thoroughbred solar

Attachment M
Preliminary Stormwater Management Plan

Exhibit 12 – Site Assessment Report

STORMWATER MANAGEMENT REPORT

Thoroughbred Solar Project

Hart County, Kentucky

AUGUST 2022

PREPARED FOR:

LEEWARD renewable energy

PREPARED BY:

Westwood

Stormwater Management Report

Thoroughbred Solar Project

Hart County, Kentucky

Prepared For:

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Project Number: R0031696.00
Date: August 23, 2022

Westwood

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Introduction

The purpose of this report is to summarize the proposed stormwater drainage for the thoroughbred Solar Project ("the project"). This report was prepared to meet state requirements and is intended for submittal to the state agencies for permitting review and approval.

The project site is proposed on approximately 531 acres of parcels with ~340 acres of solar development and is located approximately 2.5 miles southwest of the city of Munfordville in Hart County, Kentucky. The site's current use is pastureland, Conservation Resource Program (CRP) and row crop.

The proposed use of the site will be a solar facility consisting of 340 acres of solar modules and ~11.8 acres of the new impervious surface including gravel access roads and associated solar infrastructure. The proposed site under the solar modules will be converted to meadow conditions within the fenced boundary around the proposed impervious surfaces. Due to the area between and beneath the panels being vegetated, panels are typically not considered an impervious surface.

Minimal grading will be proposed on site and existing drainage patterns will be maintained. Stormwater management practices including temporary sediment basins are proposed on site to meet the requirements of the commonwealth of Kentucky. Other stormwater measures that may be needed on site to route water through the site include culverts, low water crossings, and swales.

Data Sources

TABLE 1: DATA SOURCES

Task	Format	Source	Use
Elevation	2-meter LiDAR	USGS	Model Elevations
Crop Data	Shapefile	USDA 2013 Crop Data Layer	Landcover
Soils	Shapefile	USGS SSURGO Dataset	Curve Numbers
Precipitation	PDF File	NOAA Atlas 14	Design Storms
Site Boundary	Thoroughbred Layout Constraints.kmz	Leeward	Define Model Extents
2014 Aerial Photography	ArcGIS Map Service	USDA FSA	Reference

Site Conditions

Site Location

The project area is located approximately 2.5 miles southwest of the city of Munfordville in Hart County, Kentucky.

Historical Use

A review of aerial photographs shows that the site is currently used and has historically been used for agricultural row crops and pastureland.

Topography Description

The existing topographic information used in this analysis was obtained from the USGS National Elevation Set 2m obtained from the USDA data gateway. In general, the site has slopes ranging from 1-4% but there are areas where slopes reach and exceed 10%.

Drainage Patterns

The Project is located within the Waterloo Valley-Green River HUC 12 Boundary. The Project Area is located on the south side of the Green River. The western portion of the Site has no defined drainage channels and consists of many low lying areas onsite. The eastern portion of the Site appears to have fewer low lying areas, but the ones onsite are much larger. The largest low lying areas onsite can be found on the west portion of the east side of the Project Area. The runoff and discharge from the site is minimal given the karst landscape in the region and the majority is retained onsite and within low lying areas near the Site. The eastern portion of the Project receives offsite flows and these drainage areas are similarly sized compared to the project area. The western portion of the Site has a small amount of offsite flow. In general, the site has slopes ranging from 1-4% but there are areas where slopes reach and exceed 10%. Drainage areas are shown in Exhibits 5 and 6.

Discharge Locations

The site has two ultimate discharge locations; one in Drainage Area 1 and one to east in Drainage Area 2, the majority of the drainage areas are landlocked due to the topography. Discharge locations are shown in Exhibits 5 and 6.

Soils

Soils data was downloaded from SSURGO and can be found in Exhibit 3. The site consists primarily of Hydrologic Soil Group (HSG) B and C soils. Type B soils have moderate runoff potential and infiltration rates. Type C soils have moderate runoff potential and low infiltration rates.

Construction Stormwater Requirements

Stormwater management for the project falls under the jurisdiction of the Kentucky Energy and Environment Cabinet, see the following link for requirements: https://eec.ky.gov/Environmental-Protection/Water/PermitCert/KPDES/Documents/KYG20_SWQMP_Guidance.pdf. The following requirements need to be met for the project.

The requirements in the link state that, "Requirements for construction site operators to implement erosion and sediment control best management practices (BMPs) that shall be as protective as Kentucky's General Permit for Stormwater Discharges Associated with Construction Activities (KYR100000)." The KYR100000 Permit requires basins to be installed and maintained to effectively minimize discharges up to and including the 2-year, 24-hour event.

For additional sediment basin and BMP design standards, the 2009 Best Management Practices for Controlling Erosion, Sediment, and Pollutant Runoff from Construction Sites Manual was referenced, see the following link for requirements: https://eec.ky.gov/Environmental-Protection/Forms%20Library/09BMPManual_Final.pdf.

Temporary Sediment Basins

The 2009 Best Management Practices for Controlling Erosion, Sediment, and Pollutant Runoff from Construction Sites Manual requires sediment basin for disturbed areas greater than 10 acres, however the minimum recommended drainage area is 5 acres. Based on site conditions temporary sediment basins are recommended where more than 10 acres of contributing area leaves the site at a concentrated point.

Storage within the basin must be provided for the 2-year 24-hour runoff volume based on permit KY100000. Outlets from the basin can be either skimmer structures, riser structures, or riprap overflows per the commonwealth of Kentucky requirements. Basins are required to safely pass the 100-year 6-hour post development peak flow and must provide minimum one foot freeboard during the 100-year 6-hour storm at the top of the embankment.

Stormwater Management Requirements

Stormwater management for the project falls under the jurisdiction of Kentucky Energy and Environment Cabinet, https://eec.ky.gov/Environmental-Protection/Water/PermitCert/KPDES/Documents/KYR10FactSheet.pdf. The following requirements need to be met for the project:

- Soil stabilization such as seeding, mulching, placing sod, and using erosion control blanket. All disturbed areas must be stabilized within 14 days of reaching final grade. Areas that will be inactive for 21 days or more shall be stabilized within 14 days of reaching temporary grade.
- Perimeter Structural Practices such as silt fence, sediment basins, sediment traps, check dams, inlet protection, etc. Sediment basins must be used where the disturbed drainage area is more than 10 acres.
- Stormwater Management Devices to control the pollutants in stormwater after construction has been completed. Velocity dissipation devices must be installed at pipe outlets and along channels to prevent erosion. Other devices must be used to remove 80% of the total suspended solids that exceed predevelopment levels. This includes devices such as detention ponds, wet ponds, vegetated swales, velocity dissipation at culvert outlets, etc.

Water Quantity/Runoff Analysis

Stormwater quantity control must be provided so that proposed conditions peak runoff rates must be equal to or less than existing conditions. The 2-year, 10-year, and 100-year 24-hour stormwater events must meet these requirements.

Water Quality Requirements

The commonwealth of Kentucky indicates in the Best Management Practices (BMPs) for Controlling Erosion, Sediment, and Pollutant Runoff from Construction Sites that stormwater controls must reduce the total suspended solids (TSS) load by 80% for the 10-year 24-hour storm, or provide a detention time of 24 to 48 hours for the 10-year 24-hour storm. The TSS removal is being met by the finished grassland condition of the project.

Drainage Improvements

Stormwater measures that may be needed on site to route water through the site include culverts, low water crossings, and swales but will be designed as the project progresses.

Methodology

Existing and proposed conditions are modeled in HydroCAD software. HydroCAD is a widely accepted hydrologic and hydraulic modeling package based on TR-20 unit hydrograph equations. It models stormwater runoff discharge rates and velocities from ponds, culverts, outlet control structures, and stream reaches.

Hydrology

Curve Number Methodology, based on the NRCS-TR 55 method, was used in the modeling for predicting direct runoff. Curve numbers were assigned by reviewing the soil and landcover for each drainage area (Exhibits 3 and 4).

Time of concentrations were calculated for each drainage area in HydroCAD using the lag method. The lag method uses the hydraulic length (distance traveled by a drop of water from the most distant part of the subcatchment to the outlet point) and the average land slope (average slope of entire watershed). The overall curve number for the site along with the lag information is used to get the time of concentration for the site.

NOAA Atlas 14 precipitation and distribution data for the 2-year, 10-year, and 100-year 24-hour storm events were used as input for the analysis (Appendix A).

Existing Conditions

The existing site consists of row crops, pastureland, CRP, and wooded areas. Offsite runoff was not included in the analysis, however the entire project parcels were looked at for this analysis not just the fenced project areas. Cover for the analysis was determined using the USDA 2013 Crop Data Layer and aerial photos. Curve numbers were assigned based on the landcover and soil types, see table below for summary.

TABLE 2: EXISTING CONDITIONS COVER

Cover	CN	Area [ac]
Cultivated (HSG B)	78	94.1
Cultivated (HSG C)	85	48.4
Pasture (HSG B)	69	72.2
Woods (HSG B)	60	9.6
Woods (HSG C)	73	13.5
Meadow (CRP) (HSG B)	58	230.6
Meadow (CRP) (HSG C)	71	62.9
Total	67	531

Construction Conditions

During construction conditions, higher runoff rates and volumes can be expected than the fully vegetated final condition. To account for this, dewatering of temporary should be anticipated as needed until vegetation has fully established on the site. This may include pumping of temporary swales, basins and diversions.

Solar project construction typically does not disturb the full site area. Disturbed footprints are determined by reviewing the proposed grading areas, removed tree rows, and past experiences near the project location.

Temporary Sediment Basins

Temporary sediment basins are proposed in locations where more than 10 acres of runoff leaves the site as a concentrated discharge and follow guidance from the General Permit for Stormwater Discharges Associated with Construction Activities (KYR100000) and Best Management Practices (BMPs) for Controlling Erosion, Sediment, and Pollutant Runoff from Construction Sites.

Disturbance areas were outlined by reviewing grading areas and the area contributing to the temporary sediment basin locations. This area is used in the calculations for required storage. See civil plans for disturbed area.

HydroCAD was used to model the disturbed area to determine required storage volume, see Appendix D for calculations. Table 3 summarizes the required storages for each basin, see civil plans for locations.

TABLE 3: TEMPORARY SEDIMENT BASIN SIZING

Basin	Disturbed Area (ac)	Required Storage Volume (ac-ft)	Provided Storage Volume (ac-ft)
1A	9.3	1.5	TBD
1B	10.7	1.7	TBD
1C	15.5	3.0	TBD
1D	13.8	2.2	TBD
1E	21.5	4.2	TBD

In locations where temporary basin sizing is infeasible, additional measures will need to be installed upstream to assist in erosion and sediment control for the site which can include the following:

- preseeding upstream drainage areas
- installing baffles in basin
- installing straw bales to capture and filter runoff

Once the site has been stabilized, sediment will need to be removed from any temporary basins on site. Using temporary seed/mulch at the onset of construction can greatly reduce the amount of erosion and rework on solar sites. As the project progresses to construction a separate stormwater pollution prevention plan will be prepared to account for these concerns in greater detail.

Proposed Conditions

The use of the site will be a solar plant. The site will consist of approximately 340 acres of solar modules mounted above grade on a racking system and 11.8 acres of gravel access roads, electrical equipment, O&M facility, and a substation. The solar modules will be located above grade with meadow grass below the proposed array.

The proposed substation and switchyard will be a raised pad and runoff from this area will sheet flow off the raised pad.

Moderate grading is proposed to meet the tolerances of the proposed solar array. Drainage patterns will remain the same. Swales and culverts may be proposed to route water through the site. Offsite drainage area remains the same as existing conditions. Table 4 shows the proposed landcover of the project.

TABLE 4: PROPOSED CONDITIONS COVER

Cover	CN	Area [ac]
Low Maintenance Grass with Solar Above (HSG B)	58	378.0
Low Maintenance Grass with Solar Above (HSG C)	71	90.1
Cultivated (HSG B)	78	10.7
Cultivated (HSG C)	85	21.5
Woods (HSG B)	60	9.6
Woods (HSG C)	73	9.5
Roads	96	8.5
Inverters/Substation/Substation Facility	98	3.2
Total	63	531

Proposed Stormwater Management

A solar project differs greatly from other commercial or residential developments. When constructed, a solar project will include solar panels, at-grade gravel access roads, and other electrical equipment. The panels will be mounted a minimum of 18" above the ground with a low maintenance perennial meadow grass growing under the panels. Due to the area between and beneath the panels being vegetated, panels are not considered an impervious surface. While solar projects may require grading, the existing terrain is smoothed to accommodate array installation, rather than significant changes to grades or slopes, and the grading is designed to maintain existing drainage patterns. Access roads are installed at grade and allow for runoff to sheet flow through the proposed meadow cover which provides treatment and reduction in runoff. The proposed vegetation slows the runoff and allows for water to filter into the soils for treatment.

Water quality is not usually a concern and is actually reduced over pre-development conditions due to the land cover's conversion from a higher runoff rate row-crop field and pasture to a lower runoff rate meadow grass. Water quality concerns are also minimized due to the low percentage of impervious surfaces and the fact that runoff from these surfaces filters through the meadow grasses on site prior to discharging.

The temporary sediment basins will have an emergency overflow and skimmers during construction to allow water to slowly release to meet requirements.

In addition to typical stormwater management BMPs, the recommended approach for solar projects should include the following: limit the amount of impervious surfaces to reduce runoff, minimize the amount of grading to promote sheet flow, and the planting of the meadow grass on the majority of the site to provide both runoff reduction and treatment.

Water Quantity/Runoff Analysis

Stormwater quantity calculations for the site were prepared using HydroCAD. The proposed site meets the rate control requirements of the commonwealth of Kentucky. Table 5 shows a summary of the runoff rates for each event at the site discharge locations. Calculations are included in Appendix B and C.

TABLE 5: RUNOFF RATE SUMMARY

Location	2-year Runoff (cfs)		10-year Runoff (cfs)		100-year Runoff (cfs)	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
DA-1	91.5	60.2	204.7	151.9	427.3	345.9
DA-2	17.2	5.2	36.6	17.3	71.2	43.9
DA-3	25.6	22.9	64.6	60.2	143.9	137.3
DA-4	47.2	28.9	78.6	54.9	127.6	99.4
DA-5	23.2	10.8	41.1	24.5	69.8	49.2
Overall	204.7	128.0	425.6	308.8	839.8	675.7

Stormwater Management Practices

Basin Calculations

If the temporary sedimentation basins will remain in place for final conditions the basins will need the following updates:

- Remove skimmer, riser structure, and outlet culvert
- Install outlet weir at basin bottom to limit standing water onsite
- Provide stabilization for new outlet

Conclusion

The proposed site was designed to meet the requirements of the commonwealth of Kentucky for stormwater management. The proposed site may consist of proposed basins, swales, and crossings in order to maintain existing drainage patterns and reduce runoff rates. Grading on site and proposed swales and crossings maintain existing drainage areas throughout the site. The proposed vegetative cover below the array and sediment basins throughout the site reduces runoff rates for the final conditions.

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National Engineering Handbook, Part 630 Hydrology. Chapter 9 Hydrologic Soil-Cover Complexes. USDA. NRCS. 210-VI-NEH, July 2004

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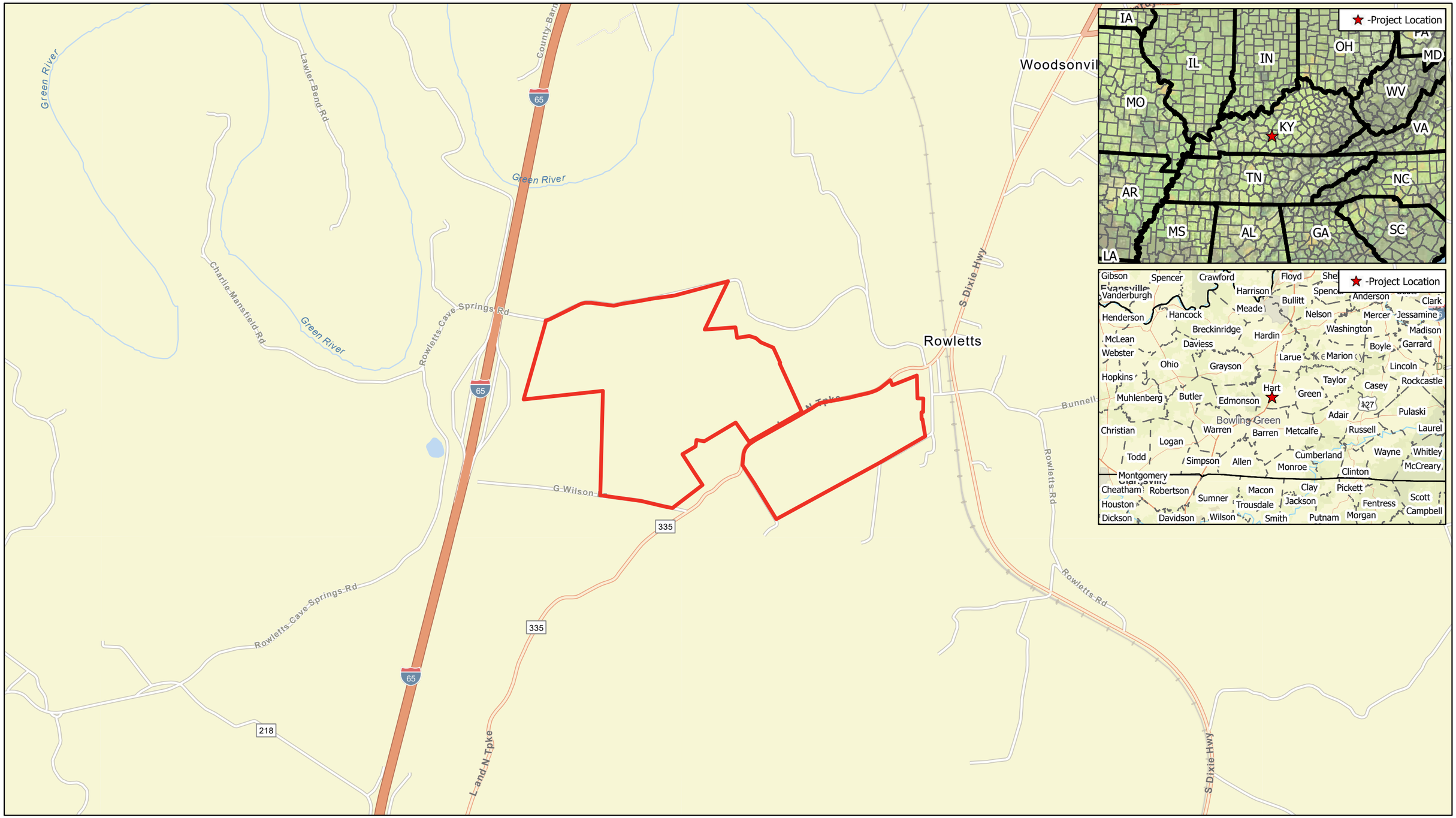
Exhibits



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

Legend

- Project Boundary
- County Boundary

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N

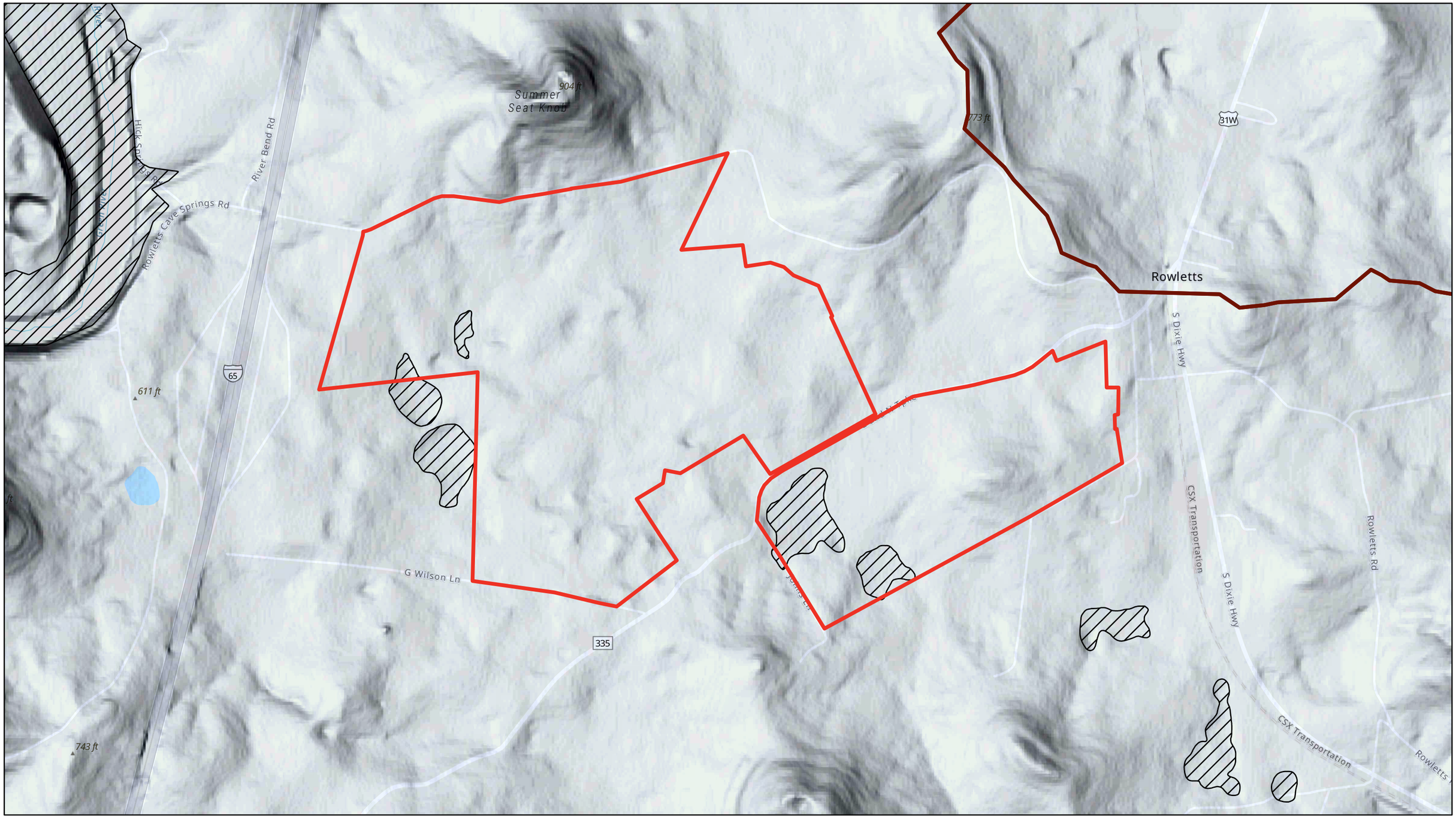
0 Feet 2,000

Thoroughbred Solar Project

Hart County, Kentucky

Exhibit 1: Location Map

September 6, 2022



Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

Legend

- Project Boundary
- County Boundary
- HUC-12 Boundaries

FEMA Flood Zone

- FEMA Zone A
- FEMA Zone AE

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Hart County, Kentucky

N

0 1,000 Feet

Exhibit 2: Base Hydrologic Map

September 6, 2022

Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

Legend

- Project Boundary
- County Boundary

Hydrologic Soil Group

- A
- B
- C
- D
- Water

N

0 1,000 Feet

Thoroughbred Solar Project

Hart County, Kentucky

Exhibit 4: Soils Map

September 6, 2022

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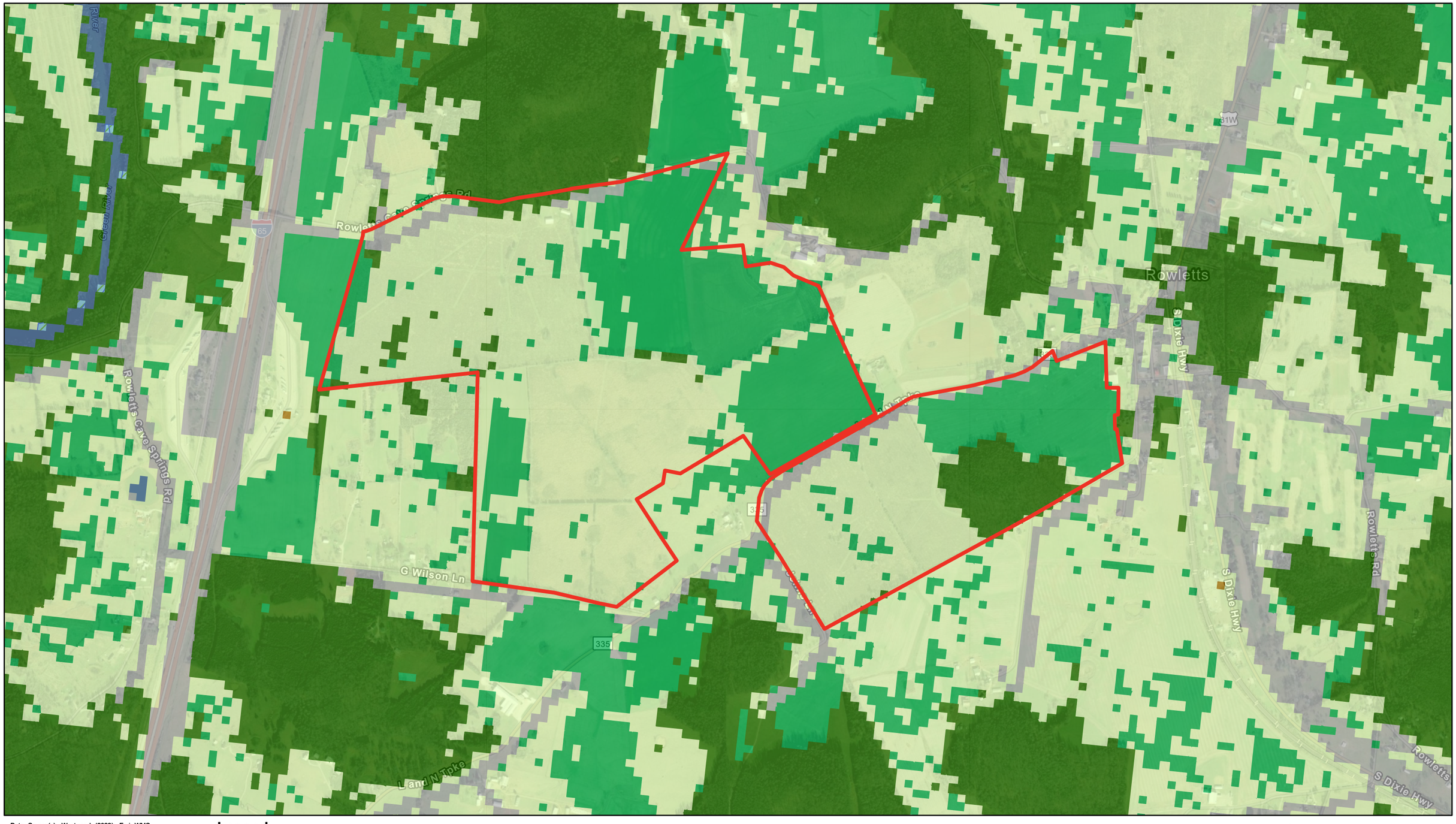

Data Source(s): Westwood (2022); Esri WMS Basemap Imagery (Accessed 2022); USGS (2022); FEMA (2022); USDA (2022)

Legend

- Project Boundary
- County Boundary

Landcover

- Barren
- Cultivated
- Developed
- Woods
- Grassland/Pasture
- Water
- Wetland

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N

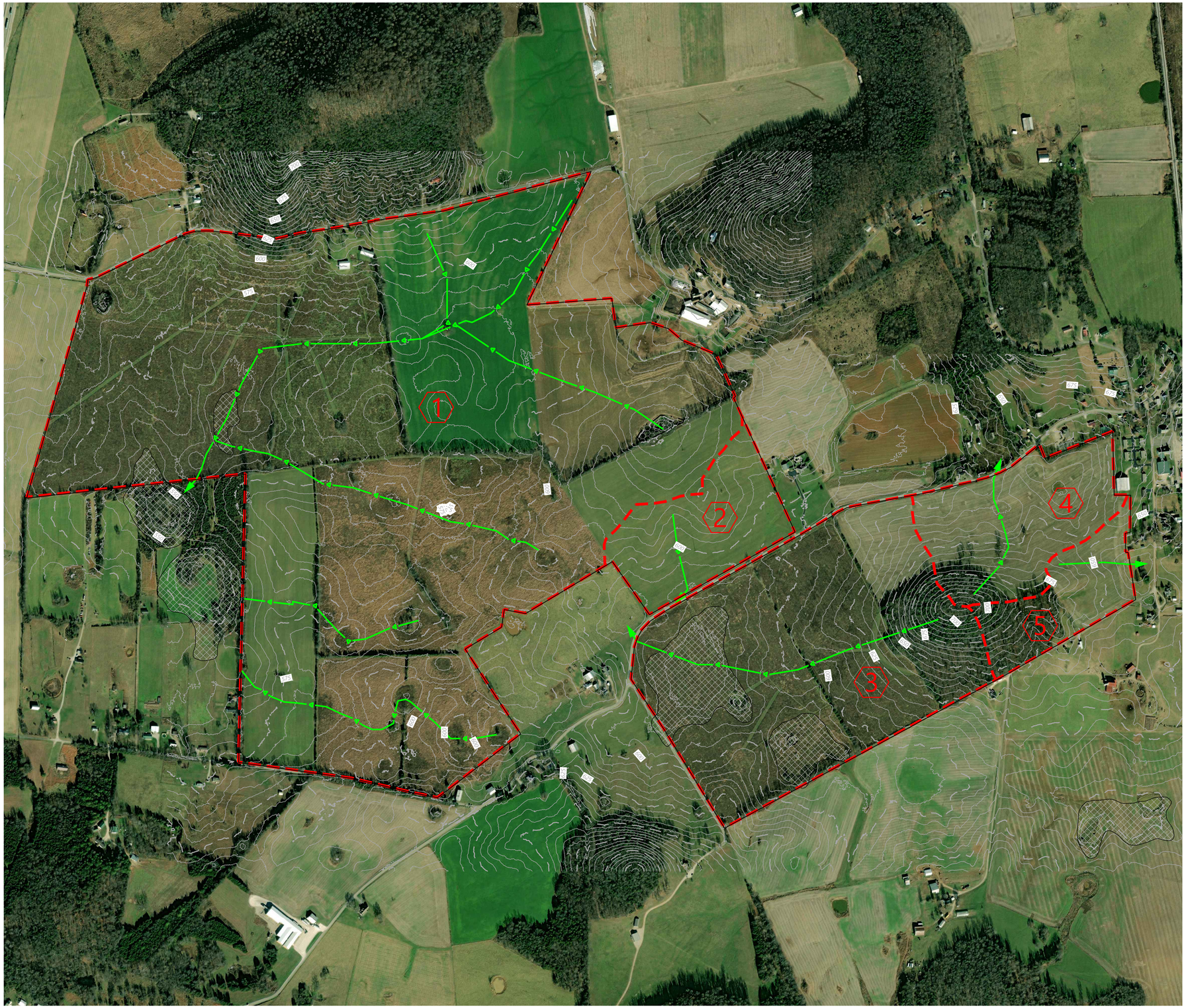
0 Feet 1,000

Thoroughbred Solar Project

Hart County, Kentucky

Exhibit 4: Landcover Map

September 6, 2022



LEGEND:

- PROJECT BOUNDARY
- EX. INDEX CONTOUR
- EX. INTERVAL CONTOUR
- EX. STREAM CHANNEL
- EX. WETLAND
- FEMA FLOOD HAZARD ZONE
- EX. ONSITE DRAINAGE AREA BOUNDARY
- EX. TIME OF CONCENTRATION LINE
- DISCHARGE LOCATION
- 1 DRAINAGE AREA LABEL

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REVISIONS:

#	DATE	COMMENT	BY	CHK	APR

0' 400' 800' 1200'

Thoroughbred Solar Project

Hart County, Kentucky

Overall Existing Drainage Map

NOT FOR CONSTRUCTION

DATE: 9/06/2022

REV:

SHEET: 5

LEGEND:

- PROJECT BOUNDARY
- EX. INDEX CONTOUR
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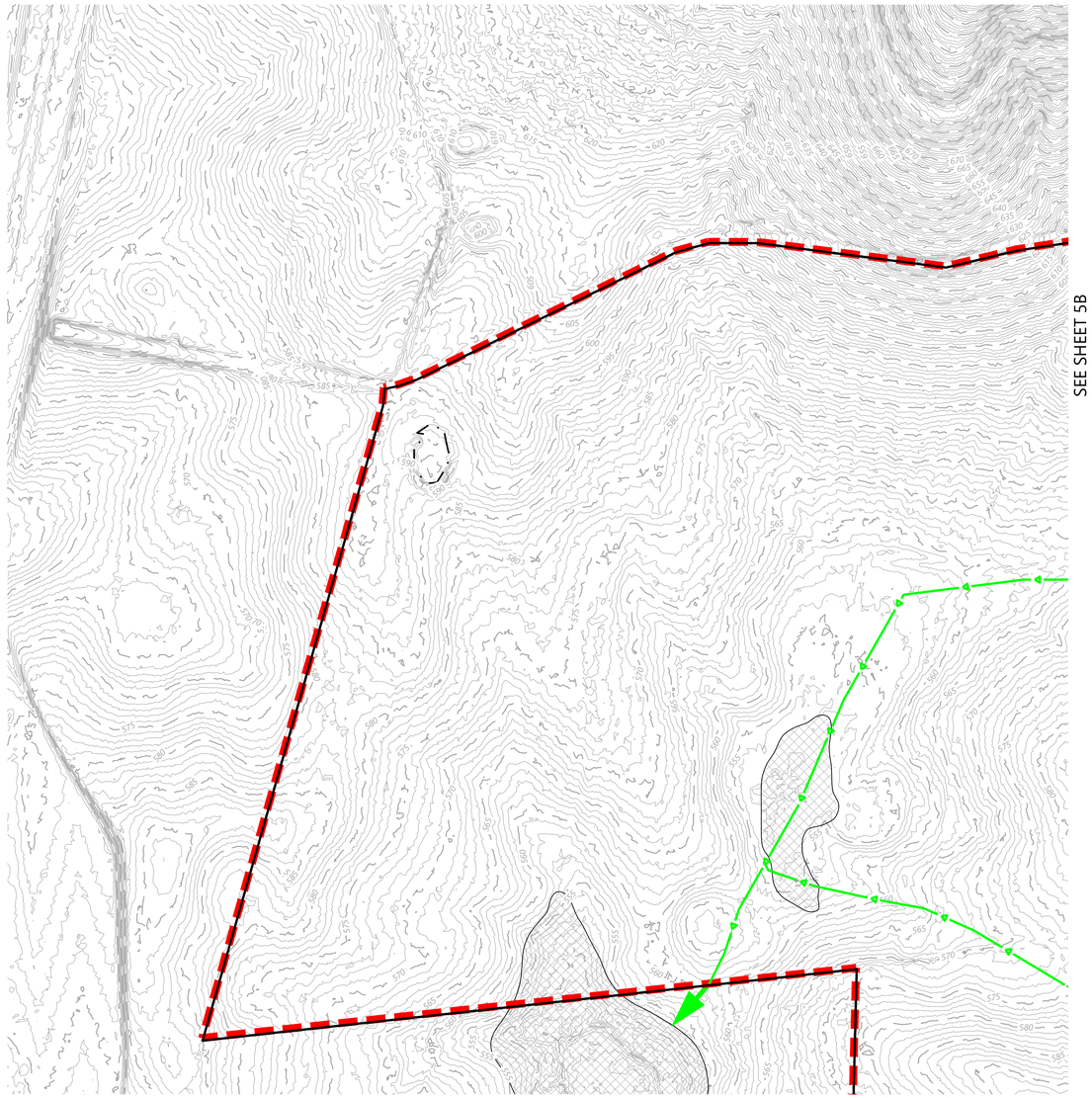
- DRAINAGE AREA LABEL



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REVISIONS:

#	DATE	COMMENT	BY	CHK	APR

0' 200' 400' 600'

Thoroughbred Solar Project

Hart County, Kentucky

Existing Drainage Map

NOT FOR CONSTRUCTION

DATE: 9/06/2022

REV:

SHEET: 5A

LEGEND:

- PROJECT BOUNDARY
- EX. INDEX CONTOUR
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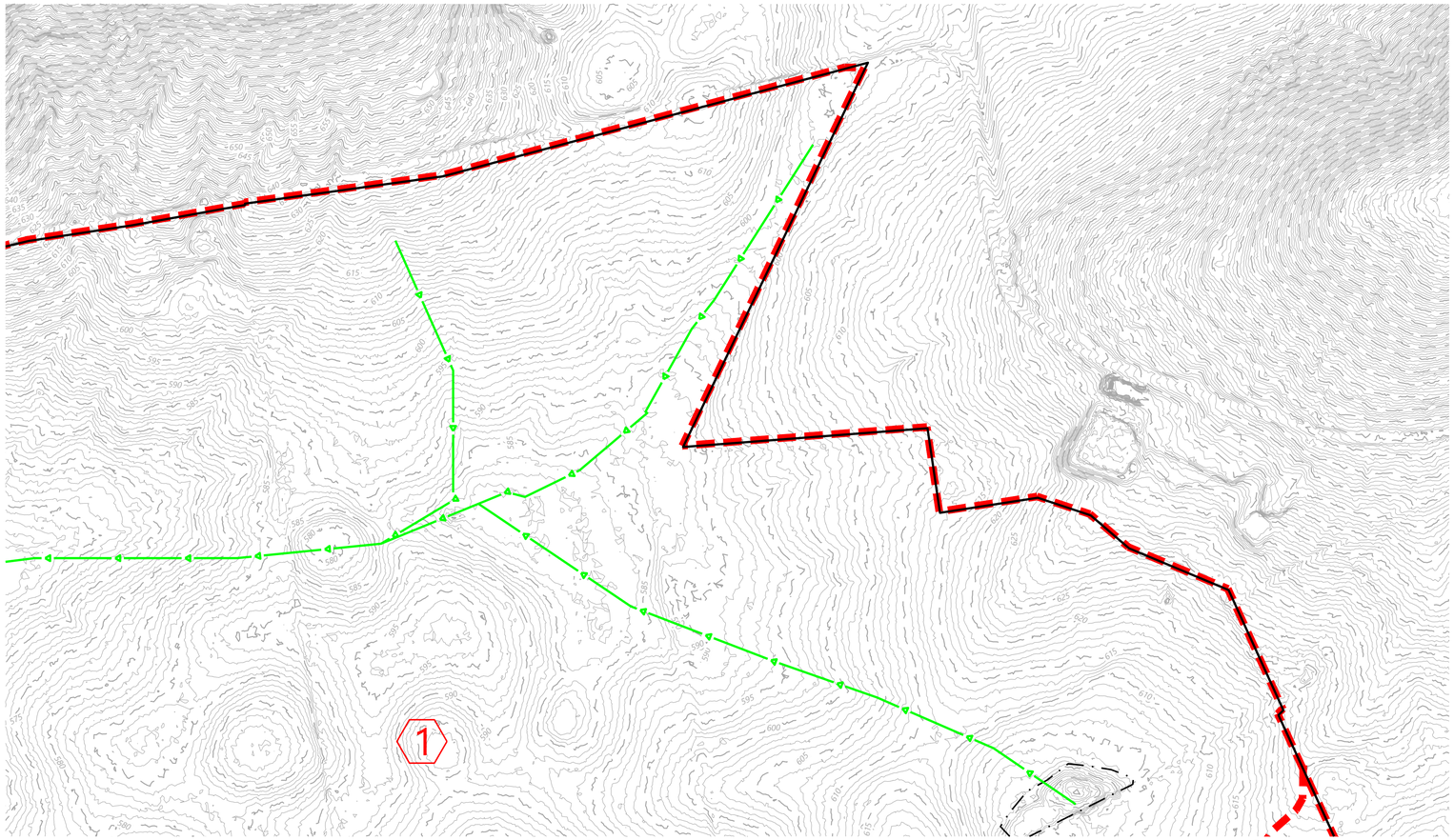

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Existing Drainage Map

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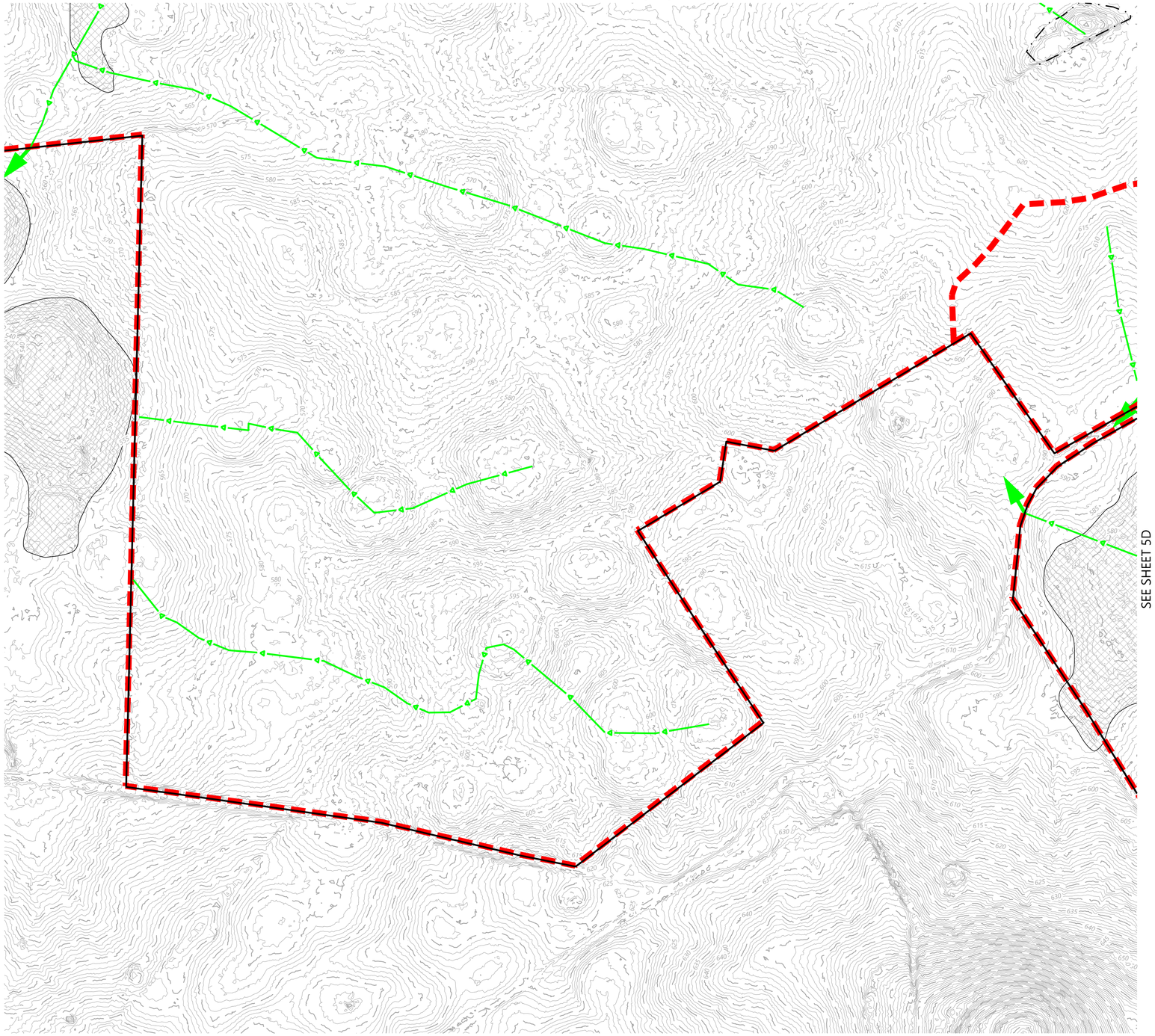
DATE: 9/06/2022
REV:
SHEET: 5B

SEE SHEET 5B

SEE SHEET 5A



SEE SHEET 5D

LEGEND:

- PROJECT BOUNDARY
- EX. INDEX CONTOUR
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- EX. STREAM CHANNEL
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Existing Drainage Map

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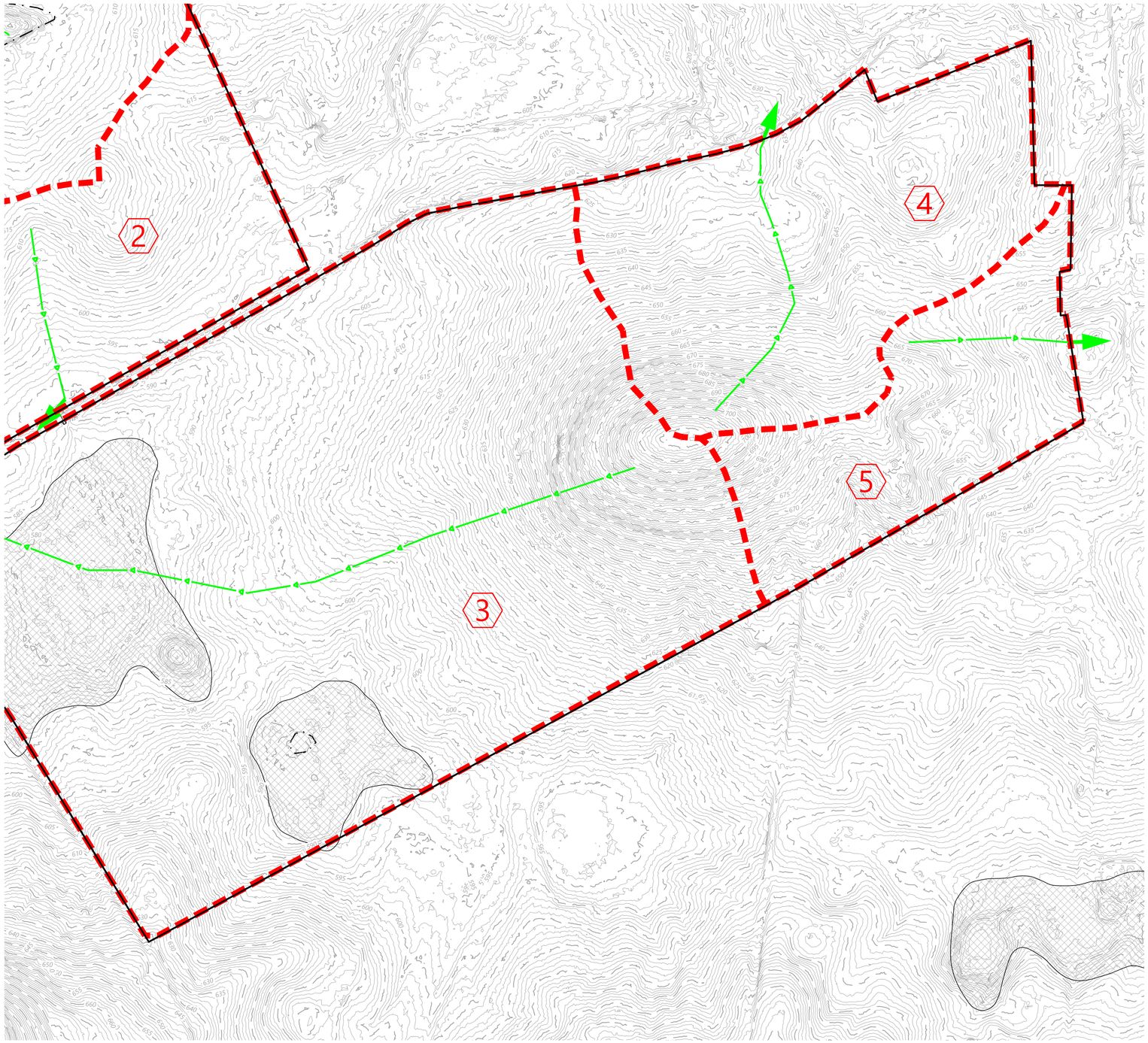
DATE: 9/06/2022

REV:

SHEET: 5C

SEE SHEET 5B

SEE SHEET 5C



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Existing Drainage Map

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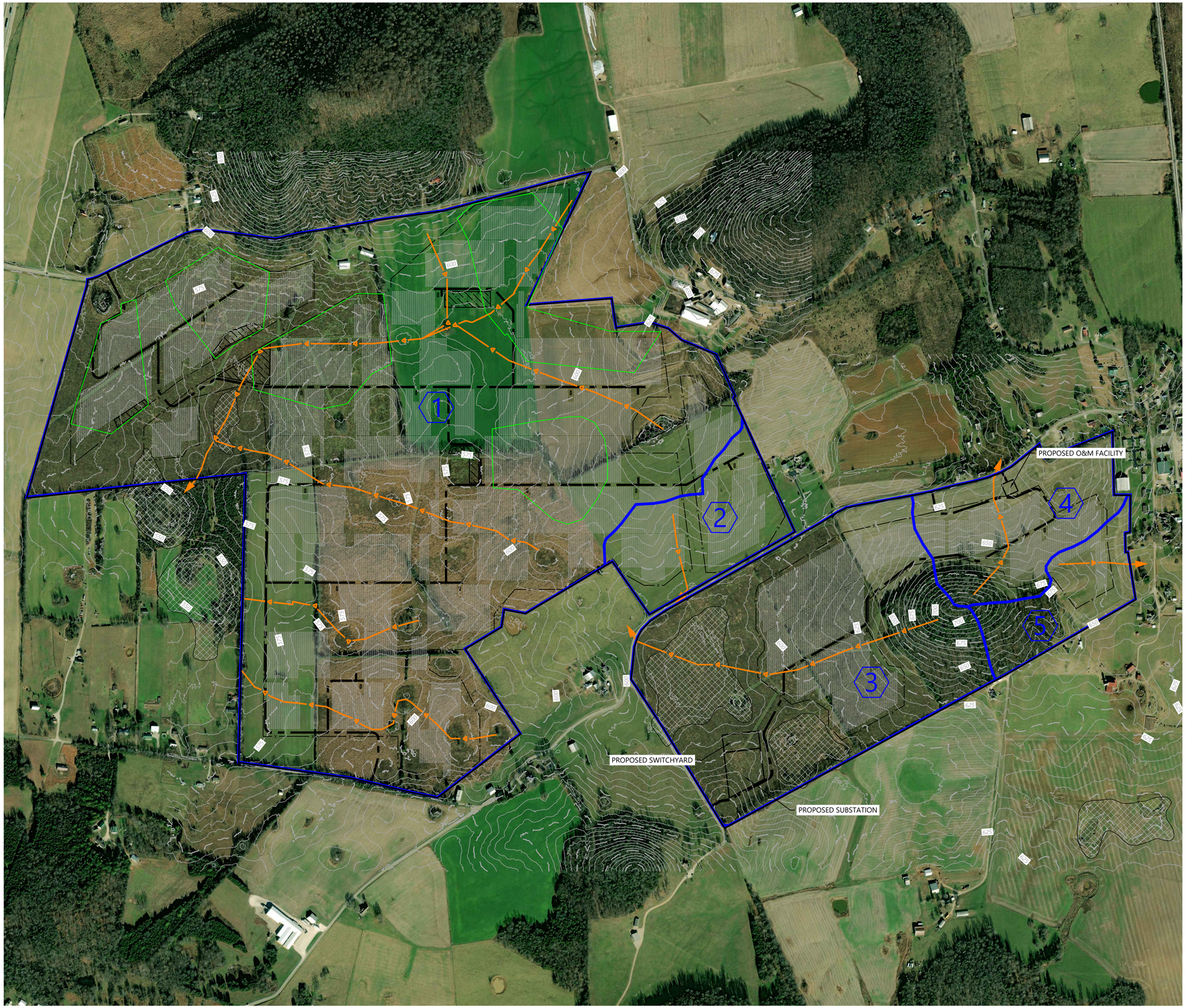

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- EX. INTERVAL CONTOUR
- EX. STREAM CHANNEL
- EX. WETLAND
- FEMA FLOOD HAZARD ZONE
- PROPOSED SOLAR ARRAY
- PROPOSED ACCESS ROAD
- PROPOSED SECURITY FENCE
- PROPOSED ELECTRICAL EQUIPMENT
- TEMPORARY DRAINAGE AREA BOUNDARY
- PROPOSED ONSITE DRAINAGE AREA BOUNDARY
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N

0' 400' 800' 1200'

Thoroughbred Solar Project

Hart County, Kentucky

Overall Proposed Drainage Map

NOT FOR CONSTRUCTION

DATE: 9/06/2022
REV:
SHEET: 6

LEGEND:

- PROJECT BOUNDARY
- EX. INDEX CONTOUR
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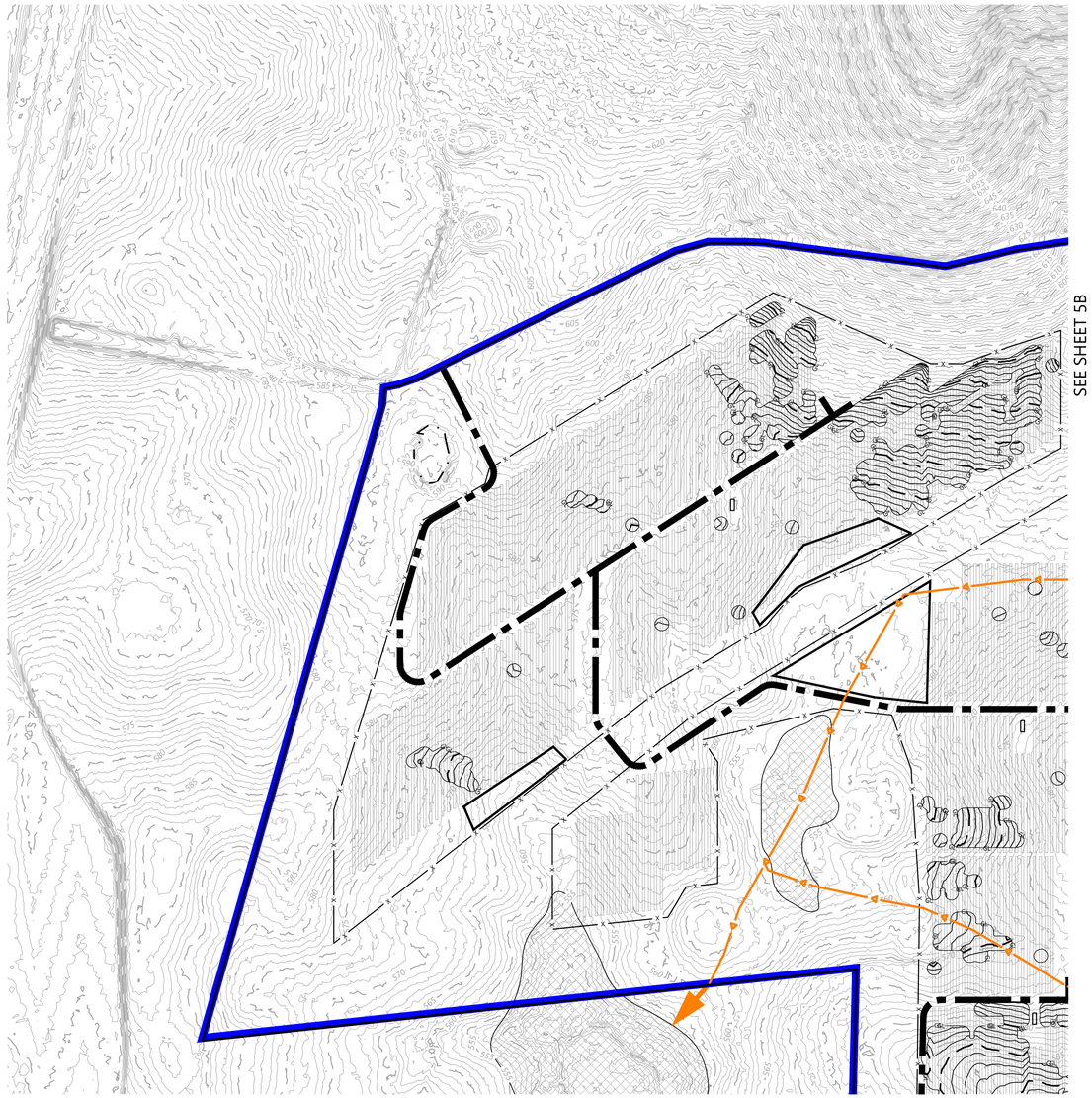
- EX. STREAM CHANNEL
- EX. WETLAND
- FEMA FLOOD HAZARD ZONE
- PROPOSED SOLAR ARRAY
- PROPOSED ACCESS ROAD
- PROPOSED SECURITY FENCE
- PROPOSED ELECTRICAL EQUIPMENT
- PROPOSED INDEX CONTOUR
- PROPOSED INTERVAL CONTOUR
- PROPOSED ONSITE DRAINAGE AREA BOUNDARY
- PROPOSED TIME OF CONCENTRATION LINE
- DISCHARGE LOCATION
- 1 DRAINAGE AREA LABEL



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westwoodps.com

Westwood Professional Services, Inc.

PREPARED FOR:

LEEWARD renewable energy

6688 North Central Expressway, Suite 500
Dallas, TX 75206

REVISIONS:

#	DATE	COMMENT	BY	CHK	APR

N

0' 200' 400' 600'

Thoroughbred Solar Project

Hart County, Kentucky

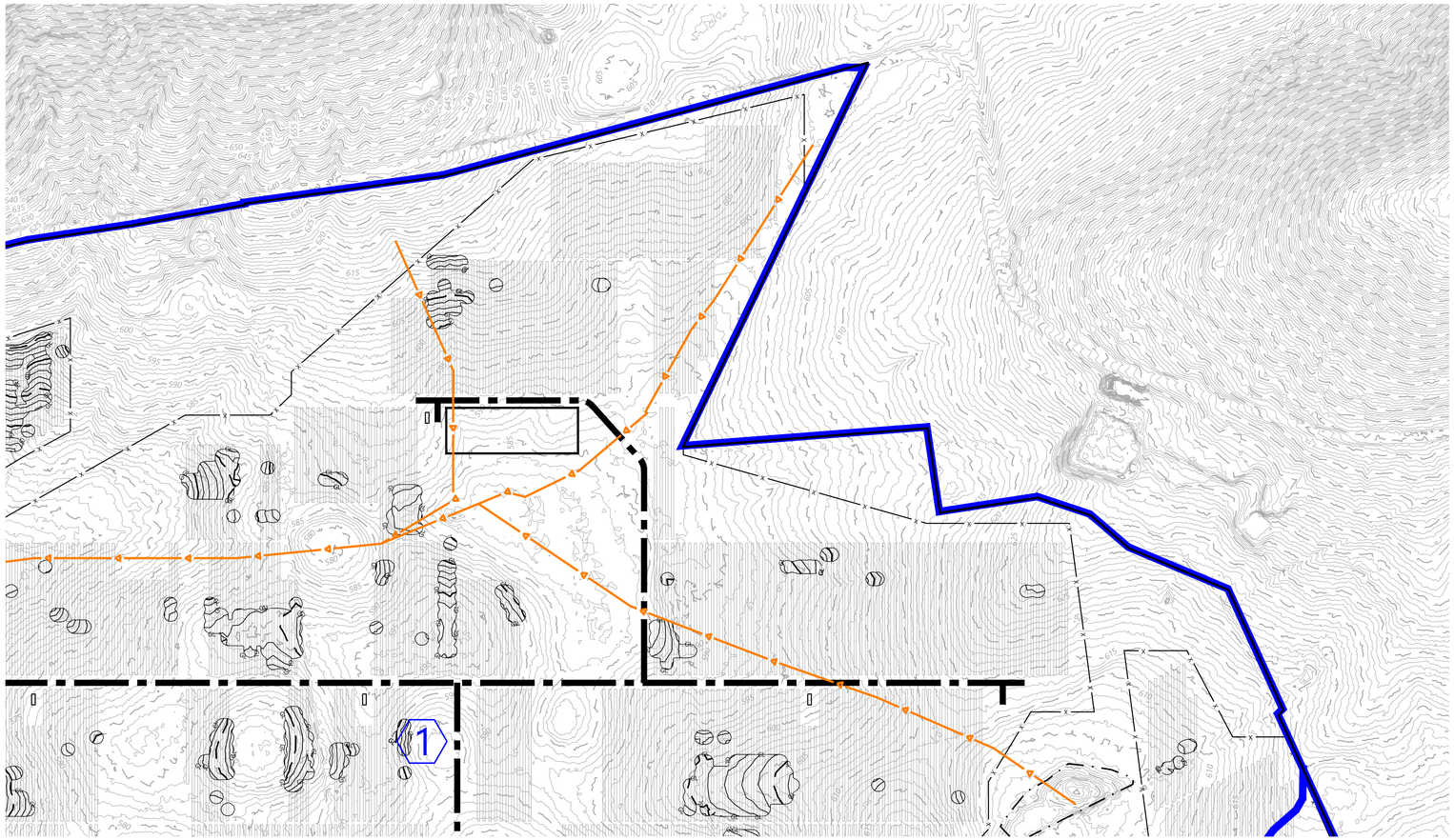
Proposed Drainage Map

NOT FOR CONSTRUCTION

DATE: 9/06/2022

REV:

SHEET: 6A



LEGEND:

- PROJECT BOUNDARY
- EX. INDEX CONTOUR
- EX. INTERVAL CONTOUR
- EX. STREAM CHANNEL
- EX. WETLAND
- FEMA FLOOD HAZARD ZONE
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DATE: 9/06/2022
REV:
SHEET: 6B

SEE SHEET 5B

SEE SHEET 5A

SEE SHEET 5D

LEGEND:

- PROJECT BOUNDARY
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Hart County, Kentucky

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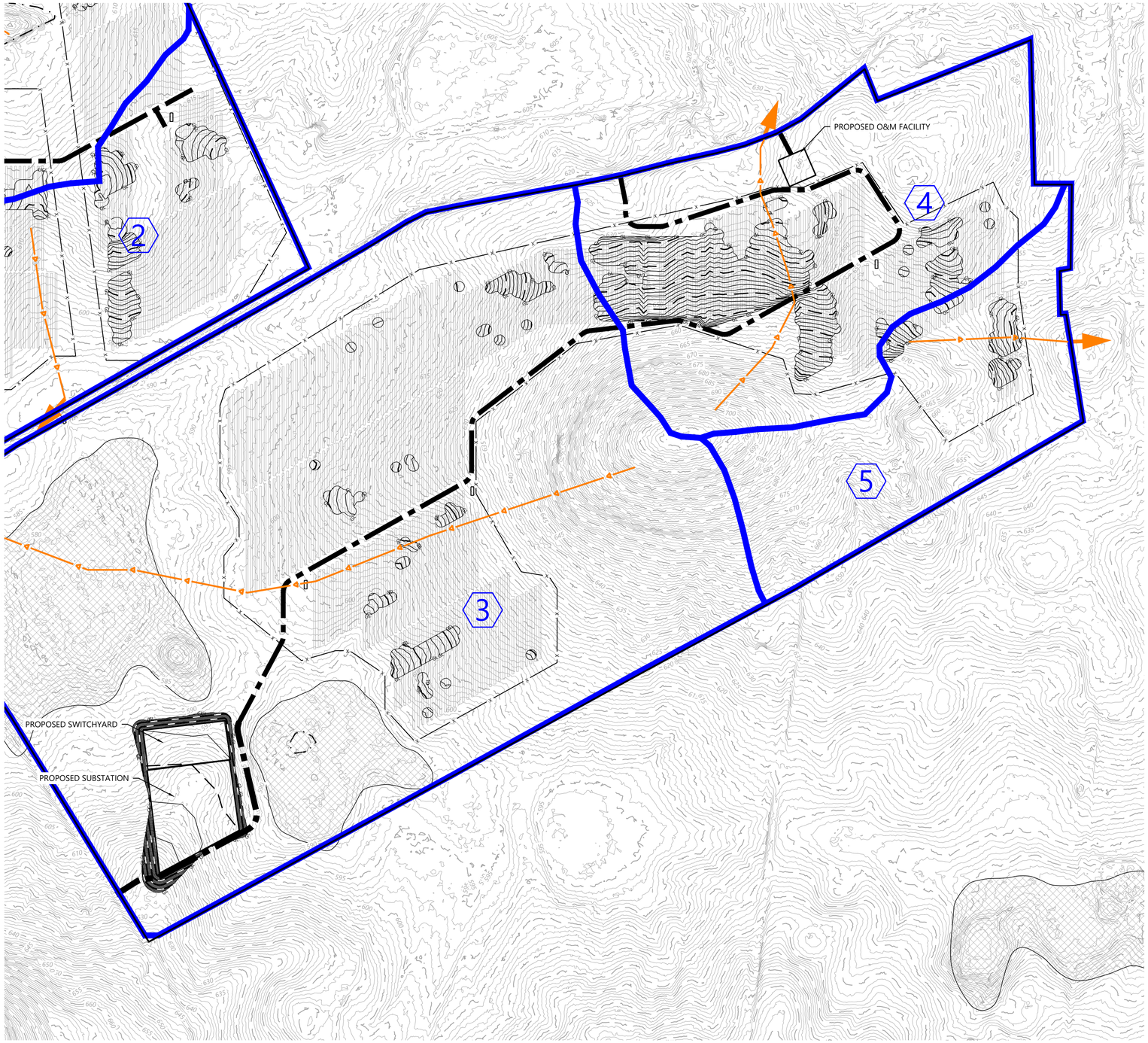
DATE: 9/06/2022

REV:

SHEET: 6C

SEE SHEET 5B

SEE SHEET 5C



LEGEND:

- PROJECT BOUNDARY
- EX. INDEX CONTOUR
- EX. INTERVAL CONTOUR
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0' 200' 400' 600'

Thoroughbred Solar Project

Hart County, Kentucky

Proposed Drainage Map

NOT FOR CONSTRUCTION

DATE: 9/06/2022

REV:

SHEET: 6D

Appendix A

NOAA Atlas 14 Precipitation Data

NOAA Atlas 14, Volume 2, Version 3
Location name: Horse Cave, Kentucky, USA*
Latitude: 37.2382°, Longitude: -85.9163°
Elevation: 586.91 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.359** (0.326-0.395)	**0.422** (0.383-0.465)	**0.484** (0.439-0.533)	**0.534** (0.484-0.587)	**0.595** (0.537-0.654)	**0.641** (0.576-0.703)	**0.686** (0.613-0.753)	**0.728** (0.646-0.799)	**0.779** (0.685-0.858)	**0.818** (0.715-0.904)
10-min	**0.573** (0.521-0.631)	**0.674** (0.613-0.743)	**0.775** (0.703-0.853)	**0.854** (0.775-0.939)	**0.948** (0.855-1.04)	**1.02** (0.917-1.12)	**1.09** (0.975-1.20)	**1.15** (1.02-1.27)	**1.23** (1.08-1.36)	**1.29** (1.13-1.42)
15-min	**0.717** (0.652-0.789)	**0.848** (0.771-0.934)	**0.980** (0.889-1.08)	**1.08** (0.980-1.19)	**1.20** (1.08-1.32)	**1.29** (1.16-1.42)	**1.38** (1.23-1.51)	**1.46** (1.29-1.60)	**1.55** (1.36-1.71)	**1.62** (1.41-1.79)
30-min	**0.982** (0.893-1.08)	**1.17** (1.07-1.29)	**1.39** (1.26-1.53)	**1.57** (1.42-1.72)	**1.78** (1.61-1.96)	**1.95** (1.75-2.14)	**2.11** (1.89-2.32)	**2.27** (2.01-2.49)	**2.47** (2.17-2.72)	**2.62** (2.29-2.89)
60-min	**1.23** (1.11-1.35)	**1.47** (1.34-1.62)	**1.79** (1.62-1.97)	**2.04** (1.85-2.24)	**2.37** (2.14-2.60)	**2.64** (2.37-2.90)	**2.91** (2.60-3.19)	**3.18** (2.82-3.49)	**3.54** (3.11-3.90)	**3.82** (3.34-4.22)
2-hr	**1.46** (1.32-1.61)	**1.74** (1.58-1.92)	**2.11** (1.91-2.33)	**2.40** (2.17-2.65)	**2.81** (2.53-3.10)	**3.14** (2.82-3.46)	**3.49** (3.11-3.85)	**3.85** (3.40-4.25)	**4.34** (3.79-4.81)	**4.74** (4.11-5.27)
3-hr	**1.60** (1.46-1.78)	**1.91** (1.73-2.12)	**2.31** (2.09-2.56)	**2.65** (2.39-2.93)	**3.11** (2.79-3.44)	**3.49** (3.12-3.86)	**3.89** (3.45-4.30)	**4.31** (3.79-4.77)	**4.89** (4.25-5.43)	**5.37** (4.62-5.99)
6-hr	**1.96** (1.79-2.18)	**2.33** (2.12-2.59)	**2.83** (2.57-3.14)	**3.26** (2.95-3.60)	**3.86** (3.47-4.27)	**4.37** (3.90-4.84)	**4.91** (4.36-5.44)	**5.49** (4.83-6.10)	**6.33** (5.48-7.04)	**7.01** (6.00-7.82)
12-hr	**2.35** (2.16-2.59)	**2.80** (2.57-3.09)	**3.40** (3.11-3.74)	**3.92** (3.57-4.31)	**4.65** (4.21-5.10)	**5.27** (4.73-5.78)	**5.93** (5.28-6.50)	**6.64** (5.86-7.29)	**7.66** (6.65-8.45)	**8.51** (7.28-9.45)
24-hr	**2.89** (2.70-3.12)	**3.45** (3.22-3.72)	**4.21** (3.91-4.54)	**4.83** (4.49-5.22)	**5.74** (5.29-6.19)	**6.48** (5.94-7.01)	**7.27** (6.61-7.89)	**8.12** (7.31-8.84)	**9.33** (8.27-10.2)	**10.3** (9.03-11.4)
2-day	**3.46** (3.21-3.74)	**4.13** (3.83-4.47)	**5.05** (4.68-5.47)	**5.82** (5.39-6.31)	**6.93** (6.37-7.53)	**7.86** (7.16-8.56)	**8.85** (7.99-9.67)	**9.90** (8.86-10.9)	**11.4** (10.1-12.7)	**12.7** (11.0-14.2)
3-day	**3.71** (3.45-4.01)	**4.42** (4.11-4.79)	**5.40** (5.01-5.85)	**6.20** (5.74-6.71)	**7.33** (6.75-7.95)	**8.26** (7.55-8.98)	**9.25** (8.39-10.1)	**10.3** (9.24-11.3)	**11.8** (10.5-13.0)	**13.0** (11.4-14.5)
4-day	**3.96** (3.68-4.28)	**4.72** (4.39-5.10)	**5.74** (5.34-6.22)	**6.58** (6.09-7.12)	**7.73** (7.13-8.37)	**8.67** (7.95-9.40)	**9.65** (8.78-10.5)	**10.7** (9.63-11.7)	**12.2** (10.9-13.4)	**13.4** (11.8-14.9)
7-day	**4.75** (4.40-5.14)	**5.66** (5.25-6.14)	**6.90** (6.38-7.48)	**7.91** (7.30-8.58)	**9.36** (8.58-10.1)	**10.5** (9.61-11.4)	**11.8** (10.7-12.8)	**13.1** (11.8-14.3)	**15.0** (13.2-16.5)	**16.5** (14.4-18.2)
10-day	**5.43** (5.07-5.85)	**6.48** (6.03-6.97)	**7.81** (7.26-8.40)	**8.87** (8.23-9.54)	**10.3** (9.53-11.1)	**11.5** (10.6-12.4)	**12.7** (11.6-13.7)	**13.9** (12.6-15.1)	**15.6** (14.0-16.9)	**16.9** (15.1-18.5)
20-day	**7.41** (6.95-7.90)	**8.78** (8.24-9.37)	**10.4** (9.75-11.1)	**11.6** (10.9-12.4)	**13.2** (12.4-14.1)	**14.5** (13.5-15.5)	**15.7** (14.5-16.8)	**16.9** (15.6-18.1)	**18.4** (16.9-19.8)	**19.5** (17.8-21.2)
30-day	**9.08** (8.52-9.67)	**10.7** (10.1-11.4)	**12.6** (11.8-13.4)	**14.0** (13.1-14.9)	**15.8** (14.7-16.8)	**17.2** (16.0-18.3)	**18.6** (17.2-19.8)	**19.9** (18.4-21.4)	**21.7** (19.9-23.4)	**23.0** (20.9-24.9)
45-day	**11.4** (10.7-12.0)	**13.4** (12.6-14.2)	**15.4** (14.5-16.3)	**17.0** (16.0-18.0)	**19.0** (17.8-20.1)	**20.5** (19.2-21.7)	**21.9** (20.5-23.3)	**23.3** (21.7-24.8)	**25.1** (23.2-26.8)	**26.3** (24.3-28.2)
60-day	**13.7** (13.0-14.5)	**16.1** (15.2-17.0)	**18.4** (17.4-19.4)	**20.1** (19.0-21.3)	**22.3** (21.0-23.6)	**23.9** (22.5-25.3)	**25.3** (23.8-26.8)	**26.7** (25.0-28.4)	**28.4** (26.5-30.2)	**29.6** (27.5-31.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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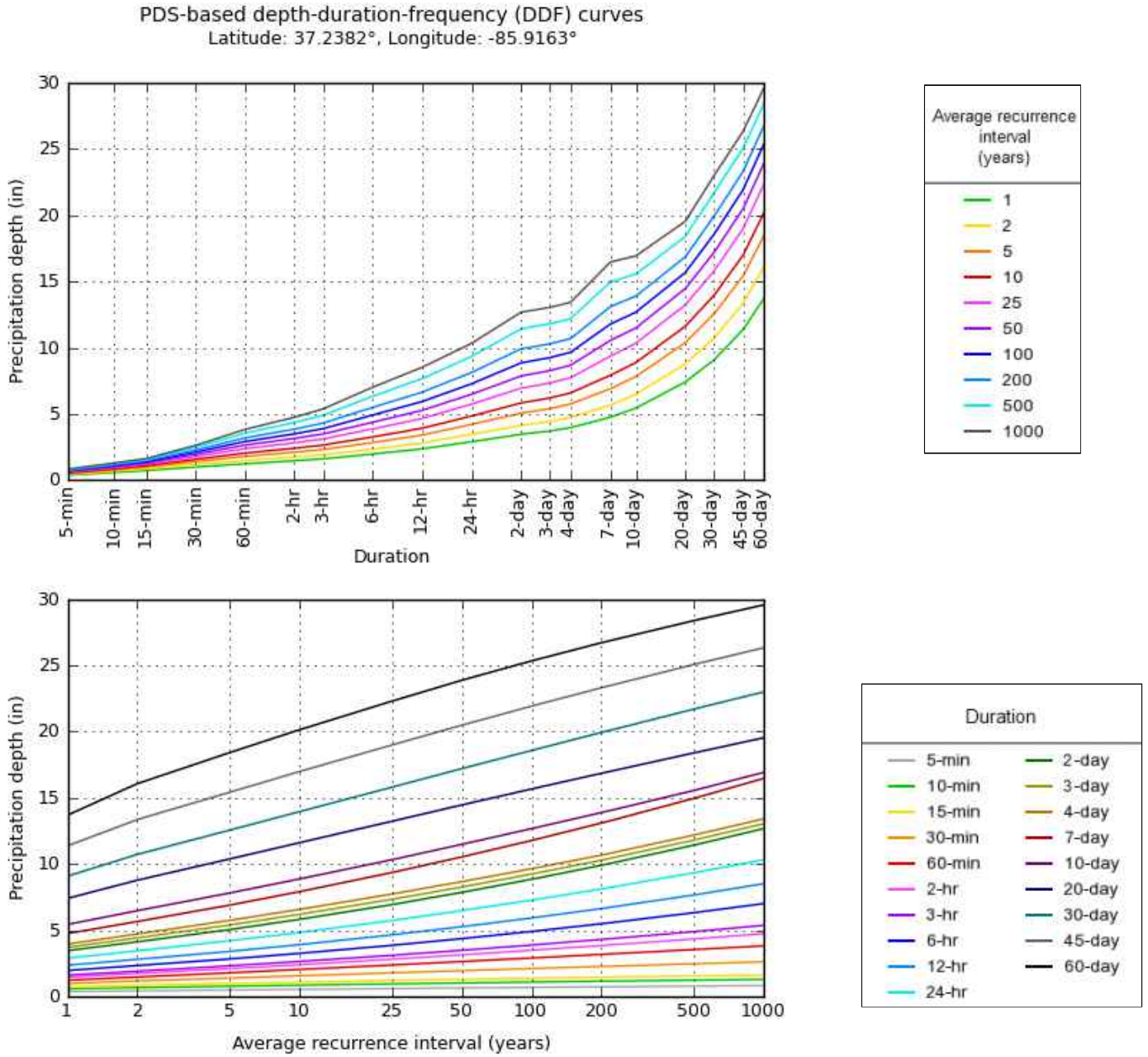
PF graphical



NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Thu Feb 10 13:55:00 2022

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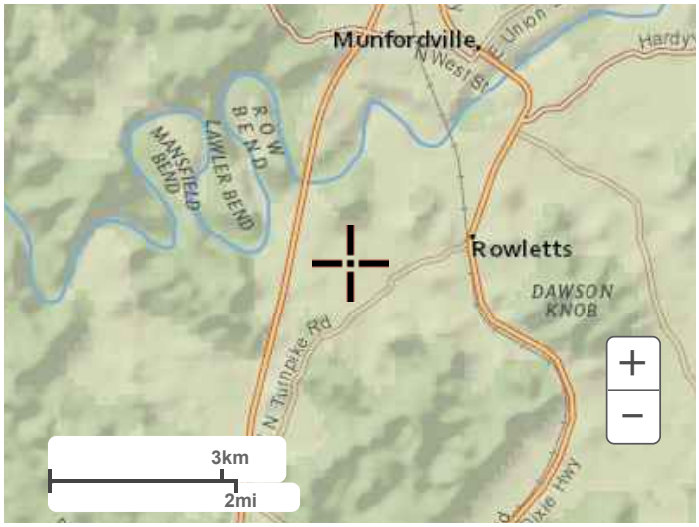
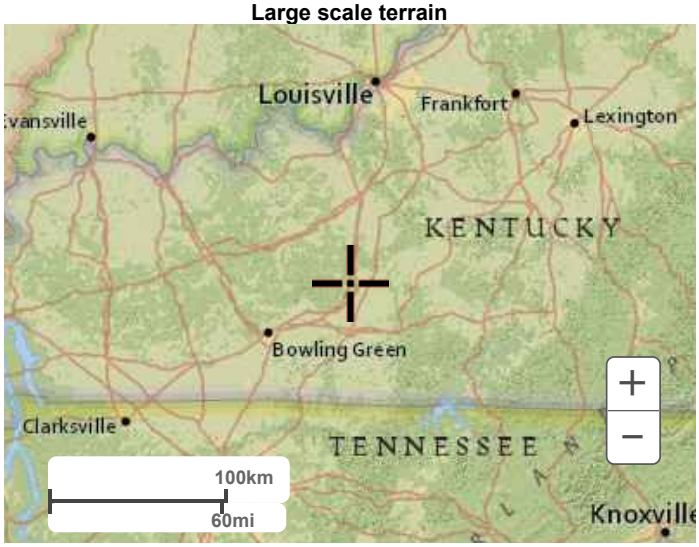
Maps & aerials

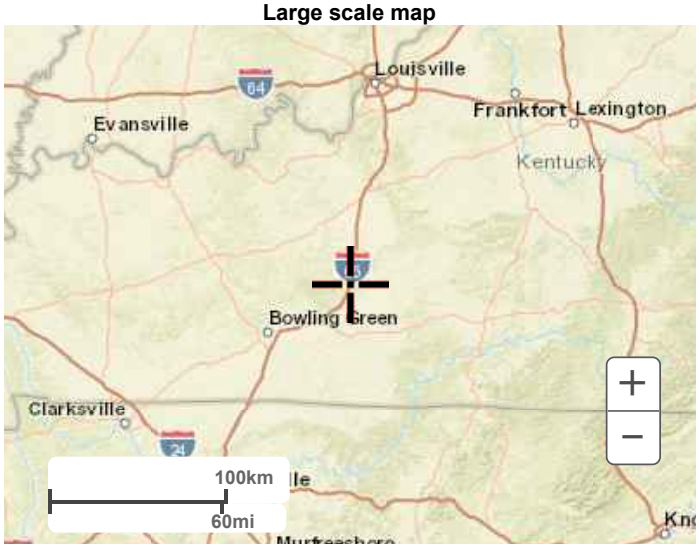
Small scale terrain



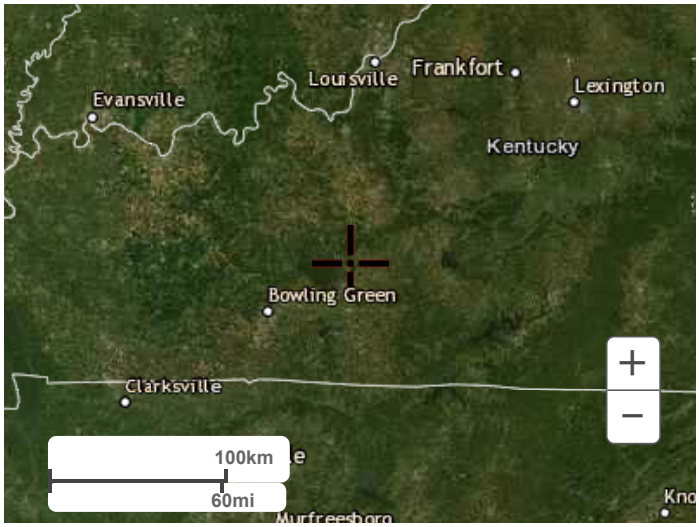
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

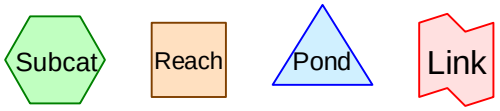
Disclaimer

Appendix B

Existing HydroCAD Results

Existing

DA-1EX DA-2EX DA-3EX DA-4EX DA-5EX



Routing Diagram for 2022-09-02_Thoroughbred_PrePost
Prepared by Westwood MultiDisciplined Eng, Printed 9/2/2022

Project Notes

Copied 7 events from Thoroughbred 24-hr S1 storm

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Thoroughbred 24-hr S1	2-yr	Default	24.00	1	3.45	2
2	10-yr	Thoroughbred 24-hr S1	10-yr	Default	24.00	1	4.83	2
3	100-yr	Thoroughbred 24-hr S1	100-yr	Default	24.00	1	7.27	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
230.550	58	Meadow, non-grazed, HSG B (DA-1EX, DA-2EX, DA-3EX)
62.900	71	Meadow, non-grazed, HSG C (DA-1EX, DA-3EX)
72.210	69	Pasture/grassland/range, Fair, HSG B (DA-1EX, DA-2EX)
94.100	78	Row crops, straight row, Good, HSG B (DA-1EX, DA-3EX, DA-4EX, DA-5EX)
48.360	85	Row crops, straight row, Good, HSG C (DA-1EX, DA-3EX, DA-4EX, DA-5EX)
9.570	60	Woods, Fair, HSG B (DA-3EX, DA-4EX, DA-5EX)
13.480	73	Woods, Fair, HSG C (DA-3EX, DA-4EX, DA-5EX)
531.170	**67**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
406.430	HSG B	DA-1EX, DA-2EX, DA-3EX, DA-4EX, DA-5EX
124.740	HSG C	DA-1EX, DA-3EX, DA-4EX, DA-5EX
0.000	HSG D	
0.000	Other	
531.170		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	230.550	62.900	0.000	0.000	293.450	Meadow, non-grazed	DA-1EX, DA-2EX, DA-3EX
0.000	72.210	0.000	0.000	0.000	72.210	Pasture/grassland/range, Fair	DA-1EX, DA-2EX
0.000	94.100	48.360	0.000	0.000	142.460	Row crops, straight row, Good	DA-1EX, DA-3EX, DA-4EX, DA-5EX
0.000	9.570	13.480	0.000	0.000	23.050	Woods, Fair	DA-3EX, DA-4EX, DA-5EX
0.000	**406.430**	**124.740**	**0.000**	**0.000**	**531.170**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1EX: DA-1EX Runoff Area=354.000 ac 0.00% Impervious Runoff Depth>0.68"
Flow Length=3,600' Slope=0.0200 '/' Tc=90.5 min CN=67 Runoff=91.52 cfs 20.190 af

Subcatchment DA-2EX: DA-2EX Runoff Area=26.210 ac 0.00% Impervious Runoff Depth>0.76"
Flow Length=790' Slope=0.0423 '/' Tc=18.0 min CN=68 Runoff=17.23 cfs 1.671 af

Subcatchment DA-3EX: DA-3EX Runoff Area=101.200 ac 0.00% Impervious Runoff Depth>0.53"
Flow Length=2,850' Slope=0.0480 '/' Tc=53.8 min CN=63 Runoff=25.63 cfs 4.489 af

Subcatchment DA-4EX: DA-4EX Runoff Area=32.200 ac 0.00% Impervious Runoff Depth>1.38"
Flow Length=1,150' Slope=0.0650 '/' Tc=14.4 min CN=79 Runoff=47.20 cfs 3.712 af

Subcatchment DA-5EX: DA-5EX Runoff Area=17.560 ac 0.00% Impervious Runoff Depth>1.14"
Flow Length=625' Slope=0.0540 '/' Tc=10.9 min CN=75 Runoff=23.17 cfs 1.665 af

Total Runoff Area = 531.170 ac Runoff Volume = 31.728 af Average Runoff Depth = 0.72"
100.00% Pervious = 531.170 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment DA-1EX: DA-1EX

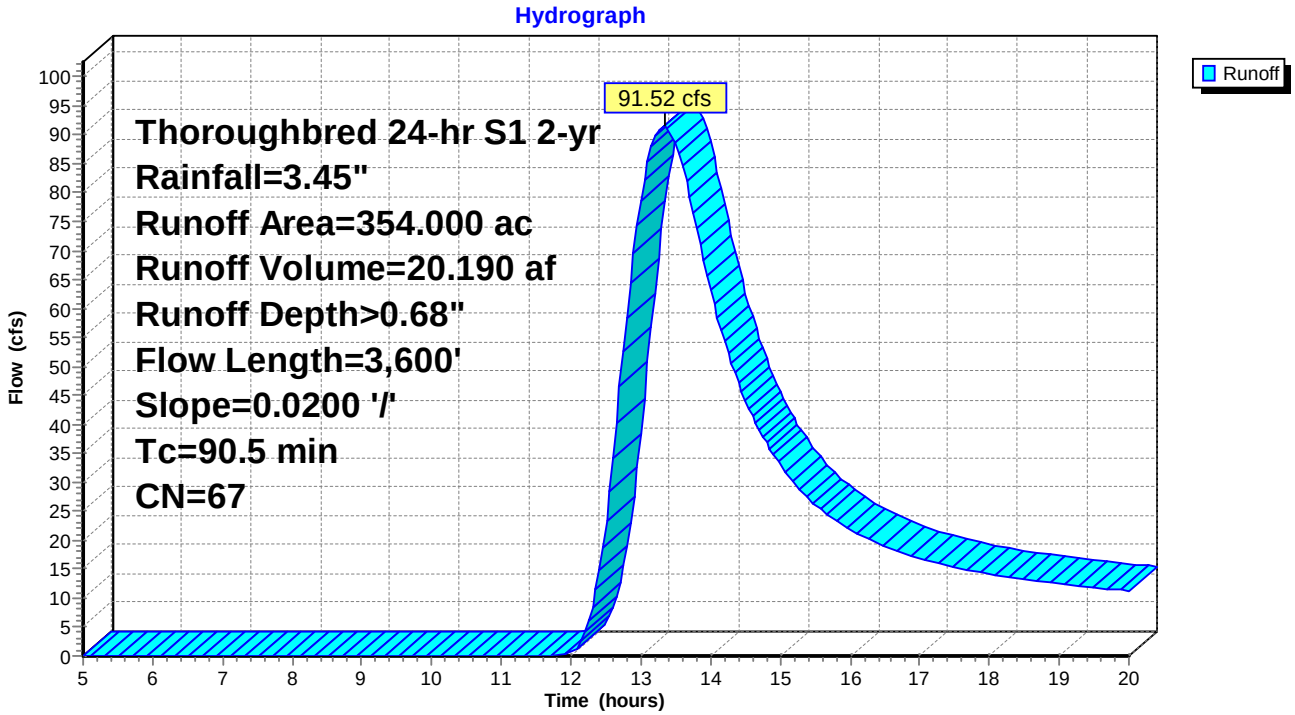
Runoff = 91.52 cfs @ 13.34 hrs, Volume= 20.190 af, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

Area (ac)	CN	Description
157.330	58	Meadow, non-grazed, HSG B
55.800	71	Meadow, non-grazed, HSG C
47.600	69	Pasture/grassland/range, Fair, HSG B
32.600	85	Row crops, straight row, Good, HSG C
60.670	78	Row crops, straight row, Good, HSG B
354.000	67	Weighted Average
354.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.5	3,600	0.0200	0.66		**Lag/CN Method,**

Subcatchment DA-1EX: DA-1EX



Summary for Subcatchment DA-2EX: DA-2EX

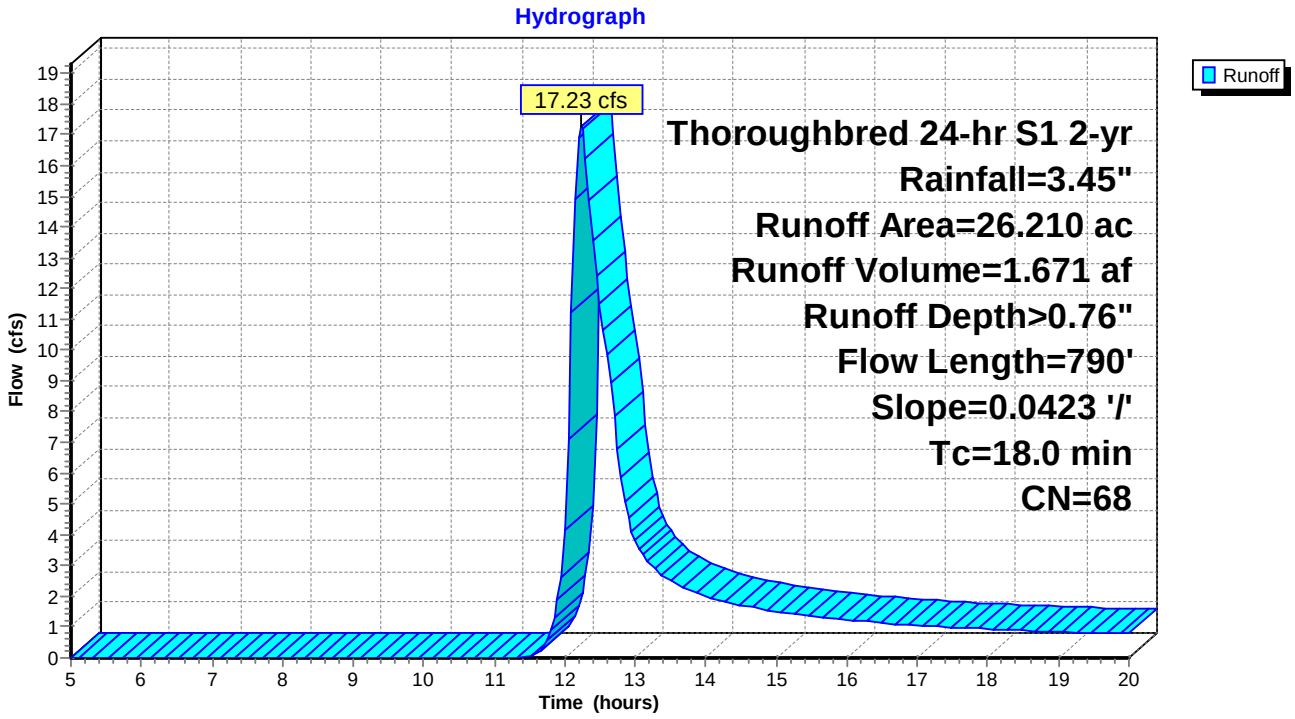
Runoff = 17.23 cfs @ 12.24 hrs, Volume= 1.671 af, Depth> 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

Area (ac)	CN	Description
1.600	58	Meadow, non-grazed, HSG B
24.610	69	Pasture/grassland/range, Fair, HSG B
26.210	68	Weighted Average
26.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	790	0.0423	0.73		**Lag/CN Method,**

Subcatchment DA-2EX: DA-2EX



Summary for Subcatchment DA-3EX: DA-3EX

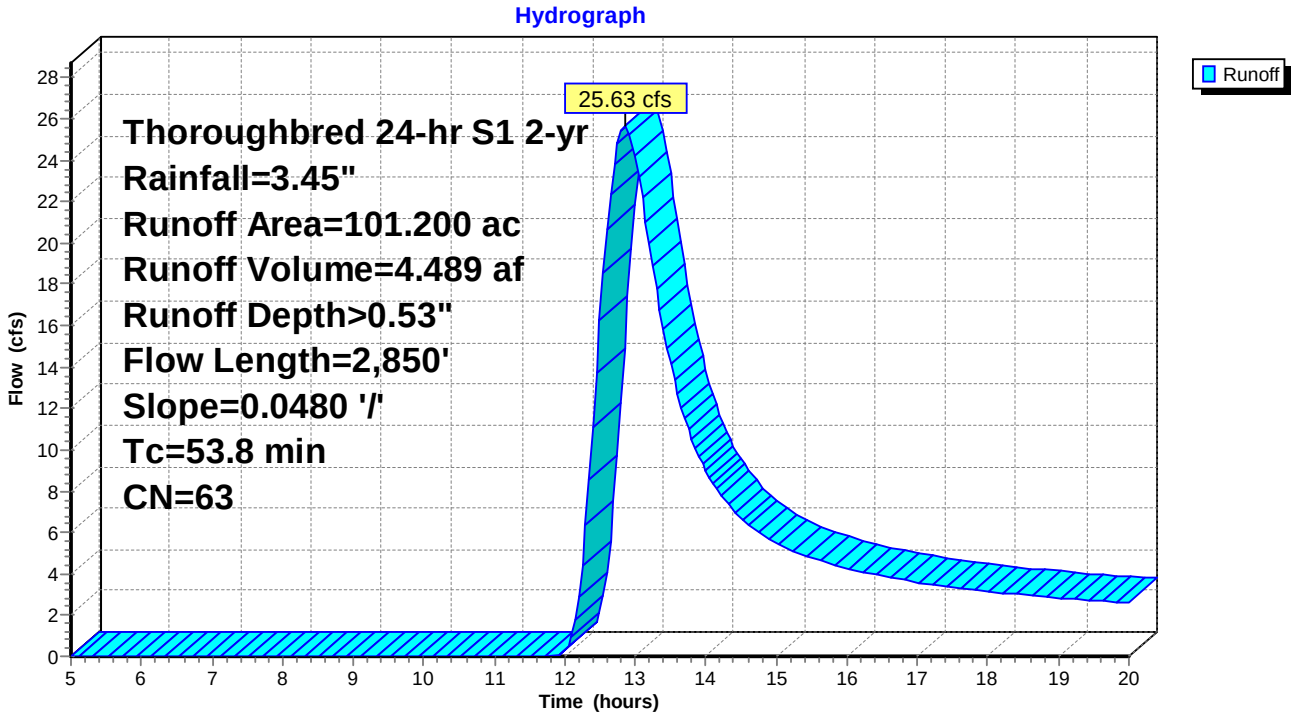
Runoff = 25.63 cfs @ 12.85 hrs, Volume= 4.489 af, Depth> 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

Area (ac)	CN	Description
7.100	71	Meadow, non-grazed, HSG C
71.620	58	Meadow, non-grazed, HSG B
4.960	78	Row crops, straight row, Good, HSG B
5.370	85	Row crops, straight row, Good, HSG C
7.370	73	Woods, Fair, HSG C
4.780	60	Woods, Fair, HSG B
101.200	63	Weighted Average
101.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
53.8	2,850	0.0480	0.88		**Lag/CN Method,**

Subcatchment DA-3EX: DA-3EX



Summary for Subcatchment DA-4EX: DA-4EX

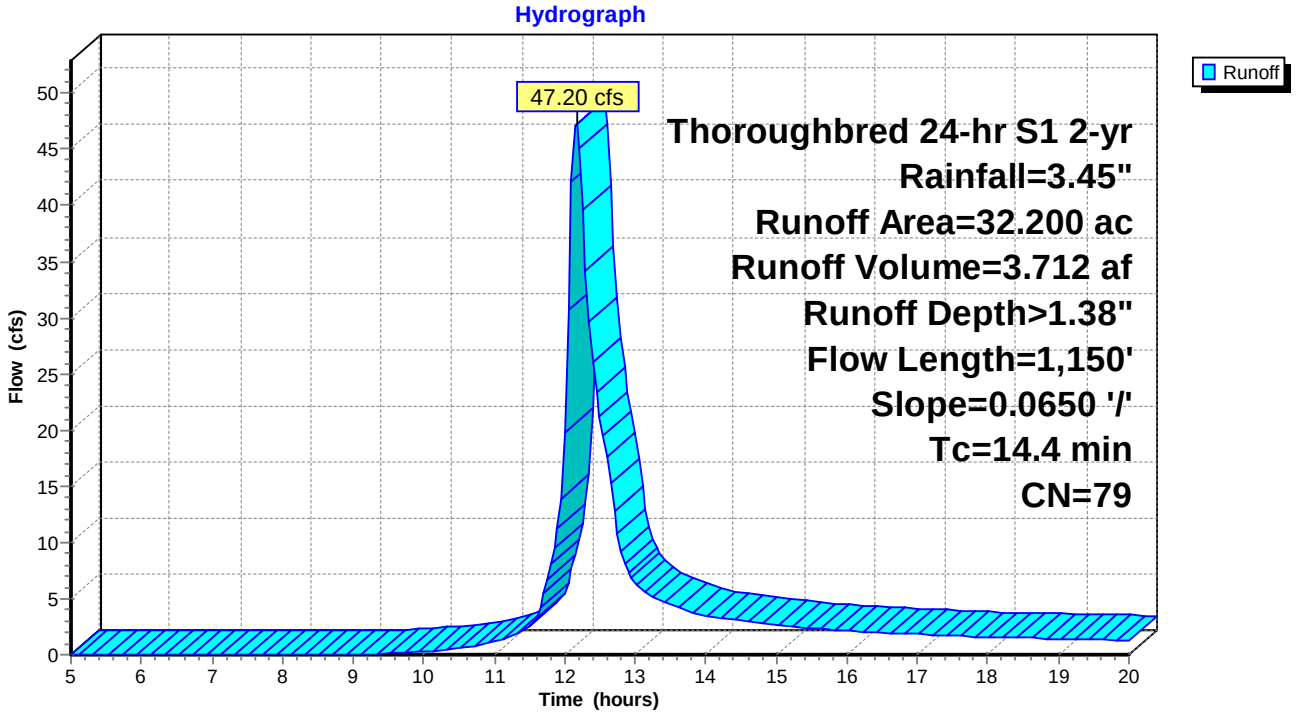
Runoff = 47.20 cfs @ 12.16 hrs, Volume= 3.712 af, Depth> 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

Area (ac)	CN	Description
1.710	60	Woods, Fair, HSG B
1.650	73	Woods, Fair, HSG C
7.880	85	Row crops, straight row, Good, HSG C
20.960	78	Row crops, straight row, Good, HSG B
32.200	79	Weighted Average
32.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	1,150	0.0650	1.33		**Lag/CN Method,**

Subcatchment DA-4EX: DA-4EX



Summary for Subcatchment DA-5EX: DA-5EX

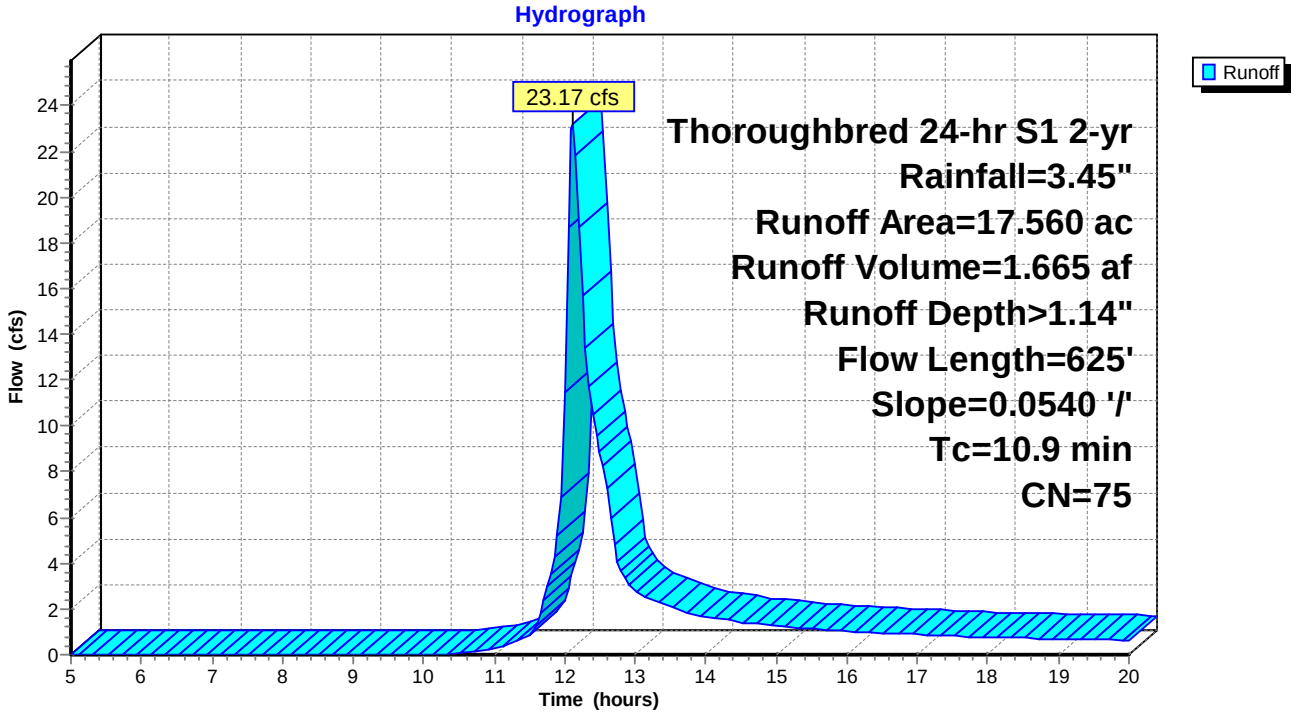
Runoff = 23.17 cfs @ 12.11 hrs, Volume= 1.665 af, Depth> 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

Area (ac)	CN	Description
3.080	60	Woods, Fair, HSG B
4.460	73	Woods, Fair, HSG C
2.510	85	Row crops, straight row, Good, HSG C
7.510	78	Row crops, straight row, Good, HSG B
17.560	75	Weighted Average
17.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	625	0.0540	0.96		**Lag/CN Method,**

Subcatchment DA-5EX: DA-5EX



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1EX: DA-1EX Runoff Area=354.000 ac 0.00% Impervious Runoff Depth>1.44"
Flow Length=3,600' Slope=0.0200 '/' Tc=90.5 min CN=67 Runoff=204.72 cfs 42.588 af

Subcatchment DA-2EX: DA-2EX Runoff Area=26.210 ac 0.00% Impervious Runoff Depth>1.57"
Flow Length=790' Slope=0.0423 '/' Tc=18.0 min CN=68 Runoff=36.63 cfs 3.436 af

Subcatchment DA-3EX: DA-3EX Runoff Area=101.200 ac 0.00% Impervious Runoff Depth>1.21"
Flow Length=2,850' Slope=0.0480 '/' Tc=53.8 min CN=63 Runoff=64.61 cfs 10.224 af

Subcatchment DA-4EX: DA-4EX Runoff Area=32.200 ac 0.00% Impervious Runoff Depth>2.43"
Flow Length=1,150' Slope=0.0650 '/' Tc=14.4 min CN=79 Runoff=78.58 cfs 6.522 af

Subcatchment DA-5EX: DA-5EX Runoff Area=17.560 ac 0.00% Impervious Runoff Depth>2.10"
Flow Length=625' Slope=0.0540 '/' Tc=10.9 min CN=75 Runoff=41.03 cfs 3.079 af

Total Runoff Area = 531.170 ac Runoff Volume = 65.849 af Average Runoff Depth = 1.49"
100.00% Pervious = 531.170 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment DA-1EX: DA-1EX

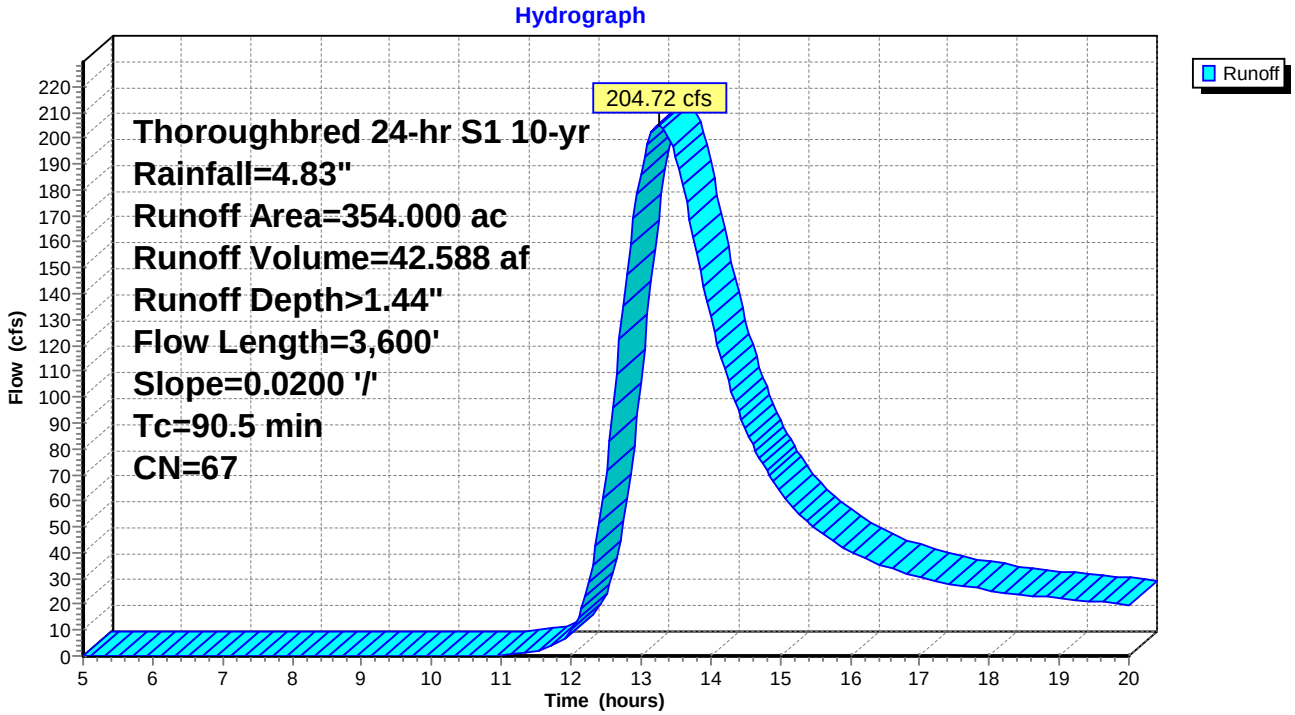
Runoff = 204.72 cfs @ 13.25 hrs, Volume= 42.588 af, Depth> 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 10-yr Rainfall=4.83"

Area (ac)	CN	Description
157.330	58	Meadow, non-grazed, HSG B
55.800	71	Meadow, non-grazed, HSG C
47.600	69	Pasture/grassland/range, Fair, HSG B
32.600	85	Row crops, straight row, Good, HSG C
60.670	78	Row crops, straight row, Good, HSG B
354.000	67	Weighted Average
354.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.5	3,600	0.0200	0.66		**Lag/CN Method,**

Subcatchment DA-1EX: DA-1EX



Summary for Subcatchment DA-2EX: DA-2EX

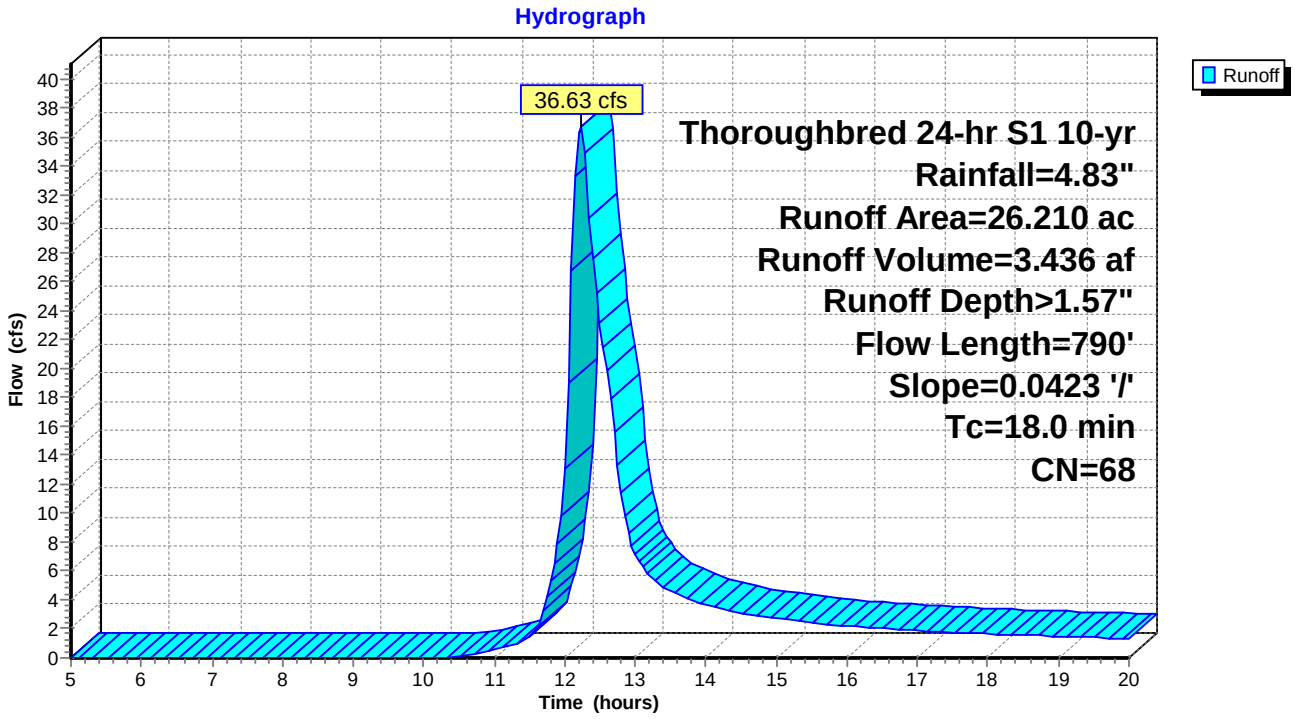
Runoff = 36.63 cfs @ 12.22 hrs, Volume= 3.436 af, Depth> 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 10-yr Rainfall=4.83"

Area (ac)	CN	Description
1.600	58	Meadow, non-grazed, HSG B
24.610	69	Pasture/grassland/range, Fair, HSG B
26.210	68	Weighted Average
26.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	790	0.0423	0.73		**Lag/CN Method,**

Subcatchment DA-2EX: DA-2EX



Summary for Subcatchment DA-3EX: DA-3EX

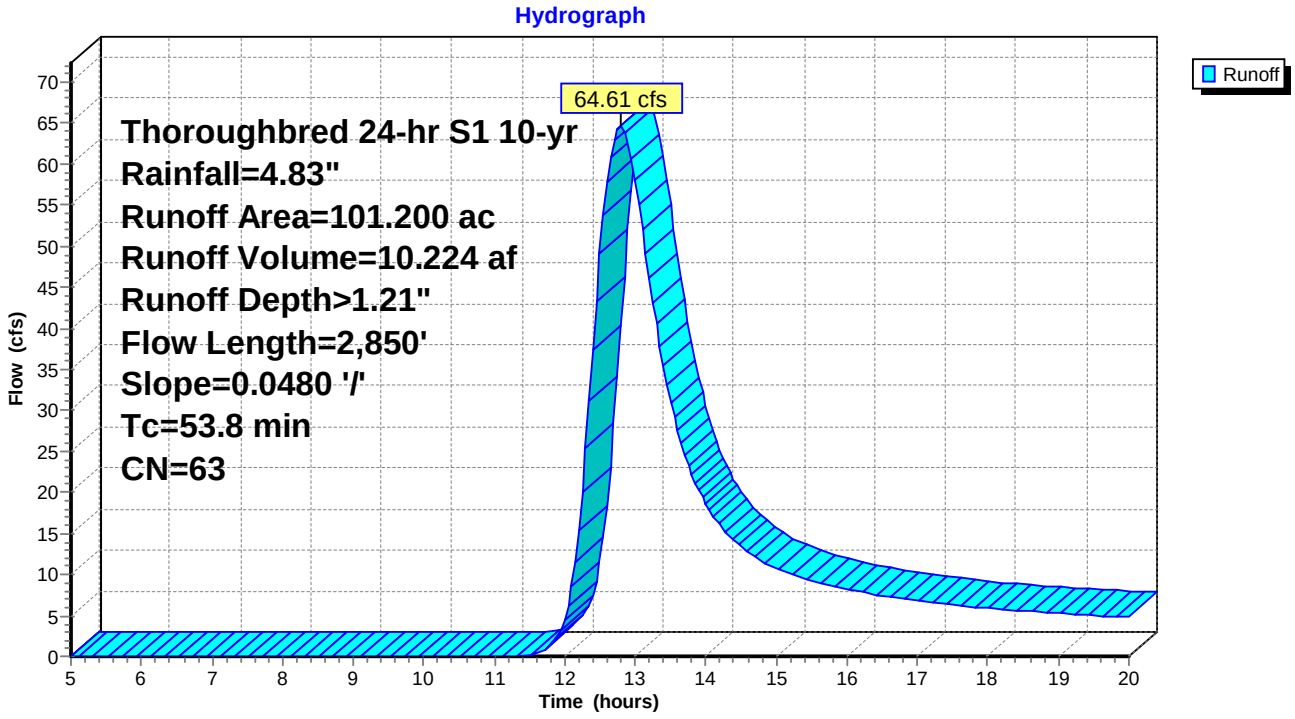
Runoff = 64.61 cfs @ 12.79 hrs, Volume= 10.224 af, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 10-yr Rainfall=4.83"

Area (ac)	CN	Description
7.100	71	Meadow, non-grazed, HSG C
71.620	58	Meadow, non-grazed, HSG B
4.960	78	Row crops, straight row, Good, HSG B
5.370	85	Row crops, straight row, Good, HSG C
7.370	73	Woods, Fair, HSG C
4.780	60	Woods, Fair, HSG B
101.200	63	Weighted Average
101.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
53.8	2,850	0.0480	0.88		**Lag/CN Method,**

Subcatchment DA-3EX: DA-3EX



Summary for Subcatchment DA-4EX: DA-4EX

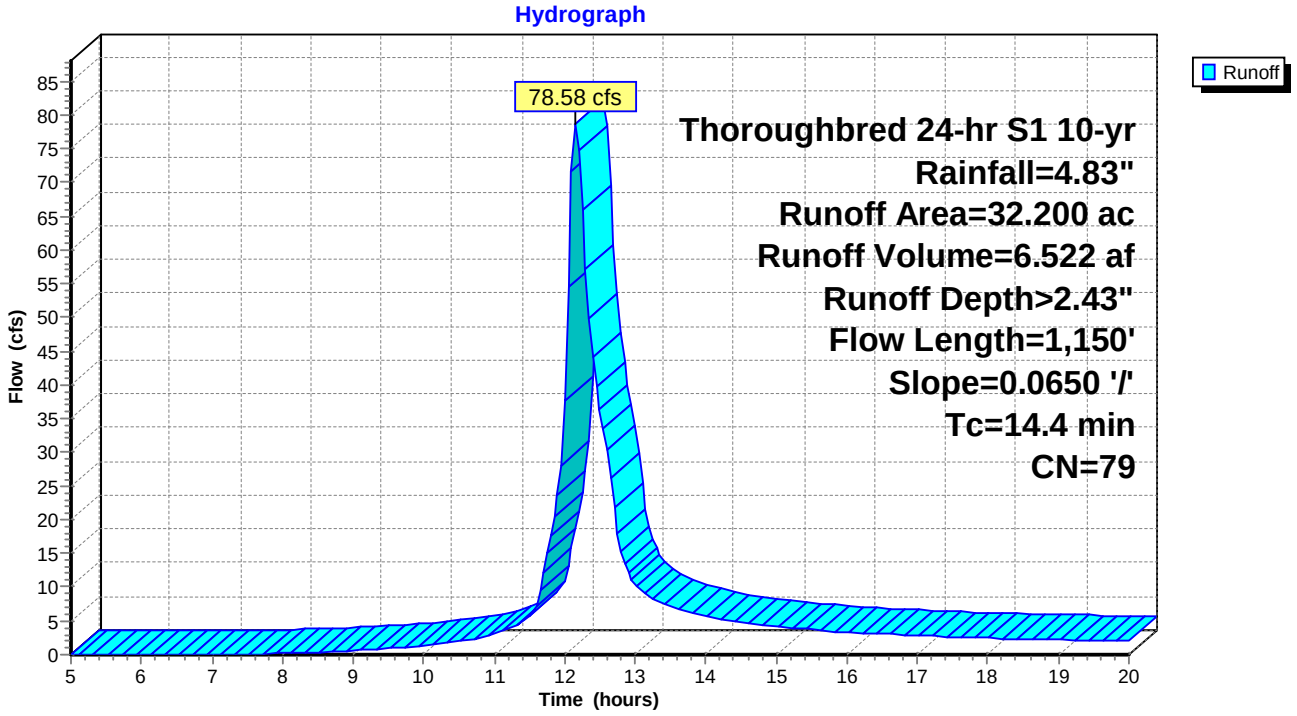
Runoff = 78.58 cfs @ 12.16 hrs, Volume= 6.522 af, Depth> 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 10-yr Rainfall=4.83"

Area (ac)	CN	Description
1.710	60	Woods, Fair, HSG B
1.650	73	Woods, Fair, HSG C
7.880	85	Row crops, straight row, Good, HSG C
20.960	78	Row crops, straight row, Good, HSG B
32.200	79	Weighted Average
32.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	1,150	0.0650	1.33		**Lag/CN Method,**

Subcatchment DA-4EX: DA-4EX



Summary for Subcatchment DA-5EX: DA-5EX

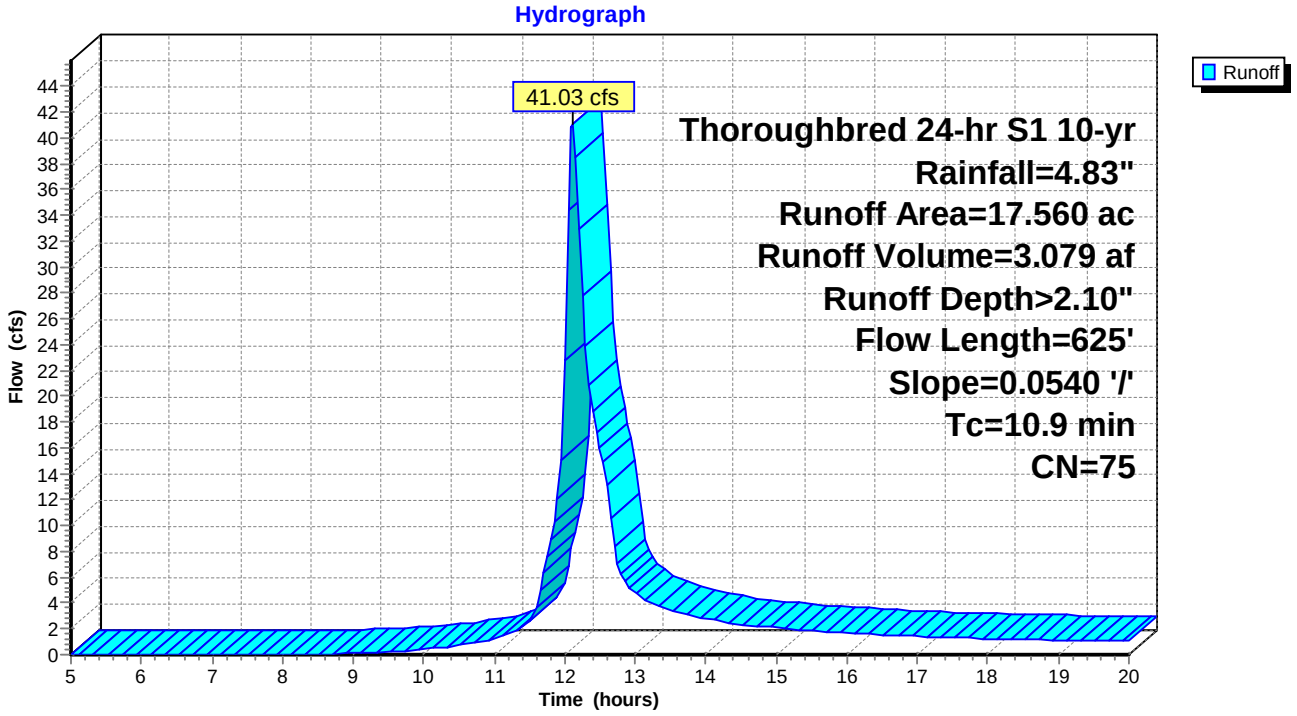
Runoff = 41.03 cfs @ 12.11 hrs, Volume= 3.079 af, Depth> 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 10-yr Rainfall=4.83"

Area (ac)	CN	Description
3.080	60	Woods, Fair, HSG B
4.460	73	Woods, Fair, HSG C
2.510	85	Row crops, straight row, Good, HSG C
7.510	78	Row crops, straight row, Good, HSG B
17.560	75	Weighted Average
17.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	625	0.0540	0.96		**Lag/CN Method,**

Subcatchment DA-5EX: DA-5EX



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1EX: DA-1EX Runoff Area=354.000 ac 0.00% Impervious Runoff Depth>3.07"
Flow Length=3,600' Slope=0.0200 '/' Tc=90.5 min CN=67 Runoff=427.30 cfs 90.463 af

Subcatchment DA-2EX: DA-2EX Runoff Area=26.210 ac 0.00% Impervious Runoff Depth>3.28"
Flow Length=790' Slope=0.0423 '/' Tc=18.0 min CN=68 Runoff=71.22 cfs 7.167 af

Subcatchment DA-3EX: DA-3EX Runoff Area=101.200 ac 0.00% Impervious Runoff Depth>2.73"
Flow Length=2,850' Slope=0.0480 '/' Tc=53.8 min CN=63 Runoff=143.90 cfs 23.034 af

Subcatchment DA-4EX: DA-4EX Runoff Area=32.200 ac 0.00% Impervious Runoff Depth>4.44"
Flow Length=1,150' Slope=0.0650 '/' Tc=14.4 min CN=79 Runoff=127.55 cfs 11.926 af

Subcatchment DA-5EX: DA-5EX Runoff Area=17.560 ac 0.00% Impervious Runoff Depth>4.02"
Flow Length=625' Slope=0.0540 '/' Tc=10.9 min CN=75 Runoff=69.74 cfs 5.883 af

Total Runoff Area = 531.170 ac Runoff Volume = 138.472 af Average Runoff Depth = 3.13"
100.00% Pervious = 531.170 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment DA-1EX: DA-1EX

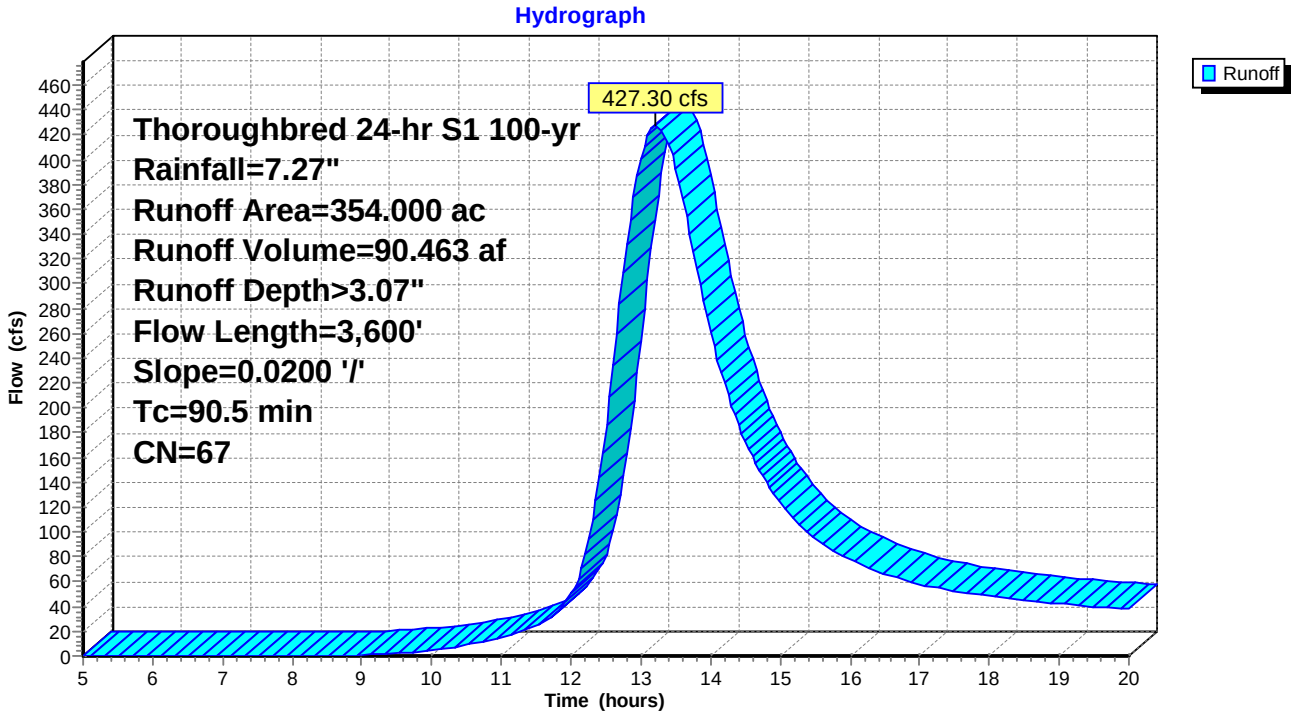
Runoff = 427.30 cfs @ 13.21 hrs, Volume= 90.463 af, Depth> 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 100-yr Rainfall=7.27"

Area (ac)	CN	Description
157.330	58	Meadow, non-grazed, HSG B
55.800	71	Meadow, non-grazed, HSG C
47.600	69	Pasture/grassland/range, Fair, HSG B
32.600	85	Row crops, straight row, Good, HSG C
60.670	78	Row crops, straight row, Good, HSG B
354.000	67	Weighted Average
354.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.5	3,600	0.0200	0.66		**Lag/CN Method,**

Subcatchment DA-1EX: DA-1EX



Summary for Subcatchment DA-2EX: DA-2EX

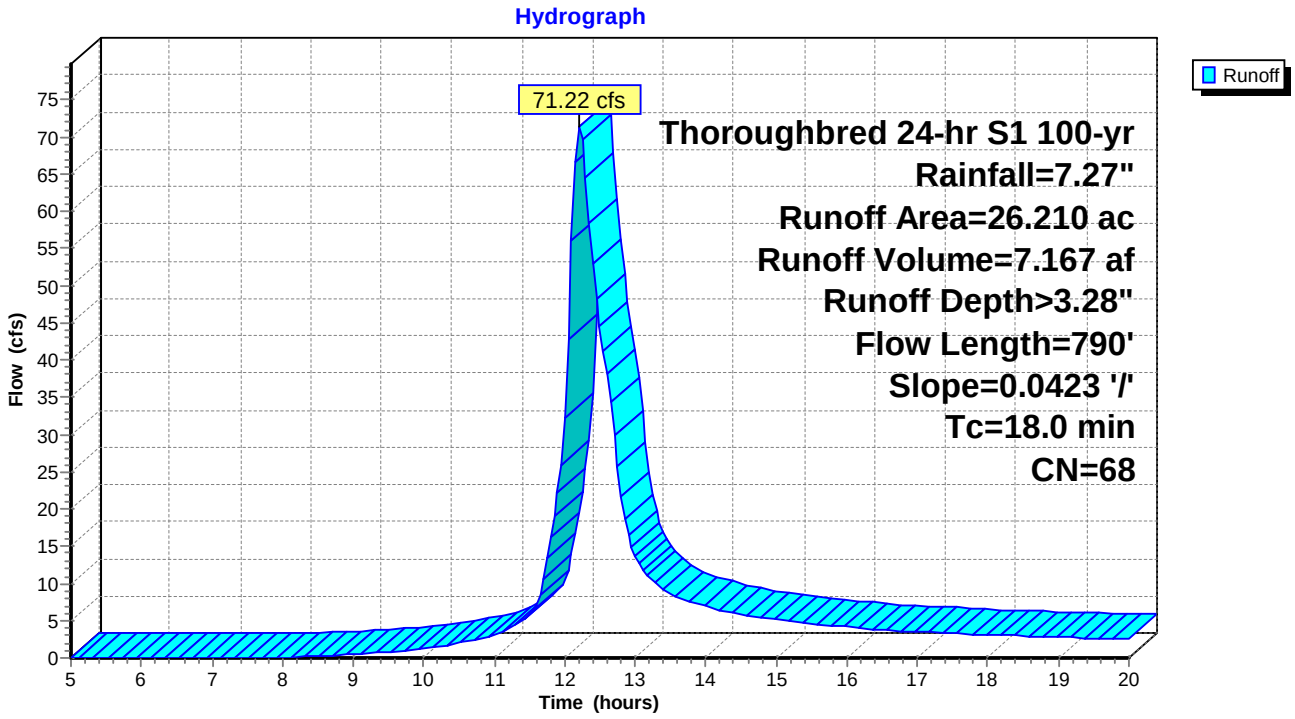
Runoff = 71.22 cfs @ 12.21 hrs, Volume= 7.167 af, Depth> 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 100-yr Rainfall=7.27"

Area (ac)	CN	Description
1.600	58	Meadow, non-grazed, HSG B
24.610	69	Pasture/grassland/range, Fair, HSG B
26.210	68	Weighted Average
26.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	790	0.0423	0.73		**Lag/CN Method,**

Subcatchment DA-2EX: DA-2EX



Summary for Subcatchment DA-3EX: DA-3EX

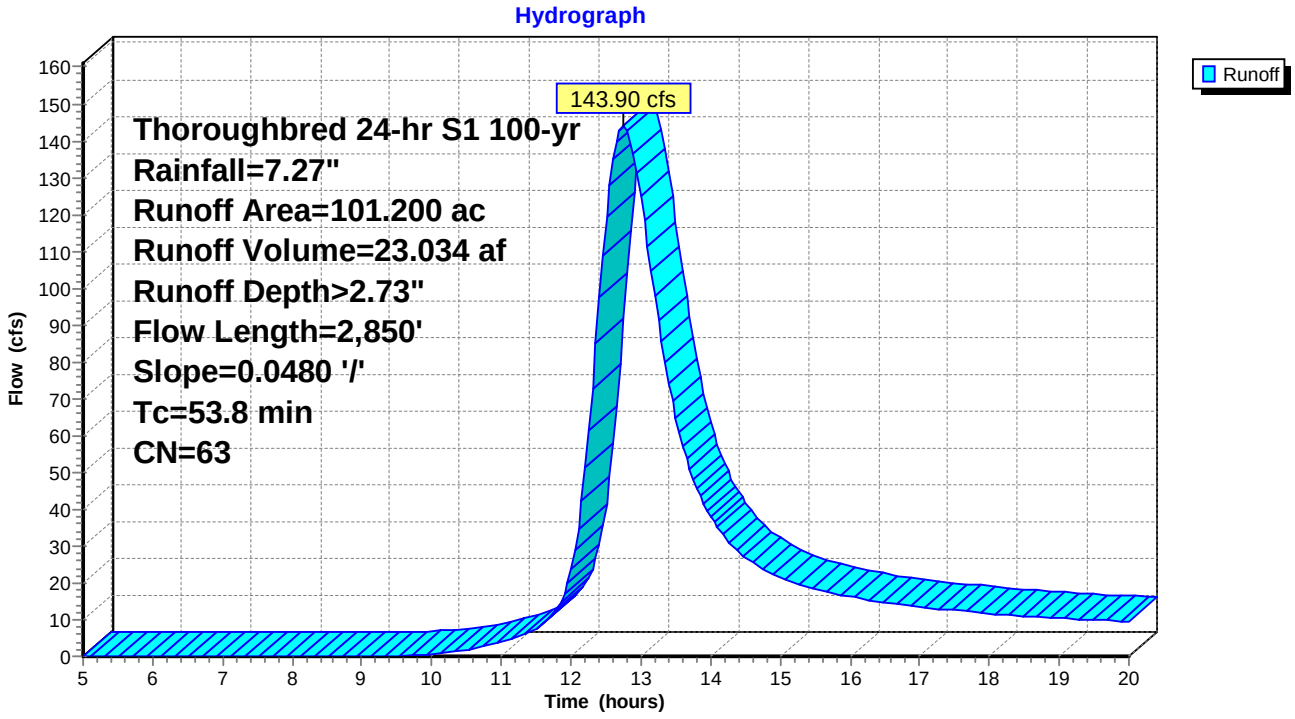
Runoff = 143.90 cfs @ 12.75 hrs, Volume= 23.034 af, Depth> 2.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 100-yr Rainfall=7.27"

Area (ac)	CN	Description
7.100	71	Meadow, non-grazed, HSG C
71.620	58	Meadow, non-grazed, HSG B
4.960	78	Row crops, straight row, Good, HSG B
5.370	85	Row crops, straight row, Good, HSG C
7.370	73	Woods, Fair, HSG C
4.780	60	Woods, Fair, HSG B
101.200	63	Weighted Average
101.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
53.8	2,850	0.0480	0.88		**Lag/CN Method,**

Subcatchment DA-3EX: DA-3EX



Summary for Subcatchment DA-4EX: DA-4EX

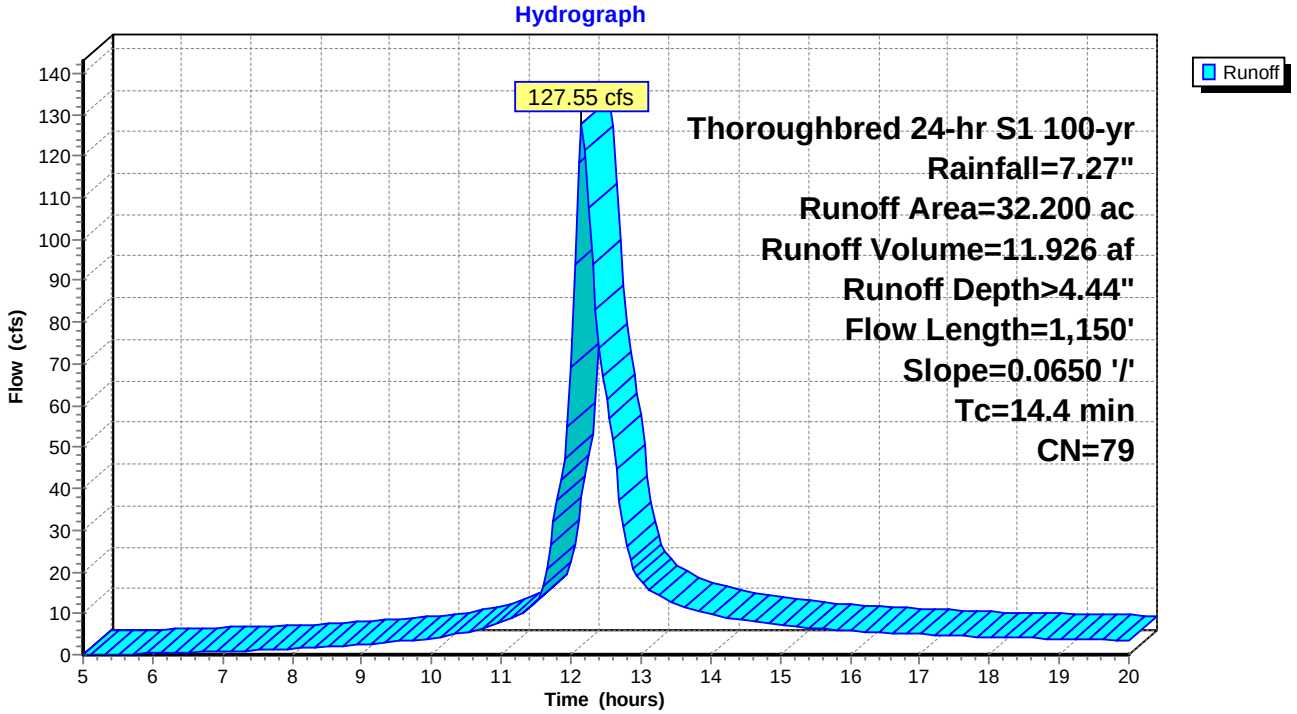
Runoff = 127.55 cfs @ 12.15 hrs, Volume= 11.926 af, Depth> 4.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 100-yr Rainfall=7.27"

Area (ac)	CN	Description
1.710	60	Woods, Fair, HSG B
1.650	73	Woods, Fair, HSG C
7.880	85	Row crops, straight row, Good, HSG C
20.960	78	Row crops, straight row, Good, HSG B
32.200	79	Weighted Average
32.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	1,150	0.0650	1.33		**Lag/CN Method,**

Subcatchment DA-4EX: DA-4EX



Summary for Subcatchment DA-5EX: DA-5EX

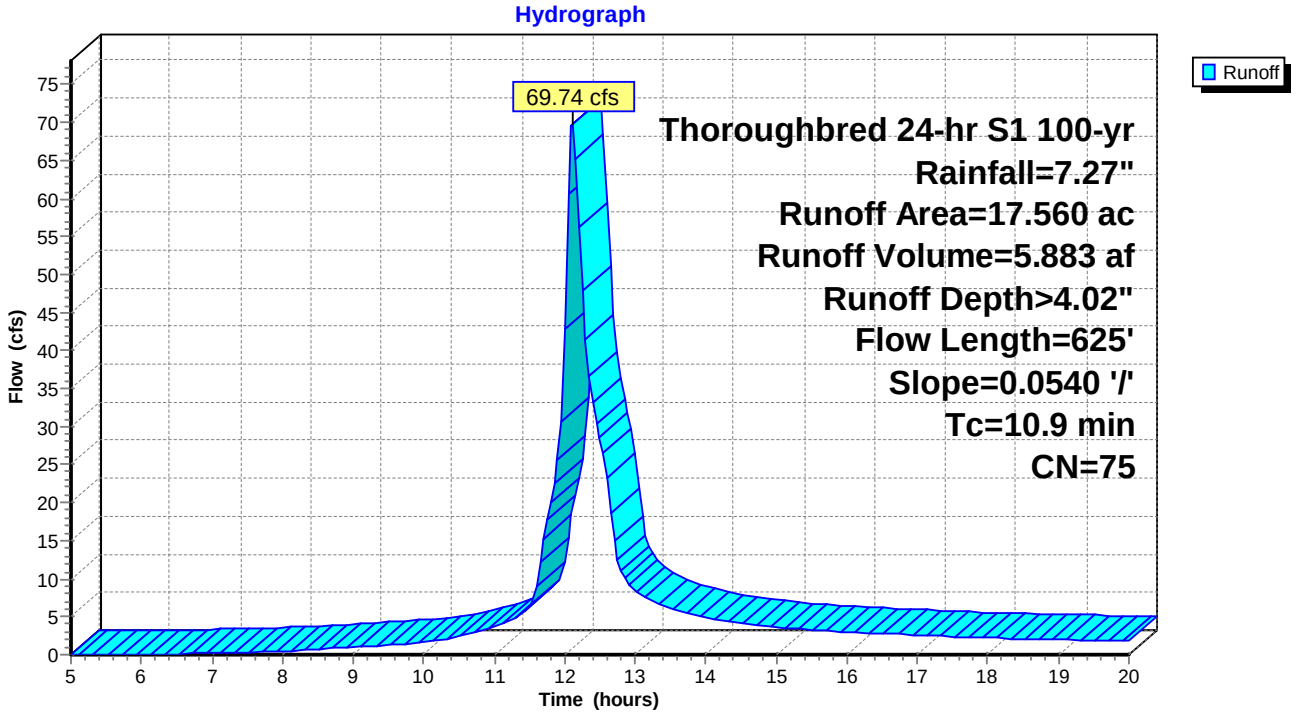
Runoff = 69.74 cfs @ 12.11 hrs, Volume= 5.883 af, Depth> 4.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 100-yr Rainfall=7.27"

Area (ac)	CN	Description
3.080	60	Woods, Fair, HSG B
4.460	73	Woods, Fair, HSG C
2.510	85	Row crops, straight row, Good, HSG C
7.510	78	Row crops, straight row, Good, HSG B
17.560	75	Weighted Average
17.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	625	0.0540	0.96		**Lag/CN Method,**

Subcatchment DA-5EX: DA-5EX

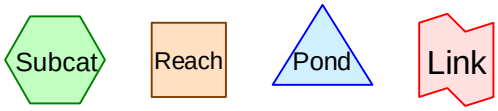


Appendix C

Proposed HydroCAD Results

Proposed

DA-1Prop DA-2Prop DA-3Prop DA-4Prop DA-5Prop



Routing Diagram for 2022-09-02_Thoroughbred_PrePost
Prepared by Westwood MultiDisciplined Eng, Printed 9/2/2022

Project Notes

Copied 7 events from Thoroughbred 24-hr S1 storm

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Thoroughbred 24-hr S1	2-yr	Default	24.00	1	3.45	2
2	10-yr	Thoroughbred 24-hr S1	10-yr	Default	24.00	1	4.83	2
3	100-yr	Thoroughbred 24-hr S1	100-yr	Default	24.00	1	7.27	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.150	96	(DA-2Prop)
0.820	96	Access Road (DA-4Prop)
6.700	96	Access Roads (DA-1Prop)
0.820	96	Acess Road (DA-3Prop)
377.980	58	Meadow, non-grazed, HSG B (DA-1Prop, DA-2Prop, DA-3Prop, DA-4Prop, DA-5Prop)
90.010	71	Meadow, non-grazed, HSG C (DA-1Prop, DA-3Prop, DA-4Prop)
0.250	98	OM (DA-4Prop)
10.700	78	Row crops, straight row, Good, HSG B (DA-4Prop)
21.510	85	Row crops, straight row, Good, HSG C (DA-1Prop, DA-4Prop, DA-5Prop)
3.140	98	Substation (DA-3Prop)
9.570	60	Woods, Fair, HSG B (DA-3Prop, DA-4Prop, DA-5Prop)
9.520	73	Woods, Fair, HSG C (DA-3Prop, DA-4Prop, DA-5Prop)
531.170	**63**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
398.250	HSG B	DA-1Prop, DA-2Prop, DA-3Prop, DA-4Prop, DA-5Prop
121.040	HSG C	DA-1Prop, DA-3Prop, DA-4Prop, DA-5Prop
0.000	HSG D	
11.880	Other	DA-1Prop, DA-2Prop, DA-3Prop, DA-4Prop
531.170		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	0.150	0.150		DA-2Prop
0.000	0.000	0.000	0.000	0.820	0.820	Access Road	DA-4Prop
0.000	0.000	0.000	0.000	6.700	6.700	Access Roads	DA-1Prop
0.000	0.000	0.000	0.000	0.820	0.820	Acess Road	DA-3Prop
0.000	377.980	90.010	0.000	0.000	467.990	Meadow, non-grazed	DA-1Prop, DA-2Prop, DA-3Prop, DA-4Prop, DA-5Prop
0.000	0.000	0.000	0.000	0.250	0.250	OM	DA-4Prop
0.000	10.700	21.510	0.000	0.000	32.210	Row crops, straight row, Good	DA-1Prop, DA-4Prop, DA-5Prop
0.000	0.000	0.000	0.000	3.140	3.140	Substation	DA-3Prop
0.000	9.570	9.520	0.000	0.000	19.090	Woods, Fair	DA-3Prop, DA-4Prop, DA-5Prop
0.000	**398.250**	**121.040**	**0.000**	**11.880**	**531.170**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1Prop: DA-1Prop Runoff Area=354.000 ac 0.00% Impervious Runoff Depth>0.51"
Flow Length=3,600' Slope=0.0200 '/' Tc=100.4 min CN=63 Runoff=60.17 cfs 15.130 af

Subcatchment DA-2Prop: DA-2Prop Runoff Area=26.210 ac 0.00% Impervious Runoff Depth>0.36"
Flow Length=790' Slope=0.0423 '/' Tc=23.3 min CN=58 Runoff=5.17 cfs 0.788 af

Subcatchment DA-3Prop: DA-3Prop Runoff Area=101.200 ac 3.10% Impervious Runoff Depth>0.49"
Flow Length=2,850' Slope=0.0480 '/' Tc=55.2 min CN=62 Runoff=22.93 cfs 4.156 af

Subcatchment DA-4Prop: DA-4Prop Runoff Area=32.200 ac 0.78% Impervious Runoff Depth>0.97"
Flow Length=1,150' Slope=0.0650 '/' Tc=17.6 min CN=72 Runoff=28.76 cfs 2.594 af

Subcatchment DA-5Prop: DA-5Prop Runoff Area=17.560 ac 0.00% Impervious Runoff Depth>0.67"
Flow Length=625' Slope=0.0540 '/' Tc=13.9 min CN=66 Runoff=10.82 cfs 0.987 af

Total Runoff Area = 531.170 ac Runoff Volume = 23.655 af Average Runoff Depth = 0.53"
99.36% Pervious = 527.780 ac 0.64% Impervious = 3.390 ac

Summary for Subcatchment DA-1Prop: DA-1Prop

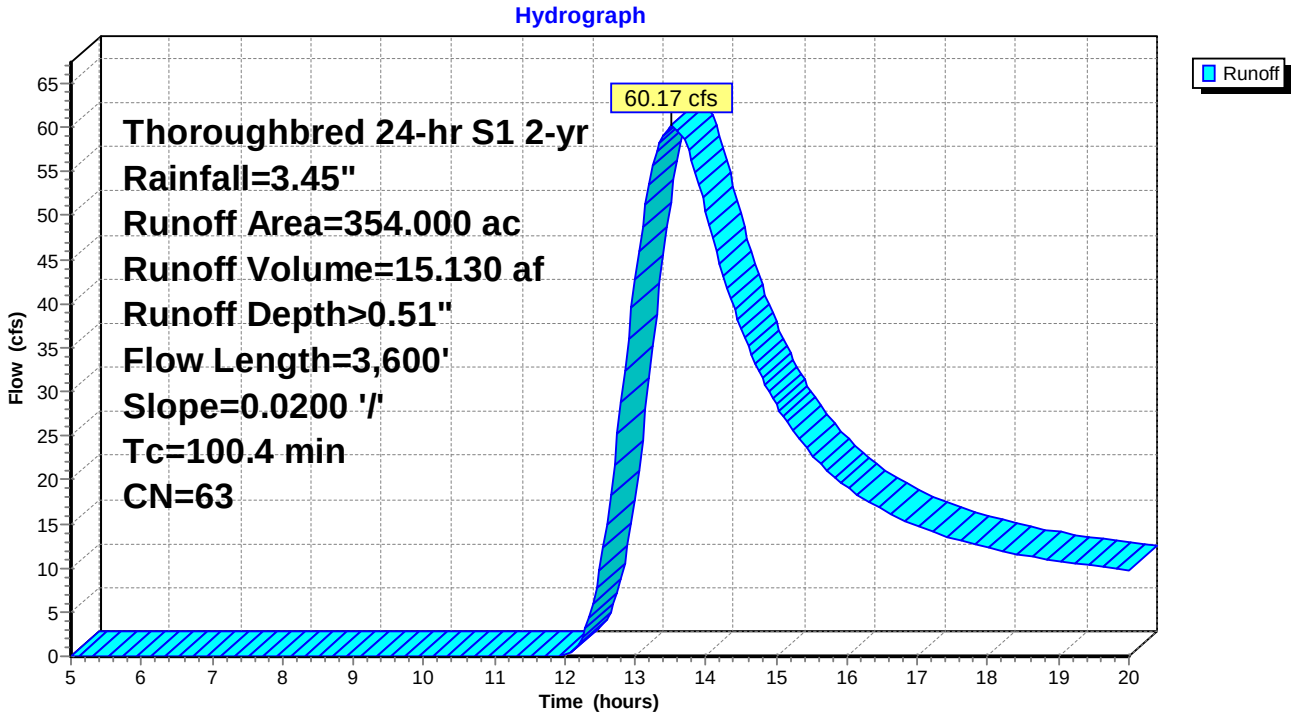
Runoff = 60.17 cfs @ 13.51 hrs, Volume= 15.130 af, Depth> 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

	Area (ac)	CN	Description
	157.330	58	Meadow, non-grazed, HSG B
	55.800	71	Meadow, non-grazed, HSG C
	47.600	58	Meadow, non-grazed, HSG B
	14.000	85	Row crops, straight row, Good, HSG C
*	6.700	96	Access Roads
	53.970	58	Meadow, non-grazed, HSG B
	18.600	71	Meadow, non-grazed, HSG C
	354.000	63	Weighted Average
	354.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
100.4	3,600	0.0200	0.60		**Lag/CN Method,**

Subcatchment DA-1Prop: DA-1Prop



Summary for Subcatchment DA-2Prop: DA-2Prop

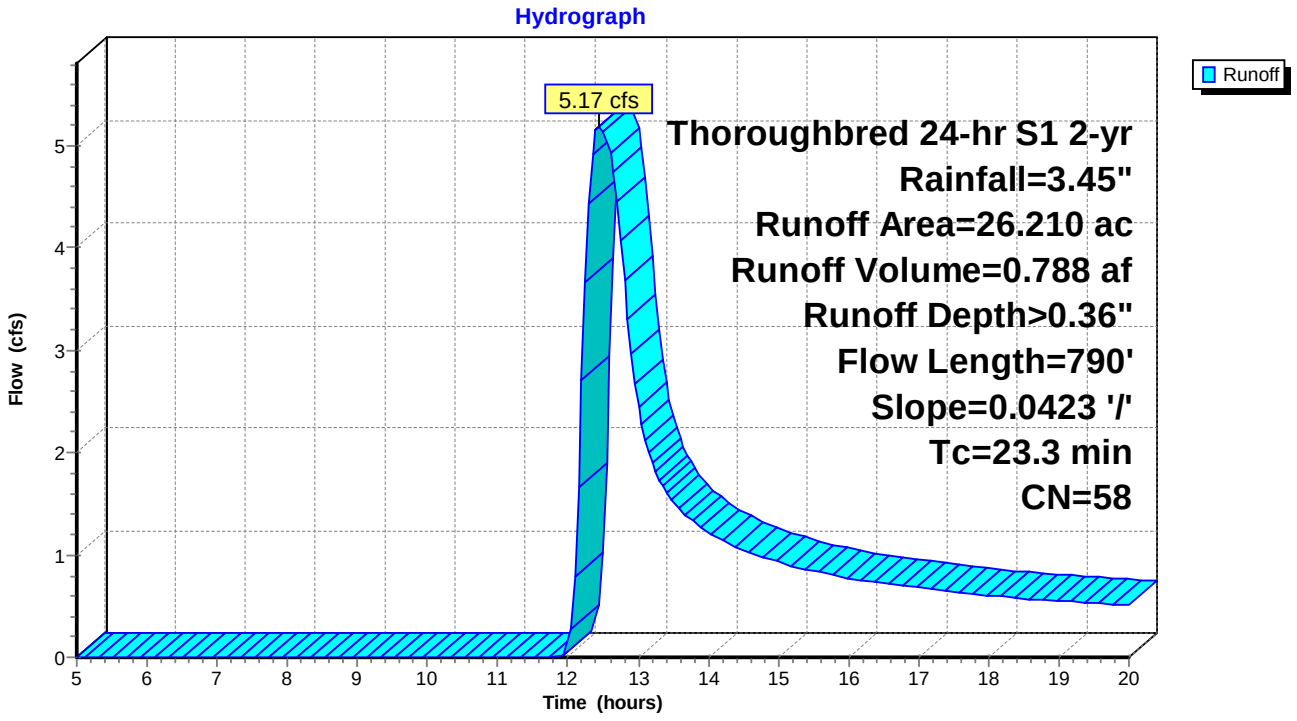
Runoff = 5.17 cfs @ 12.45 hrs, Volume= 0.788 af, Depth> 0.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

	Area (ac)	CN	Description
	1.600	58	Meadow, non-grazed, HSG B
	24.460	58	Meadow, non-grazed, HSG B
*	0.150	96	
	26.210	58	Weighted Average
	26.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.3	790	0.0423	0.57		**Lag/CN Method,**

Subcatchment DA-2Prop: DA-2Prop



Summary for Subcatchment DA-3Prop: DA-3Prop

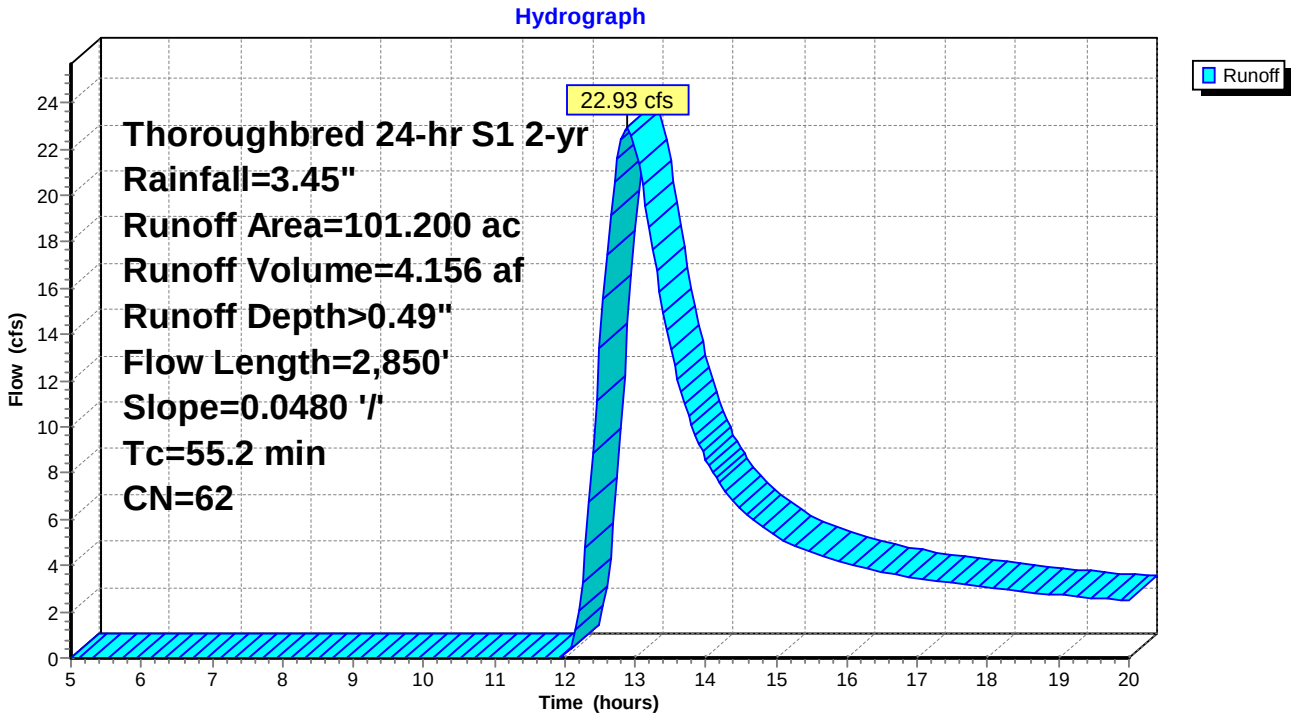
Runoff = 22.93 cfs @ 12.89 hrs, Volume= 4.156 af, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

	Area (ac)	CN	Description
	7.100	71	Meadow, non-grazed, HSG C
	71.620	58	Meadow, non-grazed, HSG B
	4.960	58	Meadow, non-grazed, HSG B
	5.370	71	Meadow, non-grazed, HSG C
	3.410	73	Woods, Fair, HSG C
	4.780	60	Woods, Fair, HSG B
*	3.140	98	Substation
*	0.820	96	Acess Road
	101.200	62	Weighted Average
	98.060		96.90% Pervious Area
	3.140		3.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
55.2	2,850	0.0480	0.86		**Lag/CN Method,**

Subcatchment DA-3Prop: DA-3Prop



Summary for Subcatchment DA-4Prop: DA-4Prop

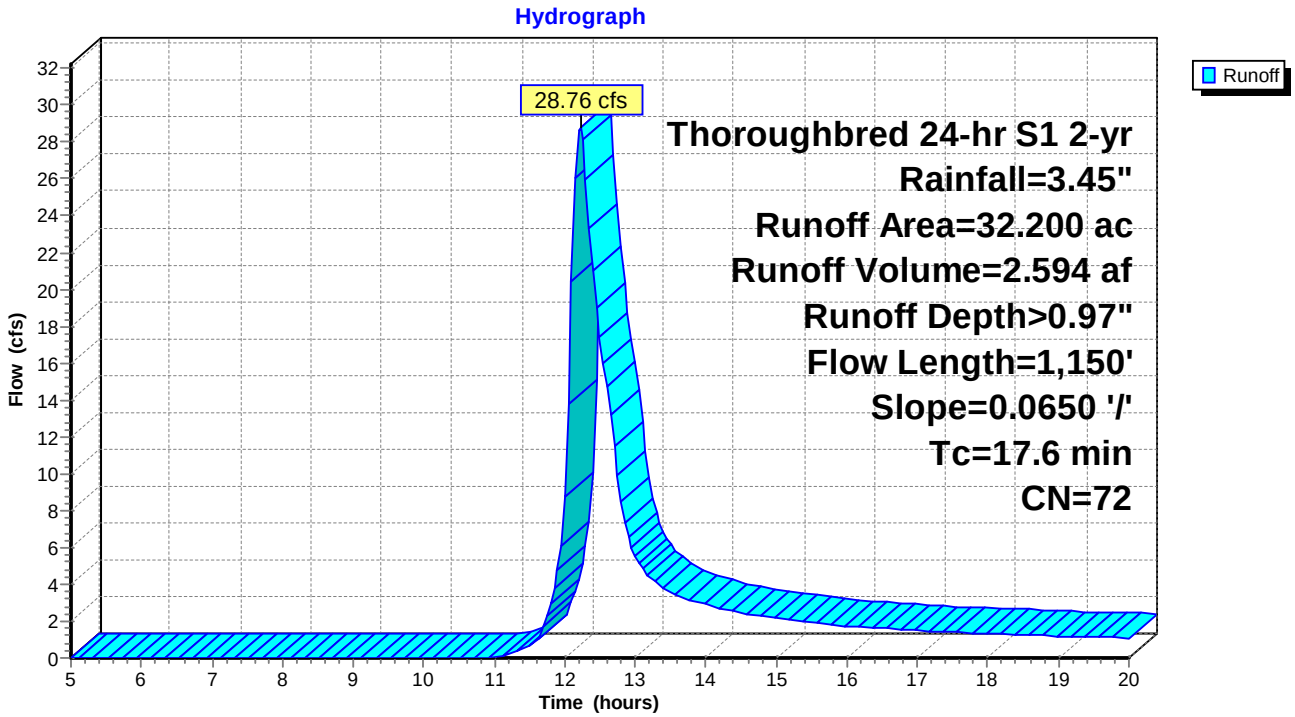
Runoff = 28.76 cfs @ 12.22 hrs, Volume= 2.594 af, Depth> 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

	Area (ac)	CN	Description
	1.710	60	Woods, Fair, HSG B
	1.650	73	Woods, Fair, HSG C
	5.000	85	Row crops, straight row, Good, HSG C
	10.700	78	Row crops, straight row, Good, HSG B
*	0.820	96	Access Road
*	0.250	98	OM
	8.930	58	Meadow, non-grazed, HSG B
	3.140	71	Meadow, non-grazed, HSG C
	32.200	72	Weighted Average
	31.950		99.22% Pervious Area
	0.250		0.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	1,150	0.0650	1.09		**Lag/CN Method,**

Subcatchment DA-4Prop: DA-4Prop



Summary for Subcatchment DA-5Prop: DA-5Prop

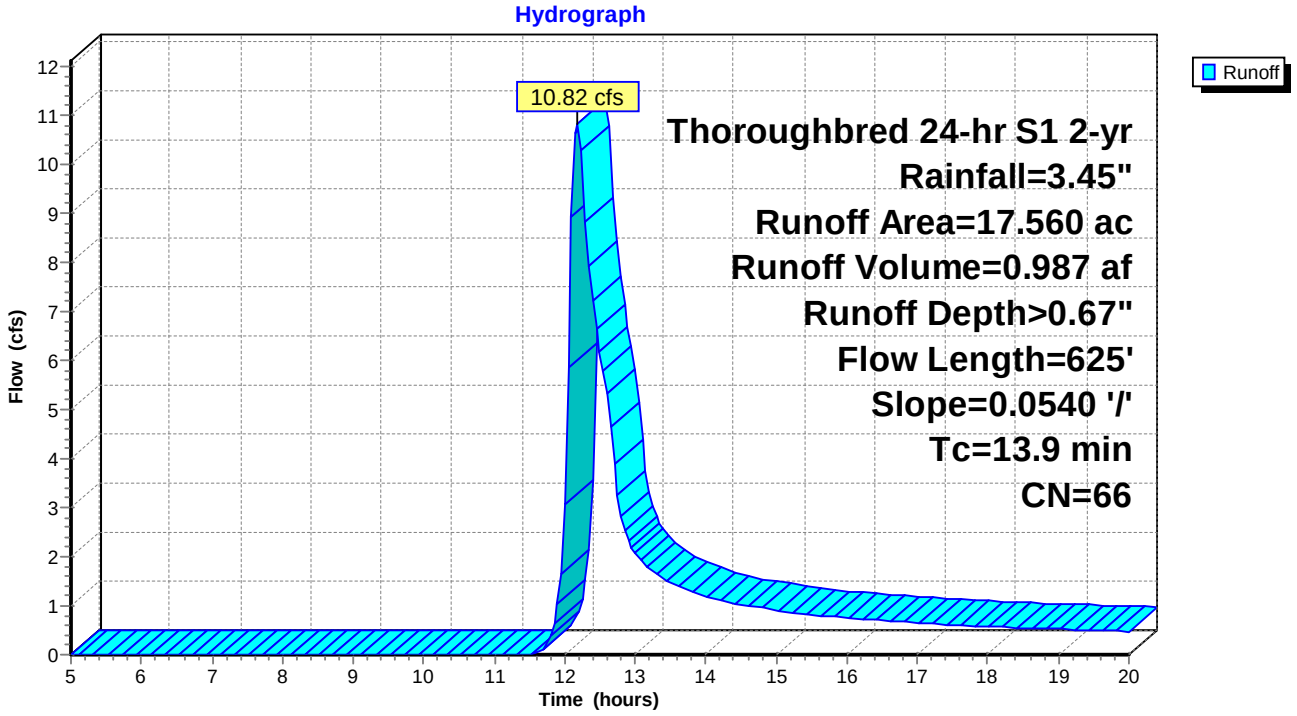
Runoff = 10.82 cfs @ 12.18 hrs, Volume= 0.987 af, Depth> 0.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

Area (ac)	CN	Description
3.080	60	Woods, Fair, HSG B
4.460	73	Woods, Fair, HSG C
2.510	85	Row crops, straight row, Good, HSG C
7.510	58	Meadow, non-grazed, HSG B
17.560	66	Weighted Average
17.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	625	0.0540	0.75		**Lag/CN Method,**

Subcatchment DA-5Prop: DA-5Prop



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1Prop: DA-1Prop Runoff Area=354.000 ac 0.00% Impervious Runoff Depth>1.18"
Flow Length=3,600' Slope=0.0200 '/' Tc=100.4 min CN=63 Runoff=151.91 cfs 34.697 af

Subcatchment DA-2Prop: DA-2Prop Runoff Area=26.210 ac 0.00% Impervious Runoff Depth>0.93"
Flow Length=790' Slope=0.0423 '/' Tc=23.3 min CN=58 Runoff=17.32 cfs 2.036 af

Subcatchment DA-3Prop: DA-3Prop Runoff Area=101.200 ac 3.10% Impervious Runoff Depth>1.15"
Flow Length=2,850' Slope=0.0480 '/' Tc=55.2 min CN=62 Runoff=60.21 cfs 9.689 af

Subcatchment DA-4Prop: DA-4Prop Runoff Area=32.200 ac 0.78% Impervious Runoff Depth>1.87"
Flow Length=1,150' Slope=0.0650 '/' Tc=17.6 min CN=72 Runoff=54.91 cfs 5.005 af

Subcatchment DA-5Prop: DA-5Prop Runoff Area=17.560 ac 0.00% Impervious Runoff Depth>1.44"
Flow Length=625' Slope=0.0540 '/' Tc=13.9 min CN=66 Runoff=24.53 cfs 2.105 af

Total Runoff Area = 531.170 ac Runoff Volume = 53.532 af Average Runoff Depth = 1.21"
99.36% Pervious = 527.780 ac 0.64% Impervious = 3.390 ac

Summary for Subcatchment DA-1Prop: DA-1Prop

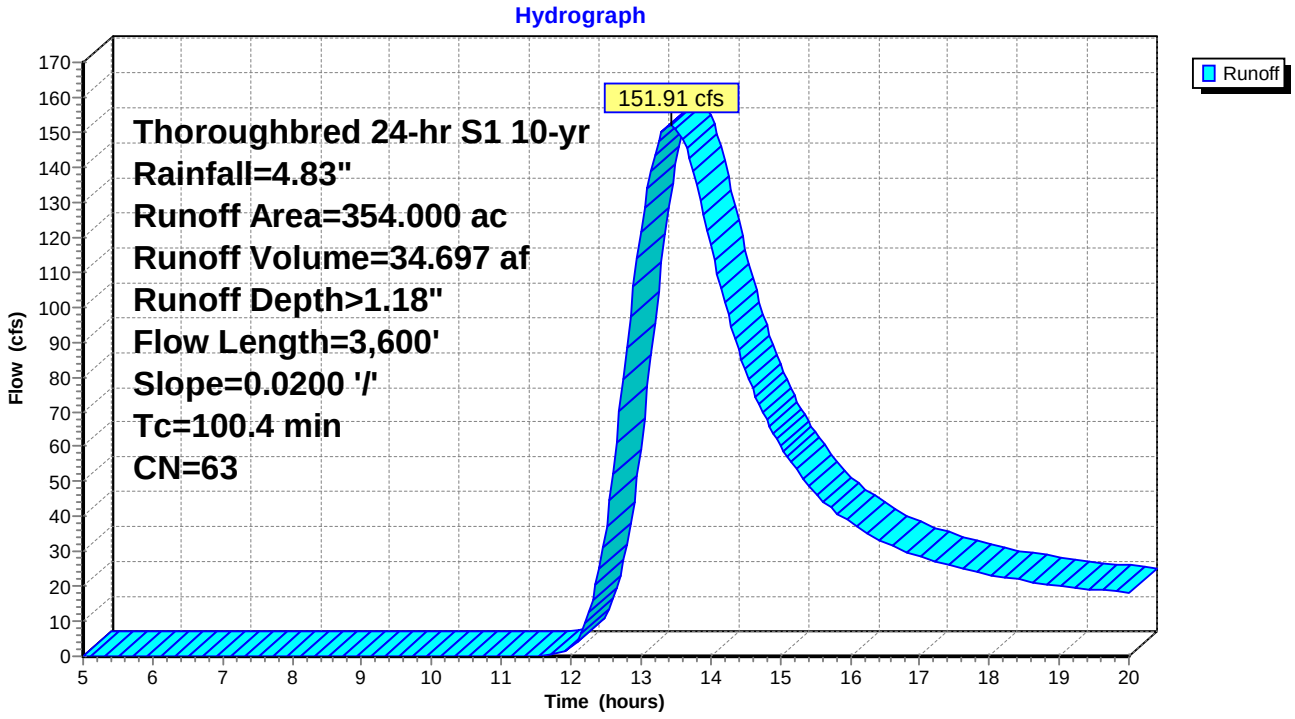
Runoff = 151.91 cfs @ 13.43 hrs, Volume= 34.697 af, Depth> 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 10-yr Rainfall=4.83"

	Area (ac)	CN	Description
	157.330	58	Meadow, non-grazed, HSG B
	55.800	71	Meadow, non-grazed, HSG C
	47.600	58	Meadow, non-grazed, HSG B
	14.000	85	Row crops, straight row, Good, HSG C
*	6.700	96	Access Roads
	53.970	58	Meadow, non-grazed, HSG B
	18.600	71	Meadow, non-grazed, HSG C
	354.000	63	Weighted Average
	354.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
100.4	3,600	0.0200	0.60		**Lag/CN Method,**

Subcatchment DA-1Prop: DA-1Prop



Summary for Subcatchment DA-2Prop: DA-2Prop

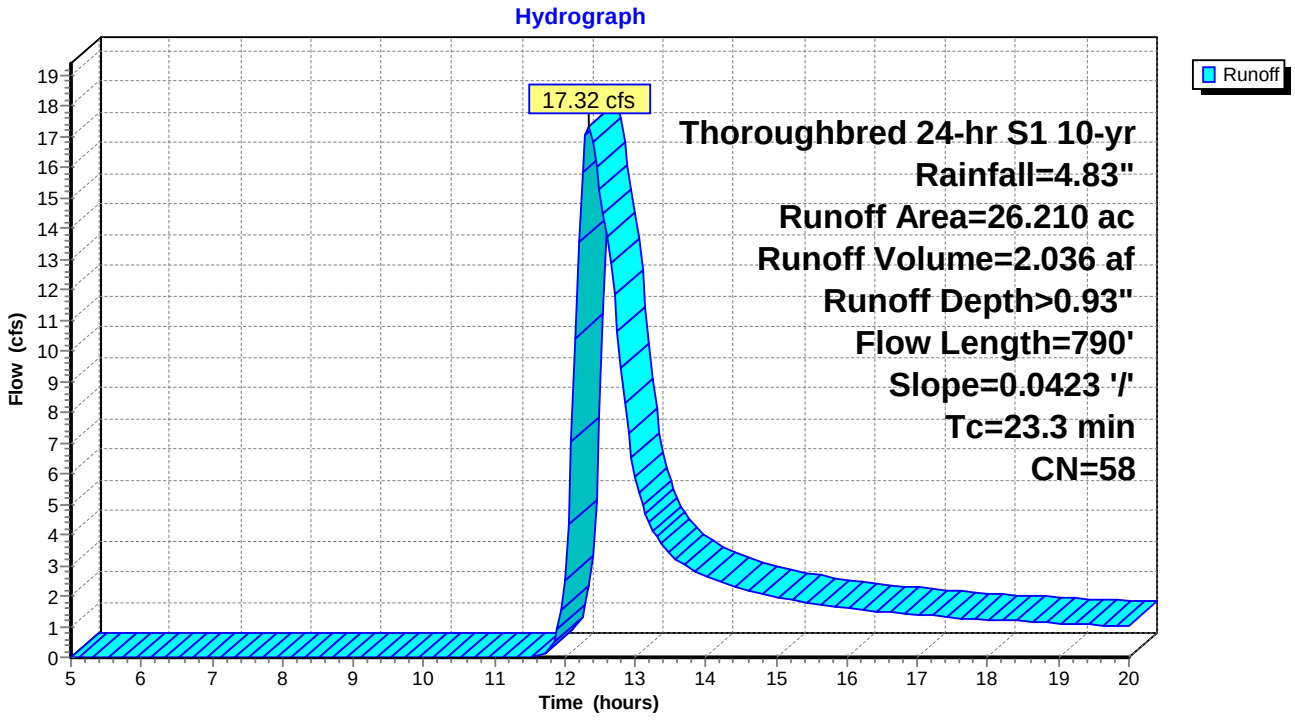
Runoff = 17.32 cfs @ 12.34 hrs, Volume= 2.036 af, Depth> 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 10-yr Rainfall=4.83"

	Area (ac)	CN	Description
	1.600	58	Meadow, non-grazed, HSG B
	24.460	58	Meadow, non-grazed, HSG B
*	0.150	96	
	26.210	58	Weighted Average
	26.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.3	790	0.0423	0.57		**Lag/CN Method,**

Subcatchment DA-2Prop: DA-2Prop



Summary for Subcatchment DA-3Prop: DA-3Prop

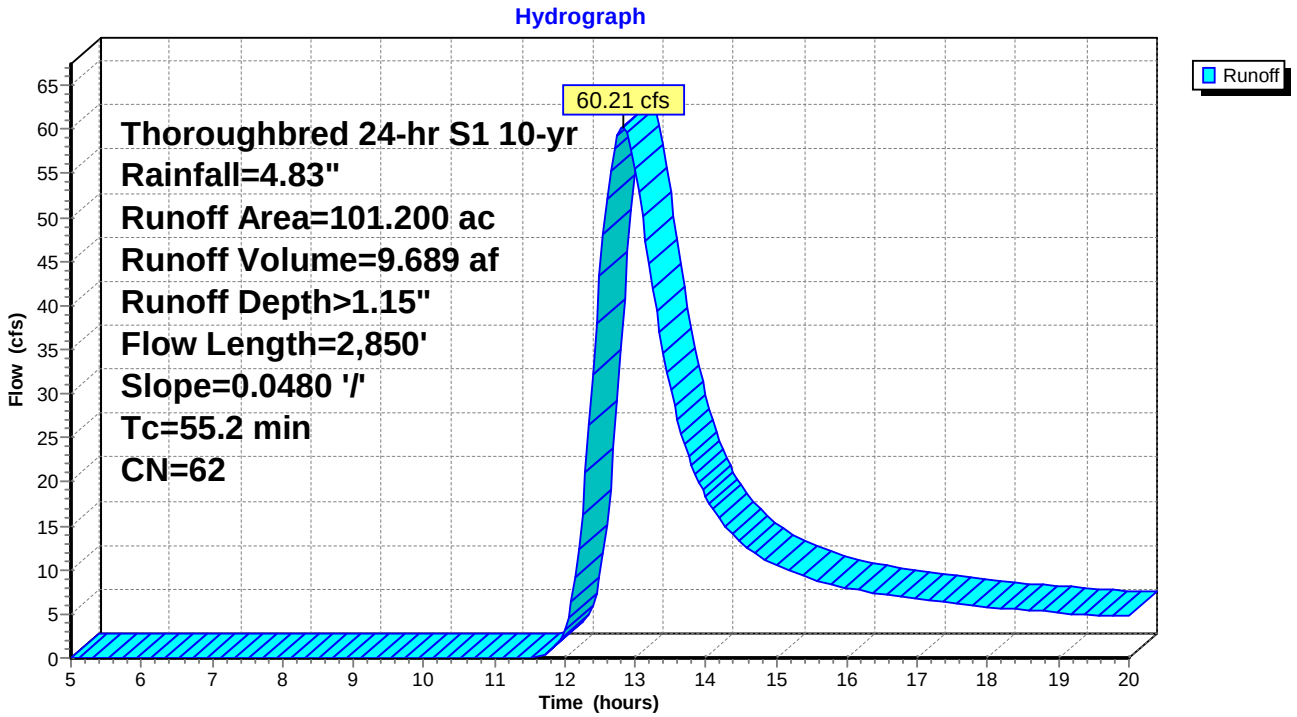
Runoff = 60.21 cfs @ 12.82 hrs, Volume= 9.689 af, Depth> 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 10-yr Rainfall=4.83"

	Area (ac)	CN	Description
	7.100	71	Meadow, non-grazed, HSG C
	71.620	58	Meadow, non-grazed, HSG B
	4.960	58	Meadow, non-grazed, HSG B
	5.370	71	Meadow, non-grazed, HSG C
	3.410	73	Woods, Fair, HSG C
	4.780	60	Woods, Fair, HSG B
*	3.140	98	Substation
*	0.820	96	Acess Road
	101.200	62	Weighted Average
	98.060		96.90% Pervious Area
	3.140		3.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
55.2	2,850	0.0480	0.86		**Lag/CN Method,**

Subcatchment DA-3Prop: DA-3Prop



Summary for Subcatchment DA-4Prop: DA-4Prop

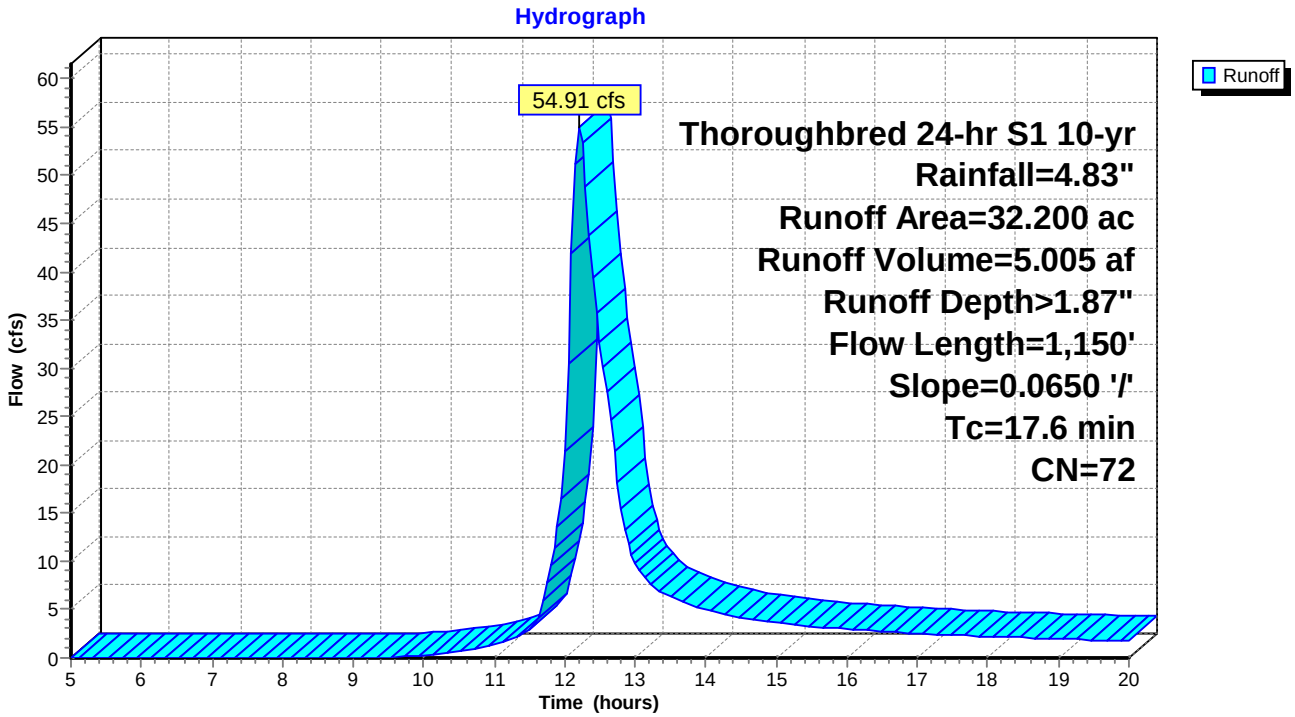
Runoff = 54.91 cfs @ 12.21 hrs, Volume= 5.005 af, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 10-yr Rainfall=4.83"

	Area (ac)	CN	Description
	1.710	60	Woods, Fair, HSG B
	1.650	73	Woods, Fair, HSG C
	5.000	85	Row crops, straight row, Good, HSG C
	10.700	78	Row crops, straight row, Good, HSG B
*	0.820	96	Access Road
*	0.250	98	OM
	8.930	58	Meadow, non-grazed, HSG B
	3.140	71	Meadow, non-grazed, HSG C
	32.200	72	Weighted Average
	31.950		99.22% Pervious Area
	0.250		0.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	1,150	0.0650	1.09		**Lag/CN Method,**

Subcatchment DA-4Prop: DA-4Prop



Summary for Subcatchment DA-5Prop: DA-5Prop

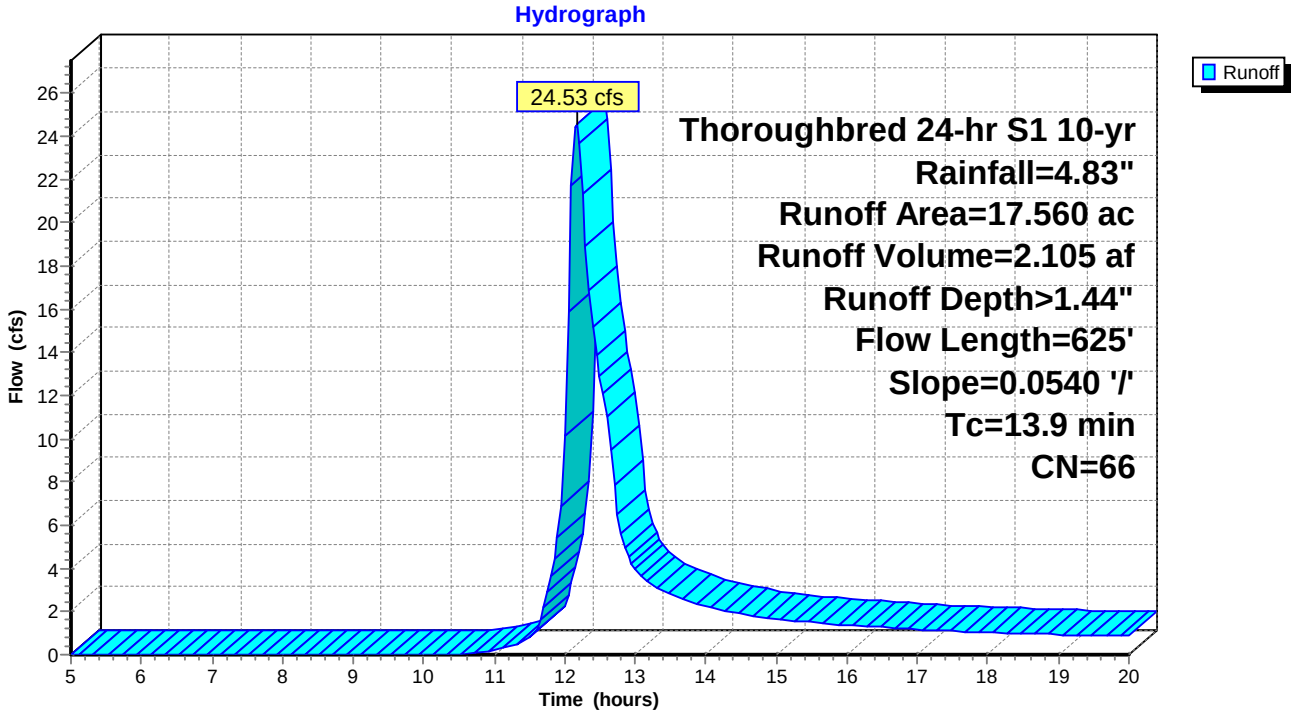
Runoff = 24.53 cfs @ 12.16 hrs, Volume= 2.105 af, Depth> 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 10-yr Rainfall=4.83"

Area (ac)	CN	Description
3.080	60	Woods, Fair, HSG B
4.460	73	Woods, Fair, HSG C
2.510	85	Row crops, straight row, Good, HSG C
7.510	58	Meadow, non-grazed, HSG B
17.560	66	Weighted Average
17.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	625	0.0540	0.75		**Lag/CN Method,**

Subcatchment DA-5Prop: DA-5Prop



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment DA-1Prop: DA-1Prop Runoff Area=354.000 ac 0.00% Impervious Runoff Depth>2.66"
Flow Length=3,600' Slope=0.0200 '/' Tc=100.4 min CN=63 Runoff=345.86 cfs 78.469 af

Subcatchment DA-2Prop: DA-2Prop Runoff Area=26.210 ac 0.00% Impervious Runoff Depth>2.29"
Flow Length=790' Slope=0.0423 '/' Tc=23.3 min CN=58 Runoff=43.94 cfs 5.012 af

Subcatchment DA-3Prop: DA-3Prop Runoff Area=101.200 ac 3.10% Impervious Runoff Depth>2.63"
Flow Length=2,850' Slope=0.0480 '/' Tc=55.2 min CN=62 Runoff=137.25 cfs 22.200 af

Subcatchment DA-4Prop: DA-4Prop Runoff Area=32.200 ac 0.78% Impervious Runoff Depth>3.69"
Flow Length=1,150' Slope=0.0650 '/' Tc=17.6 min CN=72 Runoff=99.40 cfs 9.912 af

Subcatchment DA-5Prop: DA-5Prop Runoff Area=17.560 ac 0.00% Impervious Runoff Depth>3.09"
Flow Length=625' Slope=0.0540 '/' Tc=13.9 min CN=66 Runoff=49.20 cfs 4.515 af

Total Runoff Area = 531.170 ac Runoff Volume = 120.107 af Average Runoff Depth = 2.71"
99.36% Pervious = 527.780 ac 0.64% Impervious = 3.390 ac

Summary for Subcatchment DA-1Prop: DA-1Prop

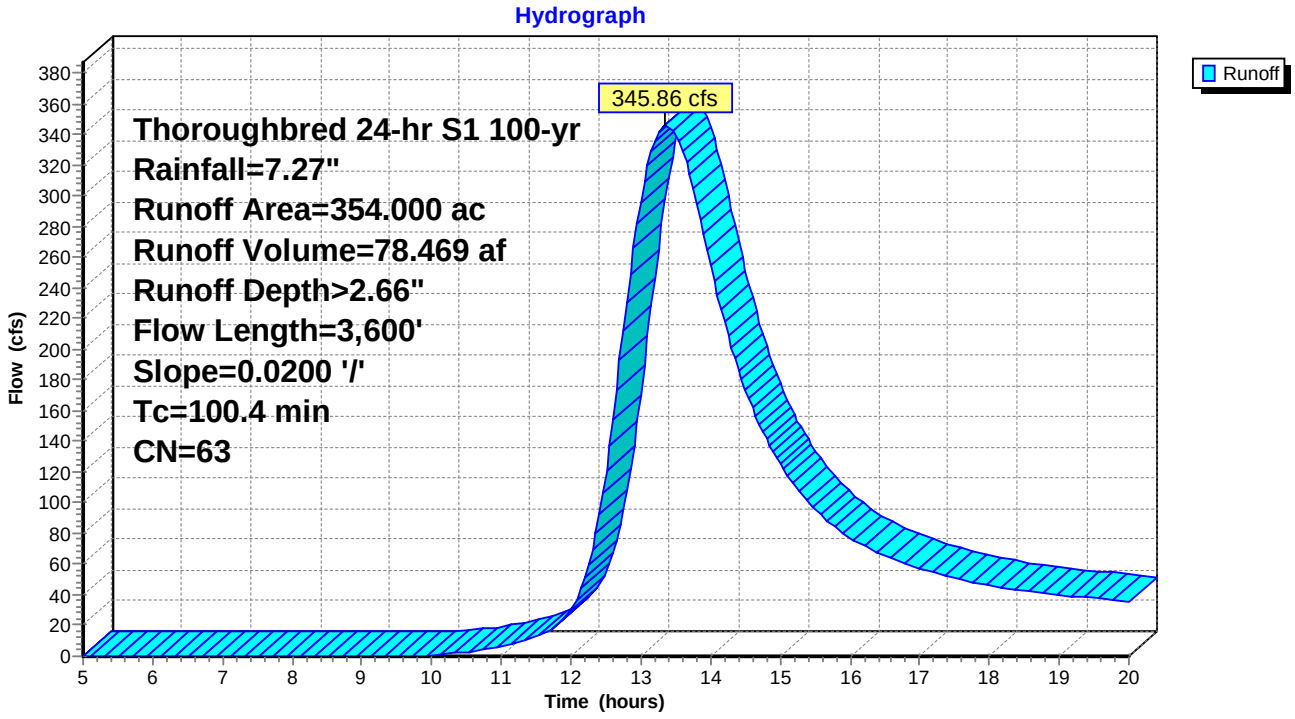
Runoff = 345.86 cfs @ 13.36 hrs, Volume= 78.469 af, Depth> 2.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 100-yr Rainfall=7.27"

	Area (ac)	CN	Description
	157.330	58	Meadow, non-grazed, HSG B
	55.800	71	Meadow, non-grazed, HSG C
	47.600	58	Meadow, non-grazed, HSG B
	14.000	85	Row crops, straight row, Good, HSG C
*	6.700	96	Access Roads
	53.970	58	Meadow, non-grazed, HSG B
	18.600	71	Meadow, non-grazed, HSG C
	354.000	63	Weighted Average
	354.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
100.4	3,600	0.0200	0.60		**Lag/CN Method,**

Subcatchment DA-1Prop: DA-1Prop



Summary for Subcatchment DA-2Prop: DA-2Prop

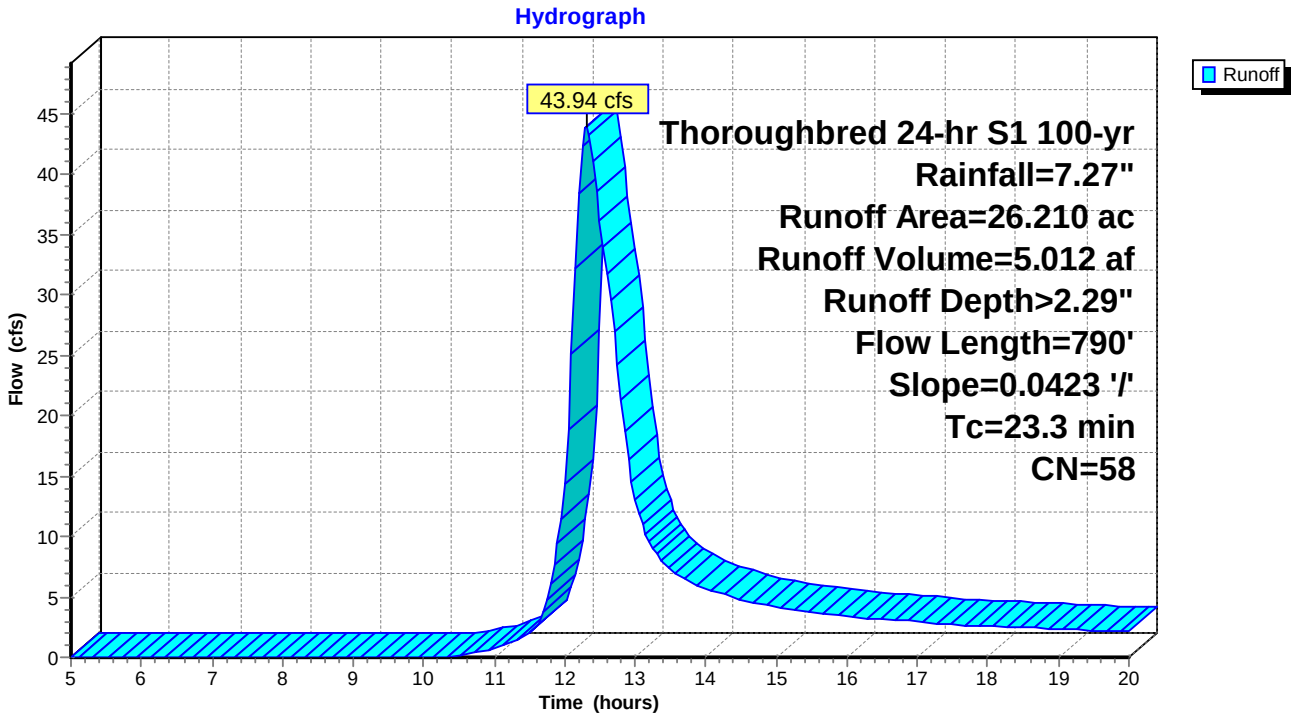
Runoff = 43.94 cfs @ 12.31 hrs, Volume= 5.012 af, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 100-yr Rainfall=7.27"

	Area (ac)	CN	Description
	1.600	58	Meadow, non-grazed, HSG B
	24.460	58	Meadow, non-grazed, HSG B
*	0.150	96	
	26.210	58	Weighted Average
	26.210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.3	790	0.0423	0.57		**Lag/CN Method,**

Subcatchment DA-2Prop: DA-2Prop



Summary for Subcatchment DA-3Prop: DA-3Prop

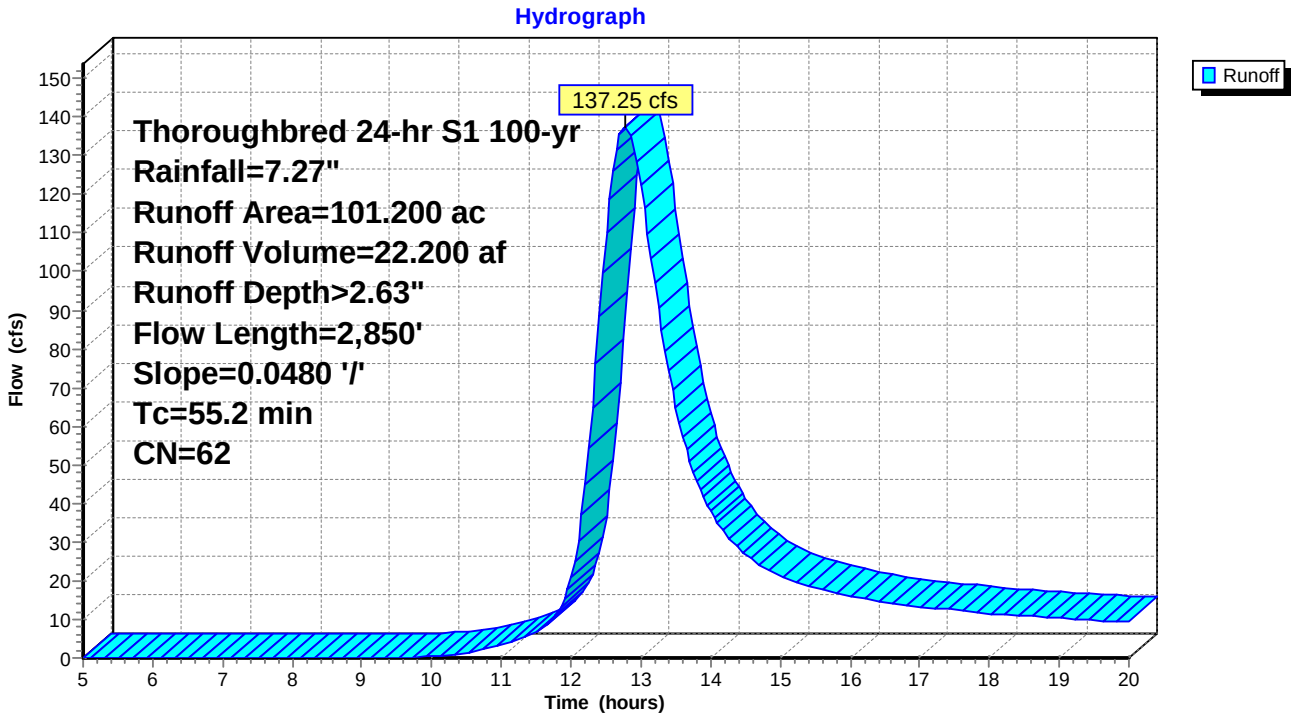
Runoff = 137.25 cfs @ 12.78 hrs, Volume= 22.200 af, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 100-yr Rainfall=7.27"

	Area (ac)	CN	Description
	7.100	71	Meadow, non-grazed, HSG C
	71.620	58	Meadow, non-grazed, HSG B
	4.960	58	Meadow, non-grazed, HSG B
	5.370	71	Meadow, non-grazed, HSG C
	3.410	73	Woods, Fair, HSG C
	4.780	60	Woods, Fair, HSG B
*	3.140	98	Substation
*	0.820	96	Acess Road
	101.200	62	Weighted Average
	98.060		96.90% Pervious Area
	3.140		3.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
55.2	2,850	0.0480	0.86		**Lag/CN Method,**

Subcatchment DA-3Prop: DA-3Prop



Summary for Subcatchment DA-4Prop: DA-4Prop

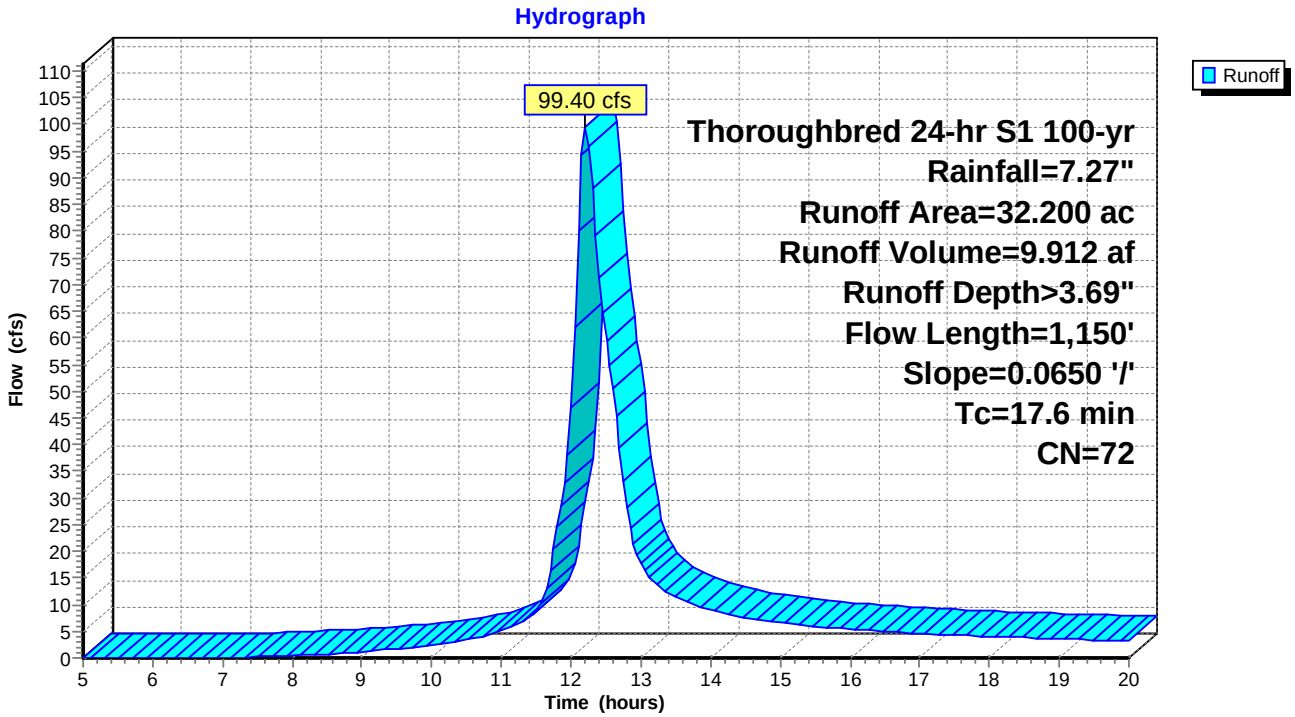
Runoff = 99.40 cfs @ 12.20 hrs, Volume= 9.912 af, Depth> 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 100-yr Rainfall=7.27"

	Area (ac)	CN	Description
	1.710	60	Woods, Fair, HSG B
	1.650	73	Woods, Fair, HSG C
	5.000	85	Row crops, straight row, Good, HSG C
	10.700	78	Row crops, straight row, Good, HSG B
*	0.820	96	Access Road
*	0.250	98	OM
	8.930	58	Meadow, non-grazed, HSG B
	3.140	71	Meadow, non-grazed, HSG C
	32.200	72	Weighted Average
	31.950		99.22% Pervious Area
	0.250		0.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.6	1,150	0.0650	1.09		**Lag/CN Method,**

Subcatchment DA-4Prop: DA-4Prop



Summary for Subcatchment DA-5Prop: DA-5Prop

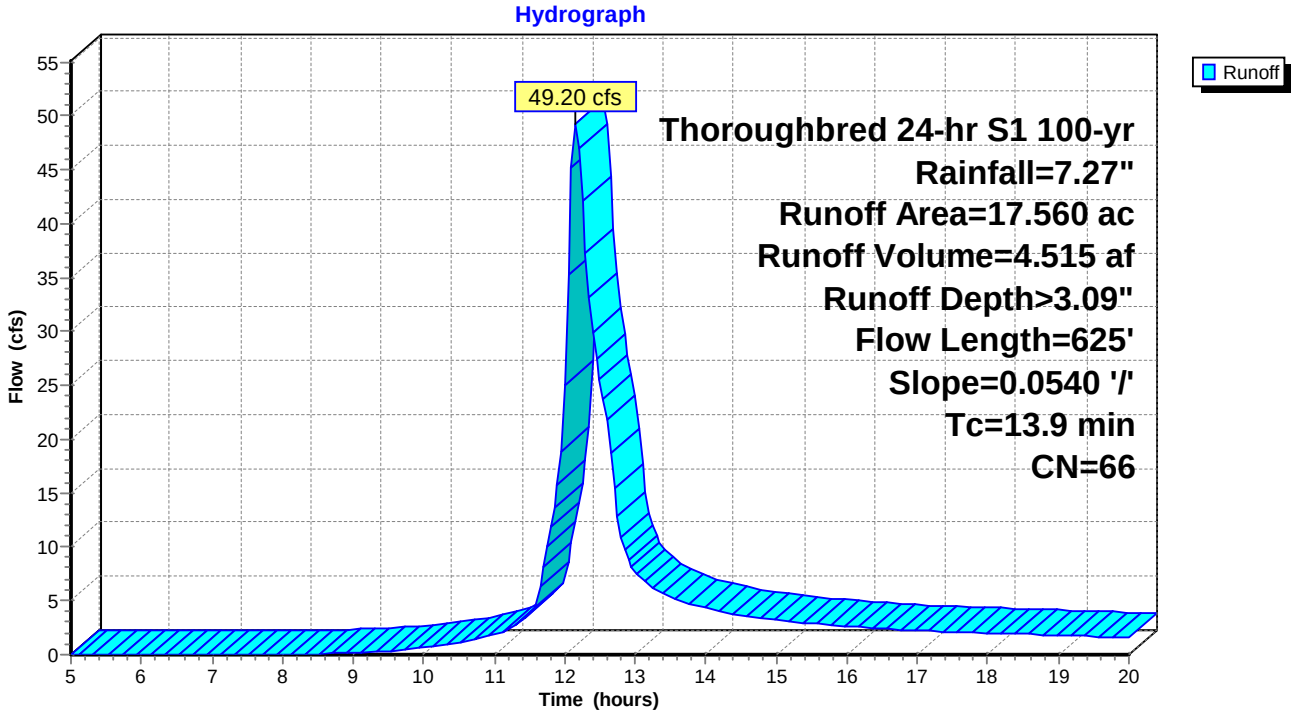
Runoff = 49.20 cfs @ 12.16 hrs, Volume= 4.515 af, Depth> 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 100-yr Rainfall=7.27"

Area (ac)	CN	Description
3.080	60	Woods, Fair, HSG B
4.460	73	Woods, Fair, HSG C
2.510	85	Row crops, straight row, Good, HSG C
7.510	58	Meadow, non-grazed, HSG B
17.560	66	Weighted Average
17.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	625	0.0540	0.75		**Lag/CN Method,**

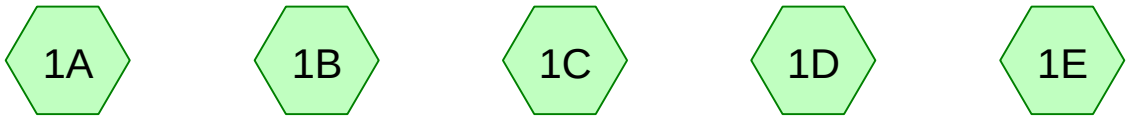
Subcatchment DA-5Prop: DA-5Prop



Appendix D

Temporary Sediment Basin Calculations

Temp Basin



1A 1B 1C 1D 1E

Subcat Reach Pond Link

Routing Diagram for 2022-08-23_Thoroughbred_TempBasin
Prepared by Westwood MultiDisciplined Eng, Printed 8/31/2022

Project Notes

Copied 7 events from Thoroughbred 24-hr S1 storm

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Thoroughbred 24-hr S1	2-yr	Default	24.00	1	3.45	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
33.800	86	Fallow, bare soil, HSG B (1A, 1B, 1D)
37.000	91	Fallow, bare soil, HSG C (1C, 1E)
70.800	**89**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
33.800	HSG B	1A, 1B, 1D
37.000	HSG C	1C, 1E
0.000	HSG D	
0.000	Other	
70.800		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	33.800	37.000	0.000	0.000	70.800	Fallow, bare soil	1A, 1B, 1C, 1D, 1E
0.000	**33.800**	**37.000**	**0.000**	**0.000**	**70.800**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: 1A Runoff Area=9.300 ac 0.00% Impervious Runoff Depth>1.89"
Flow Length=800' Slope=0.0343 '/' Tc=11.7 min CN=86 Runoff=20.38 cfs 1.466 af

Subcatchment 1B: 1B Runoff Area=10.700 ac 0.00% Impervious Runoff Depth>1.89"
Flow Length=700' Slope=0.0390 '/' Tc=9.9 min CN=86 Runoff=24.90 cfs 1.687 af

Subcatchment 1C: 1C Runoff Area=15.500 ac 0.00% Impervious Runoff Depth>2.32"
Flow Length=1,100' Slope=0.0290 '/' Tc=13.6 min CN=91 Runoff=38.18 cfs 2.992 af

Subcatchment 1D: 1D Runoff Area=13.800 ac 0.00% Impervious Runoff Depth>1.89"
Flow Length=900' Slope=0.0500 '/' Tc=10.7 min CN=86 Runoff=31.31 cfs 2.176 af

Subcatchment 1E: 1E Runoff Area=21.500 ac 0.00% Impervious Runoff Depth>2.32"
Flow Length=1,050' Slope=0.0320 '/' Tc=12.4 min CN=91 Runoff=55.23 cfs 4.152 af

Total Runoff Area = 70.800 ac Runoff Volume = 12.473 af Average Runoff Depth = 2.11"
100.00% Pervious = 70.800 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1A: 1A

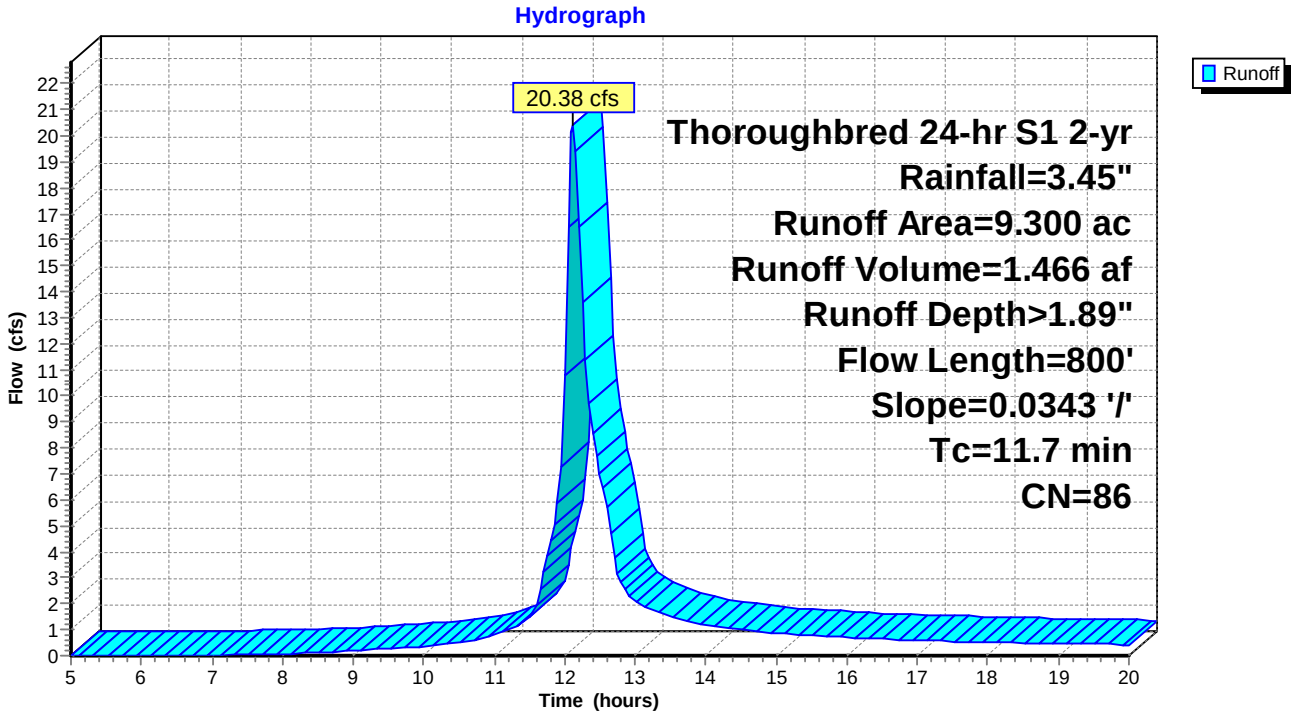
Runoff = 20.38 cfs @ 12.12 hrs, Volume= 1.466 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

Area (ac)	CN	Description
9.300	86	Fallow, bare soil, HSG B
9.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	800	0.0343	1.14		**Lag/CN Method,**

Subcatchment 1A: 1A



Summary for Subcatchment 1B: 1B

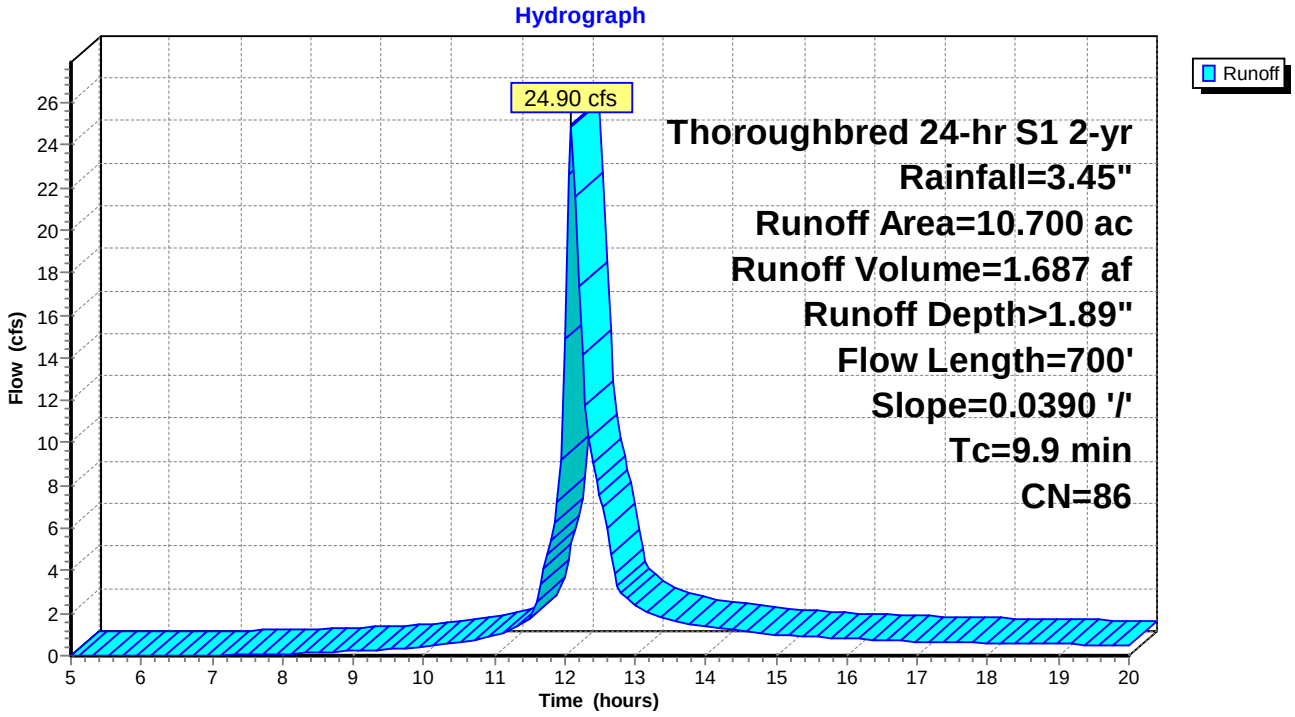
Runoff = 24.90 cfs @ 12.10 hrs, Volume= 1.687 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

Area (ac)	CN	Description
10.700	86	Fallow, bare soil, HSG B
10.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	700	0.0390	1.18		**Lag/CN Method,**

Subcatchment 1B: 1B



Summary for Subcatchment 1C: 1C

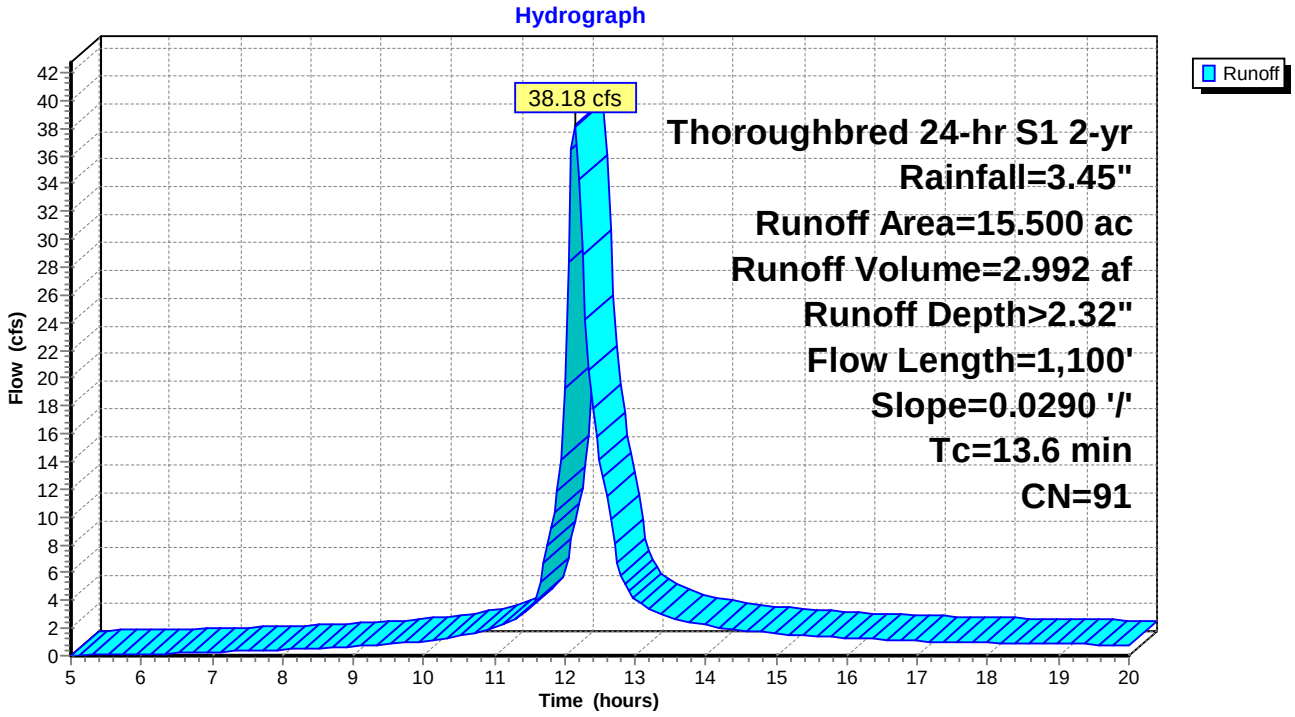
Runoff = 38.18 cfs @ 12.14 hrs, Volume= 2.992 af, Depth> 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

Area (ac)	CN	Description
15.500	91	Fallow, bare soil, HSG C
15.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	1,100	0.0290	1.35		**Lag/CN Method,**

Subcatchment 1C: 1C



Summary for Subcatchment 1D: 1D

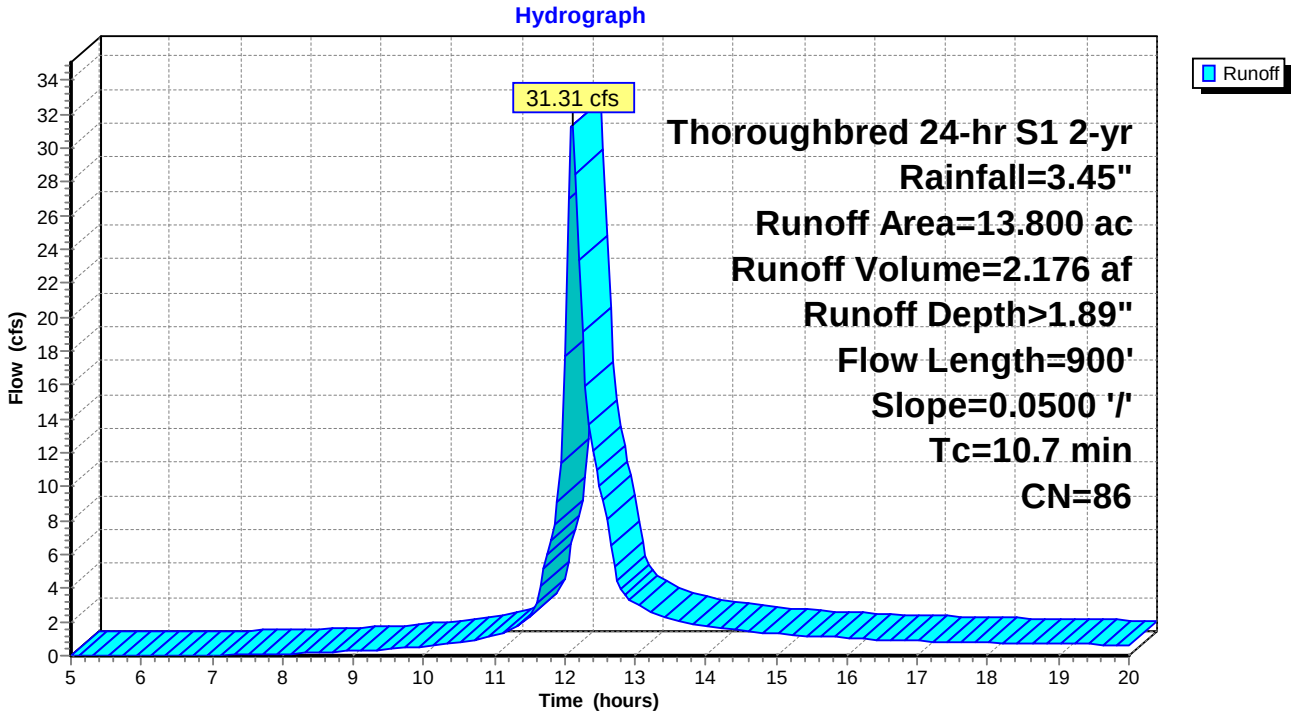
Runoff = 31.31 cfs @ 12.10 hrs, Volume= 2.176 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

Area (ac)	CN	Description
13.800	86	Fallow, bare soil, HSG B
13.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	900	0.0500	1.40		**Lag/CN Method,**

Subcatchment 1D: 1D



Summary for Subcatchment 1E: 1E

Runoff = 55.23 cfs @ 12.12 hrs, Volume= 4.152 af, Depth> 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Thoroughbred 24-hr S1 2-yr Rainfall=3.45"

Area (ac)	CN	Description
21.500	91	Fallow, bare soil, HSG C
21.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	1,050	0.0320	1.41		**Lag/CN Method,**

Subcatchment 1E: 1E