

Second Creek Meadows Subdivision

November 2022 Preliminary Stormwater Analysis

I **CERTIFY** this analysis was prepared by me or under my direct personal supervision and that I am a duly Registered Professional Engineer under the laws of the State of Missouri.



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STORMWATER ANALYSIS

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Property Description

The project is located on a 32 Ac parcel west of downtown Smithville on 2nd Creek Rd. See figure 1, the parcel is located at the northeast corner of the intersection of 2nd Creek Rd and 164th St (Lowman Rd.). The proposed project is a new subdivision consisting of 53 lots zoned single family (R-1B) and 17 lots zoned multiple family (R-3).

Property Drainage

The property naturally drains west and north. Approximately 24.7 Ac of the site drains to an existing 1.6 Ac pond. There is approximately 3.5 Ac of offsite area that drains directly into the project area. Drainage from the land west of 164th St is intercepted by the west drainage ditch of 164th St and around the project area. All runoff from the project site flows to the Little Platte River.

FEMA

Figure 2: Zone AE Flood Area



See figure 2, approximately 8.8 Ac of the property is located within the FEMA designated AE flood zone. The boundary of the flood zone as shown in figure 2 was determined using FIRM map number 29047C0014E dated August 3, 2015. The base flood elevation is approximately 812 and the development will utilize a minimum floor elevation of 814 for design. No portion of the development is in the floodway.

USACE

No jurisdictional water issues are anticipated. There are no streams located through the property and drainage from the property is ephemeral. The property is bordered along the north by a stream which drains approximately 120 Ac located west of 164th St. The stream is shown as an intermittent blue line stream per the USGS 2021 Smithville quadrangle topo map. The east side of the property is bordered by the Little Platte River and Second Creek. The proposed development will not disturb any stream or river.

USGS topo mapping indicates the existing pond has been present on the property since 1961. See figure 3, the pond was checked against the national wetlands inventory interactive mapping system which categorizes the pond as manmade freshwater. The mapping system does not indicate any emerging or existing wetlands within the footprint of the proposed development. The development will continue to utilize the pond and surrounding area as recreational open space. The pond will be disturbed during construction to deepen the water and reshaped to fit the plat footprint.

Figure 1: Location Map

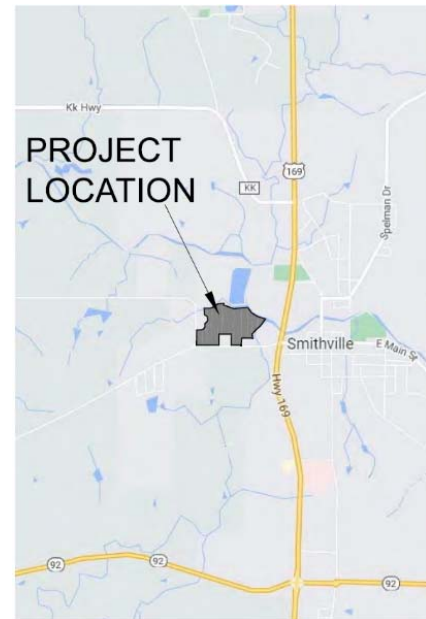
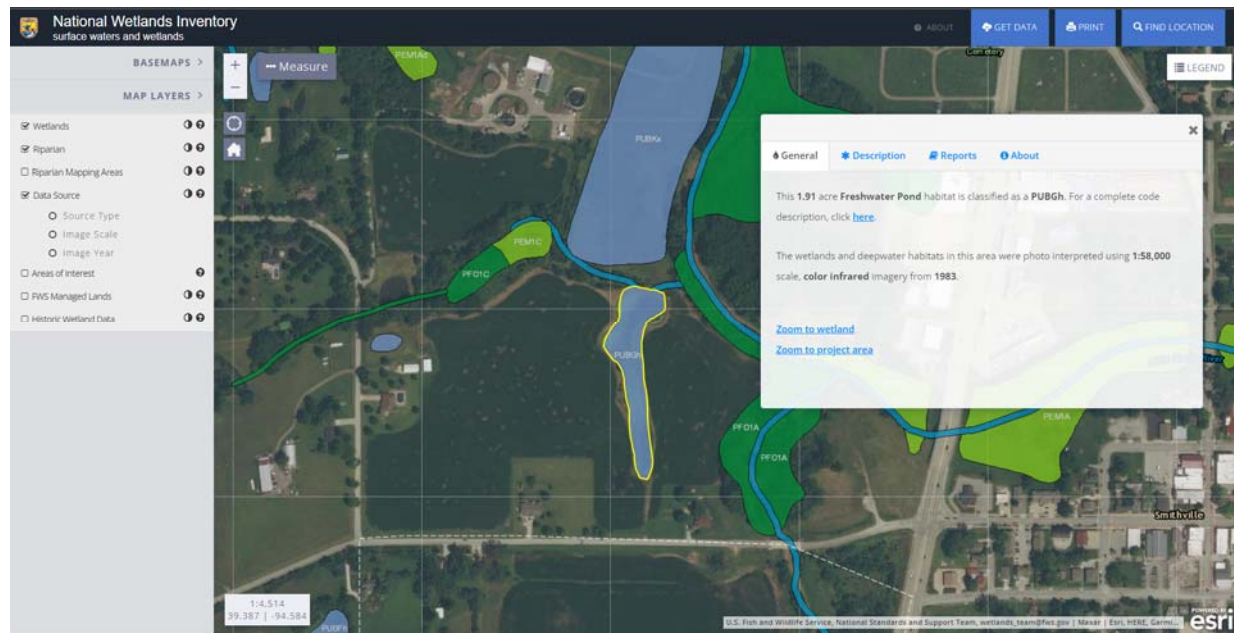


Figure 3: Wetland Inventory Map



The mapping system can be accessed at the following link:

<https://www.fws.gov/program/national-wetlands-inventory/wetlands-mapper>

Soils Report

A web soil survey report was obtained for the property and is in the appendix for review. The report was utilized to determine the hydrologic soil group for the property. The soil consists of a variety of silt loam.

Runoff Coefficients & Methodology

Pre- and post-developed conditions were modeled utilizing HydroCAD version 10.10-4a. Calculations are based on the SCS TR-20 implementation of the SCS runoff curve number (CN) method. Rainfall depths are based on NOAA Atlas 14 for KCI. The HydroCAD software contains a large selection of CN values based on type ground cover, the condition of the ground cover, and soil hydrologic grouping. The CN values correlate with TR55 Table 2-2 and APWA table 5602-3. A copy of TR55 Table 2-2 is in the appendix.

Existing Conditions Analysis

The proposed site is approximately 32 Ac. The land use consists of 26.4 Ac row crop, 3.3 Ac trees, and 1.6 Ac of pond water surface. A soils map and a map of the pre-developed drainage areas are in the appendix. The soils map summarizes soil type and hydrologic grouping. The hydrologic soil group of the site ranges from B to D. Curve numbers were chosen according to the hydrologic soil group.

Figure 4 represents the pre-developed drainage areas. The subarea names correlate with the HydroCAD report in the appendix. The composite curve number for each subarea is a weighted average. The composite CN is calculated as follows: $CN_{comp} = (A_1(CN_1) + \dots + A_n(CN_n)) / A_{tot}$

Figure 4: Pre-Developed Drainage

The time of concentration (T_c) was limited to 5-minutes for each subarea area per APWA 5602.7 requirement for inlet time.

| Subarea Name | Area (Ac) | CN | Surface Description | Total Area (Ac) | Composite CN |
|--------------|-----------|----|---|-----------------|--------------|
| 1 | 0.534 | 77 | Brush, Fair, HSG D | 4.541 | 85 |
| | 0.704 | 70 | Brush, Fair, HSG C | | |
| | 0.192 | 56 | Brush, Fair, HSG B | | |
| | 0.245 | 81 | Offsite 50-75% Grass cover, Fair, HSG C | | |
| | 0.330 | 91 | Fallow, bare soil, HSG C | | |
| | 1.343 | 94 | Fallow, bare soil, HSG D | | |
| | 0.967 | 91 | Fallow, bare soil, HSG C | | |
| | 0.226 | 86 | Fallow, bare soil, HSG B | | |
| 2 | 1.001 | 82 | Offsite 50-75% Grass cover, Fair, HSG C | 24.688 | 91 |
| | 0.250 | 87 | Offsite Street & Grass, HSG C | | |
| | 2.001 | 80 | Offsite 50-75% Grass cover, Fair, HSG C | | |
| | 1.892 | 91 | Fallow, bare soil, HSG C | | |
| | 7.003 | 94 | Fallow, bare soil, HSG D | | |
| | 10.523 | 91 | Fallow, bare soil, HSG C | | |
| | 0.448 | 86 | Fallow, bare soil, HSG B | | |
| | 1.570 | 98 | Water Surface, HSG C | | |
| 3 | 0.404 | 94 | Fallow, bare soil, HSG D | 0.404 | 94 |
| 4 | 1.498 | 56 | Brush, Fair, HSG B | 4.961 | 76 |
| | 0.388 | 56 | Brush, Fair, HSG B | | |
| | 1.189 | 91 | Fallow, bare soil, HSG C | | |
| | 1.886 | 86 | Fallow, bare soil, HSG B | | |

Figure 5: Pre-Developed Flows

| | Subarea Pre-Developed Flow (cfs) | | | |
|----------|-------------------------------------|--------|------|-------|
| | 1 | 2 | 3 | 4 |
| 10-year | 29.53 | 179.30 | 3.05 | 25.60 |
| 100-year | 51.89 | 298.52 | 4.98 | 49.82 |

Figure 5 summarizes pre-developed flows generated from the site drainage. For additional detail see the HydroCAD output information located in the appendix.

Proposed Conditions Analysis

The proposed project will subdivide the property into 70 lots zoned for a combination of single and multi-family development. CN values for developed areas utilize a 1/4 Ac lot size and 38% impervious surface to represent house roof, driveway, sidewalk, and road. CN values for undisturbed areas were selected based on existing surface type. Figure 6 indicates the post-developed subareas and the developed ground conditions. See the post-developed drainage map in the appendix.

Figure 6: Post-Developed Drainage

| Subarea | | | | Total | Composite |
|---------|-----------|----|---|-----------|-----------|
| Name | Area (Ac) | CN | Surface Description | Area (Ac) | CN |
| 5 | 0.303 | 77 | Brush, Fair, HSG D | 3.490 | 78 |
| | 0.319 | 70 | Brush, Fair, HSG C | | |
| | 0.192 | 56 | Brush, Fair, HSG B | | |
| | 0.167 | 79 | Offsite 50-75% Grass cover, Fair, HSG C | | |
| | 0.113 | 83 | 1/4 acre lots, 38% imp, HSG C | | |
| | 0.546 | 87 | 1/4 acre lots, 38% imp, HSG D | | |
| | 1.509 | 83 | 1/4 acre lots, 38% imp, HSG C | | |
| | 0.341 | 61 | >75% Grass cover, Good, HSG B | | |
| 6 | 1.078 | 82 | Offsite 50-75% Grass cover, Fair, HSG C | 24.445 | 85 |
| | 2.274 | 83 | 1/4 acre lots, 38% imp, HSG C | | |
| | 7.866 | 87 | 1/4 acre lots, 38% imp, HSG D | | |
| | 10.166 | 83 | 1/4 acre lots, 38% imp, HSG C | | |
| | 2.001 | 80 | Offsite 50-75% Grass cover, Fair, HSG C | | |
| | 1.060 | 98 | Water Surface, HSG C | | |
| 7 | 0.578 | 87 | 1/4 acre lots, 38% imp, HSG D | 0.578 | 87 |
| 8 | 0.348 | 75 | 1/4 acre lots, 38% imp, HSG B | 5.846 | 76 |
| | 0.060 | 75 | 1/4 acre lots, 38% imp, HSG B | | |
| | 0.525 | 75 | 1/4 acre lots, 38% imp, HSG B | | |
| | 1.205 | 91 | Fallow, bare soil, HSG C | | |
| | 1.822 | 86 | Fallow, bare soil, HSG B | | |
| | 1.498 | 56 | Brush, Fair, HSG B | | |
| | 0.388 | 56 | Brush, Fair, HSG B | | |

Figure 7: Post-Developed Flows

| | Subarea | | | |
|----------|---------------------------|--------|------|-------|
| | Post-Developed Flow (cfs) | | | |
| | 5 | 6 | 7 | 8 |
| 10-year | 19.08 | 158.94 | 3.92 | 30.16 |
| 100-year | 36.23 | 279.31 | 6.75 | 58.7 |

Figure 7 summarizes the post-develop discharge rate for each subarea. It should be noted that pre-developed subareas 1, 2, 3, 4 are represented by post-developed 5, 6, 7, and 8 respectively. HydroCAD requires each subarea to have a unique ID but they represent the same areas.

Conclusion & Recommendations

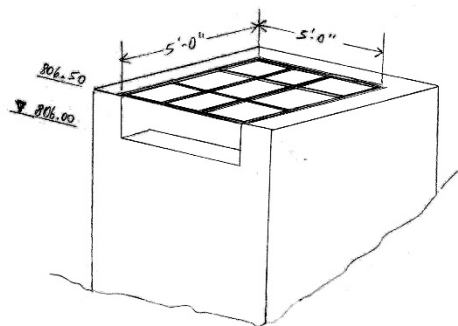
Figure 8 compares pre and post flow rates for the 10-yr and 100-yr events. The net reduction in storm water discharge is -10.69% for the 10-yr and -5.98% for the 100-yr event. The post-developed flows are anticipated to remain lower than those currently generated by the pre-developed site for its current use as a cultivated field.

Figure 8: Pre & Post Flow Comparison

| | Subarea | | | | Total |
|-------------------|---------|---------|--------|--------|---------|
| | 1/5 | 2/6 | 3/7 | 4/8 | |
| Pre 10-yr | 29.53 | 179.3 | 3.05 | 25.6 | 237.48 |
| Post 10-yr | 19.08 | 158.94 | 3.92 | 30.16 | 212.1 |
| 10-yr Net Change | -10.45 | -20.36 | 0.87 | 4.56 | -25.38 |
| 10-yr % Change | -35.39% | -11.36% | 28.52% | 17.81% | -10.69% |
| Pre 100-yr | 51.89 | 298.52 | 4.98 | 49.82 | 405.21 |
| Post 100-yr | 36.23 | 279.31 | 6.75 | 58.70 | 380.99 |
| 100-yr Net Change | -15.66 | -19.21 | 1.77 | 8.88 | -24.22 |
| 100-yr % Change | -30.18% | -6.44% | 35.54% | 17.82% | -5.98% |

The development will utilize the existing pond as recreational open space. The pond will be deepened and reshaped to fit the plat footprint. Approximately 24.4 Ac (sub-area 6) of the development will drain to the pond. Preliminary pond routing was completed as part of this analysis.

Figure 9: Preliminary Discharge Box

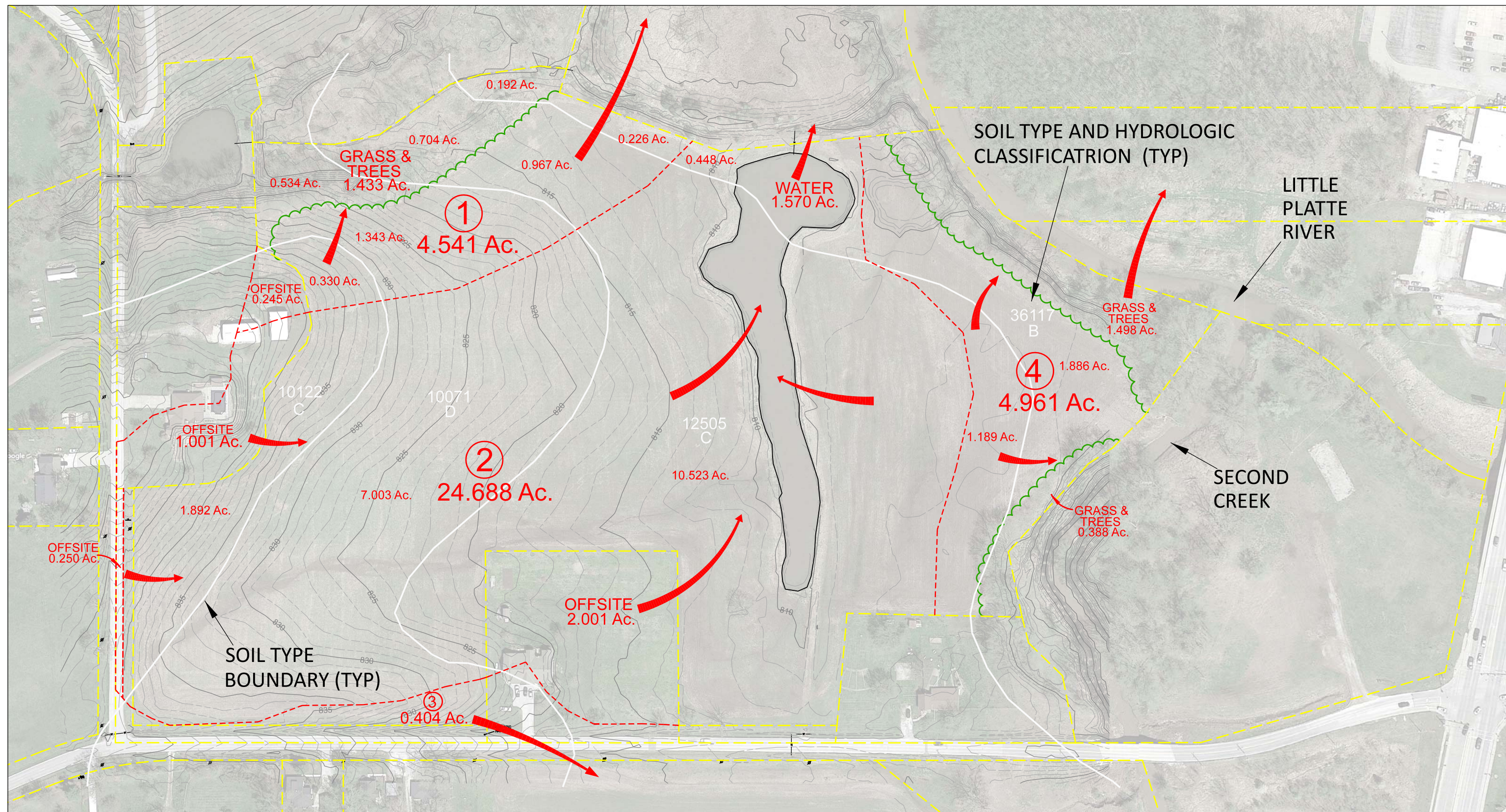


Preliminary design indicates pond discharge can be controlled using a vertical 5'x5' open-top concrete structure. See figure 9 for a sketch of the structure. A 5' weir opening on the front face will control small events and establish a full pond elevation of 806.00. The open top of the structure is 806.50 to allow full overflow. The top of the box will be equipped with a steel grate to prevent large objects from entering the box. A 4'x4' horizontal box culvert will convey flow through the dam and discharge north of the lake.

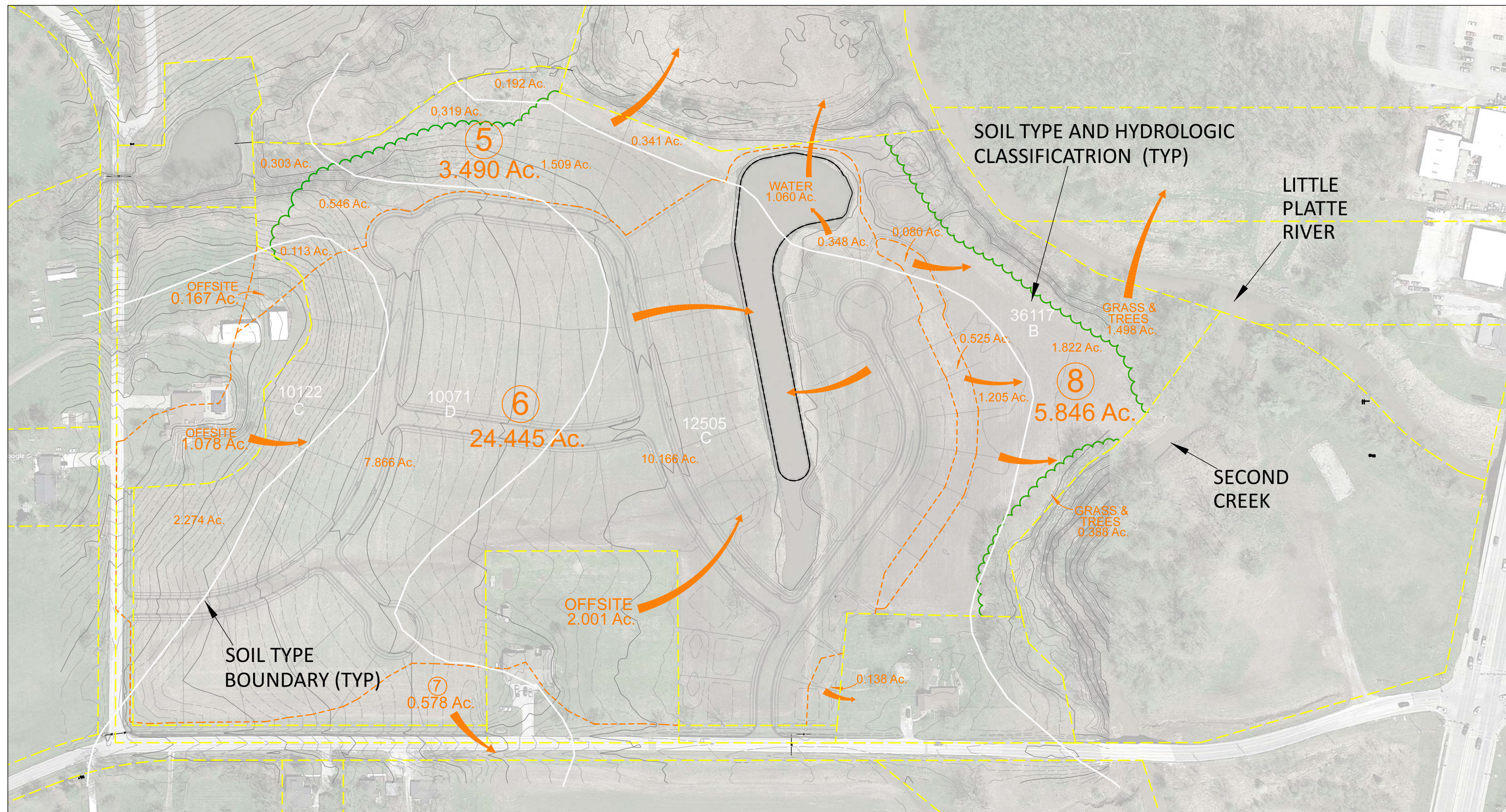
When the 24.4 ac of drainage is routed through the pond, the total post-developed flow rates from the site are 158 cfs and 263 cfs for the 10-yr and 100-yr events, respectively.

APPENDIX

- Pre-Develop Site Map
- Post Developed Site Map
- NRCS Soil Report
- TR55, Table 2-2 CN Values
- HydroCAD Report



PRE-DEVELOPED DRAINAGE
(NOT TO SCALE)



POST-DEVELOPED DRAINAGE
(NOT TO SCALE)



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 **Clay County, Missouri**

2nd Creek Meadows



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Custom Soil Resource Report Soil Map



Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|------------------------------------|--|--------------|----------------|
| 10071 | Ladoga silt loam, 5 to 9 percent slopes, eroded | 14.6 | 25.8% |
| 10122 | Sharpsburg silt loam, 5 to 9 percent slopes, eroded | 5.9 | 10.5% |
| 12505 | Wiota silt loam, 0 to 2 percent slopes | 20.5 | 36.2% |
| 36117 | Nodaway silt loam, heavy till, 0 to 2 percent slopes, occasionally flooded | 15.1 | 26.7% |
| 99003 | Miscellaneous water | 0.5 | 0.9% |
| Totals for Area of Interest | | 56.5 | 100.0% |

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

Custom Soil Resource Report

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.

Clay County, Missouri

10071—Ladoga silt loam, 5 to 9 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2qkz1

Elevation: 600 to 1,350 feet

Mean annual precipitation: 33 to 41 inches

Mean annual air temperature: 48 to 55 degrees F

Frost-free period: 175 to 220 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Ladoga and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ladoga

Setting

Landform: Ridges

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Crest

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Loess

Typical profile

Ap - 0 to 7 inches: silt loam

Bt - 7 to 46 inches: silty clay

C - 46 to 60 inches: silty clay loam

Properties and qualities

Slope: 5 to 9 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well 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 30 to 42 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: D

Ecological site: R109XY002MO - Loess Upland Prairie

Other vegetative classification: Mixed/Transitional (Mixed Native Vegetation)

Hydric soil rating: No

Minor Components

Sampsel

Percent of map unit: 5 percent

Landform: Ridges

Landform position (two-dimensional): Summit, backslope

Landform position (three-dimensional): Crest

Down-slope shape: Convex, concave

Across-slope shape: Convex, concave

Ecological site: R109XY010MO - Interbedded Sedimentary Upland Savanna

Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)

Hydric soil rating: Yes

Gara, moderately eroded

Percent of map unit: 5 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Convex

Ecological site: R109XY046MO - Till Upland Savanna

Hydric soil rating: No

Armstrong, moderately eroded

Percent of map unit: 5 percent

Landform: Hillslopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Convex

Ecological site: R109XY046MO - Till Upland Savanna

Hydric soil rating: No

10122—Sharpsburg silt loam, 5 to 9 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2yy7x

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: Farmland of statewide importance

Map Unit Composition

Sharpsburg, eroded, and similar soils: 95 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sharpsburg, Eroded

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess

Typical profile

Ap - 0 to 6 inches: silt loam
A - 6 to 8 inches: silty clay loam
Bt1 - 8 to 18 inches: silty clay loam
Bt2 - 18 to 46 inches: silty clay loam
BC - 46 to 58 inches: silty clay loam
C - 58 to 79 inches: silty clay loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 45 to 50 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R107XB007MO - Loess Upland Prairie
Hydric soil rating: No

Minor Components

Higginsville, eroded

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

12505—Wiota silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2qmt3
Elevation: 480 to 1,400 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

Wiota and similar soils: 94 percent
Minor components: 6 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wiota

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 29 inches: silt loam
Bt - 29 to 48 inches: silty clay loam
C - 48 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very high (about 12.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: C
Ecological site: R109XY034MO - Loamy Terrace Savanna
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: No

Minor Components

Bremer

Percent of map unit: 3 percent
Landform: Flood-plain steps
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R107XB021MO - Wet Terrace Savanna
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: Yes

Vesser

Percent of map unit: 3 percent
Landform: Flood-plain steps
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: R107XB019MO - Wet Floodplain Prairie
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: Yes

36117—Nodaway silt loam, heavy till, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 2t4yr
Elevation: 500 to 1,400 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 177 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Nodaway and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nodaway

Setting

Landform: Flood-plain steps
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium

Typical profile

Ap - 0 to 8 inches: silt loam
C - 8 to 79 inches: silt loam

Custom Soil Resource Report

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 36 to 60 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very high (about 13.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: F109XY030MO - Loamy Floodplain Forest
Hydric soil rating: No

Minor Components

Zook

Percent of map unit: 10 percent
Landform: Flood-plain steps
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R107XB019MO - Wet Floodplain Prairie
Hydric soil rating: Yes

Mt. sterling

Percent of map unit: 5 percent
Landform: Flood-plain steps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R107XB019MO - Wet Floodplain Prairie
Hydric soil rating: Yes

99003—Miscellaneous water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Table 2-2a Runoff curve numbers for urban areas ^{1/}

| Cover description | | Curve numbers for hydrologic soil group | | | |
|--|---|---|----|----|----|
| Cover type and hydrologic condition | Average percent impervious area ^{2/} | A | B | C | D |
| Fully developed urban areas (vegetation established) | | | | | |
| Open space (lawns, parks, golf courses, cemeteries, etc.) ^{3/} : | | | | | |
| Poor condition (grass cover < 50%) | | 68 | 79 | 86 | 89 |
| Fair condition (grass cover 50% to 75%) | | 49 | 69 | 79 | 84 |
| Good condition (grass cover > 75%) | | 39 | 61 | 74 | 80 |
| Impervious areas: | | | | | |
| Paved parking lots, roofs, driveways, etc. (excluding right-of-way) | | 98 | 98 | 98 | 98 |
| Streets and roads: | | | | | |
| Paved; curbs and storm sewers (excluding right-of-way) | | 98 | 98 | 98 | 98 |
| Paved; open ditches (including right-of-way) | | 83 | 89 | 92 | 93 |
| Gravel (including right-of-way) | | 76 | 85 | 89 | 91 |
| Dirt (including right-of-way) | | 72 | 82 | 87 | 89 |
| Western desert urban areas: | | | | | |
| Natural desert landscaping (pervious areas only) ^{4/} | | 63 | 77 | 85 | 88 |
| Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders) | | 96 | 96 | 96 | 96 |
| Urban districts: | | | | | |
| Commercial and business | 85 | 89 | 92 | 94 | 95 |
| Industrial | 72 | 81 | 88 | 91 | 93 |
| Residential districts by average lot size: | | | | | |
| 1/8 acre or less (town houses) | 65 | 77 | 85 | 90 | 92 |
| 1/4 acre | 38 | 61 | 75 | 83 | 87 |
| 1/3 acre | 30 | 57 | 72 | 81 | 86 |
| 1/2 acre | 25 | 54 | 70 | 80 | 85 |
| 1 acre | 20 | 51 | 68 | 79 | 84 |
| 2 acres | 12 | 46 | 65 | 77 | 82 |
| Developing urban areas | | | | | |
| Newly graded areas (pervious areas only, no vegetation) ^{5/} | | 77 | 86 | 91 | 94 |
| Idle lands (CN's are determined using cover types similar to those in table 2-2c). | | | | | |

¹ Average runoff condition, and $I_a = 0.2S$.² The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.³ CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.⁴ Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.⁵ Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands ^{1/}

| Cover description | | | Curve numbers for hydrologic soil group | | | |
|--|----------------------------|------------------------------------|---|----|----|----|
| Cover type | Treatment ^{2/} | Hydrologic condition ^{3/} | A | B | C | D |
| Fallow | Bare soil | — | 77 | 86 | 91 | 94 |
| | Crop residue cover (CR) | Poor | 76 | 85 | 90 | 93 |
| | | Good | 74 | 83 | 88 | 90 |
| Row crops | Straight row (SR) | Poor | 72 | 81 | 88 | 91 |
| | | Good | 67 | 78 | 85 | 89 |
| | SR + CR | Poor | 71 | 80 | 87 | 90 |
| | | Good | 64 | 75 | 82 | 85 |
| | Contoured (C) | Poor | 70 | 79 | 84 | 88 |
| | | Good | 65 | 75 | 82 | 86 |
| | C + CR | Poor | 69 | 78 | 83 | 87 |
| | | Good | 64 | 74 | 81 | 85 |
| | Contoured & terraced (C&T) | Poor | 66 | 74 | 80 | 82 |
| | | Good | 62 | 71 | 78 | 81 |
| Small grain | SR | Poor | 65 | 76 | 84 | 88 |
| | | Good | 63 | 75 | 83 | 87 |
| | SR + CR | Poor | 64 | 75 | 83 | 86 |
| | | Good | 60 | 72 | 80 | 84 |
| | C | Poor | 63 | 74 | 82 | 85 |
| | | Good | 61 | 73 | 81 | 84 |
| | C + CR | Poor | 62 | 73 | 81 | 84 |
| | | Good | 60 | 72 | 80 | 83 |
| | C&T | Poor | 61 | 72 | 79 | 82 |
| | | Good | 59 | 70 | 78 | 81 |
| Close-seeded or broadcast legumes or rotation meadow | C&T+ CR | Poor | 60 | 71 | 78 | 81 |
| | | Good | 58 | 69 | 77 | 80 |
| | SR | Poor | 66 | 77 | 85 | 89 |
| | | Good | 58 | 72 | 81 | 85 |
| | C | Poor | 64 | 75 | 83 | 85 |
| | | Good | 55 | 69 | 78 | 83 |
| | C&T | Poor | 63 | 73 | 80 | 83 |
| | | Good | 51 | 67 | 76 | 80 |

¹ Average runoff condition, and $I_a=0.2S$ ² Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.³ Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good $\geq 20\%$), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-2c Runoff curve numbers for other agricultural lands ^{1/}

| Cover description | | Curve numbers for hydrologic soil group | | | |
|--|----------------------|---|----|----|----|
| Cover type | Hydrologic condition | A | B | C | D |
| Pasture, grassland, or range—continuous forage for grazing. ^{2/} | Poor | 68 | 79 | 86 | 89 |
| | Fair | 49 | 69 | 79 | 84 |
| | Good | 39 | 61 | 74 | 80 |
| Meadow—continuous grass, protected from grazing and generally mowed for hay. | — | 30 | 58 | 71 | 78 |
| Brush—brush-weed-grass mixture with brush the major element. ^{3/} | Poor | 48 | 67 | 77 | 83 |
| | Fair | 35 | 56 | 70 | 77 |
| | Good | 30 ^{4/} | 48 | 65 | 73 |
| Woods—grass combination (orchard or tree farm). ^{5/} | Poor | 57 | 73 | 82 | 86 |
| | Fair | 43 | 65 | 76 | 82 |
| | Good | 32 | 58 | 72 | 79 |
| Woods. ^{6/} | Poor | 45 | 66 | 77 | 83 |
| | Fair | 36 | 60 | 73 | 79 |
| | Good | 30 ^{4/} | 55 | 70 | 77 |
| Farmsteads—buildings, lanes, driveways, and surrounding lots. | — | 59 | 74 | 82 | 86 |

¹ Average runoff condition, and $I_a = 0.2S$.² **Poor:** <50% ground cover or heavily grazed with no mulch.**Fair:** 50 to 75% ground cover and not heavily grazed.**Good:** > 75% ground cover and lightly or only occasionally grazed.³ **Poor:** <50% ground cover.**Fair:** 50 to 75% ground cover.**Good:** >75% ground cover.⁴ Actual curve number is less than 30; use CN = 30 for runoff computations.⁵ CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.⁶ **Poor:** Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.**Fair:** Woods are grazed but not burned, and some forest litter covers the soil.**Good:** Woods are protected from grazing, and litter and brush adequately cover the soil.

Table 2-2d Runoff curve numbers for arid and semiarid rangelands ^{1/}

| Cover description | | Curve numbers for hydrologic soil group | | | |
|--|------------------------------------|---|----|----|----|
| Cover type | Hydrologic condition ^{2/} | A ^{3/} | B | C | D |
| Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element. | Poor | | 80 | 87 | 93 |
| | Fair | | 71 | 81 | 89 |
| | Good | | 62 | 74 | 85 |
| Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush. | Poor | | 66 | 74 | 79 |
| | Fair | | 48 | 57 | 63 |
| | Good | | 30 | 41 | 48 |
| Pinyon-juniper—pinyon, juniper, or both; grass understory. | Poor | | 75 | 85 | 89 |
| | Fair | | 58 | 73 | 80 |
| | Good | | 41 | 61 | 71 |
| Sagebrush with grass understory. | Poor | | 67 | 80 | 85 |
| | Fair | | 51 | 63 | 70 |
| | Good | | 35 | 47 | 55 |
| Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus. | Poor | 63 | 77 | 85 | 88 |
| | Fair | 55 | 72 | 81 | 86 |
| | Good | 49 | 68 | 79 | 84 |

¹ Average runoff condition, and $I_a = 0.2S$. For range in humid regions, use table 2-2c.² Poor: <30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: > 70% ground cover.

³ Curve numbers for group A have been developed only for desert shrub.

2nd Creek Meadows Preliminary Drainage

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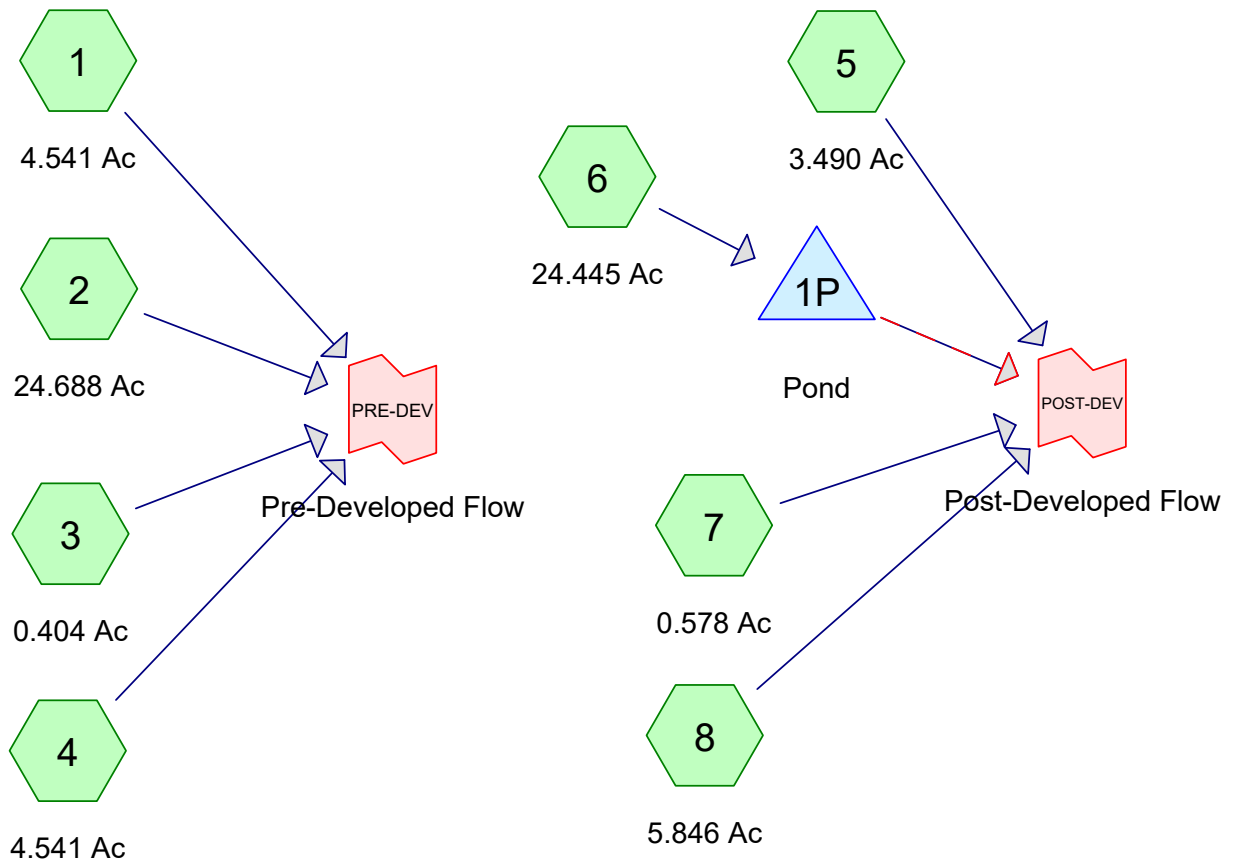
- 1 Routing Diagram

10-Year Event

- 2 Subcat 1: 4.541 Ac
- 3 Subcat 2: 24.688 Ac
- 4 Subcat 3: 0.404 Ac
- 5 Subcat 4: 4.541 Ac
- 6 Subcat 5: 3.490 Ac
- 7 Subcat 6: 24.445 Ac
- 8 Subcat 7: 0.578 Ac
- 9 Subcat 8: 5.846 Ac
- 10 Pond 1P: Pond
- 12 Link POST-DEV: Post-Developed Flow
- 13 Link PRE-DEV: Pre-Developed Flow

100-Year Event

- 14 Subcat 1: 4.541 Ac
- 15 Subcat 2: 24.688 Ac
- 16 Subcat 3: 0.404 Ac
- 17 Subcat 4: 4.541 Ac
- 18 Subcat 5: 3.490 Ac
- 19 Subcat 6: 24.445 Ac
- 20 Subcat 7: 0.578 Ac
- 21 Subcat 8: 5.846 Ac
- 22 Pond 1P: Pond
- 24 Link POST-DEV: Post-Developed Flow
- 25 Link PRE-DEV: Pre-Developed Flow



2nd Creek Meadows Preliminary Drainage

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Type II 24-hr 10-Year Rainfall=5.31"

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Page 2

Summary for Subcatchment 1: 4.541 Ac

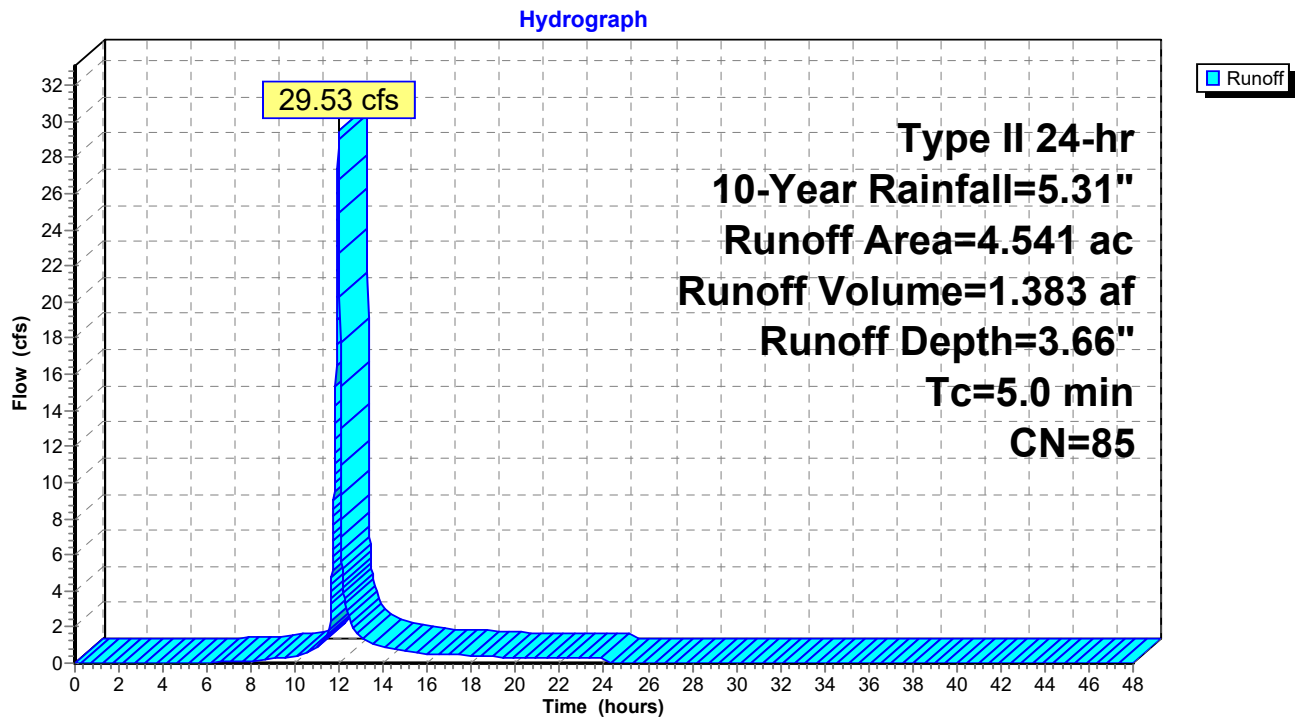
Runoff = 29.53 cfs @ 11.96 hrs, Volume= 1.383 af, Depth= 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=5.31"

| Area (ac) | CN | Description |
|-----------|----|---|
| 0.534 | 77 | Brush, Fair, HSG D |
| 0.704 | 70 | Brush, Fair, HSG C |
| 0.192 | 56 | Brush, Fair, HSG B |
| * 0.245 | 81 | Offsite 50-75% Grass cover, Fair, HSG C |
| 0.330 | 91 | Fallow, bare soil, HSG C |
| 1.343 | 94 | Fallow, bare soil, HSG D |
| 0.967 | 91 | Fallow, bare soil, HSG C |
| 0.226 | 86 | Fallow, bare soil, HSG B |
| 4.541 | 85 | Weighted Average |
| 4.541 | | 100.00% Pervious Area |

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

Subcatchment 1: 4.541 Ac



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Summary for Subcatchment 2: 24.688 Ac

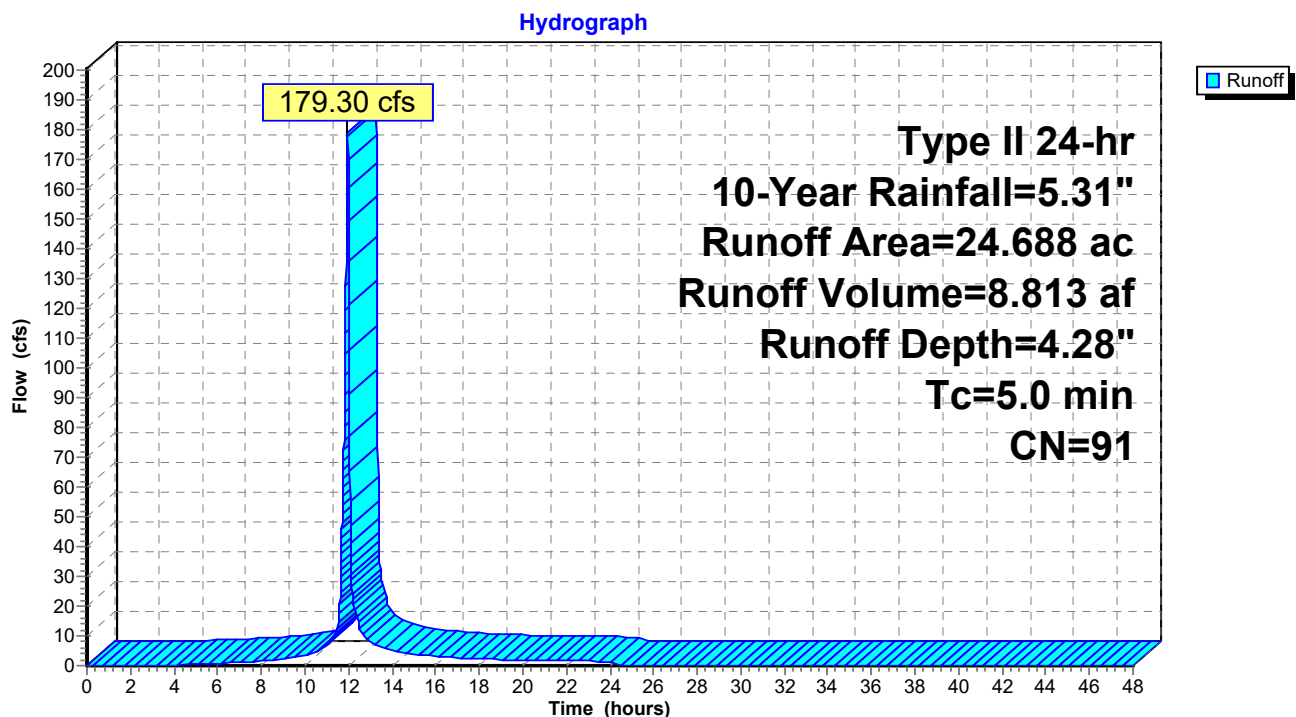
Runoff = 179.30 cfs @ 11.96 hrs, Volume= 8.813 af, Depth= 4.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=5.31"

| Area (ac) | CN | Description |
|-----------|----|---|
| * 1.001 | 82 | Offsite 50-75% Grass cover, Fair, HSG C |
| * 0.250 | 87 | Offsite Street & Grass, HSG C |
| * 2.001 | 80 | Offsite 50-75% Grass cover, Fair, HSG C |
| 1.892 | 91 | Fallow, bare soil, HSG C |
| 7.003 | 94 | Fallow, bare soil, HSG D |
| 10.523 | 91 | Fallow, bare soil, HSG C |
| 0.448 | 86 | Fallow, bare soil, HSG B |
| 1.570 | 98 | Water Surface, HSG C |
| 24.688 | 91 | Weighted Average |
| 23.118 | | 93.64% Pervious Area |
| 1.570 | | 6.36% Impervious Area |

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

Subcatchment 2: 24.688 Ac



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Summary for Subcatchment 3: 0.404 Ac

Runoff = 3.05 cfs @ 11.96 hrs, Volume= 0.155 af, Depth= 4.61"

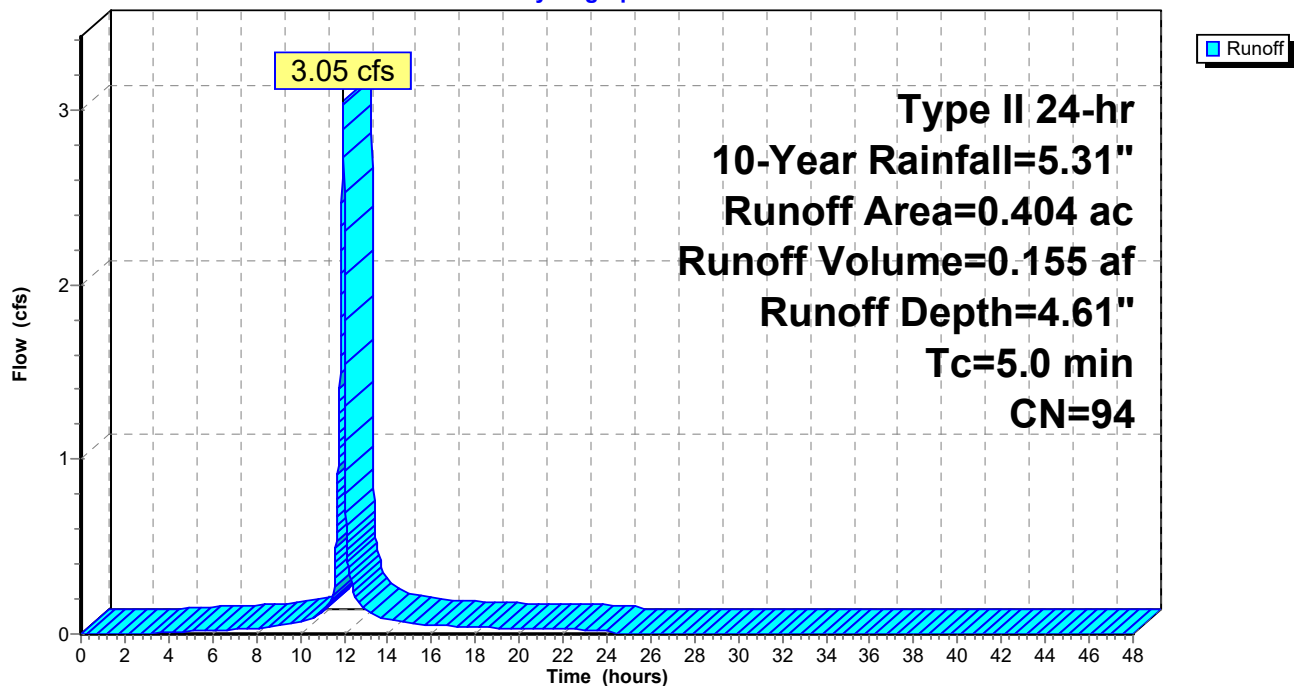
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=5.31"

| Area (ac) | CN | Description |
|-----------|----|--------------------------|
| 0.404 | 94 | Fallow, bare soil, HSG D |
| 0.404 | | 100.00% Pervious Area |

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

Subcatchment 3: 0.404 Ac

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.31"

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Summary for Subcatchment 4: 4.541 Ac

Runoff = 25.60 cfs @ 11.96 hrs, Volume= 1.155 af, Depth= 2.79"

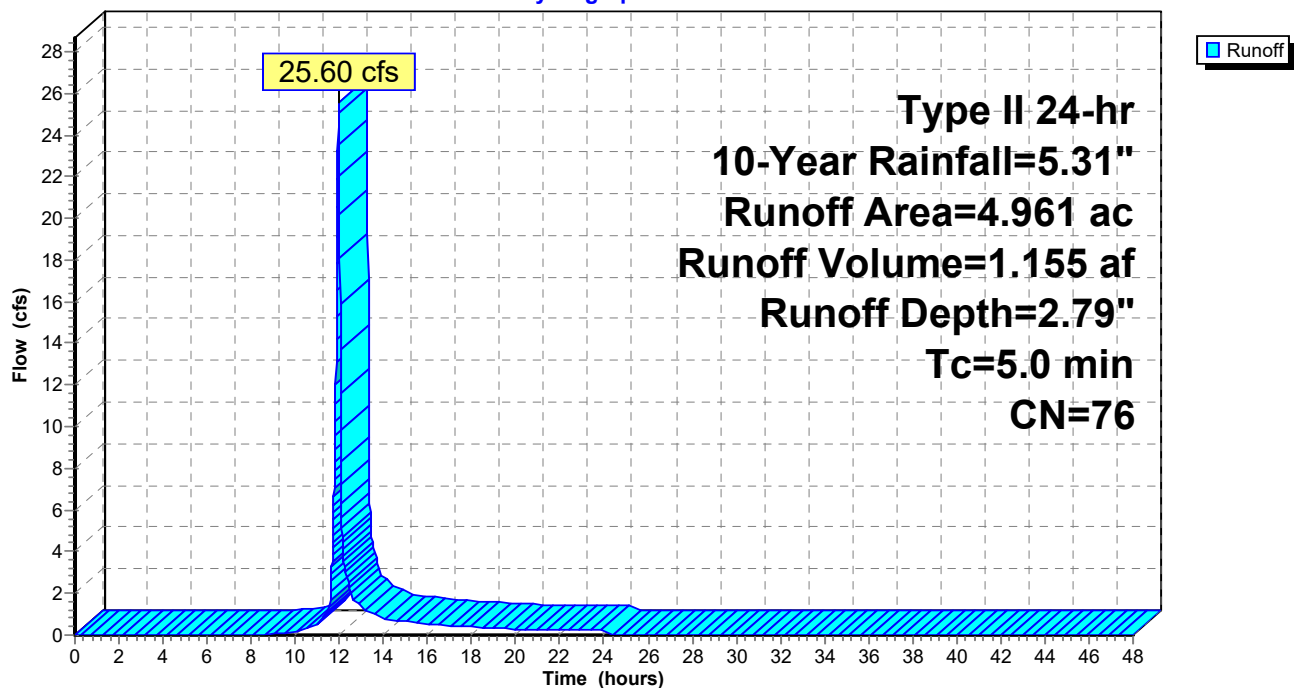
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=5.31"

| Area (ac) | CN | Description |
|-----------|----|--------------------------|
| 1.498 | 56 | Brush, Fair, HSG B |
| 0.388 | 56 | Brush, Fair, HSG B |
| 1.189 | 91 | Fallow, bare soil, HSG C |
| 1.886 | 86 | Fallow, bare soil, HSG B |
| 4.961 | 76 | Weighted Average |
| 4.961 | | 100.00% Pervious Area |

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

Subcatchment 4: 4.541 Ac

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.31"

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Summary for Subcatchment 5: 3.490 Ac

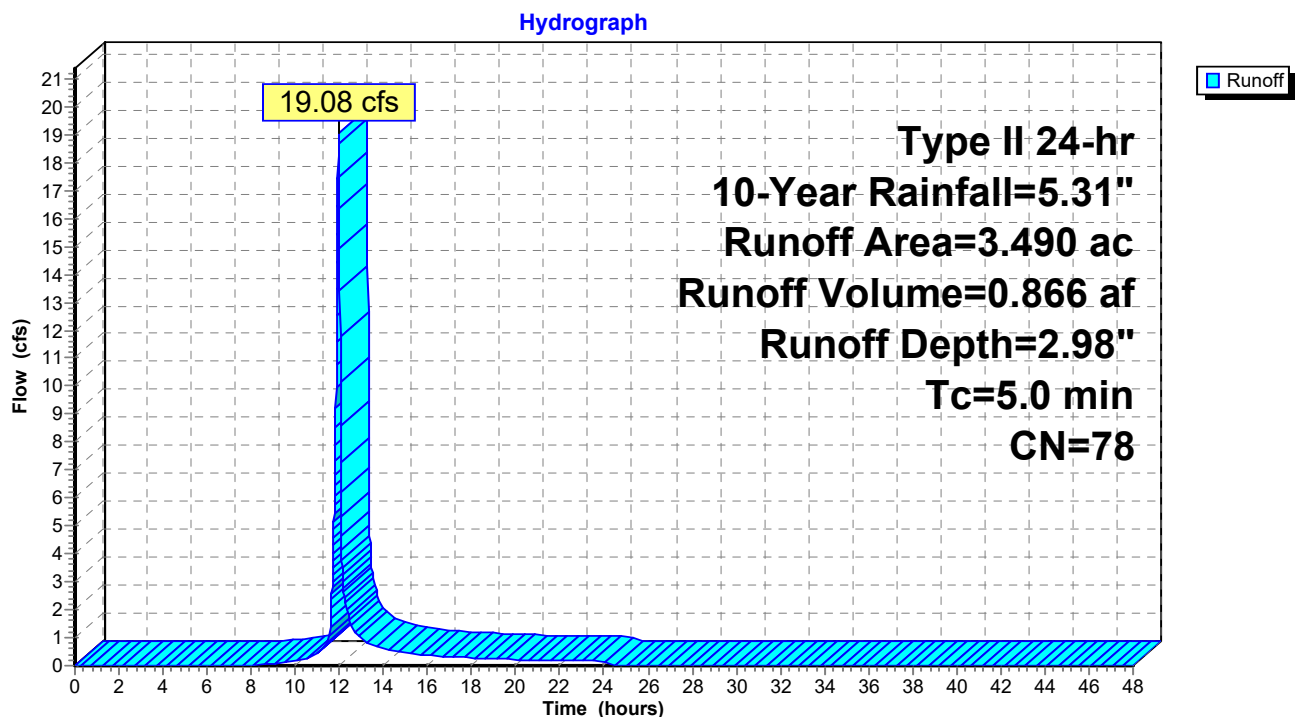
Runoff = 19.08 cfs @ 11.96 hrs, Volume= 0.866 af, Depth= 2.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=5.31"

| Area (ac) | CN | Description |
|-----------|----|---|
| 0.303 | 77 | Brush, Fair, HSG D |
| 0.319 | 70 | Brush, Fair, HSG C |
| 0.192 | 56 | Brush, Fair, HSG B |
| * 0.167 | 79 | Offsite 50-75% Grass cover, Fair, HSG C |
| 0.113 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 0.546 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 1.509 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 0.341 | 61 | >75% Grass cover, Good, HSG B |
| 3.490 | 78 | Weighted Average |
| 2.666 | | 76.39% Pervious Area |
| 0.824 | | 23.61% Impervious Area |

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

Subcatchment 5: 3.490 Ac



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Type II 24-hr 10-Year Rainfall=5.31"

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Summary for Subcatchment 6: 24.445 Ac

Runoff = 158.94 cfs @ 11.96 hrs, Volume= 7.447 af, Depth= 3.66"

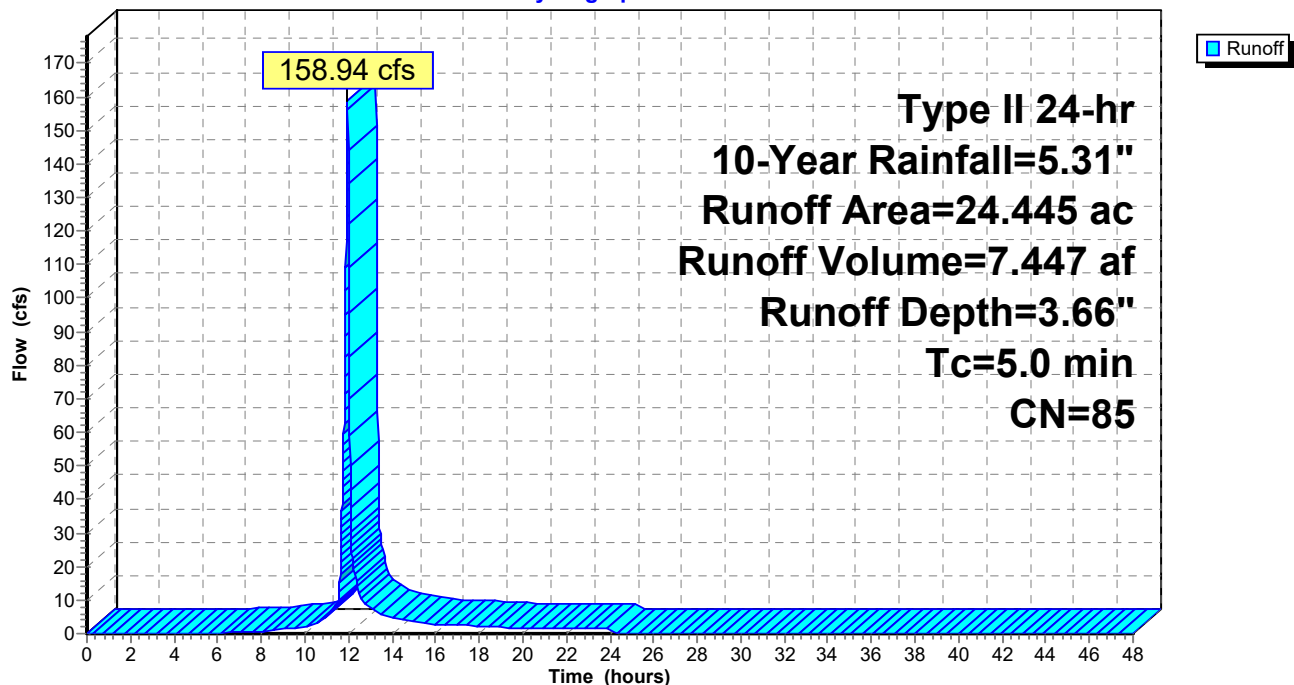
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=5.31"

| Area (ac) | CN | Description |
|-----------|----|---|
| * 1.078 | 82 | Offsite 50-75% Grass cover, Fair, HSG C |
| 2.274 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 7.866 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 10.166 | 83 | 1/4 acre lots, 38% imp, HSG C |
| * 2.001 | 80 | Offsite 50-75% Grass cover, Fair, HSG C |
| 1.060 | 98 | Water Surface, HSG C |
| 24.445 | 85 | Weighted Average |
| 15.669 | | 64.10% Pervious Area |
| 8.776 | | 35.90% Impervious Area |

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

Subcatchment 6: 24.445 Ac

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.31"

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Summary for Subcatchment 7: 0.578 Ac

Runoff = 3.92 cfs @ 11.96 hrs, Volume= 0.186 af, Depth= 3.86"

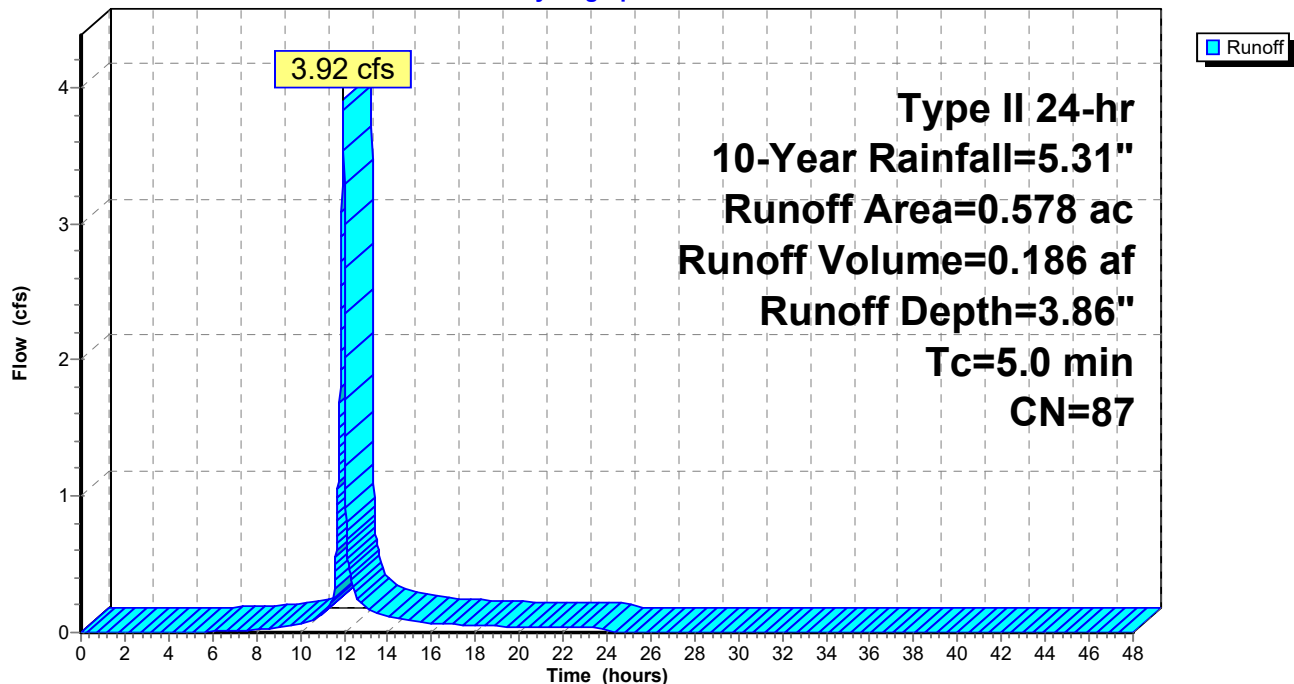
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=5.31"

| Area (ac) | CN | Description |
|-----------|----|-------------------------------|
| 0.578 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 0.358 | | 62.00% Pervious Area |
| 0.220 | | 38.00% Impervious Area |

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

Subcatchment 7: 0.578 Ac

Hydrograph



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Type II 24-hr 10-Year Rainfall=5.31"

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Summary for Subcatchment 8: 5.846 Ac

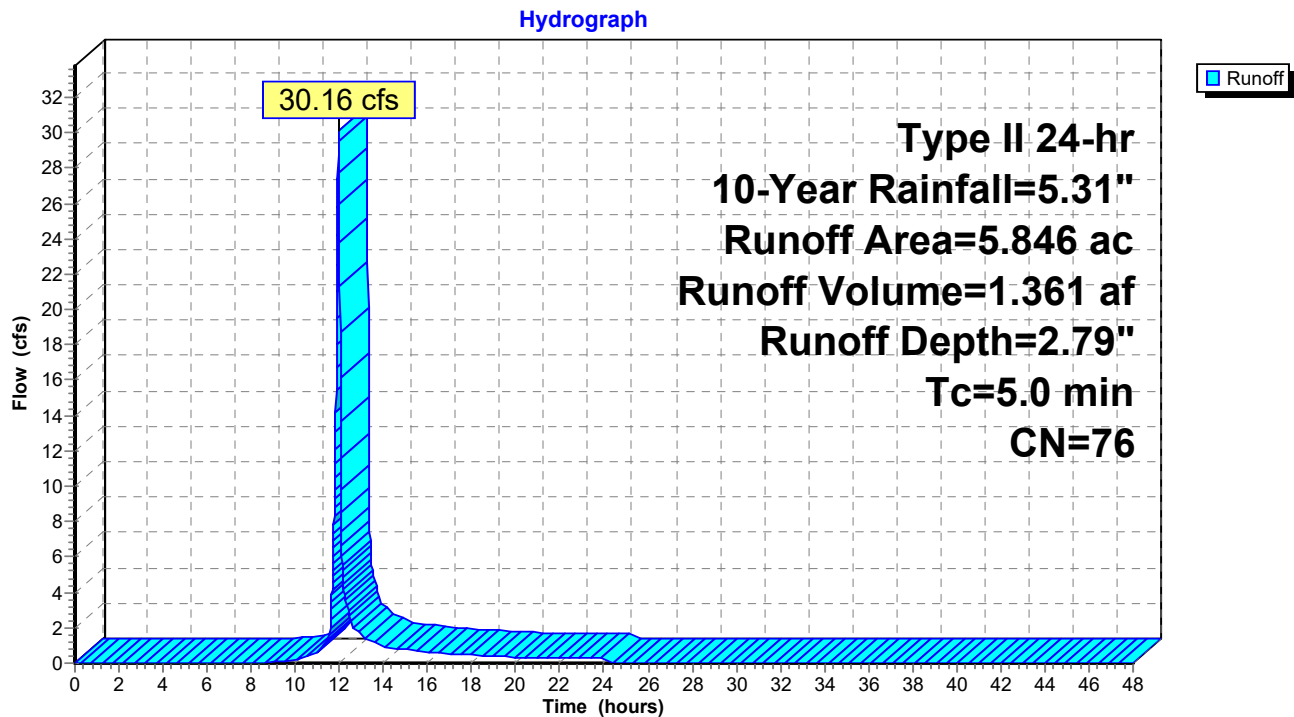
Runoff = 30.16 cfs @ 11.96 hrs, Volume= 1.361 af, Depth= 2.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=5.31"

| Area (ac) | CN | Description |
|-----------|----|-------------------------------|
| 0.348 | 75 | 1/4 acre lots, 38% imp, HSG B |
| 0.060 | 75 | 1/4 acre lots, 38% imp, HSG B |
| 0.525 | 75 | 1/4 acre lots, 38% imp, HSG B |
| 1.205 | 91 | Fallow, bare soil, HSG C |
| 1.822 | 86 | Fallow, bare soil, HSG B |
| 1.498 | 56 | Brush, Fair, HSG B |
| 0.388 | 56 | Brush, Fair, HSG B |
| 5.846 | 76 | Weighted Average |
| 5.491 | | 93.94% Pervious Area |
| 0.355 | | 6.06% Impervious Area |

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

Subcatchment 8: 5.846 Ac



2nd Creek Meadows Preliminary Drainage

Type II 24-hr 10-Year Rainfall=5.31"

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Summary for Pond 1P: Pond

Inflow Area = 24.445 ac, 35.90% Impervious, Inflow Depth = 3.66" for 10-Year event
 Inflow = 158.94 cfs @ 11.96 hrs, Volume= 7.447 af
 Outflow = 113.60 cfs @ 12.02 hrs, Volume= 7.447 af, Atten= 29%, Lag= 3.5 min
 Primary = 113.60 cfs @ 12.02 hrs, Volume= 7.447 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 807.81' @ 12.02 hrs Storage= 76,230 cf

Plug-Flow detention time= 44.2 min calculated for 7.447 af (100% of inflow)

Center-of-Mass det. time= 44.2 min (845.4 - 801.2)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|---------------------------------------|
| #1 | 806.00' | 192,835 cf | Custom Stage Data Listed below |

| Elevation (feet) | Cum.Store (cubic-feet) |
|---------------------|---------------------------|
| 806.00 | 0 |
| 806.25 | 9,844 |
| 806.50 | 19,912 |
| 806.75 | 30,159 |
| 807.00 | 40,589 |
| 807.25 | 51,233 |
| 807.50 | 62,128 |
| 807.75 | 73,281 |
| 808.00 | 84,694 |
| 808.25 | 96,378 |
| 808.50 | 108,346 |
| 808.75 | 120,604 |
| 809.00 | 133,160 |
| 809.25 | 146,686 |
| 809.50 | 161,047 |
| 809.75 | 176,383 |
| 810.00 | 192,835 |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|---------|---|
| #1 | Primary | 802.00' | 48.0" W x 48.0" H Box 4'x4' Rectangular Box Culvert L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 802.00' / 801.60' S= 0.0100 1' Cc= 0.900 n= 0.012, Flow Area= 16.00 sf |
| #2 | Device 1 | 806.00' | 5.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) |
| #3 | Device 1 | 806.50' | 60.0" x 60.0" Horiz. 5'x5' Horizontal Overflow C= 0.600 Limited to weir flow at low heads |
| #4 | Secondary | 809.00' | 40' Wide Earth Formed Spillway, C= 3.27 Offset (feet) 0.00 4.00 34.00 38.00 Elev. (feet) 810.00 809.00 809.00 810.00 |

2nd Creek Meadows Preliminary Drainage

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Type II 24-hr 10-Year Rainfall=5.31"

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Primary OutFlow Max=113.46 cfs @ 12.02 hrs HW=807.81' (Free Discharge)

1=4'x4' Rectangular Box Culvert (Passes 113.46 cfs of 147.88 cfs potential flow)

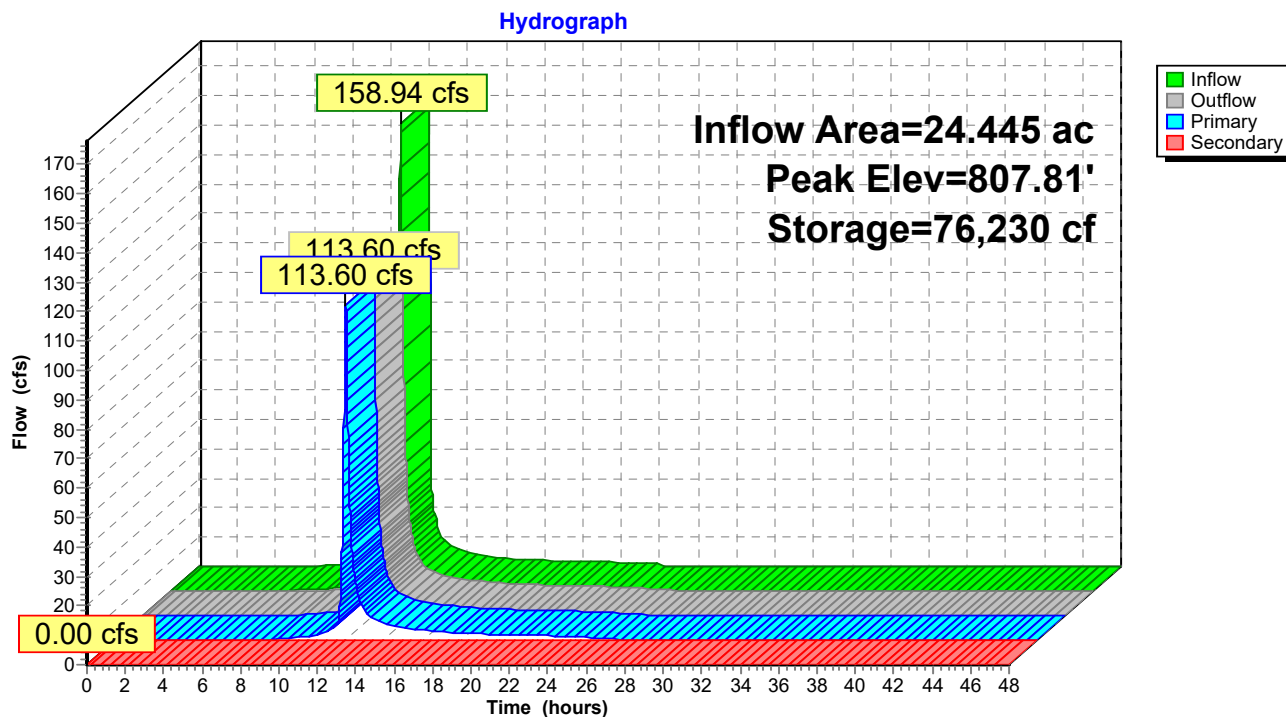
2=Sharp-Crested Rectangular Weir (Orifice Controls 15.01 cfs @ 6.13 fps)

3=5'x5' Horizontal Overflow (Weir Controls 98.45 cfs @ 3.75 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=806.00' (Free Discharge)

4=40' Wide Earth Formed Spillway (Controls 0.00 cfs)

Pond 1P: Pond



2nd Creek Meadows Preliminary Drainage

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Type II 24-hr 10-Year Rainfall=5.31"

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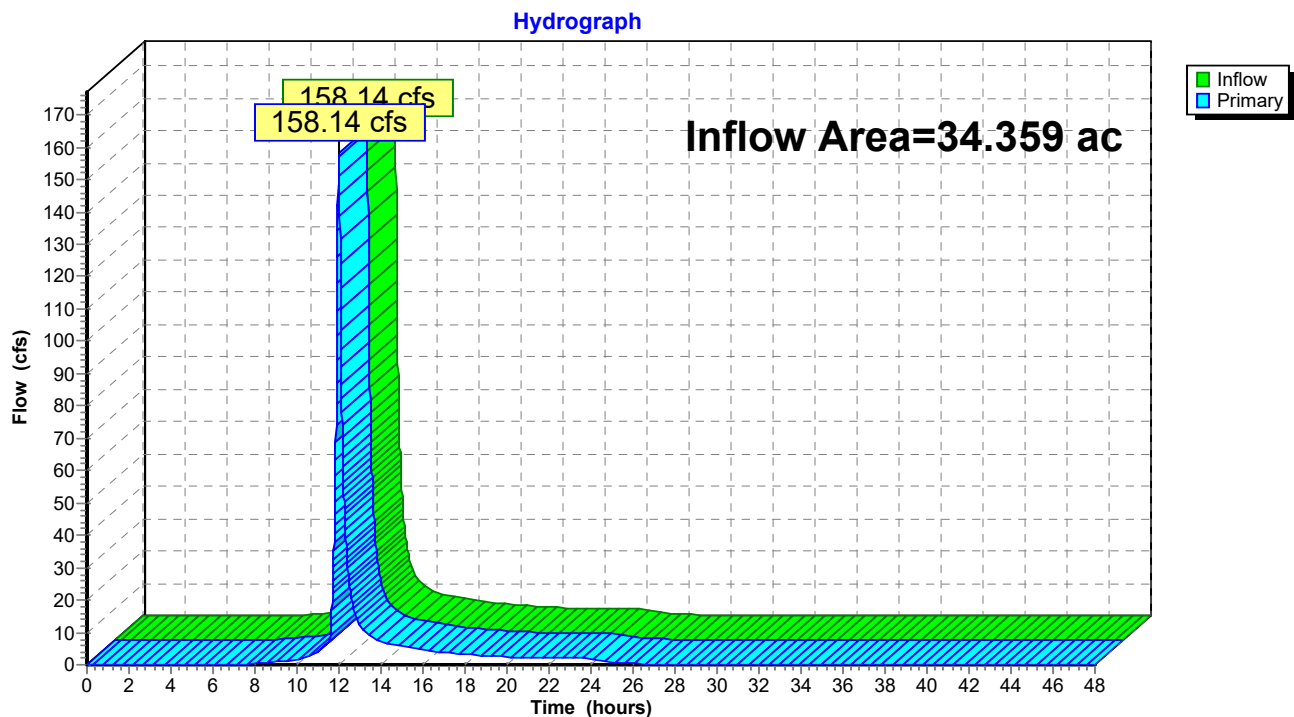
Page 12

Summary for Link POST-DEV: Post-Developed Flow

Inflow Area = 34.359 ac, 29.61% Impervious, Inflow Depth = 3.44" for 10-Year event
Inflow = 158.14 cfs @ 11.99 hrs, Volume= 9.859 af
Primary = 158.14 cfs @ 11.99 hrs, Volume= 9.859 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link POST-DEV: Post-Developed Flow



2nd Creek Meadows Preliminary Drainage

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Type II 24-hr 10-Year Rainfall=5.31"

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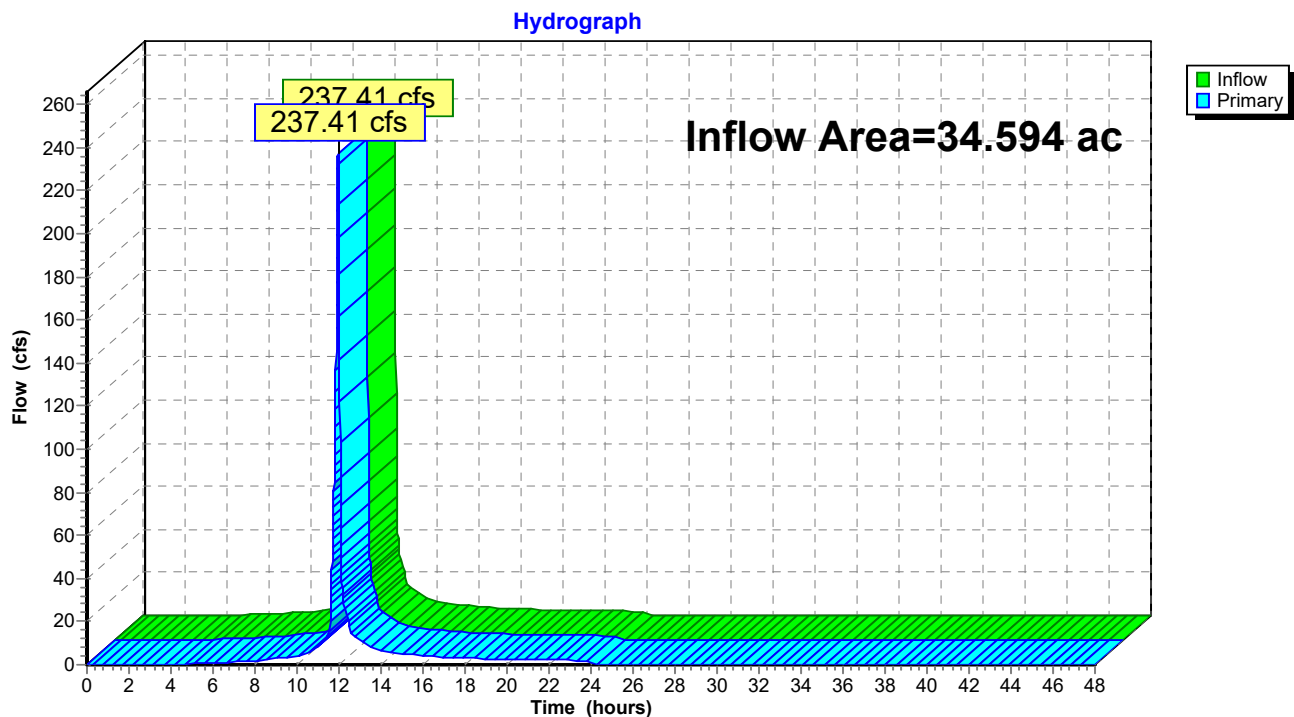
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Summary for Link PRE-DEV: Pre-Developed Flow

Inflow Area = 34.594 ac, 4.54% Impervious, Inflow Depth = 3.99" for 10-Year event
Inflow = 237.41 cfs @ 11.96 hrs, Volume= 11.506 af
Primary = 237.41 cfs @ 11.96 hrs, Volume= 11.506 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link PRE-DEV: Pre-Developed Flow



2nd Creek Meadows Preliminary Drainage

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Type II 24-hr 100-Year Rainfall=8.48"

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Summary for Subcatchment 1: 4.541 Ac

Runoff = 51.89 cfs @ 11.96 hrs, Volume= 2.527 af, Depth= 6.68"

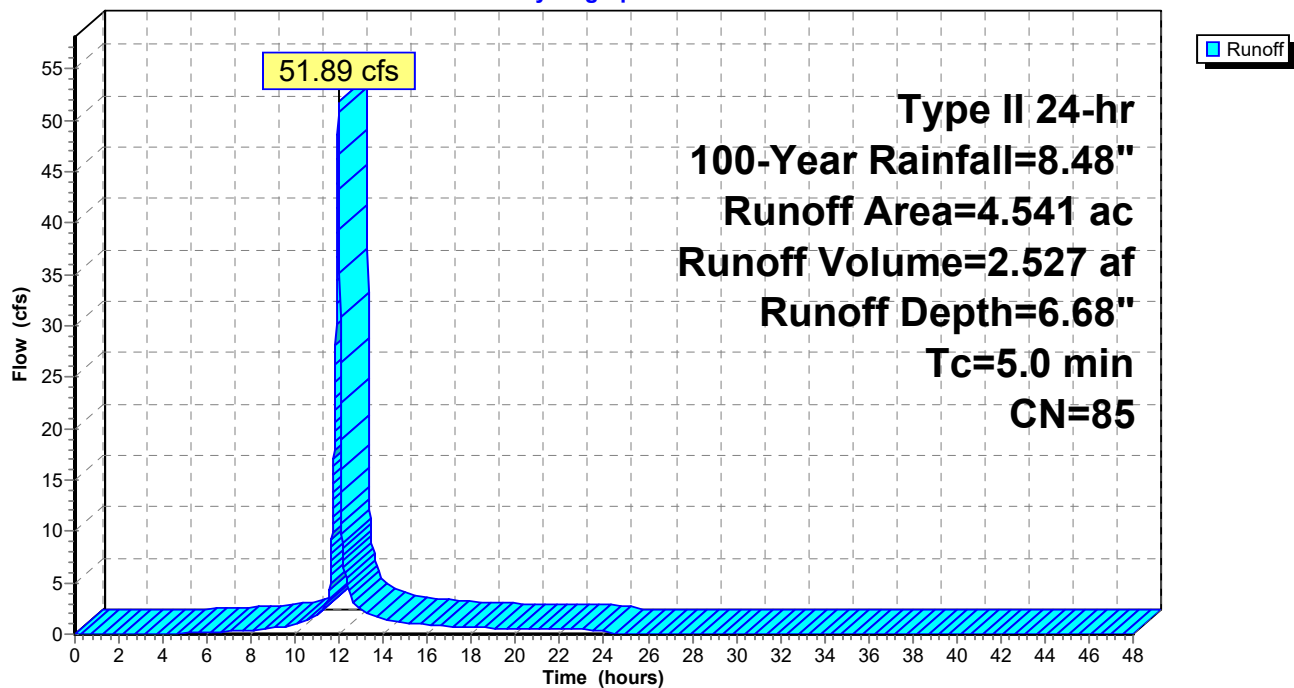
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=8.48"

| Area (ac) | CN | Description |
|-----------|----|---|
| 0.534 | 77 | Brush, Fair, HSG D |
| 0.704 | 70 | Brush, Fair, HSG C |
| 0.192 | 56 | Brush, Fair, HSG B |
| * 0.245 | 81 | Offsite 50-75% Grass cover, Fair, HSG C |
| 0.330 | 91 | Fallow, bare soil, HSG C |
| 1.343 | 94 | Fallow, bare soil, HSG D |
| 0.967 | 91 | Fallow, bare soil, HSG C |
| 0.226 | 86 | Fallow, bare soil, HSG B |
| 4.541 | 85 | Weighted Average |
| 4.541 | | 100.00% Pervious Area |

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

Subcatchment 1: 4.541 Ac

Hydrograph



2nd Creek Meadows Preliminary Drainage

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Type II 24-hr 100-Year Rainfall=8.48"

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Summary for Subcatchment 2: 24.688 Ac

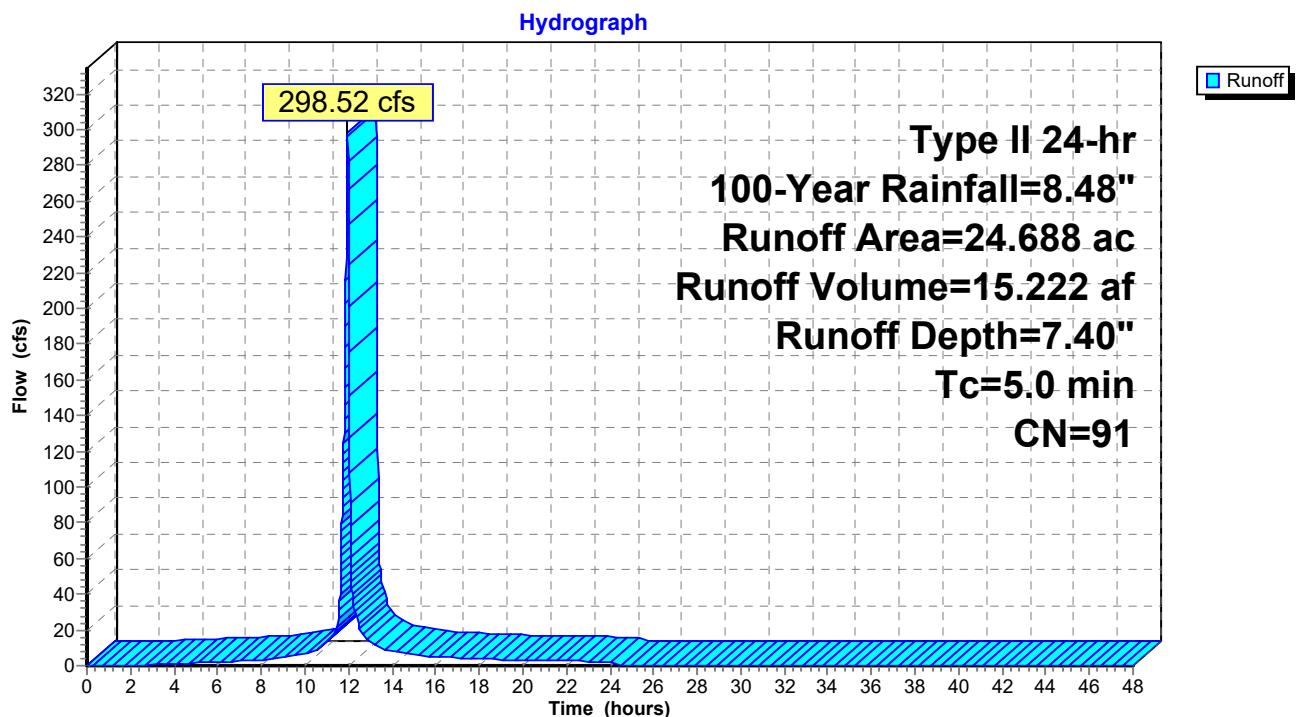
Runoff = 298.52 cfs @ 11.96 hrs, Volume= 15.222 af, Depth= 7.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=8.48"

| Area (ac) | CN | Description |
|-----------|----|---|
| * 1.001 | 82 | Offsite 50-75% Grass cover, Fair, HSG C |
| * 0.250 | 87 | Offsite Street & Grass, HSG C |
| * 2.001 | 80 | Offsite 50-75% Grass cover, Fair, HSG C |
| 1.892 | 91 | Fallow, bare soil, HSG C |
| 7.003 | 94 | Fallow, bare soil, HSG D |
| 10.523 | 91 | Fallow, bare soil, HSG C |
| 0.448 | 86 | Fallow, bare soil, HSG B |
| 1.570 | 98 | Water Surface, HSG C |
| 24.688 | 91 | Weighted Average |
| 23.118 | | 93.64% Pervious Area |
| 1.570 | | 6.36% Impervious Area |

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

Subcatchment 2: 24.688 Ac



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Type II 24-hr 100-Year Rainfall=8.48"

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Summary for Subcatchment 3: 0.404 Ac

Runoff = 4.98 cfs @ 11.96 hrs, Volume= 0.261 af, Depth= 7.76"

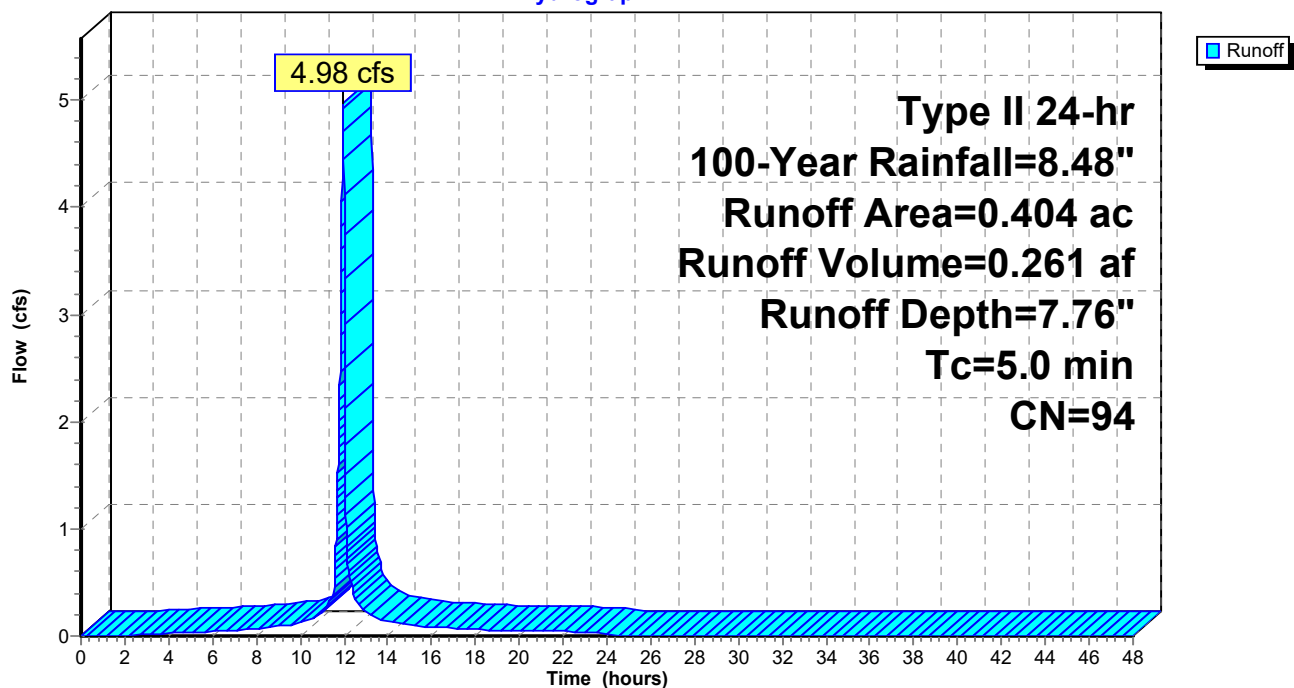
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=8.48"

| Area (ac) | CN | Description |
|-----------|----|--------------------------|
| 0.404 | 94 | Fallow, bare soil, HSG D |
| 0.404 | | 100.00% Pervious Area |

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

Subcatchment 3: 0.404 Ac

Hydrograph



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Type II 24-hr 100-Year Rainfall=8.48"

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Summary for Subcatchment 4: 4.541 Ac

Runoff = 49.82 cfs @ 11.96 hrs, Volume= 2.314 af, Depth= 5.60"

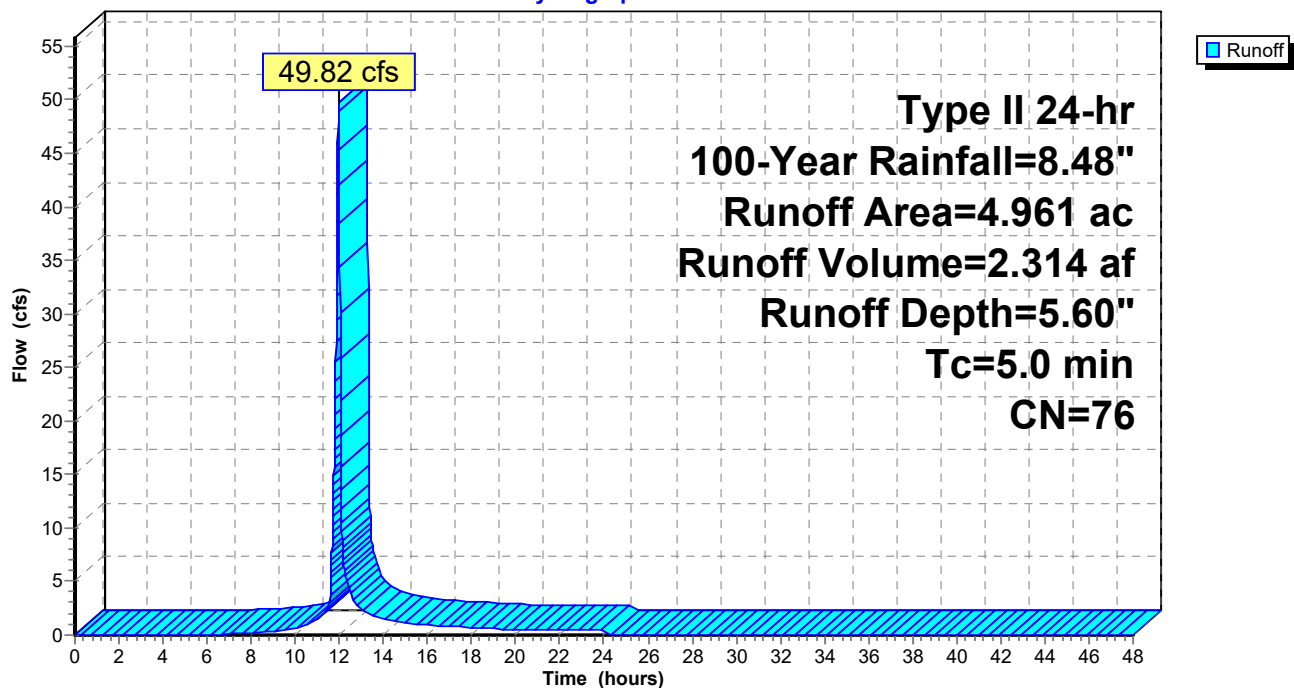
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=8.48"

| Area (ac) | CN | Description |
|-----------|----|--------------------------|
| 1.498 | 56 | Brush, Fair, HSG B |
| 0.388 | 56 | Brush, Fair, HSG B |
| 1.189 | 91 | Fallow, bare soil, HSG C |
| 1.886 | 86 | Fallow, bare soil, HSG B |
| 4.961 | 76 | Weighted Average |
| 4.961 | | 100.00% Pervious Area |

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

Subcatchment 4: 4.541 Ac

Hydrograph



2nd Creek Meadows Preliminary Drainage

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Type II 24-hr 100-Year Rainfall=8.48"

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Summary for Subcatchment 5: 3.490 Ac

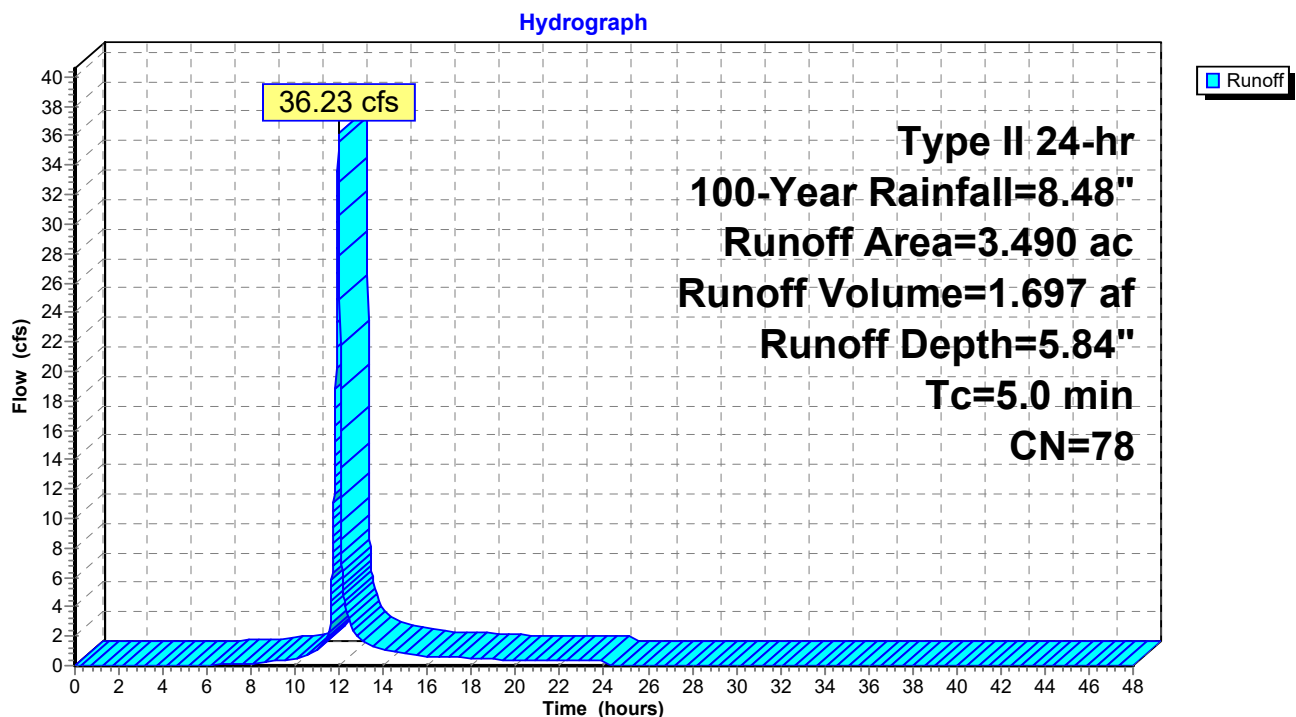
Runoff = 36.23 cfs @ 11.96 hrs, Volume= 1.697 af, Depth= 5.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=8.48"

| Area (ac) | CN | Description |
|-----------|----|---|
| 0.303 | 77 | Brush, Fair, HSG D |
| 0.319 | 70 | Brush, Fair, HSG C |
| 0.192 | 56 | Brush, Fair, HSG B |
| * 0.167 | 79 | Offsite 50-75% Grass cover, Fair, HSG C |
| 0.113 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 0.546 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 1.509 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 0.341 | 61 | >75% Grass cover, Good, HSG B |
| 3.490 | 78 | Weighted Average |
| 2.666 | | 76.39% Pervious Area |
| 0.824 | | 23.61% Impervious Area |

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

Subcatchment 5: 3.490 Ac



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Type II 24-hr 100-Year Rainfall=8.48"

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Summary for Subcatchment 6: 24.445 Ac

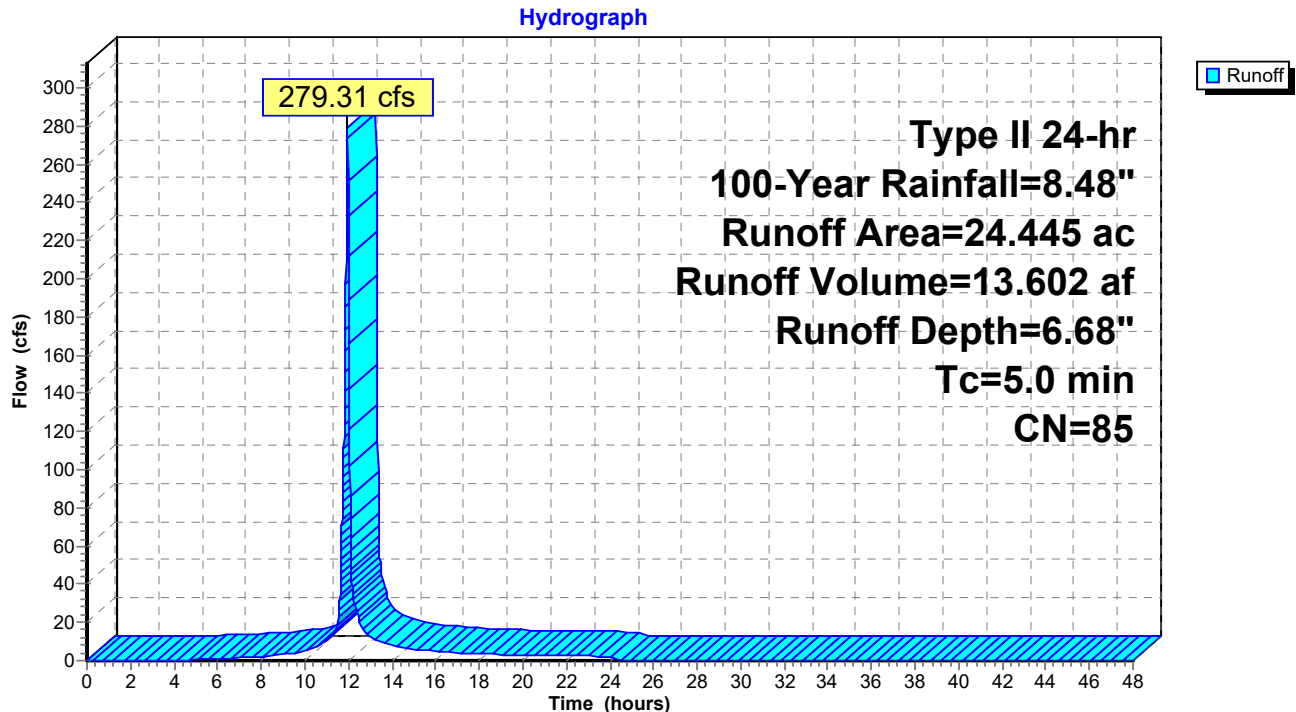
Runoff = 279.31 cfs @ 11.96 hrs, Volume= 13.602 af, Depth= 6.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=8.48"

| Area (ac) | CN | Description |
|-----------|----|---|
| * 1.078 | 82 | Offsite 50-75% Grass cover, Fair, HSG C |
| 2.274 | 83 | 1/4 acre lots, 38% imp, HSG C |
| 7.866 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 10.166 | 83 | 1/4 acre lots, 38% imp, HSG C |
| * 2.001 | 80 | Offsite 50-75% Grass cover, Fair, HSG C |
| 1.060 | 98 | Water Surface, HSG C |
| 24.445 | 85 | Weighted Average |
| 15.669 | | 64.10% Pervious Area |
| 8.776 | | 35.90% Impervious Area |

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

Subcatchment 6: 24.445 Ac



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Type II 24-hr 100-Year Rainfall=8.48"

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Summary for Subcatchment 7: 0.578 Ac

Runoff = 6.75 cfs @ 11.96 hrs, Volume= 0.333 af, Depth= 6.92"

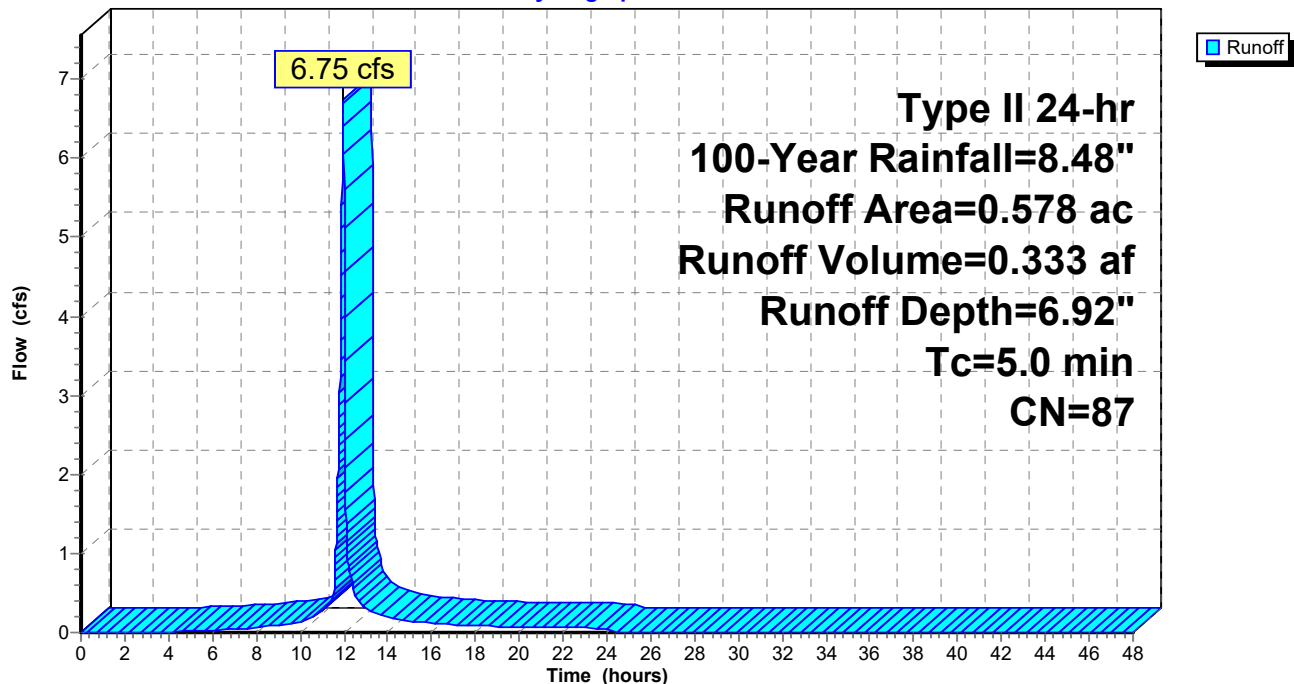
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=8.48"

| Area (ac) | CN | Description |
|-----------|----|-------------------------------|
| 0.578 | 87 | 1/4 acre lots, 38% imp, HSG D |
| 0.358 | | 62.00% Pervious Area |
| 0.220 | | 38.00% Impervious Area |

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

Subcatchment 7: 0.578 Ac

Hydrograph



2nd Creek Meadows Preliminary Drainage

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Type II 24-hr 100-Year Rainfall=8.48"

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Summary for Subcatchment 8: 5.846 Ac

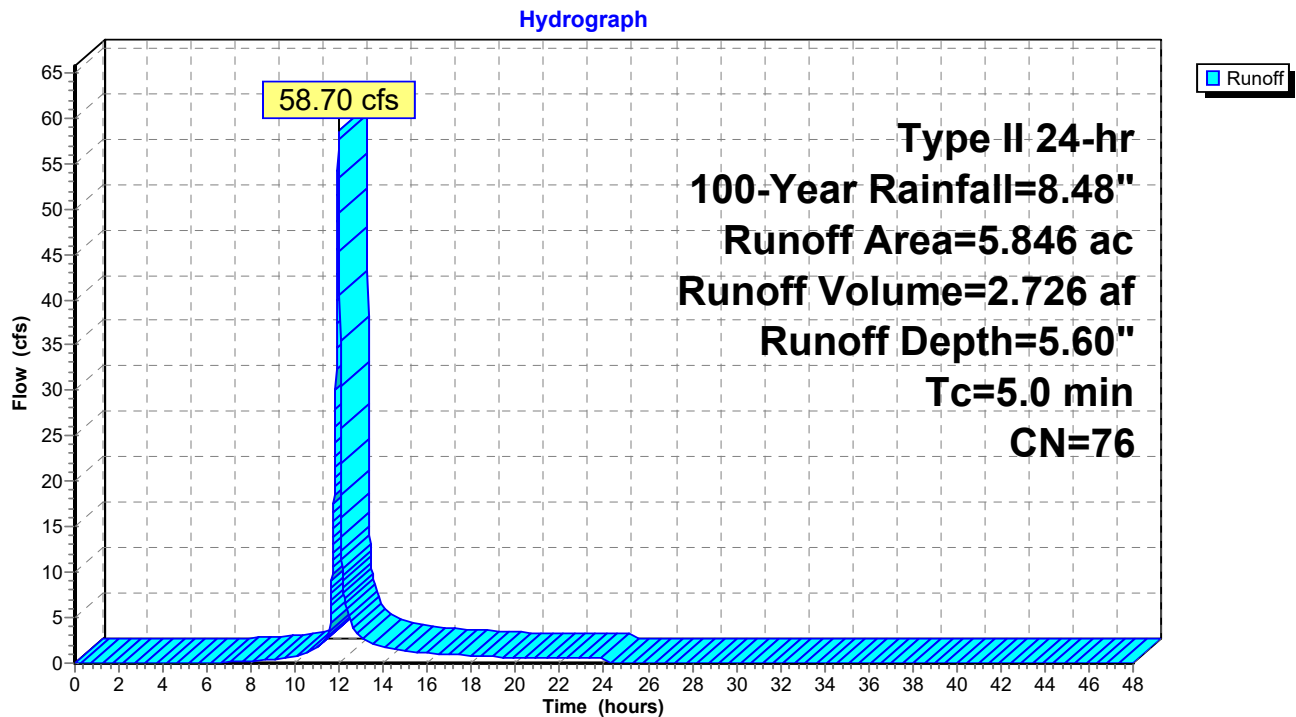
Runoff = 58.70 cfs @ 11.96 hrs, Volume= 2.726 af, Depth= 5.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=8.48"

| Area (ac) | CN | Description |
|-----------|----|-------------------------------|
| 0.348 | 75 | 1/4 acre lots, 38% imp, HSG B |
| 0.060 | 75 | 1/4 acre lots, 38% imp, HSG B |
| 0.525 | 75 | 1/4 acre lots, 38% imp, HSG B |
| 1.205 | 91 | Fallow, bare soil, HSG C |
| 1.822 | 86 | Fallow, bare soil, HSG B |
| 1.498 | 56 | Brush, Fair, HSG B |
| 0.388 | 56 | Brush, Fair, HSG B |
| 5.846 | 76 | Weighted Average |
| 5.491 | | 93.94% Pervious Area |
| 0.355 | | 6.06% Impervious Area |

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

Subcatchment 8: 5.846 Ac



2nd Creek Meadows Preliminary Drainage

Type II 24-hr 100-Year Rainfall=8.48"

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Summary for Pond 1P: Pond

Inflow Area = 24.445 ac, 35.90% Impervious, Inflow Depth = 6.68" for 100-Year event
 Inflow = 279.31 cfs @ 11.96 hrs, Volume= 13.602 af
 Outflow = 167.48 cfs @ 12.03 hrs, Volume= 13.602 af, Atten= 40%, Lag= 4.3 min
 Primary = 167.48 cfs @ 12.03 hrs, Volume= 13.602 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 808.80' @ 12.03 hrs Storage= 123,010 cf

Plug-Flow detention time= 35.4 min calculated for 13.599 af (100% of inflow)

Center-of-Mass det. time= 35.6 min (819.9 - 784.3)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|---------------------------------------|
| #1 | 806.00' | 192,835 cf | Custom Stage Data Listed below |

| Elevation (feet) | Cum.Store (cubic-feet) |
|---------------------|---------------------------|
| 806.00 | 0 |
| 806.25 | 9,844 |
| 806.50 | 19,912 |
| 806.75 | 30,159 |
| 807.00 | 40,589 |
| 807.25 | 51,233 |
| 807.50 | 62,128 |
| 807.75 | 73,281 |
| 808.00 | 84,694 |
| 808.25 | 96,378 |
| 808.50 | 108,346 |
| 808.75 | 120,604 |
| 809.00 | 133,160 |
| 809.25 | 146,686 |
| 809.50 | 161,047 |
| 809.75 | 176,383 |
| 810.00 | 192,835 |

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|---------|---|
| #1 | Primary | 802.00' | 48.0" W x 48.0" H Box 4'x4' Rectangular Box Culvert L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 802.00' / 801.60' S= 0.0100 1' Cc= 0.900 n= 0.012, Flow Area= 16.00 sf |
| #2 | Device 1 | 806.00' | 5.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s) |
| #3 | Device 1 | 806.50' | 60.0" x 60.0" Horiz. 5'x5' Horizontal Overflow C= 0.600 Limited to weir flow at low heads |
| #4 | Secondary | 809.00' | 40' Wide Earth Formed Spillway, C= 3.27 Offset (feet) 0.00 4.00 34.00 38.00 Elev. (feet) 810.00 809.00 809.00 810.00 |

2nd Creek Meadows Preliminary Drainage

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Type II 24-hr 100-Year Rainfall=8.48"

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Primary OutFlow Max=167.47 cfs @ 12.03 hrs HW=808.80' (Free Discharge)

1=4'x4' Rectangular Box Culvert (Inlet Controls 167.47 cfs @ 10.47 fps)

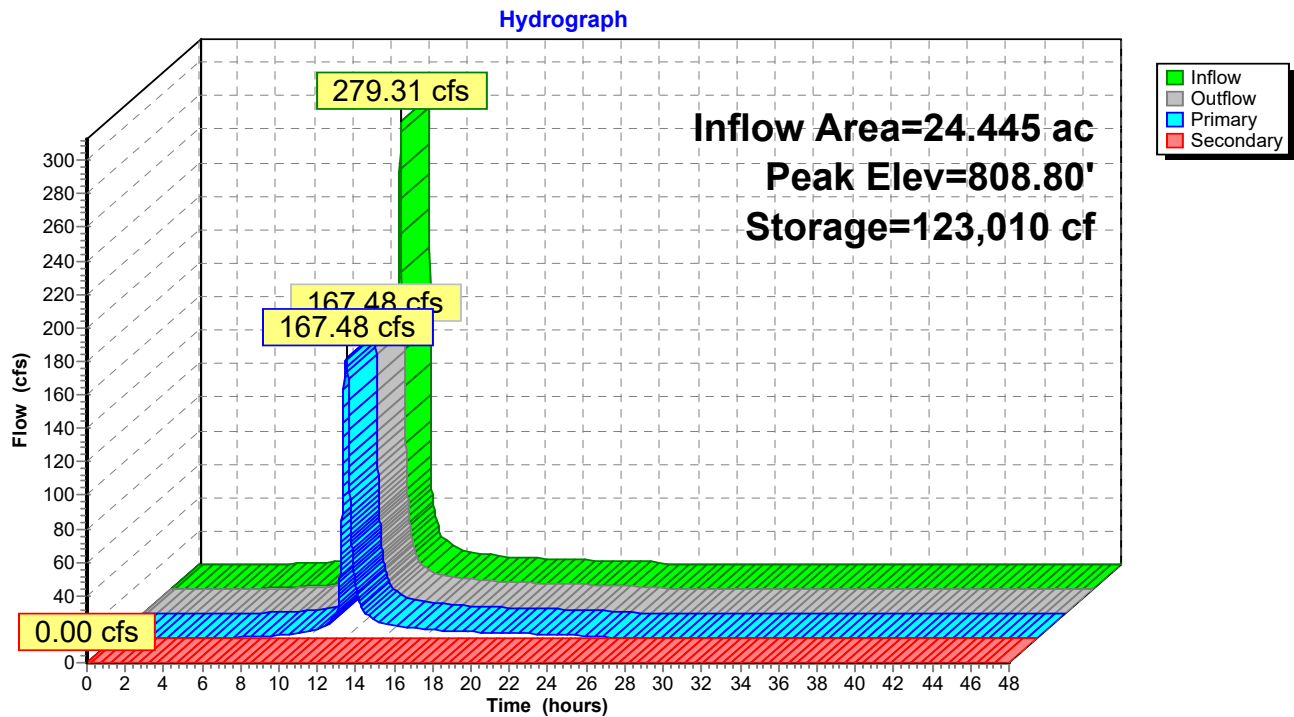
2=Sharp-Crested Rectangular Weir (Passes < 19.17 cfs potential flow)

3=5'x5' Horizontal Overflow (Passes < 182.45 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=806.00' (Free Discharge)

4=40' Wide Earth Formed Spillway (Controls 0.00 cfs)

Pond 1P: Pond



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Type II 24-hr 100-Year Rainfall=8.48"

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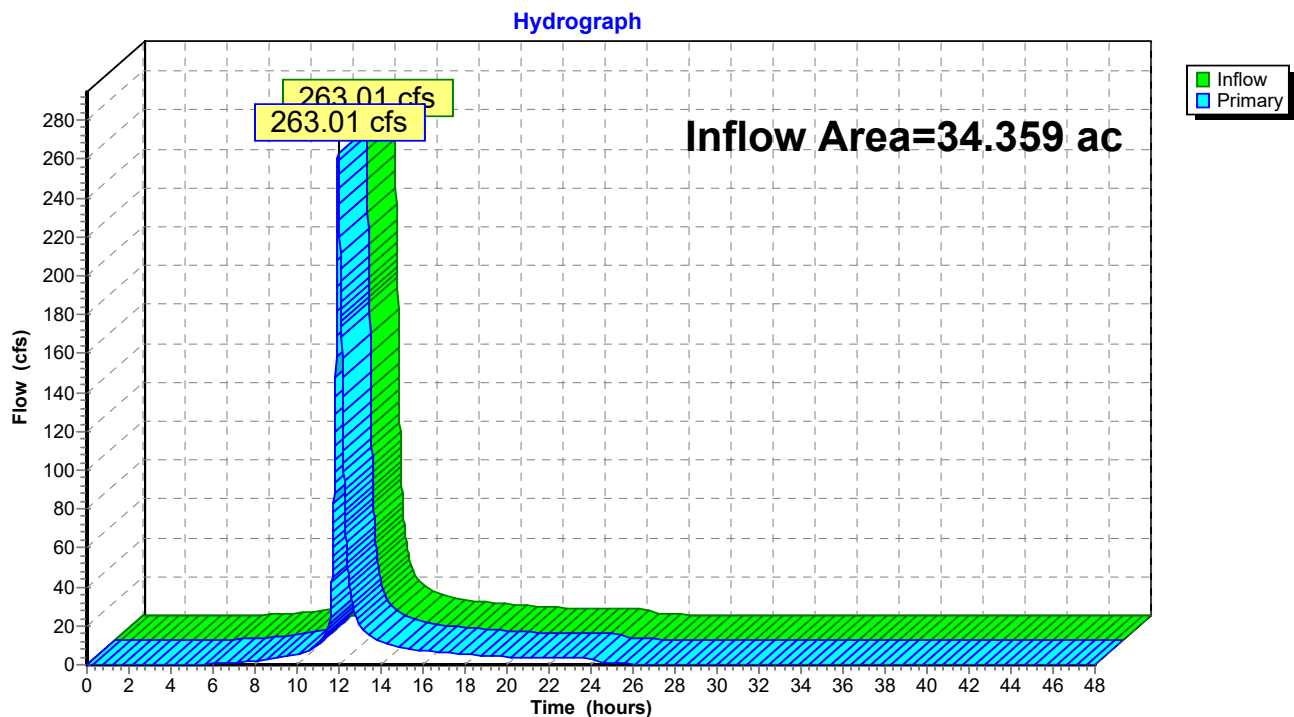
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Summary for Link POST-DEV: Post-Developed Flow

Inflow Area = 34.359 ac, 29.61% Impervious, Inflow Depth = 6.41" for 100-Year event
Inflow = 263.01 cfs @ 11.97 hrs, Volume= 18.359 af
Primary = 263.01 cfs @ 11.97 hrs, Volume= 18.359 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link POST-DEV: Post-Developed Flow



2nd Creek Meadows Preliminary Drainage

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Type II 24-hr 100-Year Rainfall=8.48"

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Summary for Link PRE-DEV: Pre-Developed Flow

Inflow Area = 34.594 ac, 4.54% Impervious, Inflow Depth = 7.05" for 100-Year event
Inflow = 405.17 cfs @ 11.96 hrs, Volume= 20.323 af
Primary = 405.17 cfs @ 11.96 hrs, Volume= 20.323 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link PRE-DEV: Pre-Developed Flow

