = 0.40 cfs @ 22.69 hrs, Volume= 0.336 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 986.74' @ 22.69 hrs Surf.Area= 34,616 sf Storage= 24,649 cf

Plug-Flow detention time= 400.0 min calculated for 0.335 af (37% of inflow)
Center-of-Mass det. time= 210.3 min (1,123.9 - 913.5)

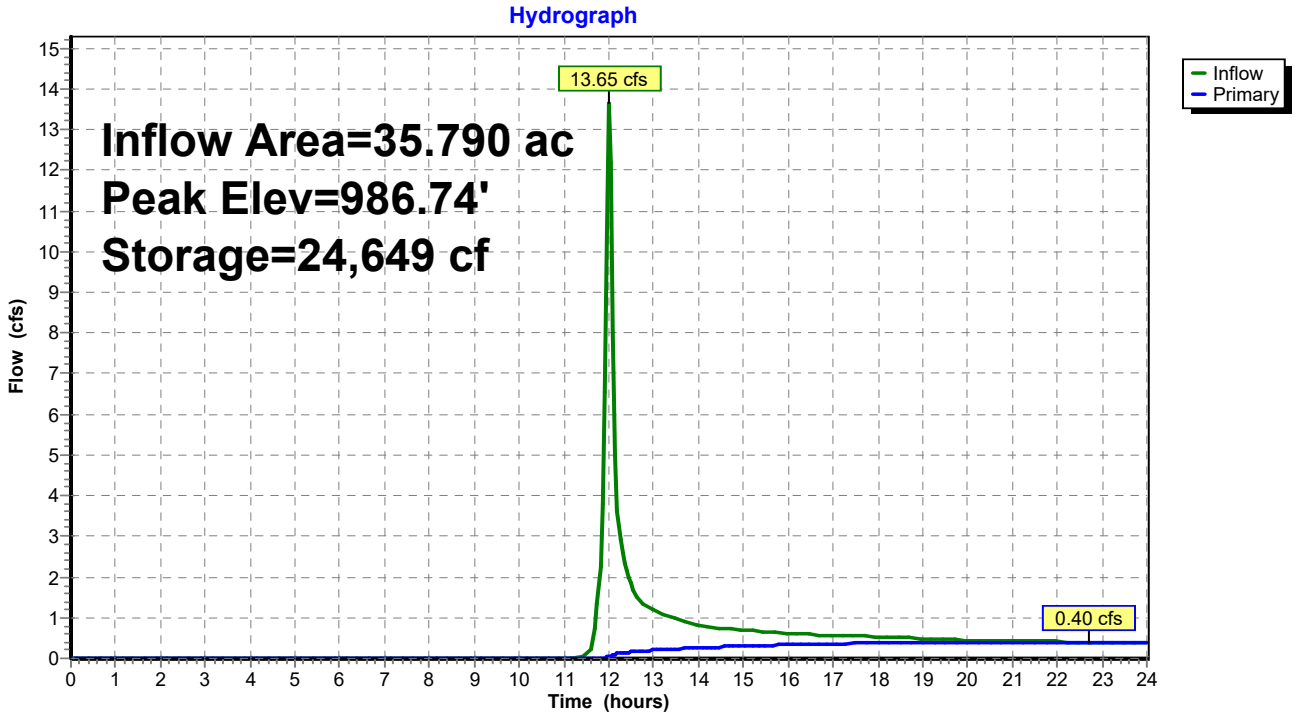
Volume	Invert	Avail.Storage	Storage Description
#1	986.00'	260,929 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
986.00	32,444	0	0
987.00	35,398	33,921	33,921
988.00	38,453	36,926	70,847
989.00	42,954	40,704	111,550
990.00	47,178	45,066	156,616
991.00	52,032	49,605	206,221
992.00	57,384	54,708	260,929

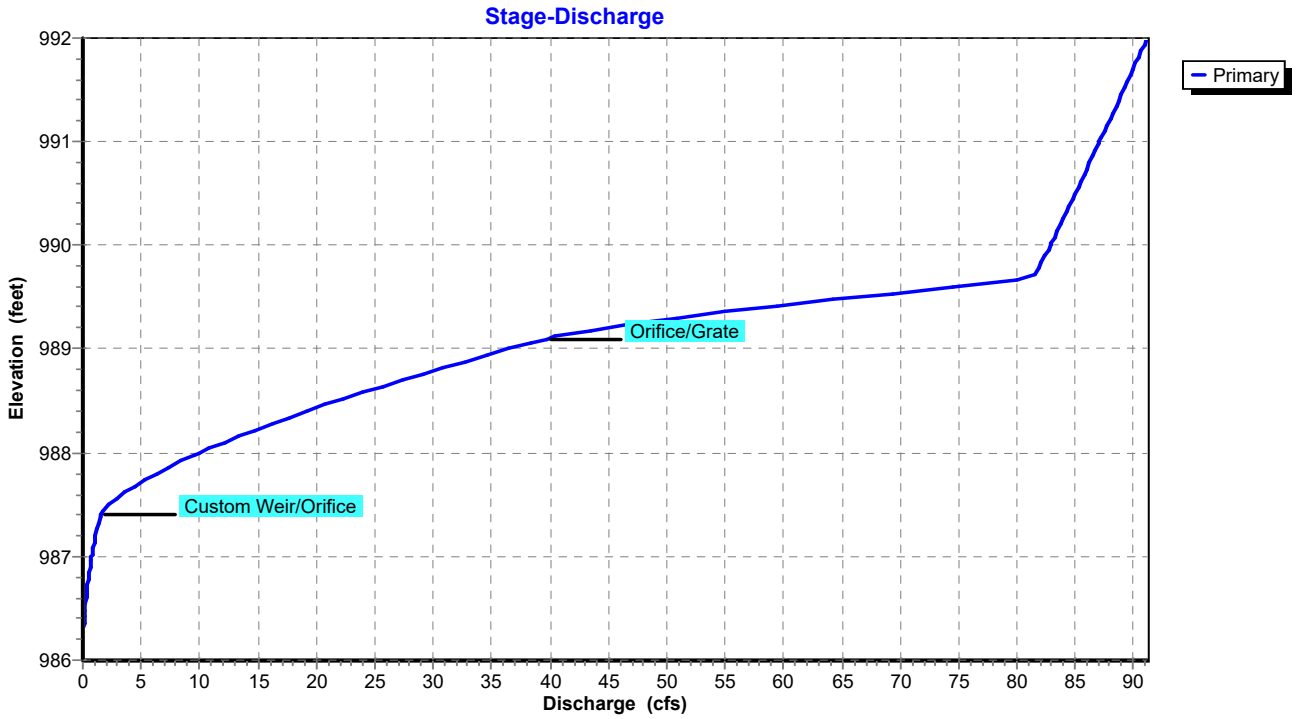
Device	Routing	Invert	Outlet Devices
#1	Primary	979.00'	**36.0" Round Culvert** L= 200.1' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 979.00' / 977.28' S= 0.0086 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 7.07 sf
#2	Device 1	985.80'	**20.0 deg x 1.60' rise Sharp-Crested Vee/Trap Weir** Cv= 2.69 (C= 3.36)
#3	Device 1	987.40'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Elev. (feet) 987.40 989.10 Width (feet) 5.00 5.00
#4	Device 1	989.10'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.40 cfs @ 22.69 hrs HW=986.74' (Free Discharge)
└**1=Culvert** (Passes 0.40 cfs of 67.09 cfs potential flow)
  ├**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.40 cfs @ 2.60 fps)
  ├**3=Custom Weir/Orifice** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

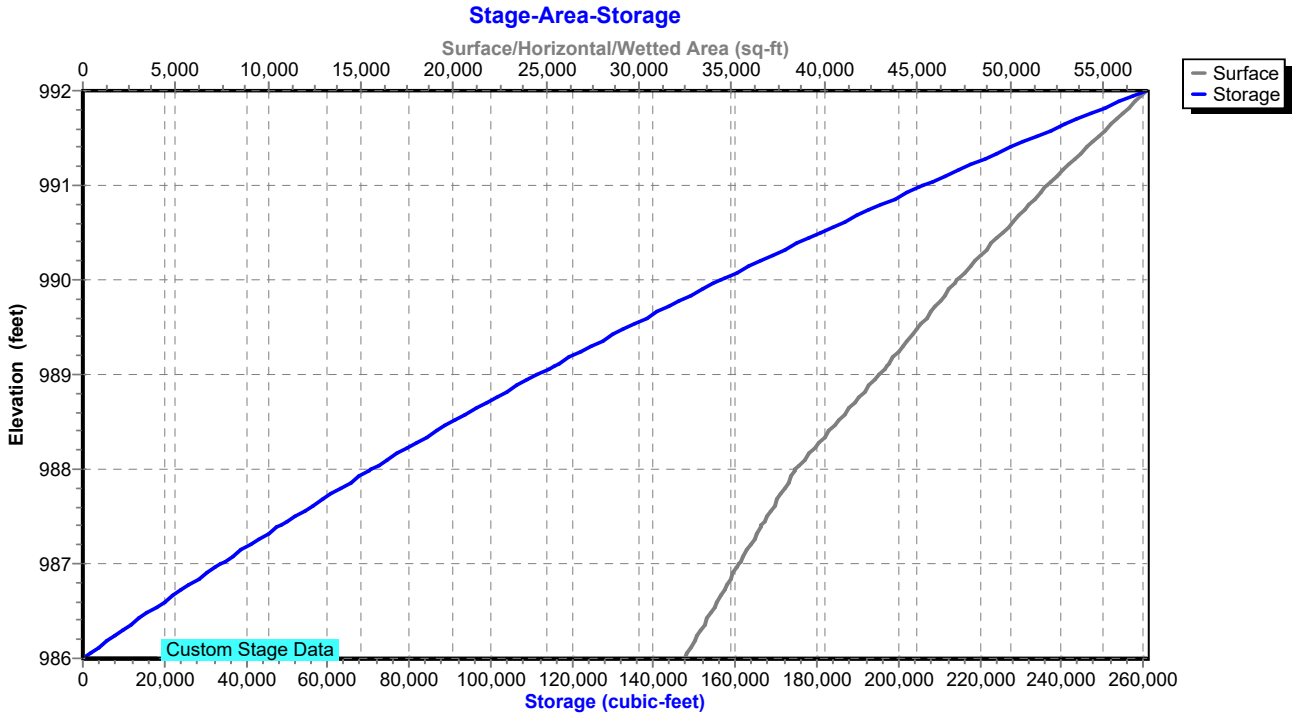
Pond 14P: EWDB #3



Pond 14P: EWDB #3



Pond 14P: EWDB #3



Summary for Pond 15P: EDDB #1

Inflow Area = 4.930 ac, 85.00% Impervious, Inflow Depth > 0.82" for WQv event
Inflow = 6.75 cfs @ 11.98 hrs, Volume= 0.337 af
Outflow = 0.21 cfs @ 14.32 hrs, Volume= 0.228 af, Atten= 97%, Lag= 140.3 min
Primary = 0.21 cfs @ 14.32 hrs, Volume= 0.228 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1,006.16' @ 14.32 hrs Surf.Area= 7,483 sf Storage= 8,057 cf

Plug-Flow detention time= 308.1 min calculated for 0.228 af (68% of inflow)
Center-of-Mass det. time= 205.5 min (1,021.2 - 815.8)

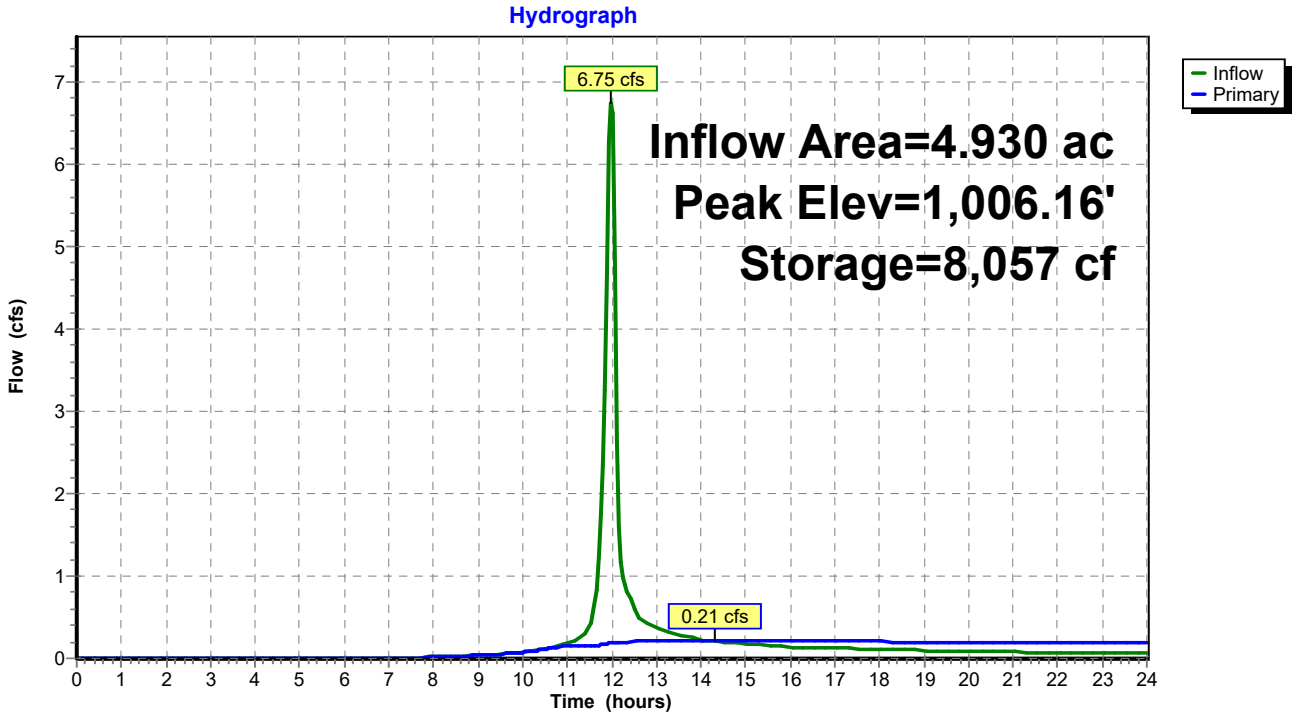
Volume	Invert	Avail.Storage	Storage Description
#1	1,004.00'	68,100 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,004.00	50	0	0
1,006.00	6,872	6,922	6,922
1,008.00	14,603	21,475	28,397
1,010.00	25,100	39,703	68,100

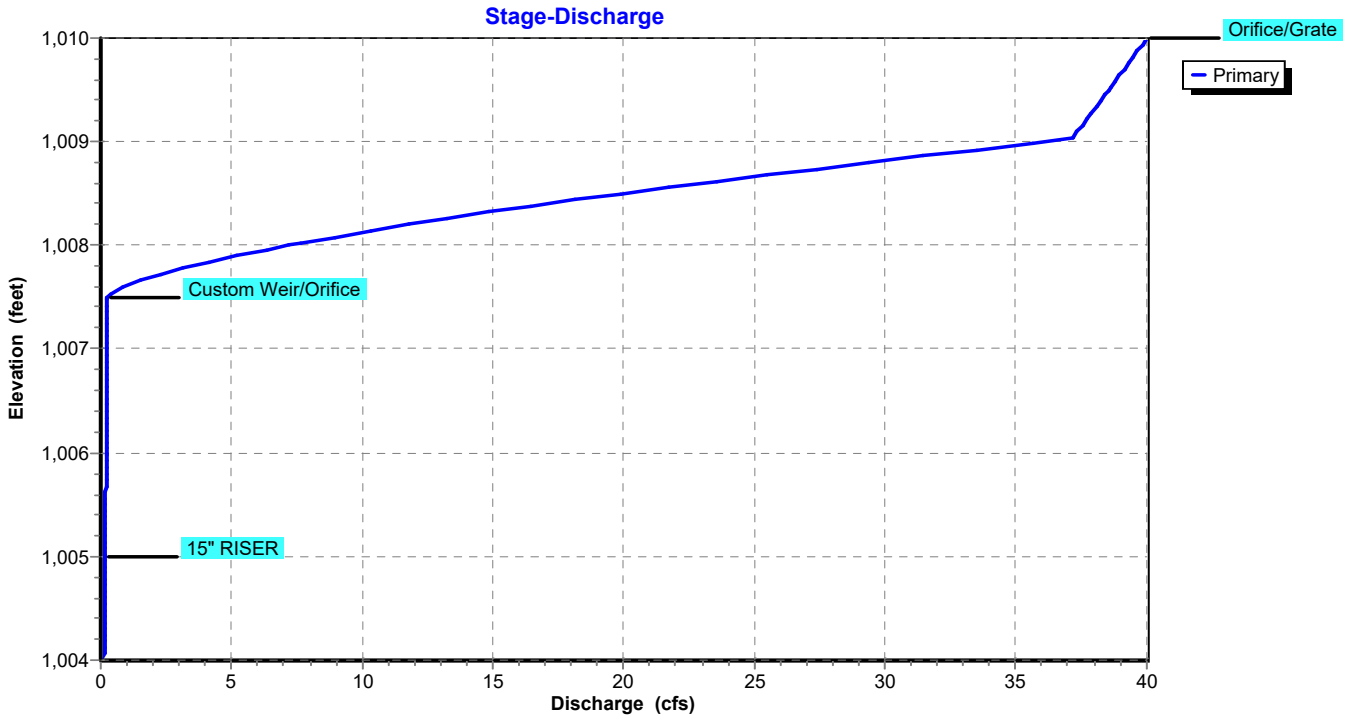
Device	Routing	Invert	Outlet Devices
#1	Primary	1,002.00'	**24.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 1,002.00' / 1,001.50' S= 0.0100 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	1,002.25'	**2.0" Vert. 2.0" ORIFICE** C= 0.600
#3	Device 1	1,007.50'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Elev. (feet) 1,007.50 1,009.50 Width (feet) 6.00 6.00
#4	Device 2	1,002.50'	**6.0" Round 6" PVC** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,002.50' / 1,002.25' S= 0.0083 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#5	Device 2	1,005.00'	**1.0" Vert. 15" RISER X 7.00 columns** X 9 rows with 4.0" cc spacing C= 0.600
#6	Device 1	1,010.00'	**72.0" x 72.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.21 cfs @ 14.32 hrs HW=1,006.16' (Free Discharge)
└─**1=Culvert** (Passes 0.21 cfs of 26.88 cfs potential flow)
  ├─**2=2.0" ORIFICE** (Orifice Controls 0.21 cfs @ 9.42 fps)
  │ ├─**4=6" PVC** (Passes < 1.71 cfs potential flow)
  │ └─**5=15" RISER** (Passes < 0.54 cfs potential flow)
  ├─**3=Custom Weir/Orifice** (Controls 0.00 cfs)
  └─**6=Orifice/Grate** (Controls 0.00 cfs)

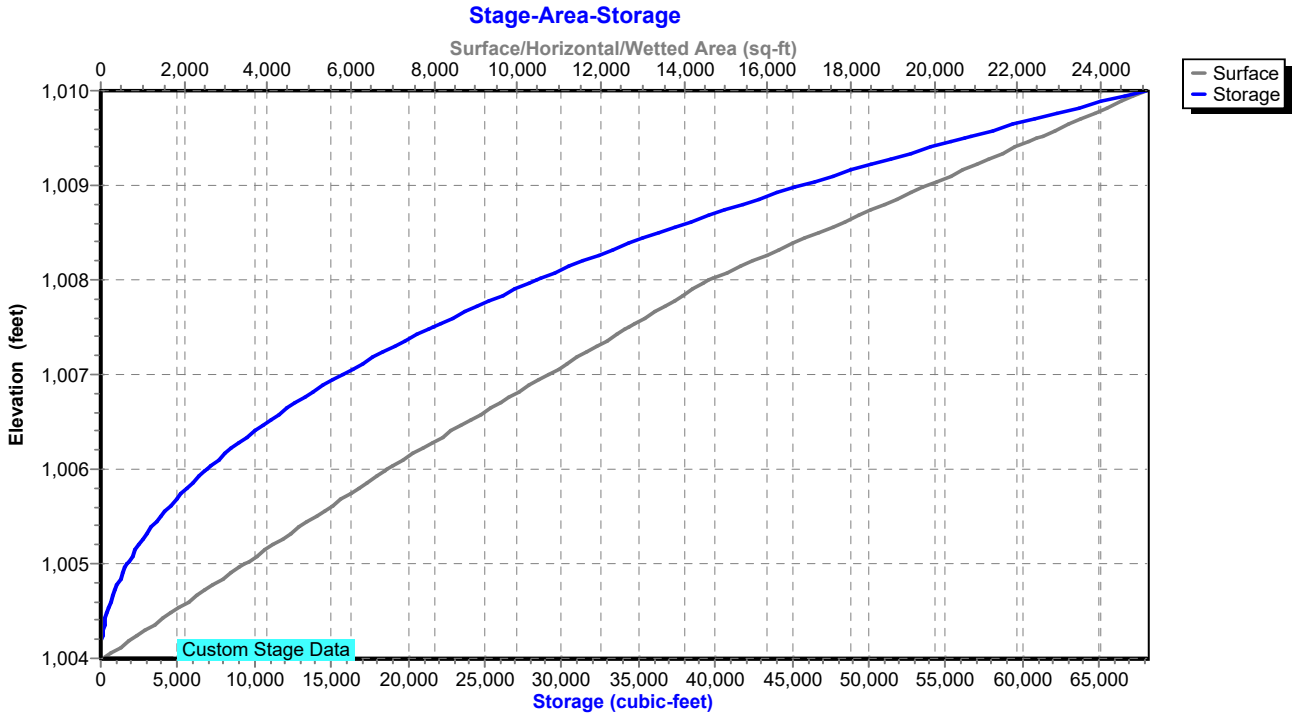
Pond 15P: EDDB #1



Pond 15P: EDDB #1



Pond 15P: EDDB #1

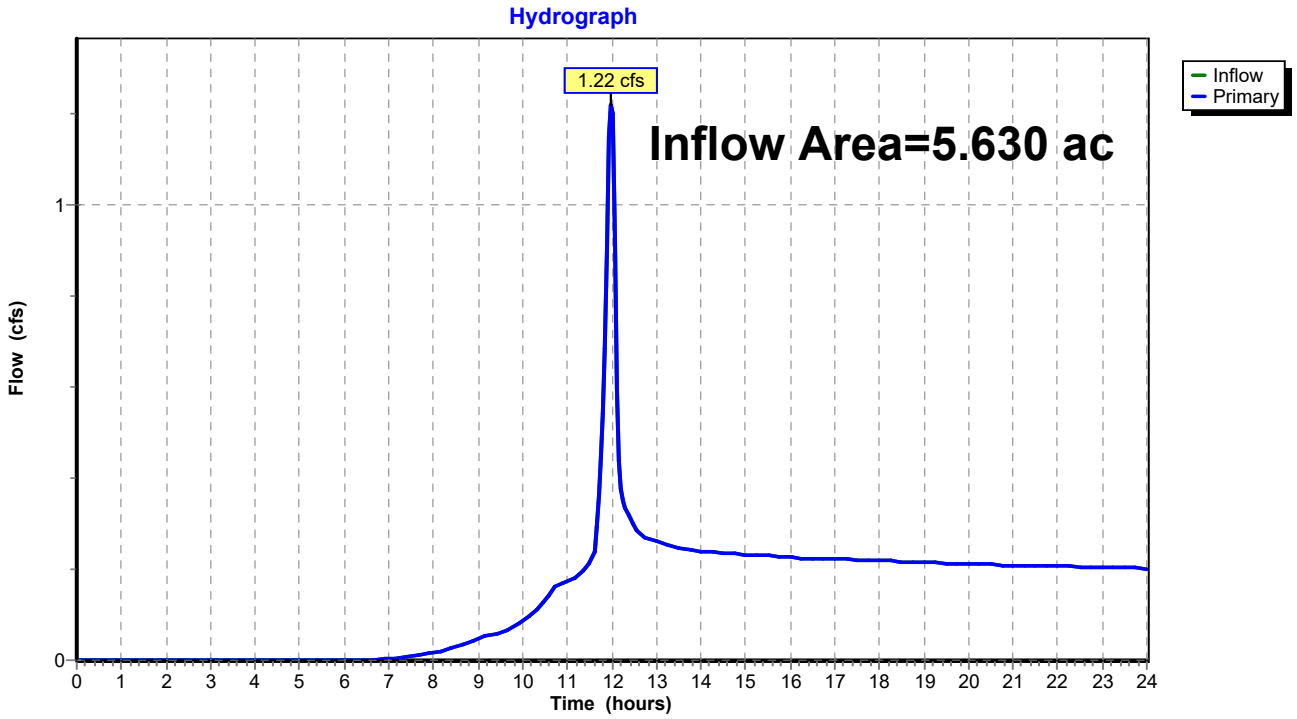


Summary for Link 7L: RP-1

Inflow Area = 5.630 ac, 85.00% Impervious, Inflow Depth > 0.60" for WQv event
Inflow = 1.22 cfs @ 11.98 hrs, Volume= 0.280 af
Primary = 1.22 cfs @ 11.98 hrs, Volume= 0.280 af, Atten= 0%, Lag= 0.0 min

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

Link 7L: RP-1

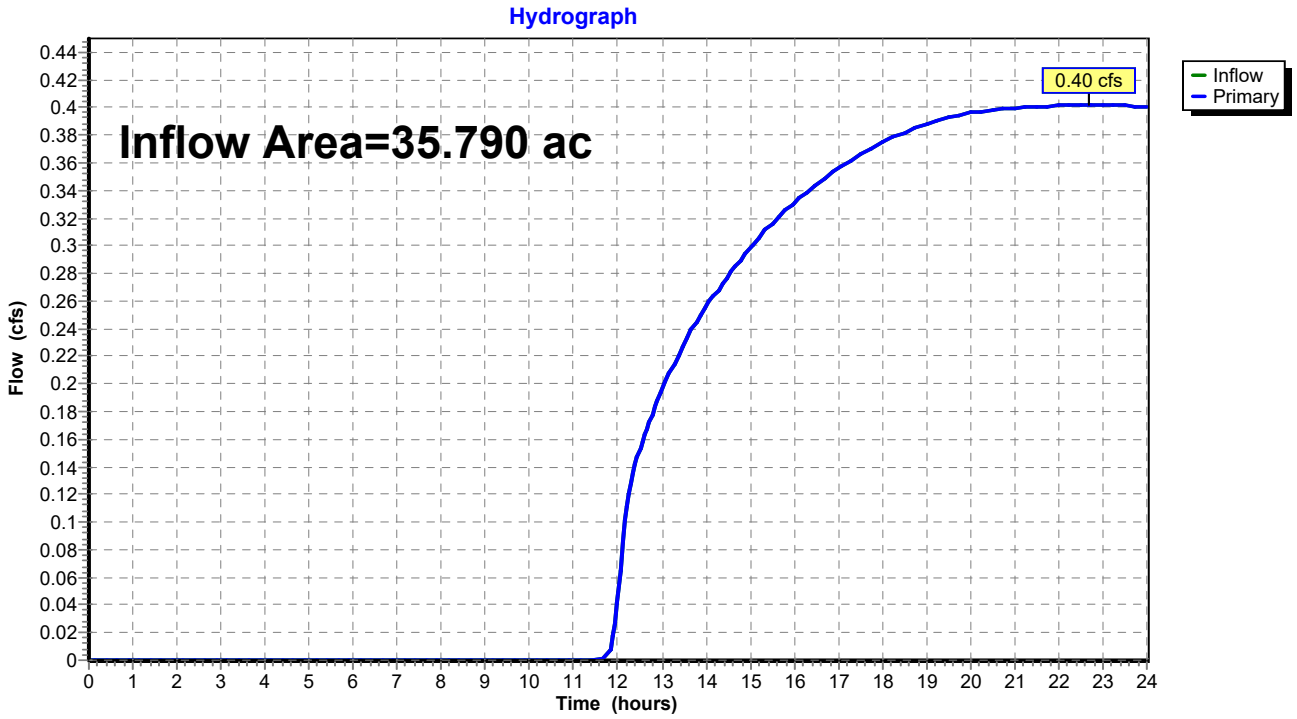


Summary for Link 9L: RP-3

Inflow Area = 35.790 ac, 44.57% Impervious, Inflow Depth > 0.11" for WQv event
Inflow = 0.40 cfs @ 22.69 hrs, Volume= 0.336 af
Primary = 0.40 cfs @ 22.69 hrs, Volume= 0.336 af, Atten= 0%, Lag= 0.0 min

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

Link 9L: RP-3

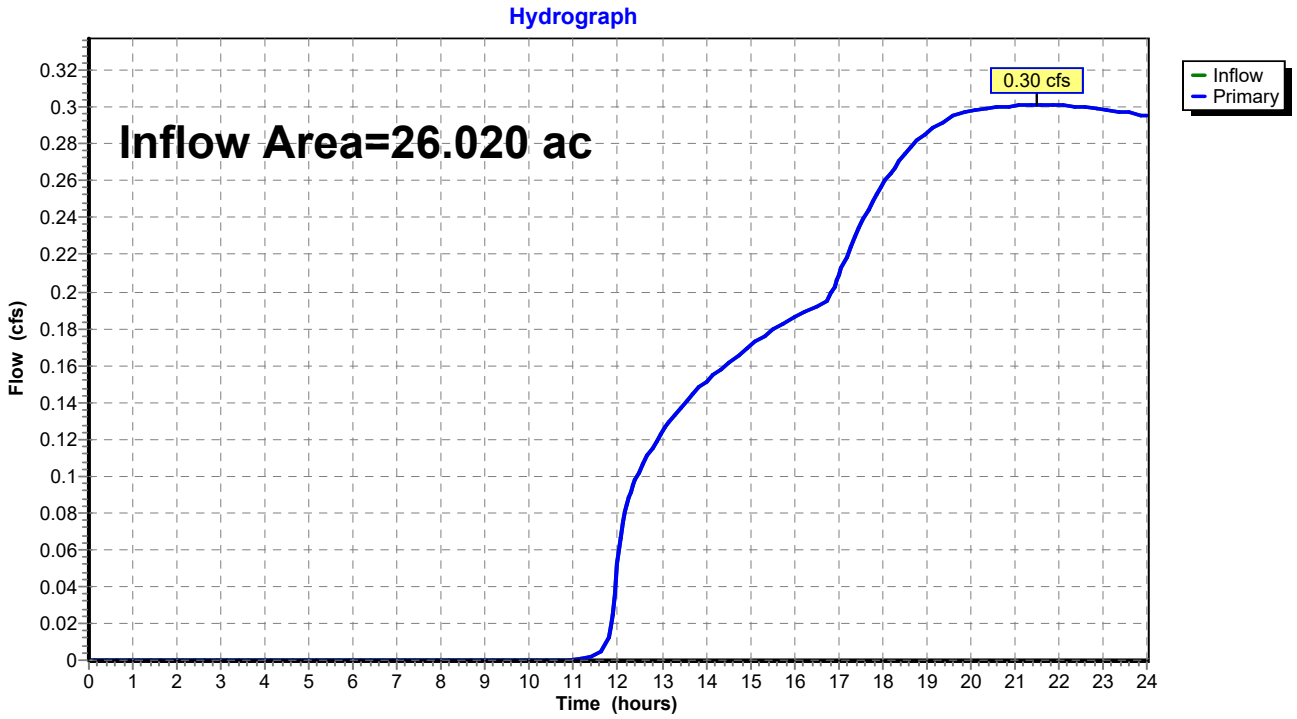


Summary for Link 10L: RP-4

Inflow Area = 26.020 ac, 65.00% Impervious, Inflow Depth > 0.11" for WQv event
Inflow = 0.30 cfs @ 21.52 hrs, Volume= 0.230 af
Primary = 0.30 cfs @ 21.52 hrs, Volume= 0.230 af, Atten= 0%, Lag= 0.0 min

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

Link 10L: RP-4



TERRA TECHNOLOGIES

Engineers • Scientists • Permit Specialists

Blackwell Parcel

Wetland Delineation And Jurisdictional Assessment

Prepared for

Griffin Riley Property Group
21 SE 29th Terrace
Lee's Summit, MO 64082

March 2022

6240 West 135th Street, Suite 100 • Overland Park, Kansas 66223
Phone: 913-385-9560 • Fax: 913-385-5295
Web: http://www.terratechnologies.com

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 INTRODUCTION

Terra Technologies is retained by the applicant, Griffin Riley Property Group, to conduct a wetlands delineation and jurisdictional assessment of wetlands and other waters of the U.S. within the project site located in Lee's Summit, Jackson County, Missouri. The property is owned by Fort Hays State University Foundation at One Tiger Place PO Box 1060 Hays, KS 67601. In accordance with Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (USACE) administers the permitting of dredge and fill activities in waters of the U.S., including wetlands. Most activities that would result in the placement of dredge or fill material in waters of the U.S. require a Section 404 Permit from the USACE. The information contained in this report will serve to delineate the presence and extents of jurisdictional waters of the U.S. within the project site.

2.0 PROJECT LOCATION, LAND USE, AND DESCRIPTION

The subject area is approximately 60.41 acres in size and is located in Section 11 of Township 47N Range 31W in the southern portion of Jackson County, Missouri (see Figures 1a & 1b [Google, 2019]).

The USGS topographic map published by the U.S. Geological Survey (USGS) indicates two ponds and one stream feature on the site (see Figure 1c [Google, 2019]).

The project site consists mainly of agricultural land and forested land. It is bordered by a school to the north, by forested land to the east, by Blue Parkway to the south, and by residential land and commercial land to the west (see Figure 1d [Google, 2019]). The subject site resides in the Central Irregular Plains Level III Ecoregion and the Wooded Osage Plains Level IV Ecoregion as mapped by the United States Environmental Protection Agency (Giffith *et al*., 2008).

According to the Federal Emergency Management Agency, the parcel is not within the mapped 100-year floodplain (see Figure 1e [Google, 2019]). The site is shown by the U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) as having four ponds and one riverine wetland (see Figure 2 [Google, 2019]).

The U.S. Department of Agriculture (USDA) National Resources Conservation Service (NRCS) mapped the soils on the site as Arisburg silt loam, 1-5% slopes (map unit 10000); Arisburg-Urban land complex, 1-5% slopes (map unit 10082); Sampsel silty clay loam, 5-9% slopes (map unit 10117); Sharpsburg-Urban land complex, 2-5% slopes (map unit 10128); Udarents-Urban land-Sampsel complex, 5-9% slopes (map unit 10181), and; Udarents-Urban land-Polo complex, 5-9% slopes (map unit 10183) (see Figure 3 [Soil Survey Staff, 2022]). The Arisburg and the Arisburg-Urban land soils are listed as hydric and the remaining soils are listed as nonhydric according to the NRCS Web Soil Survey.

3.0 FIELD EFFORTS

On February 11th, 2022 scientists with Terra Technologies completed site inspections to identify, delineate and map the locations of wetlands and other water bodies, and to document existing site conditions.

3.1 Stream Delineation

The delineation of streams was conducted through the inspection and characterization of channel characteristics, including a defined bed and bank and the presence of an ordinary high water mark (OHWM). Upon verification of an OHWM, physical attributes are measured and observed to determine channel width and depth and the extent of stream flow. Ephemeral channels carry flow for short durations after rain and snowmelt events and are typically void of pools. Ephemeral channels can exist with pools but do not receive adequate ground water following rain events to maintain pool presence. Intermittent channels carry flow for intermediate durations and often contain pools. Pool formation is supported from the transport of ground water to the pools between periods of precipitation. Intermittent pools are often determined to have a pool to pool base flow originating from the ground water source. Perennial channels represent higher order streams that carry flow for extended durations and are observed to maintain constant pooling. Perennial channels are often associated with the inflow of one or more consistent ground water sources and are typically fed by ephemeral and intermittent channels.

3.2 Wetland Delineation

Wetland delineation was performed according to the methods and procedures described in the USACE *Wetlands Delineation Manual* (Environmental Laboratory, 1987) and the *Regional*

Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0) (USACE, 2010). The presence of wetlands was ascertained by the observation of all three delineative criteria: 1) a predominance of hydrophytic (water-loving) plant species, 2) hydric soil indicators, and 3) wetland hydrology indicators. Wetland delineation sample points were established at multiple observation points in representative areas of the project. Wetland boundaries were determined in the field and surveyed using a Garmin eTrex Legend C Global Positioning System (GPS) to an approximate accuracy of 10 feet.

The methods used to evaluate the three mandatory wetland criteria (hydrophytic vegetation, hydric soil, and wetland hydrology) are described as follows:

Hydrophytic Vegetation Indicators

The hydrophytic vegetation criterion for wetland determination is met when more than 50 percent of the dominant plant species at a given site are obligate, facultative wetland, or facultative species according to the plant list published by the USACE (Lichvar et al, 2016), the vegetation has a prevalence index score of ≤3.0, the vegetation displays certain morphological adaptations, or is problematic hydrophytic vegetation that is determined to be hydrophytic using our best professional judgment. A semi-quantitative (routine determination) or quantitative (comprehensive determination) estimate is made of the dominant plant species for each vegetation stratum (herb, shrub, vine, and tree). Vegetative sampling is conducted using a graduated series of plots for each stratum (5-foot radius for herbaceous species, 15-foot radius for saplings and shrubs and 30-foot radius for trees and woody vines). A wetland boundary is determined based on the percentage of wetland species versus upland vegetation per vegetation strata identified during the on-site investigation. The indicator status of the vegetation, as listed in Lichvar et al (2016), is used to determine if an area is dominated by hydrophytic or upland species. Taxonomic nomenclature follows that used in Lichvar et al (2016).

Hydric Soil Indicators

Hydric soil is defined by the USACE as soil that is formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. An area is considered to have hydric soil when the National Technical Committee for Hydric Soils criteria are met. These conditions

relate to soil types, soil drainage characteristics, water table levels, and frequency of flooding. The presence or absence of hydric soils throughout the specified reach was determined by collecting soil cores using a 1 ¼-inch diameter stainless steel sampling tube. Soil samples were analyzed per the Munsell soil color charts (Gretag/Macbeth, 2010), USDA soil texture, consistency, moisture content, special features, and horizon designation.

Wetland Hydrology Indicators

Wetland hydrology is defined by the USACE as permanent or periodic inundation or prolonged soil saturation sufficient to create anaerobic conditions in the soil. Weather data, season of the year, and field observations of hydrologic indicators (water-stained leaves, high-water marks, saturated or inundated soils, *etc*.) are used to determine whether or not the wetland hydrology criterion is satisfied for the area of investigation.

3.3 Jurisdictional Assessment

Opinions about the jurisdictional nature of a wetland or other water of the U.S. are based upon the Clean Water Act and appropriate case law, most importantly to this project being the 1985 *United States v. Riverside Bayview Homes, Inc.,* the 2001 *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers,* and the 2006 *Rapanos v. United States & Carabell v. United States* rulings. Additionally, the December 2, 2008 U.S. Environmental Protection Agency / USACE guidance document titled *Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States* and prior history of USACE Kansas City District jurisdictional rulings and guidance were utilized. Despite our best professional judgment, the USACE retains the sole authority to determine the jurisdiction of waters of the U.S.

4.0 DELINEATED WATERS OF THE U.S. & JURISDICTIONAL ASSESSMENT

A total of 0.48 acre of wetlands, 230 lineal feet of ephemeral stream channel, and 0.49 acre of pond, were delineated within the subject area as shown in Figures 4a and 4b. Photographs of the project site are included in Appendix A and wetland determination data sheets are included in Appendix B. Figures 4a and 4b show the locations of photo points and wetland delineation sample points provided in Appendix A and Appendix B.

4.1 Stream Channels

One ephemeral stream channel exists within the subject area.

Ephemeral #1 is a stream originating in the southeastern portion of the subject area and generally flows to the northeast. It has an OHWM which averages two feet in width and banks averaging two feet tall and four feet wide. The substrate predominantly consists of sediment, gravel, and cobble. It extends at the stream centerline approximately 230 lineal feet within the subject area and has a drainage area of approximately 14 acres. Within the assessed site, the stream is surrounded by a vegetated riparian corridor dominated by honey suckle (*Lonicera maackii*), Virginia wild rye (*Elymus virginicus*), and Osage orange (*Maclura pomifera*). Surface water from Ephemeral #1 flows to the northeast into an unnamed tributary. The unnamed tributary flows to the northwest into the East Fork Little Blue River. The East Fork Little Blue River flows to the northwest into the Little Blue River which then flows to the northeast into the Missouri River. This provides a direct surface water connection to downstream traditional navigable waters which makes it likely Ephemeral #1 will be considered a jurisdictional water of the United States.

Table 1. Stream Summary

Stream ID	Lineal Feet Within Subject Area	Likely Jurisdictional?
Ephemeral #1	230	*Yes*
TOTAL	***230***	**-**

4.2 Wetlands

A discussion of each delineated wetland follows:

Wetland #1 is an approximately 0.10-acre emergent wetland located in the northeastern portion of the subject area. It is dominated by hummocked fescue (*Schedonorus arundinaceus*). Wetland hydrology was found in this location because of the observation of the geomorphic position, drainage patterns, surface water, and saturation. Observations of the soil at this location determined it to have the hydric soil indicator redox dark surface. This wetland receives water as sheet flow from the surrounding lands as well as more concentrated flows from an erosional feature to the southwest. Surface water from this wetland flows to

the northeast through an upland swale and into a stormwater sewer system. The surface flow from the stormwater sewer system generally flows to the northeast and into an unnamed tributary. The unnamed tributary flows to the northwest into the East Fork Little Blue River. The East Fork Little Blue River flows to the northwest into the Little Blue River which then flows to the northeast into the Missouri River. This provides a direct surface water connection to downstream traditional navigable waters which makes it likely Wetland #1 will be considered a jurisdictional water of the United States.

Wetland #2 is an approximately 0.06-acre forested wetland located in the northeastern portion of the subject area. It is dominated by black willow (*Salix nigra*) and Frank's sedge (*Carex frankii*). Wetland hydrology was found in this location because of the observation of the geomorphic position, inundation visible on aerial imagery, and the FAC-neutral test. Observations of the soil at this location determined it to have the hydric soil indicator depleted matrix. This wetland receives water as sheet flow from the surrounding lands as well as more concentrated flows from an erosional feature to the southeast. Surface water from this wetland flows to the northeast through an erosional feature and into Wetland #1. The surface water then follows the same path as Wetland #1 to the Missouri River. This provides a direct surface water connection to downstream traditional navigable waters which makes it likely Wetland #2 will be considered a jurisdictional water of the United States.

Wetland #3 is an approximately 0.05-acre emergent wetland located in the northcentral portion of the subject area. It is dominated by hummocked fescue. Wetland hydrology was found in this location because of the observation of the geomorphic position and saturation. Observations of the soil at this location determined it to have the hydric soil indicator redox dark surface. This wetland receives water as sheet flow from the surrounding lands. Surface water from this wetland flows to the northeast into Pond #1. Pond #1 flows to the northeast into an erosional feature which then flows to the northwest into Wetland #2. Wetland #2 flows to the northeast through an erosional feature and into Wetland #1. The surface water then follows the same path as Wetland #1 to the Missouri River. This provides a direct surface water connection to downstream traditional navigable waters which makes it likely Wetland #3 will be considered a jurisdictional water of the United States.

Wetland #4 is an approximately 0.12-acre emergent wetland located in the southeastern portion of the subject area. It is dominated by hummocked fescue. Wetland hydrology was found in this location because of the observation of the geomorphic position, drainage patterns, surface water, and saturation. Observations of the soil at this location determined it

to have the hydric soil indicator depleted matrix. This wetland receives water as sheet flow from the surrounding lands as well as more concentrated flows from a pipe outlet to the southwest. Surface water from this wetland flows to the northeast into Ephemeral #1. Surface water from Ephemeral #1 flows to the northeast into an unnamed tributary. The unnamed tributary flows to the northwest into the East Fork Little Blue River. The East Fork Little Blue River flows to the northwest into the Little Blue River which then flows to the northeast into the Missouri River. This provides a direct surface water connection to downstream traditional navigable waters which makes it likely Wetland #4 will be considered a jurisdictional water of the United States.

Wetland #5 is an approximately 0.09-acre forested wetland located in the southeastern portion of the subject area. It is dominated by black willow, reed canary grass (*Phalaris arundinacea*), and Pennsylvania smartweed (*Persicaria pensylvanica*). Wetland hydrology was found in this location because of the observation of the geomorphic position and the FAC neutral test. Observations of the soil at this location determined it to have the hydric soil indicator depleted matrix. This wetland receives water as sheet flow from the surrounding lands. Surface water from this wetland flows to the southeast through the old pond dam overflow into the spillway which curves to the northeast around the pond dam and then into an erosional feature. The erosional feature flows to the northeast into Ephemeral #1. Ephemeral #1 flows to the northeast into an unnamed tributary. The unnamed tributary flows to the northwest into the East Fork Little Blue River. The East Fork Little Blue River flows to the northwest into the Little Blue River which then flows to the northeast into the Missouri River. This provides a direct surface water connection to downstream traditional navigable waters which makes it likely Wetland #5 will be considered a jurisdictional water of the United States.

Wetland #6 is an approximately 0.06-acre forested wetland located in the eastern portion of the subject area. It is dominated by black willow. Wetland hydrology was found in this location because of the observation of the geomorphic position, the FAC neutral test, and saturation. Observations of the soil at this location determined it to have the hydric soil indicator depleted matrix. This wetland receives water as sheet flow from the surrounding lands. This wetland is an isolated wetland which was constructed in an upland location and has no clear surface water path to traditional navigable waters. Because this wetland is an isolated wetland, it is likely this wetland will not be determined to be a jurisdictional water of the United States.

Table 2. Wetland Summary

Wetland ID	*Size (Acres)*	Wetland Type	Likely Jurisdictional?
1	0.10	Emergent	Yes
2	0.06	Forested	Yes
3	0.05	Emergent	Yes
4	0.12	Emergent	Yes
5	0.09	Forested	Yes
6	0.06	Forested	No
Total Amount of Wetlands	***0.48***	-	**-**
Total Amount of Likely Jurisdictional Wetlands	***0.42***	-	**-**

4.3 Ponds

Three ponds were present within the subject site.

Pond #1 is 0.08-acre and is located in the northcentral portion of the subject area. This pond was likely built for agricultural purposes. Pond #1 receives water as sheet flow from the surrounding lands. This pond was built in an upland area that was not in the location of a historic stream or other water feature and is not adjacent to a stream. For these reasons, it is likely that this pond will be considered a preamble water. Therefore, it is likely that this pond will not be considered to be jurisdictional water of the United States.

Pond #2 is 0.39-acre and is located in the central portion of the subject area. This pond was likely built for agricultural purposes. Pond #2 receives water as sheet flow from the surrounding lands. This pond was built in an upland area that was not in the location of a historic stream or other water feature and is not adjacent to a stream. For these reasons, it is likely that this pond will be considered a preamble water. Therefore, it is likely that this pond will not be considered to be jurisdictional water of the United States.

Pond #3 is 0.02-acre and is located in the southern portion of the subject area. While not confirmed, it is assumed that this feature was created as the effluent pond for the historic farmstead to the south of the subject area. Pond #3 does not have a drainage area that flows into it nor does it have an outlet or connection to a traditional navigable water, making it an isolated water. Additionally, this pond was built in an upland area that was not in the location of a historic stream or other water feature and is not adjacent to a stream, making it a

preamble water. For these reasons, it is likely that this pond will not be considered to be a jurisdictional water of the United States.

Table 3. Pond Summary

Pond ID	*Size (Acres)*	Likely Jurisdictional?
1	0.08	No
2	0.39	No
3	0.02	No
Total Pond Acreage	0.49	-
Total Amount of Likely Jurisdictional Ponds	***0.00***	-

5.0 CONCLUSIONS

This jurisdictional assessment represents an evaluation of potential jurisdictional environs within the subject area at the time of observation, subject to review and approval by USACE regulatory authorities. As presented above, there are six wetlands totaling 0.48-acre, one ephemeral stream channel totaling 230 lineal feet, and three ponds totaling 0.49 acre delineated on the parcel. It is likely that the stream and all the wetlands except for Wetland #6 will be considered to be jurisdictional waters of the United States. Wetland #6 is an isolated wetland and likely will not be considered a jurisdictional water of the United States. Pond #1, Pond #2, and Pond #3 will likely be determined to be preamble waters that are not considered jurisdictional waters of the United States.

6.0 REFERENCES

Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A176 912

Google Inc. 2019. Google Earth Pro (Version 7.3.2.5776) [Software]. http://www.google.com/earth/download/gep/agree.html

Gretag/Macbeth. 2010. Munsell® color. New Windsor, New York.

Griffith, G.E., J.M. Omernik (Lead Author) and M. McGinley (Topic Editor). 2008. December 2011. Ecoregions of Kansas and Nebraska (EPA). In: Encyclopedia of Earth. Eds. Cutler J. Cleveland (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment). [First published in the Encyclopedia of Earth December 11, 2008; Last revised Date December 11, 2008; <http://www.eoearth.org/article/Ecoregions_of_Kansas_and_Nebraska_(EPA)>

Lichvar, R.W., D. L. Banks, W.N. Kirchner, and N.C. Melvin, (Lichvar et al). 2016.
The National Wetland Plant List: 2016 Wetland Ratings.
Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X.
<http://www.phytoneuron.net/>

Soil Survey Staff. March 17, 2022. Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. <http://websoilsurvey.nrcs.usda.gov/>

U.S. Army Corps of Engineers (USACE). 2010. Regional supplement to the corps of engineers wetland delineation manual: Midwest region (version 2.0). ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-10-16. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

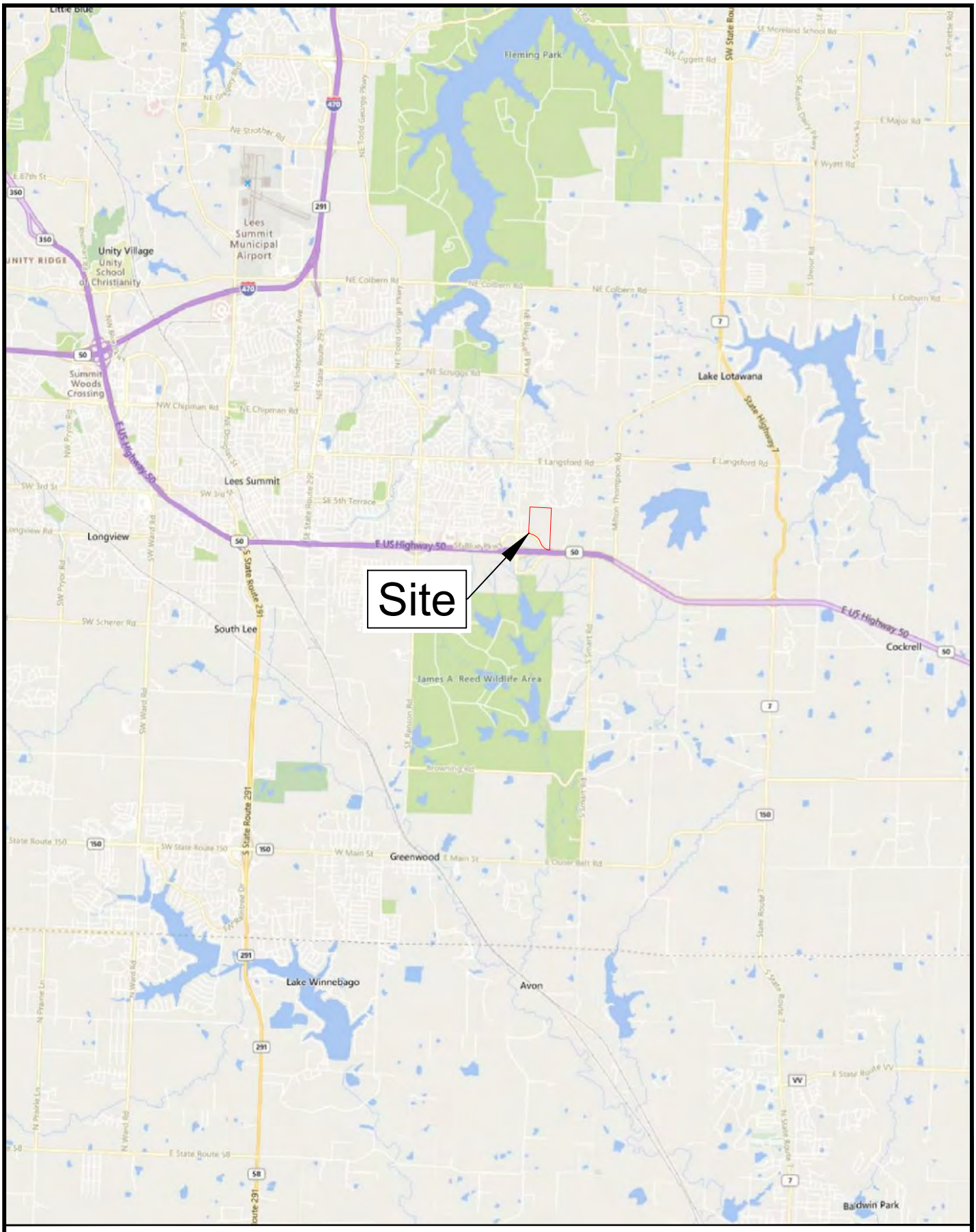
QUALIFICATIONS OF STAFF

Curricula vitae and project experience is on file with the US Army Corps of Engineers.

Sincerely,
TERRA TECHNOLOGIES INC.

Melanie Stonecypher
Environmental Scientist

Danny DeAngelo
Senior Environmental Scientist



Revisions		
No.	Description	Date

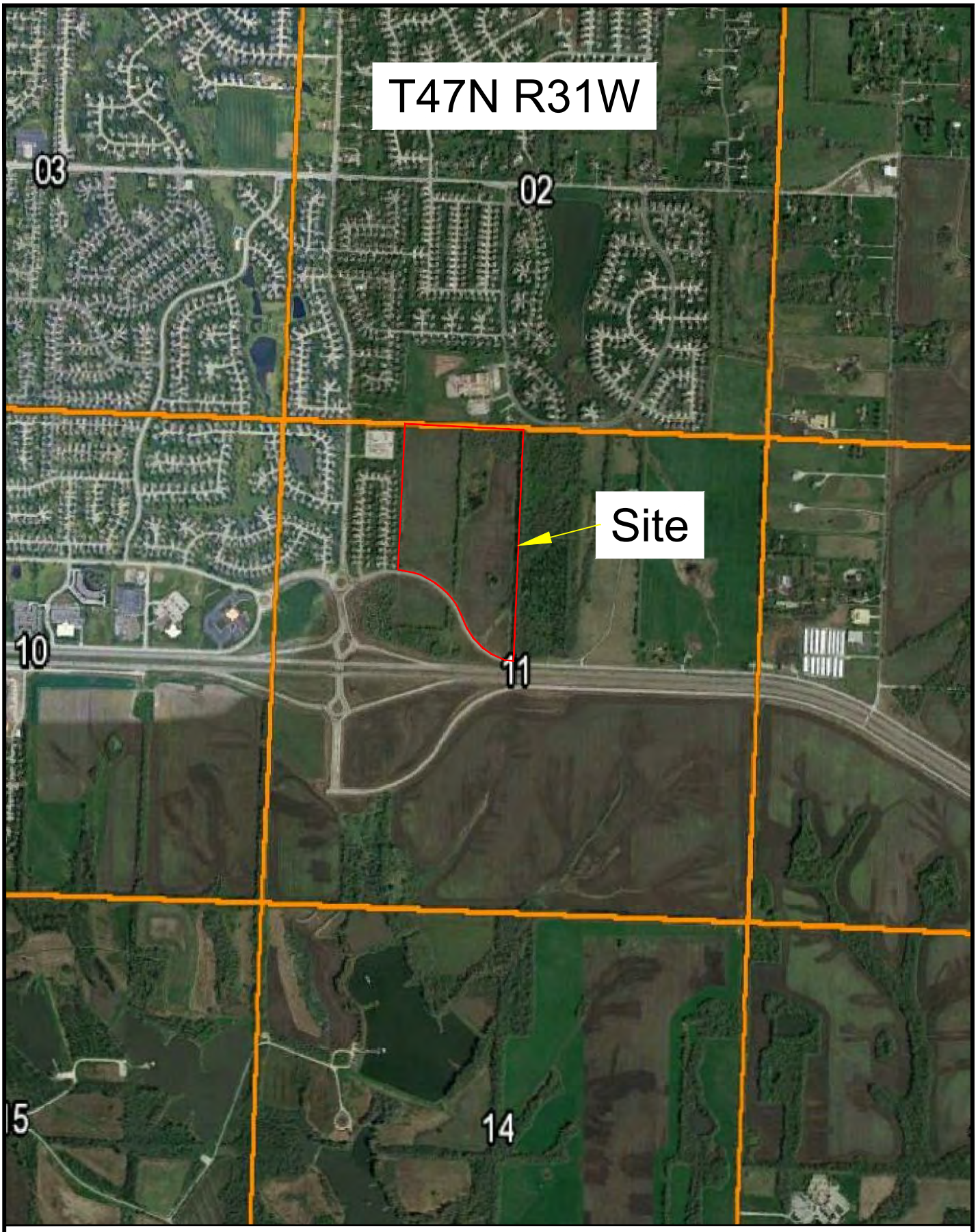
Terra Technologies

6240 West 135th Street, Suite 100, Overland Park, KS 66223

Blackwell Parcel
Lee's Summit, Jackson County, Missouri

Site Location Map

DRAWING	DATE
FIG 1a	MAR 2022



	Revisions	
No.	Description	Date

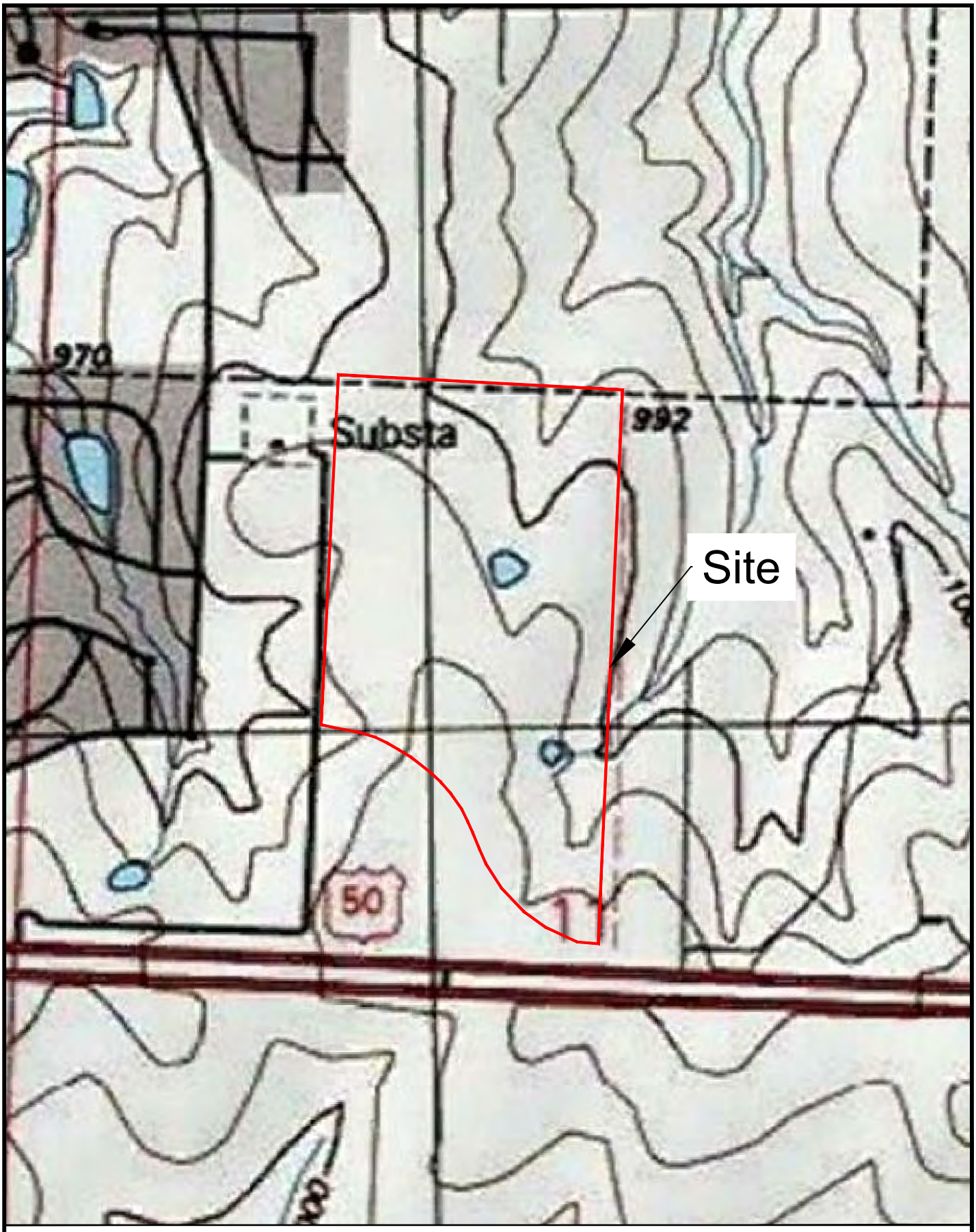
Terra Technologies

6240 West 135th Street, Suite 100, Overland Park, KS 66223

Blackwell Parcel
Lee's Summit, Jackson County, Missouri

Section, Township, Range

DRAWING	DATE
FIG 1b	MAR 2022



Revisions		
No.	Description	Date

Terra Technologies

6240 West 135th Street, Suite 100, Overland Park, KS 66223

Blackwell Parcel
Lee's Summit, Jackson County, Missouri

USGS Topography

DRAWING	DATE
FIG 1c	MAR 2022

Revisions		
No.	Description	Date

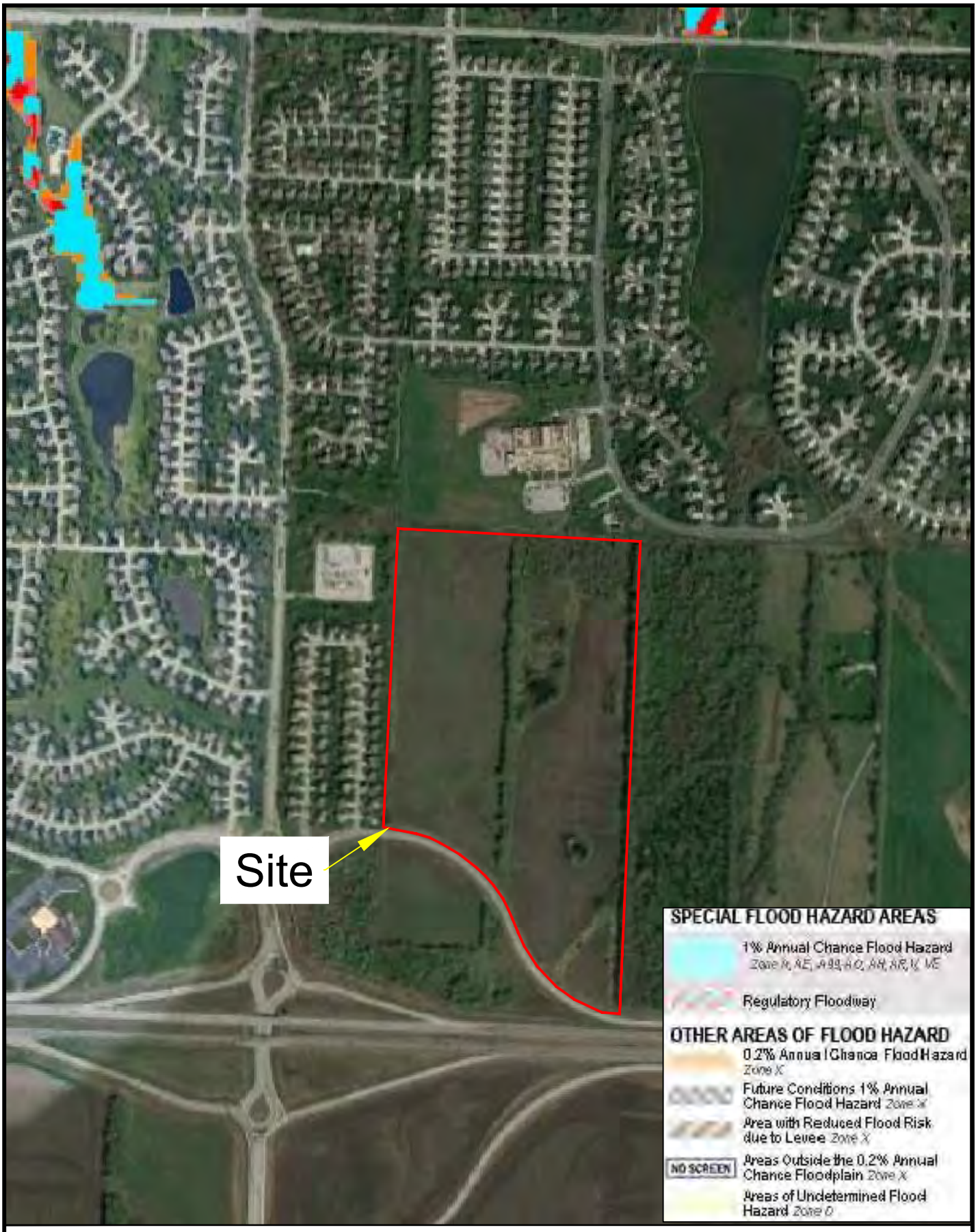
Terra Technologies

6240 West 135th Street, Suite 100, Overland Park, KS 66223

Blackwell Parcel
Lee's Summit, Jackson County, Missouri

Aerial Photograph

DRAWING	DATE
FIG 1d	FEB 2022



Revisions		
No.	Description	Date

Terra Technologies

6240 West 135th Street, Suite 100, Overland Park, KS 66223

Blackwell Parcel
Lee's Summit, Jackson County, Missouri

100-year Floodplain Map

DRAWING	DATE
FIG 1e	FEB 2022

Revisions		
No.	Description	Date

Terra Technologies

6240 West 135th Street, Suite 100, Overland Park, KS 66223

Blackwell Parcel
Lee's Summit, Jackson County, Missouri

National Wetlands Inventory Map

DRAWING	DATE
FIG 2	MAR 2022

Hydric Rating by Map Unit—Jackson County, Missouri
(Figure 3)

Map Scale: 1:4,620 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Lines

- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Points

- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- 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 1:24,000.

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: Jackson County, Missouri
Survey Area Data: Version 23, Sep 1, 2021

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

Date(s) aerial images were photographed: Sep 6, 2019—Nov 16, 2019

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.

Hydric Rating by Map Unit

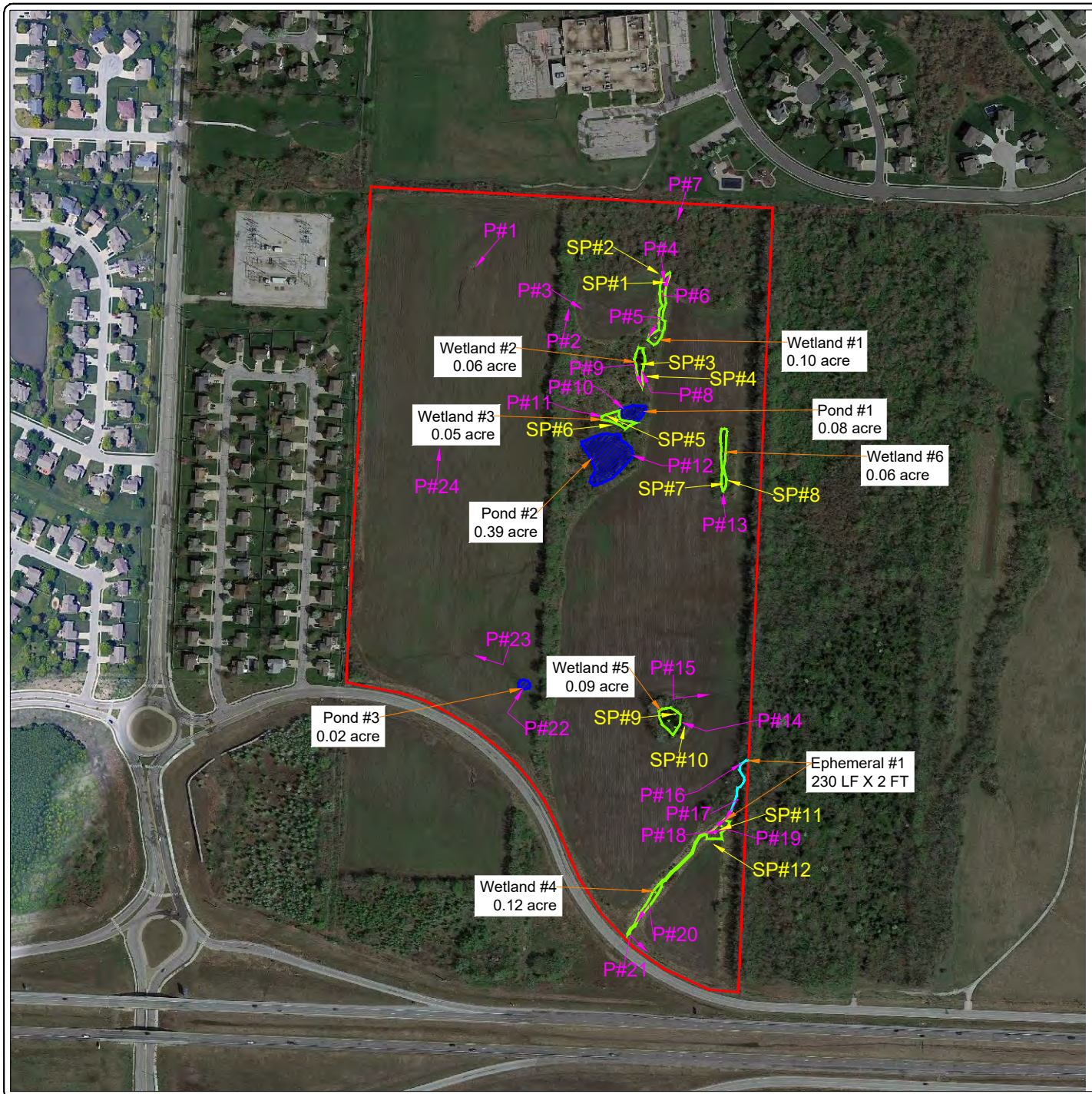
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10000	Arisburg silt loam, 1 to 5 percent slopes	3	34.7	57.5%
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	3	0.6	1.0%
10117	Sampsel silty clay loam, 5 to 9 percent slopes	0	20.8	34.4%
10128	Sharpsburg-Urban land complex, 2 to 5 percent slopes	0	1.0	1.7%
10181	Udarents-Urban land-Sampsel complex, 5 to 9 percent slopes	0	2.5	4.1%
10183	Udarents-Urban land-Polo complex, 5 to 9 percent slopes	0	0.8	1.3%
Totals for Area of Interest			**60.4**	**100.0%**

Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

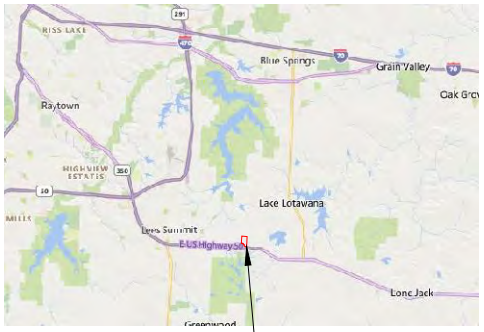


JURISDICTIONAL ASSESSMENT

Wetland 1: 0.10 acre, Lat. 38.90781, Long. -94.31287
Wetland 2: 0.06 acre, Lat. 38.90733, Long. -94.31313
Wetland 3: 0.05 acre, Lat. 38.90681, Long. -94.31337
Wetland 4: 0.12 acre, Lat. 38.90321, Long. -94.31224
Wetland 5: 0.09 acre, Lat. 38.90416, Long. -94.31279
Wetland 6: 0.06 acre, Lat. 38.90649, Long. -94.31219 (Non-Jurisdictional)
TOTAL WETLAND AREA: 0.48 Acres

Ephemeral 1: 230 LF X 2 FT, Lat. 38.90351, Long. -94.31205
TOTAL EPHEMERAL LENGTH: 230 LF

Pond 1: 0.08 acre, Lat. 38.90687, Long. -94.31321 (Non-Jurisdictional)
Pond 2: 0.39 acre, Lat. 38.90651, Long. -94.31352 (Non-Jurisdictional)
Pond 3: 0.02 acre, Lat. 38.90449, Long. -94.31445 (Non-Jurisdictional)
TOTAL POND AREA: 0.49 Acres



Site Location
T47S-R31W-S11
Lee's Summit, Jackson County, Missouri
60.41 Acres
Lat. 38.90615
Long. -94.31385

GRAPHIC SCALE
150 0 75 150 300 600
(IN FEET)
1 inch = 150 ft.

Terra Technologies
6240 W. 135th St., Ste. 100
Overland Park, Kansas 66223
Tel 913.385.9560 Fax 913.385.5295

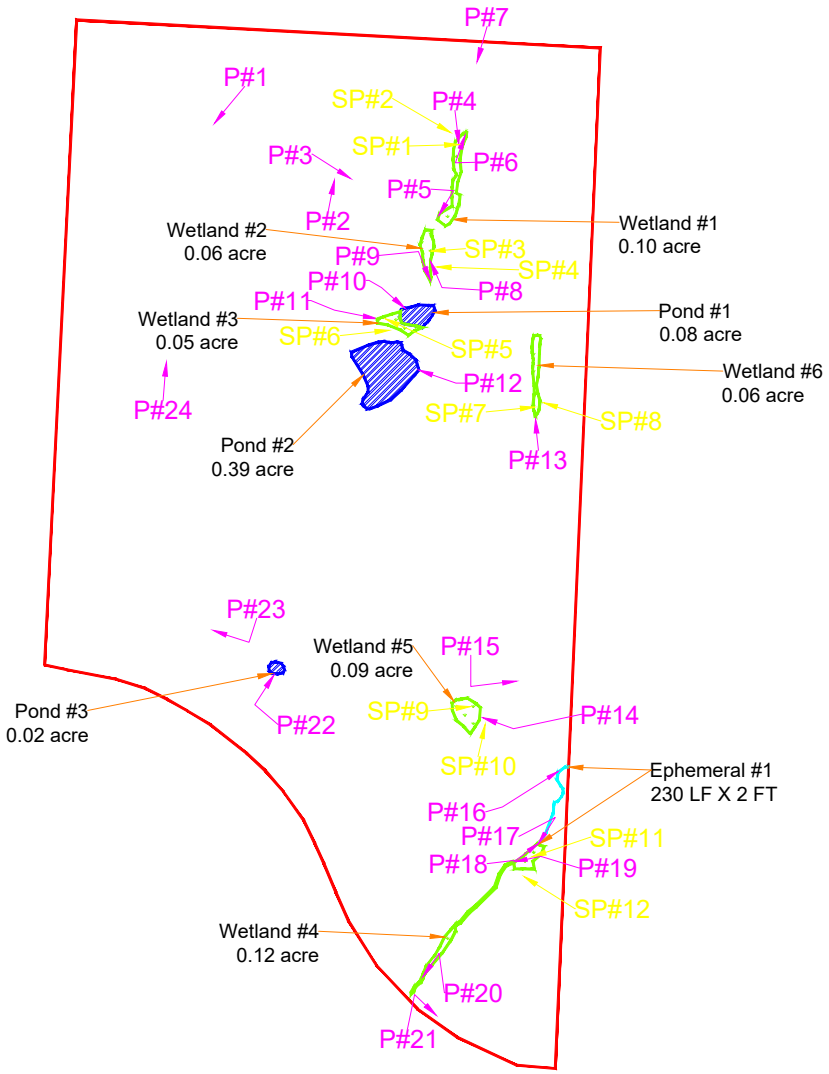
FIGURE 4a

SHEET TITLE: JURISDICTIONAL ASSESSMENT
PROJECT: BLACKWELL PARCEL
CLIENT: GRIFFIN RILEY PROPERTY GROUP

REVISIONS

DATE	DESCRIPTION

DATE 03/31/22
CHECKED BY DTD DRAWN BY MAS
SHEET NO. JA
JOB NO. XXX

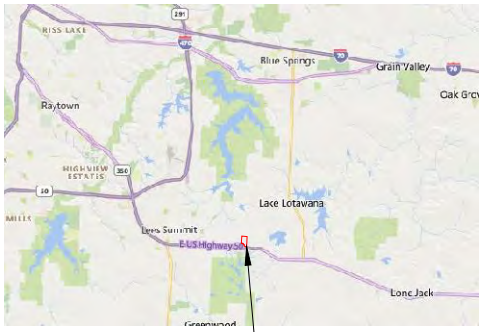


JURISDICTIONAL ASSESSMENT

Wetland 1: 0.10 acre, Lat. 38.90781, Long. -94.31287
Wetland 2: 0.06 acre, Lat. 38.90733, Long. -94.31313
Wetland 3: 0.05 acre, Lat. 38.90681, Long. -94.31337
Wetland 4: 0.12 acre, Lat. 38.90321, Long. -94.31224
Wetland 5: 0.09 acre, Lat. 38.90416, Long. -94.31279
Wetland 6: 0.06 acre, Lat. 38.90649, Long. -94.31219 (Non-Jurisdictional)
TOTAL WETLAND AREA: 0.48 Acres

Ephemeral 1: 230 LF X 2 FT, Lat. 38.90351, Long. -94.31205
TOTAL EPHEMERAL LENGTH: 230 LF

Pond 1: 0.08 acre, Lat. 38.90687, Long. -94.31321 (Non-Jurisdictional)
Pond 2: 0.39 acre, Lat. 38.90651, Long. -94.31352 (Non-Jurisdictional)
Pond 3: 0.02 acre, Lat. 38.90449, Long. -94.31445 (Non-Jurisdictional)
TOTAL POND AREA: 0.49 Acres



Site Location
T47S-R31W-S11
Lee's Summit, Jackson County, Missouri
60.41 Acres
Lat. 38.90615
Long. -94.31385

GRAPHIC SCALE
150 0 75 150 300 600
(IN FEET)
1 inch = 150 ft.

Terra Technologies
6240 W. 135th St., Ste. 100
Overland Park, Kansas 66223
Tel 913.385.9560 Fax 913.385.5295

FIGURE 4b

SHEET TITLE: JURISDICTIONAL ASSESSMENT (WITHOUT PHOTO)
PROJECT: BLACKWELL PARCEL
CLIENT: GRIFFIN RILEY PROPERTY GROUP

REVISIONS

DATE	DESCRIPTION

DATE 03/31/22
CHECKED BY DTD DRAWN BY MAS
SHEET NO. JA
JOB NO. XXX

PHOTO LOG

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing southwest showing the erosional feature within the agricultural field. PHOTO #: 1	

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing northeast showing the upland fence line dominated by Osage orange (*Maclura pomifera*) and honeysuckle (*Lonicera maackii*) at this location. PHOTO #: 2	

PHOTO LOG

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing southeast showing the upland fallow field dominated by Japanese bristle grass (*Setaria faberi*). PHOTO #: 3	

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing southeast showing Wetland #1. PHOTO #: 4	

PHOTO LOG

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing southwest showing an erosional feature flowing into Wetland #1. PHOTO #: 5	

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing northeast showing Wetland #1 flowing into an upland swale dominated by honeysuckle, honey locust (*Gleditsia triacanthos*), and Osage orange. PHOTO #: 6	

PHOTO LOG

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing southwest showing the upland swale surface water from Wetland #1 flows through before flowing offsite. PHOTO #: 7	

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing northwest showing Wetland #2. PHOTO #: 8	

PHOTO LOG

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing southeast showing an erosional feature flowing into Wetland #2 at this location. PHOTO #: 9	

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing southeast showing Pond #1. PHOTO #: 10	

PHOTO LOG

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing southeast showing Wetland #3.	
PHOTO #: 11	

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing northwest showing Pond #2.	
PHOTO #: 12	

PHOTO LOG

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing northwest showing Wetland #6. PHOTO #: 13	

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing northwest showing Wetland #5. PHOTO #: 14	

PHOTO LOG

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing northeast showing an erosional feature within the agricultural field. PHOTO #: 15	

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing northeast looking downstream on Ephemeral #1 as it flows offsite. PHOTO #: 16	

PHOTO LOG

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing southwest showing Wetland #4. PHOTO #: 17	

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing northeast looking downstream on Ephemeral #1 as it flows out of Wetland #4. PHOTO #: 18	

PHOTO LOG

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing southwest showing an erosional feature flowing through Wetland #4 at this location. PHOTO #: 19	

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing southwest showing water flowing into Wetland #4 from a pipe outlet. PHOTO #: 20	

PHOTO LOG

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing southeast showing an erosional feature within a roadside ditch at this location. PHOTO #: 21	

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing northeast showing Pond #3. PHOTO #: 22	

PHOTO LOG

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing northwest showing an erosional feature within the agricultural field. PHOTO #: 23	

DATE: 02/11/22 TAKEN BY: MS	SITE NAME: BLACKWELL PARCEL
COMMENTS: Photograph facing north showing a well-drained agricultural field at this location. PHOTO #: 24	

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	1
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM xxs	xxxxxxxe xxxxxxxn	Lat:	38.90804	Long: -94.31286	Datum: NAD 83
Soil Map Unit Name:	Sampsel silty clay loam, 5-9% slopes	NWI classification:	N/A		

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area within a Wetland? Yes X No
Hydric Soil Present?	Yes	X	No		
Wetland Hydrology Present?	Yes	X	No		

Remarks:

VEGETATION - Use scientific names of plants.

	Tree Stratum (Plot size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
		0	= Total Cover	
	Sapling/Shrub Stratum (Plot Size: 15ft radius)			
1				
2				
3				
4				
5				
6				
		0	= Total Cover	
	Herb Stratum (Plot Size: 5ft radius)			
1	Schedonorus arundinaceus (hummocked)	98	Y	FAC
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
		98	= Total Cover	
	Woody Vine Stratum (Plot Size: 30ft radius)			
1				
2				
3				
		0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:

OBL Species	0	x 1 =	0	
FACW Species	0	x 2 =	0	
FAC Species	98	x 3 =	294	
FACU Species	0	x 4 =	0	
UPL Species	0	x 5 =	0	
Column Totals:	98	(A)	294	(B)

Prevalence Index = B/A: 3.00

Hydrophytic Vegetation Indicators:

	1 - Rapid Test for Hydrophytic Vegetation
X	2 - Dominance Test is > 50%
X	3 - Prevalence Index is <= 3.0[1]
	4 -Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
	Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present ? Yes X No

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Horizon	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Abundance/Contrast	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-3	A	10YR 2/1	100						Silty Clay Loam	
3-15	A	10YR 3/1	95	10YR 3/6	5	Common / Prominent	C	PL	Silty Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.

[2]Location: PL= Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Gleyed Matrix (S4)
	Histic Epipedon (A2)		Sandy Redox (S5)
	Black Histic (A3)		Stripped Matrix (S6)
	Hydrogen Sulfide (A4)		Loamy Mucky Mineral (F1)
	Stratified Layers (A5)		Loamy Gleyed Matrix (F2)
	2 cm Muck (A10)		Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)	X	Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	5 cm Mucky Peat or Peat (S3)		

Indicators for Problematic Hydric Soils[3]:

	Coast Prairie Redox (A16)
	Iron-Manganese Masses (F12)
	Other (Explain in Remarks)

(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes X No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

X	Surface water (A1)		Water-stained leaves (B9)
	High water table (A2)		Aquatic Fauna (B13)
X	Saturation (A3)		True Aquatic Plants (B14)
	Water marks (B1)		Hydrogen sulfide odor (C1)
	Sediment deposits (B2)		Oxidized rhizospheres on living roots (C3)
	Drift deposits (B3)		Presence of reduced iron (C4)
	Algal mat or crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron deposits (B5)		Thin muck surface (C7)
	Inundation visible on aerial imagery (B7)		Gauge or Well Data (D9)
	Sparsely Vegetated Concave Surface (B8)		Other (explain in Remarks)

Secondary Indicators (minimum of two required)

	Surface soil cracks (B6)
X	Drainage patterns (B10)
	Dry-Season Water Table (C2)
	Crayfish burrows (C8)
	Saturation visible on aerial imagery (C9)
	Stunted or Stressed Plants (D2)
X	Geomorphic position (D2)
	FAC-neutral test (D5)
	Other (explain in Remarks)

Field Observations:

Surface Water Present?	Yes	X	No		Depth (inches)	0-2
Water Table Present?	Yes		No	X	Depth (inches)	
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches)	0-3

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	2
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM xxs xxxxxxxe xxxxxxxn		Lat: 38.90812	Long: -94.31293	Datum:	NAD 83
Soil Map Unit Name:	Sampsel silty clay loam, 5-9% slopes		NWI classification:		N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N , Soil N , or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present?	Yes		No	X	

Is the Sampled Area within a Wetland? Yes No X

Remarks:

VEGETATION - Use scientific names of plants.

	Tree Stratum (Plot size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
		0	= Total Cover	
	Sapling/Shrub Stratum (Plot Size: 15ft radius)			
1				
2				
3				
4				
5				
6				
		0	= Total Cover	
	Herb Stratum (Plot Size: 5ft radius)			
1	Setaria faberi	90	Y	FACU
2	Ambrosia artemisiifolia	10	N	FACU
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
		100	= Total Cover	
	Woody Vine Stratum (Plot Size: 30ft radius)			
1				
2				
3				
		0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC 0.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:

OBL Species	0	x 1 =	0	
FACW Species	0	x 2 =	0	
FAC Species	0	x 3 =	0	
FACU Species	100	x 4 =	400	
UPL Species	0	x 5 =	0	
Column Totals:	100	(A)	400	(B)

Prevalence Index = B/A 4.00

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is > 50%
- 3 - Prevalence Index is <= 3.0[1]
- 4 -Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present ? Yes No X

Remarks:

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Horizon	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Abundance/Contrast	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-15	A	10YR 3/1	100						Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.

[2]Location: PL= Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Gleyed Matrix (S4)
	Histic Epipedon (A2)		Sandy Redox (S5)
	Black Histic (A3)		Stripped Matrix (S6)
	Hydrogen Sulfide (A4)		Loamy Mucky Mineral (F1)
	Stratified Layers (A5)		Loamy Gleyed Matrix (F2)
	2 cm Muck (A10)		Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)		Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	5 cm Mucky Peat or Peat (S3)		

Indicators for Problematic Hydric Soils[3]:

	Coast Prairie Redox (A16)
	Iron-Manganese Masses (F12)
	Other (Explain in Remarks)

(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes [ ] No [X]

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

	Surface water (A1)		Water-stained leaves (B9)
	High water table (A2)		Aquatic Fauna (B13)
	Saturation (A3)		True Aquatic Plants (B14)
	Water marks (B1)		Hydrogen sulfide odor (C1)
	Sediment deposits (B2)		Oxidized rhizospheres on living roots (C3)
	Drift deposits (B3)		Presence of reduced iron (C4)
	Algal mat or crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron deposits (B5)		Thin muck surface (C7)
	Inundation visible on aerial imagery (B7)		Gauge or Well Data (D9)
	Sparsely Vegetated Concave Surface (B8)		Other (explain in Remarks)

Secondary Indicators (minimum of two required)

	Surface soil cracks (B6)
	Drainage patterns (B10)
	Dry-Season Water Table (C2)
	Crayfish burrows (C8)
	Saturation visible on aerial imagery (C9)
	Stunted or Stressed Plants (D2)
	Geomorphic position (D2)
	FAC-neutral test (D5)
	Other (explain in Remarks)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches)	
Water Table Present?	Yes		No	X	Depth (inches)	
Saturation Present? (includes capillary fringe)	Yes		No	X	Depth (inches)	

Wetland Hydrology Present? Yes [ ] No [X]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	3
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	Concave	Slope (%):	0-3
GPS: UTM xxs xxxxxxxe xxxxxxxn		Lat: 38.90732	Long: -94.3131	Datum:	NAD 83
Soil Map Unit Name:	Sampsel silty clay loam, 5-9% slopes		NWI classification:		Pond

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N , Soil N , or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area within a Wetland? Yes X No
Hydric Soil Present?	Yes	X	No		
Wetland Hydrology Present?	Yes	X	No		

Remarks:

VEGETATION - Use scientific names of plants.

		Absolute % Cover	Dominant Species?	Indicator Status
	Tree Stratum (Plot size: 30ft radius)			
1	Salix nigra	40	Y	OBL
2				
3				
4				
5				
6				
7				
8				
		40	= Total Cover	
	Sapling/Shrub Stratum (Plot Size: 15ft radius)			
1				
2				
3				
4				
5				
6				
		0	= Total Cover	
	Herb Stratum (Plot Size: 5ft radius)			
1	Carex frankii	30	Y	OBL
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
		30	= Total Cover	
	Woody Vine Stratum (Plot Size: 30ft radius)			
1				
2				
3				
		0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:

OBL Species	70	x 1 =	70
FACW Species	0	x 2 =	0
FAC Species	0	x 3 =	0
FACU Species	0	x 4 =	0
UPL Species	0	x 5 =	0
Column Totals:	70 (A)		70 (B)

Prevalence Index = B/A: 1.00

Hydrophytic Vegetation Indicators:

	1 - Rapid Test for Hydrophytic Vegetation
X	2 - Dominance Test is > 50%
X	3 - Prevalence Index is <= 3.0[1]
	4 -Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
	Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present ? Yes X No

Remarks:

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Horizon	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Abundance/Contrast	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-15	A	10YR 4/1	90	10YR 3/6	10	Common / Prominent	C	PL	Silty Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.

[2]Location: PL= Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Gleyed Matrix (S4)
	Histic Epipedon (A2)		Sandy Redox (S5)
	Black Histic (A3)		Stripped Matrix (S6)
	Hydrogen Sulfide (A4)		Loamy Mucky Mineral (F1)
	Stratified Layers (A5)		Loamy Gleyed Matrix (F2)
	2 cm Muck (A10)	X	Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)		Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	5 cm Mucky Peat or Peat (S3)		

Indicators for Problematic Hydric Soils[3]:

	Coast Prairie Redox (A16)
	Iron-Manganese Masses (F12)
	Other (Explain in Remarks)

(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes X No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

	Surface water (A1)		Water-stained leaves (B9)
	High water table (A2)		Aquatic Fauna (B13)
	Saturation (A3)		True Aquatic Plants (B14)
	Water marks (B1)		Hydrogen sulfide odor (C1)
	Sediment deposits (B2)		Oxidized rhizospheres on living roots (C3)
	Drift deposits (B3)		Presence of reduced iron (C4)
	Algal mat or crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron deposits (B5)		Thin muck surface (C7)
X	Inundation visible on aerial imagery (B7)		Gauge or Well Data (D9)
	Sparsely Vegetated Concave Surface (B8)		Other (explain in Remarks)

Secondary Indicators (minimum of two required)

	Surface soil cracks (B6)
	Drainage patterns (B10)
	Dry-Season Water Table (C2)
	Crayfish burrows (C8)
	Saturation visible on aerial imagery (C9)
	Stunted or Stressed Plants (D2)
X	Geomorphic position (D2)
X	FAC-neutral test (D5)
	Other (explain in Remarks)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches)	
Water Table Present?	Yes		No	X	Depth (inches)	
Saturation Present? (includes capillary fringe)	Yes		No	X	Depth (inches)	

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	4
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM xxs	xxxxxxxe xxxxxxxn	Lat:	38.90721	Long: -94.31305	Datum: NAD 83
Soil Map Unit Name:	Sampsel silty clay loam, 5-9% slopes	NWI classification:	N/A		

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present?	Yes		No	X	

Is the Sampled Area within a Wetland? Yes No X

Remarks:

VEGETATION - Use scientific names of plants.

		Absolute % Cover		Dominant Species?		Indicator Status
	Tree Stratum (Plot size: 30ft radius)					
1	Maclura pomifera	40		Y		FACU
2						
3						
4						
5						
6						
7						
8						
		40	= Total Cover			
	Sapling/Shrub Stratum (Plot Size: 15ft radius)					
1	Symphoricarpos orbiculatus	30		Y		FACU
2	Lonicera maackii	20		Y		UPL
3						
4						
5						
6						
		50	= Total Cover			
	Herb Stratum (Plot Size: 5ft radius)					
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
		0	= Total Cover			
	Woody Vine Stratum (Plot Size: 30ft radius)					
1						
2						
3						
		0	= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:

OBL Species	0	x 1 =	0	
FACW Species	0	x 2 =	0	
FAC Species	0	x 3 =	0	
FACU Species	70	x 4 =	280	
UPL Species	20	x 5 =	100	
Column Totals:	90	(A)	380	(B)

Prevalence Index = B/A: 4.22

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is > 50%
- 3 - Prevalence Index is <= 3.0[1]
- 4 -Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present ? Yes No X

Remarks:

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Horizon	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Abundance/Contrast	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-15	A	10YR 3/1	100						Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.

[2]Location: PL= Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Gleyed Matrix (S4)
	Histic Epipedon (A2)		Sandy Redox (S5)
	Black Histic (A3)		Stripped Matrix (S6)
	Hydrogen Sulfide (A4)		Loamy Mucky Mineral (F1)
	Stratified Layers (A5)		Loamy Gleyed Matrix (F2)
	2 cm Muck (A10)		Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)		Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	5 cm Mucky Peat or Peat (S3)		

Indicators for Problematic Hydric Soils[3]:

	Coast Prairie Redox (A16)
	Iron-Manganese Masses (F12)
	Other (Explain in Remarks)

(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes [ ] No [X]

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

	Surface water (A1)		Water-stained leaves (B9)
	High water table (A2)		Aquatic Fauna (B13)
	Saturation (A3)		True Aquatic Plants (B14)
	Water marks (B1)		Hydrogen sulfide odor (C1)
	Sediment deposits (B2)		Oxidized rhizospheres on living roots (C3)
	Drift deposits (B3)		Presence of reduced iron (C4)
	Algal mat or crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron deposits (B5)		Thin muck surface (C7)
	Inundation visible on aerial imagery (B7)		Gauge or Well Data (D9)
	Sparsely Vegetated Concave Surface (B8)		Other (explain in Remarks)

Secondary Indicators (minimum of two required)

	Surface soil cracks (B6)
	Drainage patterns (B10)
	Dry-Season Water Table (C2)
	Crayfish burrows (C8)
	Saturation visible on aerial imagery (C9)
	Stunted or Stressed Plants (D2)
	Geomorphic position (D2)
	FAC-neutral test (D5)
	Other (explain in Remarks)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches)	
Water Table Present?	Yes		No	X	Depth (inches)	
Saturation Present? (includes capillary fringe)	Yes		No	X	Depth (inches)	

Wetland Hydrology Present? Yes [ ] No [X]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	5
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM xxs xxxxxxxe xxxxxxxn		Lat: 38.90686	Long: -94.3135	Datum:	NAD 83
Soil Map Unit Name:	Sampsel silty clay loam, 5-9% slopes		NWI classification:		N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N , Soil N , or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area within a Wetland? Yes X No
Hydric Soil Present?	Yes	X	No		
Wetland Hydrology Present?	Yes	X	No		

Remarks:

VEGETATION - Use scientific names of plants.

	Tree Stratum (Plot size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
		0	= Total Cover	
	Sapling/Shrub Stratum (Plot Size: 15ft radius)			
1				
2				
3				
4				
5				
6				
		0	= Total Cover	
	Herb Stratum (Plot Size: 5ft radius)			
1	Schedonorus arundinaceus (hummocked)	99	Y	FAC
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
		99	= Total Cover	
	Woody Vine Stratum (Plot Size: 30ft radius)			
1				
2				
3				
		0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:

OBL Species	0	x 1 =	0	
FACW Species	0	x 2 =	0	
FAC Species	99	x 3 =	297	
FACU Species	0	x 4 =	0	
UPL Species	0	x 5 =	0	
Column Totals:	99	(A)	297	(B)

Prevalence Index = B/A: 3.00

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is > 50%
- X 3 - Prevalence Index is <= 3.0[1]
- 4 -Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present ? Yes X No

Remarks:

SOIL

Sampling Point: 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Horizon	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Abundance/Contrast	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-15	A	10YR 3/1	95	10YR 3/6	5	Common / Prominent	C	PL	Silty Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.

[2]Location: PL= Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Gleyed Matrix (S4)
	Histic Epipedon (A2)		Sandy Redox (S5)
	Black Histic (A3)		Stripped Matrix (S6)
	Hydrogen Sulfide (A4)		Loamy Mucky Mineral (F1)
	Stratified Layers (A5)		Loamy Gleyed Matrix (F2)
	2 cm Muck (A10)		Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)	X	Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	5 cm Mucky Peat or Peat (S3)		

Indicators for Problematic Hydric Soils[3]:

	Coast Prairie Redox (A16)
	Iron-Manganese Masses (F12)
	Other (Explain in Remarks)

(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes X No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

	Surface water (A1)		Water-stained leaves (B9)
	High water table (A2)		Aquatic Fauna (B13)
X	Saturation (A3)		True Aquatic Plants (B14)
	Water marks (B1)		Hydrogen sulfide odor (C1)
	Sediment deposits (B2)		Oxidized rhizospheres on living roots (C3)
	Drift deposits (B3)		Presence of reduced iron (C4)
	Algal mat or crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron deposits (B5)		Thin muck surface (C7)
	Inundation visible on aerial imagery (B7)		Gauge or Well Data (D9)
	Sparsely Vegetated Concave Surface (B8)		Other (explain in Remarks)

Secondary Indicators (minimum of two required)

	Surface soil cracks (B6)
	Drainage patterns (B10)
	Dry-Season Water Table (C2)
	Crayfish burrows (C8)
	Saturation visible on aerial imagery (C9)
	Stunted or Stressed Plants (D2)
X	Geomorphic position (D2)
	FAC-neutral test (D5)
	Other (explain in Remarks)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches)	
Water Table Present?	Yes		No	X	Depth (inches)	
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches)	0-14

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	6
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	2-5
GPS: UTM xxs xxxxxxxe xxxxxxxn		Lat: 38.90678	Long: -94.31347	Datum:	NAD 83
Soil Map Unit Name:	Sampsel silty clay loam, 5-9% slopes		NWI classification:		N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N , Soil N , or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present?	Yes		No	X	

Is the Sampled Area within a Wetland? Yes No X

Remarks:

VEGETATION - Use scientific names of plants.

	Tree Stratum (Plot size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1	Maclura pomifera	10	Y	FACU
2				
3				
4				
5				
6				
7				
8				
		10	= Total Cover	
	Sapling/Shrub Stratum (Plot Size: 15ft radius)			
1	Lonicera maackii	50	Y	UPL
2				
3				
4				
5				
6				
		50	= Total Cover	
	Herb Stratum (Plot Size: 5ft radius)			
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
		0	= Total Cover	
	Woody Vine Stratum (Plot Size: 30ft radius)			
1				
2				
3				
		0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:

OBL Species	0	x 1 =	0	
FACW Species	0	x 2 =	0	
FAC Species	0	x 3 =	0	
FACU Species	10	x 4 =	40	
UPL Species	50	x 5 =	250	
Column Totals:	60	(A)	290	(B)

Prevalence Index = B/A: 4.83

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is > 50%
- 3 - Prevalence Index is <= 3.0[1]
- 4 -Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present ? Yes No X

Remarks:

SOIL

Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Horizon	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Abundance/Contrast	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-15	A	10YR 3/1	100						Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.

[2]Location: PL= Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Gleyed Matrix (S4)
	Histic Epipedon (A2)		Sandy Redox (S5)
	Black Histic (A3)		Stripped Matrix (S6)
	Hydrogen Sulfide (A4)		Loamy Mucky Mineral (F1)
	Stratified Layers (A5)		Loamy Gleyed Matrix (F2)
	2 cm Muck (A10)		Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)		Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	5 cm Mucky Peat or Peat (S3)		

Indicators for Problematic Hydric Soils[3]:

	Coast Prairie Redox (A16)
	Iron-Manganese Masses (F12)
	Other (Explain in Remarks)

(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes [ ] No [X]

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

	Surface water (A1)		Water-stained leaves (B9)
	High water table (A2)		Aquatic Fauna (B13)
	Saturation (A3)		True Aquatic Plants (B14)
	Water marks (B1)		Hydrogen sulfide odor (C1)
	Sediment deposits (B2)		Oxidized rhizospheres on living roots (C3)
	Drift deposits (B3)		Presence of reduced iron (C4)
	Algal mat or crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron deposits (B5)		Thin muck surface (C7)
	Inundation visible on aerial imagery (B7)		Gauge or Well Data (D9)
	Sparsely Vegetated Concave Surface (B8)		Other (explain in Remarks)

Secondary Indicators (minimum of two required)

	Surface soil cracks (B6)
	Drainage patterns (B10)
	Dry-Season Water Table (C2)
	Crayfish burrows (C8)
	Saturation visible on aerial imagery (C9)
	Stunted or Stressed Plants (D2)
	Geomorphic position (D2)
	FAC-neutral test (D5)
	Other (explain in Remarks)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches)	
Water Table Present?	Yes		No	X	Depth (inches)	
Saturation Present? (includes capillary fringe)	Yes		No	X	Depth (inches)	

Wetland Hydrology Present? Yes [ ] No [X]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	7
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	Concave	Slope (%):	0-3
GPS: UTM xxs xxxxxxxe xxxxxxxn		Lat: 38.90626	Long: -94.31221	Datum:	NAD 83
Soil Map Unit Name:	Arisburg silt loam, 1-5% slopes		NWI classification:		N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area within a Wetland? Yes X No
Hydric Soil Present?	Yes	X	No		
Wetland Hydrology Present?	Yes	X	No		

Remarks:

VEGETATION - Use scientific names of plants.

	Tree Stratum (Plot size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1	Salix nigra	30	Y	OBL
2				
3				
4				
5				
6				
7				
8				
		30	= Total Cover	
	Sapling/Shrub Stratum (Plot Size: 15ft radius)			
1				
2				
3				
4				
5				
6				
		0	= Total Cover	
	Herb Stratum (Plot Size: 5ft radius)			
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
		0	= Total Cover	
	Woody Vine Stratum (Plot Size: 30ft radius)			
1				
2				
3				
		0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:

OBL Species	30	x 1 =	30	
FACW Species	0	x 2 =	0	
FAC Species	0	x 3 =	0	
FACU Species	0	x 4 =	0	
UPL Species	0	x 5 =	0	
Column Totals:	30	(A)	30	(B)

Prevalence Index = B/A: 1.00

Hydrophytic Vegetation Indicators:

	1 - Rapid Test for Hydrophytic Vegetation
X	2 - Dominance Test is > 50%
X	3 - Prevalence Index is <= 3.0[1]
	4 -Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
	Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present ? Yes X No

Remarks:

SOIL

Sampling Point: 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Horizon	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Abundance/Contrast	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-15	A	10YR 5/1	85	10YR 4/6	15	Common / Prominent	C	PL	Silty Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.

[2]Location: PL= Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Gleyed Matrix (S4)
	Histic Epipedon (A2)		Sandy Redox (S5)
	Black Histic (A3)		Stripped Matrix (S6)
	Hydrogen Sulfide (A4)		Loamy Mucky Mineral (F1)
	Stratified Layers (A5)		Loamy Gleyed Matrix (F2)
	2 cm Muck (A10)	X	Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)		Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	5 cm Mucky Peat or Peat (S3)		

Indicators for Problematic Hydric Soils[3]:

	Coast Prairie Redox (A16)
	Iron-Manganese Masses (F12)
	Other (Explain in Remarks)

(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes X No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

	Surface water (A1)		Water-stained leaves (B9)
	High water table (A2)		Aquatic Fauna (B13)
X	Saturation (A3)		True Aquatic Plants (B14)
	Water marks (B1)		Hydrogen sulfide odor (C1)
	Sediment deposits (B2)		Oxidized rhizospheres on living roots (C3)
	Drift deposits (B3)		Presence of reduced iron (C4)
	Algal mat or crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron deposits (B5)		Thin muck surface (C7)
	Inundation visible on aerial imagery (B7)		Gauge or Well Data (D9)
	Sparsely Vegetated Concave Surface (B8)		Other (explain in Remarks)

Secondary Indicators (minimum of two required)

	Surface soil cracks (B6)
	Drainage patterns (B10)
	Dry-Season Water Table (C2)
	Crayfish burrows (C8)
	Saturation visible on aerial imagery (C9)
	Stunted or Stressed Plants (D2)
X	Geomorphic position (D2)
X	FAC-neutral test (D5)
	Other (explain in Remarks)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches)	
Water Table Present?	Yes		No	X	Depth (inches)	
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches)	0-8

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	8
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM xxs xxxxxxxe xxxxxxxn		Lat: 38.90629	Long: -94.31213	Datum:	NAD 83
Soil Map Unit Name:	Arisburg silt loam, 1-5% slopes		NWI classification:		N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N , Soil N , or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present?	Yes		No	X	

Is the Sampled Area within a Wetland? Yes No X

Remarks:

VEGETATION - Use scientific names of plants.

		Absolute % Cover	Dominant Species?	Indicator Status
	Tree Stratum (Plot size: 30ft radius)			
1	Gleditsia triacanthos	10	Y	FACU
2				
3				
4				
5				
6				
7				
8				
		10	= Total Cover	
	Sapling/Shrub Stratum (Plot Size: 15ft radius)			
1	Lonicera maackii	40	Y	UPL
2	Symphoricarpos orbiculatus	20	Y	FACU
3				
4				
5				
6				
		60	= Total Cover	
	Herb Stratum (Plot Size: 5ft radius)			
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
		0	= Total Cover	
	Woody Vine Stratum (Plot Size: 30ft radius)			
1				
2				
3				
		0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:

OBL Species	0	x 1 =	0	
FACW Species	0	x 2 =	0	
FAC Species	0	x 3 =	0	
FACU Species	30	x 4 =	120	
UPL Species	40	x 5 =	200	
Column Totals:	70	(A)	320	(B)

Prevalence Index = B/A: 4.57

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is > 50%
- 3 - Prevalence Index is <= 3.0[1]
- 4 -Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present ? Yes No X

Remarks:

SOIL

Sampling Point: 8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Horizon	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Abundance/Contrast	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-15	A	10YR 3/2	100						Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.

[2]Location: PL= Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Gleyed Matrix (S4)
	Histic Epipedon (A2)		Sandy Redox (S5)
	Black Histic (A3)		Stripped Matrix (S6)
	Hydrogen Sulfide (A4)		Loamy Mucky Mineral (F1)
	Stratified Layers (A5)		Loamy Gleyed Matrix (F2)
	2 cm Muck (A10)		Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)		Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	5 cm Mucky Peat or Peat (S3)		

Indicators for Problematic Hydric Soils[3]:

	Coast Prairie Redox (A16)
	Iron-Manganese Masses (F12)
	Other (Explain in Remarks)

(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes [ ] No [X]

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

	Surface water (A1)		Water-stained leaves (B9)
	High water table (A2)		Aquatic Fauna (B13)
	Saturation (A3)		True Aquatic Plants (B14)
	Water marks (B1)		Hydrogen sulfide odor (C1)
	Sediment deposits (B2)		Oxidized rhizospheres on living roots (C3)
	Drift deposits (B3)		Presence of reduced iron (C4)
	Algal mat or crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron deposits (B5)		Thin muck surface (C7)
	Inundation visible on aerial imagery (B7)		Gauge or Well Data (D9)
	Sparsely Vegetated Concave Surface (B8)		Other (explain in Remarks)

Secondary Indicators (minimum of two required)

	Surface soil cracks (B6)
	Drainage patterns (B10)
	Dry-Season Water Table (C2)
	Crayfish burrows (C8)
	Saturation visible on aerial imagery (C9)
	Stunted or Stressed Plants (D2)
	Geomorphic position (D2)
	FAC-neutral test (D5)
	Other (explain in Remarks)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches)	
Water Table Present?	Yes		No	X	Depth (inches)	
Saturation Present? (includes capillary fringe)	Yes		No	X	Depth (inches)	

Wetland Hydrology Present? Yes [ ] No [X]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	9
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	Concave	Slope (%):	0-3
GPS: UTM xxs xxxxxxxe xxxxxxxn		Lat: 38.90423	Long: -94.31277	Datum:	NAD 83
Soil Map Unit Name:	Sampselt silty clay loam, 5-9% slopes		NWI classification:		Pond

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N , Soil N , or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area within a Wetland? Yes X No
Hydric Soil Present?	Yes	X	No		
Wetland Hydrology Present?	Yes	X	No		

Remarks:

VEGETATION - Use scientific names of plants.

	Tree Stratum (Plot size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1	Salix nigra	30	Y	OBL
2				
3				
4				
5				
6				
7				
8				
		30	= Total Cover	
	Sapling/Shrub Stratum (Plot Size: 15ft radius)			
1				
2				
3				
4				
5				
6				
		0	= Total Cover	
	Herb Stratum (Plot Size: 5ft radius)			
1	Phalaris arundinacea	20	Y	FACW
2	Persicaria pensylvanica	10	Y	FACW
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
		30	= Total Cover	
	Woody Vine Stratum (Plot Size: 30ft radius)			
1				
2				
3				
		0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:

OBL Species	30	x 1 =	30	
FACW Species	30	x 2 =	60	
FAC Species	0	x 3 =	0	
FACU Species	0	x 4 =	0	
UPL Species	0	x 5 =	0	
Column Totals:	60	(A)	90	(B)

Prevalence Index = B/A: 1.50

Hydrophytic Vegetation Indicators:

	1 - Rapid Test for Hydrophytic Vegetation
X	2 - Dominance Test is > 50%
X	3 - Prevalence Index is <= 3.0[1]
	4 -Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
	Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present ? Yes X No

Remarks:

SOIL

Sampling Point: 9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Horizon	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Abundance/Contrast	Type[1]	Loc[2]	Texture	Remarks
0-15	A	10YR 4/1	90	10YR 3/6	10	Common / Prominent	C	PL	Silty Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.

[2]Location: PL= Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Gleyed Matrix (S4)
	Histic Epipedon (A2)		Sandy Redox (S5)
	Black Histic (A3)		Stripped Matrix (S6)
	Hydrogen Sulfide (A4)		Loamy Mucky Mineral (F1)
	Stratified Layers (A5)		Loamy Gleyed Matrix (F2)
	2 cm Muck (A10)	X	Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)		Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	5 cm Mucky Peat or Peat (S3)		

Indicators for Problematic Hydric Soils[3]:

	Coast Prairie Redox (A16)
	Iron-Manganese Masses (F12)
	Other (Explain in Remarks)

(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes X No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

	Surface water (A1)		Water-stained leaves (B9)
	High water table (A2)		Aquatic Fauna (B13)
	Saturation (A3)		True Aquatic Plants (B14)
	Water marks (B1)		Hydrogen sulfide odor (C1)
	Sediment deposits (B2)		Oxidized rhizospheres on living roots (C3)
	Drift deposits (B3)		Presence of reduced iron (C4)
	Algal mat or crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron deposits (B5)		Thin muck surface (C7)
	Inundation visible on aerial imagery (B7)		Gauge or Well Data (D9)
	Sparsely Vegetated Concave Surface (B8)		Other (explain in Remarks)

Secondary Indicators (minimum of two required)

	Surface soil cracks (B6)
	Drainage patterns (B10)
	Dry-Season Water Table (C2)
	Crayfish burrows (C8)
	Saturation visible on aerial imagery (C9)
	Stunted or Stressed Plants (D2)
X	Geomorphic position (D2)
X	FAC-neutral test (D5)
	Other (explain in Remarks)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches)	
Water Table Present?	Yes		No	X	Depth (inches)	
Saturation Present? (includes capillary fringe)	Yes		No	X	Depth (inches)	

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	10
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM xxs xxxxxxxe xxxxxxxn		Lat: 38.90411	Long: -94.31264	Datum:	NAD 83
Soil Map Unit Name:	Sampselt silty clay loam, 5-9% slopes		NWI classification:		N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N , Soil N , or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present?	Yes		No	X	

Is the Sampled Area within a Wetland? Yes No X

Remarks:

VEGETATION - Use scientific names of plants.

	Tree Stratum (Plot size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1	Gleditsia triacanthos	5	Y	FACU
2				
3				
4				
5				
6				
7				
8				
		5	= Total Cover	
	Sapling/Shrub Stratum (Plot Size: 15ft radius)			
1	Lonicera maackii	30	Y	UPL
2				
3				
4				
5				
6				
		30	= Total Cover	
	Herb Stratum (Plot Size: 5ft radius)			
1	Schedonorus arundinaceus	10	Y	FACU
2	Setaria faberi	5	Y	FACU
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
		15	= Total Cover	
	Woody Vine Stratum (Plot Size: 30ft radius)			
1				
2				
3				
		0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:

OBL Species	0	x 1 =	0	
FACW Species	0	x 2 =	0	
FAC Species	0	x 3 =	0	
FACU Species	20	x 4 =	80	
UPL Species	30	x 5 =	150	
Column Totals:	50	(A)	230	(B)

Prevalence Index = B/A: 4.60

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is > 50%
- 3 - Prevalence Index is <= 3.0[1]
- 4 -Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present ? Yes No X

Remarks:

SOIL

Sampling Point: 10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Horizon	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Abundance/Contrast	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-15	A	10YR 3/1	100						Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.

[2]Location: PL= Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Gleyed Matrix (S4)
	Histic Epipedon (A2)		Sandy Redox (S5)
	Black Histic (A3)		Stripped Matrix (S6)
	Hydrogen Sulfide (A4)		Loamy Mucky Mineral (F1)
	Stratified Layers (A5)		Loamy Gleyed Matrix (F2)
	2 cm Muck (A10)		Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)		Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	5 cm Mucky Peat or Peat (S3)		

Indicators for Problematic Hydric Soils[3]:

	Coast Prairie Redox (A16)
	Iron-Manganese Masses (F12)
	Other (Explain in Remarks)

(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes [ ] No [X]

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

	Surface water (A1)		Water-stained leaves (B9)
	High water table (A2)		Aquatic Fauna (B13)
	Saturation (A3)		True Aquatic Plants (B14)
	Water marks (B1)		Hydrogen sulfide odor (C1)
	Sediment deposits (B2)		Oxidized rhizospheres on living roots (C3)
	Drift deposits (B3)		Presence of reduced iron (C4)
	Algal mat or crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron deposits (B5)		Thin muck surface (C7)
	Inundation visible on aerial imagery (B7)		Gauge or Well Data (D9)
	Sparsely Vegetated Concave Surface (B8)		Other (explain in Remarks)

Secondary Indicators (minimum of two required)

	Surface soil cracks (B6)
	Drainage patterns (B10)
	Dry-Season Water Table (C2)
	Crayfish burrows (C8)
	Saturation visible on aerial imagery (C9)
	Stunted or Stressed Plants (D2)
	Geomorphic position (D2)
	FAC-neutral test (D5)
	Other (explain in Remarks)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches)	
Water Table Present?	Yes		No	X	Depth (inches)	
Saturation Present? (includes capillary fringe)	Yes		No	X	Depth (inches)	

Wetland Hydrology Present? Yes [ ] No [X]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	11
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM xxs xxxxxxxe xxxxxxxn		Lat: 38.90321	Long: -94.31224	Datum:	NAD 83
Soil Map Unit Name:	Sampselt silty clay loam, 5-9% slopes		NWI classification:		N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N , Soil N , or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area within a Wetland? Yes X No
Hydric Soil Present?	Yes	X	No		
Wetland Hydrology Present?	Yes	X	No		

Remarks:

VEGETATION - Use scientific names of plants.

		Absolute % Cover	Dominant Species?	Indicator Status
	Tree Stratum (Plot size: 30ft radius)			
1				
2				
3				
4				
5				
6				
7				
8				
		0	= Total Cover	
	Sapling/Shrub Stratum (Plot Size: 15ft radius)			
1				
2				
3				
4				
5				
6				
		0	= Total Cover	
	Herb Stratum (Plot Size: 5ft radius)			
1	Schedonorus arundinaceus (hummocked)	99	Y	FAC
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
		99	= Total Cover	
	Woody Vine Stratum (Plot Size: 30ft radius)			
1				
2				
3				
		0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:

OBL Species	0	x 1 =	0	
FACW Species	0	x 2 =	0	
FAC Species	99	x 3 =	297	
FACU Species	0	x 4 =	0	
UPL Species	0	x 5 =	0	
Column Totals:	99	(A)	297	(B)

Prevalence Index = B/A: 3.00

Hydrophytic Vegetation Indicators:

	1 - Rapid Test for Hydrophytic Vegetation
X	2 - Dominance Test is > 50%
X	3 - Prevalence Index is <= 3.0[1]
	4 -Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
	Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present ? Yes X No

Remarks:

SOIL

Sampling Point: 11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Horizon	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Abundance/Contrast	Type[1]	Loc[2]	Texture	Remarks
0-15	A	10YR 4/1	95	10YR 3/6	5	Common / Prominent	C	PL	Silty Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.

[2]Location: PL= Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Gleyed Matrix (S4)
	Histic Epipedon (A2)		Sandy Redox (S5)
	Black Histic (A3)		Stripped Matrix (S6)
	Hydrogen Sulfide (A4)		Loamy Mucky Mineral (F1)
	Stratified Layers (A5)		Loamy Gleyed Matrix (F2)
	2 cm Muck (A10)	X	Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)		Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	5 cm Mucky Peat or Peat (S3)		

Indicators for Problematic Hydric Soils[3]:

	Coast Prairie Redox (A16)
	Iron-Manganese Masses (F12)
	Other (Explain in Remarks)

(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes X No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

X	Surface water (A1)		Water-stained leaves (B9)
	High water table (A2)		Aquatic Fauna (B13)
X	Saturation (A3)		True Aquatic Plants (B14)
	Water marks (B1)		Hydrogen sulfide odor (C1)
	Sediment deposits (B2)		Oxidized rhizospheres on living roots (C3)
	Drift deposits (B3)		Presence of reduced iron (C4)
	Algal mat or crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron deposits (B5)		Thin muck surface (C7)
	Inundation visible on aerial imagery (B7)		Gauge or Well Data (D9)
	Sparsely Vegetated Concave Surface (B8)		Other (explain in Remarks)

Secondary Indicators (minimum of two required)

	Surface soil cracks (B6)
X	Drainage patterns (B10)
	Dry-Season Water Table (C2)
	Crayfish burrows (C8)
	Saturation visible on aerial imagery (C9)
	Stunted or Stressed Plants (D2)
X	Geomorphic position (D2)
	FAC-neutral test (D5)
	Other (explain in Remarks)

Field Observations:

Surface Water Present?	Yes	X	No		Depth (inches)	0-1
Water Table Present?	Yes		No	X	Depth (inches)	
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches)	0-12

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site:	Blackwell Parcel	City/County:	Lee's Summit / Jackson	Sampling Date:	2/11/2022
Applicant/Owner:	Griffin Riley Property Group	State:	MO	Sampling Point:	12
Investigator(s):	M. Stonecypher	Section, Township, Range:	S11, T47N, R31W	Site ID	
Landform (hillslope, terrace, etc.):	Hillslope	Local relief (concave, convex, none):	None	Slope (%):	0-3
GPS: UTM xxs xxxxxxxe xxxxxxxn		Lat: 38.90308	Long: -94.31231	Datum:	NAD 83
Soil Map Unit Name:	Sampselt silty clay loam, 5-9% slopes		NWI classification:		N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation Y , Soil N , or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes No X

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present?	Yes		No	X	

Is the Sampled Area within a Wetland? Yes No X

Remarks:

The vegetation at this location was disregarded because the current agricultural production significantly disturbs the plant community through the removal of any natural vegetation and the cultivation of crops. Since the natural plant community is unnaturally altered, the vegetation was not taken into account at this sampling location and the determination of wetland conditions was made solely based on the hydrology and soils present.

VEGETATION - Use scientific names of plants.

	Tree Stratum (Plot size: 30ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1				
2				
3				
4				
5				
6				
7				
8				
		0	= Total Cover	
	Sapling/Shrub Stratum (Plot Size: 15ft radius)			
1				
2				
3				
4				
5				
6				
		0	= Total Cover	
	Herb Stratum (Plot Size: 5ft radius)			
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
		0	= Total Cover	
	Woody Vine Stratum (Plot Size: 30ft radius)			
1				
2				
3				
		0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC (A/B)

Prevalence Index worksheet:

Total % Cover of:

OBL Species	0	x 1 =	0	
FACW Species	0	x 2 =	0	
FAC Species	0	x 3 =	0	
FACU Species	0	x 4 =	0	
UPL Species	0	x 5 =	0	
Column Totals:	0	(A)	0	(B)

Prevalence Index = B/A

Hydrophytic Vegetation Indicators:

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is > 50%
- 3 - Prevalence Index is <= 3.0[1]
- 4 -Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present ? Yes No X

Remarks:

SOIL

Sampling Point: 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Horizon	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Abundance/Contrast	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-15	A	10YR 3/1	100						Silty Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or coated Sand Grains.

[2]Location: PL= Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Gleyed Matrix (S4)
	Histic Epipedon (A2)		Sandy Redox (S5)
	Black Histic (A3)		Stripped Matrix (S6)
	Hydrogen Sulfide (A4)		Loamy Mucky Mineral (F1)
	Stratified Layers (A5)		Loamy Gleyed Matrix (F2)
	2 cm Muck (A10)		Depleted Matrix (F3)
	Depleted Below Dark Surface (A11)		Redox Dark Surface (F6)
	Thick Dark Surface (A12)		Depleted Dark Surface (F7)
	Sandy Mucky Mineral (S1)		Redox Depressions (F8)
	5 cm Mucky Peat or Peat (S3)		

Indicators for Problematic Hydric Soils[3]:

	Coast Prairie Redox (A16)
	Iron-Manganese Masses (F12)
	Other (Explain in Remarks)

(3) Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present? Yes [ ] No [X]

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

	Surface water (A1)		Water-stained leaves (B9)
	High water table (A2)		Aquatic Fauna (B13)
	Saturation (A3)		True Aquatic Plants (B14)
	Water marks (B1)		Hydrogen sulfide odor (C1)
	Sediment deposits (B2)		Oxidized rhizospheres on living roots (C3)
	Drift deposits (B3)		Presence of reduced iron (C4)
	Algal mat or crust (B4)		Recent Iron Reduction in Tilled Soils (C6)
	Iron deposits (B5)		Thin muck surface (C7)
	Inundation visible on aerial imagery (B7)		Gauge or Well Data (D9)
	Sparsely Vegetated Concave Surface (B8)		Other (explain in Remarks)

Secondary Indicators (minimum of two required)

	Surface soil cracks (B6)
	Drainage patterns (B10)
	Dry-Season Water Table (C2)
	Crayfish burrows (C8)
	Saturation visible on aerial imagery (C9)
	Stunted or Stressed Plants (D2)
	Geomorphic position (D2)
	FAC-neutral test (D5)
	Other (explain in Remarks)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches)	
Water Table Present?	Yes		No	X	Depth (inches)	
Saturation Present? (includes capillary fringe)	Yes		No	X	Depth (inches)	

Wetland Hydrology Present? Yes [ ] No [X]

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: