Preliminary Stormwater Management Plan

prepared for

Oakview Storage
1410 Douglas Street
Lee's Summit, MO 64064

April 20, 2018

prepared by

SCHLAGEL & ASSOCIATES, P.A.
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Lenexa, Kansas
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Schlagel & Associates Project 17-019

prepared for

Oak View Capital Partners, LLC

Executive Summary

April 20, 2018

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

RE: Oakview Storage
1410 Douglas Street
Lee's Summit, MO 64064

Dear Gene Williams,

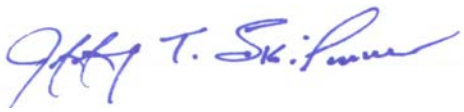
We are submitting the enclosed stormwater management study in support of the preliminary plan application for Oakview Storage. This report has been prepared to address permitting requirements and provides preliminary design calculations for the required storm water detention and BMP facilities. We have modeled the existing site conditions as they existed at the time this report was prepared.

The proposed site is a 7+acre commercial/industrial proposed parcel located in Lee's Summit, MO South of I-470 at the immediate northwest corner of Northeast Douglas Street and Northwest Victoria Drive. The proposed development has been analyzed and 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. We have been able to meet the City of Lee's Summit comprehensive control requirements in all three of the proposed sub-watersheds for the 10 year and 100 year design storms, however we are proposing a slight increase over the allowable comprehensive control release rate in one of the three watersheds (Southwest) in the two year design storm. The Southwest proposed discharge rate is 1.52 cfs versus and allowable discharge of 1.22 cfs by the comprehensive control requirements. We have also analyzed and compared the sub-watershed that does not completely comply with the comprehensive control requirements in terms of proposed runoff versus existing runoff, and we have determined that the detention facility incorporated into the sub-watersheds significantly reduces the runoff in the post-

construction scenario compared to existing runoff conditions. The proposed discharge rate of 1.52 cfs compares to a calculated, existing runoff rate of 6.29 cfs. This sub-watershed discharge to the public storms sewer system along the adjacent public street of the project and with the adequacy of the in-place storm sewers serving this areas, in this less-intensive rainfall event, and comparing the existing flows to proposed flows, we feel that this slight increase over the allowable comprehensive control requirements can be accommodated without adversely affecting the serving storm sewer systems and adjacent developments in the area. Three underground, perforated pipe/open chamber systems have been proposed to be incorporated into the development of the project to provide detention in compliance with the referenced storm water 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.



Jeffrey T. Skidmore, P.E.
Design Engineer

Mark Allen Breuer
Project Engineer

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1.0 GENERAL INFORMATION

Oak View Capital Partners, LLC is proposing to develop a 7 acre parcel of land located in the Northeast Quarter of Section 31, Township 48 North, Range 31 West, Jackson County, Missouri. The property is bounded on the East by Northeast Douglas Drive and by Northwest Victoria Drive on the South. The property is located in commercial vacant land and is bounded on the North by St. Luke's East Hospital and West by industrial development. The proposed development includes commercial office/retail buildings with associated parking/drive and walk infrastructure.

1.1 OBJECTIVE

The intent of this report is to provide information pertaining to the existing and proposed watersheds, identify and address any downstream drainage issues, determine and address any detention requirements, provide 40-hour extended detention/infiltration of runoff from the local 90% mean annual event, and address permitting requirements. This study provides the preliminary design calculations for the development of the facility and associated infrastructure. Detailed design will be required with permit documents.

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 A. 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. 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. The NOAA Atlas 14, Volume 8, Version 2 Unity Village (Station ID: 23-8524) was utilized for 24-hour precipitation frequency estimates.

* * * * *

2.0 EXISTING CONDITIONS ANALYSIS

The site lies within the Little Cedar Creek -Little Blue River Watershed. The existing site contains three small sub-watersheds. The release point for the Northeast watershed is located in the Northeast corner of the site and drains toward Douglas Street. The runoff is conveyed by curb and gutter to an existing inlet. The release point for the West/Northwest sub-watershed is located along the western property boundary. Runoff sheet flows to a swale located off site to the west which drains north. The release point for the South/Southwest watershed drains to the Southwest corner of the site to existing 15" corrugated metal pipe (CMP) that discharges runoff to a public storm pipe network along Northwest Victoria Drive.

2.1 TRIBUTARY AREAS

The existing sub-drainage watersheds are indentified in Appendix B, Sheet EX1.0. The site release points have been identified as Release Points R#1 at the Northeast Corner, R#2 at the West/Northwest Boundary and R#3 at the Southwest corner of the property. The areas have been delineated according to the existing topography.

2.2 CURVE NUMBER AND TIME OF CONCENTRATION

The existing curve numbers and time of concentrations for each sub-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 the soil type is Arisburg-Urban land complex and in the Hydrologic Soil Group (HSG) of D. Hydrologically poor conditions indicate a state of land use that will provide higher runoff compared to good conditions. Therefore, group D was utilized to model the existing runoff conditions. A current aerial photograph can be found in Appendix A, Figure A.1; 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 sub-areas.

Cover types for existing conditions were considered to be a “pasture, grassland, or range” in fair condition. Procedures outlined in *NRCS TR-55 Urban Hydrology for Small Watersheds* recommends utilizing a curve number of 84 for HSG D, for the respective cover types mentioned.

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. 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	Runoff Coeff. (CN)	Time of Concentration (minutes)	Area (acres)	2-Year Peak Flow (cfs)	10-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)
EX-1 (NE)	84	13.9	1.80	4.64	8.39	13.44
EX-2 (W)	84	15.5	2.86	6.99	12.66	20.32
EX-3 (SW)	84	13.8	2.43	6.29	11.36	18.20

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, Figure A.2. The project lies outside of the identified FEMA floodplain per panel 409 of 625 for map number 20095C0409G dated January 20, 2017 and panel 417 of 625 for map number 29095C0417G dated January 20, 2017.

2.5 AGENCY REVIEW

Permitting requirements of the following agencies were reviewed as part of the existing conditions analysis. These sections provide a discussion of the federal and state stormwater permitting that may be required for the proposed development. Supporting maps are located in Appendix A.

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, Figure A.3. We do not anticipate any Corps of Engineers requirements associated with this project at this time.

2.5.2 FEMA Requirements

No FEMA identified floodplain is located on the proposed property per panel 409 of 625 for map number 20095C0409G dated January 20, 2017 and panel 417 of 625 for map number 29095C0417G dated January 20, 2017.There is currently no work proposed in the regulated floodplain. Please see the attached FEMA FIRMette in Appendix A, Figure A.2.

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 sub-basins for analysis. Stormwater runoff will be conveyed through the site via open sheet flow, shallow concentrated flow, and the proposed underground storm sewer systems to the proposed underground chamber detention/infiltration basins within each sub-watershed and ultimately thru the detention facilities to each of the respective release points. Detention for the 2-Year, 10-Year, and 100-Year storm events will be provided for all sub-watersheds of the development.

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

All 3 sub-watersheds are proposed to consist of mostly detained areas with small outer portions along the perimeter of the drainage areas being un-detained. The Northeast watershed proposes to detain 2.11 acres of an overall 2.30 acre drainage area. The West sub-watershed proposes to detain 1.1 acres of an overall 1.38 acre drainage area, and the Southwest sub-watershed proposes to detain 3.06 acres of an overall 3.38 acre drainage area. The sub-watershed release point designation remains the same for the proposed conditions as in the existing conditions for comparative purposes. These tributary areas and their release points have been delineated and identified in Appendix B, Figure PR-1.0

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 condition were considered to be woods/grass in fair condition with impervious areas, such as roofs and pavement. A

composite curb number (CN) of 92 was calculated for the project based on proposed impervious and open space areas associated with the plan.

Time of concentration was established in a similar manner as the existing conditions. Shallow concentrated flow lengths were shortened and considered paved. Pipe lengths were calculated by proposed pipe alignment lengths with an assumed velocity of 9 feet per second. Detailed calculations with composite curve numbers and time of concentration can be found in the HydroCAD Model Output in Appendix B. Appendix B, Figure PR-1.0 depicts the proposed drainage conditions. For preliminary design purposes, we have conservatively estimated the proposed time of concentrations at 5.0 minutes, due to the small nature of each of the sub-watersheds and the amount of paved surfaces that are proposed for each of the sub-watersheds.

3.3 PROPOSED FLOW RATES

Proposed flow rates were determined for the 2-Year, 10-Year, and 100-Year design storms for each sub-watershed of each release point. Please note that that “Det-NE”, “Det-West” and “Det-SW” represents the detained runoff areas releasing to each respective release points (Northeast, West and Southwest) and the “Undet-NE”, “Undet.-West” and “Undet.-SW” areas represent the un-detained areas draining to each respective release point. Detailed calculations can be found in the HydroCAD Model Output Report in Appendix B.

Table 3-1 – HydroCAD Runoff Conditions for Each Sub-Basin

Drainage Sub-Basin	Runoff Coeff. (CN)	Time of Concentration (minutes)	Area (acres)	2-Year Peak Flow (cfs)	10-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)
Det. - NE	92	5.0	1.90	7.22	11.65	17.47
Undet. - NE #1	92	5.0	0.19	0.85	1.37	2.05
Det.-West	92	5.0	1.31	5.44	8.75	13.10
Undet.-W #1	92	5.0	0.28	1.25	2.01	3.01
Det.- SW	92	5.0	3.06	11.69	18.86	28.28
Undet.-SW#1	92	5.0	0.32	1.43	2.30	3.44

Combining the sub-watershed identified above to each release point, we have determined the total proposed runoff, without detention to each of the respective release points (Northeast, West and Southwest) can be summarized per the following table:

Table 3-2 – HydroCAD Proposed Runoff for Each Watershed Release Point

Watershed Release Point	Runoff Coeff. (CN)	Area (acres)	2-Year Peak Flow (cfs)	10-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)
Northeast	92	2.09	8.07	13.02	19.52
West	92	1.59	6.69	10.76	16.11
Southwest	92	3.38	13.12	21.16	31.72

Please note Table 3-2 is total proposed runoff to each release point and does not incorporate detention release from each of the detention basins that are proposed within the sub-watersheds of each watershed.

3.4 DETENTION ANALYSIS

The runoff hydrographs utilized to determine the peak flow volumes for each tributary area were calculated 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

Table 3-1 – HydroCAD Runoff Conditions

In tables 3-3a, 3-3b and 3-3c below, the proposed post-development peak discharge rates are shown next to the maximum allowable peak discharge rates for comparison and the existing release rates at each point have been established per Table 2-1, previously listed in this report.

Table 3-3a – Existing, Allowable, Proposed Release – 2 Yr. Storm Event.

Watershed Release Point	Runoff Coeff. (CN)	Area (acres)	Extg 2-Yr Peak flow (cfs)	Allowable 2-Yr Peak flow (cfs)	Proposed 2-Year Peak Flow (cfs)
Northeast	92	1.80	4.64	0.90	0.89
West	92	2.86	6.99	1.43	1.42
Southwest	92	2.43	6.29	1.22	1.52

Table 3-3b – Existing, Allowable, Proposed Release – 10 Yr. Storm Event.

Watershed Release Point	Runoff Coeff. (CN)	Area (acres)	Extg 10-Yr Peak flow (cfs)	Allowable 10-Yr Peak flow (cfs)	Proposed 10-Year Peak Flow (cfs)
Northeast	92	1.80	8.39	3.60	2.97
West	92	2.86	12.66	5.72	4.48
Southwest	92	2.43	11.36	4.86	3.92

Table 3-3c – Existing, Allowable, Proposed Release – 100 Yr. Storm Event.

Watershed Release Point	Runoff Coeff. (CN)	Area (acres)	Extg 100-Yr Peak flow (cfs)	Allowable 100-Yr Peak flow (cfs)	Proposed 100-Year Peak Flow (cfs)
Northeast	92	1.80	13.44	5.40	5.03
West	92	2.86	20.32	8.58	8.58
Southwest	92	2.43	18.20	7.29	7.15

Please note, due to the amount of un-detained areas in the Southwest sub-watershed, the minimal amount of runoff in the 2 year storm event and the small size of the overall sub-watershed, we were unable to meet the maximum allowable flow in the 2 year storm event defined by the comprehensive control requirements. The 2 year storm

event does, however, significantly reduce the runoff when comparing the proposed flows to existing flows (proposed of 1.62 cfs vs. existing of 6.29 cfs). With the adequacy of the in-place storm sewers serving these areas, in this less-intensive rainfall event, and comparing the existing flows to proposed flows, we feel that this slight increase over the allowable comprehensive control requirements can be accommodated without adversely affecting the serving storm sewer systems and adjacent developments in the area.

In regards to overflow of the system and/or any clogging that may occur; should the system primary outlets be clogged and the system become overwhelmed, the underground system will allow itself to be relieved thru the open inlets that are tied into the storm sewer network. Runoff that cannot be handled within the underground system will be carried via overland flow conditions via the curb and gutter/paved parking and street systems to the public downstream storm systems adjacent to the development area along the public streets. The overland flow runoff conditions can get to the adjacent streets without impacting or ponding occurring to adversely effect any of the proposed or existing buildings within the development area.

Storm water runoff at each of the sub-watershed release points is proposed to be mitigated from a storm water quality perspective by installing the underground, perforated pipe/chamber system with open gravel backfill/bedding to allow the water quality volume of each of the respective drainage area to be stored below the system outlet elevation and infiltrate back into the ground. The underground systems will be preliminarily designed to store the water quality volume in the lower chambers of the piping/chamber system and the surrounding gravel backfill, below the outlet elevation of the system to allow the storm water quality volume to be stored and infiltrated. Any runoff in excess of the water quality storm will be allowed to rise-up within the underground detention system and pass thru an orifice outlet structure or reduced-size outlet pipe, which will restrict flows to pre-development conditions prior to discharging to the adjacent, downstream public storm sewer system. Final design, sizing and detailing

of the outlet structures, perforated plates, sharp-crested weirs and orifice plates will be incorporated into the final design of the project.

* * * * *

4.0 SUMMARY AND RECOMMENDATIONS

The proposed site is a 7+ acre commercial/industrial proposed parcel located in Lee's Summit, MO on the Northwest corner of NE Douglas Street and NW Victoria Drive. The proposed development has been analyzed and preliminarily 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 with the minor exceptions in two of the three watersheds in the 2-Yeare storm event listed previously in this report.. Three underground, perforated pipe/chamber infiltration systems have been incorporated into the design to detain the mentioned events as well as provide storage and infiltration of the water quality storm water event for each of the respective sub-watersheds. All elements of the enclosed drainage system will be designed and constructed in accordance with all City of Lee's Summit, Missouri requirements and the latest design and technical specifications.

* * * *

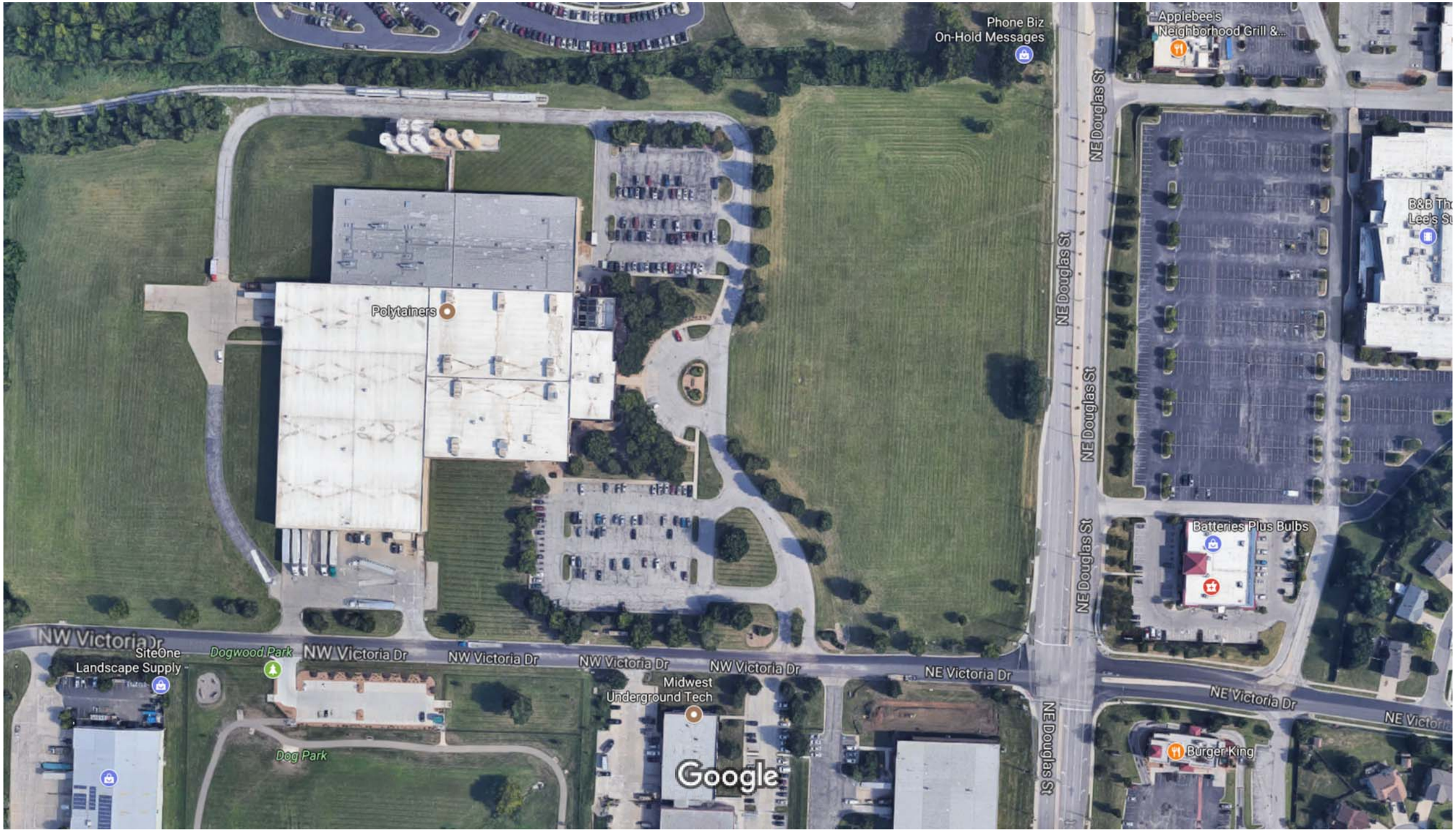
APPENDIX A

-Existing Site Aerial Photograph

-FEMA FIRMette

-National Wetlands Inventory

-NRCS Soil Resource Report



https://www.google.com/maps/place/Lee's+Summit,+MO/@38.9379989,-94.3802748,376m/data=!3m1!1e3!4m5!3m4!1s0x87c0dff6a8b596fd:0x8d2c2e9a007b187!8m2!3d38.9108408!4d-94.3821724

Figure A.1

MAP SCALE 1" = 500'

250 0 500 1000

FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0409G

FIRM

FLOOD INSURANCE RATE MAP

JACKSON COUNTY, MISSOURI AND INCORPORATED AREAS

PANEL 409 OF 625

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
KANSAS CITY, CITY OF	290173	0409	G
LEE'S SUMMIT, CITY OF	290174	0409	G
UNITY, VILLAGE OF	290513	0409	G

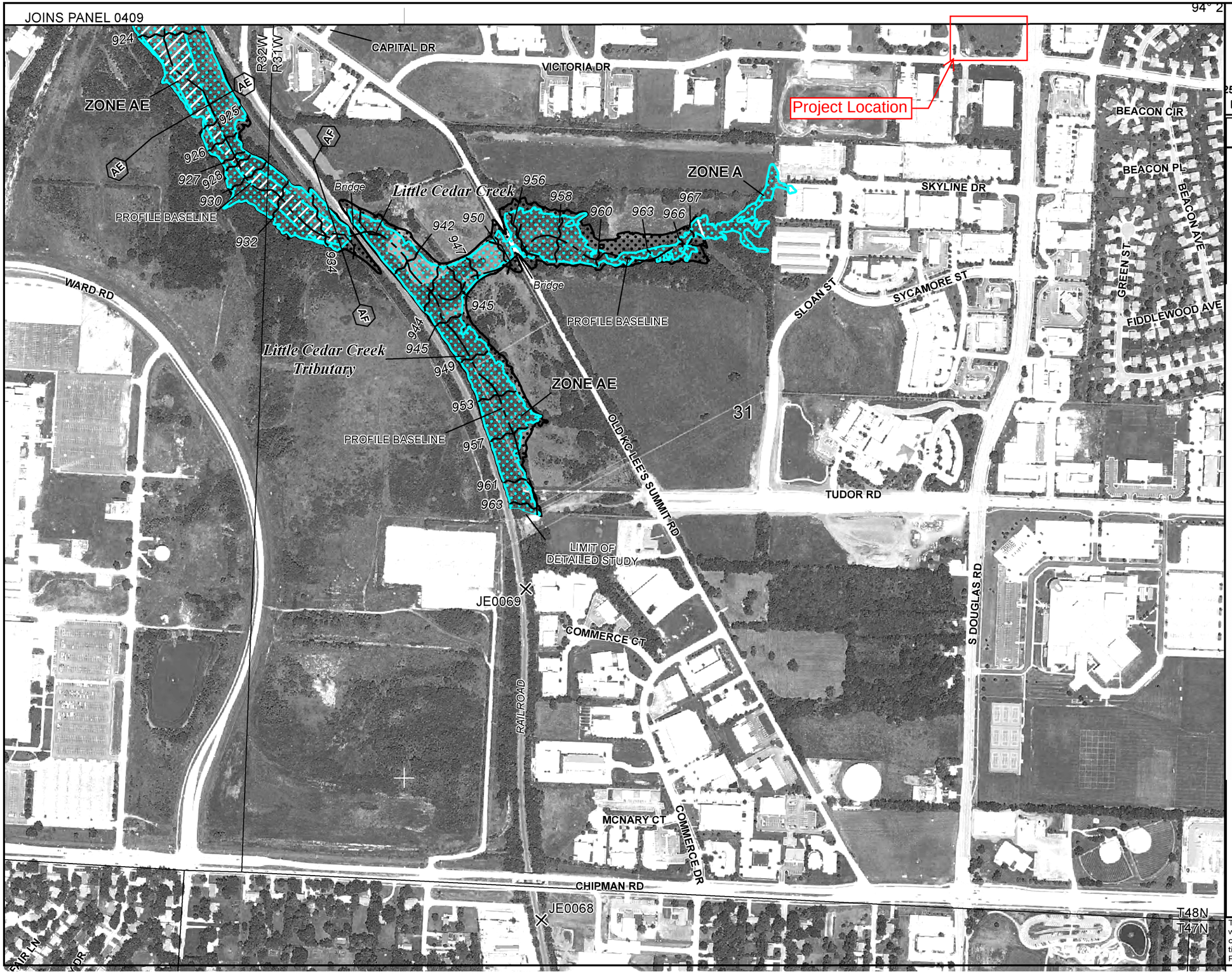
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
29095C0409G

MAP REVISED
JANUARY 20, 2017

Federal Emergency Management Agency

Figure A.2(1)



MAP SCALE 1" = 500'

250 0 500 1000 FEET METERS

NFIP

PANEL 0417G

FIRM

FLOOD INSURANCE RATE MAP

JACKSON COUNTY, MISSOURI

AND INCORPORATED AREAS

PANEL 417 OF 625

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LEE'S SUMMIT, CITY OF	290174	0417	G

NATIONAL FLOOD INSURANCE PROGRAM

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
29095C0417G

MAP REVISED
JANUARY 20, 2017

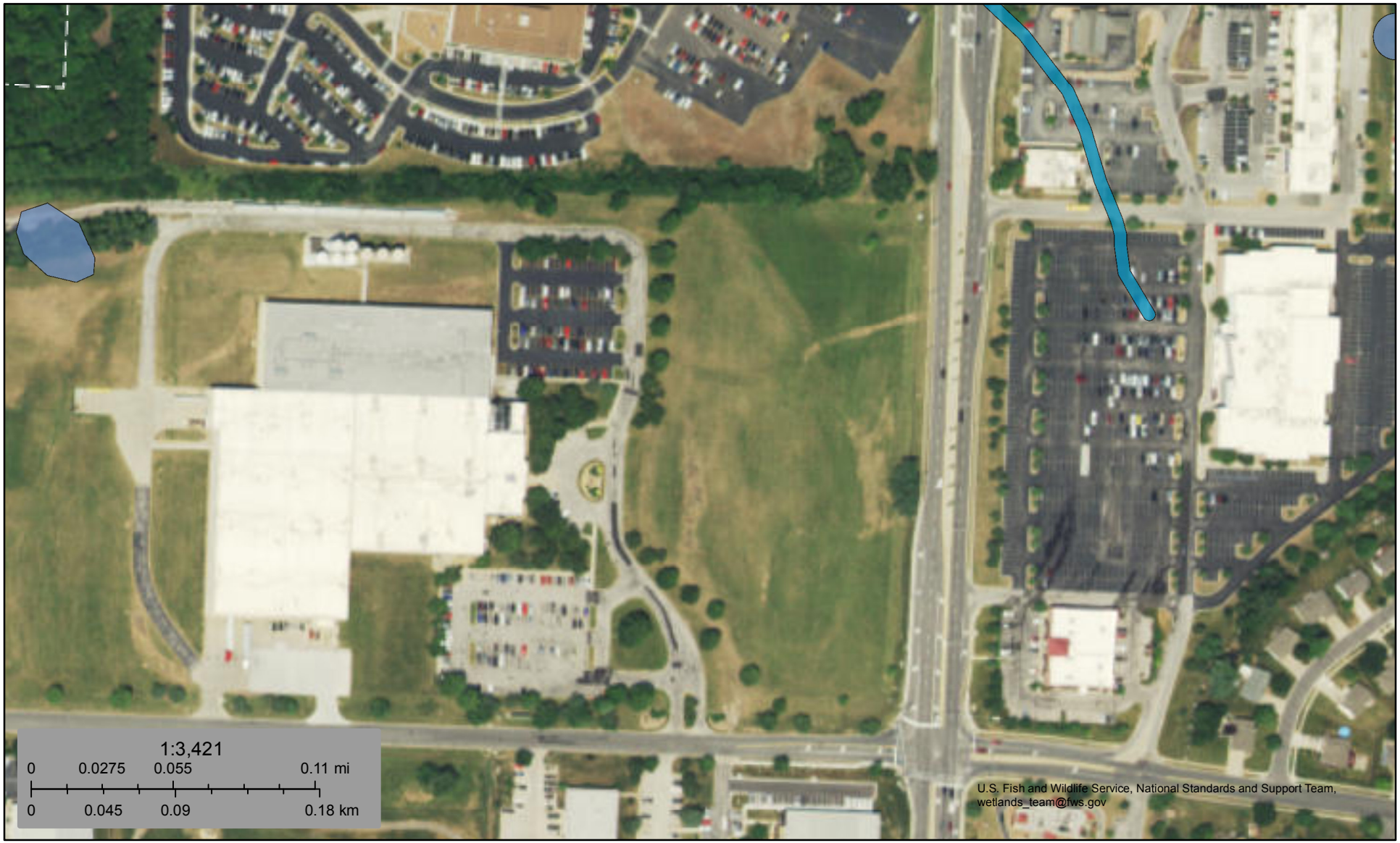
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Figure A.2(2)

U.S. Fish and Wildlife Service
National Wetlands Inventory

17-135 Oakview Storage



September 20, 2017

Wetlands

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

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Figure A.3

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

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

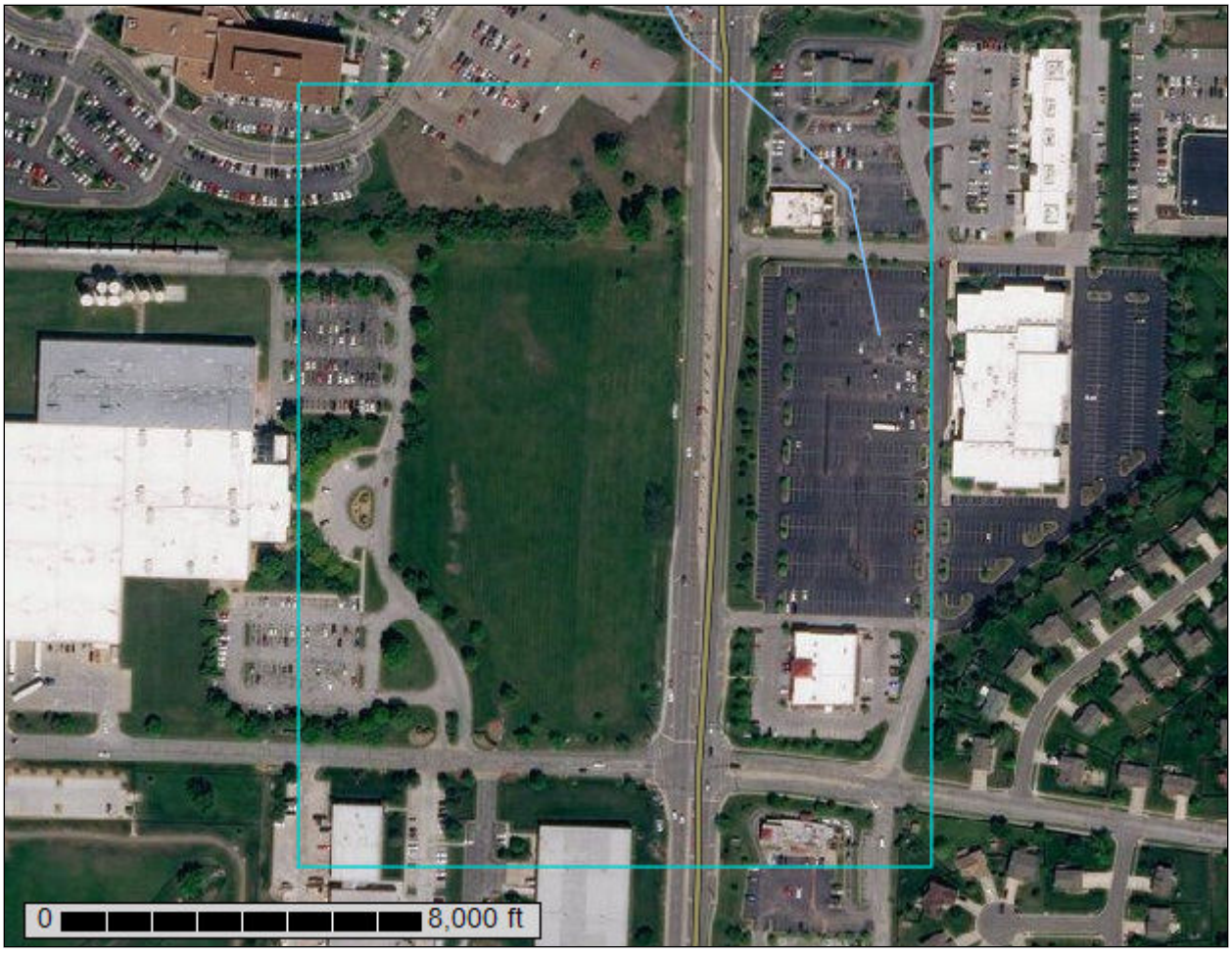


Figure A.4

September 20, 2017

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.

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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.

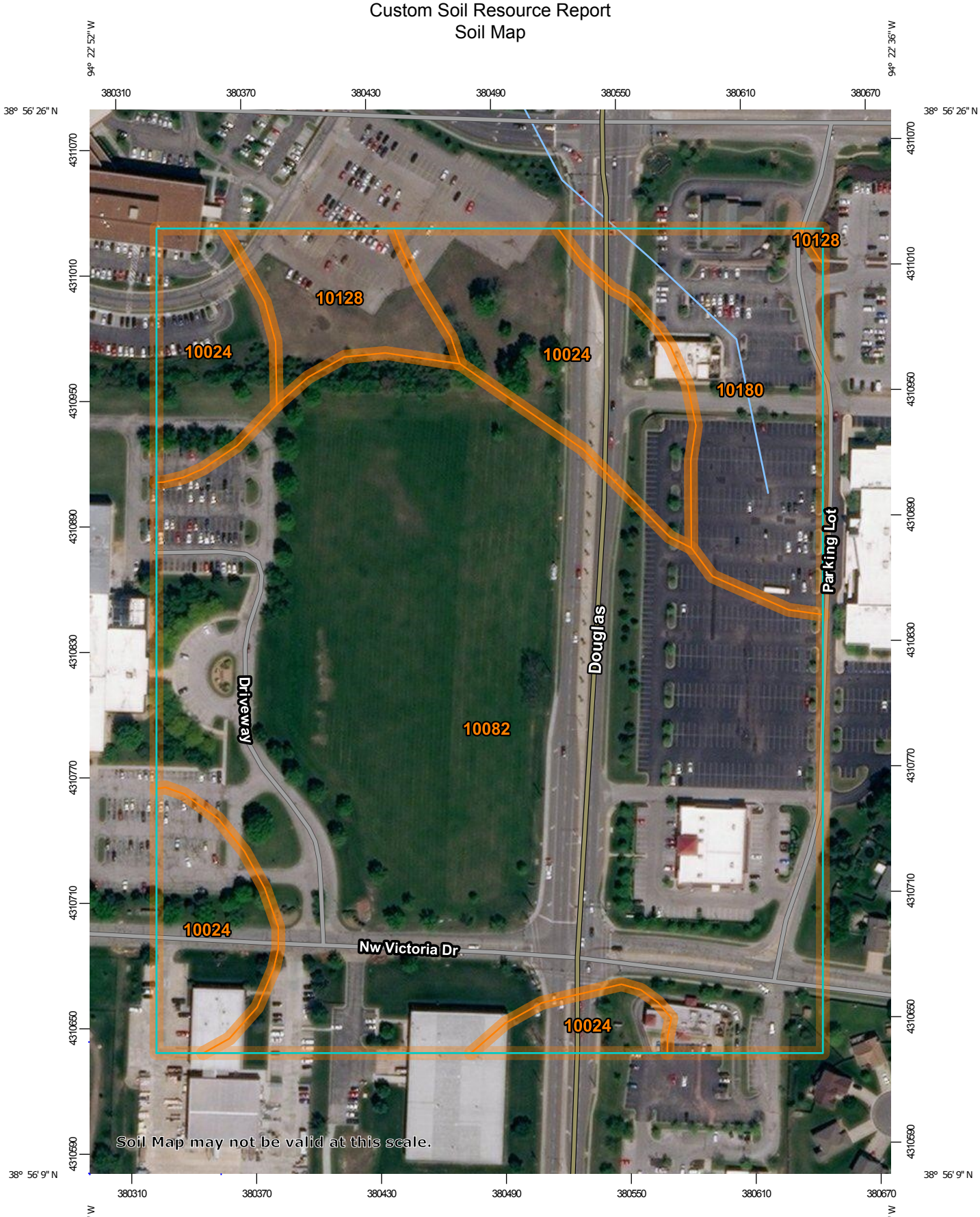
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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: 1:2,480 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

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 17, Sep 28, 2016

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

Date(s) aerial images were photographed: Oct 14, 2014—Oct 10, 2016

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

Jackson County, Missouri (MO095)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
10024	Greenton-Urban land complex, 5 to 9 percent slopes	6.0	19.1%
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	20.7	66.2%
10128	Sharpsburg-Urban land complex, 2 to 5 percent slopes	1.3	4.3%
10180	Udarents-Urban land-Sampsel complex, 2 to 5 percent slopes	3.3	10.4%
Totals for Area of Interest		**31.3**	**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

10024—Greenton-Urban land complex, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2qky4
Elevation: 800 to 1,100 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

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

Description of Greenton

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex, concave
Parent material: Loess over residuum weathered from limestone and shale

Typical profile

A - 0 to 16 inches: silty clay loam
Bt1 - 16 to 26 inches: silty clay loam
2Bt2 - 26 to 80 inches: silty clay

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: About 16 inches to abrupt textural change
Natural 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 12 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: Loess Upland Prairie (R109XY002MO)
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: No

Description of Urban Land

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Across-slope shape: Convex, concave

Interpretive groups

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

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

Map Unit Setting

National map unit symbol: 2qkz8
Elevation: 700 to 1,390 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

Arisburg and similar soils: 63 percent
Urban land: 33 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: Concave, convex
Across-slope shape: Concave, convex
Parent material: Loess

Typical profile

A - 0 to 13 inches: silt loam
AB - 13 to 19 inches: silty clay loam
Btg - 19 to 56 inches: silty clay loam
Cg - 56 to 80 inches: silty clay loam

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly 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 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: Loess Upland Prairie (R107BY007MO)
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

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
Natural 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
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: 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: Loess Upland Prairie (R109XY002MO)
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
Natural 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
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
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
Natural 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
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: 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: Wet Footslope Prairie (R112XY041MO)
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: No

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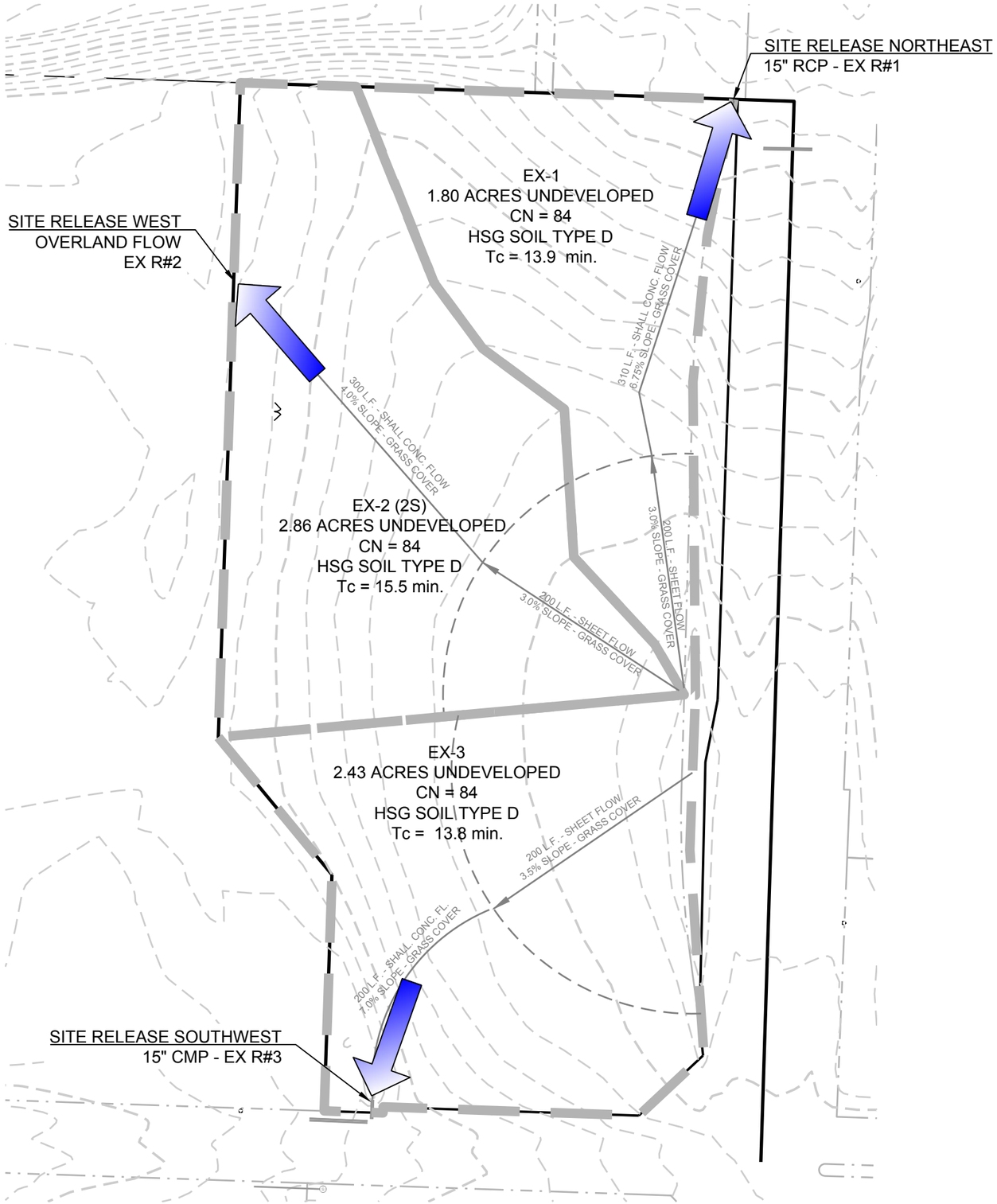
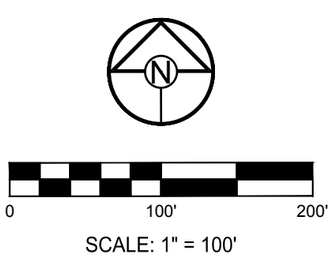
APPENDIX B

-Existing Drainage Map

-Proposed Drainage Map

-HydroCAD Model Output Report





SCALE: 1" = 100'

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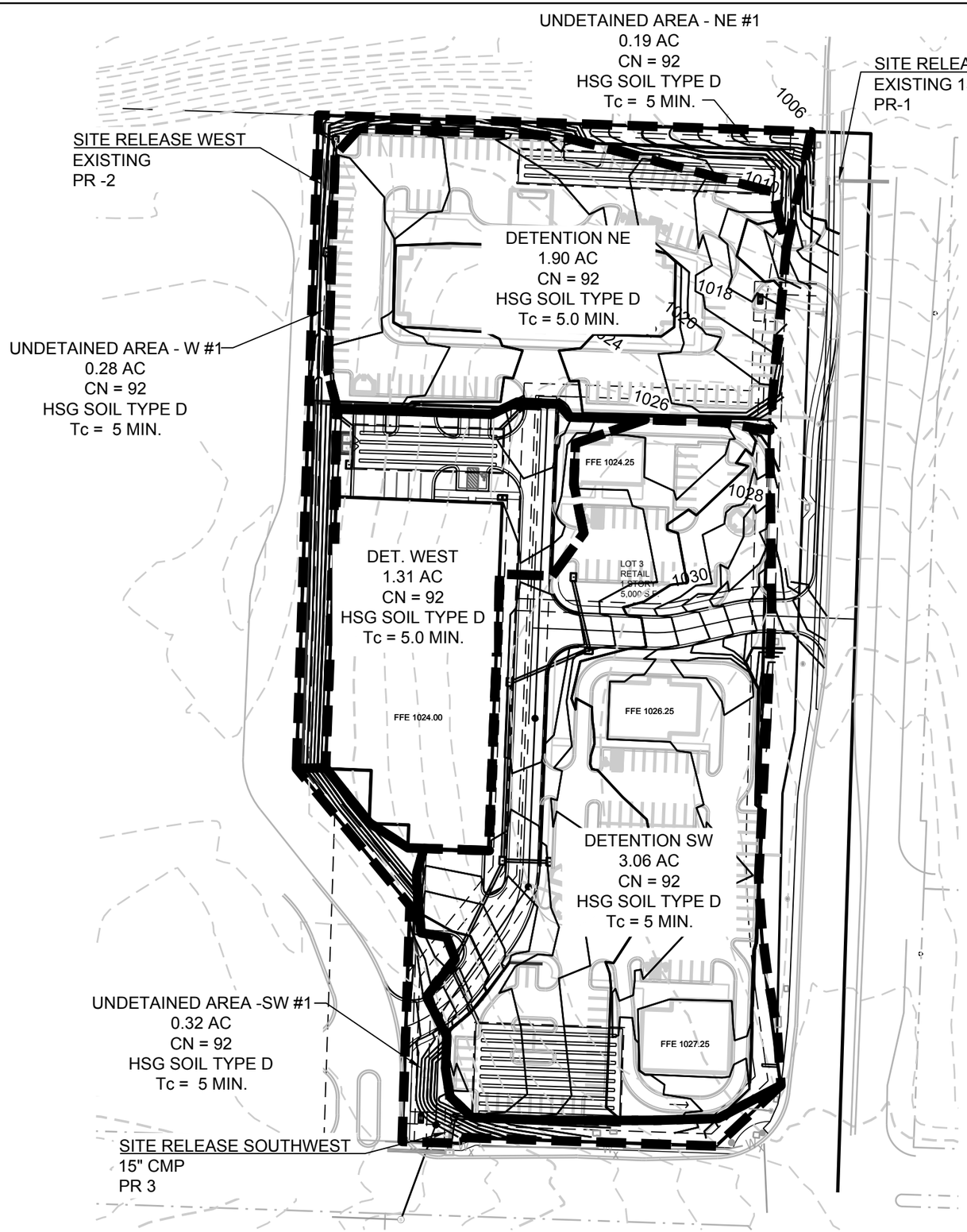
OAKVIEW STORAGE
PRELIMINARY DEVELOPMENT PLAN

NE DOUGLAS STREET AND NW VITORIA DRIVE
LEE'S SUMMIT, MISSOURI

DRAWN BY:	DATE PREPARED:	PROJ. NUMBER:
###	9-22-17	17-135

EXISTING
DRAINAGE MAP

SHEET
EX-1.0
OF



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OAKVIEW STORAGE
PRELIMINARY DEVELOPMENT PLAN

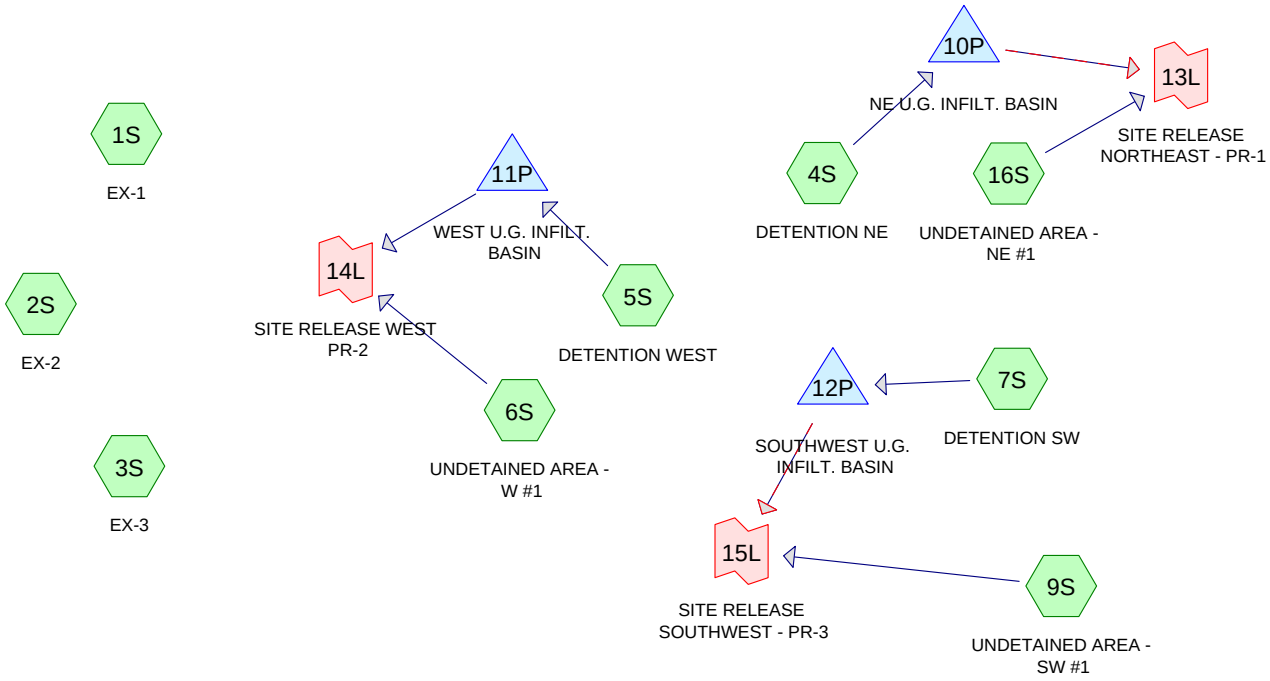
NE DOUGLAS STREET AND NW VITORIA DRIVE
LEE'S SUMMIT, MISSOURI

DRAWN BY:	DATE PREPARED:	PROJ. NUMBER:
###	9-22-17	17-135

PROPOSED
DRAINAGE MAP

SHEET
PR-1.0
OF

0 100' 200'
SCALE: 1" = 100'



Subcat Reach Pond Link

Routing Diagram for 20180420 update_17-135 Stormwater Calcs
Prepared by Schlagel & Associates, P.A., Printed 4/20/2018

Summary for Subcatchment 1S: EX-1

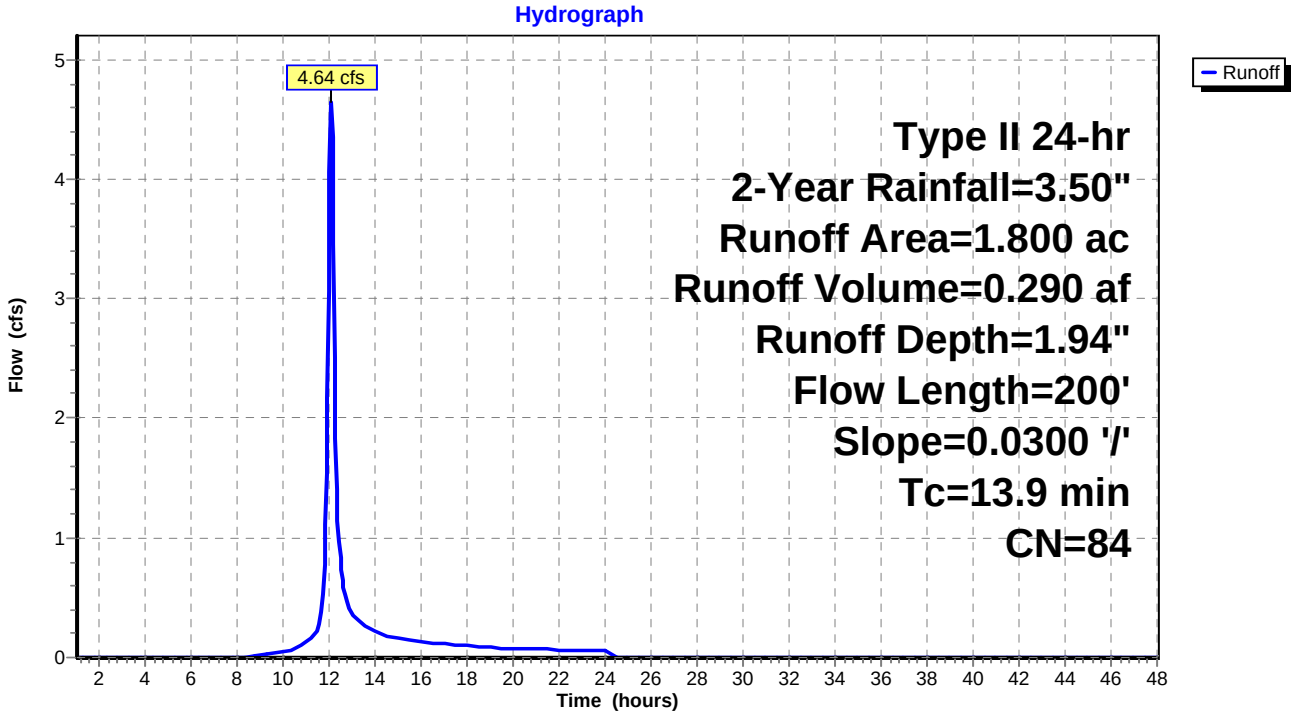
Runoff = 4.64 cfs @ 12.06 hrs, Volume= 0.290 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	1.800	84	
	1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	200	0.0300	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

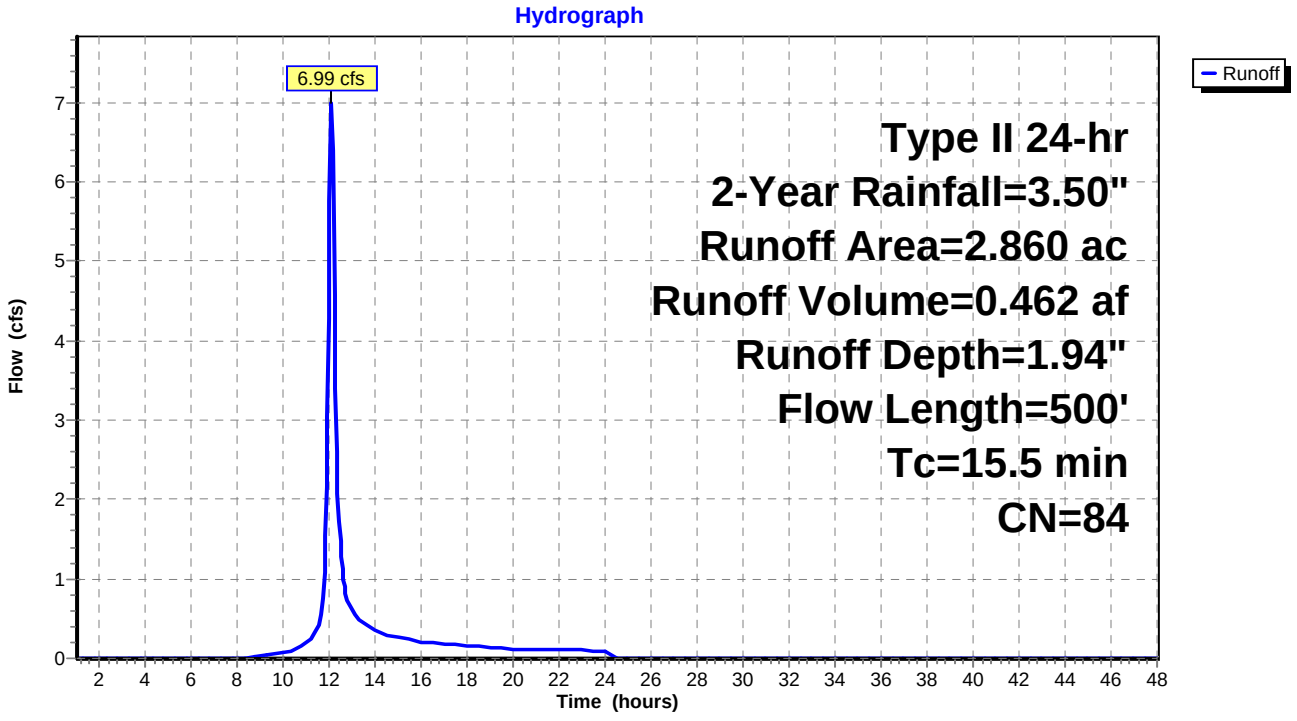
Runoff = 6.99 cfs @ 12.08 hrs, Volume= 0.462 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	2.860	84	
	2.860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	200	0.0300	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.6	300	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.5	500	Total			

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

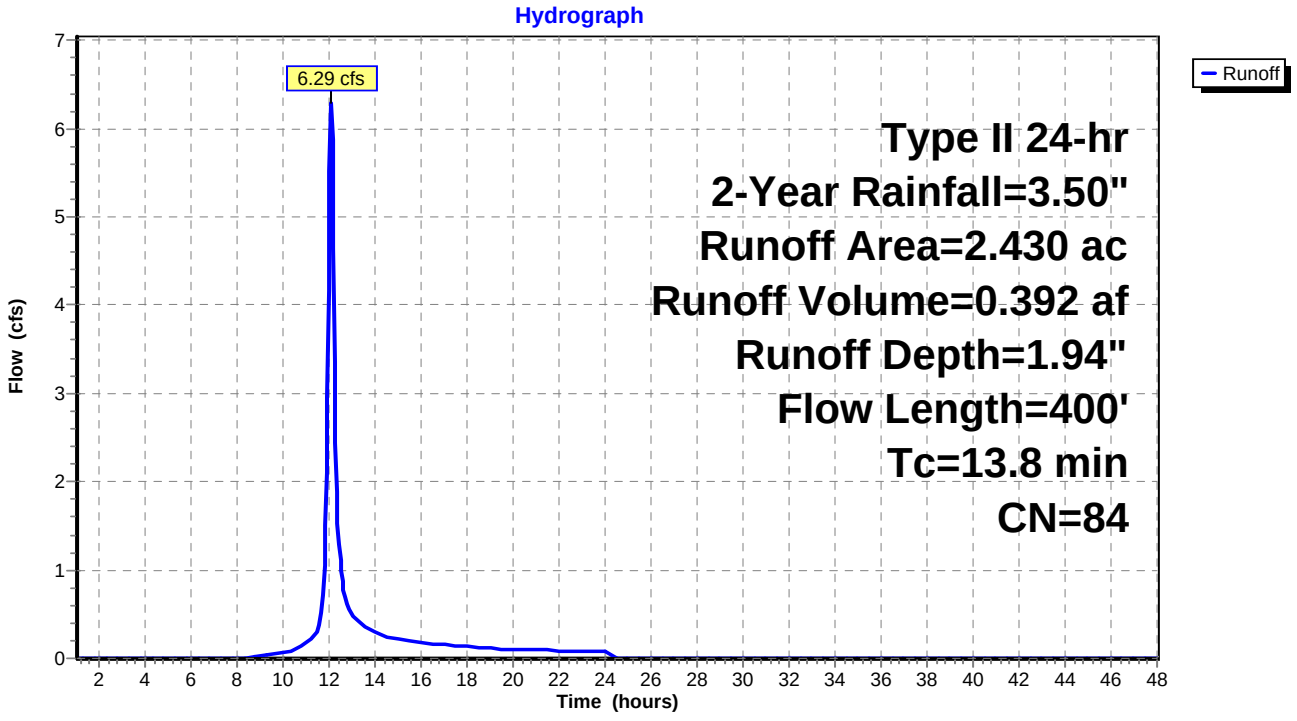
Runoff = 6.29 cfs @ 12.06 hrs, Volume= 0.392 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	2.430	84	
	2.430		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	200	0.0350	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.8	200	0.0700	4.26		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
13.8	400	Total			

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: DETENTION NE

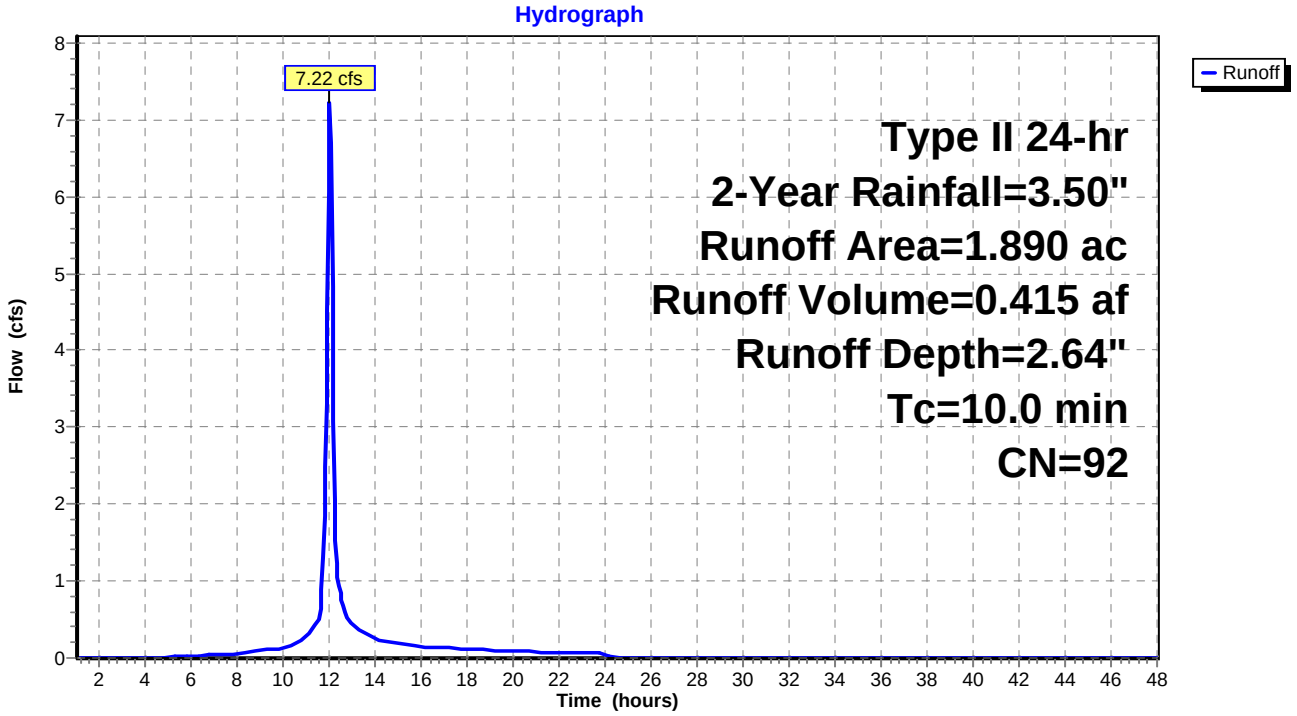
Runoff = 7.22 cfs @ 12.01 hrs, Volume= 0.415 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	1.890	92	
	1.890		100.00% Pervious Area

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

Subcatchment 4S: DETENTION NE



Summary for Subcatchment 5S: DETENTION WEST

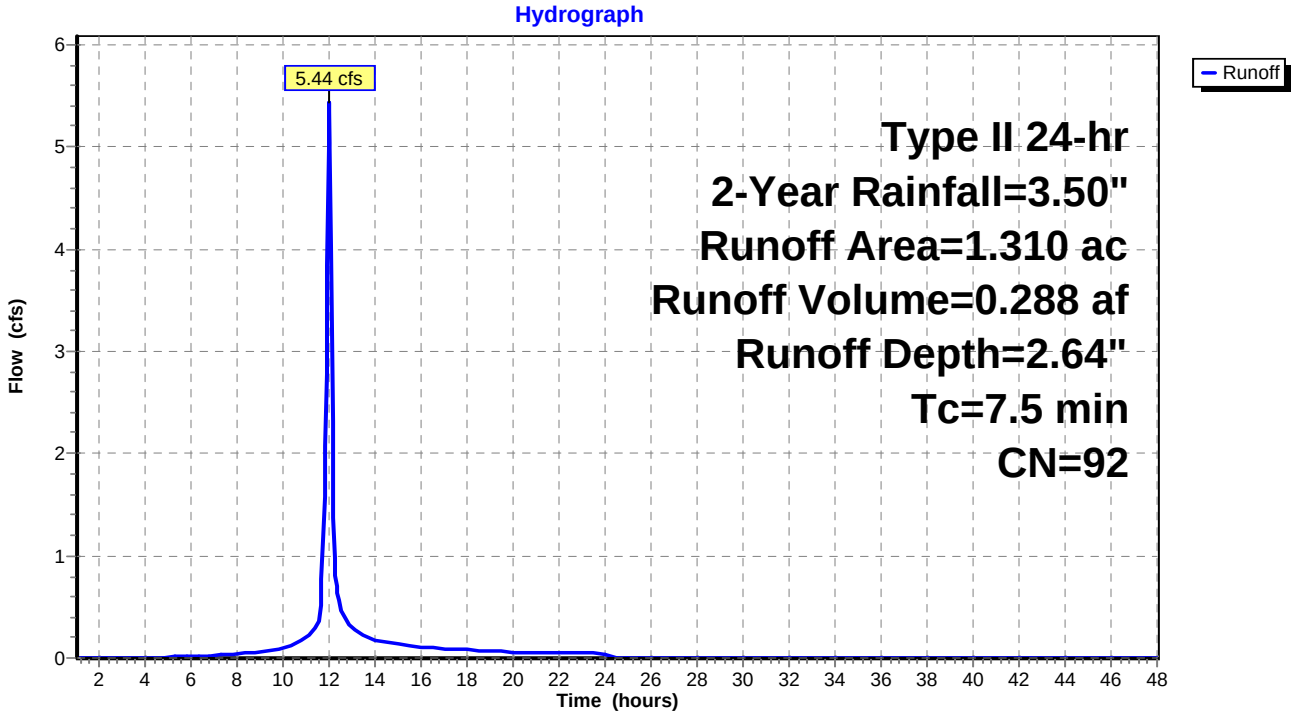
Runoff = 5.44 cfs @ 11.98 hrs, Volume= 0.288 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	1.310	92	
	1.310		100.00% Pervious Area

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

Subcatchment 5S: DETENTION WEST



Summary for Subcatchment 6S: UNDETAINED AREA - W #1

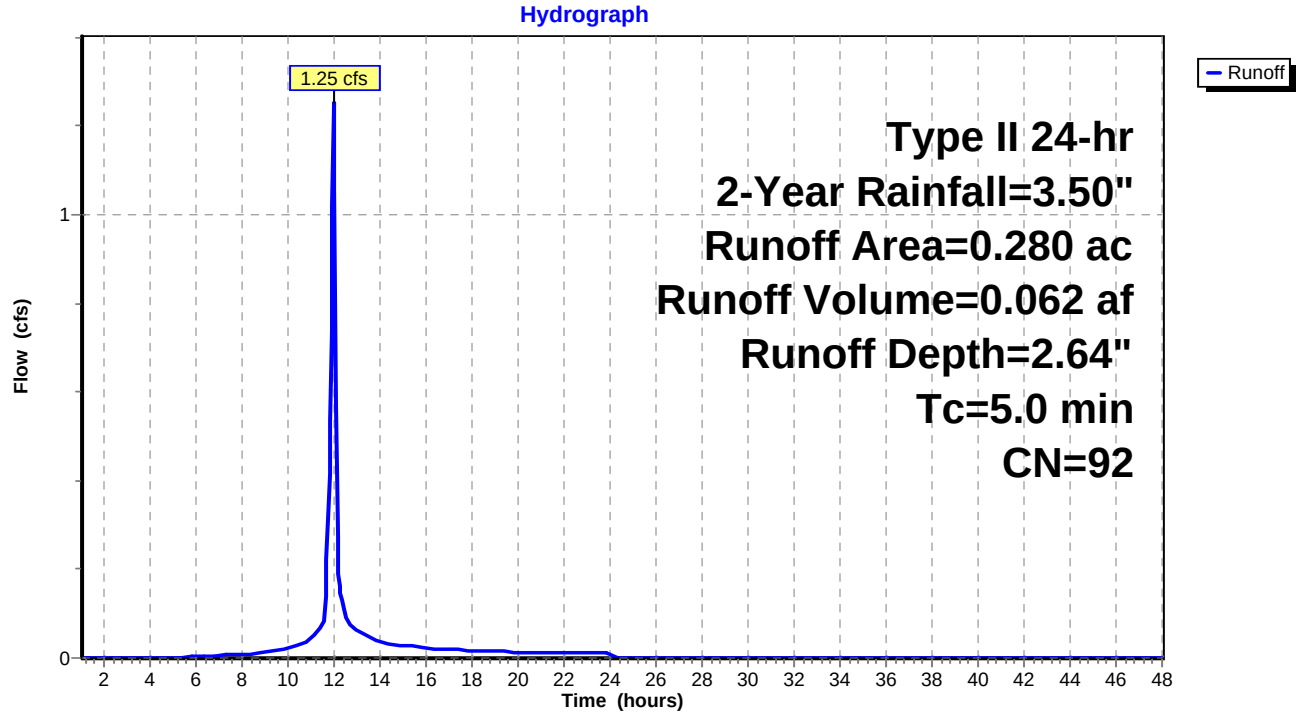
Runoff = 1.25 cfs @ 11.95 hrs, Volume= 0.062 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	0.280	92	
	0.280		100.00% Pervious Area

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

Subcatchment 6S: UNDETAINED AREA - W #1



Summary for Subcatchment 7S: DETENTION SW

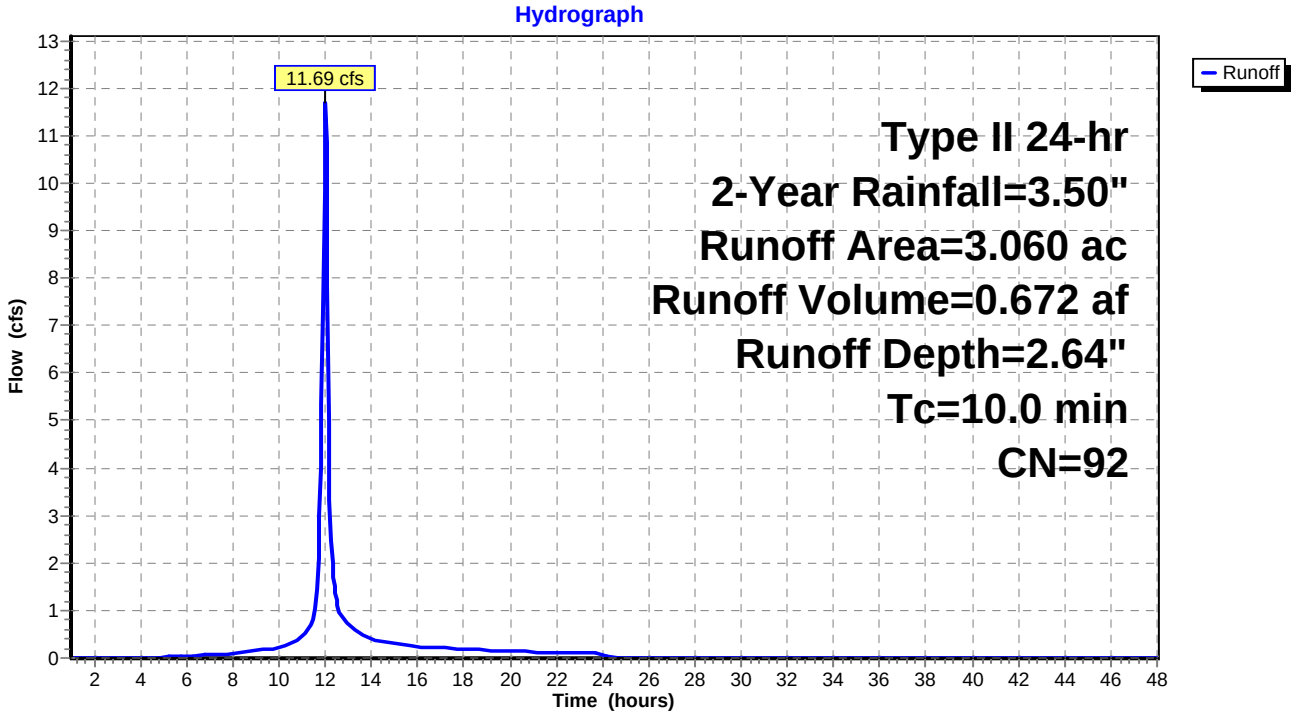
Runoff = 11.69 cfs @ 12.01 hrs, Volume= 0.672 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	3.060	92	
	3.060		100.00% Pervious Area

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

Subcatchment 7S: DETENTION SW



Summary for Subcatchment 9S: UNDETAINED AREA - SW #1

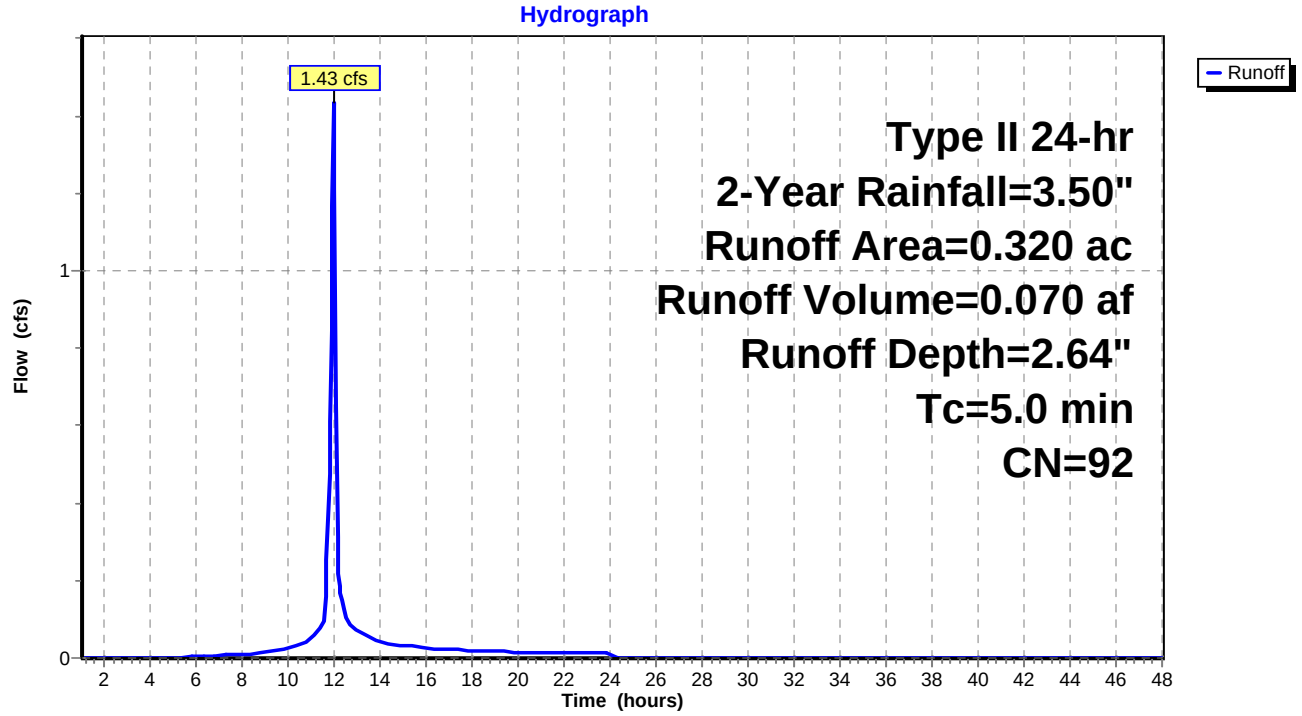
Runoff = 1.43 cfs @ 11.95 hrs, Volume= 0.070 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	0.320	92	
	0.320		100.00% Pervious Area

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

Subcatchment 9S: UNDETAINED AREA - SW #1



Summary for Subcatchment 16S: UNDETAINED AREA - NE #1

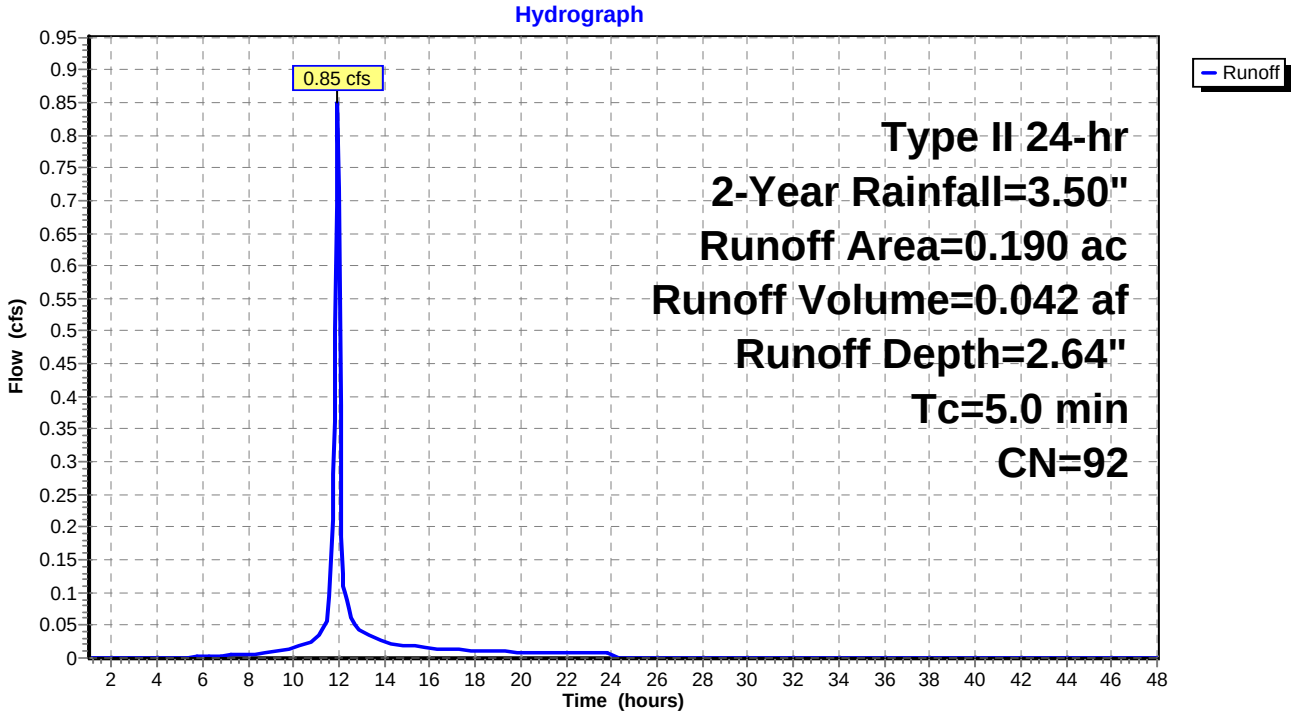
Runoff = 0.85 cfs @ 11.95 hrs, Volume= 0.042 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.50"

	Area (ac)	CN	Description
*	0.190	92	
	0.190		100.00% Pervious Area

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

Subcatchment 16S: UNDETAINED AREA - NE #1



Summary for Pond 10P: NE U.G. INFILT. BASIN

Inflow Area = 1.890 ac, 0.00% Impervious, Inflow Depth = 2.64" for 2-Year event
Inflow = 7.22 cfs @ 12.01 hrs, Volume= 0.415 af
Outflow = 0.80 cfs @ 12.48 hrs, Volume= 0.281 af, Atten= 89%, Lag= 28.0 min
Primary = 0.80 cfs @ 12.48 hrs, Volume= 0.281 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,007.16' @ 12.48 hrs Surf.Area= 6,254 sf Storage= 10,430 cf

Plug-Flow detention time= 273.6 min calculated for 0.281 af (68% of inflow)
Center-of-Mass det. time= 175.0 min (970.1 - 795.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,004.50'	7,479 cf	**29.50'W x 212.00'L x 6.00'H Field A** 37,524 cf Overall - 16,749 cf Embedded = 20,775 cf x 36.0% Voids
#2A	1,005.00'	16,749 cf	**CMP_Round 60** x 40 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 27.50' Header x 19.59 sf x 2 = 1,077.5 cf Inside
		24,228 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,006.20'	**15.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,006.20' / 1,005.70' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,006.20'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Secondary	1,007.30'	**8.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.80 cfs @ 12.48 hrs HW=1,007.16' (Free Discharge)
└**1=Culvert** (Passes 0.80 cfs of 3.18 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.80 cfs @ 4.06 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,004.50' (Free Discharge)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 10P: NE U.G. INFILT. BASIN - Chamber Wizard Field A

Chamber Model = CMP_Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

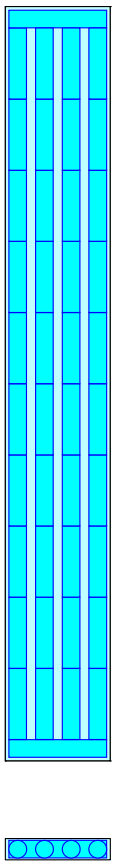
10 Chambers/Row x 20.00' Long +5.00' Header x 2 = 210.00' Row Length +12.0" End Stone x 2 = 212.00' Base Length
4 Rows x 60.0" Wide + 30.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.50' Base Width
6.0" Base + 60.0" Chamber Height + 6.0" Cover = 6.00' Field Height

40 Chambers x 391.8 cf + 27.50' Header x 19.59 sf x 2 = 16,749.5 cf Chamber Storage

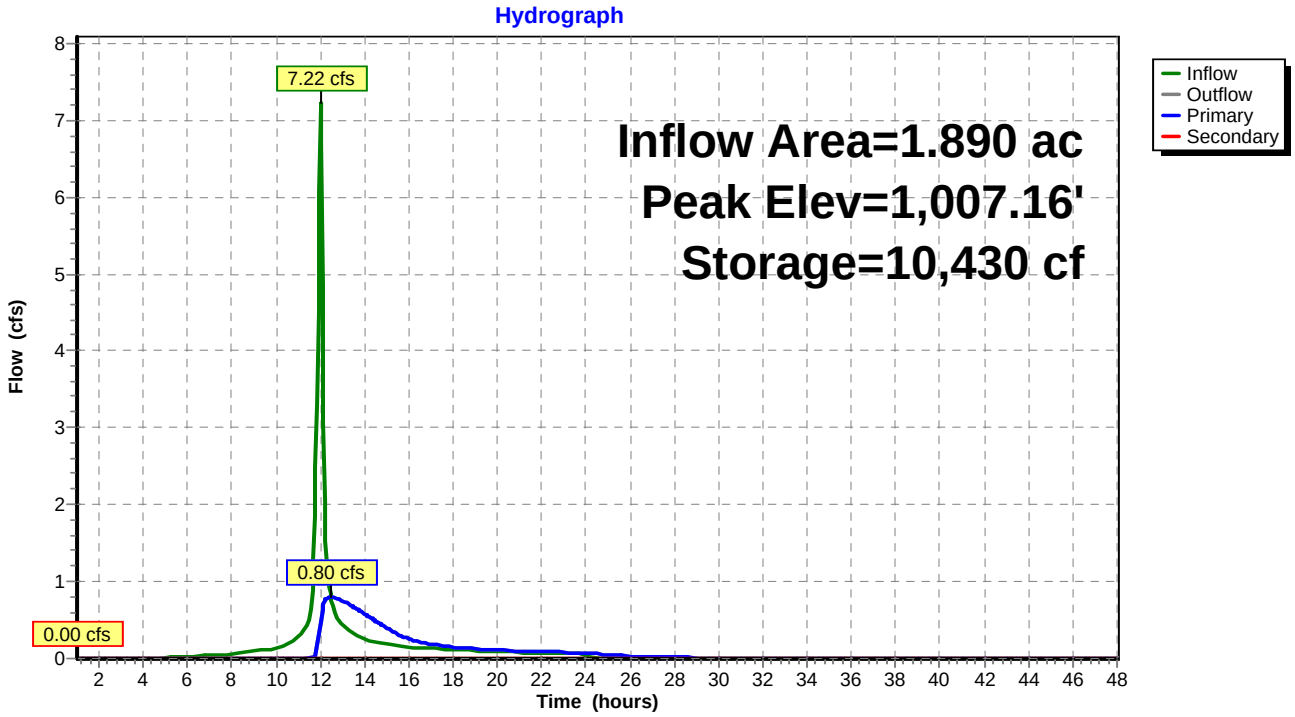
37,524.0 cf Field - 16,749.5 cf Chambers = 20,774.5 cf Stone x 36.0% Voids = 7,478.8 cf Stone Storage

Chamber Storage + Stone Storage = 24,228.3 cf = 0.556 af
Overall Storage Efficiency = 64.6%

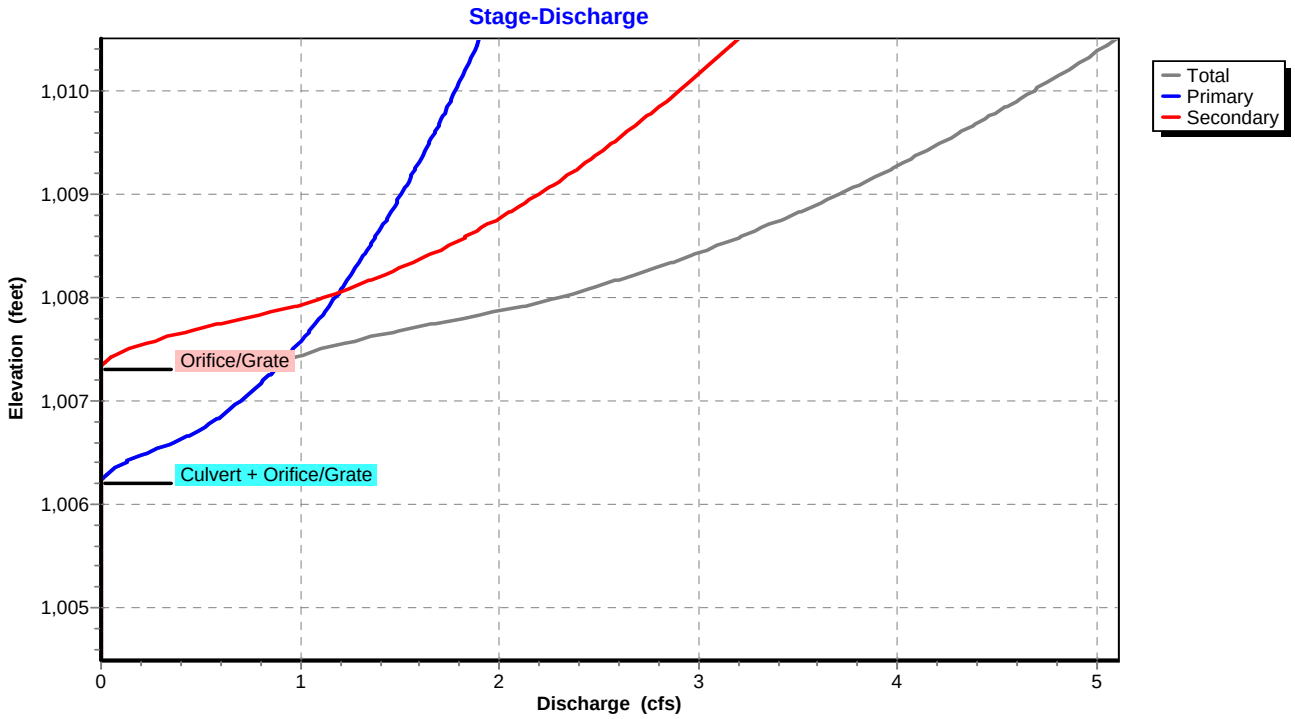
40 Chambers
1,389.8 cy Field
769.4 cy Stone



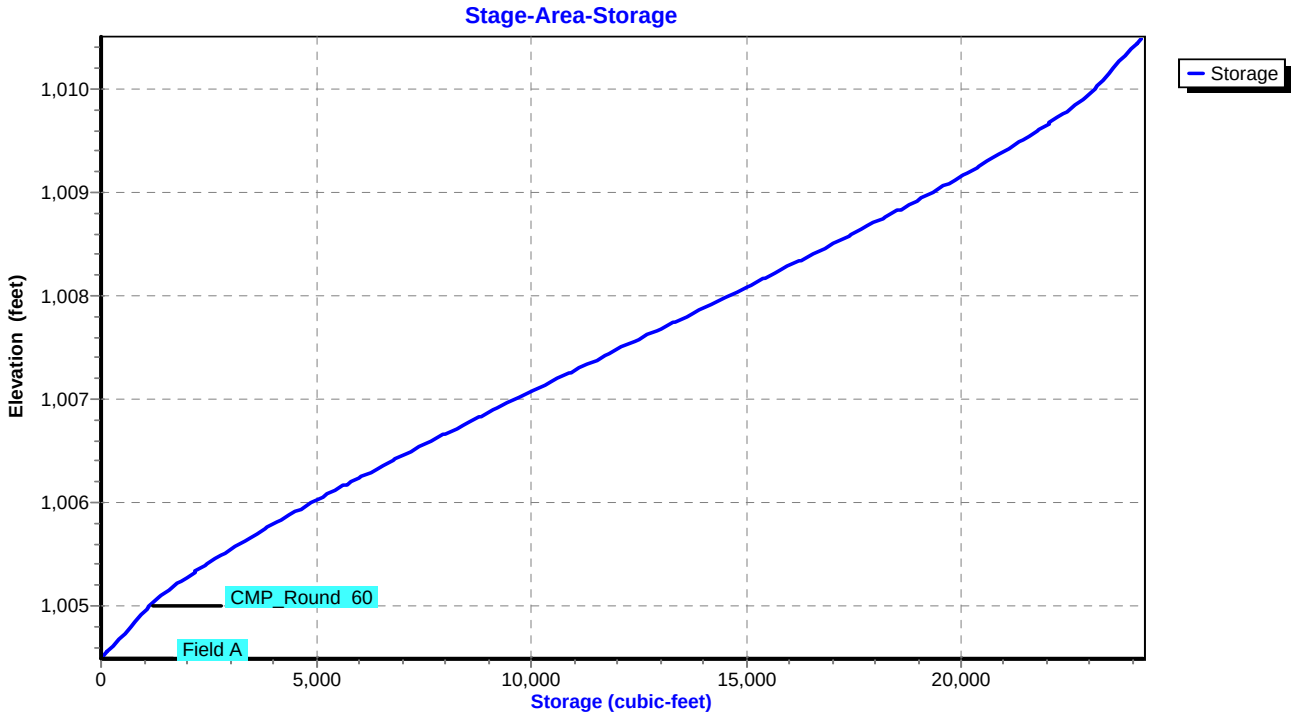
Pond 10P: NE U.G. INFILT. BASIN



Pond 10P: NE U.G. INFILT. BASIN



Pond 10P: NE U.G. INFILT. BASIN



Summary for Pond 11P: WEST U.G. INFILT. BASIN

Inflow Area = 1.310 ac, 0.00% Impervious, Inflow Depth = 2.64" for 2-Year event
Inflow = 5.44 cfs @ 11.98 hrs, Volume= 0.288 af
Outflow = 0.45 cfs @ 12.54 hrs, Volume= 0.200 af, Atten= 92%, Lag= 33.5 min
Primary = 0.45 cfs @ 12.54 hrs, Volume= 0.200 af

Routing by Stor-Ind method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,018.70' @ 12.54 hrs Surf.Area= 3,515 sf Storage= 7,387 cf

Plug-Flow detention time= 272.5 min calculated for 0.200 af (70% of inflow)
Center-of-Mass det. time= 175.9 min (968.6 - 792.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,015.50'	4,172 cf	**37.00'W x 95.00'L x 6.00'H Field A** 21,090 cf Overall - 9,501 cf Embedded = 11,589 cf x 36.0% Voids
#2A	1,016.00'	9,501 cf	**CMP_Round 60** x 20 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf Overall Size= 60.0"W x 60.0"H x 20.00'L Row Length Adjustment= +3.00' x 19.59 sf x 5 rows 35.00' Header x 19.59 sf x 2 = 1,371.3 cf Inside
		13,673 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,017.40'	**15.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,017.40' / 1,016.90' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,017.40'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	1,018.70'	**13.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.45 cfs @ 12.54 hrs HW=1,018.70' (Free Discharge)
└─**1=Culvert** (Passes 0.45 cfs of 4.81 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.45 cfs @ 5.12 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 11P: WEST U.G. INFILT. BASIN - Chamber Wizard Field A

Chamber Model = CMP_Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L
Row Length Adjustment= +3.00' x 19.59 sf x 5 rows

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

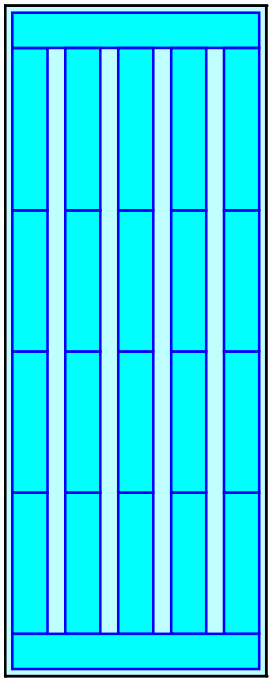
4 Chambers/Row x 20.00' Long +3.00' Row Adjustment +5.00' Header x 2 = 93.00' Row Length +12.0" End Stone x 2 = 95.00' Base Length
5 Rows x 60.0" Wide + 30.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.00' Base Width
6.0" Base + 60.0" Chamber Height + 6.0" Cover = 6.00' Field Height

20 Chambers x 391.8 cf +3.00' Row Adjustment x 19.59 sf x 5 Rows + 35.00' Header x 19.59 sf x 2 = 9,501.2 cf Chamber Storage

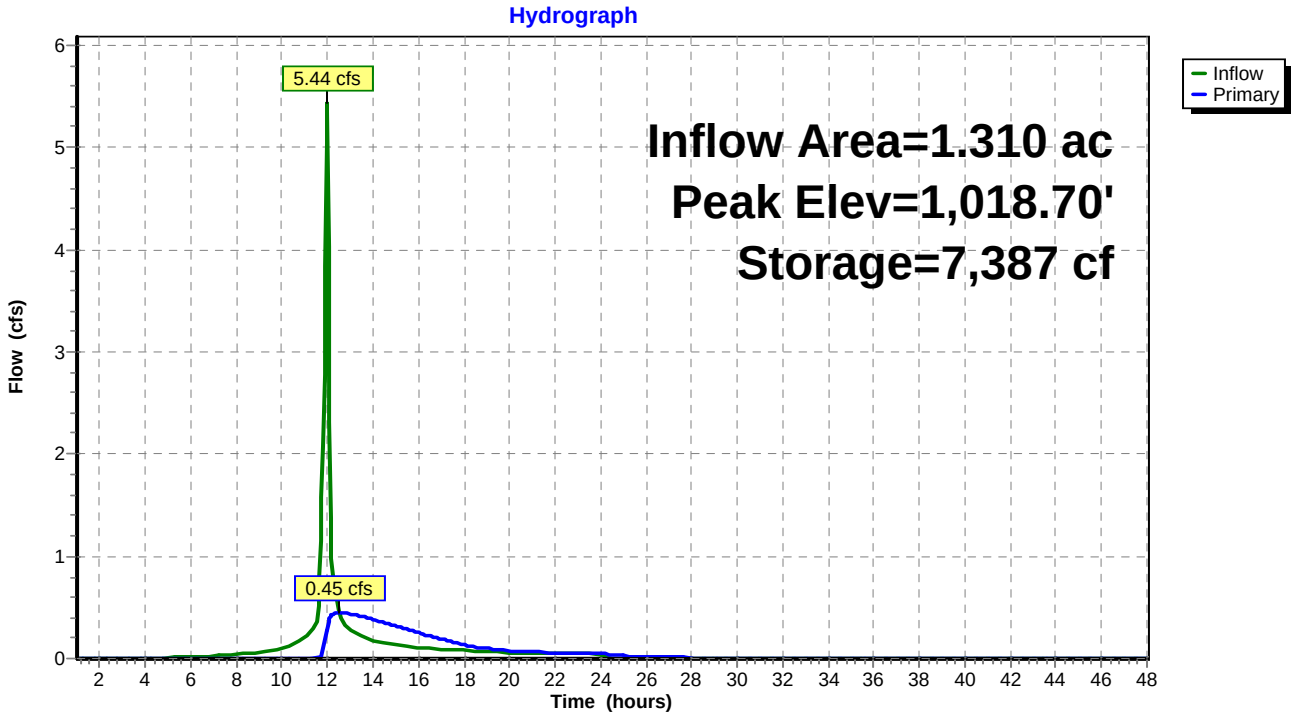
21,090.0 cf Field - 9,501.2 cf Chambers = 11,588.8 cf Stone x 36.0% Voids = 4,172.0 cf Stone Storage

Chamber Storage + Stone Storage = 13,673.1 cf = 0.314 af
Overall Storage Efficiency = 64.8%

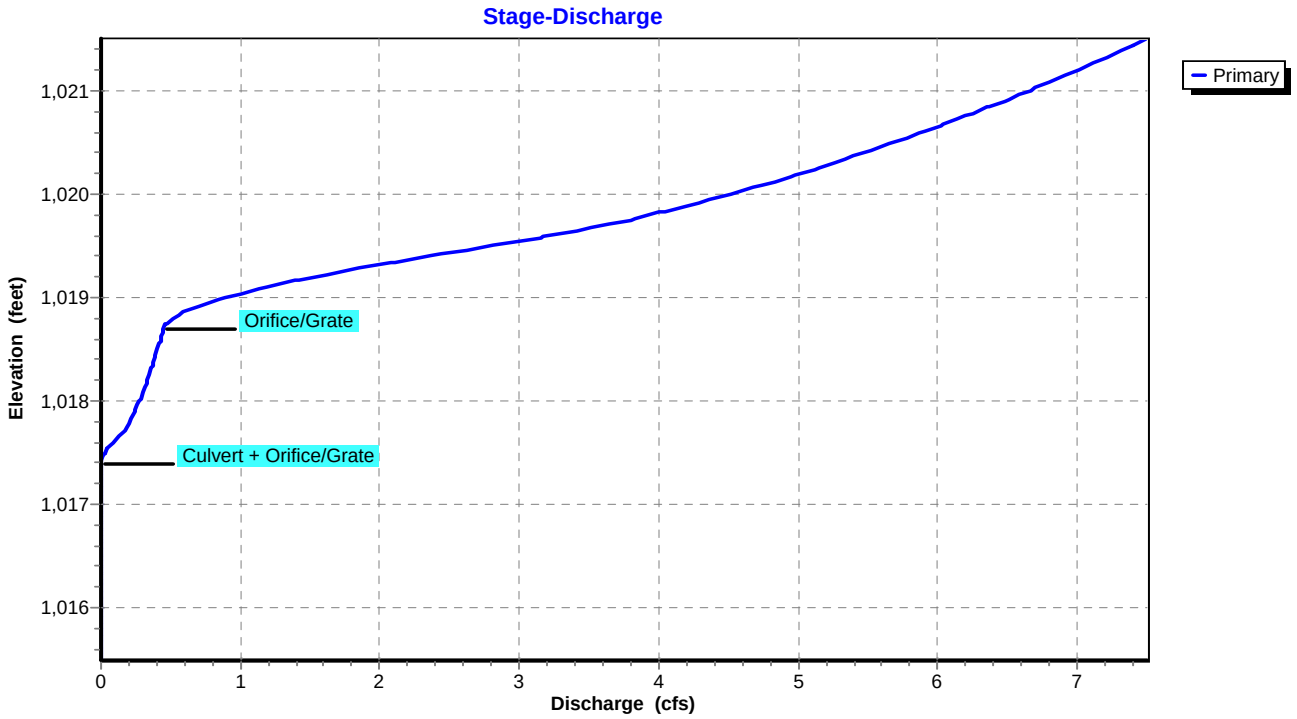
20 Chambers
781.1 cy Field
429.2 cy Stone



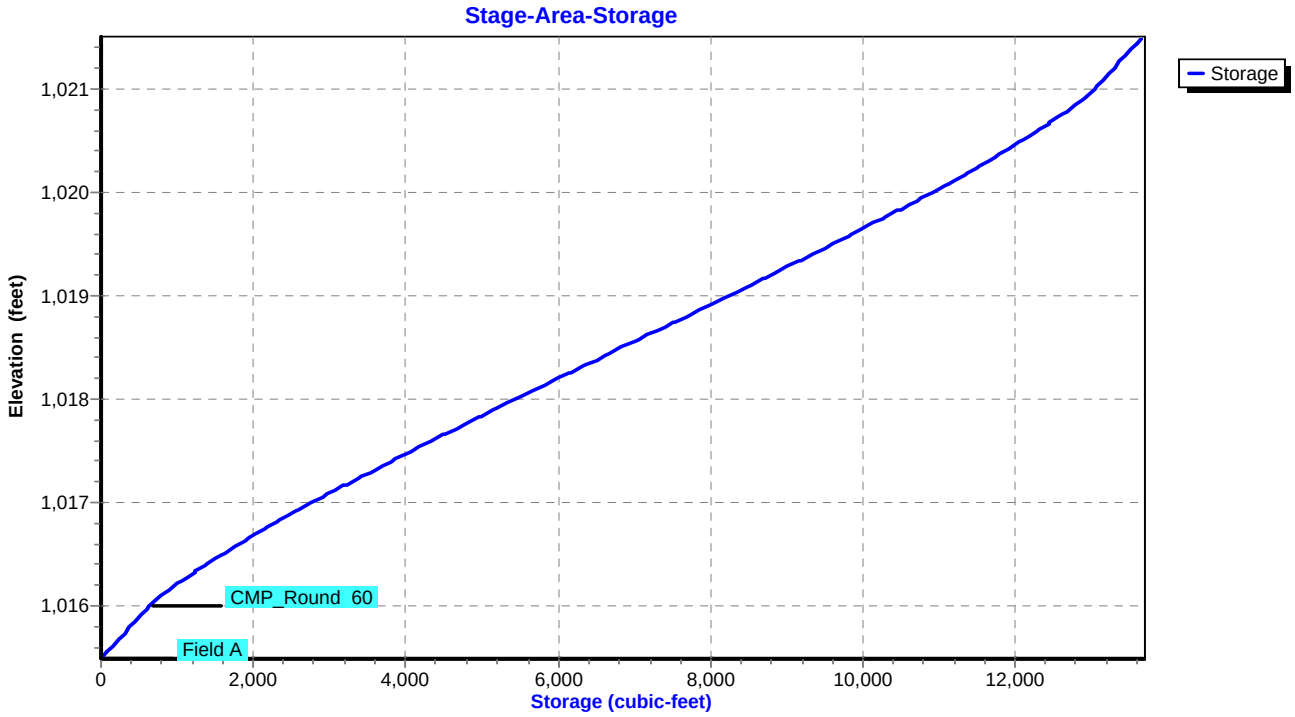
Pond 11P: WEST U.G. INFILT. BASIN



Pond 11P: WEST U.G. INFILT. BASIN



Pond 11P: WEST U.G. INFILT. BASIN



Summary for Pond 12P: SOUTHWEST U.G. INFILT. BASIN

Inflow Area = 3.060 ac, 0.00% Impervious, Inflow Depth = 2.64" for 2-Year event
Inflow = 11.69 cfs @ 12.01 hrs, Volume= 0.672 af
Outflow = 0.90 cfs @ 12.68 hrs, Volume= 0.469 af, Atten= 92%, Lag= 40.0 min
Primary = 0.89 cfs @ 12.68 hrs, Volume= 0.469 af
Secondary = 0.01 cfs @ 12.68 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,018.24' @ 12.68 hrs Surf.Area= 10,168 sf Storage= 17,610 cf

Plug-Flow detention time= 313.7 min calculated for 0.469 af (70% of inflow)
Center-of-Mass det. time= 219.2 min (1,014.3 - 795.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,015.50'	12,146 cf	**82.00'W x 124.00'L x 6.00'H Field A** 61,008 cf Overall - 27,269 cf Embedded = 33,739 cf x 36.0% Voids
#2A	1,016.00'	27,269 cf	**CMP_Round 60** x 66 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf Overall Size= 60.0"W x 60.0"H x 20.00'L Row Length Adjustment= -8.00' x 19.59 sf x 11 rows 80.00' Header x 19.59 sf x 2 = 3,134.4 cf Inside
		39,415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,017.10'	**15.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,017.10' / 1,016.60' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,017.10'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Secondary	1,018.20'	**10.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.89 cfs @ 12.68 hrs HW=1,018.24' (Free Discharge)
↑—**1=Culvert** (Passes 0.89 cfs of 4.08 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 0.89 cfs @ 4.55 fps)

Secondary OutFlow Max=0.01 cfs @ 12.68 hrs HW=1,018.24' (Free Discharge)
↑—**3=Orifice/Grate** (Orifice Controls 0.01 cfs @ 0.69 fps)

Pond 12P: SOUTHWEST U.G. INFILT. BASIN - Chamber Wizard Field A

Chamber Model = CMP_Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L
Row Length Adjustment= -8.00' x 19.59 sf x 11 rows

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

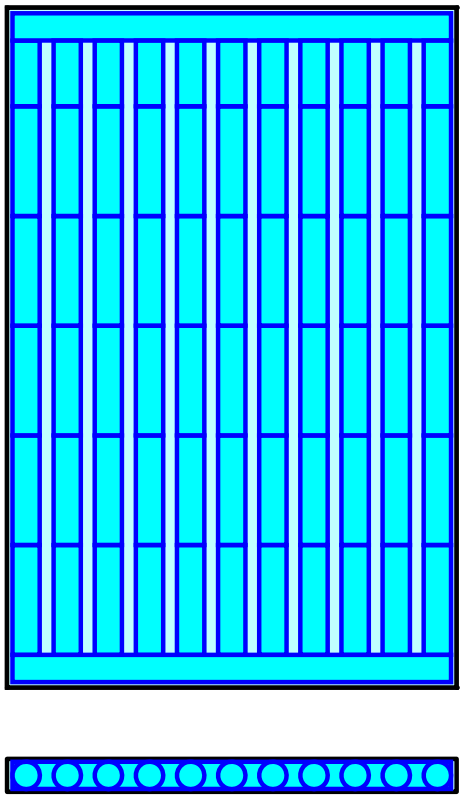
6 Chambers/Row x 20.00' Long -8.00' Row Adjustment +5.00' Header x 2 = 122.00' Row Length +12.0" End Stone x 2 = 124.00' Base Length
11 Rows x 60.0" Wide + 30.0" Spacing x 10 + 12.0" Side Stone x 2 = 82.00' Base Width
6.0" Base + 60.0" Chamber Height + 6.0" Cover = 6.00' Field Height

66 Chambers x 391.8 cf -8.00' Row Adjustment x 19.59 sf x 11 Rows + 80.00' Header x 19.59 sf x 2 = 27,269.3 cf Chamber Storage

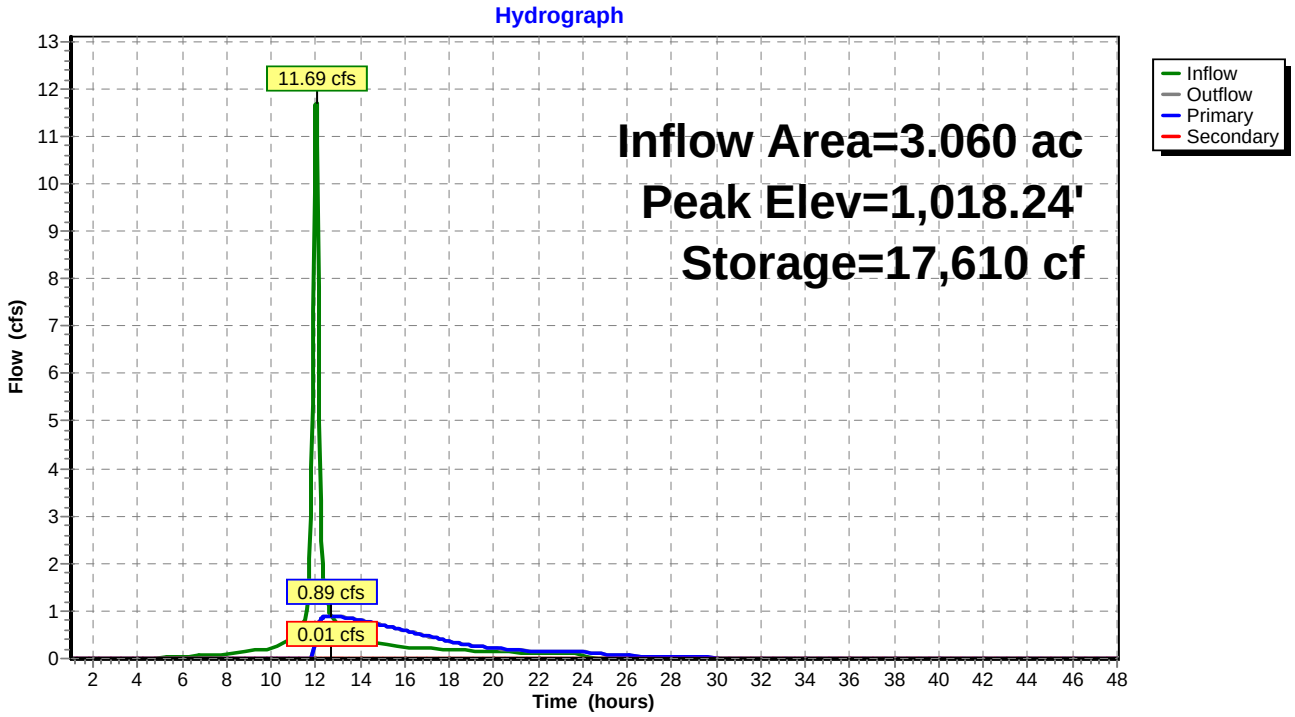
61,008.0 cf Field - 27,269.3 cf Chambers = 33,738.7 cf Stone x 36.0% Voids = 12,145.9 cf Stone Storage

Chamber Storage + Stone Storage = 39,415.2 cf = 0.905 af
Overall Storage Efficiency = 64.6%

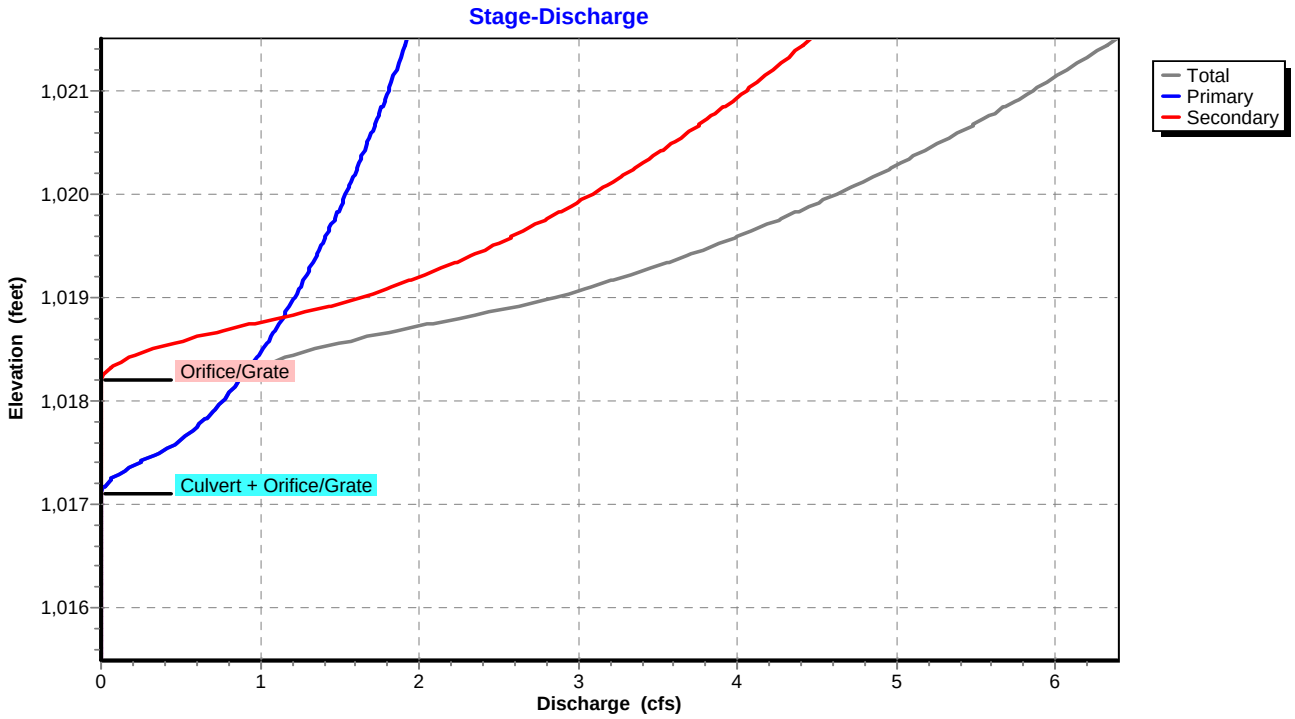
66 Chambers
2,259.6 cy Field
1,249.6 cy Stone



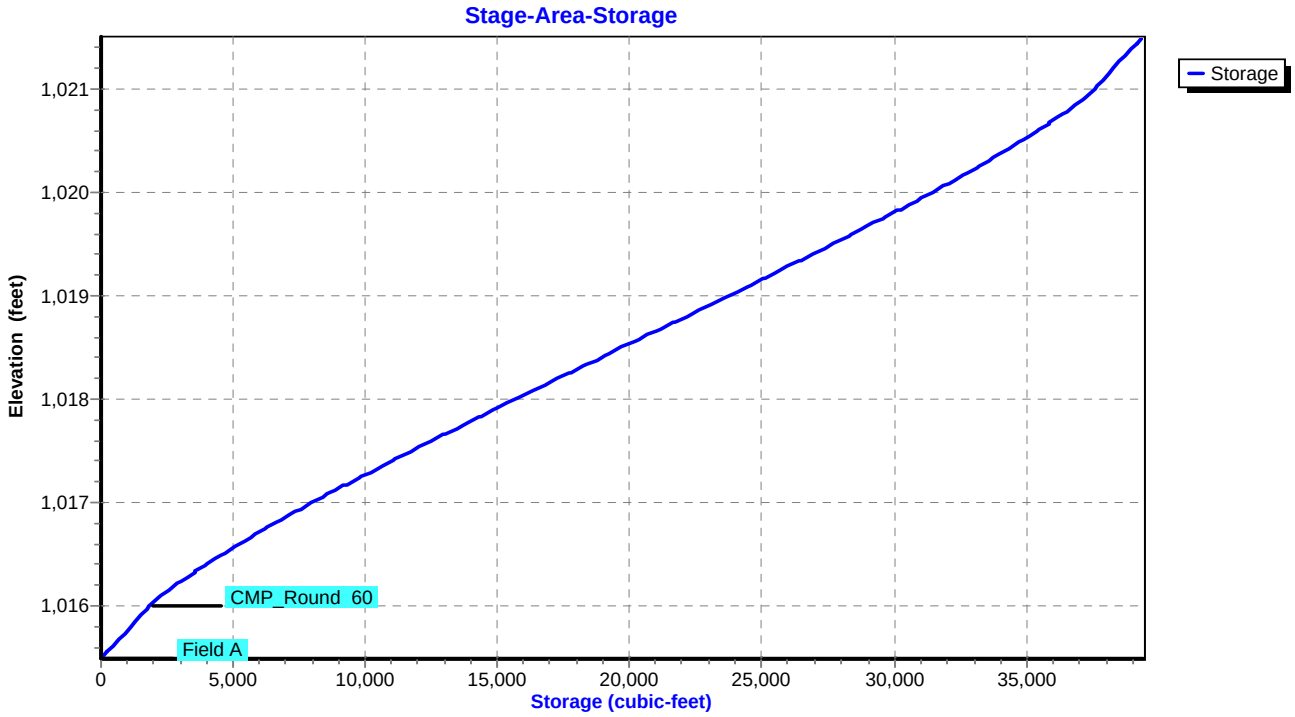
Pond 12P: SOUTHWEST U.G. INFILT. BASIN



Pond 12P: SOUTHWEST U.G. INFILT. BASIN



Pond 12P: SOUTHWEST U.G. INFILT. BASIN

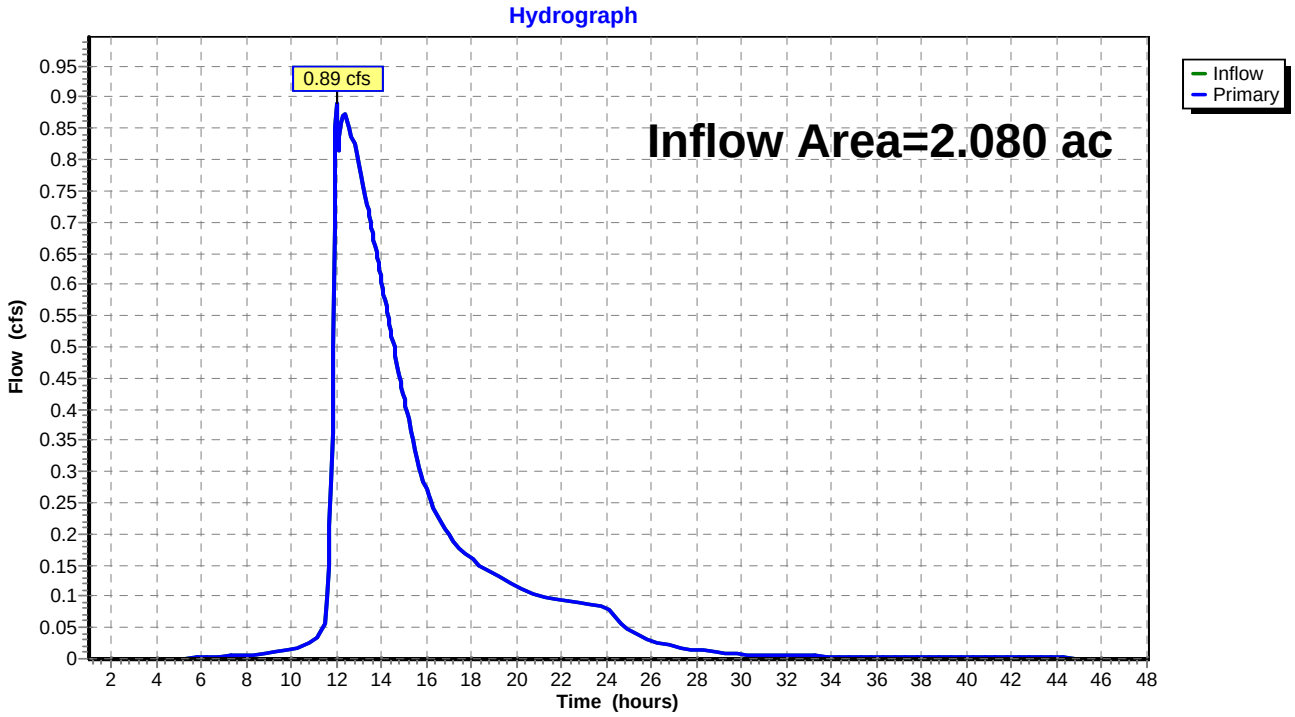


Summary for Link 13L: SITE RELEASE NORTHEAST - PR-1

Inflow Area = 2.080 ac, 0.00% Impervious, Inflow Depth > 1.86" for 2-Year event
Inflow = 0.89 cfs @ 12.00 hrs, Volume= 0.323 af
Primary = 0.89 cfs @ 12.00 hrs, Volume= 0.323 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Link 13L: SITE RELEASE NORTHEAST - PR-1

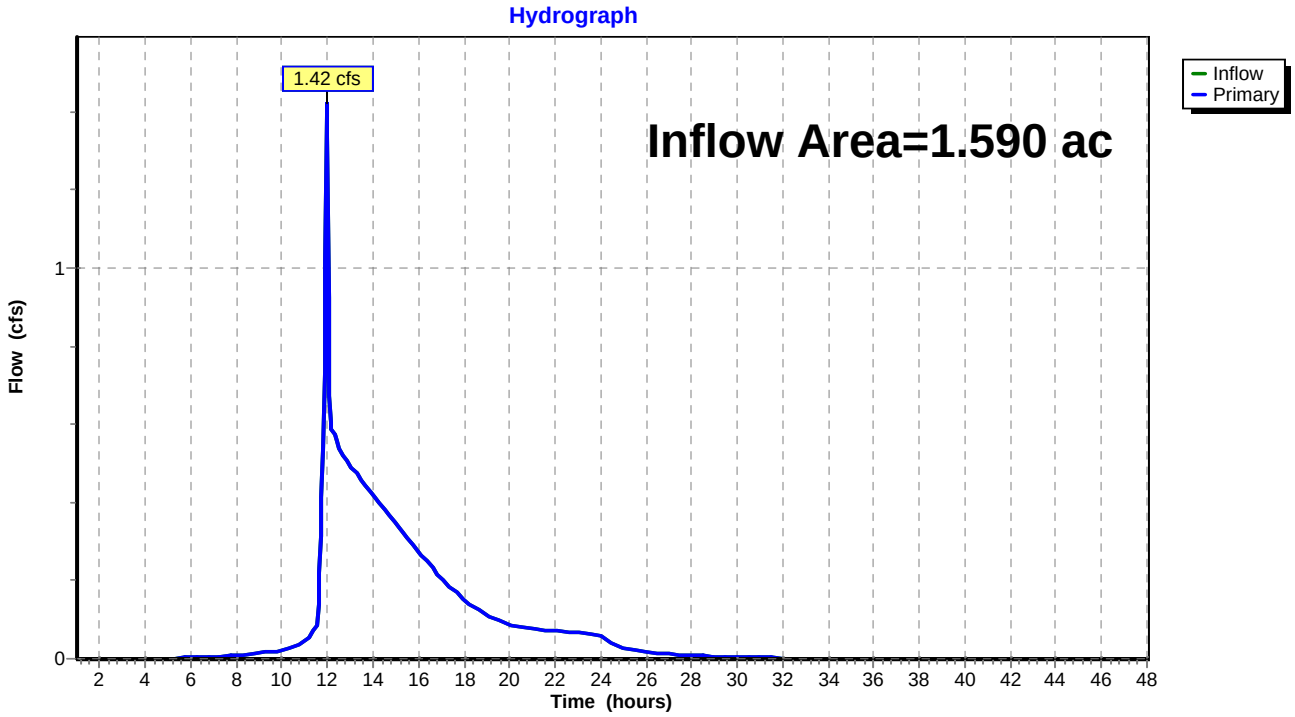


Summary for Link 14L: SITE RELEASE WEST PR-2

Inflow Area = 1.590 ac, 0.00% Impervious, Inflow Depth > 1.98" for 2-Year event
Inflow = 1.42 cfs @ 11.97 hrs, Volume= 0.262 af
Primary = 1.42 cfs @ 11.97 hrs, Volume= 0.262 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Link 14L: SITE RELEASE WEST PR-2

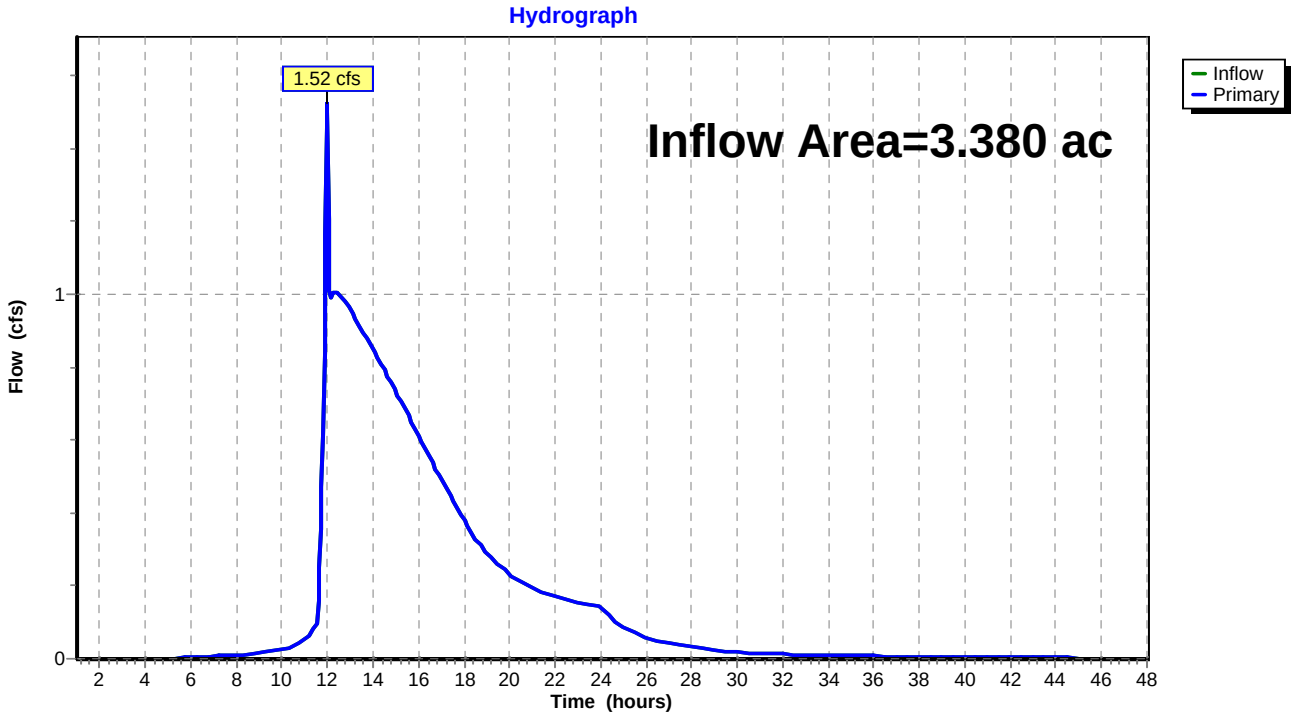


Summary for Link 15L: SITE RELEASE SOUTHWEST - PR-3

Inflow Area = 3.380 ac, 0.00% Impervious, Inflow Depth > 1.92" for 2-Year event
Inflow = 1.52 cfs @ 11.98 hrs, Volume= 0.540 af
Primary = 1.52 cfs @ 11.98 hrs, Volume= 0.540 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Link 15L: SITE RELEASE SOUTHWEST - PR-3



Summary for Subcatchment 1S: EX-1

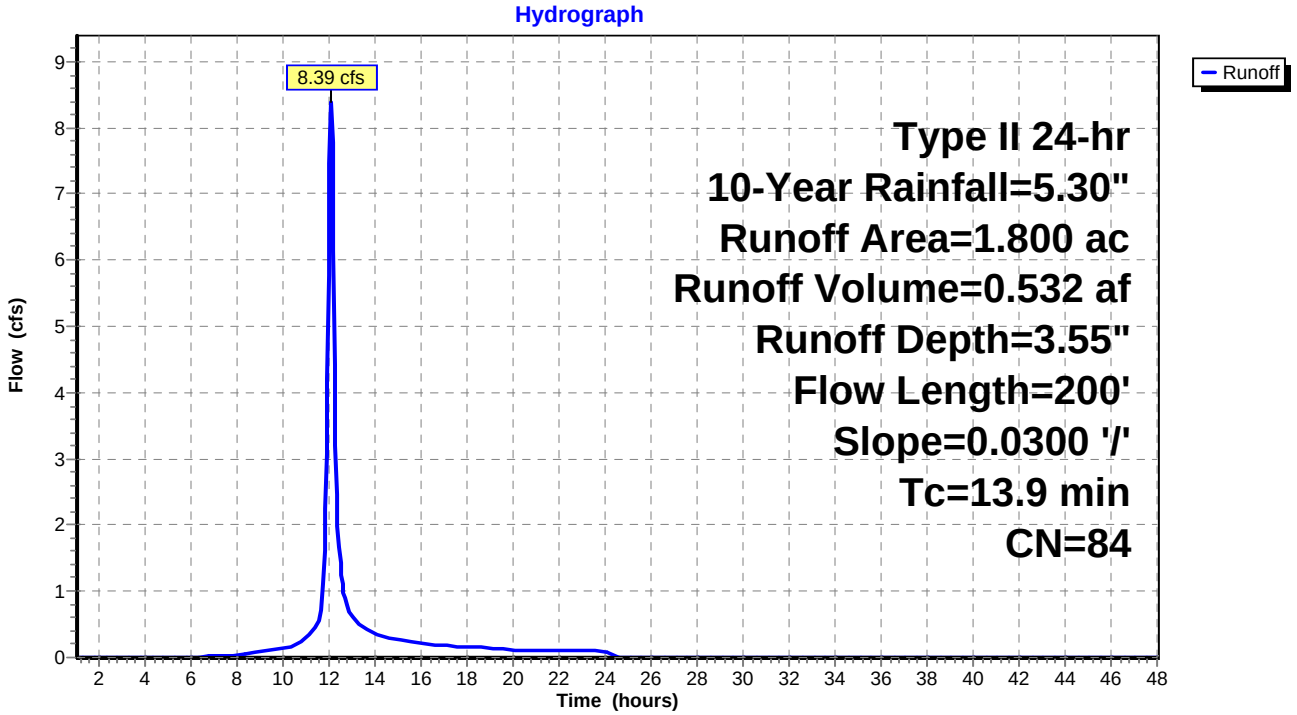
Runoff = 8.39 cfs @ 12.06 hrs, Volume= 0.532 af, Depth= 3.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	1.800	84	
	1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	200	0.0300	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

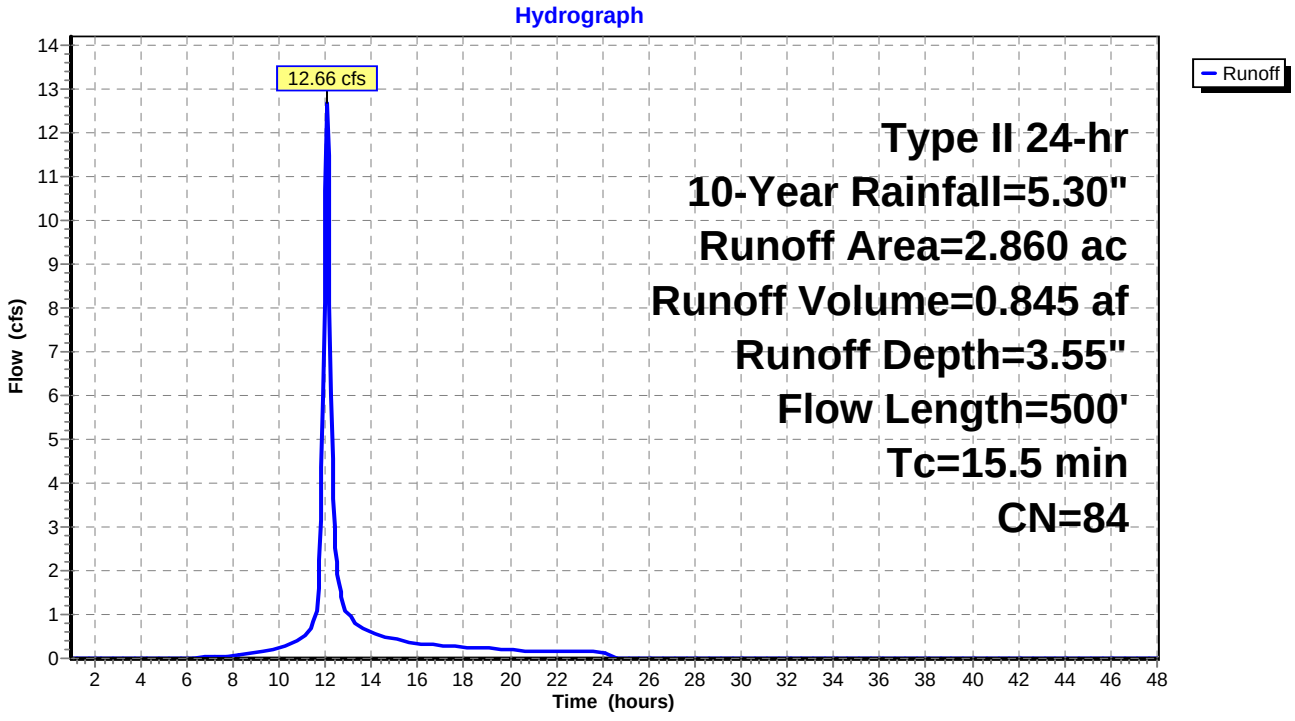
Runoff = 12.66 cfs @ 12.07 hrs, Volume= 0.845 af, Depth= 3.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	2.860	84	
	2.860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	200	0.0300	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.6	300	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.5	500	Total			

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

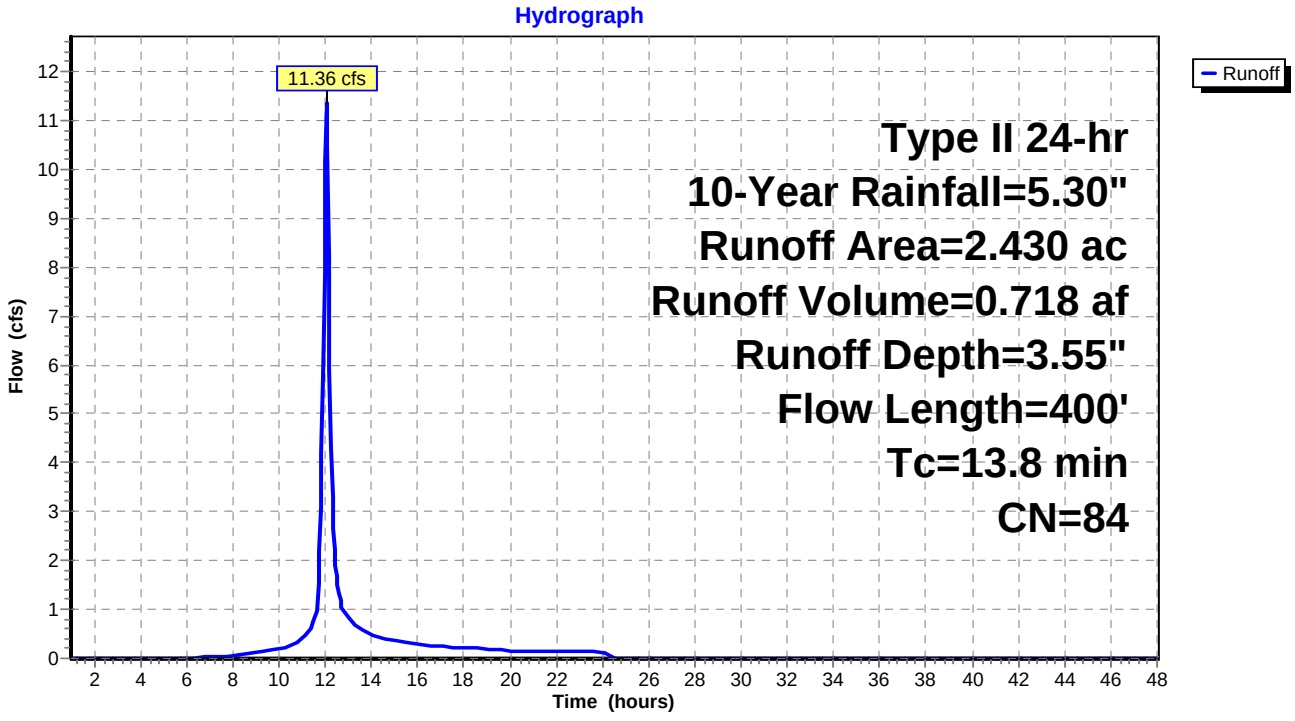
Runoff = 11.36 cfs @ 12.05 hrs, Volume= 0.718 af, Depth= 3.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	2.430	84	
	2.430		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	200	0.0350	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.8	200	0.0700	4.26		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
13.8	400	Total			

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: DETENTION NE

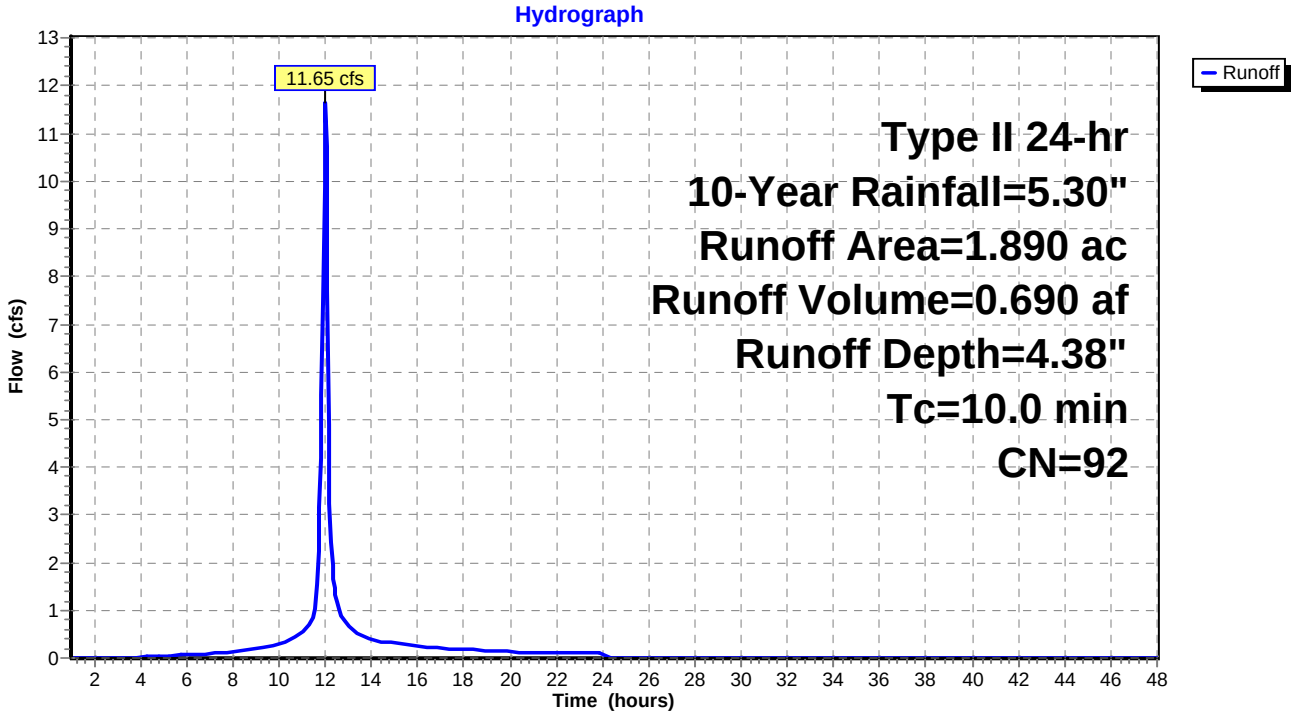
Runoff = 11.65 cfs @ 12.01 hrs, Volume= 0.690 af, Depth= 4.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	1.890	92	
	1.890		100.00% Pervious Area

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

Subcatchment 4S: DETENTION NE



Summary for Subcatchment 5S: DETENTION WEST

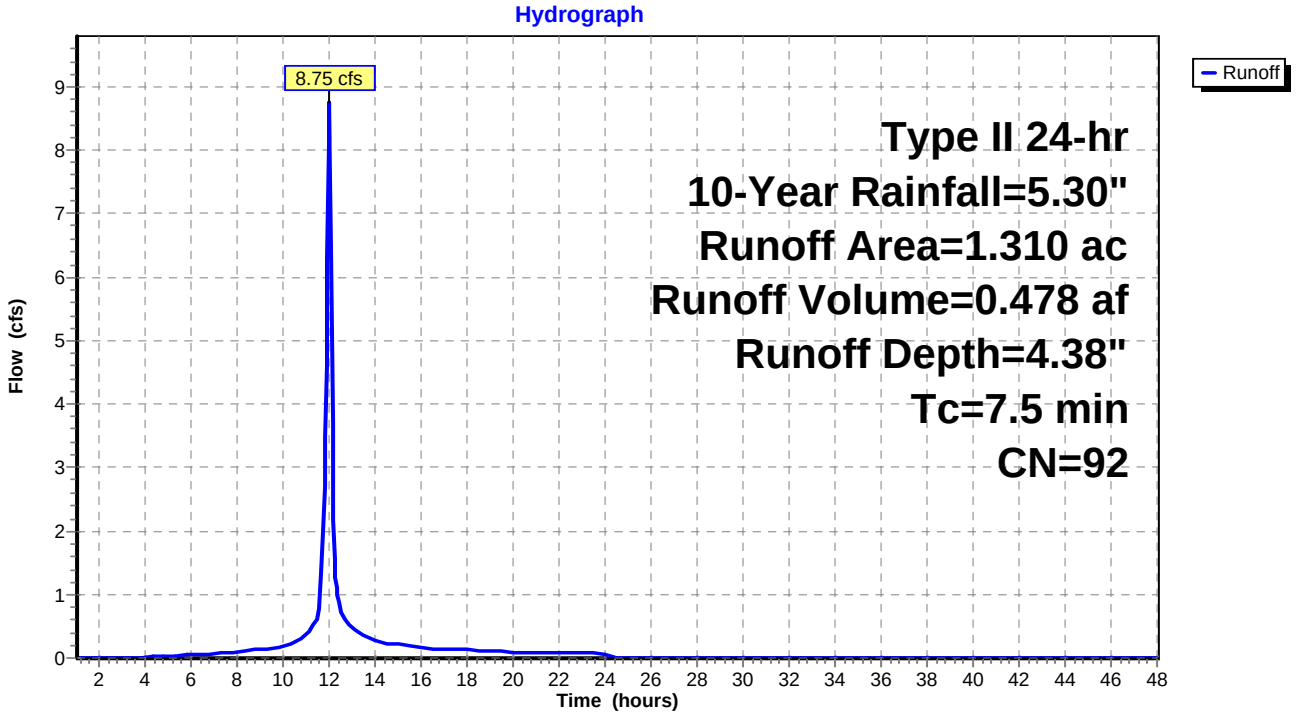
Runoff = 8.75 cfs @ 11.98 hrs, Volume= 0.478 af, Depth= 4.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	1.310	92	
	1.310		100.00% Pervious Area

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

Subcatchment 5S: DETENTION WEST



Summary for Subcatchment 6S: UNDETAINED AREA - W #1

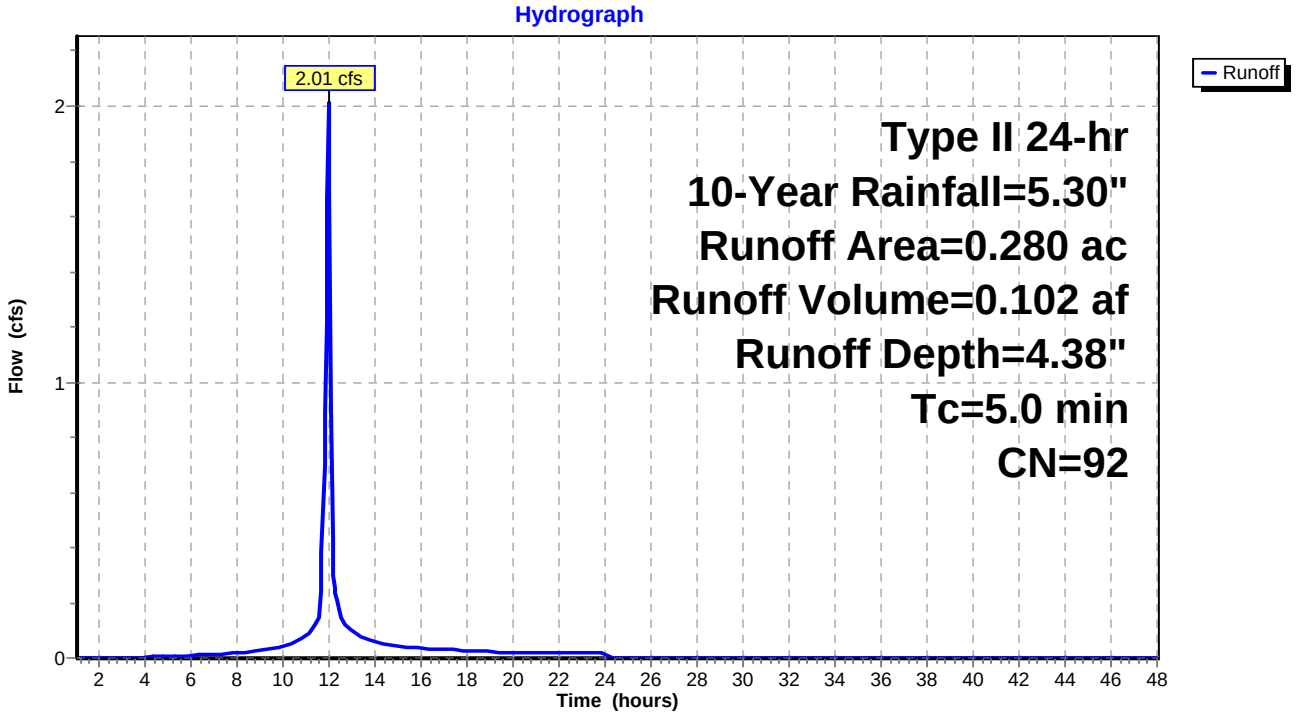
Runoff = 2.01 cfs @ 11.95 hrs, Volume= 0.102 af, Depth= 4.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	0.280	92	
	0.280		100.00% Pervious Area

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

Subcatchment 6S: UNDETAINED AREA - W #1



Summary for Subcatchment 7S: DETENTION SW

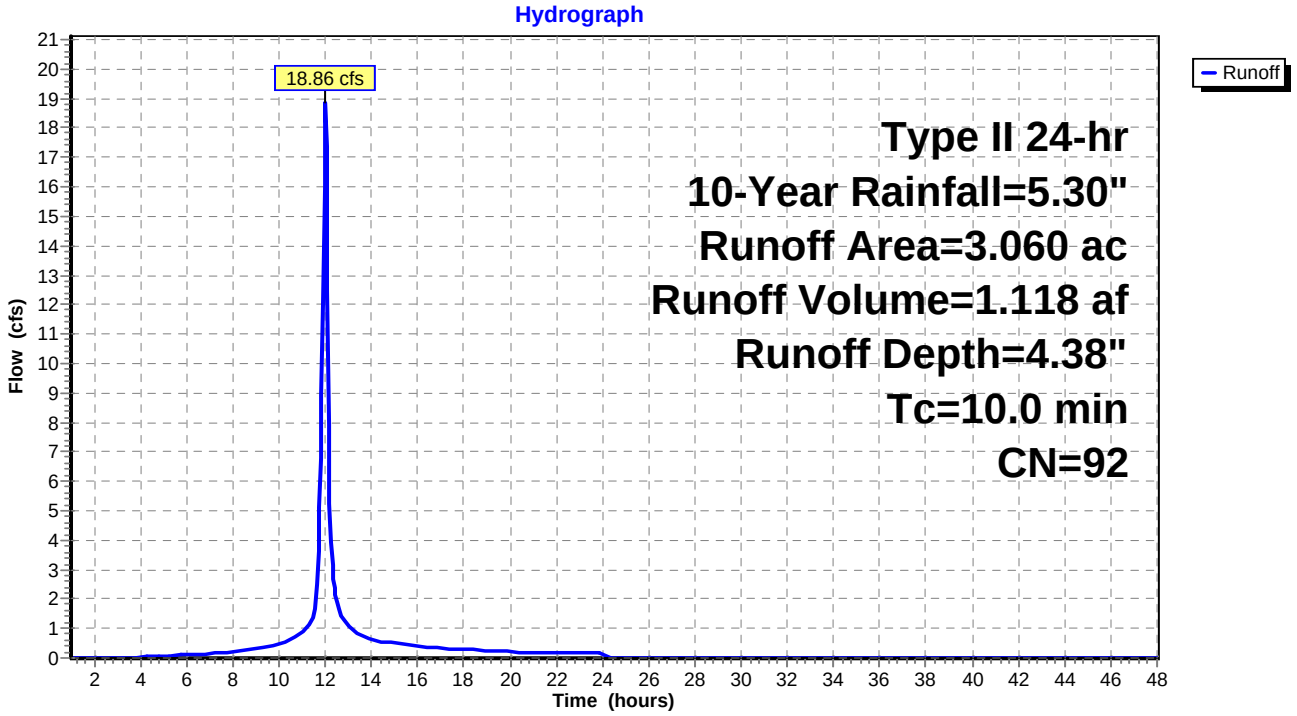
Runoff = 18.86 cfs @ 12.01 hrs, Volume= 1.118 af, Depth= 4.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	3.060	92	
	3.060		100.00% Pervious Area

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

Subcatchment 7S: DETENTION SW



Summary for Subcatchment 9S: UNDETAINED AREA - SW #1

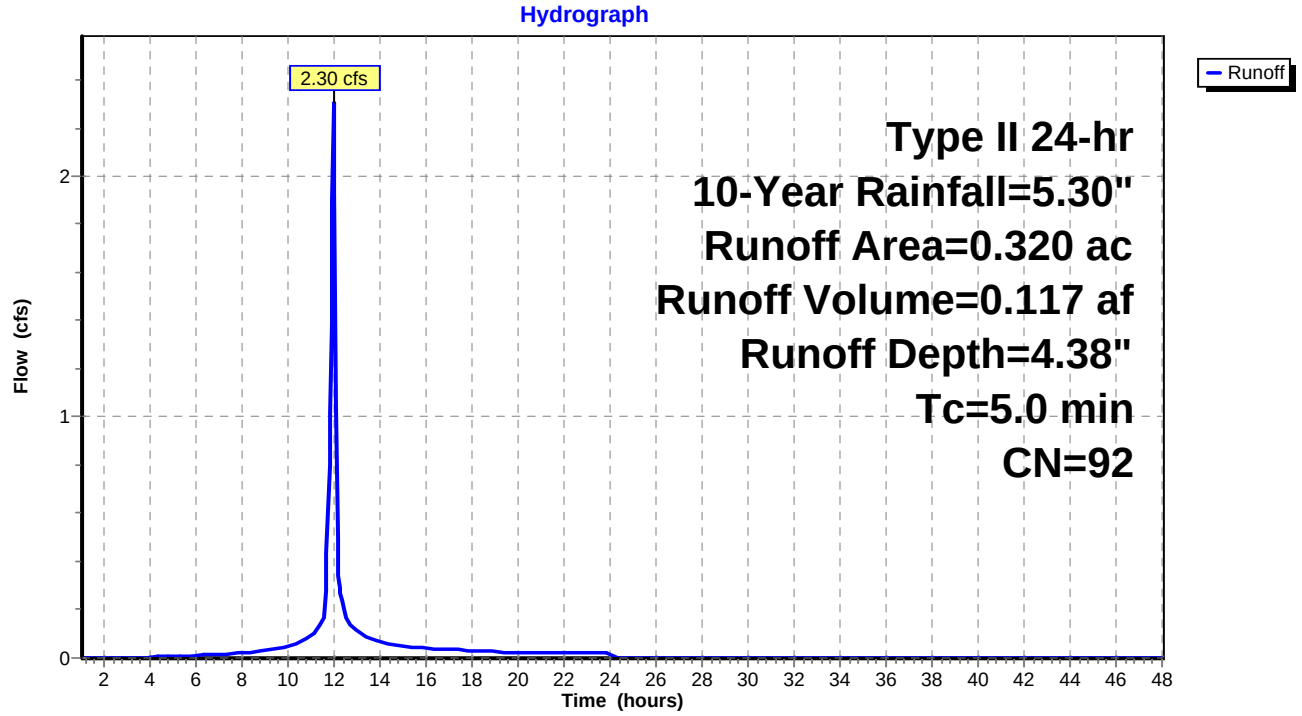
Runoff = 2.30 cfs @ 11.95 hrs, Volume= 0.117 af, Depth= 4.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	0.320	92	
	0.320		100.00% Pervious Area

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

Subcatchment 9S: UNDETAINED AREA - SW #1



Summary for Subcatchment 16S: UNDETAINED AREA - NE #1

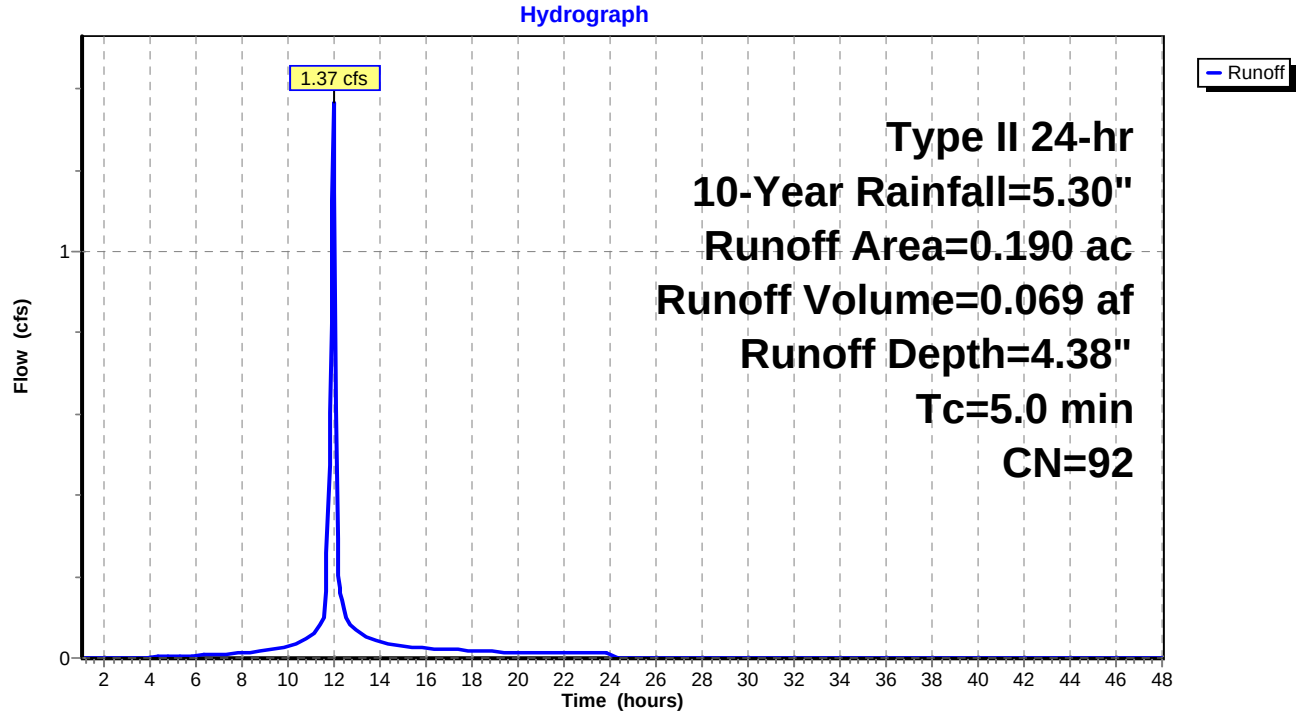
Runoff = 1.37 cfs @ 11.95 hrs, Volume= 0.069 af, Depth= 4.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=5.30"

	Area (ac)	CN	Description
*	0.190	92	
	0.190		100.00% Pervious Area

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

Subcatchment 16S: UNDETAINED AREA - NE #1



Summary for Pond 10P: NE U.G. INFILT. BASIN

Inflow Area = 1.890 ac, 0.00% Impervious, Inflow Depth = 4.38" for 10-Year event
Inflow = 11.65 cfs @ 12.01 hrs, Volume= 0.690 af
Outflow = 2.80 cfs @ 12.23 hrs, Volume= 0.556 af, Atten= 76%, Lag= 13.2 min
Primary = 1.28 cfs @ 12.23 hrs, Volume= 0.456 af
Secondary = 1.52 cfs @ 12.23 hrs, Volume= 0.100 af

Routing by Stor-Ind method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,008.29' @ 12.23 hrs Surf.Area= 6,254 sf Storage= 16,031 cf

Plug-Flow detention time= 214.6 min calculated for 0.556 af (80% of inflow)
Center-of-Mass det. time= 137.9 min (919.2 - 781.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,004.50'	7,479 cf	**29.50'W x 212.00'L x 6.00'H Field A** 37,524 cf Overall - 16,749 cf Embedded = 20,775 cf x 36.0% Voids
#2A	1,005.00'	16,749 cf	**CMP_Round 60** x 40 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 27.50' Header x 19.59 sf x 2 = 1,077.5 cf Inside
		24,228 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,006.20'	**15.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,006.20' / 1,005.70' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,006.20'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Secondary	1,007.30'	**8.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.28 cfs @ 12.23 hrs HW=1,008.29' (Free Discharge)
└**1=Culvert** (Passes 1.28 cfs of 6.98 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 1.28 cfs @ 6.53 fps)

Secondary OutFlow Max=1.51 cfs @ 12.23 hrs HW=1,008.29' (Free Discharge)
└**3=Orifice/Grate** (Orifice Controls 1.51 cfs @ 3.84 fps)

Pond 10P: NE U.G. INFILT. BASIN - Chamber Wizard Field A

Chamber Model = CMP_Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

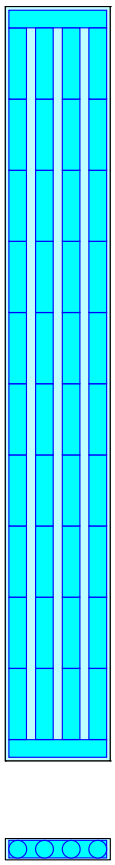
10 Chambers/Row x 20.00' Long +5.00' Header x 2 = 210.00' Row Length +12.0" End Stone x 2 = 212.00' Base Length
4 Rows x 60.0" Wide + 30.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.50' Base Width
6.0" Base + 60.0" Chamber Height + 6.0" Cover = 6.00' Field Height

40 Chambers x 391.8 cf + 27.50' Header x 19.59 sf x 2 = 16,749.5 cf Chamber Storage

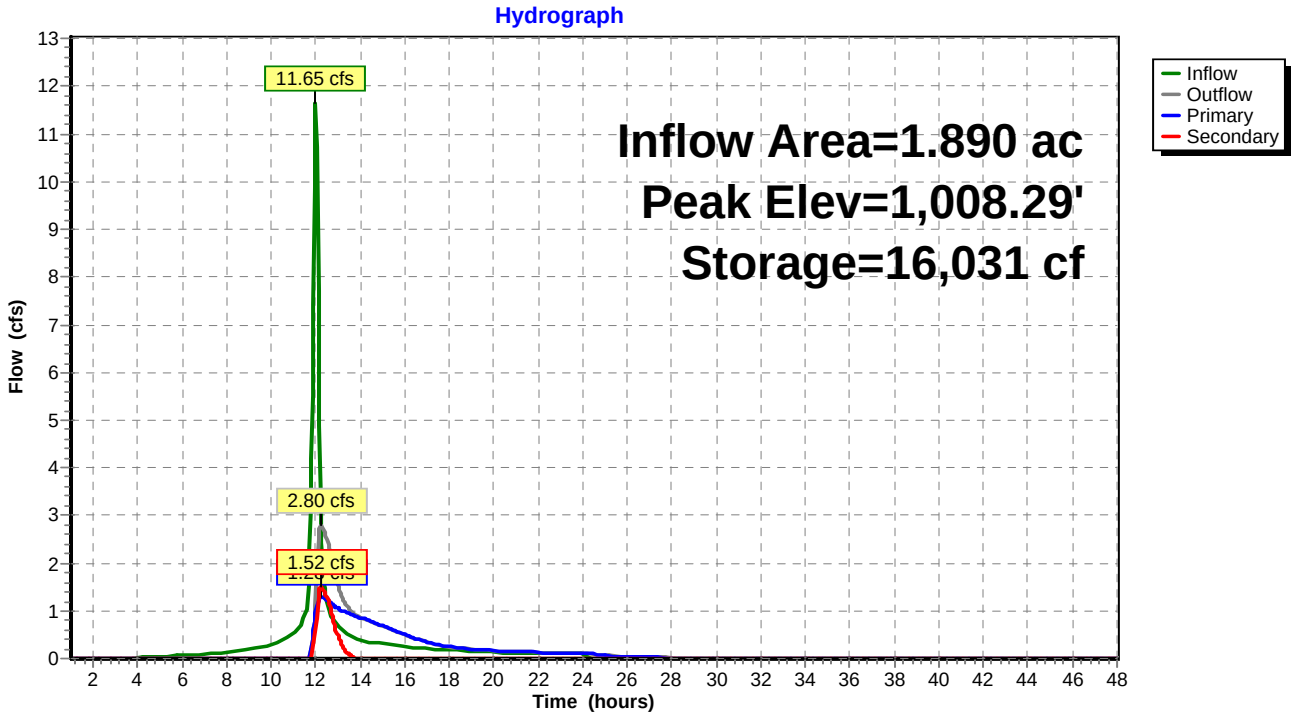
37,524.0 cf Field - 16,749.5 cf Chambers = 20,774.5 cf Stone x 36.0% Voids = 7,478.8 cf Stone Storage

Chamber Storage + Stone Storage = 24,228.3 cf = 0.556 af
Overall Storage Efficiency = 64.6%

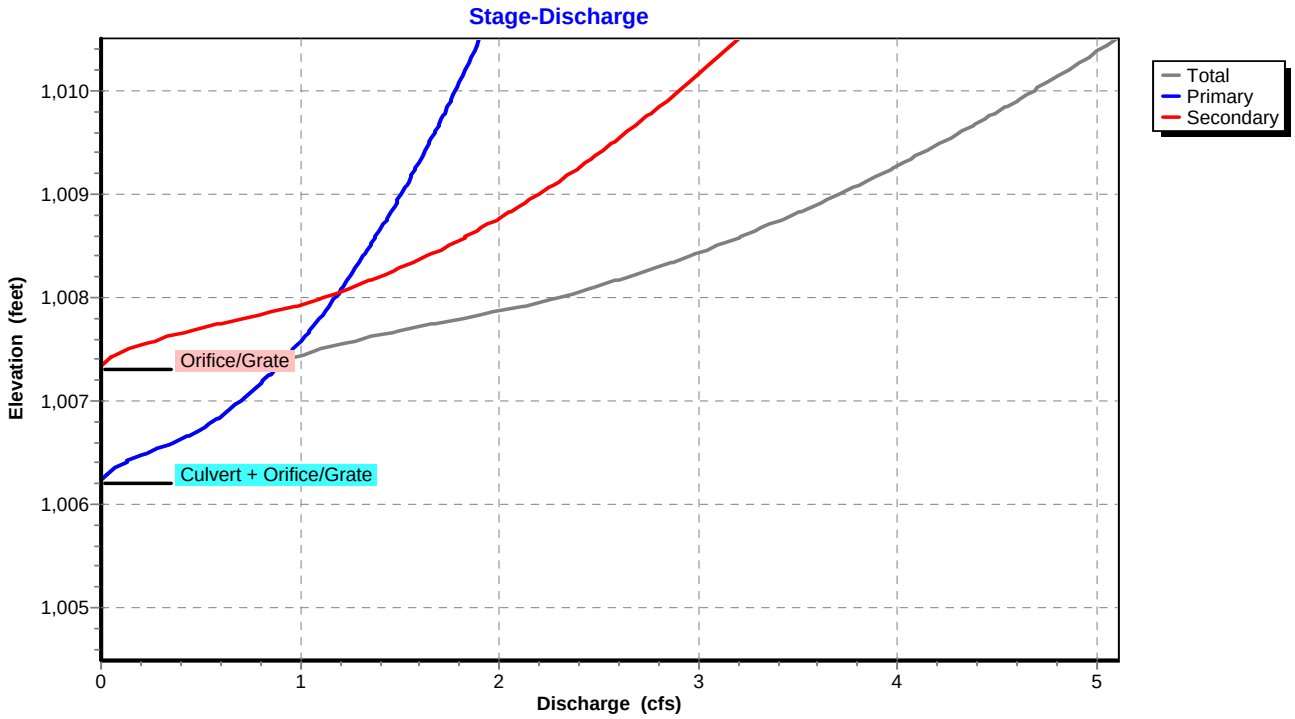
40 Chambers
1,389.8 cy Field
769.4 cy Stone



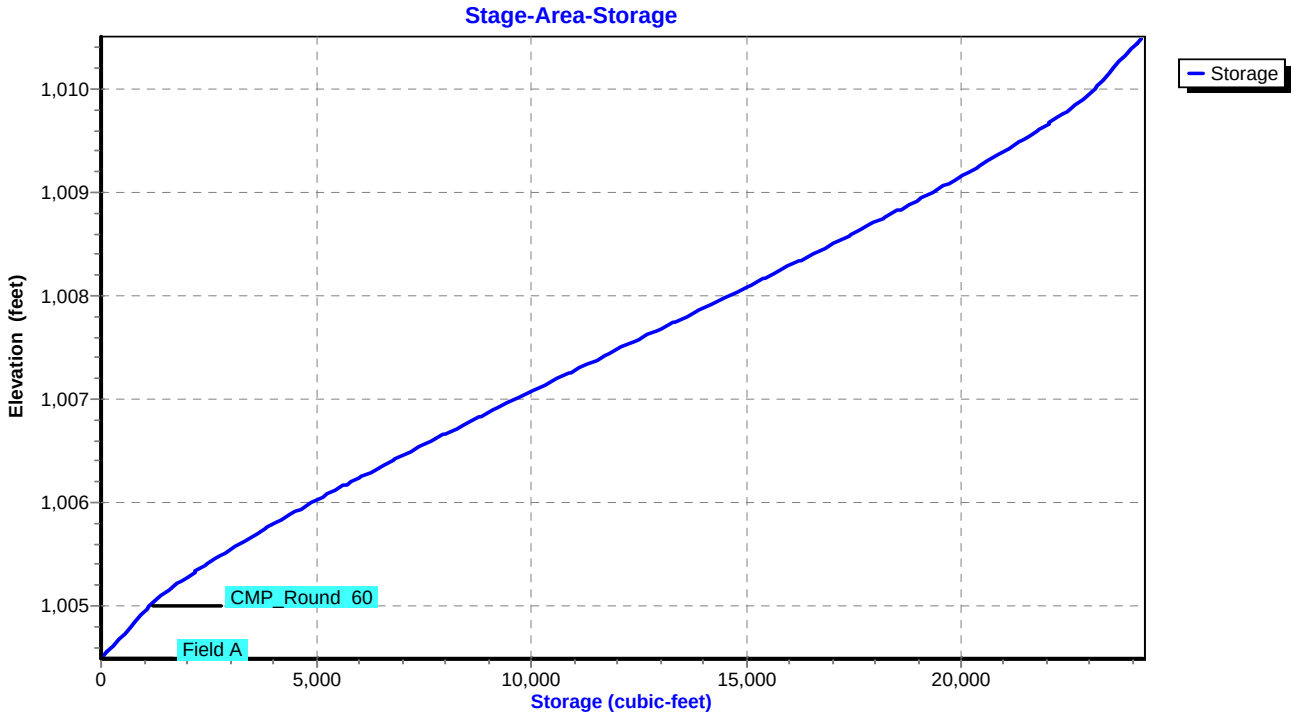
Pond 10P: NE U.G. INFILT. BASIN



Pond 10P: NE U.G. INFILT. BASIN



Pond 10P: NE U.G. INFILT. BASIN



Summary for Pond 11P: WEST U.G. INFILT. BASIN

Inflow Area = 1.310 ac, 0.00% Impervious, Inflow Depth = 4.38" for 10-Year event
Inflow = 8.75 cfs @ 11.98 hrs, Volume= 0.478 af
Outflow = 3.87 cfs @ 12.11 hrs, Volume= 0.391 af, Atten= 56%, Lag= 7.4 min
Primary = 3.87 cfs @ 12.11 hrs, Volume= 0.391 af

Routing by Stor-Ind method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,019.77' @ 12.11 hrs Surf.Area= 3,515 sf Storage= 10,329 cf

Plug-Flow detention time= 205.6 min calculated for 0.390 af (82% of inflow)
Center-of-Mass det. time= 131.1 min (910.0 - 778.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,015.50'	4,172 cf	**37.00'W x 95.00'L x 6.00'H Field A** 21,090 cf Overall - 9,501 cf Embedded = 11,589 cf x 36.0% Voids
#2A	1,016.00'	9,501 cf	**CMP_Round 60** x 20 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf Overall Size= 60.0"W x 60.0"H x 20.00'L Row Length Adjustment= +3.00' x 19.59 sf x 5 rows 35.00' Header x 19.59 sf x 2 = 1,371.3 cf Inside
		13,673 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,017.40'	**15.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,017.40' / 1,016.90' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,017.40'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	1,018.70'	**13.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=3.84 cfs @ 12.11 hrs HW=1,019.76' (Free Discharge)
└─**1=Culvert** (Passes 3.84 cfs of 7.66 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.62 cfs @ 7.13 fps)
  └─**3=Orifice/Grate** (Orifice Controls 3.22 cfs @ 3.51 fps)

Pond 11P: WEST U.G. INFILT. BASIN - Chamber Wizard Field A

Chamber Model = CMP_Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L
Row Length Adjustment= +3.00' x 19.59 sf x 5 rows

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

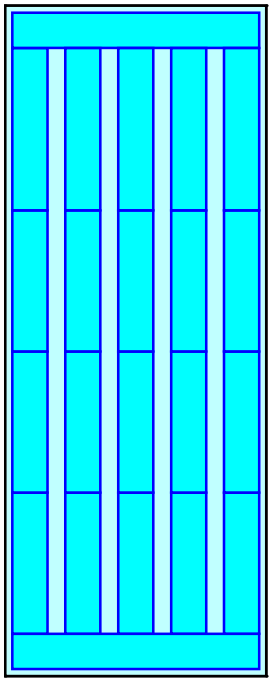
4 Chambers/Row x 20.00' Long +3.00' Row Adjustment +5.00' Header x 2 = 93.00' Row Length +12.0" End Stone x 2 = 95.00' Base Length
5 Rows x 60.0" Wide + 30.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.00' Base Width
6.0" Base + 60.0" Chamber Height + 6.0" Cover = 6.00' Field Height

20 Chambers x 391.8 cf +3.00' Row Adjustment x 19.59 sf x 5 Rows + 35.00' Header x 19.59 sf x 2 = 9,501.2 cf Chamber Storage

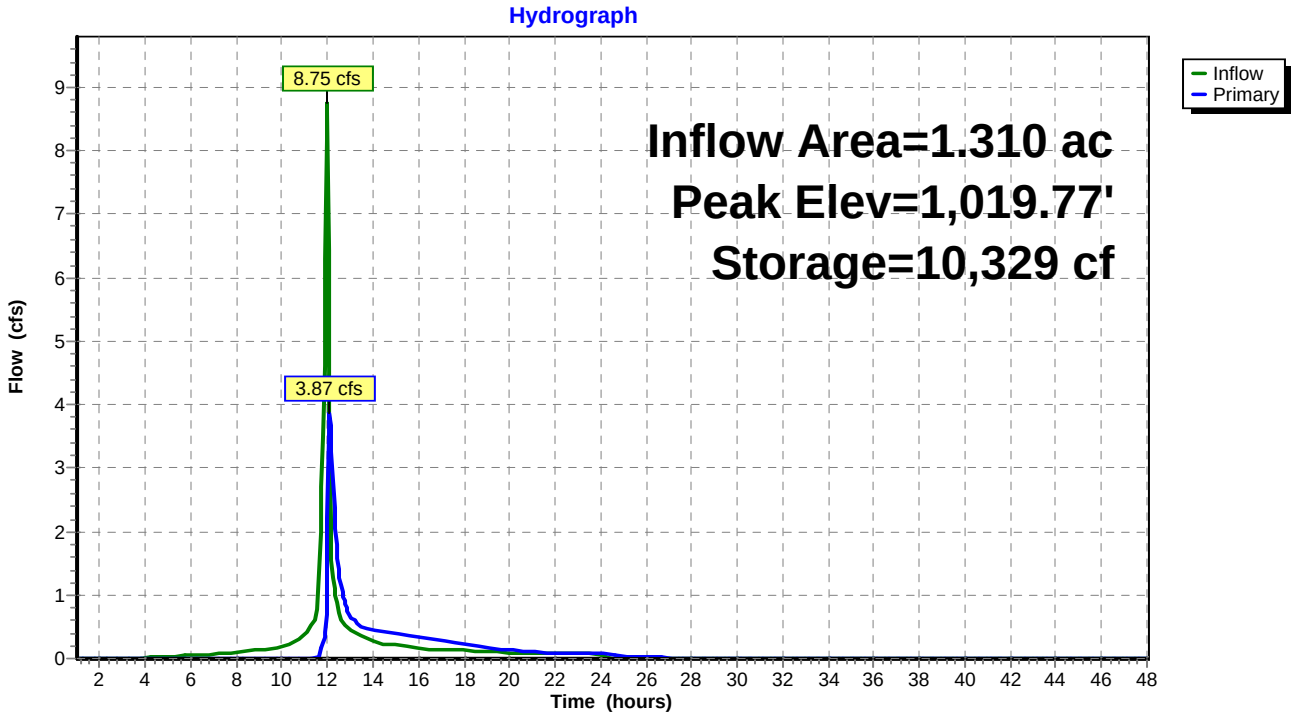
21,090.0 cf Field - 9,501.2 cf Chambers = 11,588.8 cf Stone x 36.0% Voids = 4,172.0 cf Stone Storage

Chamber Storage + Stone Storage = 13,673.1 cf = 0.314 af
Overall Storage Efficiency = 64.8%

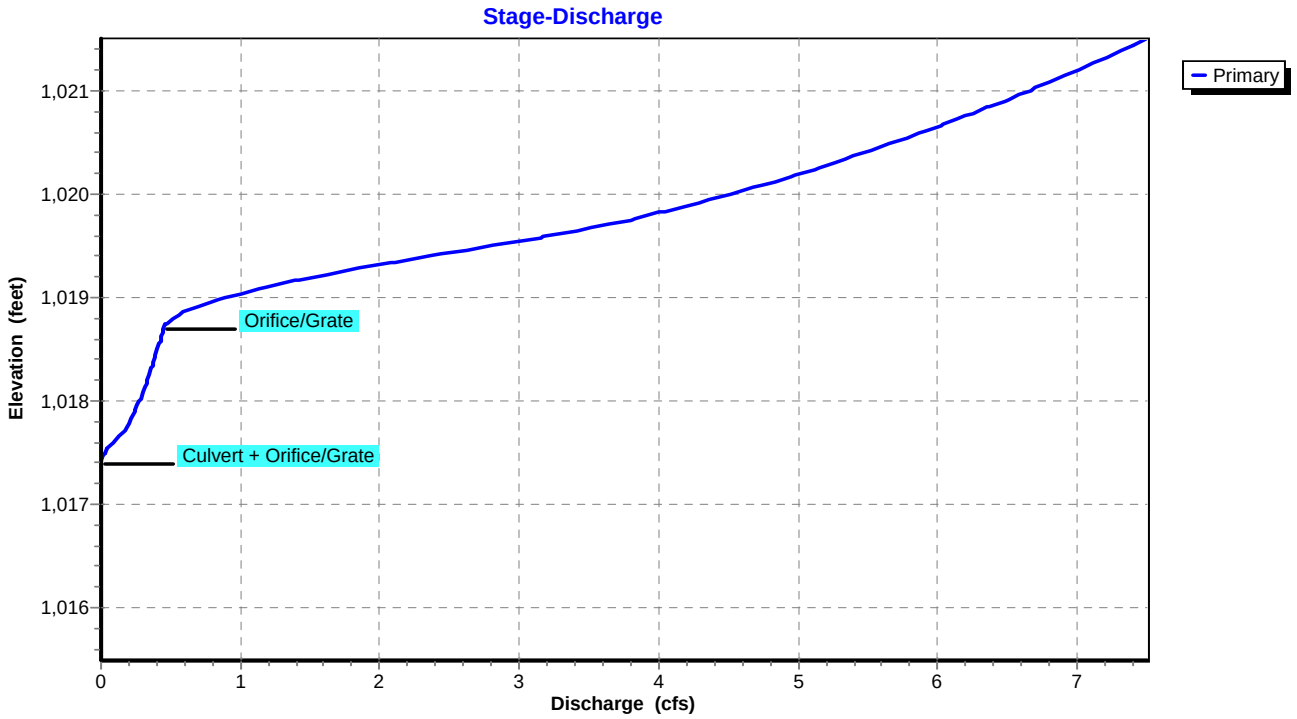
20 Chambers
781.1 cy Field
429.2 cy Stone



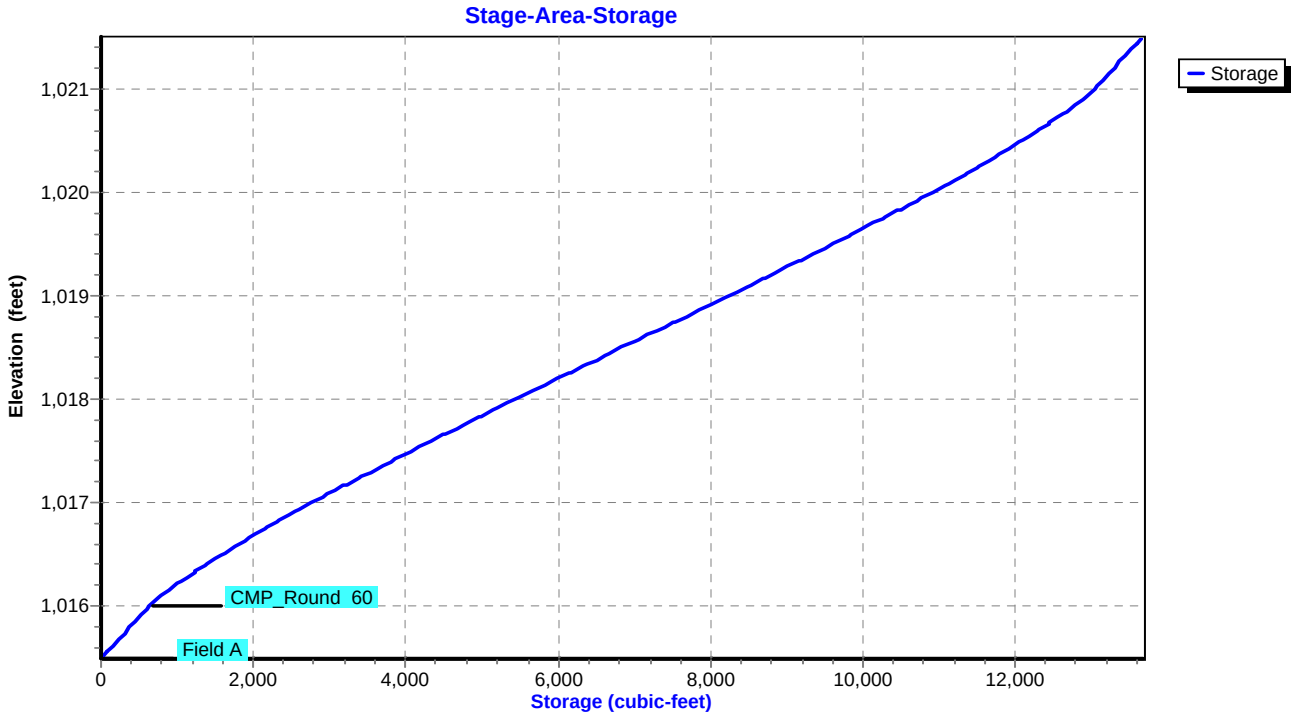
Pond 11P: WEST U.G. INFILT. BASIN



Pond 11P: WEST U.G. INFILT. BASIN



Pond 11P: WEST U.G. INFILT. BASIN



Summary for Pond 12P: SOUTHWEST U.G. INFILT. BASIN

Inflow Area = 3.060 ac, 0.00% Impervious, Inflow Depth = 4.38" for 10-Year event
Inflow = 18.86 cfs @ 12.01 hrs, Volume= 1.118 af
Outflow = 3.66 cfs @ 12.27 hrs, Volume= 0.914 af, Atten= 81%, Lag= 15.7 min
Primary = 1.35 cfs @ 12.27 hrs, Volume= 0.687 af
Secondary = 2.31 cfs @ 12.27 hrs, Volume= 0.227 af

Routing by Stor-Ind method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,019.39' @ 12.27 hrs Surf.Area= 10,168 sf Storage= 26,852 cf

Plug-Flow detention time= 248.0 min calculated for 0.914 af (82% of inflow)
Center-of-Mass det. time= 172.3 min (953.6 - 781.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,015.50'	12,146 cf	**82.00'W x 124.00'L x 6.00'H Field A** 61,008 cf Overall - 27,269 cf Embedded = 33,739 cf x 36.0% Voids
#2A	1,016.00'	27,269 cf	**CMP_Round 60** x 66 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf Overall Size= 60.0"W x 60.0"H x 20.00'L Row Length Adjustment= -8.00' x 19.59 sf x 11 rows 80.00' Header x 19.59 sf x 2 = 3,134.4 cf Inside
		39,415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,017.10'	**15.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,017.10' / 1,016.60' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,017.10'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Secondary	1,018.20'	**10.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.35 cfs @ 12.27 hrs HW=1,019.39' (Free Discharge)
↑└**1=Culvert** (Passes 1.35 cfs of 7.48 cfs potential flow)
↑└**2=Orifice/Grate** (Orifice Controls 1.35 cfs @ 6.87 fps)

Secondary OutFlow Max=2.31 cfs @ 12.27 hrs HW=1,019.39' (Free Discharge)
↑└**3=Orifice/Grate** (Orifice Controls 2.31 cfs @ 4.23 fps)

Pond 12P: SOUTHWEST U.G. INFILT. BASIN - Chamber Wizard Field A

Chamber Model = CMP_Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L
Row Length Adjustment= -8.00' x 19.59 sf x 11 rows

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

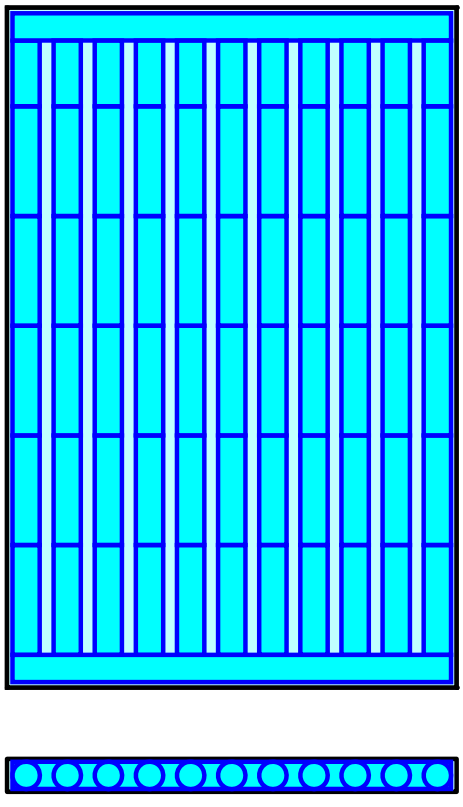
6 Chambers/Row x 20.00' Long -8.00' Row Adjustment +5.00' Header x 2 = 122.00' Row Length +12.0" End Stone x 2 = 124.00' Base Length
11 Rows x 60.0" Wide + 30.0" Spacing x 10 + 12.0" Side Stone x 2 = 82.00' Base Width
6.0" Base + 60.0" Chamber Height + 6.0" Cover = 6.00' Field Height

66 Chambers x 391.8 cf -8.00' Row Adjustment x 19.59 sf x 11 Rows + 80.00' Header x 19.59 sf x 2 = 27,269.3 cf Chamber Storage

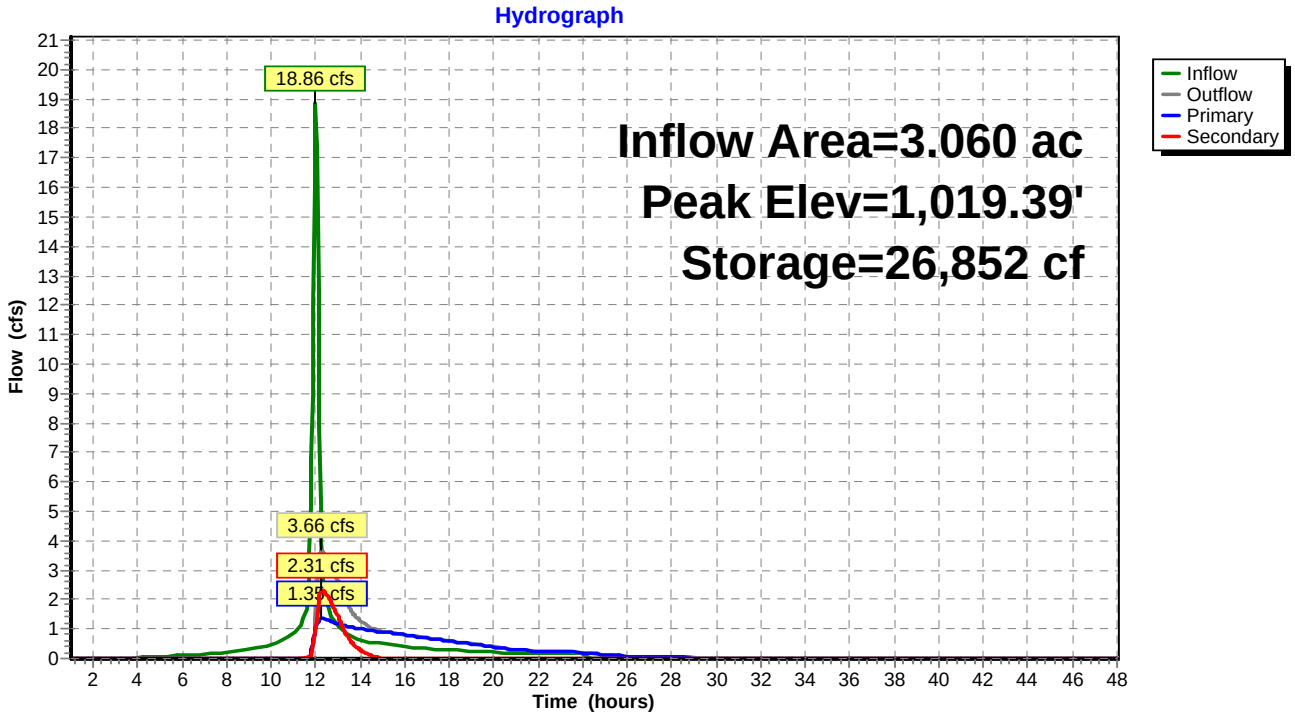
61,008.0 cf Field - 27,269.3 cf Chambers = 33,738.7 cf Stone x 36.0% Voids = 12,145.9 cf Stone Storage

Chamber Storage + Stone Storage = 39,415.2 cf = 0.905 af
Overall Storage Efficiency = 64.6%

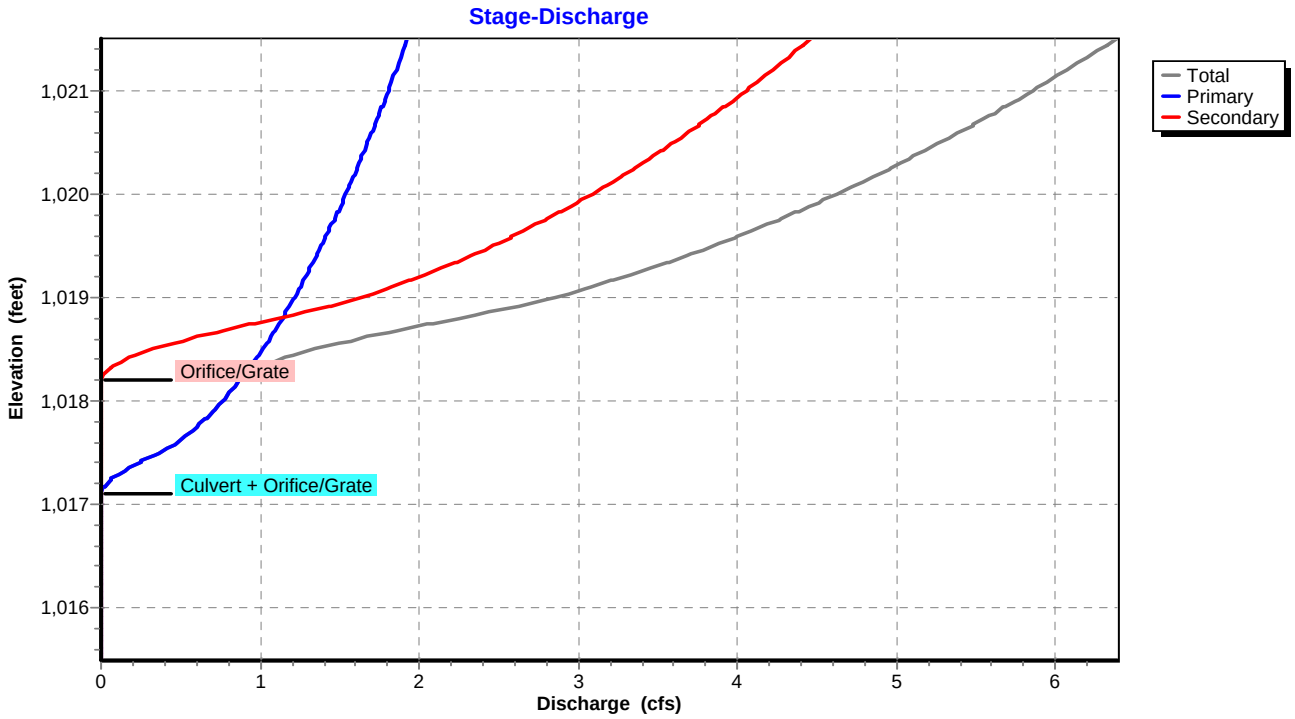
66 Chambers
2,259.6 cy Field
1,249.6 cy Stone



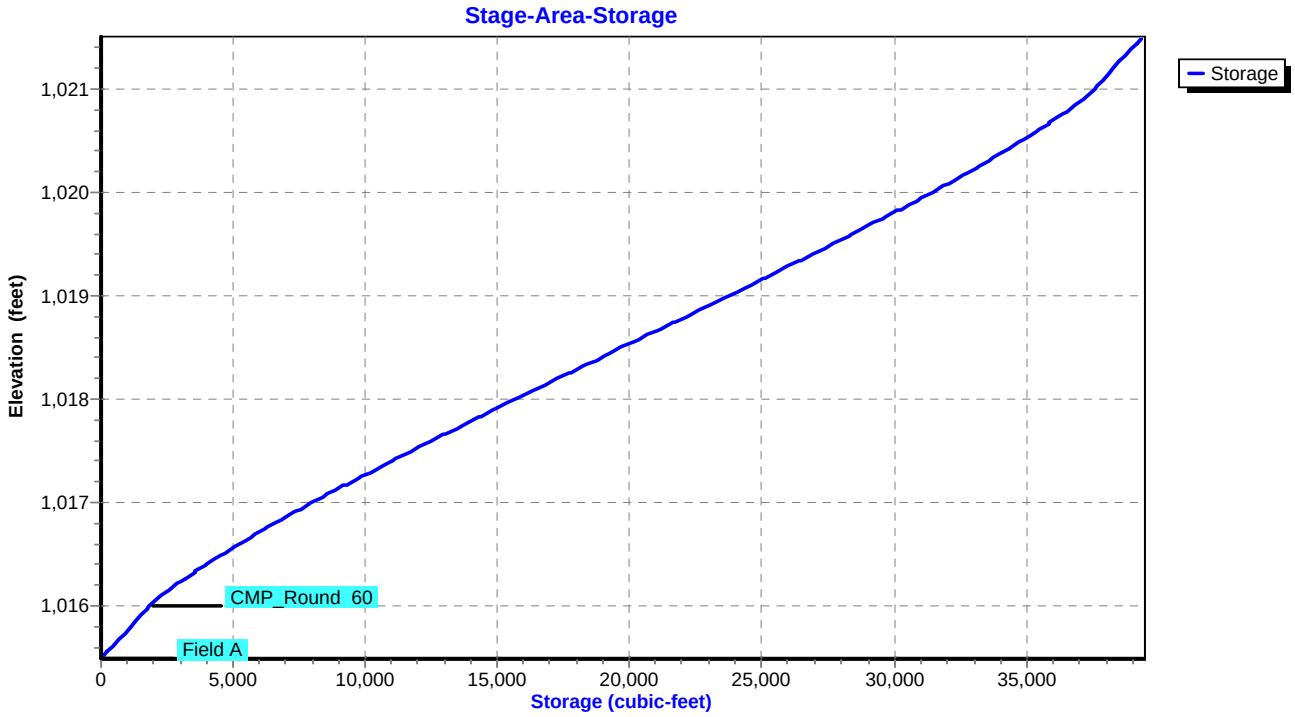
Pond 12P: SOUTHWEST U.G. INFILT. BASIN



Pond 12P: SOUTHWEST U.G. INFILT. BASIN



Pond 12P: SOUTHWEST U.G. INFILT. BASIN

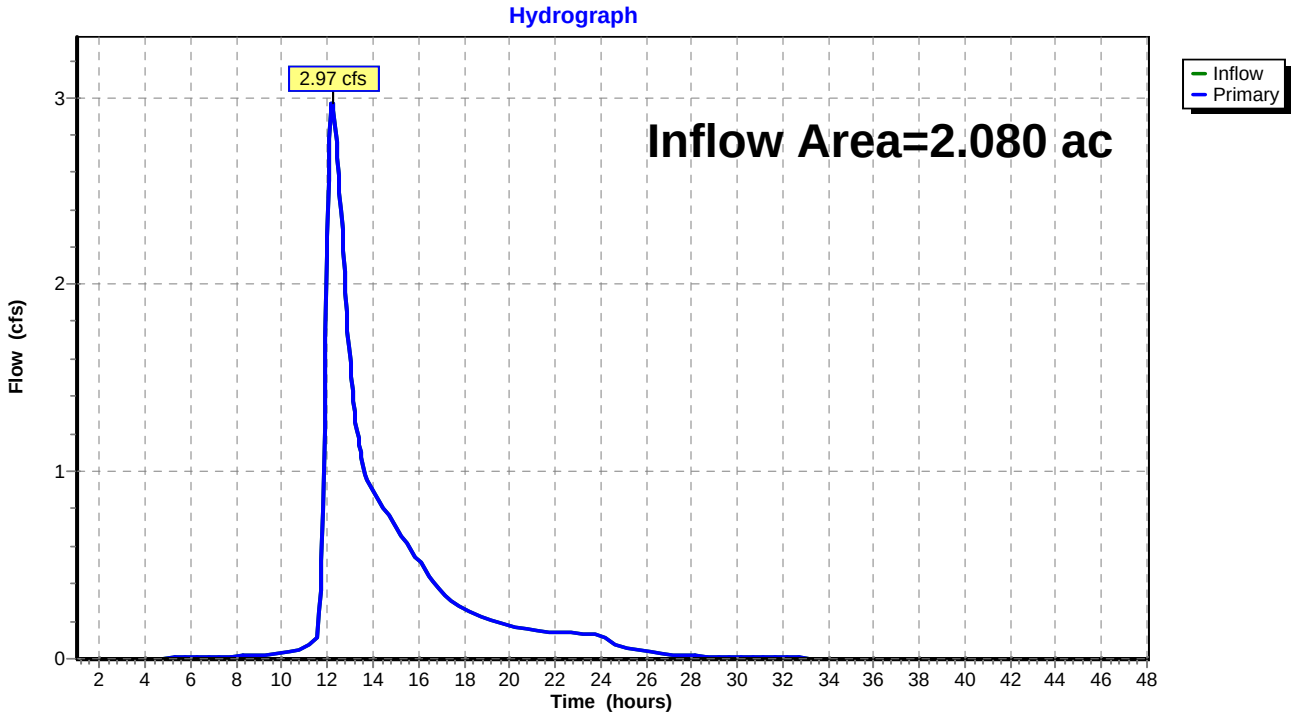


Summary for Link 13L: SITE RELEASE NORTHEAST - PR-1

Inflow Area = 2.080 ac, 0.00% Impervious, Inflow Depth > 3.61" for 10-Year event
Inflow = 2.97 cfs @ 12.21 hrs, Volume= 0.626 af
Primary = 2.97 cfs @ 12.21 hrs, Volume= 0.626 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Link 13L: SITE RELEASE NORTHEAST - PR-1

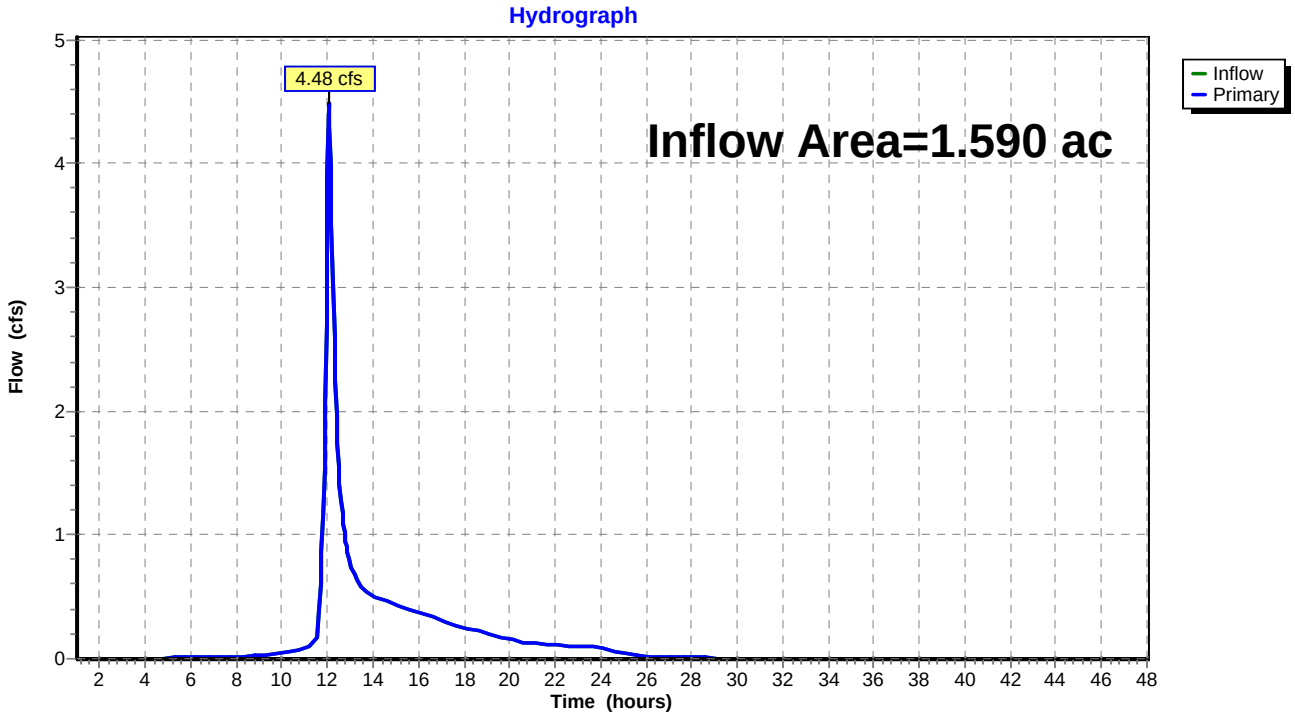


Summary for Link 14L: SITE RELEASE WEST PR-2

Inflow Area = 1.590 ac, 0.00% Impervious, Inflow Depth = 3.72" for 10-Year event
Inflow = 4.48 cfs @ 12.06 hrs, Volume= 0.493 af
Primary = 4.48 cfs @ 12.06 hrs, Volume= 0.493 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Link 14L: SITE RELEASE WEST PR-2

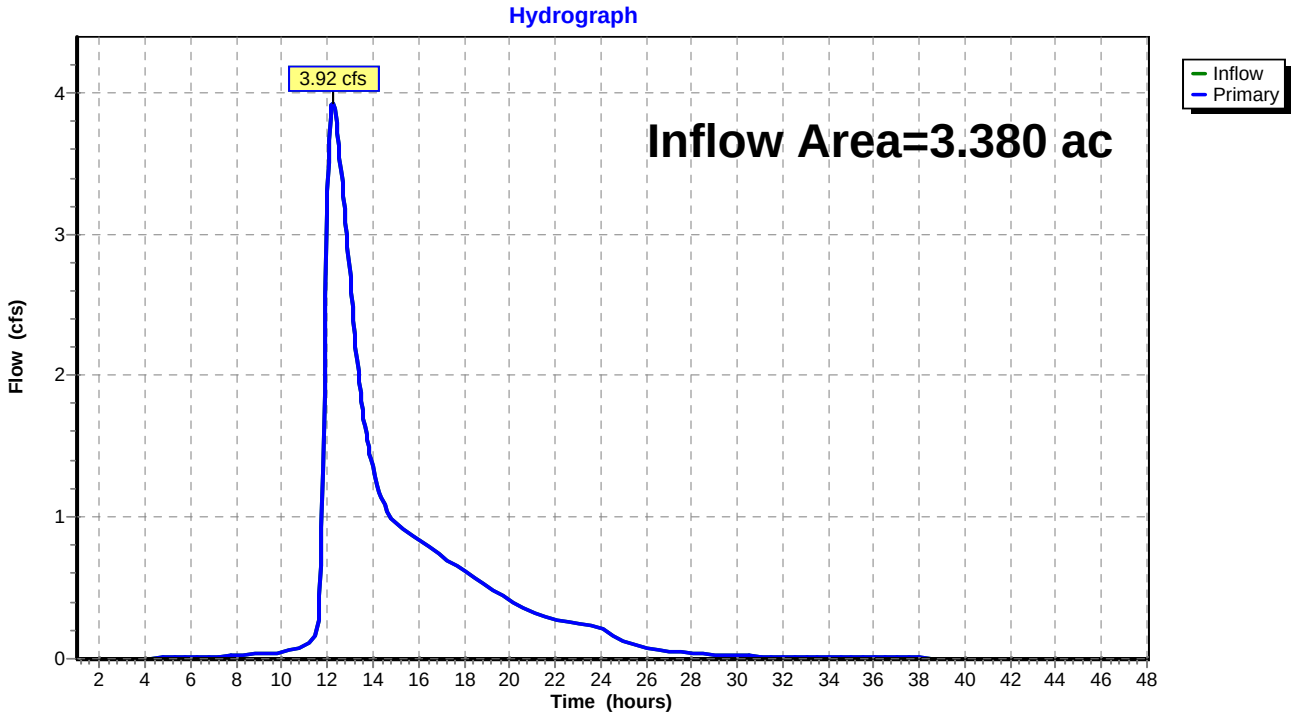


Summary for Link 15L: SITE RELEASE SOUTHWEST - PR-3

Inflow Area = 3.380 ac, 0.00% Impervious, Inflow Depth > 3.66" for 10-Year event
Inflow = 3.92 cfs @ 12.24 hrs, Volume= 1.031 af
Primary = 3.92 cfs @ 12.24 hrs, Volume= 1.031 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Link 15L: SITE RELEASE SOUTHWEST - PR-3



Summary for Subcatchment 1S: EX-1

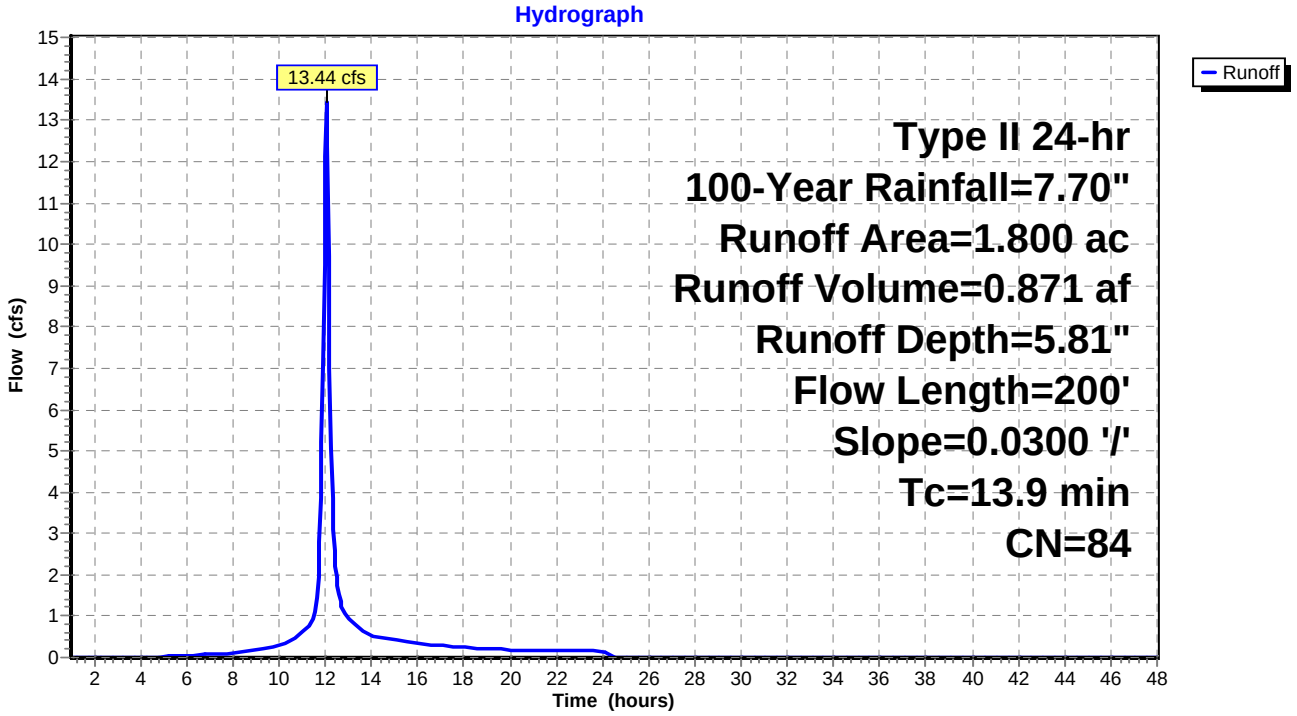
Runoff = 13.44 cfs @ 12.05 hrs, Volume= 0.871 af, Depth= 5.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	1.800	84	
	1.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	200	0.0300	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

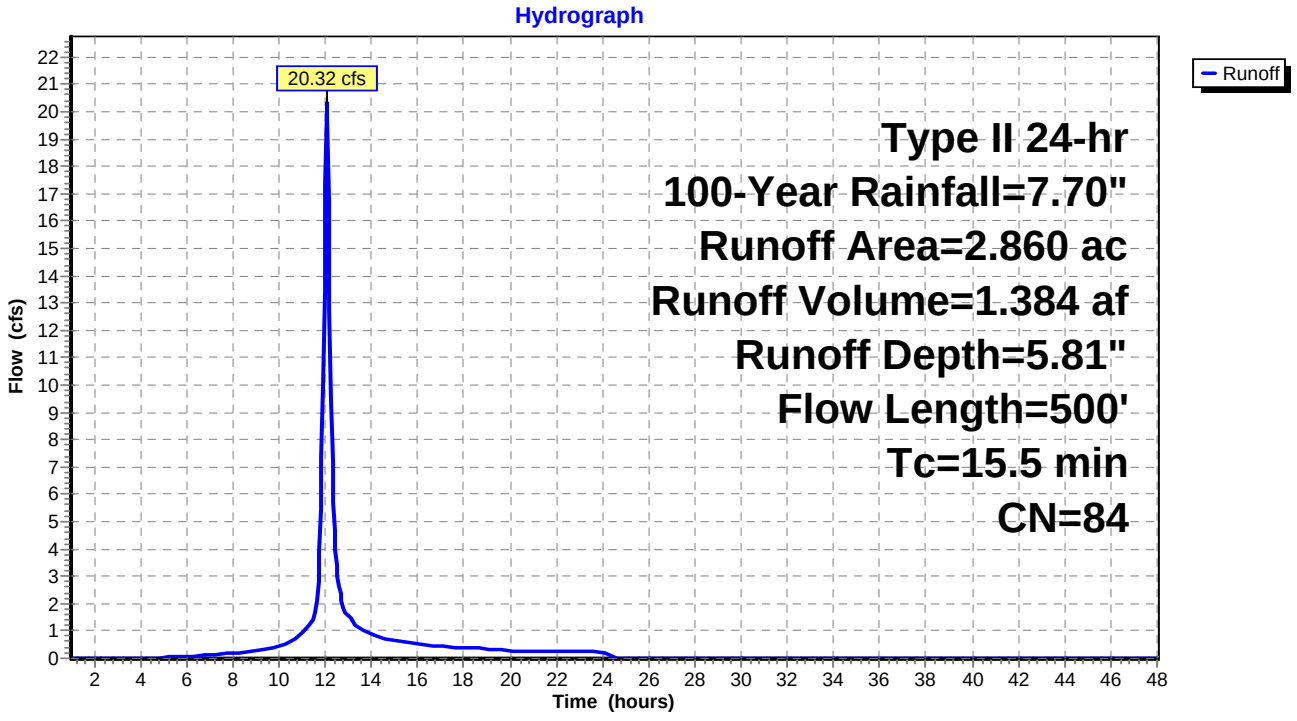
Runoff = 20.32 cfs @ 12.07 hrs, Volume= 1.384 af, Depth= 5.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	2.860	84	
	2.860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	200	0.0300	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.6	300	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
15.5	500	Total			

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

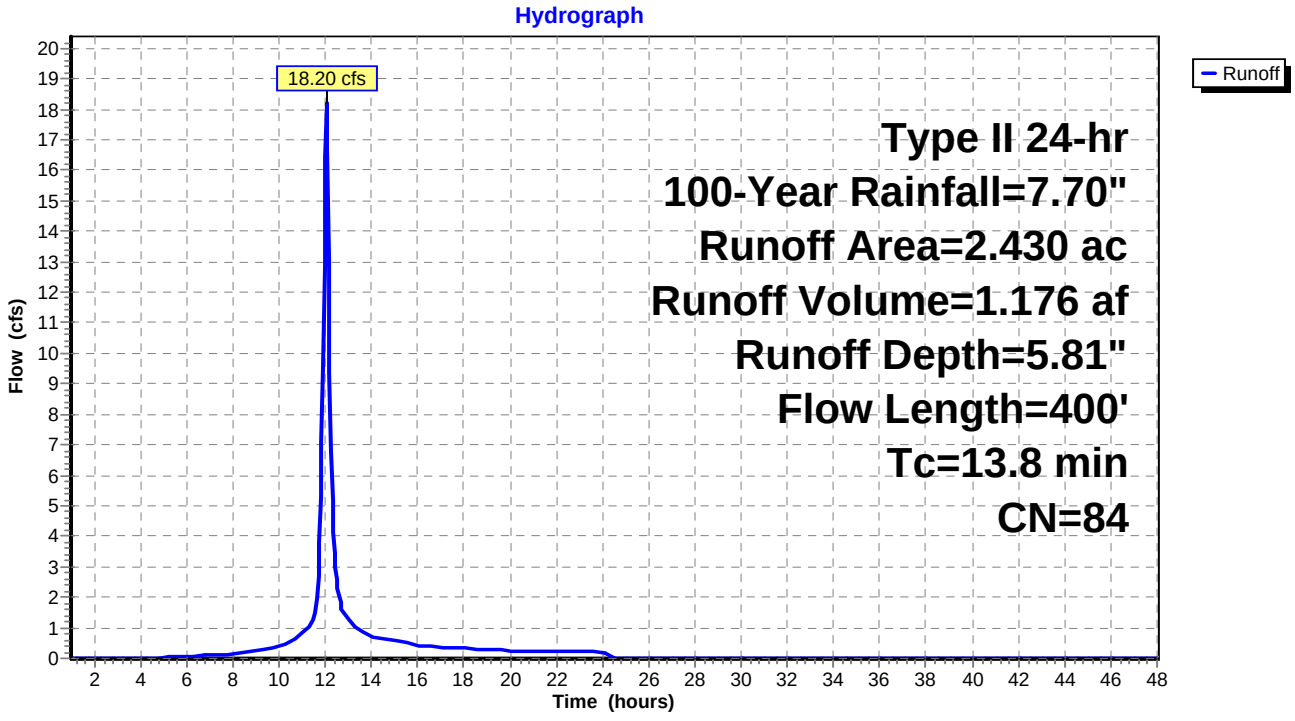
Runoff = 18.20 cfs @ 12.05 hrs, Volume= 1.176 af, Depth= 5.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	2.430	84	
	2.430		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	200	0.0350	0.26		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.8	200	0.0700	4.26		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
13.8	400	Total			

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: DETENTION NE

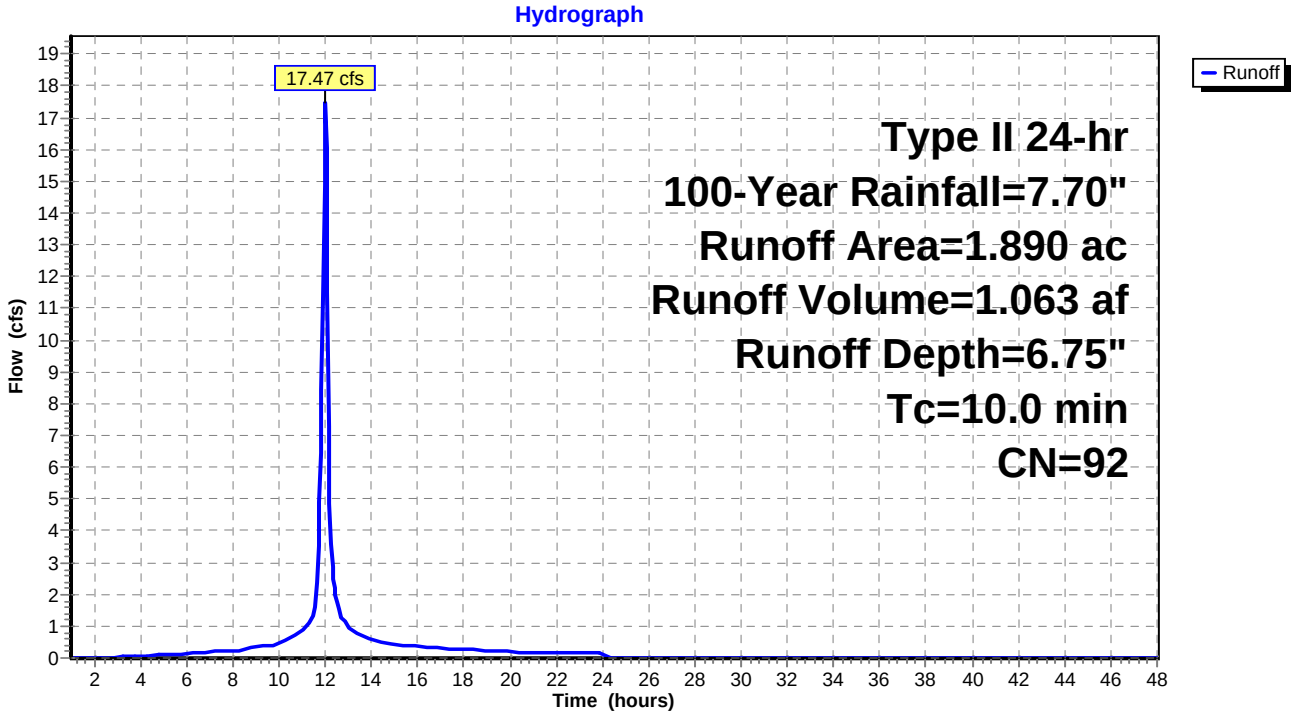
Runoff = 17.47 cfs @ 12.01 hrs, Volume= 1.063 af, Depth= 6.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	1.890	92	
	1.890		100.00% Pervious Area

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

Subcatchment 4S: DETENTION NE



Summary for Subcatchment 5S: DETENTION WEST

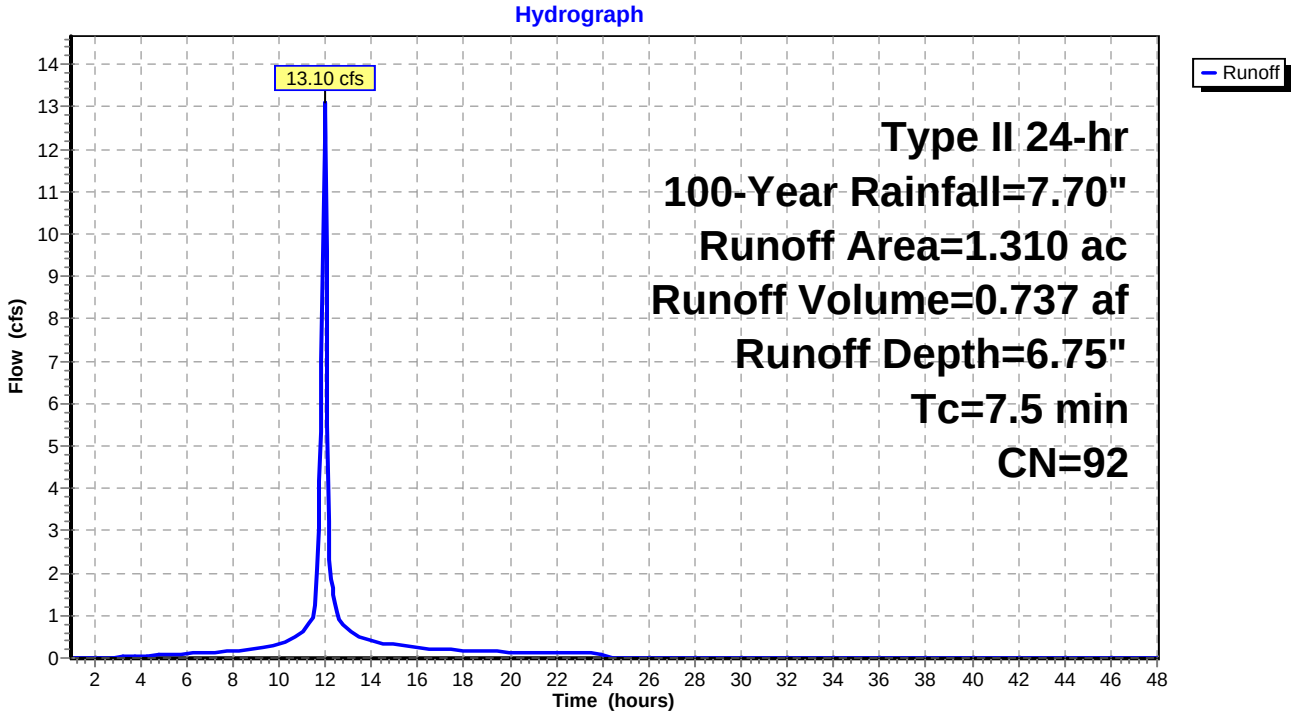
Runoff = 13.10 cfs @ 11.98 hrs, Volume= 0.737 af, Depth= 6.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	1.310	92	
	1.310		100.00% Pervious Area

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

Subcatchment 5S: DETENTION WEST



Summary for Subcatchment 6S: UNDETAINED AREA - W #1

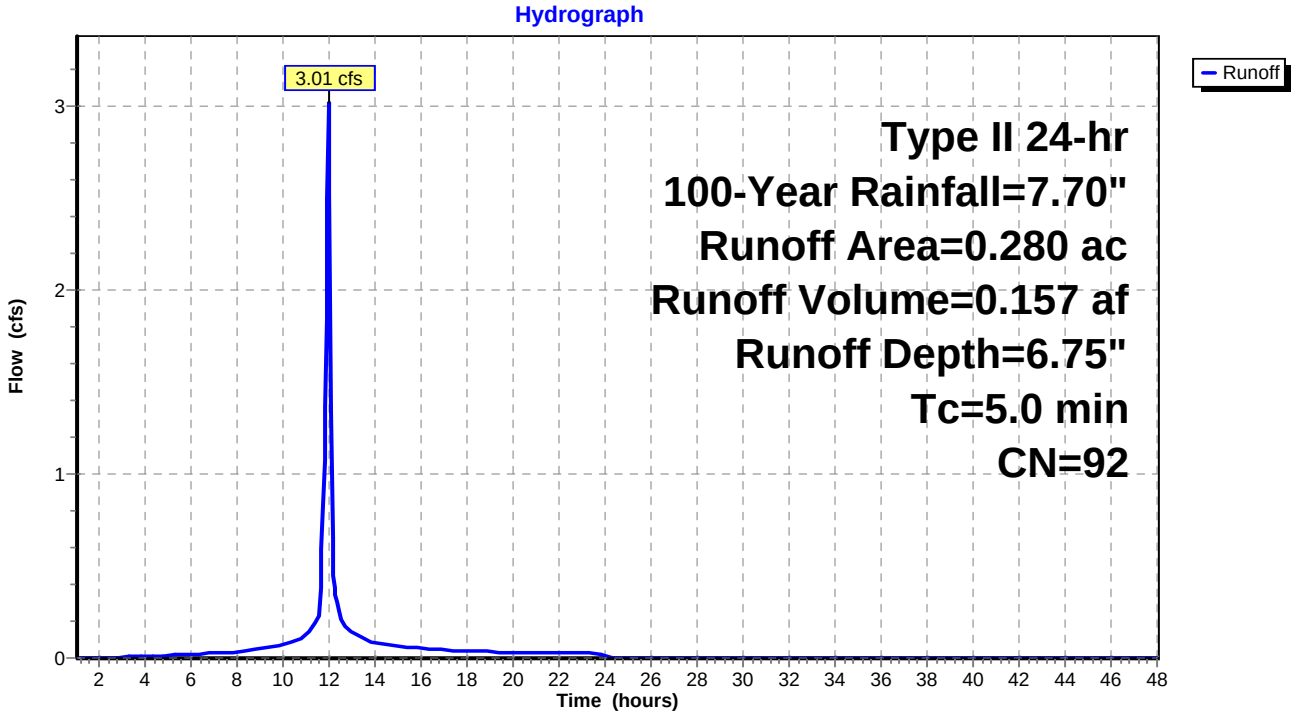
Runoff = 3.01 cfs @ 11.95 hrs, Volume= 0.157 af, Depth= 6.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	0.280	92	
	0.280		100.00% Pervious Area

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

Subcatchment 6S: UNDETAINED AREA - W #1



Summary for Subcatchment 7S: DETENTION SW

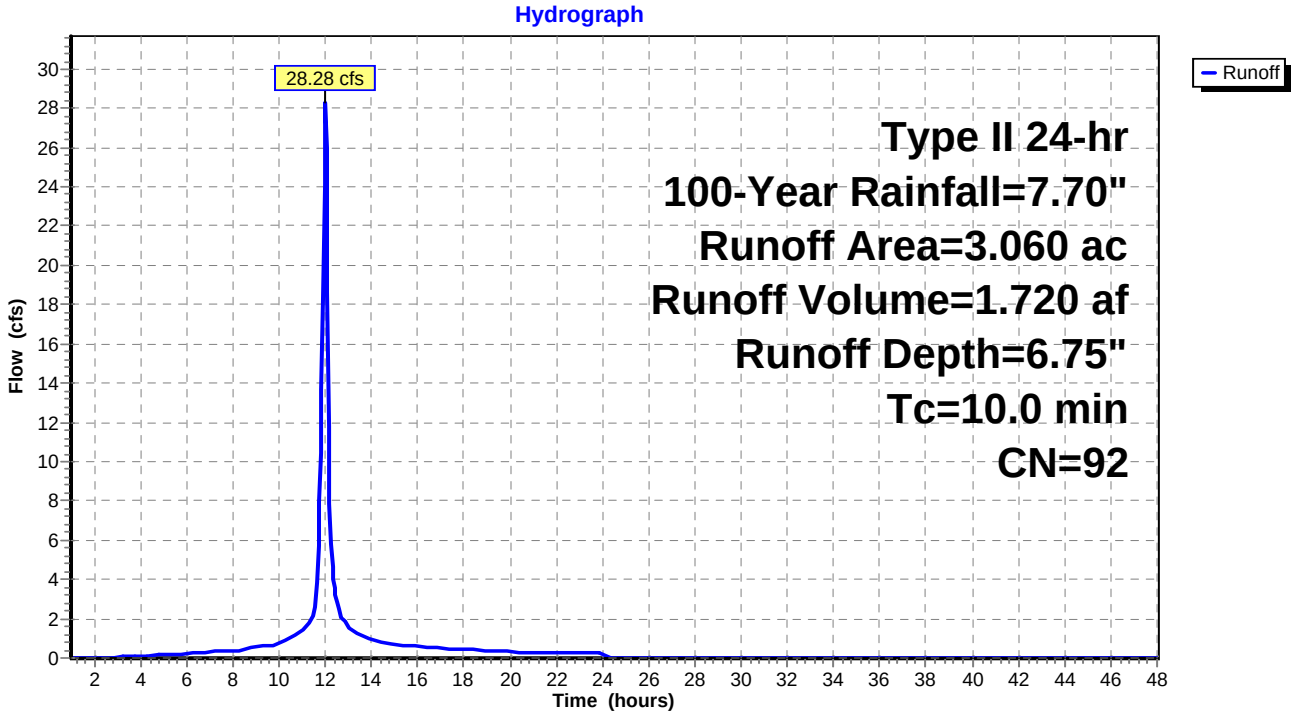
Runoff = 28.28 cfs @ 12.01 hrs, Volume= 1.720 af, Depth= 6.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	3.060	92	
	3.060		100.00% Pervious Area

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

Subcatchment 7S: DETENTION SW



Summary for Subcatchment 9S: UNDETAINED AREA - SW #1

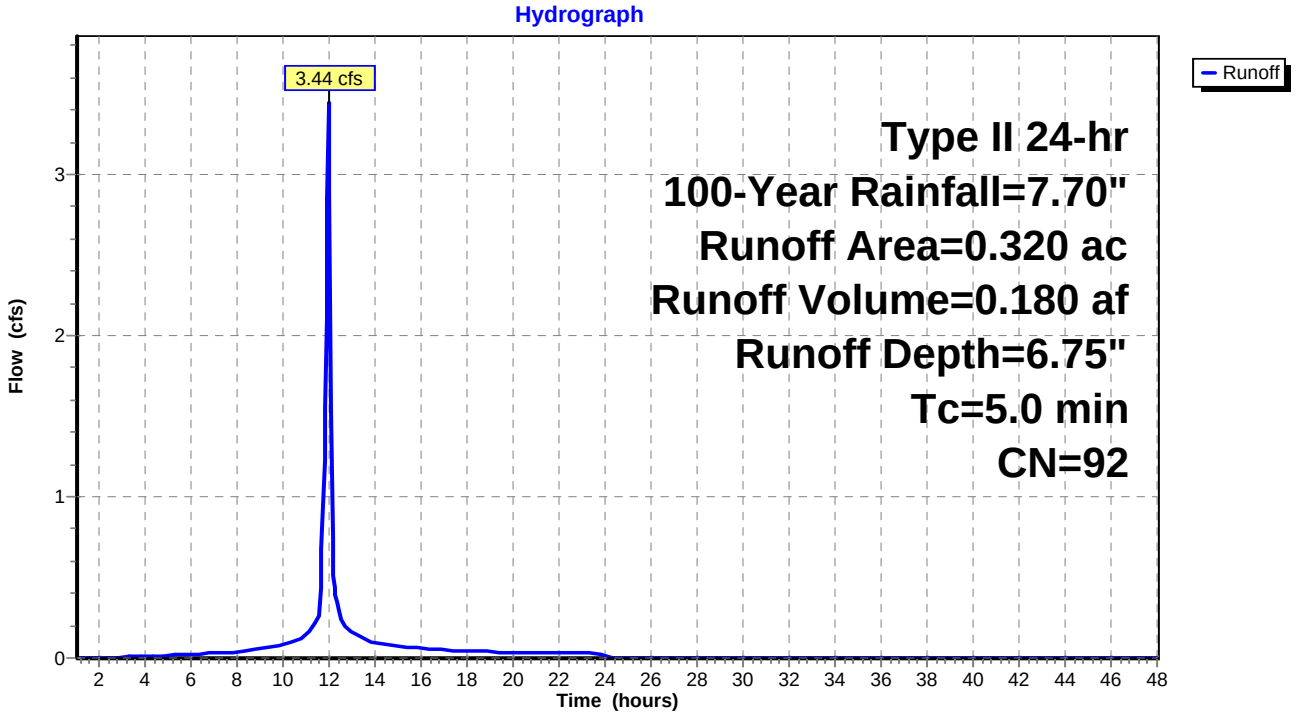
Runoff = 3.44 cfs @ 11.95 hrs, Volume= 0.180 af, Depth= 6.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	0.320	92	
	0.320		100.00% Pervious Area

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

Subcatchment 9S: UNDETAINED AREA - SW #1



Summary for Subcatchment 16S: UNDETAINED AREA - NE #1

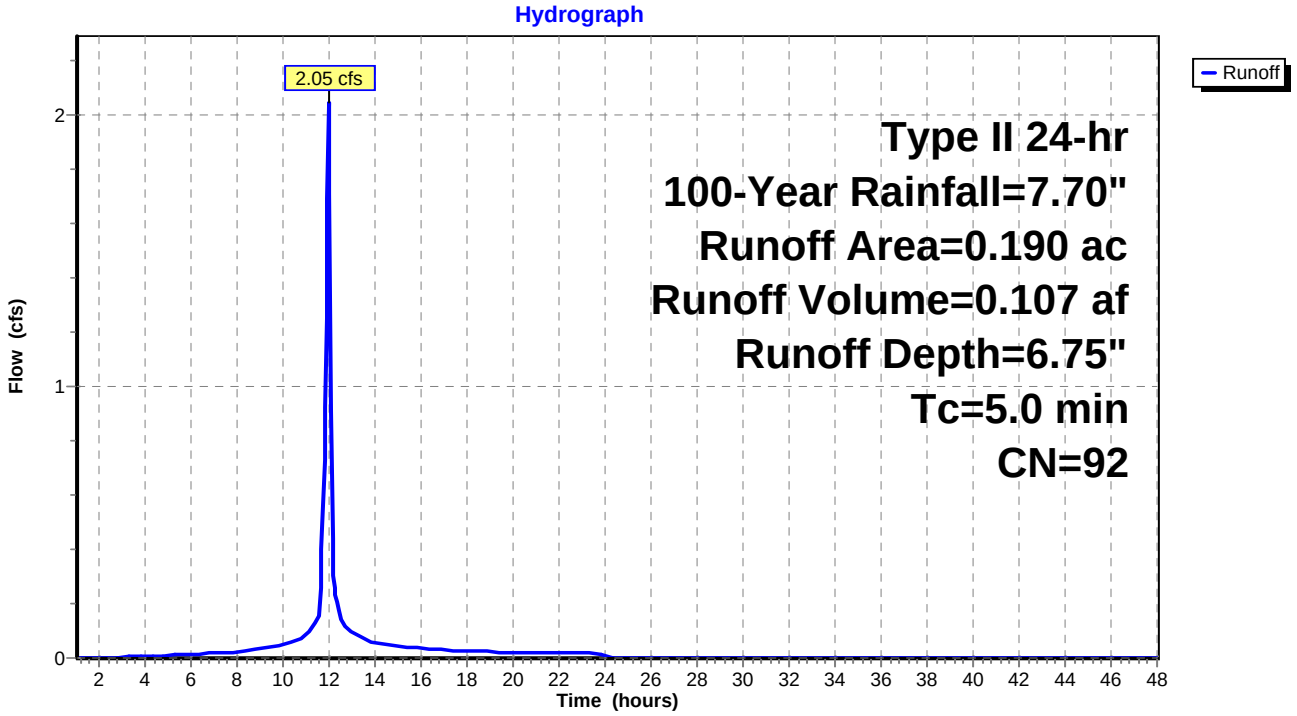
Runoff = 2.05 cfs @ 11.95 hrs, Volume= 0.107 af, Depth= 6.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.70"

	Area (ac)	CN	Description
*	0.190	92	
	0.190		100.00% Pervious Area

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

Subcatchment 16S: UNDETAINED AREA - NE #1



Summary for Pond 10P: NE U.G. INFILT. BASIN

Inflow Area = 1.890 ac, 0.00% Impervious, Inflow Depth = 6.75" for 100-Year event
Inflow = 17.47 cfs @ 12.01 hrs, Volume= 1.063 af
Outflow = 4.67 cfs @ 12.21 hrs, Volume= 0.929 af, Atten= 73%, Lag= 12.3 min
Primary = 1.78 cfs @ 12.21 hrs, Volume= 0.641 af
Secondary = 2.89 cfs @ 12.21 hrs, Volume= 0.288 af

Routing by Stor-Ind method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,009.98' @ 12.21 hrs Surf.Area= 6,254 sf Storage= 23,047 cf

Plug-Flow detention time= 181.1 min calculated for 0.929 af (87% of inflow)
Center-of-Mass det. time= 120.4 min (890.7 - 770.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,004.50'	7,479 cf	**29.50'W x 212.00'L x 6.00'H Field A** 37,524 cf Overall - 16,749 cf Embedded = 20,775 cf x 36.0% Voids
#2A	1,005.00'	16,749 cf	**CMP_Round 60** x 40 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 27.50' Header x 19.59 sf x 2 = 1,077.5 cf Inside
		24,228 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,006.20'	**15.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,006.20' / 1,005.70' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,006.20'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Secondary	1,007.30'	**8.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.77 cfs @ 12.21 hrs HW=1,009.96' (Free Discharge)
↑—**1=Culvert** (Passes 1.77 cfs of 10.47 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 1.77 cfs @ 9.03 fps)

Secondary OutFlow Max=2.88 cfs @ 12.21 hrs HW=1,009.96' (Free Discharge)
↑—**3=Orifice/Grate** (Orifice Controls 2.88 cfs @ 7.32 fps)

Pond 10P: NE U.G. INFILT. BASIN - Chamber Wizard Field A

Chamber Model = CMP_Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

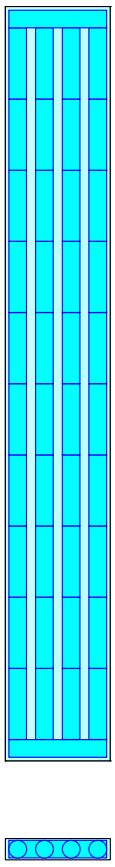
10 Chambers/Row x 20.00' Long +5.00' Header x 2 = 210.00' Row Length +12.0" End Stone x 2 = 212.00' Base Length
4 Rows x 60.0" Wide + 30.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.50' Base Width
6.0" Base + 60.0" Chamber Height + 6.0" Cover = 6.00' Field Height

40 Chambers x 391.8 cf + 27.50' Header x 19.59 sf x 2 = 16,749.5 cf Chamber Storage

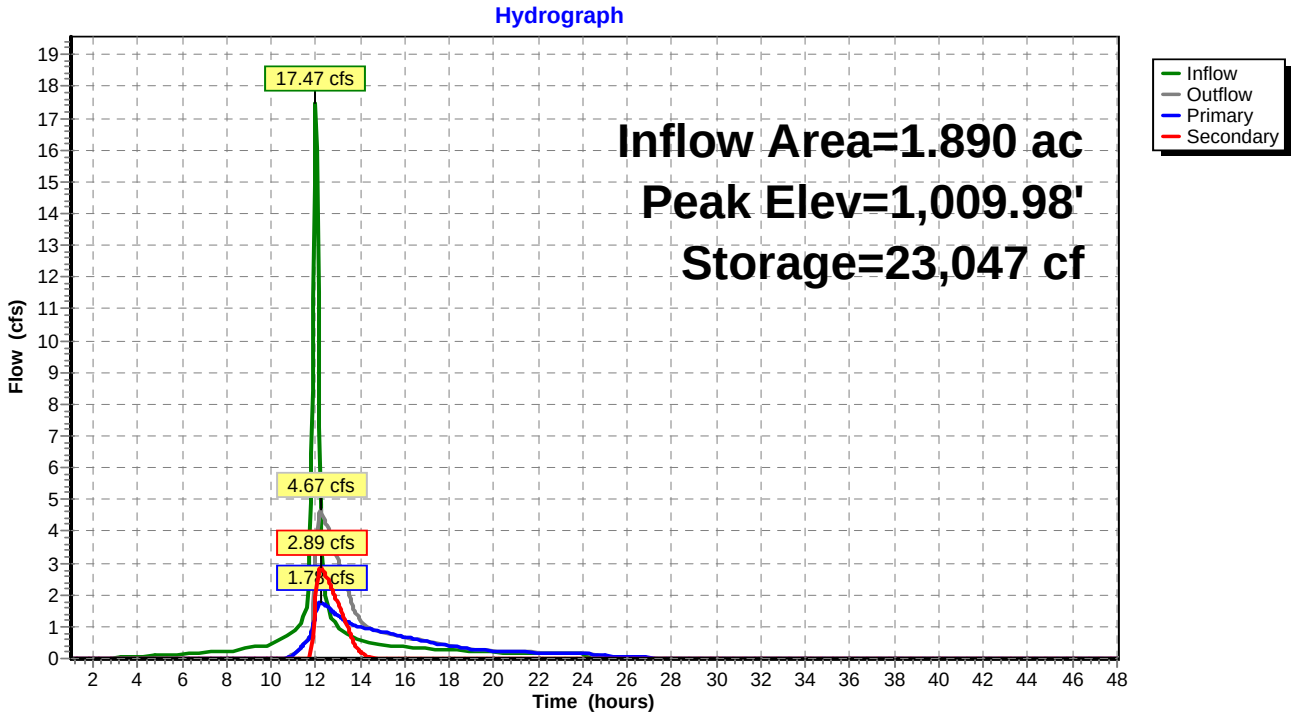
37,524.0 cf Field - 16,749.5 cf Chambers = 20,774.5 cf Stone x 36.0% Voids = 7,478.8 cf Stone Storage

Chamber Storage + Stone Storage = 24,228.3 cf = 0.556 af
Overall Storage Efficiency = 64.6%

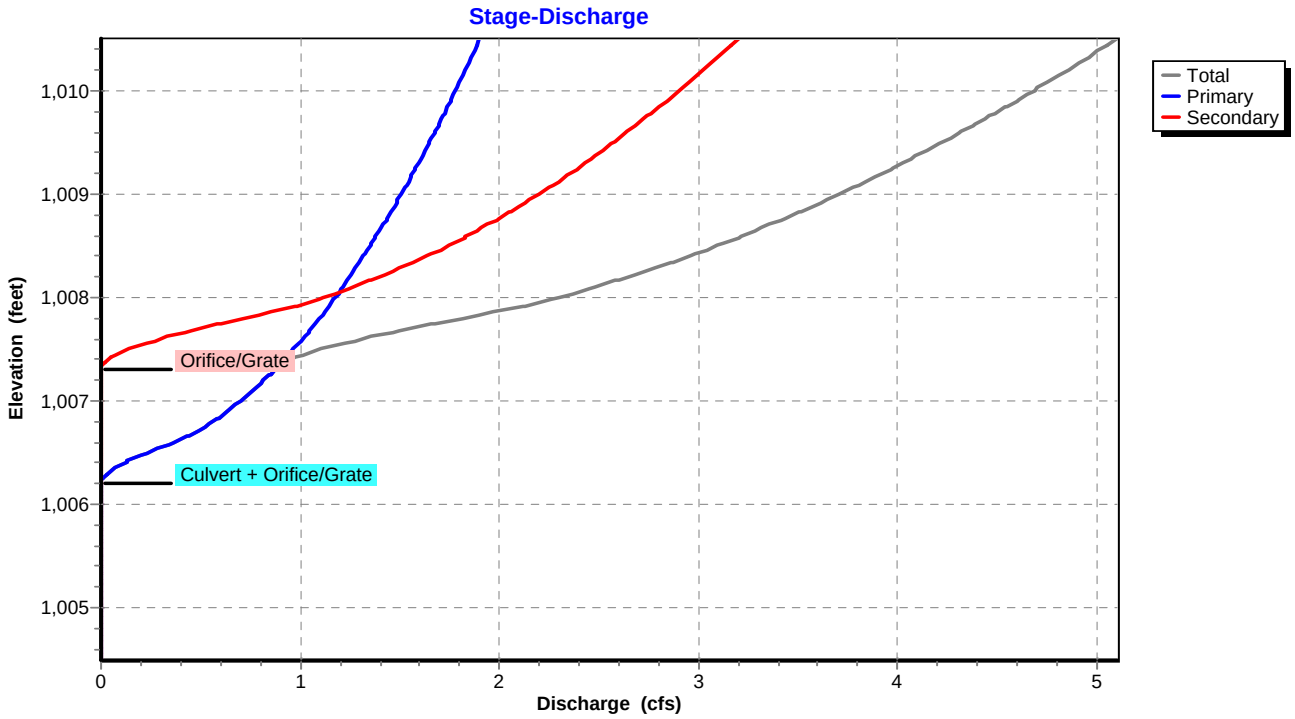
40 Chambers
1,389.8 cy Field
769.4 cy Stone



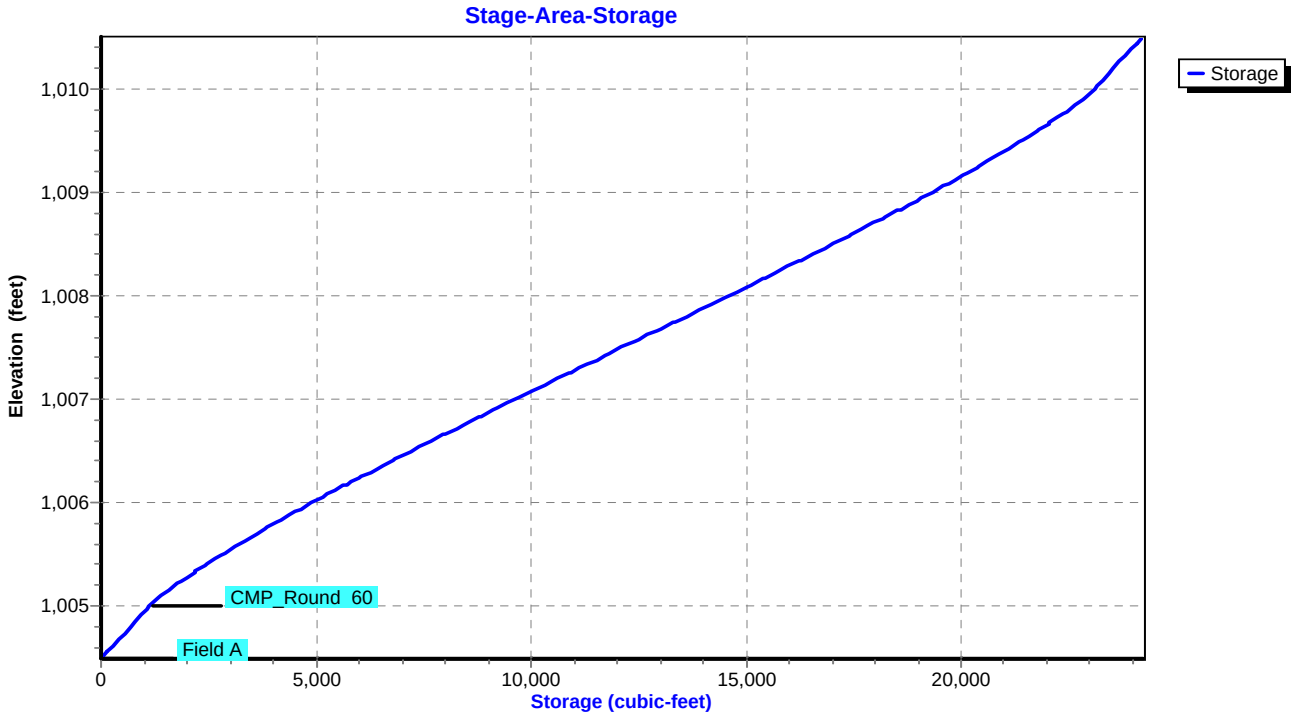
Pond 10P: NE U.G. INFILT. BASIN



Pond 10P: NE U.G. INFILT. BASIN



Pond 10P: NE U.G. INFILT. BASIN



Summary for Pond 11P: WEST U.G. INFILT. BASIN

Inflow Area = 1.310 ac, 0.00% Impervious, Inflow Depth = 6.75" for 100-Year event
Inflow = 13.10 cfs @ 11.98 hrs, Volume= 0.737 af
Outflow = 7.15 cfs @ 12.08 hrs, Volume= 0.649 af, Atten= 45%, Lag= 6.1 min
Primary = 7.15 cfs @ 12.08 hrs, Volume= 0.649 af

Routing by Stor-Ind method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,021.28' @ 12.08 hrs Surf.Area= 3,515 sf Storage= 13,398 cf

Plug-Flow detention time= 165.9 min calculated for 0.648 af (88% of inflow)
Center-of-Mass det. time= 109.0 min (876.9 - 767.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,015.50'	4,172 cf	**37.00'W x 95.00'L x 6.00'H Field A** 21,090 cf Overall - 9,501 cf Embedded = 11,589 cf x 36.0% Voids
#2A	1,016.00'	9,501 cf	**CMP_Round 60** x 20 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf Overall Size= 60.0"W x 60.0"H x 20.00'L Row Length Adjustment= +3.00' x 19.59 sf x 5 rows 35.00' Header x 19.59 sf x 2 = 1,371.3 cf Inside
		13,673 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,017.40'	**15.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,017.40' / 1,016.90' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,017.40'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	1,018.70'	**13.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=7.07 cfs @ 12.08 hrs HW=1,021.24' (Free Discharge)
└**1=Culvert** (Passes 7.07 cfs of 10.59 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.81 cfs @ 9.22 fps)
  └**3=Orifice/Grate** (Orifice Controls 6.27 cfs @ 6.80 fps)

Pond 11P: WEST U.G. INFILT. BASIN - Chamber Wizard Field A

Chamber Model = CMP_Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L
Row Length Adjustment= +3.00' x 19.59 sf x 5 rows

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

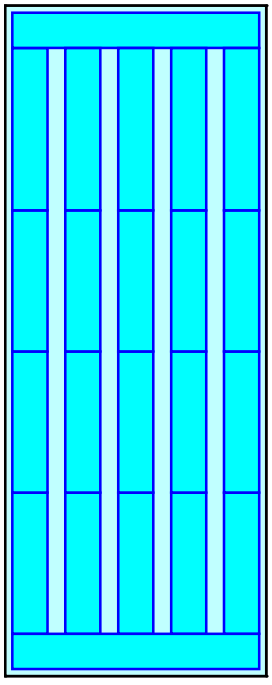
4 Chambers/Row x 20.00' Long +3.00' Row Adjustment +5.00' Header x 2 = 93.00' Row Length +12.0" End Stone x 2 = 95.00' Base Length
5 Rows x 60.0" Wide + 30.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.00' Base Width
6.0" Base + 60.0" Chamber Height + 6.0" Cover = 6.00' Field Height

20 Chambers x 391.8 cf +3.00' Row Adjustment x 19.59 sf x 5 Rows + 35.00' Header x 19.59 sf x 2 = 9,501.2 cf Chamber Storage

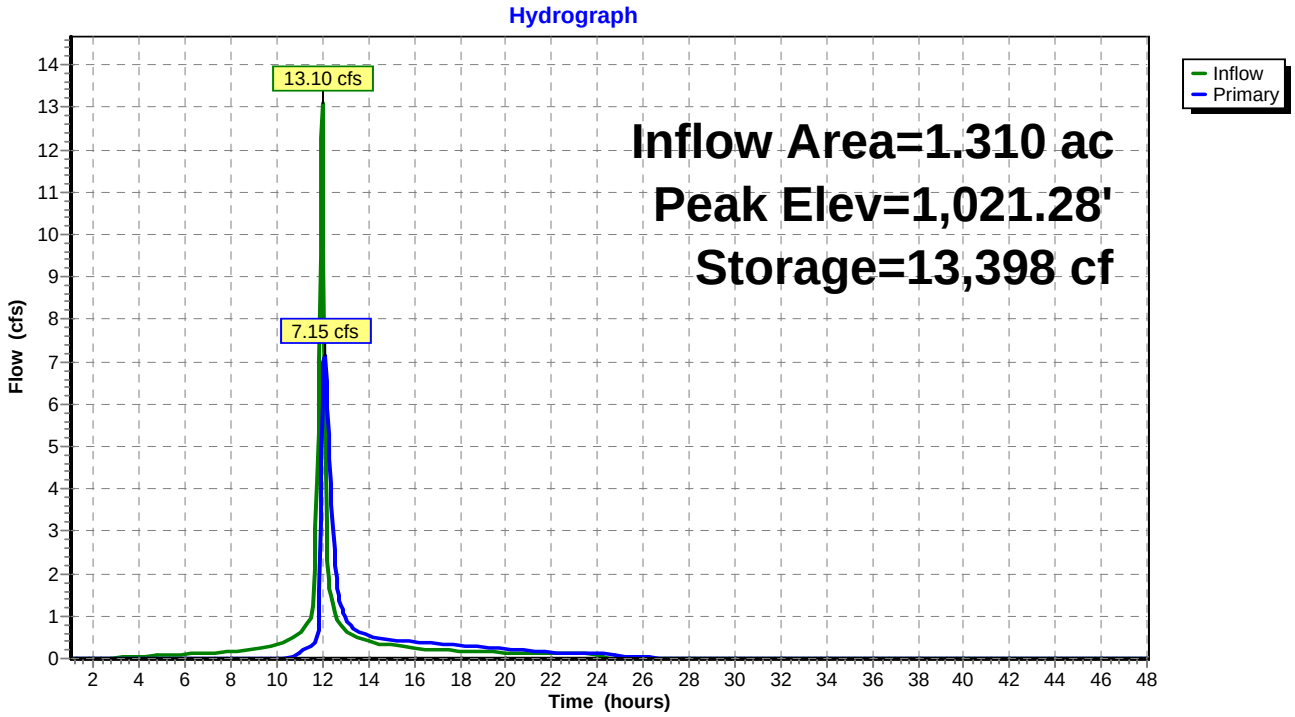
21,090.0 cf Field - 9,501.2 cf Chambers = 11,588.8 cf Stone x 36.0% Voids = 4,172.0 cf Stone Storage

Chamber Storage + Stone Storage = 13,673.1 cf = 0.314 af
Overall Storage Efficiency = 64.8%

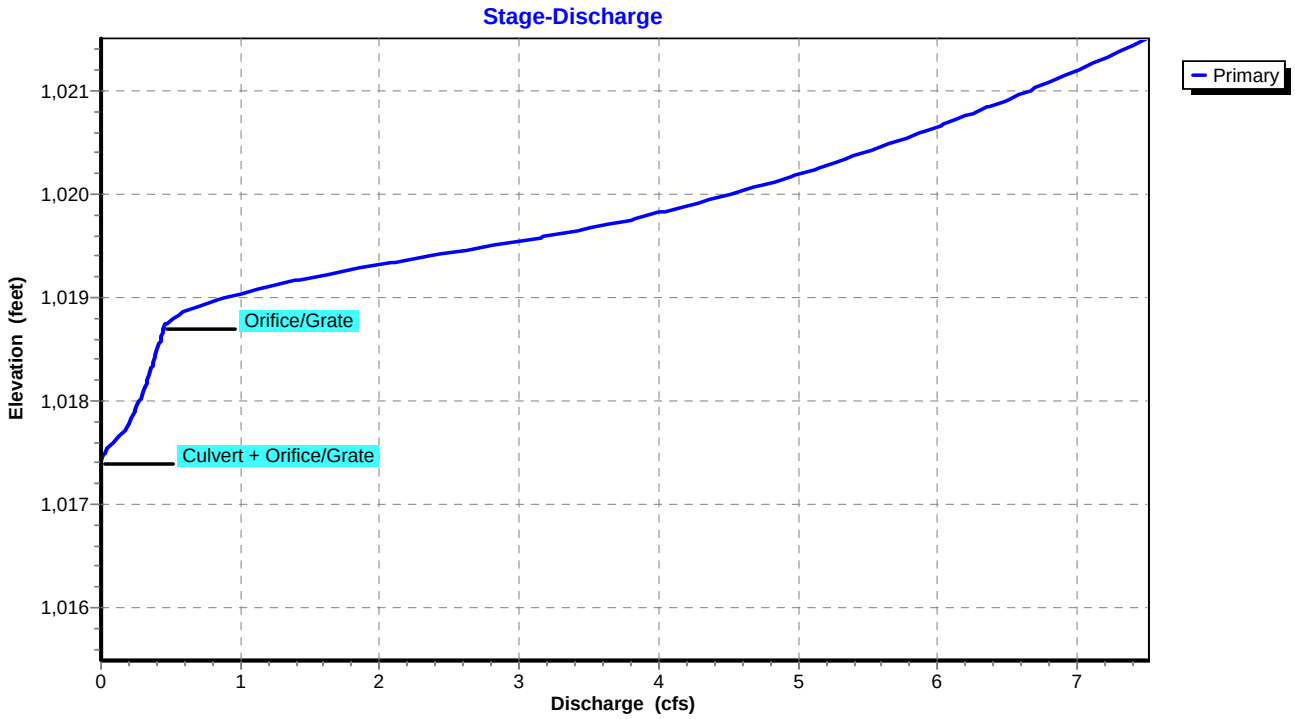
20 Chambers
781.1 cy Field
429.2 cy Stone



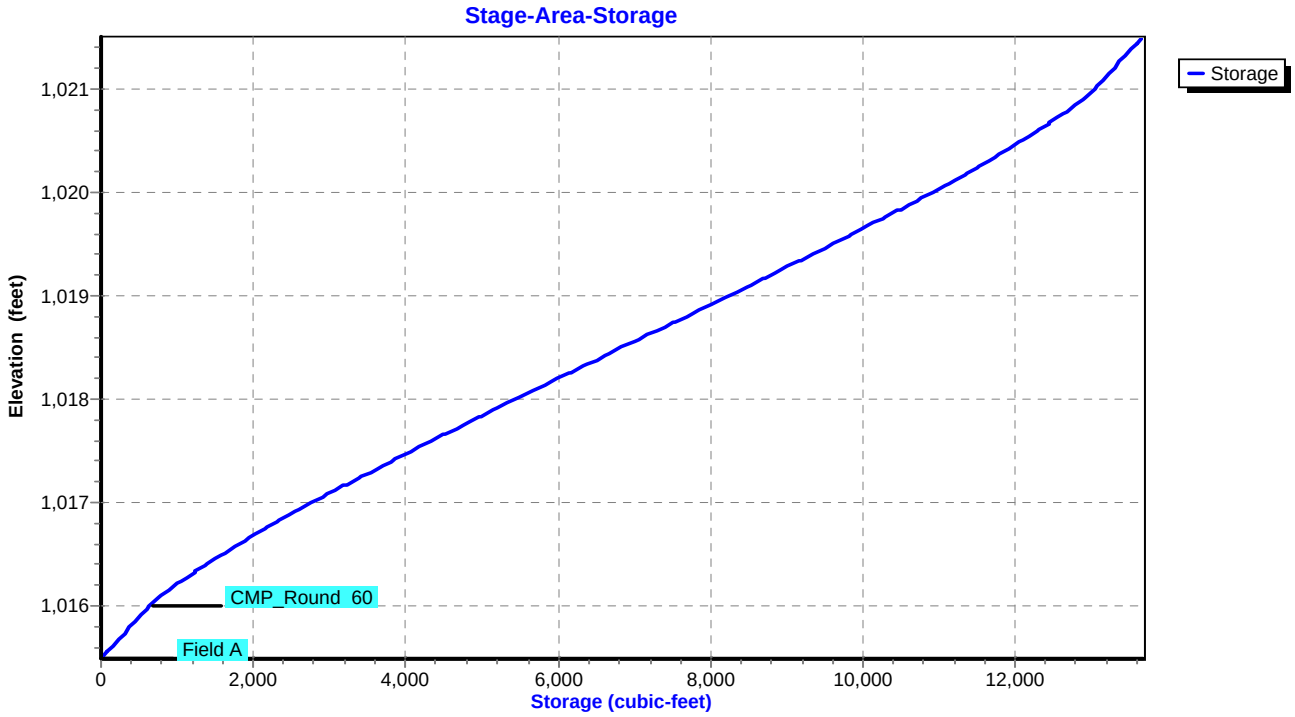
Pond 11P: WEST U.G. INFILT. BASIN



Pond 11P: WEST U.G. INFILT. BASIN



Pond 11P: WEST U.G. INFILT. BASIN



Summary for Pond 12P: SOUTHWEST U.G. INFILT. BASIN

Inflow Area = 3.060 ac, 0.00% Impervious, Inflow Depth = 6.75" for 100-Year event
Inflow = 28.28 cfs @ 12.01 hrs, Volume= 1.720 af
Outflow = 6.31 cfs @ 12.24 hrs, Volume= 1.517 af, Atten= 78%, Lag= 14.0 min
Primary = 1.91 cfs @ 12.24 hrs, Volume= 0.927 af
Secondary = 4.40 cfs @ 12.24 hrs, Volume= 0.590 af

Routing by Stor-Ind method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,021.43' @ 12.24 hrs Surf.Area= 10,168 sf Storage= 39,154 cf

Plug-Flow detention time= 207.0 min calculated for 1.515 af (88% of inflow)
Center-of-Mass det. time= 150.5 min (920.7 - 770.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,015.50'	12,146 cf	**82.00'W x 124.00'L x 6.00'H Field A** 61,008 cf Overall - 27,269 cf Embedded = 33,739 cf x 36.0% Voids
#2A	1,016.00'	27,269 cf	**CMP_Round 60** x 66 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf Overall Size= 60.0"W x 60.0"H x 20.00'L Row Length Adjustment= -8.00' x 19.59 sf x 11 rows 80.00' Header x 19.59 sf x 2 = 3,134.4 cf Inside
		39,415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,017.10'	**15.0" Round Culvert** L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,017.10' / 1,016.60' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	1,017.10'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Secondary	1,018.20'	**10.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.91 cfs @ 12.24 hrs HW=1,021.42' (Free Discharge)
↑└**1=Culvert** (Passes 1.91 cfs of 11.36 cfs potential flow)
↑└**2=Orifice/Grate** (Orifice Controls 1.91 cfs @ 9.72 fps)

Secondary OutFlow Max=4.40 cfs @ 12.24 hrs HW=1,021.42' (Free Discharge)
↑└**3=Orifice/Grate** (Orifice Controls 4.40 cfs @ 8.07 fps)

Pond 12P: SOUTHWEST U.G. INFILT. BASIN - Chamber Wizard Field A

Chamber Model = CMP_Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.59 sf x 20.00'L = 391.8 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L
Row Length Adjustment= -8.00' x 19.59 sf x 11 rows

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

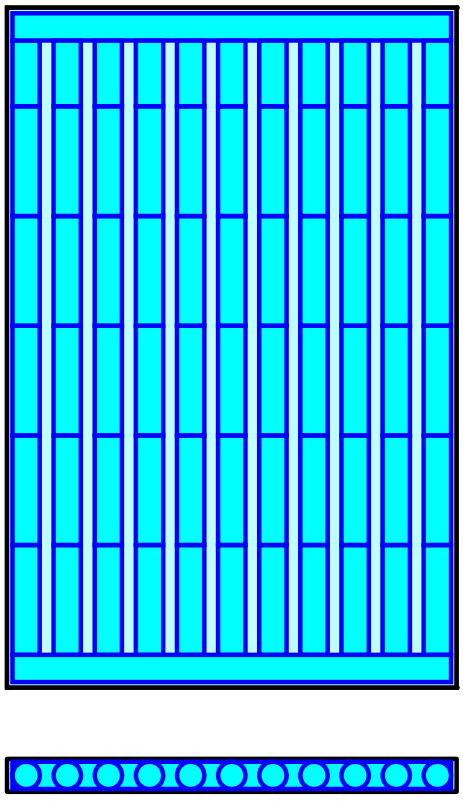
6 Chambers/Row x 20.00' Long -8.00' Row Adjustment +5.00' Header x 2 = 122.00' Row Length +12.0" End Stone x 2 = 124.00' Base Length
11 Rows x 60.0" Wide + 30.0" Spacing x 10 + 12.0" Side Stone x 2 = 82.00' Base Width
6.0" Base + 60.0" Chamber Height + 6.0" Cover = 6.00' Field Height

66 Chambers x 391.8 cf -8.00' Row Adjustment x 19.59 sf x 11 Rows + 80.00' Header x 19.59 sf x 2 = 27,269.3 cf Chamber Storage

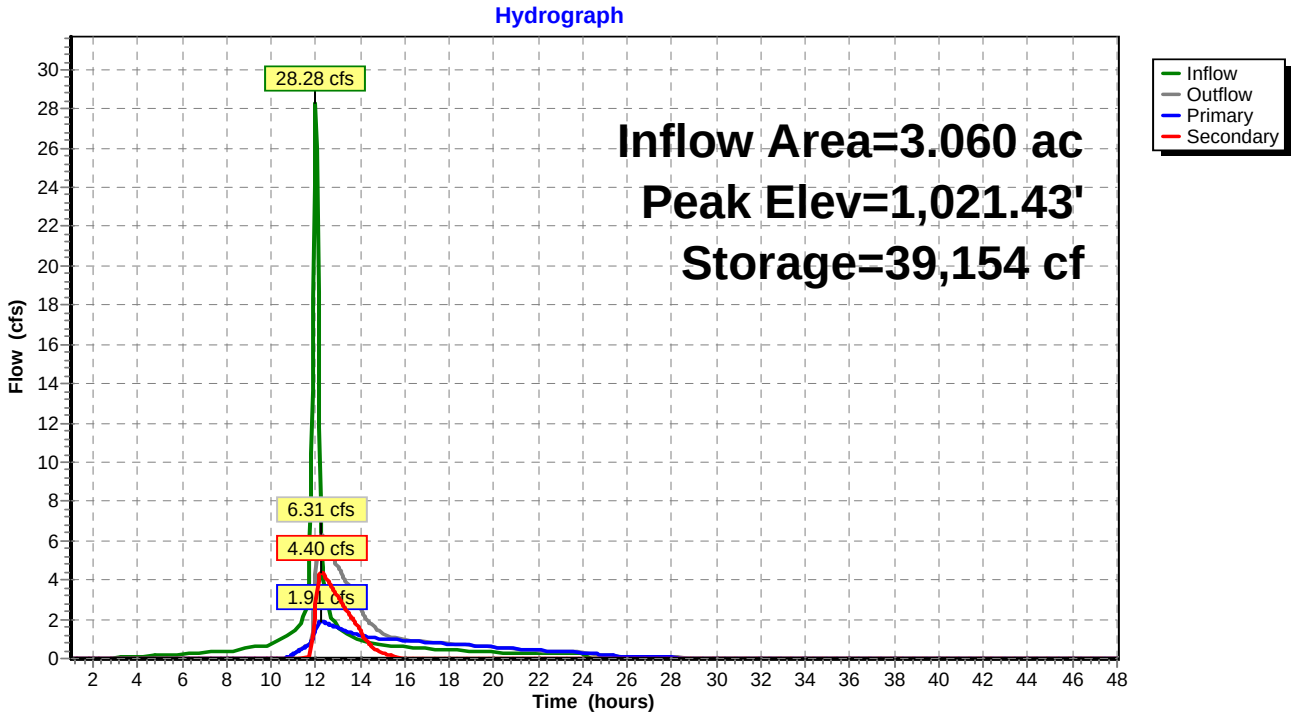
61,008.0 cf Field - 27,269.3 cf Chambers = 33,738.7 cf Stone x 36.0% Voids = 12,145.9 cf Stone Storage

Chamber Storage + Stone Storage = 39,415.2 cf = 0.905 af
Overall Storage Efficiency = 64.6%

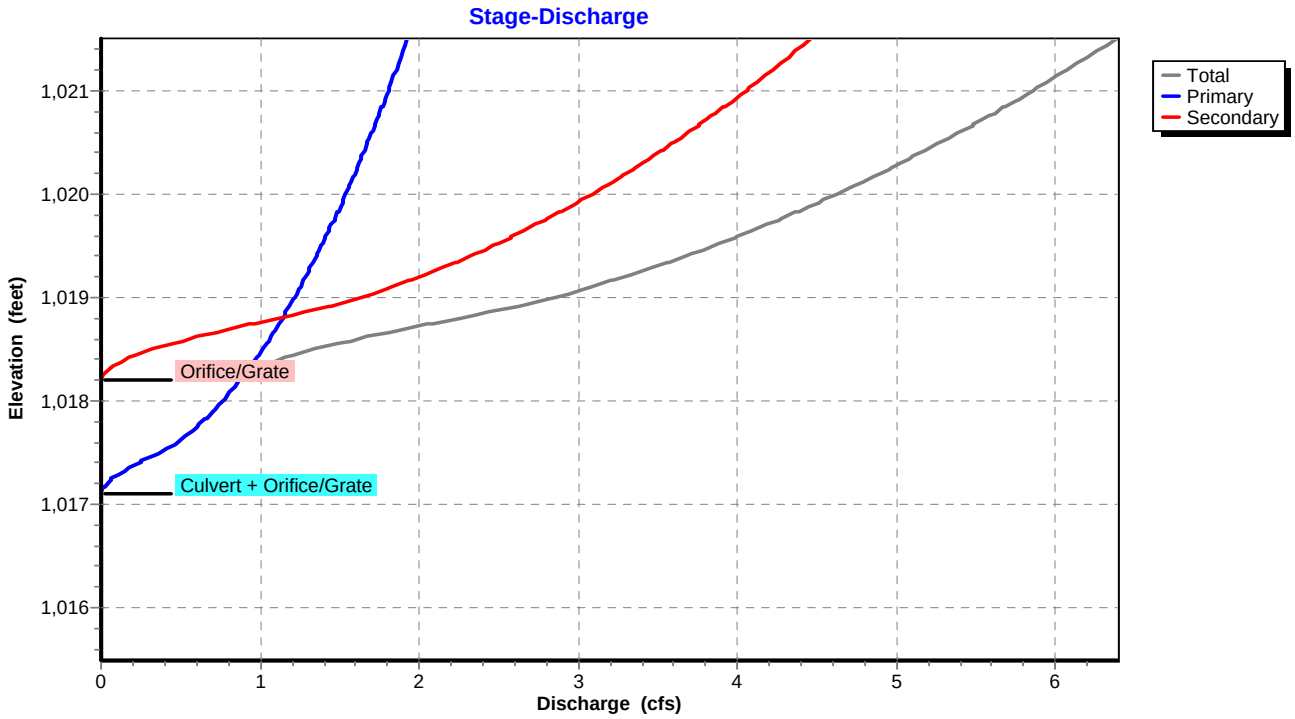
66 Chambers
2,259.6 cy Field
1,249.6 cy Stone



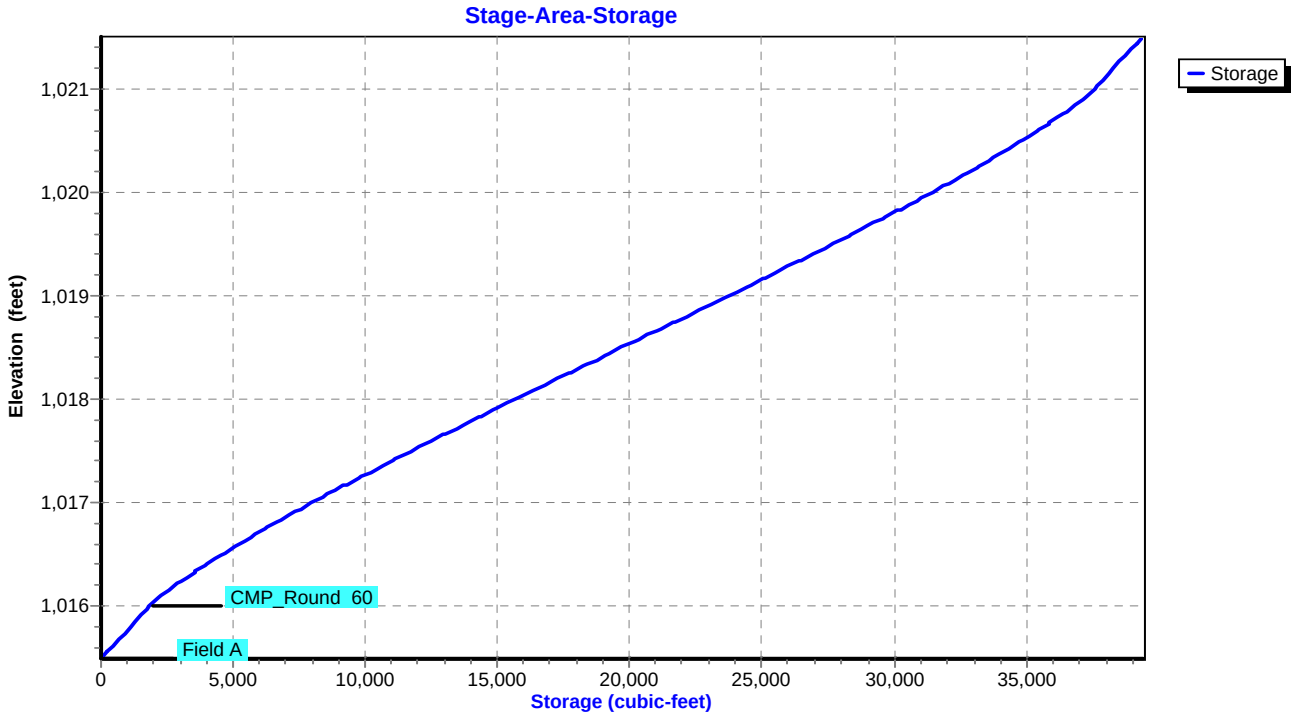
Pond 12P: SOUTHWEST U.G. INFILT. BASIN



Pond 12P: SOUTHWEST U.G. INFILT. BASIN



Pond 12P: SOUTHWEST U.G. INFILT. BASIN

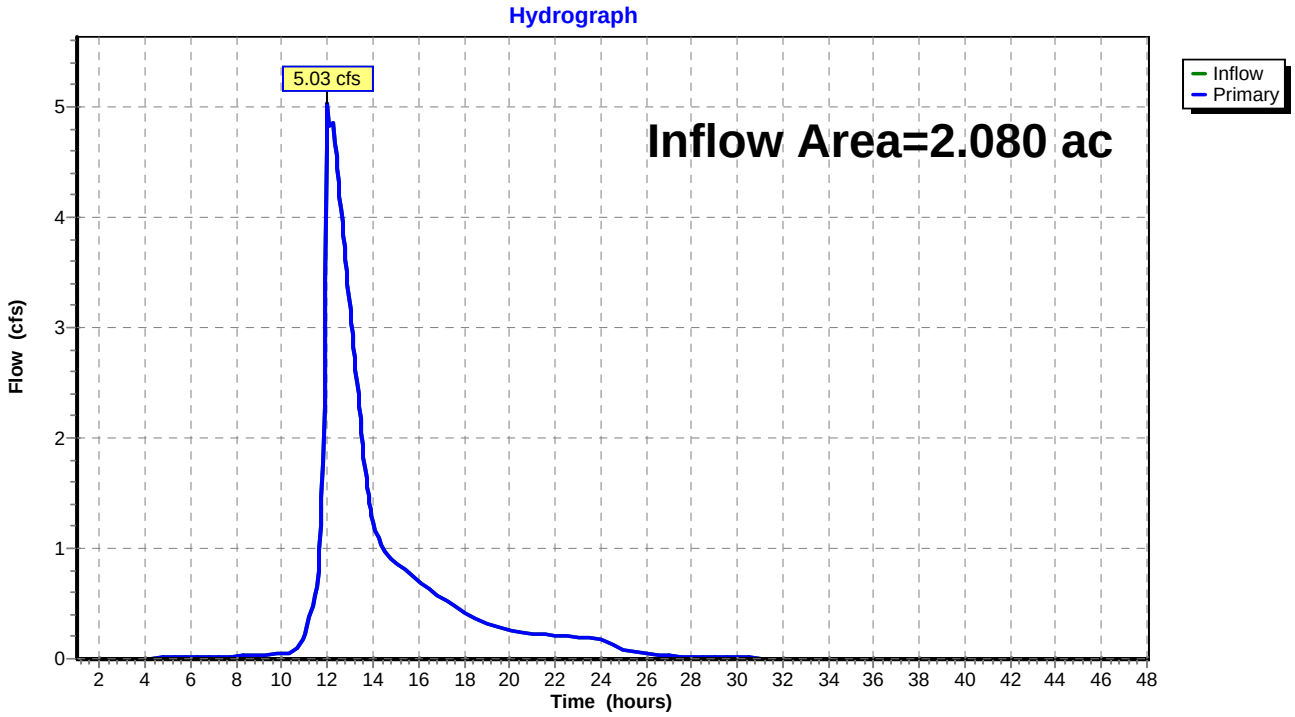


Summary for Link 13L: SITE RELEASE NORTHEAST - PR-1

Inflow Area = 2.080 ac, 0.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 5.03 cfs @ 12.01 hrs, Volume= 1.035 af
Primary = 5.03 cfs @ 12.01 hrs, Volume= 1.035 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Link 13L: SITE RELEASE NORTHEAST - PR-1

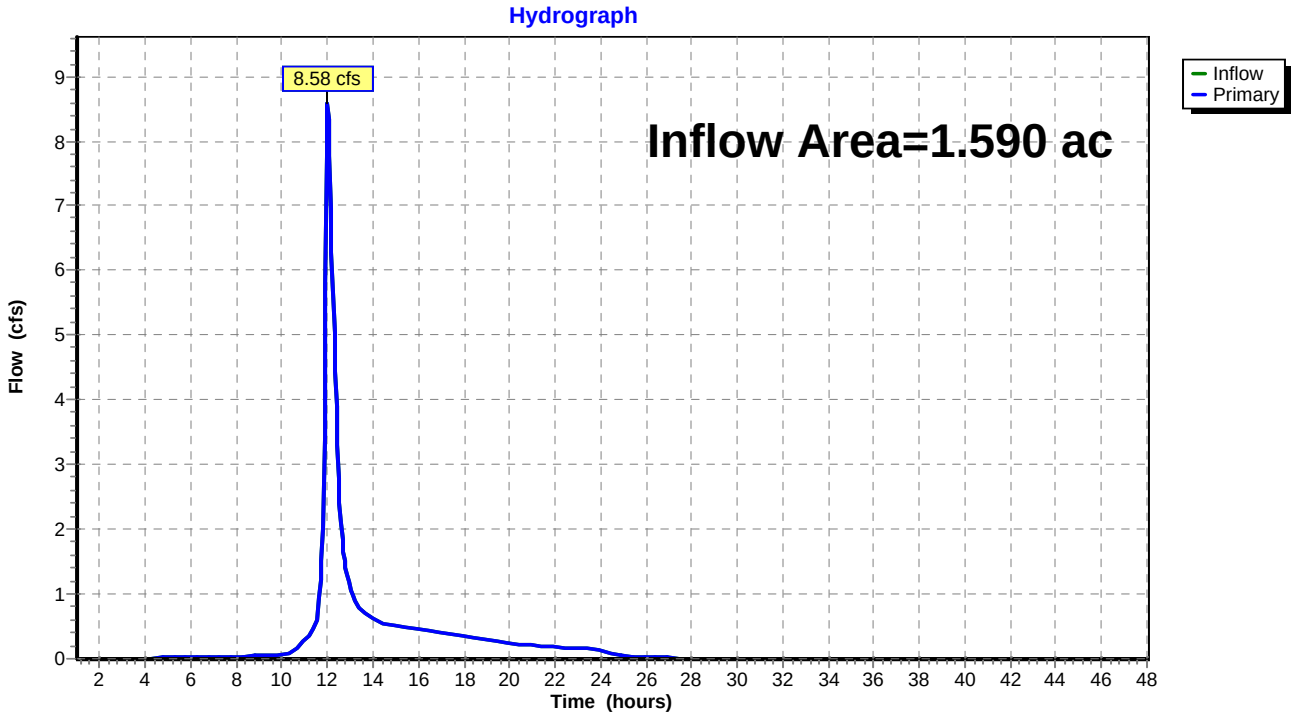


Summary for Link 14L: SITE RELEASE WEST PR-2

Inflow Area = 1.590 ac, 0.00% Impervious, Inflow Depth = 6.08" for 100-Year event
Inflow = 8.58 cfs @ 12.01 hrs, Volume= 0.806 af
Primary = 8.58 cfs @ 12.01 hrs, Volume= 0.806 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Link 14L: SITE RELEASE WEST PR-2



Summary for Link 15L: SITE RELEASE SOUTHWEST - PR-3

Inflow Area = 3.380 ac, 0.00% Impervious, Inflow Depth > 6.02" for 100-Year event
Inflow = 7.15 cfs @ 11.99 hrs, Volume= 1.697 af
Primary = 7.15 cfs @ 11.99 hrs, Volume= 1.697 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Link 15L: SITE RELEASE SOUTHWEST - PR-3