LCA Architects

Double T Ranch Equestrian Center Hydrology Study

Prepared by HydroScience Engineers

June 2023

HydroScience
Strategic Water Solutions

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SECTION 1 – INTRODUCTION AND BACKGROUND

The County of Solano Planning Services Division (County) requested a Hydrology Report be prepared to complete the environmental review process for the proposed development project named Double T Ranch Equestrian Center (Project). HydroScience Engineers (HydroScience) was retained by LCA Architects to prepare a preliminary hydrology report for the Double T Ranch Equestrian Center (Project).

The project site is located at 8325 Quail Canyon Road in an unincorporated area of Sonoma County, California, west of the City of Winters (see **Figure 1-1**). This report, and associated plans, are intended to provide information for the environmental analysis of the Project.

1.1 Project Description

The Project proposes to transform the existing Project site to its agricultural roots. The project will include the construction of livestock barns, pastures, accessory agricultural structures, horse training facilities, a water storage tank, an irrigation well, and maintenance facilities for the care and boarding of horses.

The preliminary drainage plan concept will incorporate areas for storm water detention to mitigate the increase in storm runoff created by the development of the proposed facility and site improvements. The proposed drainage concept is to provide a detention basin on the easterly edge of the property, immediately upstream of existing culvert crossing underneath Quail Canyon Road.

1.2 Existing Site Description and Topography

The existing undeveloped site encompasses approximately 47.49 acres of natural grassland, trees, water storage ponds, and fencing. The site is generally bounded by Quail Canyon Road to the east and private properties to the north, west, and south. The existing topography of the site has moderate rolling hills ranging in elevation from 463 feet to 235 feet and generally slopes from west to east. (See **Figure 1-2**).

1.3 Flood Insurance Rate Map (FIRM) Floodplain

The property is located within Flood Insurance Rate Map (FIRM) Panel 060631 entitled Solano County, California (Unincorporated Areas). A Firmette showing the Project site is attached as **Appendix A**. The Firmette shows the site is an area of minimal flood hazard Zone X. It should be noted, east of Quail Canyon Road, downstream of the drainage culverts there is a flood hazard area, marked as Zone AE, which has a 100-year base flood elevation.

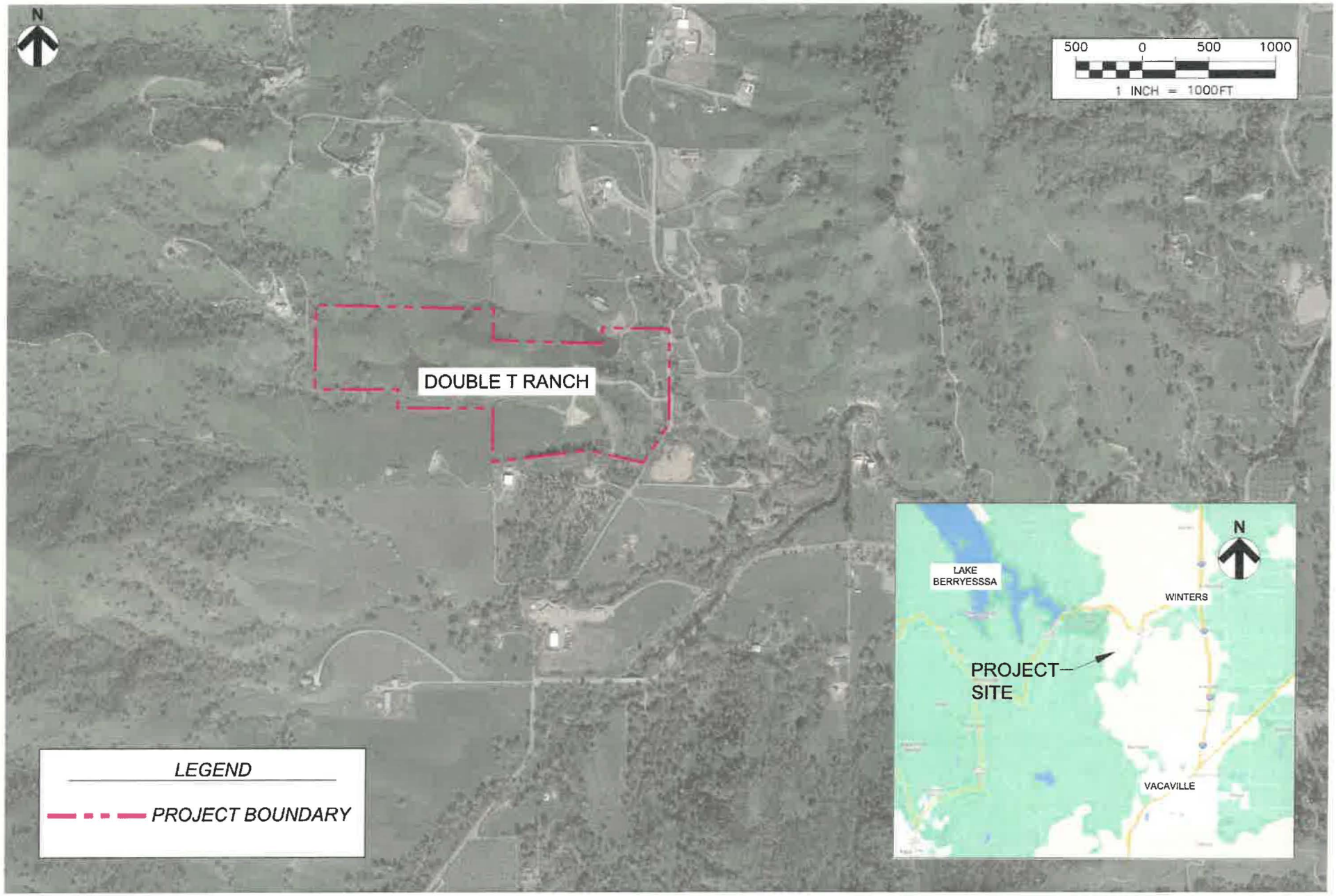

Figure 1-1
Double T Ranch
Equestrian Center Project Hydrology Study
Vicinity and Location Map

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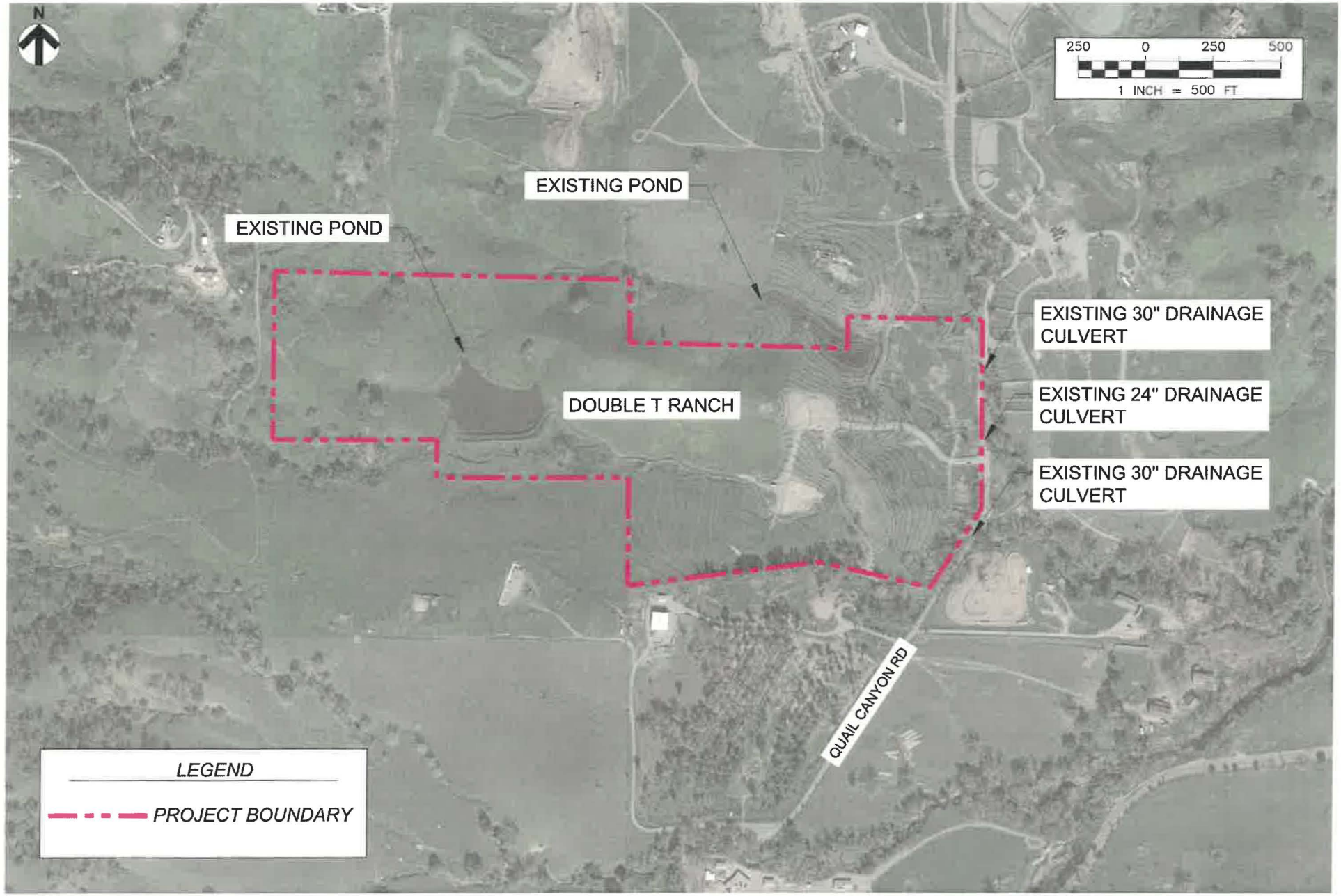

Figure 1-2
Double T Ranch
Equestrian Center Project Hydrology Study
Aerial Site Plan

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SECTION 2 – PROPOSED SITE PLAN

Site improvements consist of construction of various livestock related structures, such as barns horse training facilities and pastures and will be located on the easterly half of the site. The westerly portion of the site is to remain in its existing condition, and no site improvements or grading is proposed in this area. The project proposes minimal site grading and earthwork on the easterly half of the site, utilizing existing flat areas to construct the facilities. Ingress and egress will occur by constructing a paved access road and driveway from Quail Canyon Road. Other paths shown on the site plan consist of pervious aggregate base travel ways that are significantly less intrusive for the livestock in-lieu of paved roadways. See **Figure 2-1** below for the proposed site improvement plan.

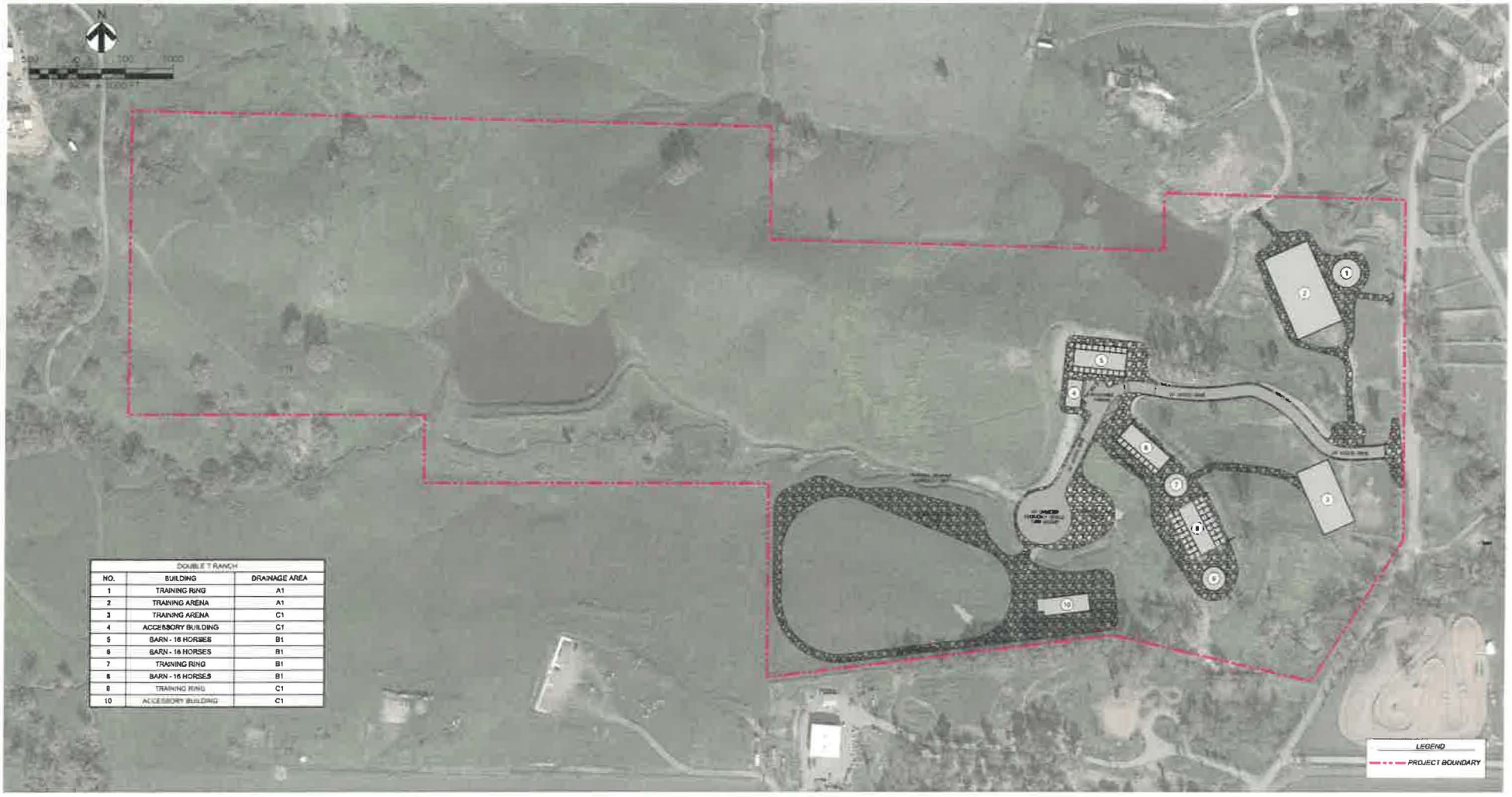

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Figure 2-1
Double T Ranch
Equestrian Center Project Hydrology Study
Site Improvement Plan

SECTION 3 – HYDROLOGY CALCULATIONS

Solano County Code Chapter 31 governs all grading, drainage, land leveling and erosion control work in Solano County. It addresses the problem of increasing peak runoff as a result of development. Section 31-30 (h) states "The plan shall identify mitigation measures that result in no net increase in peak runoff due to development".

3.1 Methodology

The Solano County Water Agency Hydrology Manual prescribes hydrologic analysis procedures that can be applied to studies and designs of drainage and flood control facilities within Solano County.

The Hydrology Manual requires one of two hydrologic analysis methods for typical projects and facilities, depending on the size of the project/watershed area and the complexity of the situation:

- The Rational Method – for projects less than 200 acres (ac) with no detention; or
- The Hydrologic Engineering Center – Hydrologic Modeling System (HEC-HMS) – for all other projects

To mitigate the impacts, the stormwater drainage system for the alternatives will be designed to limit the peak flow and stormwater volume from the developed site to the undeveloped peak flows. Storm water detention basins are being proposed to attenuate the increase in peak flow and runoff volumes created by the development. Per the Hydrology Manual, HEC-HMS shall be used as the method of hydrological analysis when using detention basins.

3.2 Hydrology Parameters

Chapter 2 of the Hydrology Manual describes the following parameters as needed for the HEC-HMS model and hydrology calculations. These parameters are intended to form the basis for modeling the hydrologic conditions of site and are required for the HEC-HMS software to simulate rainfall intensity, rainfall losses due to infiltration, simulation of ground surface flow, and hydrograph routing through detention basins.

The existing watershed areas of the site are divided into three different watersheds and are summarized in **Table 3-1**. Each shed drains to existing culverts on the easterly edge of the property, and flows underneath Quail Canyon Road. A hydrology map of the existing site is provided as **Figure 3-1**.

Table 3-1: Existing Drainage Areas

Subbasin	Area (Ac)
A-1	2.12
B-1	5.30
B-2	7.23
C-1	6.07
C-2	12.86
C-3	13.91

Rainfall intensities were determined by site specific data retrieved from Table 3-4 of the Hydrology Manual for a 100-year, 24-hour storm event. This data is intended for developing the hydrographs and peak flows from design storms of various durations determined by the site's Mean Annual Precipitation (MAP). Based on the Isohyetal Map of the site, the MAP was determined to be 32 inches. Rainfall Intensities for the MAP, area included as **Appendix B**.

The next steps in determining the existing hydrologic conditions are to determine the precipitation loss rates due to wetting of vegetation, storage in depressions, or infiltration into the ground. The site Hydrologic Soils Group for the site can be determined by the Natural Resources Conservation Service maps. The soils group for the site has been determined to be Soils Group D. A copy of the NRCS map determination is included as **Appendix C**.

HEC-HMS calculates infiltration losses based on three conditions: initial loss, constant loss, and impervious area percentage. Initial loss can be determined by Table 3-5 of the Hydrology Manual by the existing land use of the property. Constant loss is determined by the reference of Table 3-6 of the Hydrology Manual and is determined by the soils group. The storm event parameters are provided in **Table 3-2**.

Table 3-2: Storm Event Parameters

Parameter	Value
Mean Annual Precipitation	32 Inches
Hydrologic Soils Group	D
Land Use	Terrain
Initial Soil Loss	0.20
Constant Soil Loss	0.02

3.3 Existing Hydrology

The Hydrology Manual recommends the use of the "Snyder's Method" for use within the HEC-HMS software to transform the rainfall excess into a runoff hydrograph. This method estimates the unit hydrograph based on physical characteristics of the site.

Table 3-3: Snyder's Method (Existing)

Subbasin	Area (Acres)	% Urbanization	Slope (Ft/Ft)	Lag Time	Peaking Coefficient
A-1	2.12	1%	0.0850	0.37	0.45
B-1	5.30	1%	0.0964	0.43	0.45
B-2	7.23	1%	0.0776	0.47	0.45
C-1	6.07	1%	0.0605	0.47	0.45
C-2	12.86	1%	0.0298	0.58	0.45
C-3	13.91	1%	0.0928	0.53	0.45

HEC-HMS Model simulations of the existing site condition are presented in **Appendix D,** summarized in **Table 3-4** below, and visually shown in **Figure 3-1** Existing Hydrology Map.

Table 3-4: Existing Site Hydrology

Subbasin	Peak Discharge (CFS)	Runoff Depth (IN)	Runoff Volume
A-1	4.2	6.96	53,448
B-1	9.8	6.95	133,628
B-2	12.6	6.94	182,128
C-1	10.6	6.94	152,967
C-2	19.9	6.91	322,644
C-3	22.7	6.92	349,430

It should be noted that the site has two seasonal water storage ponds. In order to be conservative in these calculations, it was assumed that these ponds were full at the time of the storm event and would not accept any runoff volume.

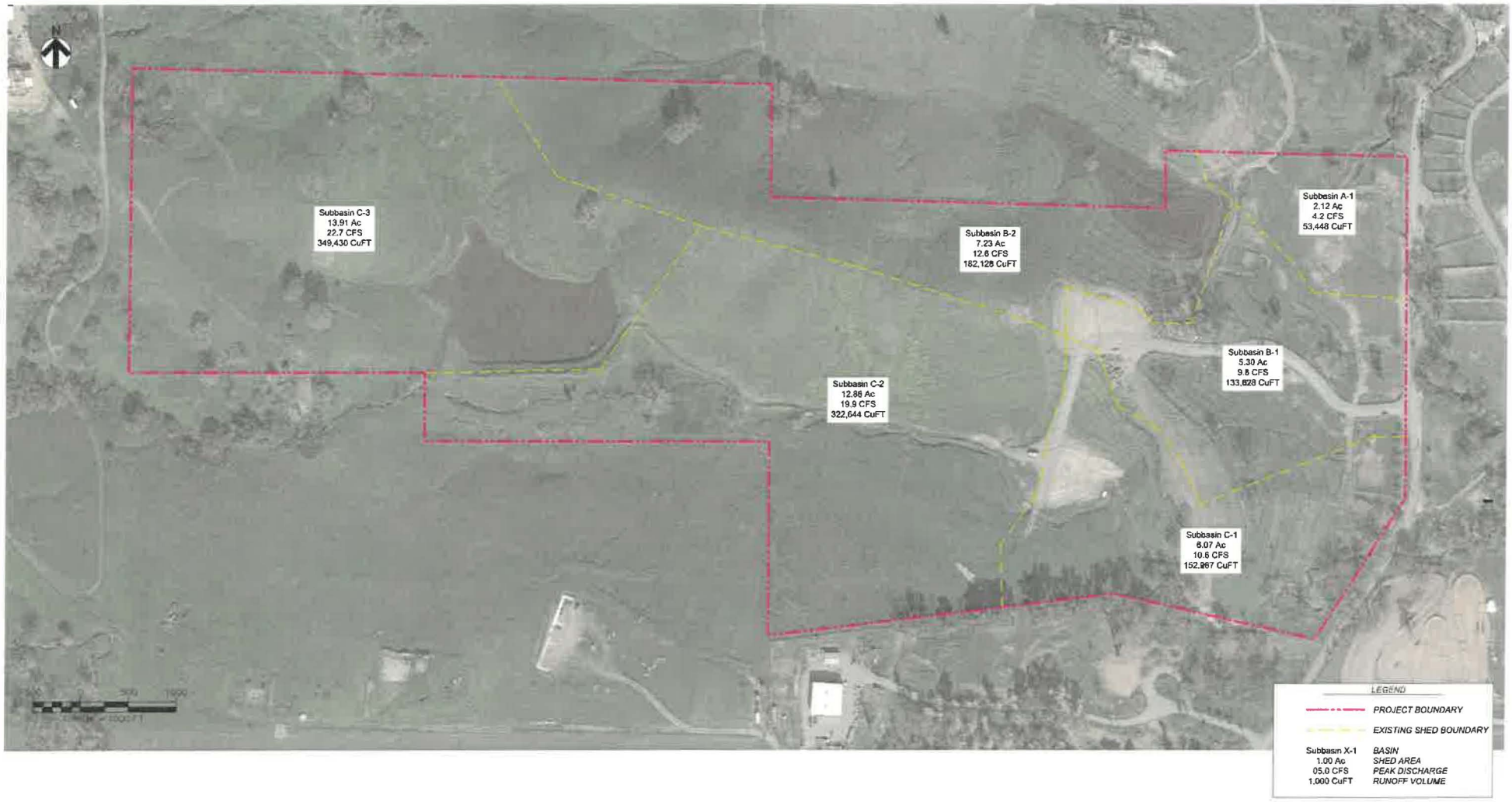

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Figure 3-1
Double T Ranch
Equestrian Center Project Hydrology Study
Existing Hydrology

3.4 Proposed Hydrology

The site grading for the proposed site plan improvements consists of minimal grading in building pad areas. Resulting in minor changes to basin areas and transform calculations which are summarized in **Table 3-5** and **Table 3-6**.

Table 3-5: Proposed Drainage Areas

Subbasin	Area (Ac)
A-1	2.14
B-1	5.39
B-2	7.31
C-1	5.56
C-2	13.18
C-3	13.91

Table 3-6: Snyder's Method (Proposed)

Subbasin	Area (Acres)	% Urbanization	Slope (Ft/Ft)	Lag Time	Peaking Coefficient
A-1	2.14	5	0.0850	0.35	0.45
B-1	5.39	5	0.0964	0.42	0.45
B-2	7.31	1	0.0776	0.47	0.45
C-1	5.56	5	0.0605	0.44	0.45
C-2	13.18	5	0.0298	0.57	0.45
C-3	13.91	1	0.0928	0.53	0.45

In addition to the previous hydrologic parameters used, the proposed site improvements need to include runoff from impervious areas. **Table 3-7** provides the impervious areas of asphalt and building improvements within each subbasin.

Table 3-7: Site Impervious Areas

Subbasin	Impervious Area (SF)	% Impervious
A-1	20,827	0.22%
B-1	31,831	0.14%
B-2	0	0
C-1	27,456	0.11%
C-2	4,015	0.01%
C-3	0	0

HEC-HMS Model simulations of the proposed site plan conditions, including impervious areas are presented in **Appendix E,** summarized in **Table 3-8**, and shown in **Figure 3-2** Proposed Hydrology Map.

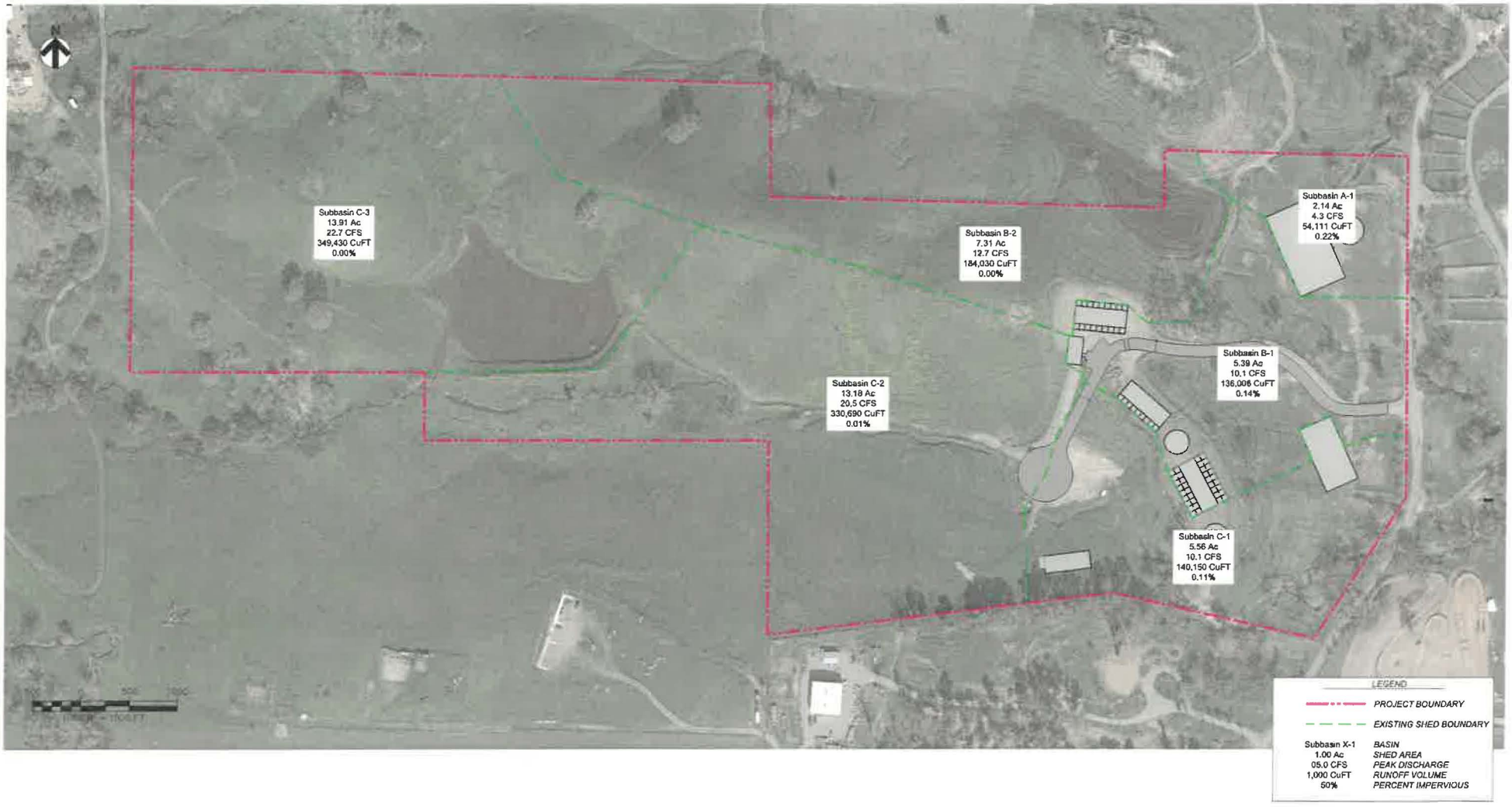

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Figure 3-2
Double T Ranch
Equestrian Center Project Hydrology Study
Proposed Hydrology

Table 3-8: Proposed Site Hydrology

Subbasin	Peak Discharge (CFS)	Runoff Depth (IN)	Runoff Volume (CuFT)
A-1	4.3	6.96	54,111
B-1	10.1	6.95	136,006
B-2	12.7	6.94	184,030
C-1	10.1	6.95	140,150
C-2	20.5	6.91	330,690
C-3	22.7	6.92	349,430

3.5 Runoff Mitigation

To mitigate the impacts of the additional runoff volume of the proposed improvements, detention basins will be designed to limit the runoff volume to existing conditions. The existing and proposed runoff volumes within each basin are summarized in **Table 3-9: Mitigation Volume**

Table 3-9: Mitigation Volume

Basin	Existing Cumulative Runoff Volume (CuFT)	Proposed Cumulative Runoff Volume (CuFT)	Mitigation Volume (CuFT)
A	53,448	5,411	663
B	315,756	320,037	4,281
C	825,741	820,270	(4,771)

The detention basins will be sized to accommodate the mitigation volume shown in **Table 3-9** above. We can calculate the area of runoff within each basin by dividing the volume with the known rainfall depth of the shed to determine the drainage area of the shed that will need to be detained.

Table 3-10: Mitigation Area

Basin	Mitigation Volume (CuFT)	Runoff Depth (IN)	Mitigation Area (SF)
A	663	6.96	1,150
B	4,281	6.95	7,400
C	(4,771)	N/A	N/A

Detention basins will be designed per Solano County design standards and are proposed to be located per **Figure 3-2** Proposed Detention Basin Plan. These basins are sized to mitigate the site runoff for the 100-year storm event to pre-development volumes.

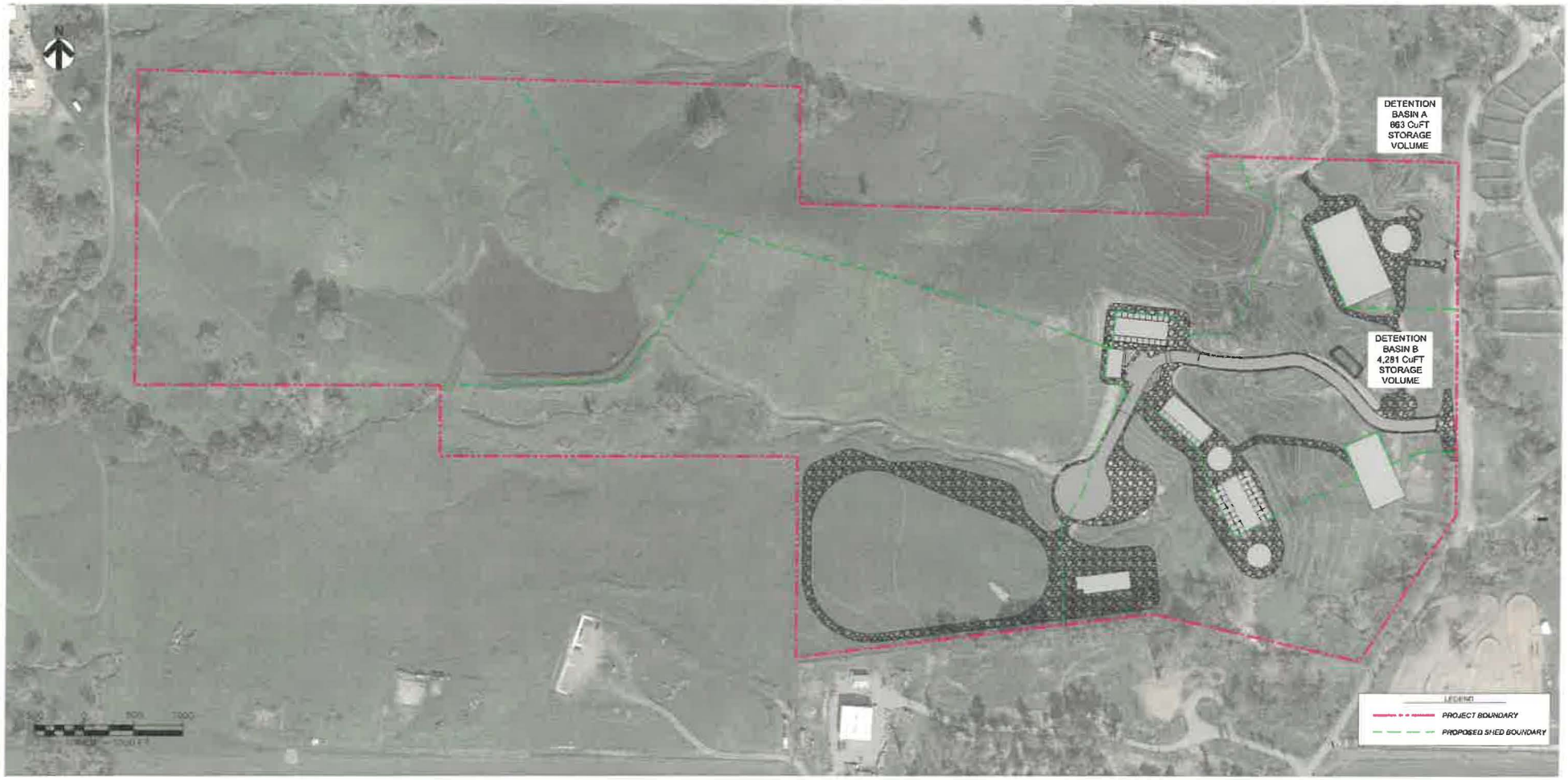

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Figure 3-3
Double T Ranch
Equestrian Center Project Hydrology Study
Proposed Detention Basin Plan

APPENDIX A

Double T Ranch Equestrian Center
Hydrology Report
FEMA Firmette

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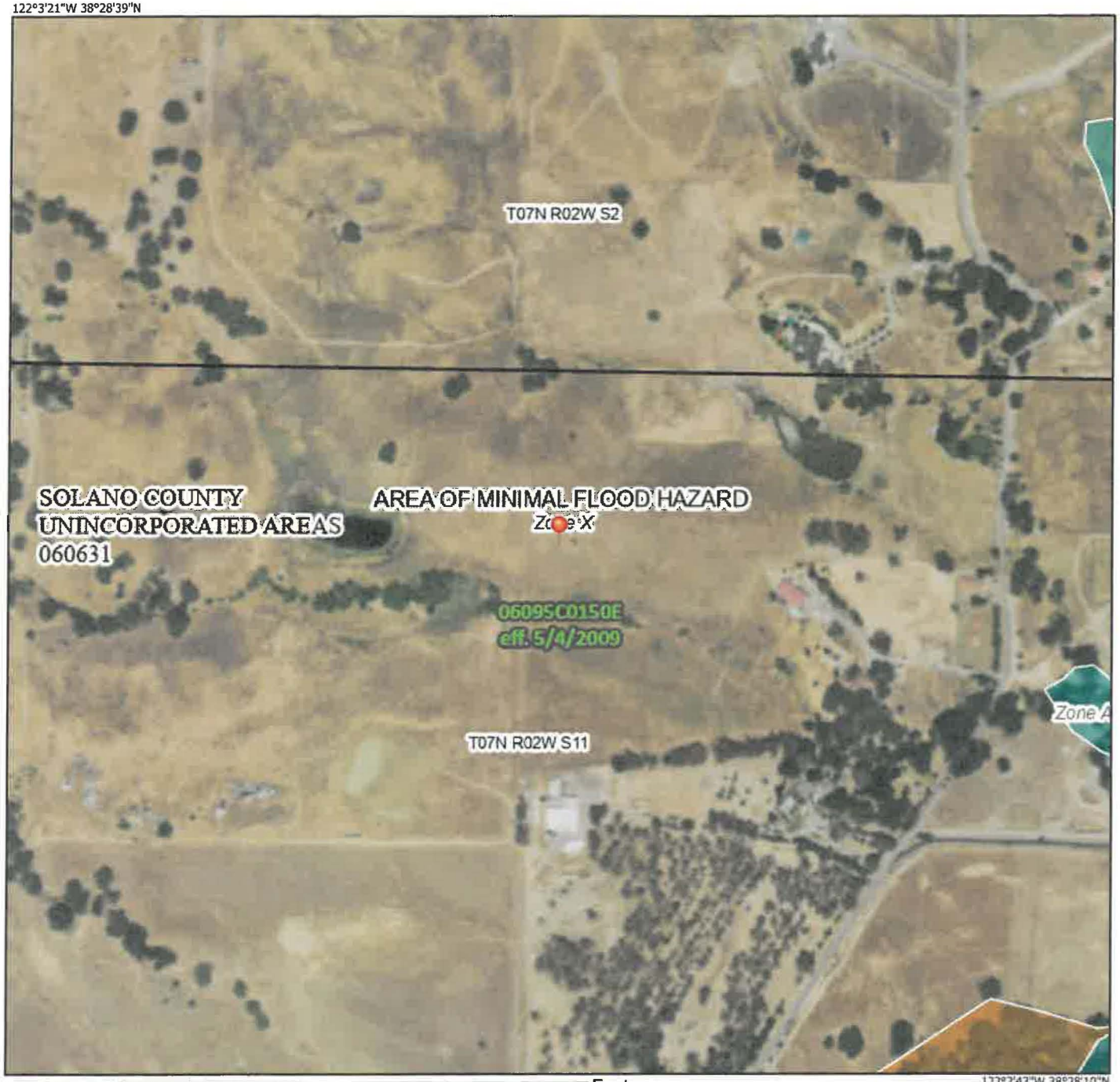
National Flood Hazard Layer FIRMette

FEMA

122°3'21"W 38°28'39"N



122°2'43"W 38°28'10"N

0 250 500 1,000 1,500 2,000 Feet 1:6,000

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

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/22/2023 at 1:41 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX B

Double T Ranch Equestrian Center
Hydrology Report
Rainfall Intensity – Mean Area Precipitation

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Table 3-4B. Solano County Design Rainfall for Sacramento River Drainage Region

25-Year Return Period

MAP	5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	1 Day	2 Day	3 Day	4 Day	5 Day	6 Day	8 Day	10 day	15 Day	20 Day	30 Day	60 Day	Year
14	0.25	0.33	0.39	0.53	0.71	0.96	1.14	1.54	2.07	2.79	3.91	4.14	4.60	4.96	5.25	5.80	6.31	7.10	8.63	9.50	13.52	22.16
15	0.26	0.35	0.42	0.57	0.76	1.03	1.23	1.65	2.22	2.99	4.16	4.45	4.94	5.34	5.65	6.25	6.79	7.63	9.23	10.18	14.54	23.74
16	0.28	0.38	0.45	0.61	0.82	1.10	1.31	1.76	2.37	3.19	4.42	4.75	5.28	5.72	6.04	6.70	7.27	8.17	9.82	10.87	15.57	25.32
17	0.30	0.40	0.48	0.64	0.87	1.17	1.39	1.87	2.52	3.39	4.67	5.06	5.62	6.09	6.43	7.15	7.75	8.71	10.42	11.56	16.59	26.91
18	0.32	0.43	0.51	0.68	0.92	1.24	1.47	1.98	2.66	3.59	4.92	5.36	5.96	6.47	6.83	7.60	8.23	9.25	11.01	12.24	17.61	28.49
19	0.33	0.45	0.53	0.72	0.97	1.30	1.55	2.09	2.81	3.79	5.17	5.67	6.30	6.85	7.22	8.05	8.71	9.78	11.61	12.93	18.63	30.07
20	0.35	0.47	0.56	0.76	1.02	1.37	1.63	2.20	2.96	3.99	5.42	5.97	6.64	7.23	7.62	8.50	9.19	10.32	12.20	13.61	19.66	31.66
22	0.39	0.52	0.62	0.83	1.12	1.51	1.80	2.42	3.26	4.39	5.92	6.58	7.31	7.99	8.41	9.40	10.16	11.39	13.39	14.99	21.70	34.82
24	0.42	0.57	0.67	0.91	1.22	1.65	1.96	2.64	3.55	4.78	6.42	7.19	7.99	8.75	9.20	10.31	11.12	12.47	14.58	16.36	23.74	37.99
26	0.46	0.61	0.73	0.98	1.33	1.78	2.12	2.86	3.85	5.18	6.93	7.80	8.67	9.50	9.98	11.21	12.08	13.54	15.77	17.73	25.79	41.15
28	0.49	0.66	0.79	1.06	1.43	1.92	2.29	3.08	4.15	5.58	7.43	8.41	9.35	10.26	10.77	12.11	13.04	14.61	16.96	19.10	27.83	44.32
30	0.53	0.71	0.84	1.14	1.53	2.06	2.45	3.30	4.44	5.98	7.93	9.02	10.03	11.02	11.56	13.01	14.01	15.69	18.15	20.47	29.88	47.48
32	0.56	0.76	0.90	1.21	1.63	2.20	2.61	3.52	4.74	6.38	8.43	9.63	10.71	11.78	12.35	13.91	14.97	16.76	19.34	21.84	31.92	50.65
34	0.60	0.80	0.96	1.29	1.73	2.33	2.78	3.74	5.03	6.78	8.93	10.24	11.38	12.54	13.14	14.82	15.93	17.84	20.53	23.22	33.97	53.82
36	0.63	0.85	1.01	1.36	1.84	2.47	2.94	3.96	5.33	7.18	9.44	10.85	12.06	13.29	13.93	15.72	16.89	18.91	21.72	24.59	36.01	56.98
38	0.67	0.90	1.07	1.44	1.94	2.61	3.10	4.18	5.63	7.57	9.94	11.46	12.74	14.05	14.72	16.62	17.85	19.98	22.91	25.96	38.06	60.15
40	0.70	0.95	1.12	1.51	2.04	2.74	3.27	4.40	5.92	7.97	10.44	12.07	13.42	14.81	15.50	17.52	18.82	21.06	24.10	27.33	40.10	63.31
45	0.79	1.06	1.27	1.70	2.29	3.09	3.68	4.95	6.66	8.97	11.69	13.60	15.11	16.70	17.48	19.78	21.22	23.74	27.08	30.76	45.22	71.23

50-Year Return Period

MAP	5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	1 Day	2 Day	3 Day	4 Day	5 Day	6 Day	8 Day	10 day	15 Day	20 Day	30 Day	60 Day	Year
14	0.27	0.37	0.44	0.59	0.79	1.06	1.26	1.70	2.29	3.09	4.38	4.64	5.14	5.53	5.82	6.40	6.90	7.75	9.47	10.41	14.75	23.81
15	0.29	0.39	0.47	0.63	0.85	1.14	1.35	1.82	2.46	3.31	4.66	4.98	5.52	5.96	6.26	6.90	7.43	8.34	10.12	11.16	15.87	25.51
16	0.31	0.42	0.50	0.67	0.90	1.21	1.44	1.95	2.62	3.53	4.94	5.33	5.90	6.38	6.69	7.40	7.96	8.93	10.77	11.91	16.98	27.21
17	0.33	0.44	0.53	0.71	0.96	1.29	1.54	2.07	2.78	3.75	5.22	5.67	6.28	6.80	7.13	7.90	8.48	9.51	11.42	12.66	18.10	28.92
18	0.35	0.47	0.56	0.75	1.01	1.37	1.63	2.19	2.95	3.97	5.50	6.01	6.66	7.23	7.57	8.39	9.01	10.10	12.08	13.41	19.21	30.62
19	0.37	0.50	0.59	0.80	1.07	1.44	1.72	2.31	3.11	4.19	5.78	6.35	7.04	7.65	8.01	8.89	9.54	10.68	12.73	14.16	20.33	32.32
20	0.39	0.52	0.62	0.84	1.13	1.52	1.81	2.43	3.27	4.41	6.07	6.69	7.41	8.07	8.44	9.39	10.06	11.27	13.38	14.91	21.44	34.02
22	0.43	0.57	0.68	0.92	1.24	1.67	1.99	2.67	3.60	4.85	6.63	7.38	8.17	8.92	9.32	10.39	11.12	12.44	14.69	16.42	23.68	37.42
24	0.47	0.63	0.75	1.00	1.35	1.82	2.17	2.92	3.93	5.29	7.19	8.06	8.93	9.76	10.19	11.38	12.17	13.62	15.99	17.92	25.91	40.82
26	0.50	0.68	0.81	1.09	1.47	1.97	2.35	3.16	4.26	5.73	7.75	8.74	9.69	10.61	11.07	12.38	13.22	14.79	17.30	19.42	28.14	44.22
28	0.54	0.73	0.87	1.17	1.58	2.12	2.53	3.40	4.58	6.17	8.31	9.43	10.45	11.46	11.94	13.37	14.27	15.96	18.60	20.93	30.37	47.63
30	0.58	0.78	0.93	1.26	1.69	2.28	2.71	3.65	4.91	6.61	8.87	10.11	11.20	12.30	12.81	14.37	15.33	17.13	19.91	22.43	32.60	51.03
32	0.62	0.84	1.00	1.34	1.80	2.43	2.89	3.89	5.24	7.05	9.44	10.79	11.96	13.15	13.69	15.37	16.38	18.31	21.21	23.93	34.83	54.43
34	0.66	0.89	1.06	1.42	1.92	2.58	3.07	4.13	5.57	7.49	10.00	11.48	12.72	13.99	14.56	16.36	17.43	19.48	22.52	25.43	37.06	57.83
36	0.70	0.94	1.12	1.51	2.03	2.73	3.25	4.38	5.89	7.93	10.56	12.16	13.48	14.84	15.44	17.36	18.49	20.65	23.82	26.94	39.29	61.23
38	0.74	0.99	1.18	1.59	2.14	2.88	3.43	4.62	6.22	8.38	11.12	12.85	14.24	15.69	16.31	18.35	19.54	21.82	25.13	28.44	41.52	64.63
40	0.78	1.05	1.24	1.67	2.25	3.03	3.61	4.86	6.55	8.82	11.68	13.53	14.99	16.53	17.18	19.35	20.59	23.00	26.43	29.94	43.76	68.04
45	0.87	1.18	1.40	1.88	2.54	3.41	4.06	5.47	7.37	9.92	13.09	15.24	16.89	18.65	19.37	21.84	23.22	25.93	29.70	33.70	49.33	76.54

100-Year Return Period

MAP	5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	1 Day	2 Day	3 Day	4 Day	5 Day	6 Day	8 Day	10 day	15 Day	20 Day	30 Day	60 Day	Year
14	0.30	0.40	0.48	0.64	0.86	1.16	1.38	1.86	2.50	3.37	4.83	5.13	5.67	6.10	6.37	5.89	7.50	8.37	10.26	11.27	15.91	25.35
15	0.32	0.43	0.51	0.69	0.92	1.24	1.48	1.99	2.68	3.61	5.14	5.51	6.08	6.56	6.85	6.35	8.08	9.00	10.96	12.08	17.12	27.16
16	0.34	0.46	0.54	0.73	0.99	1.33	1.58	2.13	2.86	3.85	5.45	5.88	6.50	7.03	7.32	6.81	8.65	9.64	11.67	12.89	18.32	28.97
17	0.36	0.49	0.58	0.78	1.05	1.41	1.68	2.26	3.04	4.09	5.76	6.26	6.92	7.49	7.80	7.27	9.22	10.27	12.38	13.71	19.52	30.78
18	0.38	0.51	0.61	0.82	1.11	1.49	1.78	2.39	3.22	4.33	6.07	6.64	7.34	7.96	8.28	7.73	9.79	10.90	13.08	14.52	20.73	32.59
19	0.40	0.54	0.65	0.87	1.17	1.57	1.87	2.52	3.40	4.58	6.38	7.02	7.75	8.43	8.76	8.19	10.36	11.53	13.79	15.33	21.93	34.40
20	0.42	0.57	0.68	0.91	1.23	1.66	1.97	2.66	3.58	4.82	6.69	7.39	8.17	8.89	9.24	8.65	10.94	12.17	14.50	16.15	23.13	36.21
22	0.47	0.63	0.75	1.01	1.35	1.82	2.17	2.92	3.93	5.30	7.31	8.15	9.01	9.82	10.19	9.56	12.08	13.43	15.91	17.77	25.54	39.83
24	0.51	0.69	0.82	1.10	1.48	1.99	2.37	3.19	4.29	5.78	7.93	8.91	9.84	10.76	11.15	10.48	13.23	14.70	17.33	19.40	27.95	43.46
26	0.55	0.74	0.88	1.19	1.60	2.16	2.57	3.45	4.65	6.26	8.55	9.66	10.68	11.69	12.11	11.40	14.37	15.96	18.74	21.03	30.35	47.08
28	0.59	0.80	0.95	1.28	1.72	2.32	2.76	3.72	5.01	6.74	9.17	10.42	11.51	12.62	13.06	12.31	15.51	17.23	20.16	22.66	32.76	50.70
30	0.64	0.86	1.02	1.37	1.85	2.49	2.96	3.99	5.37	7.22	9.79	11.17	12.35	13.55	14.02	13.23	16.66	18.50	21.57	24.28	35.16	54.32
32	0.68	0.91	1.09	1.46	1.97	2.65	3.16	4.25	5.72	7.71	10.41	11.93	13.18	14.48	14.98	14.15	17.80	19.76	22.98	25.91	37.57	57.94
34	0.72	0.97	1.15	1.56	2.09	2.82	3.35	4.52	6.08	8.19	11.03	12.68	14.02	15.41	15.93	15.07	18.95	21.03	24.40	27.54	39.98	61.56
36	0.76	1.03	1.22	1.65	2.22	2.98	3.55	4.78	6.44	8.67	11.65	13.44	14.85	16.35	16.89	15.98	20.09	22.29	25.81	29.16	42.38	65.18
38	0.81	1.08	1.29	1.74	2.34	3.15	3.75	5.05	6.80	9.15	12.27	14.19	15.69	17.28	17.85	16.90	21.24	23.56	27.23	30.79	44.79	68.80
40	0.85	1.14	1.36	1.83	2.46	3.32	3.95	5.31	7.15	9.63	12.89	14.95	16.53	18.21	18.80	17.82	22.38	24.83	28.64	32.42	47.20	72.43
45	0.95	1.28	1.53	2.06	2.77	3.73	4.44	5.98	8.05	10.84	14.44	16.84	18.61	20.54	21.19	20.11	25.24	27.99	32.18	36.49	53.21	81.48

200-Year Return Period

MAP	5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	1 Day	2 Day	3 Day	4 Day	5 Day	6 Day	8 Day	10 day	15 Day	20 Day	30 Day	60 Day	Year
14	0.32	0.43	0.51	0.69	0.93	1.26	1.49	2.01	2.71	3.65	5.28	5.61	6.18	6.65	6.90	7.54	8.08	8.96	11.01	12.09	16.75	26.80
15	0.34	0.46	0.55	0.74	1.00	1.35	1.60	2.16	2.90	3.91	5.62	6.02	6.64	7.15	7.42	8.13	8.70	9.63	11.77	12.96	18.02	28.71
16	0.37	0.49	0.59	0.79	1.07	1.44	1.71	2.30	3.10	4.17	5.96	6.43	7.09	7.66	7.94	8.71	9.31	10.31	12.53	13.83	19.28	30.63
17	0.39	0.53	0.63	0.84	1.13	1.53	1.82	2.44	3.29	4.43	6.29	6.85	7.55	8.17	8.45	9.30	9.93	10.99	13.29	14.71	20.55	32.54
18	0.41	0.56	0.66	0.89	1.20	1.61	1.92	2.59	3.48	4.69	6.63	7.26	8.00	8.68	8.97	9.88	10.54	11.67	14.05	15.58	21.82	34.46
19	0.44	0.59	0.70	0.94	1.27	1.70	2.03	2.73	3.68	4.95	6.97	7.67	8.46	9.19	9.49	10.47	11.16	12.34	14.81	16.45	23.08	36.37
20	0.46	0.62	0.74	0.99	1.33	1.79	2.14	2.88	3.87	5.21	7.31	8.08	8.91	9.69	10.01	11.06	11.78	13.02	15.57	17.33	24.35	38.28
22	0.50	0.68	0.81	1.09	1.47	1.97	2.35	3.16	4.26	5.73	7.99	8.91	9.82	10.71	11.04	12.23	13.01	14.38	17.09	19.07	26.88	42.11
24	0.55	0.74	0.88	1.19	1.60	2.15	2.56	3.45	4.65	6.25	8.66	9.74	10.74	11.72	12.08	13.40	14.24	15.73	18.61	20.82	29.42	45.94
26	0.60	0.80	0.96	1.29	1.73	2.33	2.78	3.74	5.03	6.78	9.34	10.56	11.65	12.74	13.12	14.58	15.47	17.09	20.12	22.56	31.95	49.77
28	0.64	0.87	1.03	1.39	1.87	2.51	2.99	4.03	5.42	7.30	10.02	11.39	12.56	13.76	14.15	15.75	16.71	18.44	21.64	24.31	34.48	53.60
30	0.69	0.93	1.10	1.49	2.00	2.69	3.20	4.31	5.81	7.82	10.70	12.21	13.47	14.77	15.19	16.92	17.94	19.79	23.16	26.06	37.02	57.43
32	0.73	0.99	1.18	1.58	2.13	2.87	3.42	4.60	6.19	8.34	11.37	13.04	14.38	15.79	16.23	18.10	19.17	21.15	24.68	27.80	39.55	61.25
34	0.78	1.05	1.25	1.68	2.27	3.05	3.63	4.89	6.58	8.86	12.05	13.86	15.29	16.80	17.26	19.27	20.40	22.50	26.20	29.55	42.08	65.08
36	0.83	1.11	1.32	1.78	2.40	3.23	3.84	5.18	6.97	9.38	12.73	14.69	16.20	17.82	18.30	20.44	21.63	23.86	27.72	31.29	44.62	68.91
38	0.87	1.17	1.40	1.88	2.53	3.41	4.06	5.46	7.36	9.90	13.40	15.52	17.11	18.83	19.33	21.61	22.87	25.21	29.24	33.04	47.15	72.74
40	0.92	1.24	1.47	1.98	2.67	3.59	4.27	5.75	7.74	10.42	14.08	16.34	18.02	19.85	20.37	22.79	24.10	26.57	30.75	34.79	49.68	76.57
45	1.03	1.39	1.65	2.23	3.00	4.04	4.81	6.47	8.71	11.73	15.77	18.41	20.30	22.39	22.96	25.72	27.18	29.96	34.55	39.15	56.02	86.14

APPENDIX C
Double T Ranch
Hydrology Report
NCRS Hydrologic Soils Group

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Solano County, California

DIE—Dibble-Los Osos clay loams, 9 to 30 percent slopes

Map Unit Setting

National map unit symbol: h9lb
Elevation: 100 to 2,000 feet
Mean annual precipitation: 20 to 30 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 225 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Dibble and similar soils: 60 percent
Los osos and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dibble

Setting

Landform: Mountains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Center third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone

Typical profile

H1 - 0 to 13 inches: clay loam
H2 - 13 to 30 inches: clay loam
H3 - 30 to 59 inches: bedrock

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: 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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R015XE020CA - Fine Loamy 9-13

Hydric soil rating: No

Description of Los Osos

Setting

Landform: Mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Center third of mountainflank
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sedimentary rock

Typical profile

H1 - 0 to 7 inches: clay loam
H2 - 7 to 25 inches: clay
H3 - 25 to 59 inches: bedrock

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: 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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R015XE020CA - Fine Loamy 9-13
Hydric soil rating: No

Minor Components

Millsholm

Percent of map unit: 5 percent
Hydric soil rating: No

Los gatos

Percent of map unit: 5 percent

Hydric soil rating: No

Data Source Information

Soil Survey Area: Napa County, California
Survey Area Data: Version 15, Sep 1, 2022

Soil Survey Area: Solano County, California
Survey Area Data: Version 17, Sep 1, 2022

Soil Survey Area: Yolo County, California
Survey Area Data: Version 19, Sep 1, 2022

APPENDIX D

Double T Ranch Equestrian Center
Hydrology Report
Existing Hydrology Calculations

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Project: Double_T_Ranch__Existing_
Simulation Run: Basin A-1 (Existing)
Simulation Start: 1 January 2023, 08:00
Simulation End: 2 January 2023, 08:00

HMS Version: 4.10
Executed: 08 June 2023, 19:29

Global Parameter Summary - Subbasin

	Location	
Element Name	Longitude Degrees	Latitude Degrees
Subbasin A - 1	-122.05	38.38

	Area (MI2)
Element Name	Area (MI2)
Subbasin A - 1	0

	Downstream
Element Name	Downstream
Subbasin A - 1	Sink - 1

	Loss Rate: Initial + Constant		
Element Name	Percent Impervious Area	Initial Loss	Constant Loss Rate
Subbasin A - 1	0	0.2	0.02

	Transform: Snyder		
Element Name	Snyder Method	Snyder Tp	Snyder Cp
Subbasin A - 1	Standard	0.37	0.45

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin A - 1	0	4.23	01Jan2023, 20:25	6.96
Sink - 1	0	4.23	01Jan2023, 20:25	6.96

Subbasin: Subbasin A-1

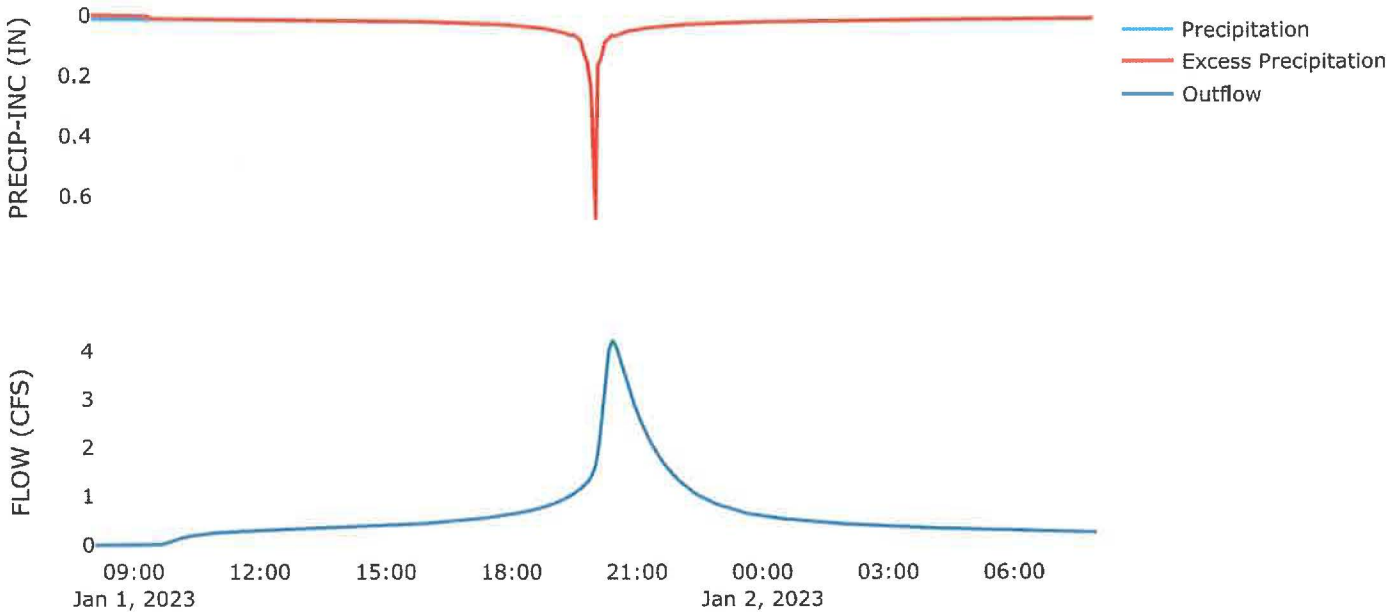
Area (MI2) : 0
Latitude Degrees : 38.38
Longitude Degrees : -122.05
Downstream : Sink - 1

Loss Rate: Initial + Constant	
Percent Impervious Area	0
Initial Loss	0.2
Constant Loss Rate	0.02

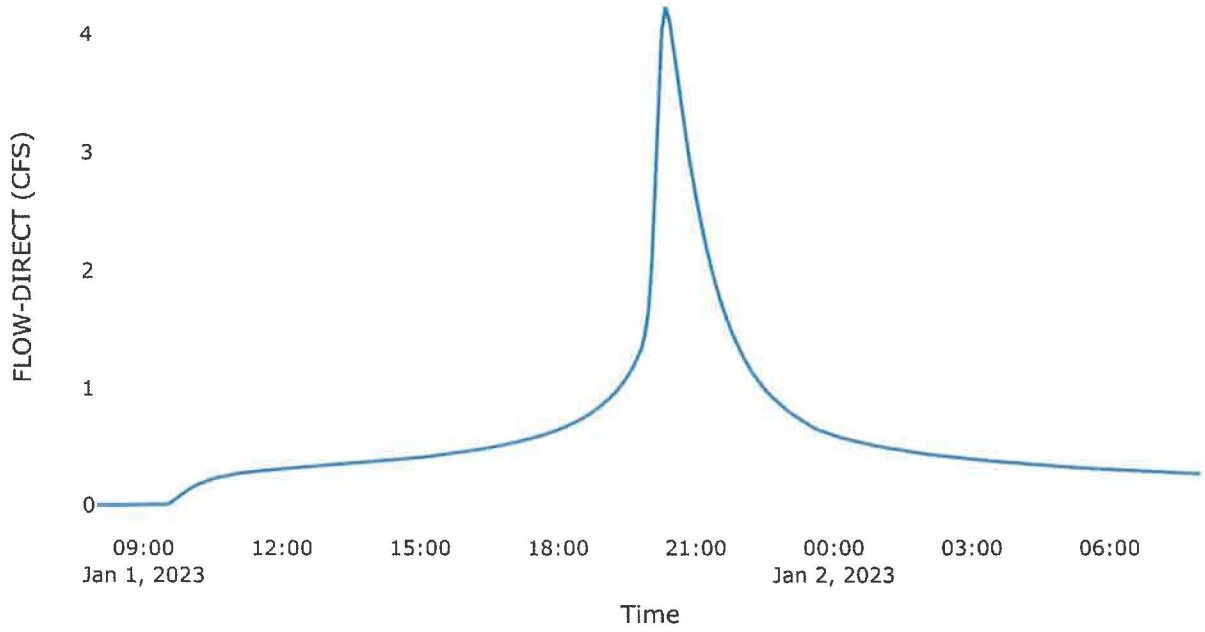
Transform: Snyder	
Snyder Method	Standard
Snyder Tp	0.37
Snyder Cp	0.45

Results: Subbasin A-1	
Peak Discharge (CFS)	4.23
Time of Peak Discharge	01Jan2023, 20:25
Volume (IN)	6.96
Precipitation Volume (AC - FT)	1.36
Loss Volume (AC - FT)	0.12
Excess Volume (AC - FT)	1.25
Direct Runoff Volume (AC - FT)	1.23
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



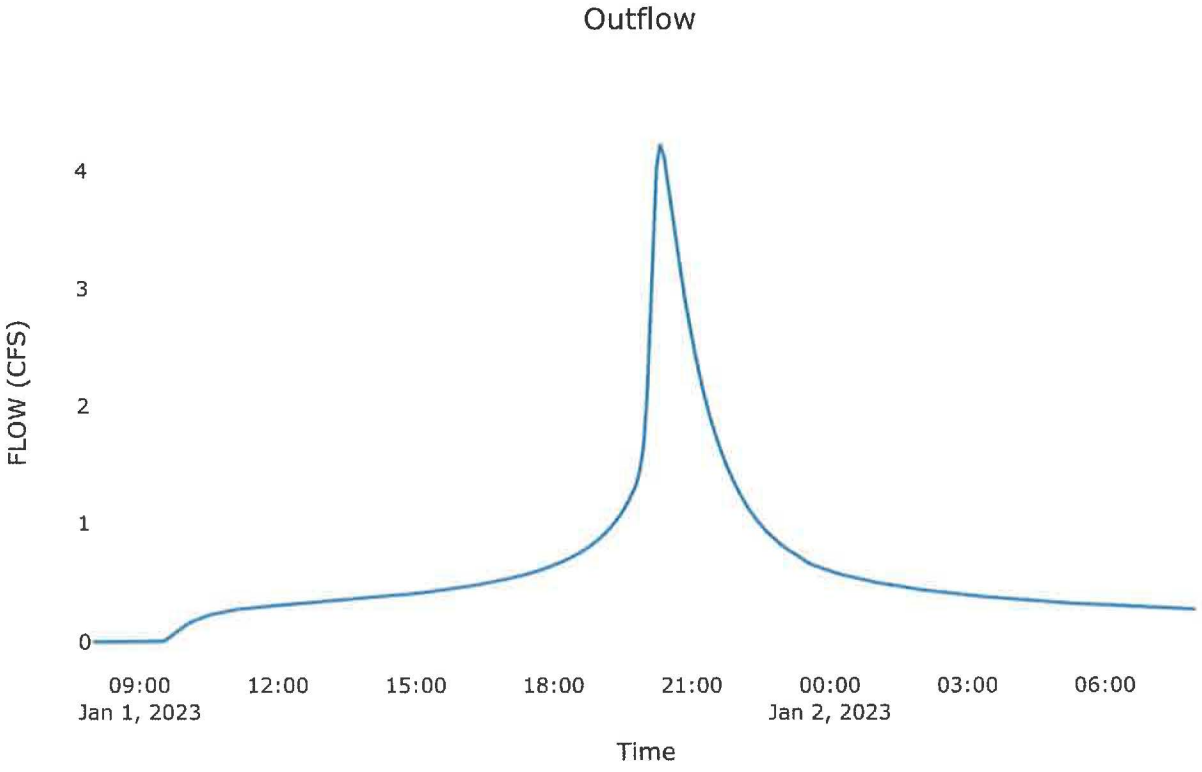
Direct Runoff



Sink: Sink-1

Results: Sink-1

Peak Discharge (CFS)	4.23
Time of Peak Discharge	01Jan2023, 20:25
Volume (IN)	6.96



Project: Double_T_Ranch__Existing_
Simulation Run: Basin B-1 (Existing)
Simulation Start: 1 January 2023, 08:00
Simulation End: 2 January 2023, 08:00

HMS Version: 4.10
Executed: 08 June 2023, 19:29

Global Parameter Summary - Subbasin

	Location	
Element Name	Longitude Degrees	Latitude Degrees
Subbasin B - 1	-122.05	38.38

	Area (MI2)
Element Name	Area (MI2)
Subbasin B - 1	0.01

	Downstream
Element Name	Downstream
Subbasin B - 1	Sink - 2

	Loss Rate: Initial + Constant		
Element Name	Percent Impervious Area	Initial Loss	Constant Loss Rate
Subbasin B - 1	0	0.2	0.02

	Transform: Snyder		
Element Name	Snyder Method	Snyder Tp	Snyder Cp
Subbasin B - 1	Standard	0.43	0.45

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin B - 1	0.01	9.76	01Jan2023, 20:30	6.95
Sink - 2	0.01	9.76	01Jan2023, 20:30	6.95

Subbasin: Subbasin B-1

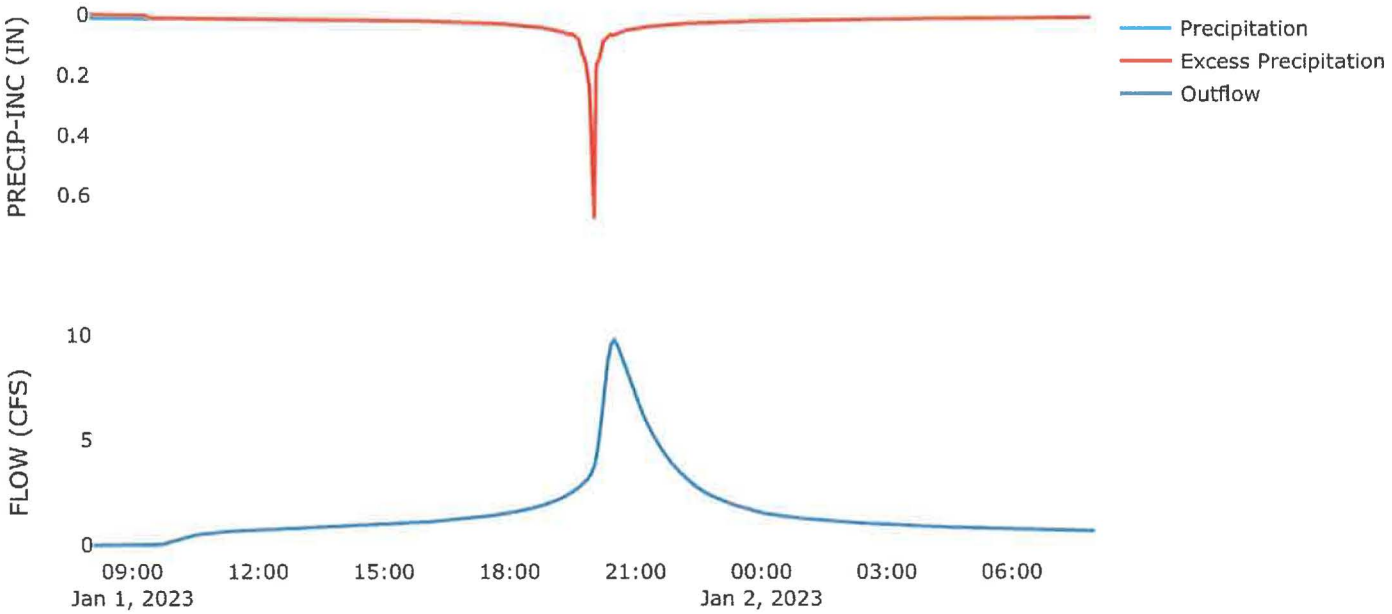
Area (MI2) : 0.01
Latitude Degrees : 38.38
Longitude Degrees : -122.05
Downstream : Sink - 2

Loss Rate: Initial + Constant	
Percent Impervious Area	0
Initial Loss	0.2
Constant Loss Rate	0.02

Transform: Snyder	
Snyder Method	Standard
Snyder Tp	0.43
Snyder Cp	0.45

Results: Subbasin B-1	
Peak Discharge (CFS)	9.76
Time of Peak Discharge	01Jan2023, 20:30
Volume (IN)	6.95
Precipitation Volume (AC - FT)	3.4
Loss Volume (AC - FT)	0.29
Excess Volume (AC - FT)	3.12
Direct Runoff Volume (AC - FT)	3.07
Baseflow Volume (AC - FT)	0

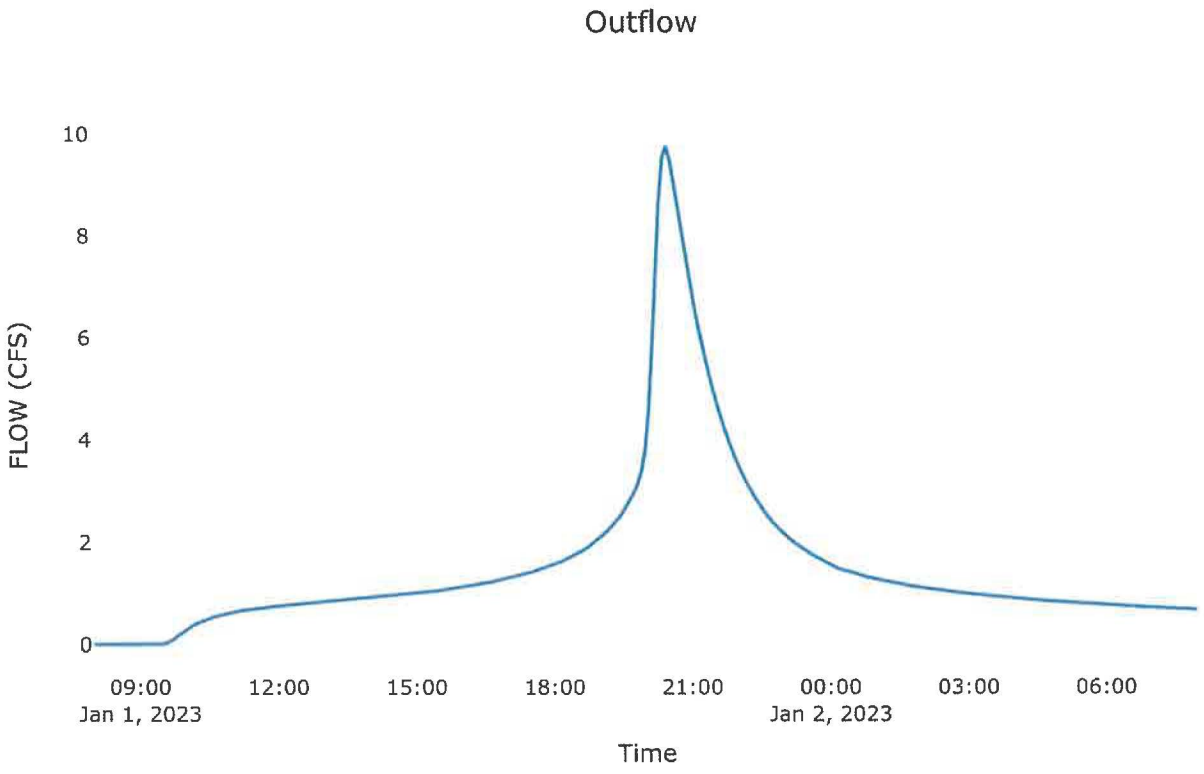
Precipitation and Outflow



Sink: Sink-2

Results: Sink-2

Peak Discharge (CFS)	9.76
Time of Peak Discharge	01Jan2023, 20:30
Volume (IN)	6.95



Project: Double_T_Ranch__Existing_
Simulation Run: Basin B-2 (Existing)
Simulation Start: 1 January 2023, 08:00
Simulation End: 2 January 2023, 08:00

HMS Version: 4.10
Executed: 08 June 2023, 19:29

Global Parameter Summary - Subbasin

	Location	
Element Name	Longitude Degrees	Latitude Degrees
Subbasin B - 2	-122.05	38.38

	Area (MI2)
Element Name	Area (MI2)
Subbasin B - 2	0.01

	Downstream
Element Name	Downstream
Subbasin B - 2	Sink - 4

	Loss Rate: Initial + Constant		
Element Name	Percent Impervious Area	Initial Loss	Constant Loss Rate
Subbasin B - 2	0	0.2	0.02

	Transform: Snyder		
Element Name	Snyder Method	Snyder Tp	Snyder Cp
Subbasin B - 2	Standard	0.47	0.45

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin B - 2	0.01	12.58	01Jan2023, 20:30	6.94
Sink - 4	0.01	12.58	01Jan2023, 20:30	6.94

Subbasin: Subbasin B-2

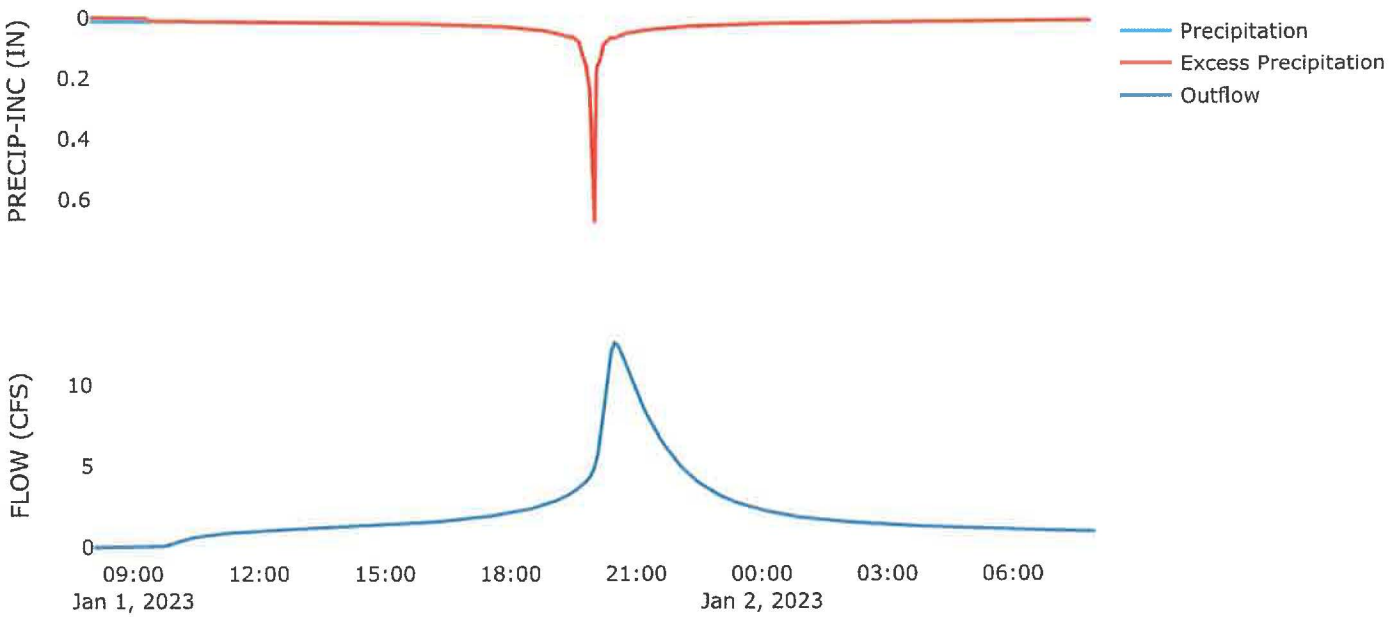
Area (MI2) : 0.01
Latitude Degrees : 38.38
Longitude Degrees : -122.05
Downstream : Sink - 4

Loss Rate: Initial + Constant	
Percent Impervious Area	0
Initial Loss	0.2
Constant Loss Rate	0.02

Transform: Snyder	
Snyder Method	Standard
Snyder Tp	0.47
Snyder Cp	0.45

Results: Subbasin B-2	
Peak Discharge (CFS)	12.58
Time of Peak Discharge	01Jan2023, 20:30
Volume (IN)	6.94
Precipitation Volume (AC - FT)	4.65
Loss Volume (AC - FT)	0.39
Excess Volume (AC - FT)	4.25
Direct Runoff Volume (AC - FT)	4.18
Baseflow Volume (AC - FT)	0

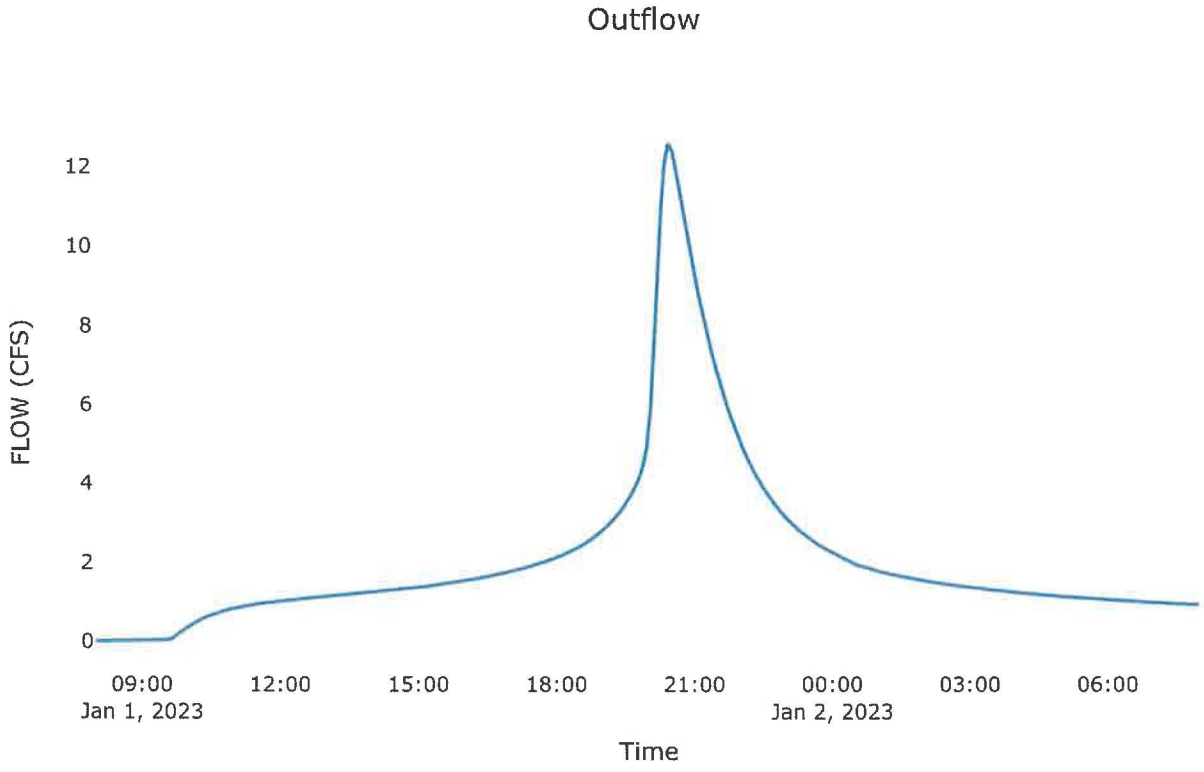
Precipitation and Outflow



Sink: Sink-4

Results: Sink-4

Peak Discharge (CFS)	12.58
Time of Peak Discharge	01Jan2023, 20:30
Volume (IN)	6.94



Project: Double_T_Ranch__Existing_
Simulation Run: Basin C-1 (Existing)
Simulation Start: 1 January 2023, 08:00
Simulation End: 2 January 2023, 08:00

HMS Version: 4.10
Executed: 08 June 2023, 19:29

Global Parameter Summary - Subbasin

	Location	
Element Name	Longitude Degrees	Latitude Degrees
Subbasin C - 1	-122.05	38.38

	Area (MI2)
Element Name	Area (MI2)
Subbasin C - 1	0.01

	Downstream
Element Name	Downstream
Subbasin C - 1	Sink - 3

	Loss Rate: Initial + Constant		
Element Name	Percent Impervious Area	Initial Loss	Constant Loss Rate
Subbasin C - 1	0	0.2	0.02

	Transform: Snyder		
Element Name	Snyder Method	Snyder Tp	Snyder Cp
Subbasin C - 1	Standard	0.47	0.45

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin C - 1	0.01	10.56	01Jan2023, 20:30	6.94
Sink - 3	0.01	10.56	01Jan2023, 20:30	6.94

Subbasin: Subbasin C-1

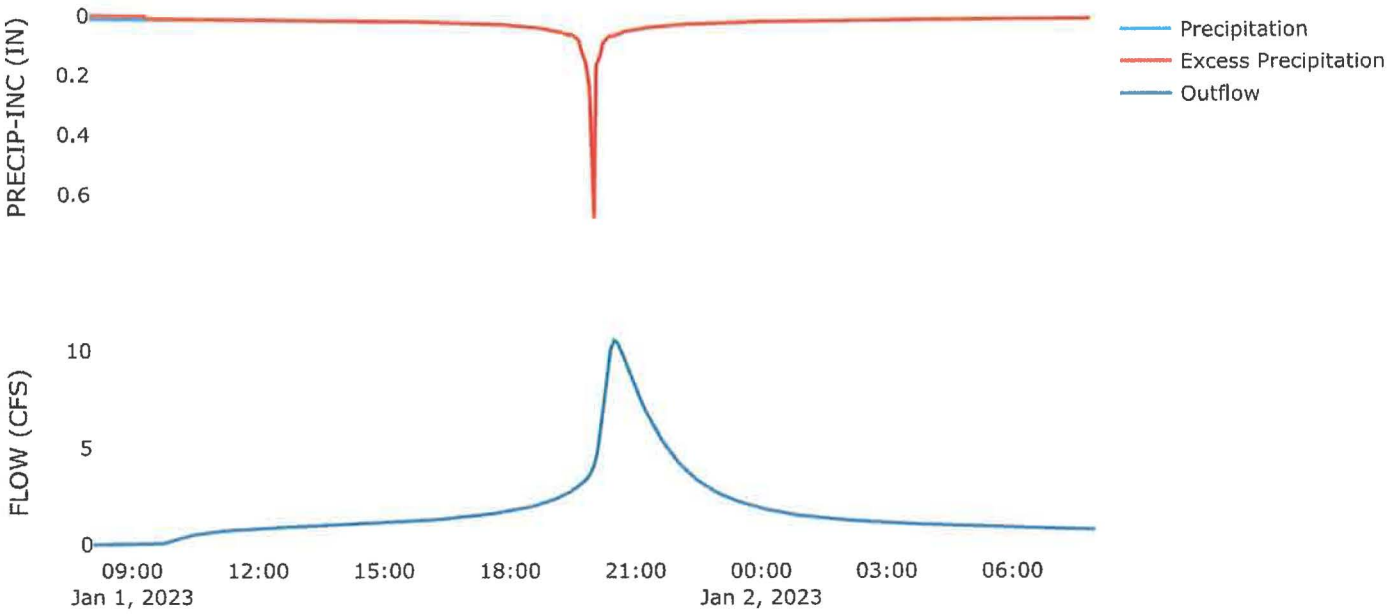
Area (MI2) : 0.01
Latitude Degrees : 38.38
Longitude Degrees : -122.05
Downstream : Sink - 3

Loss Rate: Initial + Constant	
Percent Impervious Area	0
Initial Loss	0.2
Constant Loss Rate	0.02

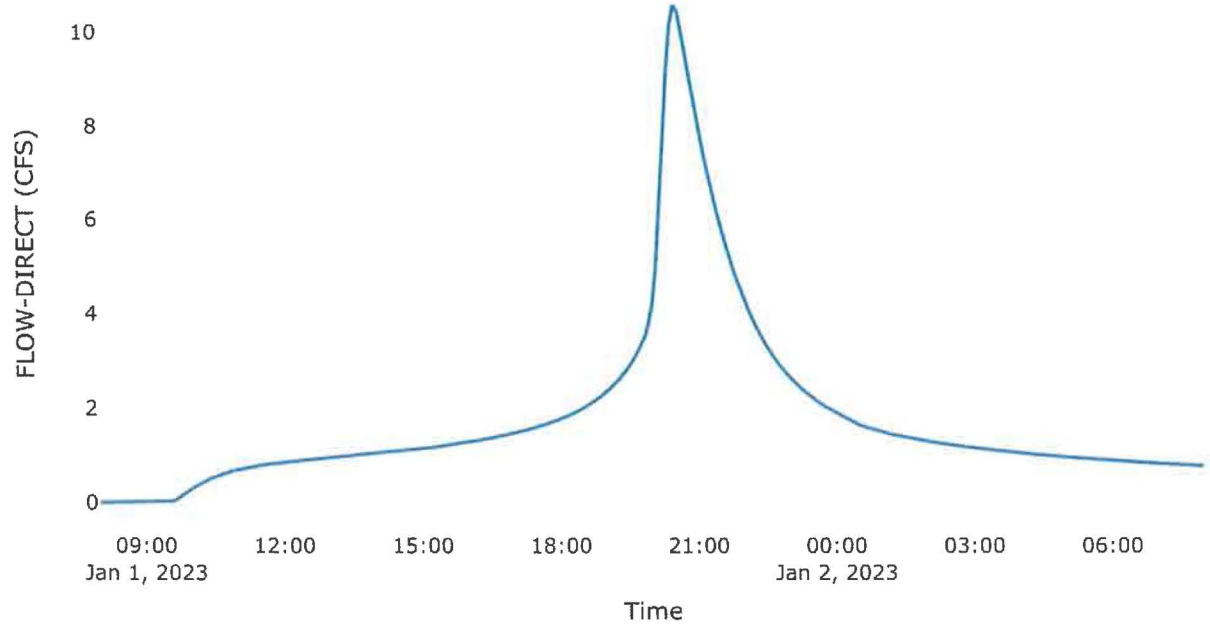
Transform: Snyder	
Snyder Method	Standard
Snyder Tp	0.47
Snyder Cp	0.45

Results: Subbasin C-1	
Peak Discharge (CFS)	10.56
Time of Peak Discharge	01Jan2023, 20:30
Volume (IN)	6.94
Precipitation Volume (AC - FT)	3.9
Loss Volume (AC - FT)	0.33
Excess Volume (AC - FT)	3.57
Direct Runoff Volume (AC - FT)	3.51
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



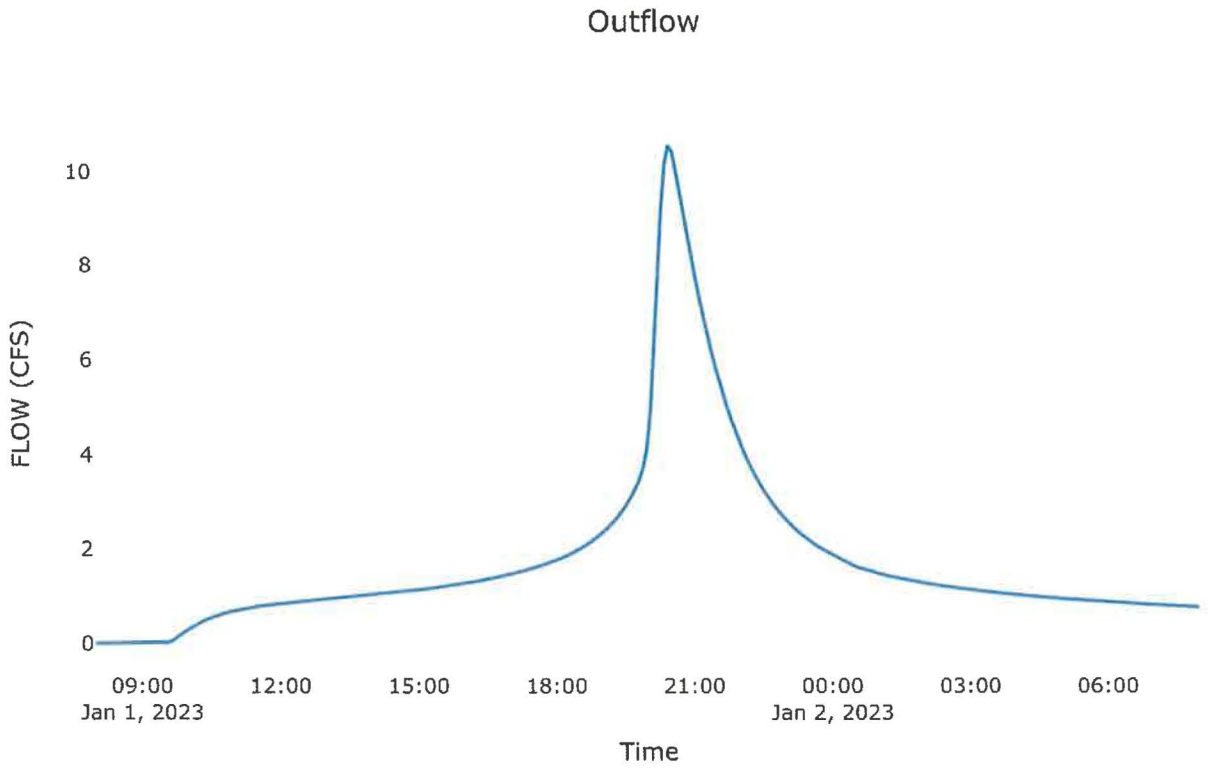
Direct Runoff



Sink: Sink-3

Results: Sink-3

Peak Discharge (CFS)	10.56
Time of Peak Discharge	01Jan2023, 20:30
Volume (IN)	6.94



Project: Double_T_Ranch__Existing_
Simulation Run: Basin C-2 (Existing)
Simulation Start: 1 January 2023, 08:00
Simulation End: 2 January 2023, 08:00

HMS Version: 4.10
Executed: 08 June 2023, 19:30

Global Parameter Summary - Subbasin

	Location	
Element Name	**Longitude Degrees**	**Latitude Degrees**
Subbasin C - 2	-122.05	38.38

	Area (MI2)
Element Name	**Area (MI2)**
Subbasin C - 2	0.02

	Downstream
Element Name	**Downstream**
Subbasin C - 2	Sink - 5

	Loss Rate: Initial + Constant		
Element Name	**Percent Impervious Area**	**Initial Loss**	**Constant Loss Rate**
Subbasin C - 2	0	0.2	0.02

	Transform: Snyder		
Element Name	**Snyder Method**	**Snyder Tp**	**Snyder Cp**
Subbasin C - 2	Standard	0.58	0.45

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin C - 2	0.02	19.85	01Jan2023, 20:40	6.91
Sink - 5	0.02	19.85	01Jan2023, 20:40	6.91

Subbasin: Subbasin C-2

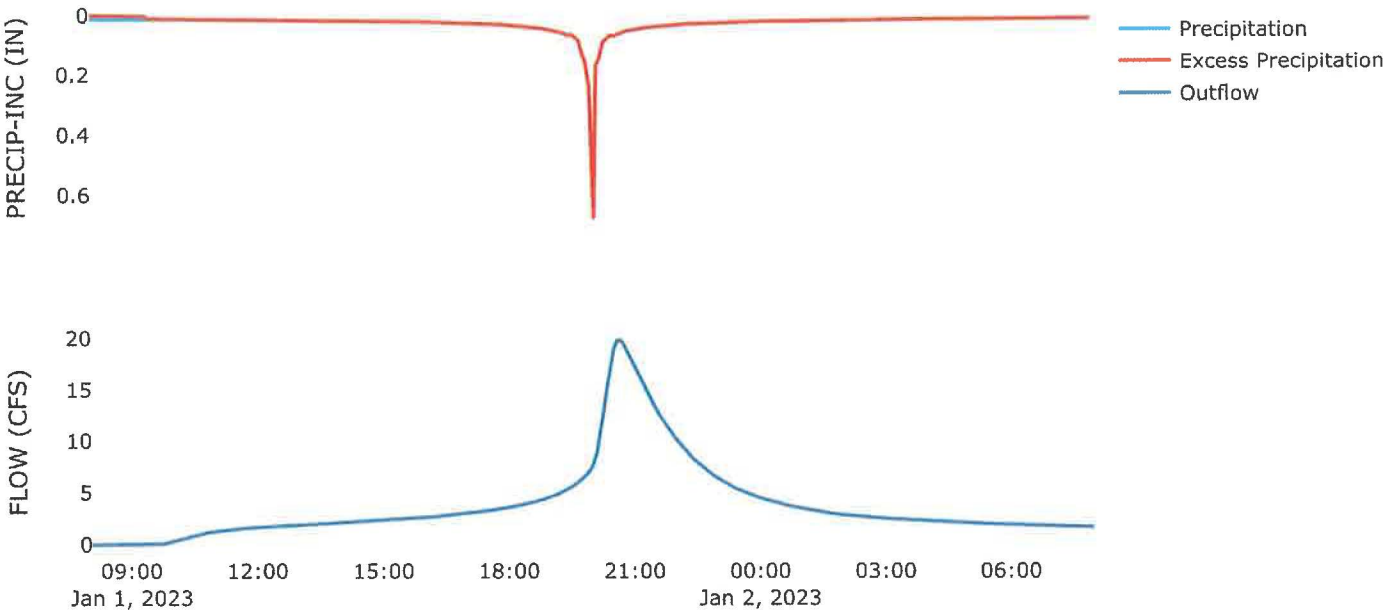
Area (MI2) : 0.02
Latitude Degrees : 38.38
Longitude Degrees : -122.05
Downstream : Sink - 5

Loss Rate: Initial + Constant	
Percent Impervious Area	0
Initial Loss	0.2
Constant Loss Rate	0.02

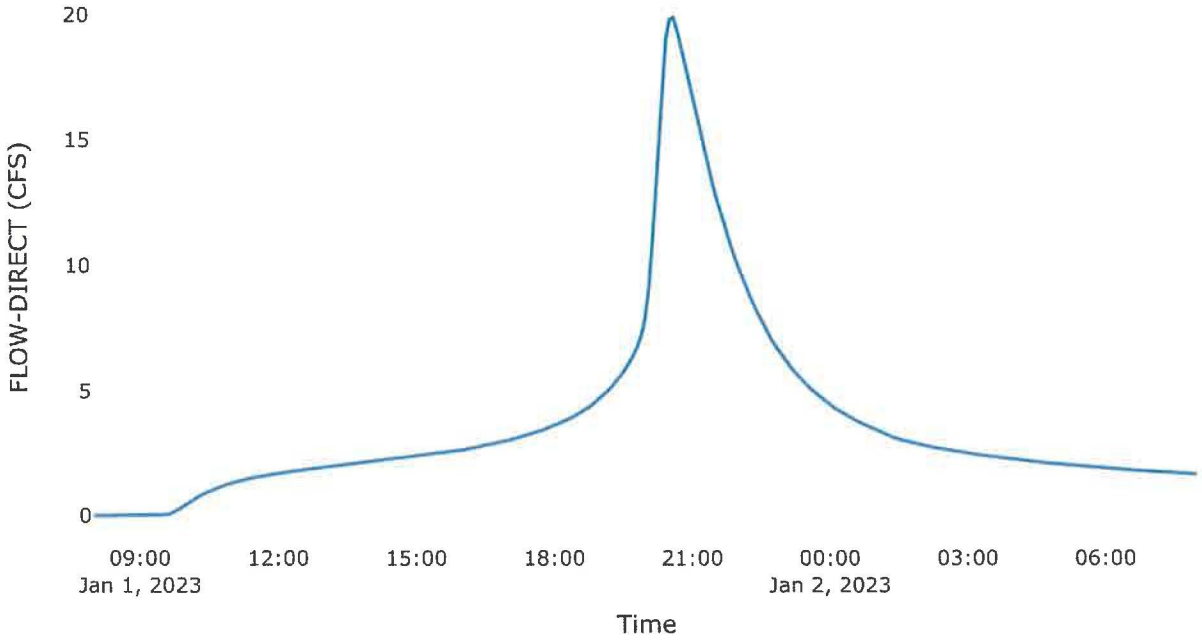
Transform: Snyder	
Snyder Method	Standard
Snyder Tp	0.58
Snyder Cp	0.45

Results: Subbasin C-2	
Peak Discharge (CFS)	19.85
Time of Peak Discharge	01Jan2023, 20:40
Volume (IN)	6.91
Precipitation Volume (AC - FT)	8.27
Loss Volume (AC - FT)	0.7
Excess Volume (AC - FT)	7.57
Direct Runoff Volume (AC - FT)	7.4
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



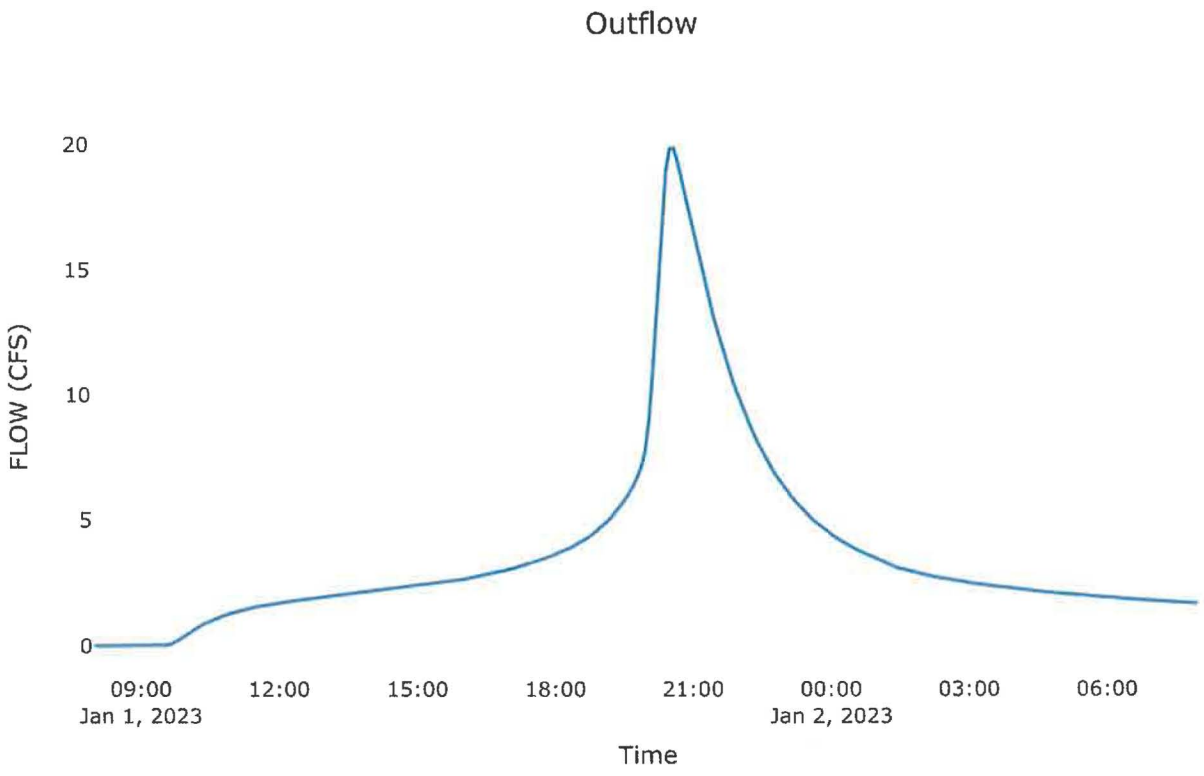
Direct Runoff



Sink: Sink-5

Results: Sink-5

Peak Discharge (CFS)	19.85
Time of Peak Discharge	01Jan2023, 20:40
Volume (IN)	6.91



Project: Double_T_Ranch__Existing_
Simulation Run: Basin C-3 (Existing)
Simulation Start: 1 January 2023, 08:00
Simulation End: 2 January 2023, 08:00

HMS Version: 4.10
Executed: 08 June 2023, 19:30

Global Parameter Summary - Subbasin

	Location	
Element Name	**Longitude Degrees**	**Latitude Degrees**
Subbasin C - 3	-122.05	38.38

	Area (MI2)
Element Name	**Area (MI2)**
Subbasin C - 3	0.02

	Downstream
Element Name	**Downstream**
Subbasin C - 3	Sink - 6

	Loss Rate: Initial + Constant		
Element Name	**Percent Impervious Area**	**Initial Loss**	**Constant Loss Rate**
Subbasin C - 3	0	0.2	0.02

	Transform: Snyder		
Element Name	**Snyder Method**	**Snyder Tp**	**Snyder Cp**
Subbasin C - 3	Standard	0.53	0.45

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin C - 3	0.02	22.7	01Jan2023, 20:35	6.92
Sink - 6	0.02	22.7	01Jan2023, 20:35	6.92

Subbasin: Subbasin C-3

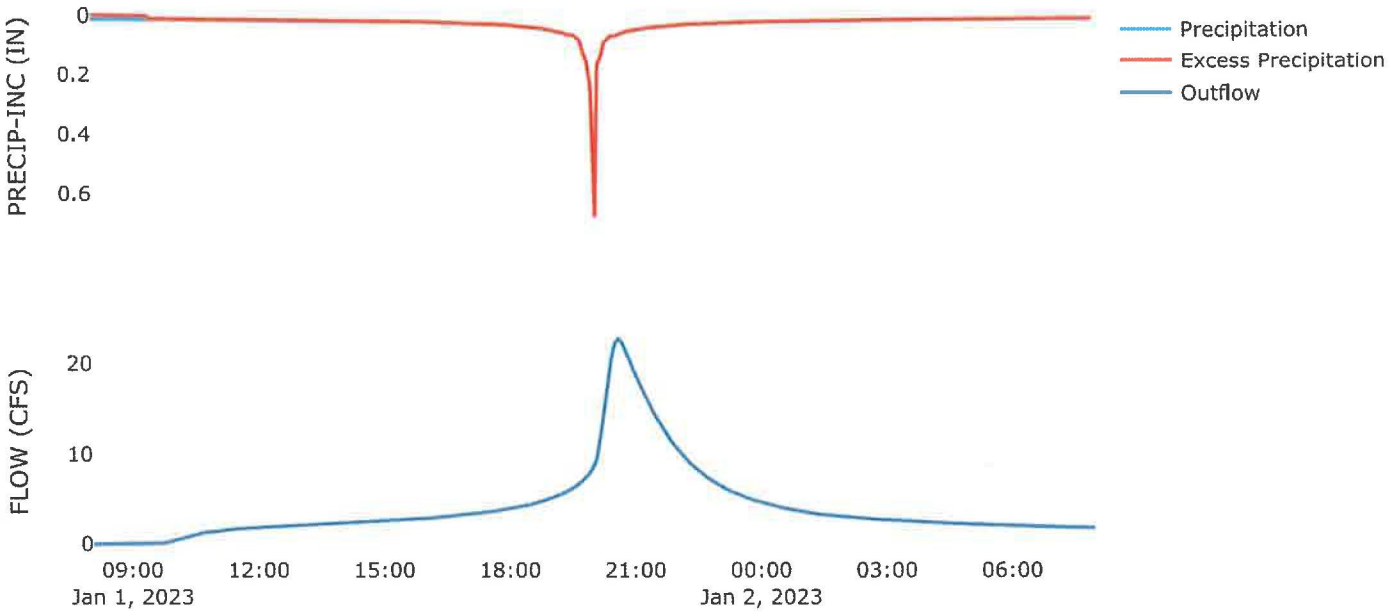
Area (MI2) : 0.02
Latitude Degrees : 38.38
Longitude Degrees : -122.05
Downstream : Sink - 6

Loss Rate: Initial + Constant	
Percent Impervious Area	0
Initial Loss	0.2
Constant Loss Rate	0.02

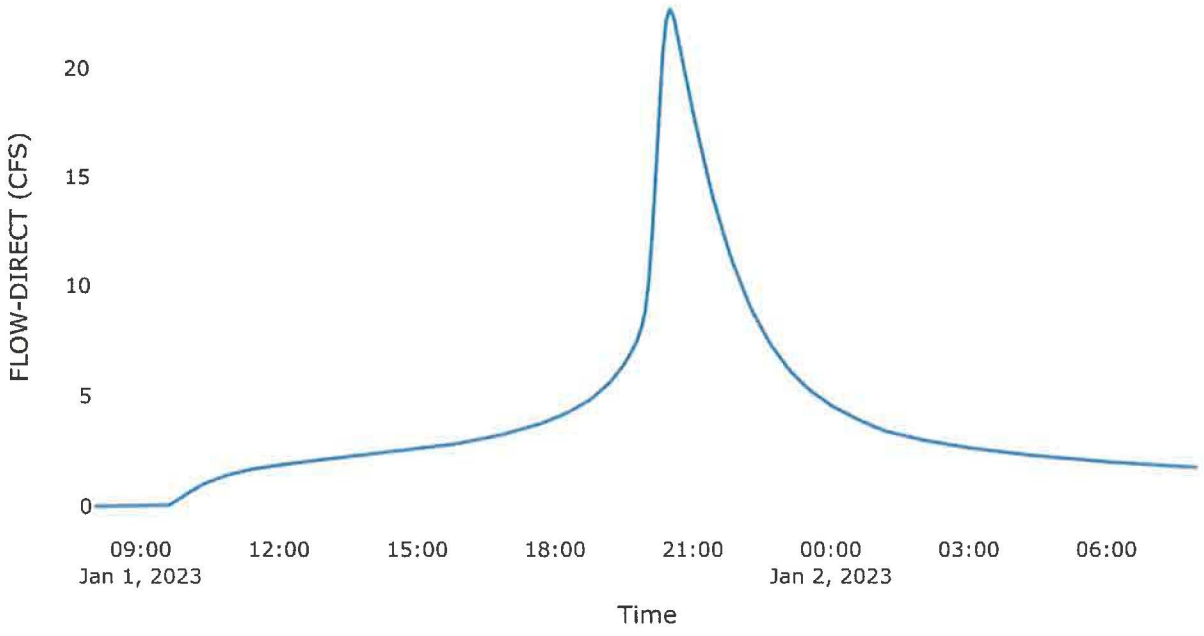
Transform: Snyder	
Snyder Method	Standard
Snyder Tp	0.53
Snyder Cp	0.45

Results: Subbasin C-3	
Peak Discharge (CFS)	22.7
Time of Peak Discharge	01Jan2023, 20:35
Volume (IN)	6.92
Precipitation Volume (AC - FT)	8.94
Loss Volume (AC - FT)	0.76
Excess Volume (AC - FT)	8.18
Direct Runoff Volume (AC - FT)	8.02
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



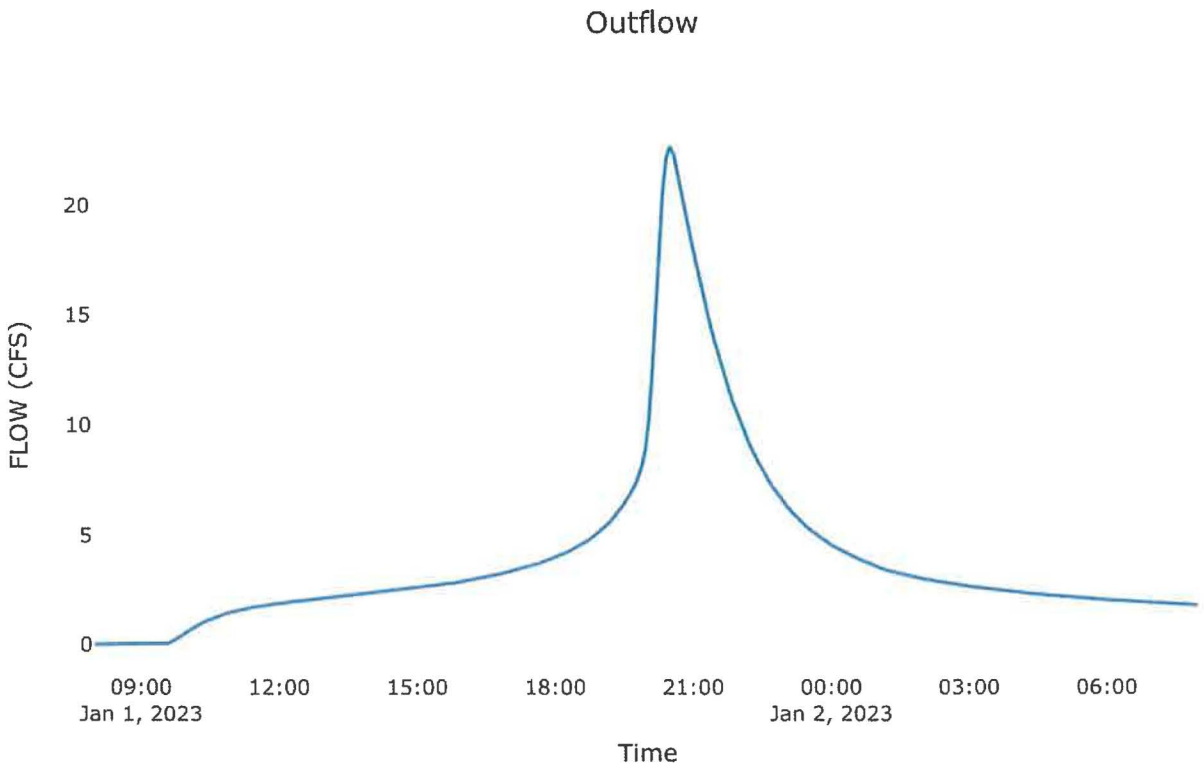
Direct Runoff



Sink: Sink-6

Results: Sink-6

Peak Discharge (CFS)	22.7
Time of Peak Discharge	01Jan2023, 20:35
Volume (IN)	6.92



APPENDIX E

Double T Ranch Equestrian Center
Hydrology Report
Proposed Hydrology Calculations

Project: Double_T_Ranch__Proposed_
Simulation Run: Basin A-1 (Proposed)
Simulation Start: 1 January 2023, 08:00
Simulation End: 2 January 2023, 08:00

HMS Version: 4.10
Executed: 08 June 2023, 20:51

Global Parameter Summary - Subbasin

	Location	
Element Name	**Longitude Degrees**	**Latitude Degrees**
Subbasin A - 1	-122.05	38.38

	Area (MI2)
Element Name	**Area (MI2)**
Subbasin A - 1	0

	Downstream
Element Name	**Downstream**
Subbasin A - 1	Sink - 1

	Loss Rate: Initial + Constant		
Element Name	**Percent Impervious Area**	**Initial Loss**	**Constant Loss Rate**
Subbasin A - 1	0.22	0.2	0.02

	Transform: Snyder		
Element Name	**Snyder Method**	**Snyder Tp**	**Snyder Cp**
Subbasin A - 1	Standard	0.37	0.45

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin A - 1	0	4.28	01Jan2023, 20:25	6.96
Sink - 1	0	4.28	01Jan2023, 20:25	6.96

Subbasin: Subbasin A-1

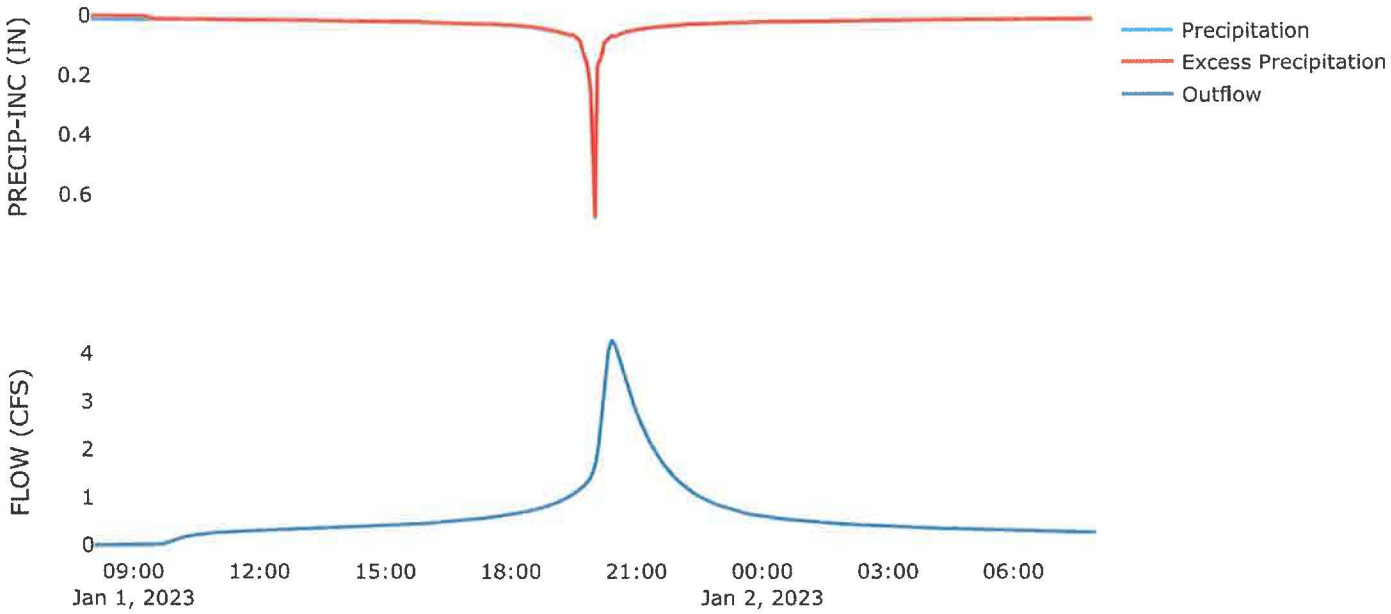
Area (MI2) : 0
Latitude Degrees : 38.38
Longitude Degrees : -122.05
Downstream : Sink - 1

Loss Rate: Initial + Constant	
Percent Impervious Area	0.22
Initial Loss	0.2
Constant Loss Rate	0.02

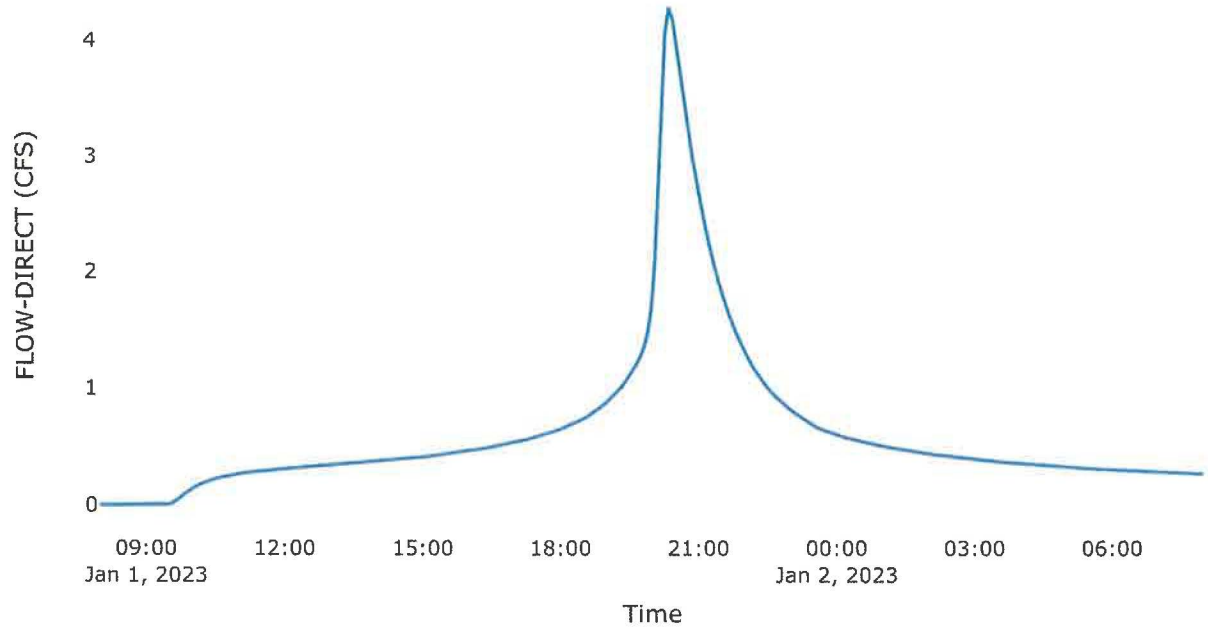
Transform: Snyder	
Snyder Method	Standard
Snyder Tp	0.37
Snyder Cp	0.45

Results: Subbasin A-1	
Peak Discharge (CFS)	4.28
Time of Peak Discharge	01Jan2023, 20:25
Volume (IN)	6.96
Precipitation Volume (AC - FT)	1.38
Loss Volume (AC - FT)	0.12
Excess Volume (AC - FT)	1.26
Direct Runoff Volume (AC - FT)	1.24
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



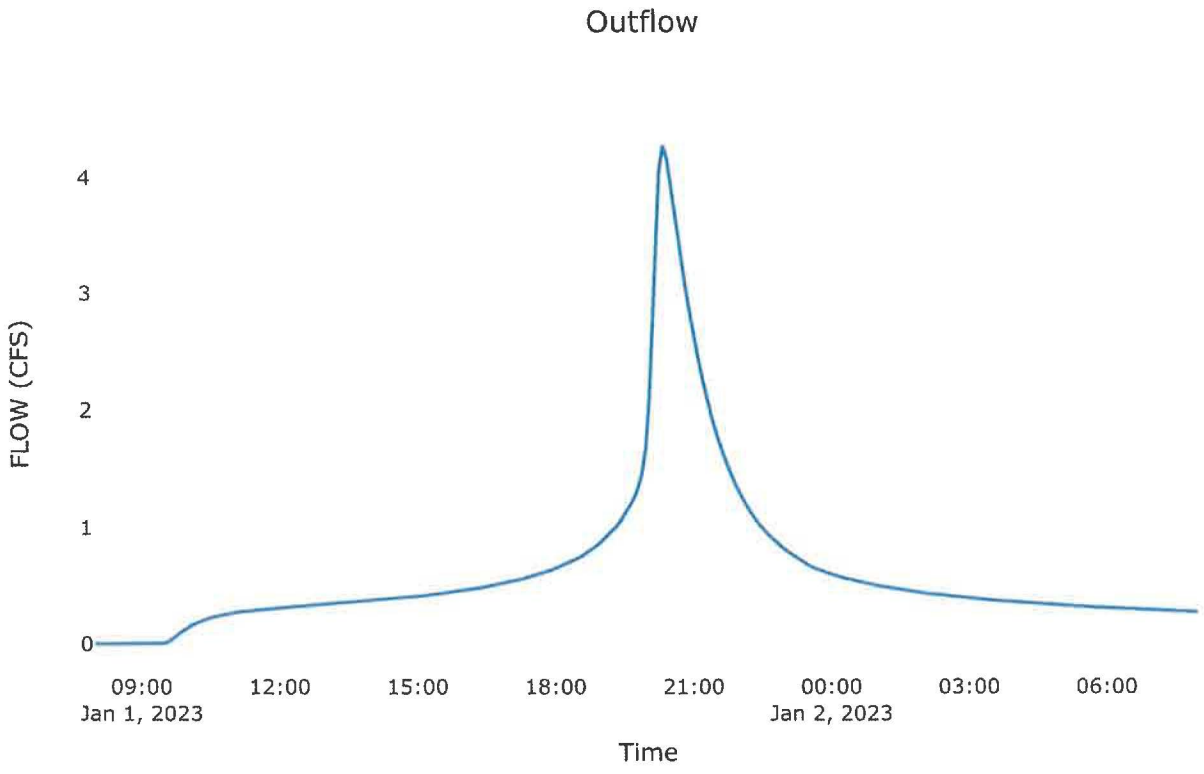
Direct Runoff



Sink: Sink-1

Results: Sink-1

Peak Discharge (CFS)	4.28
Time of Peak Discharge	01Jan2023, 20:25
Volume (IN)	6.96



Project: Double_T_Ranch__Proposed_
Simulation Run: Basin B-1 (Proposed)
Simulation Start: 1 January 2023, 08:00
Simulation End: 2 January 2023, 08:00

HMS Version: 4.10
Executed: 09 June 2023, 16:33

Global Parameter Summary - Subbasin

	Location	
Element Name	Longitude Degrees	Latitude Degrees
Subbasin B - 1	-122.05	38.38

	Area (MI2)
Element Name	Area (MI2)
Subbasin B - 1	0.01

	Downstream
Element Name	Downstream
Subbasin B - 1	Sink - 2

	Loss Rate: Initial + Constant		
Element Name	Percent Impervious Area	Initial Loss	Constant Loss Rate
Subbasin B - 1	0.14	0.2	0.02

	Transform: Snyder		
Element Name	Snyder Method	Snyder Tp	Snyder Cp
Subbasin B - 1	Standard	0.42	0.45

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin B - 1	0.01	10.1	01Jan2023, 20:30	6.95
Sink - 2	0.01	10.1	01Jan2023, 20:30	6.95

Subbasin: Subbasin B-1

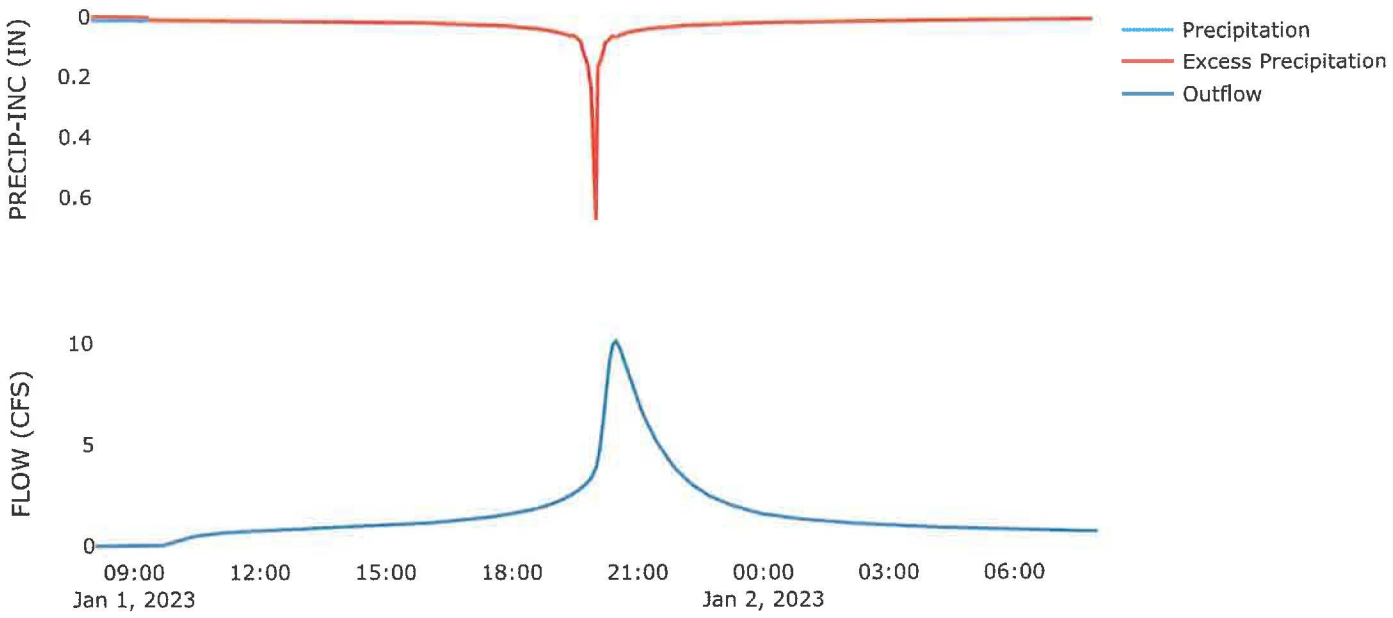
Area (MI2) : 0.01
Latitude Degrees : 38.38
Longitude Degrees : -122.05
Downstream : Sink - 2

Loss Rate: Initial + Constant	
Percent Impervious Area	0.14
Initial Loss	0.2
Constant Loss Rate	0.02

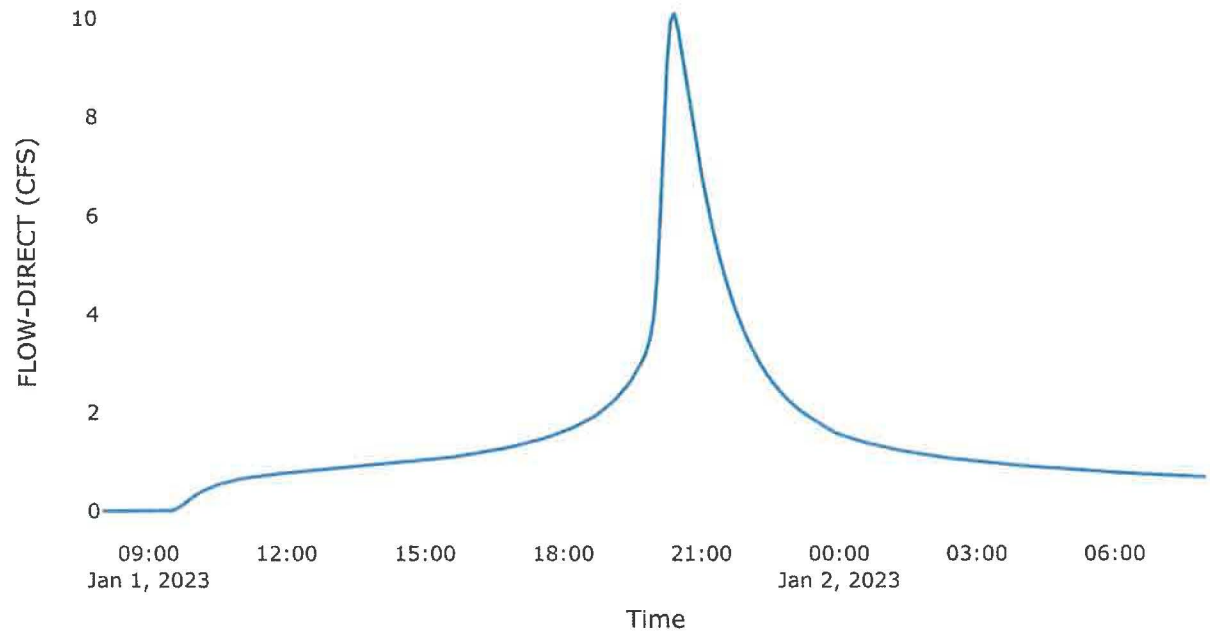
Transform: Snyder	
Snyder Method	Standard
Snyder Tp	0.42
Snyder Cp	0.45

Results: Subbasin B-1	
Peak Discharge (CFS)	10.1
Time of Peak Discharge	01Jan2023, 20:30
Volume (IN)	6.95
Precipitation Volume (AC - FT)	3.46
Loss Volume (AC - FT)	0.29
Excess Volume (AC - FT)	3.17
Direct Runoff Volume (AC - FT)	3.12
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



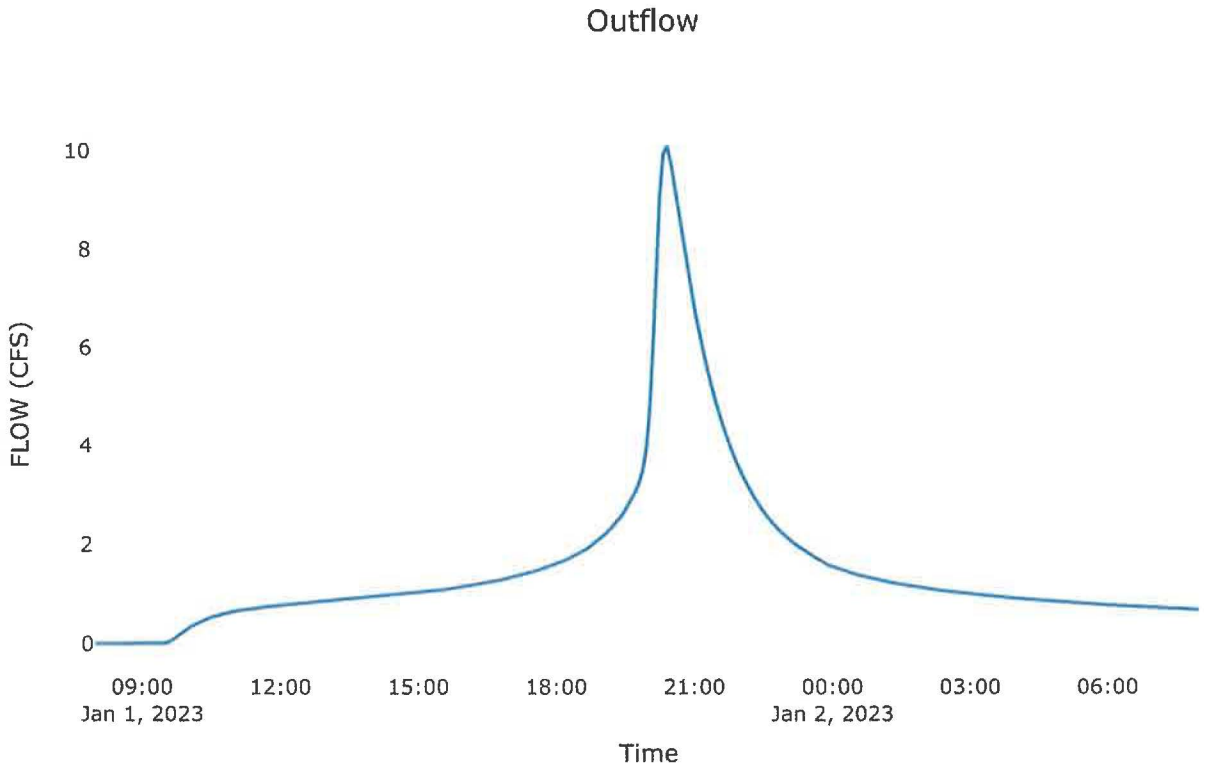
Direct Runoff



Sink: Sink-2

Results: Sink-2

Peak Discharge (CFS)	10.1
Time of Peak Discharge	01Jan2023, 20:30
Volume (IN)	6.95



Project: Double_T_Ranch__Proposed_
Simulation Run: Basin B-2 (Proposed)
Simulation Start: 1 January 2023, 08:00
Simulation End: 2 January 2023, 08:00

HMS Version: 4.10
Executed: 08 June 2023, 20:40

Global Parameter Summary - Subbasin

	Location	
Element Name	Longitude Degrees	Latitude Degrees
Subbasin B - 2	-122.05	38.38

	Area (MI2)
Element Name	Area (MI2)
Subbasin B - 2	0.01

	Downstream
Element Name	Downstream
Subbasin B - 2	Sink - 4

	Loss Rate: Initial + Constant		
Element Name	Percent Impervious Area	Initial Loss	Constant Loss Rate
Subbasin B - 2	0	0.2	0.02

	Transform: Snyder		
Element Name	Snyder Method	Snyder Tp	Snyder Cp
Subbasin B - 2	Standard	0.47	0.45

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin B - 2	0.01	12.7	01Jan2023, 20:30	6.94
Sink - 4	0.01	12.7	01Jan2023, 20:30	6.94

Subbasin: Subbasin B-2

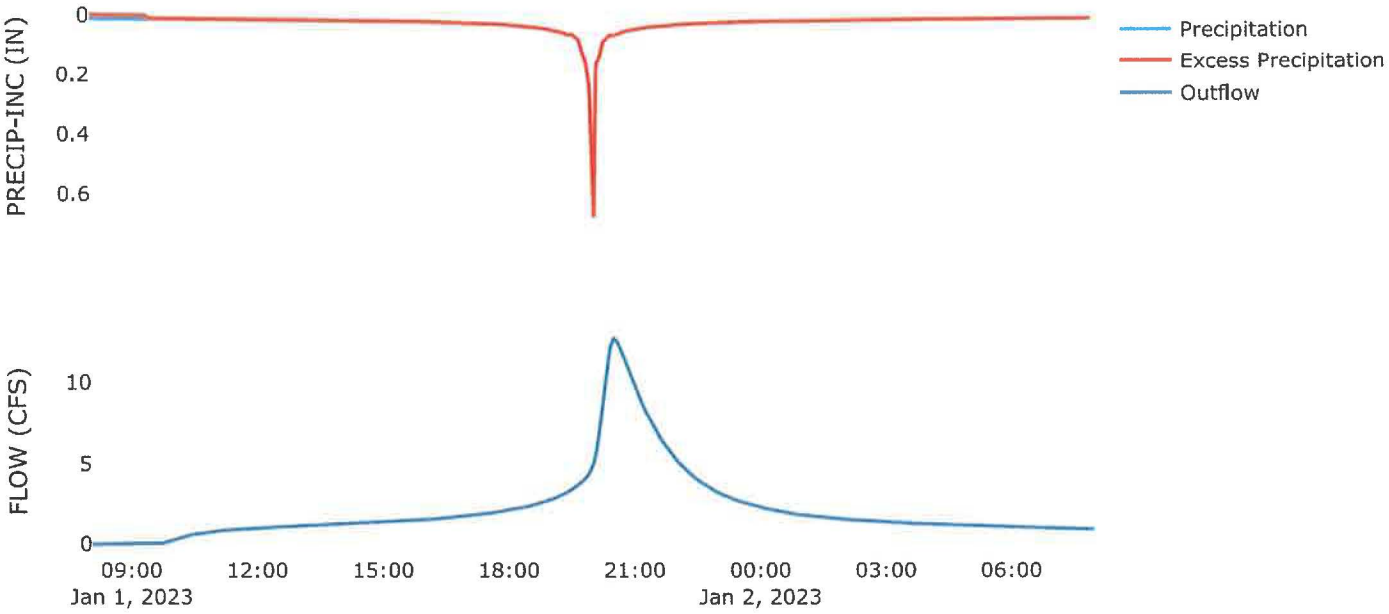
Area (MI2) : 0.01
Latitude Degrees : 38.38
Longitude Degrees : -122.05
Downstream : Sink - 4

Loss Rate: Initial + Constant	
Percent Impervious Area	0
Initial Loss	0.2
Constant Loss Rate	0.02

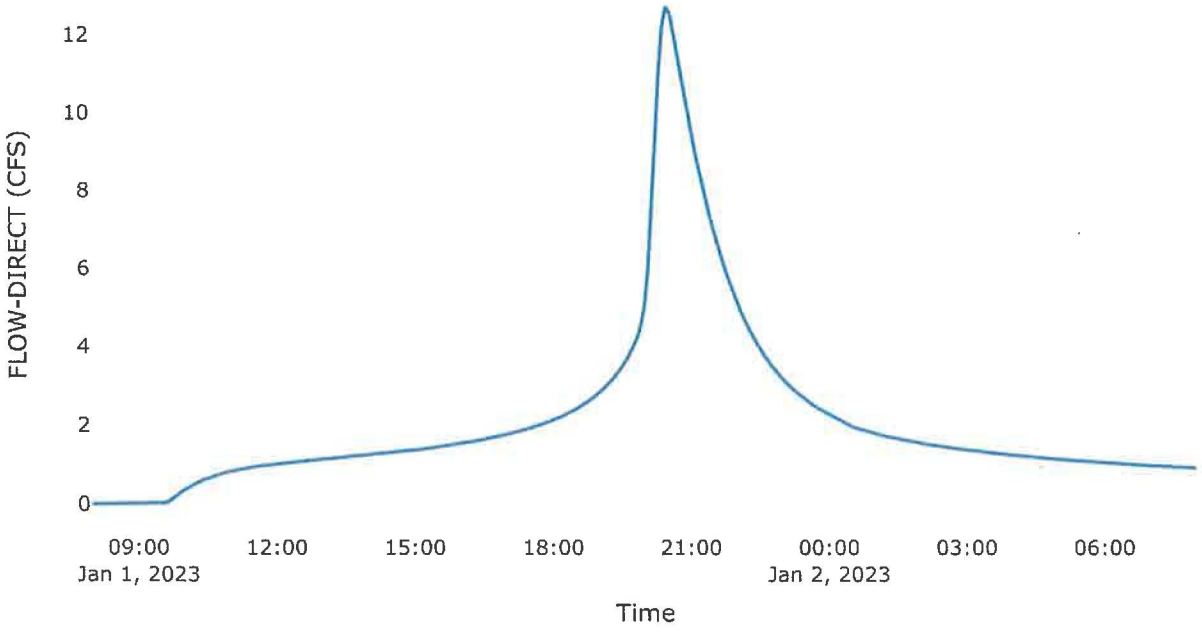
Transform: Snyder	
Snyder Method	Standard
Snyder Tp	0.47
Snyder Cp	0.45

Results: Subbasin B-2	
Peak Discharge (CFS)	12.7
Time of Peak Discharge	01Jan2023, 20:30
Volume (IN)	6.94
Precipitation Volume (AC - FT)	4.69
Loss Volume (AC - FT)	0.4
Excess Volume (AC - FT)	4.29
Direct Runoff Volume (AC - FT)	4.22
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



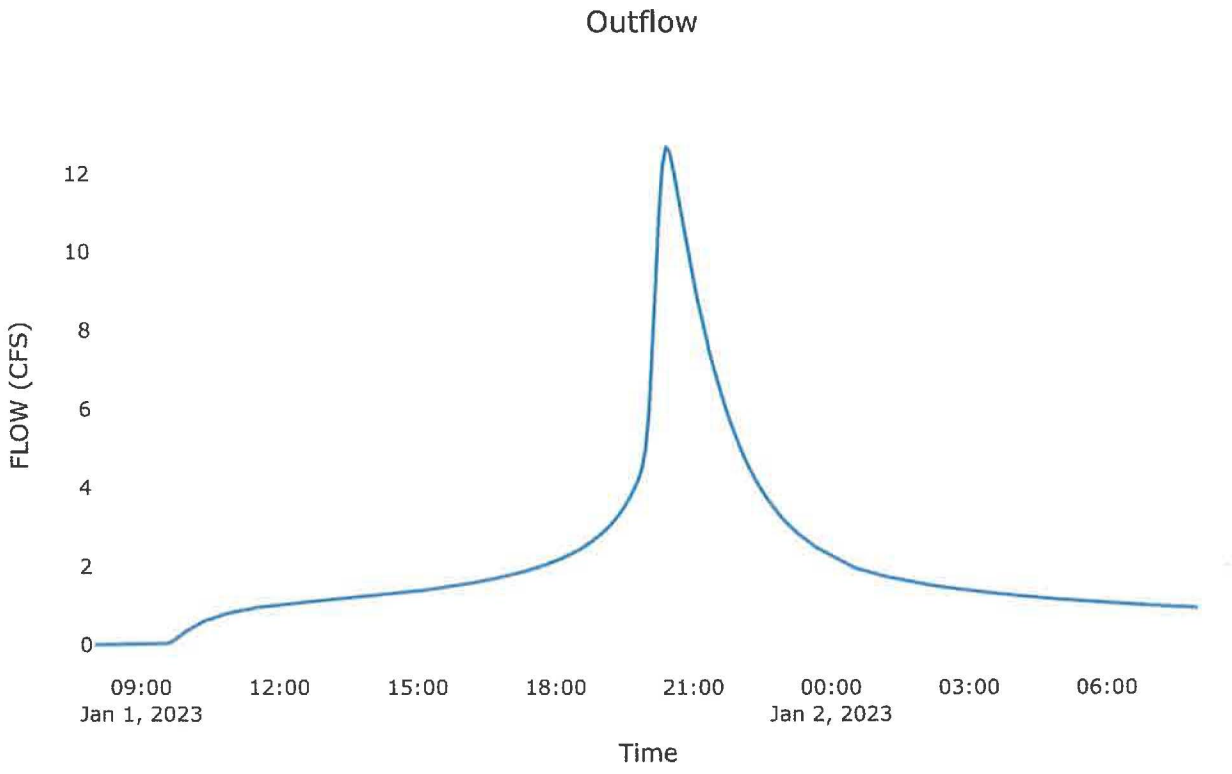
Direct Runoff



Sink: Sink-4

Results: Sink-4

Peak Discharge (CFS)	12.7
Time of Peak Discharge	01Jan2023, 20:30
Volume (IN)	6.94



Project: Double_T_Ranch__Proposed_
Simulation Run: Basin C-1 (Proposed)
Simulation Start: 1 January 2023, 08:00
Simulation End: 2 January 2023, 08:00

HMS Version: 4.10
Executed: 09 June 2023, 16:35

Global Parameter Summary - Subbasin

	Location	
Element Name	**Longitude Degrees**	**Latitude Degrees**
Subbasin C - 1	-122.05	38.38

	Area (MI2)
Element Name	**Area (MI2)**
Subbasin C - 1	0.01

	Downstream
Element Name	**Downstream**
Subbasin C - 1	Sink - 3

	Loss Rate: Initial + Constant		
Element Name	**Percent Impervious Area**	**Initial Loss**	**Constant Loss Rate**
Subbasin C - 1	0.11	0.2	0.02

	Transform: Snyder		
Element Name	**Snyder Method**	**Snyder Tp**	**Snyder Cp**
Subbasin C - 1	Standard	0.44	0.45

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin C - 1	0.01	10.11	01Jan2023, 20:30	6.95
Sink - 3	0.01	10.11	01Jan2023, 20:30	6.95

Subbasin: Subbasin C-1

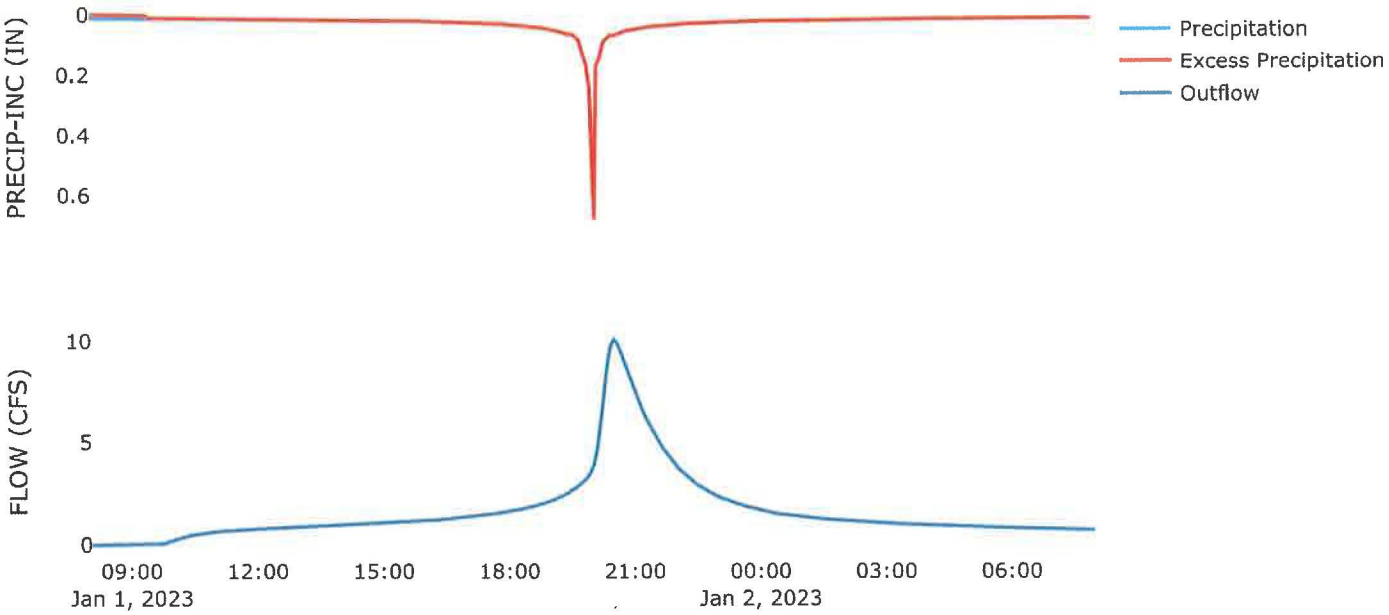
Area (MI2) : 0.01
Latitude Degrees : 38.38
Longitude Degrees : -122.05
Downstream : Sink - 3

Loss Rate: Initial + Constant	
Percent Impervious Area	0.11
Initial Loss	0.2
Constant Loss Rate	0.02

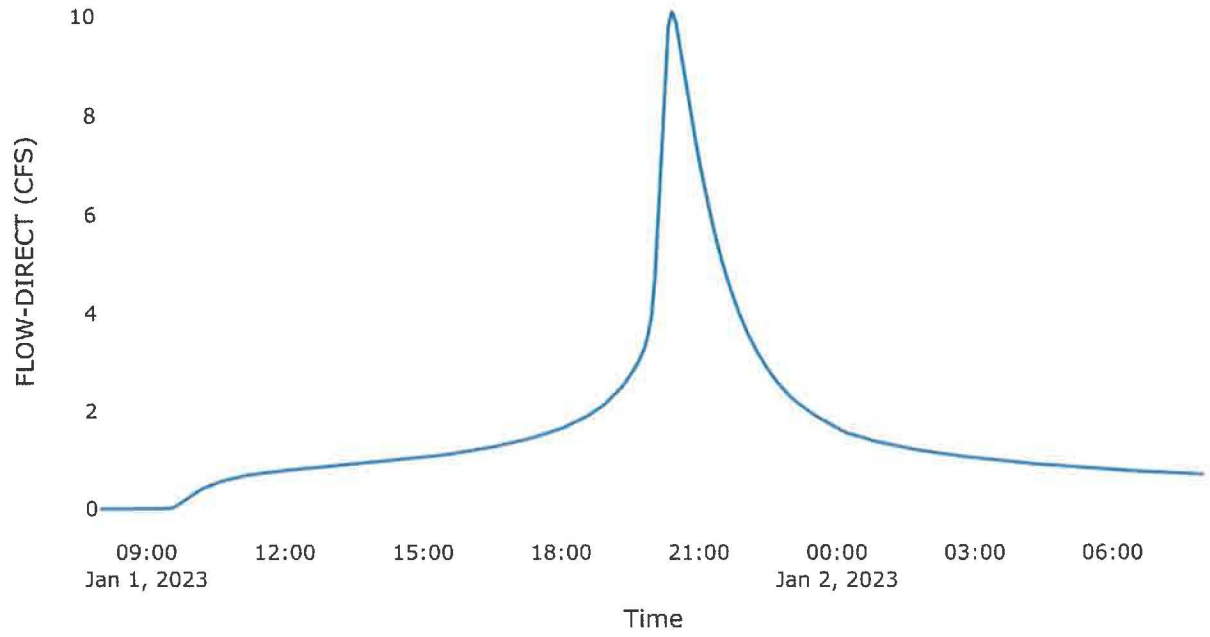
Transform: Snyder	
Snyder Method	Standard
Snyder Tp	0.44
Snyder Cp	0.45

Results: Subbasin C-1	
Peak Discharge (CFS)	10.11
Time of Peak Discharge	01Jan2023, 20:30
Volume (IN)	6.95
Precipitation Volume (AC - FT)	3.57
Loss Volume (AC - FT)	0.3
Excess Volume (AC - FT)	3.27
Direct Runoff Volume (AC - FT)	3.22
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



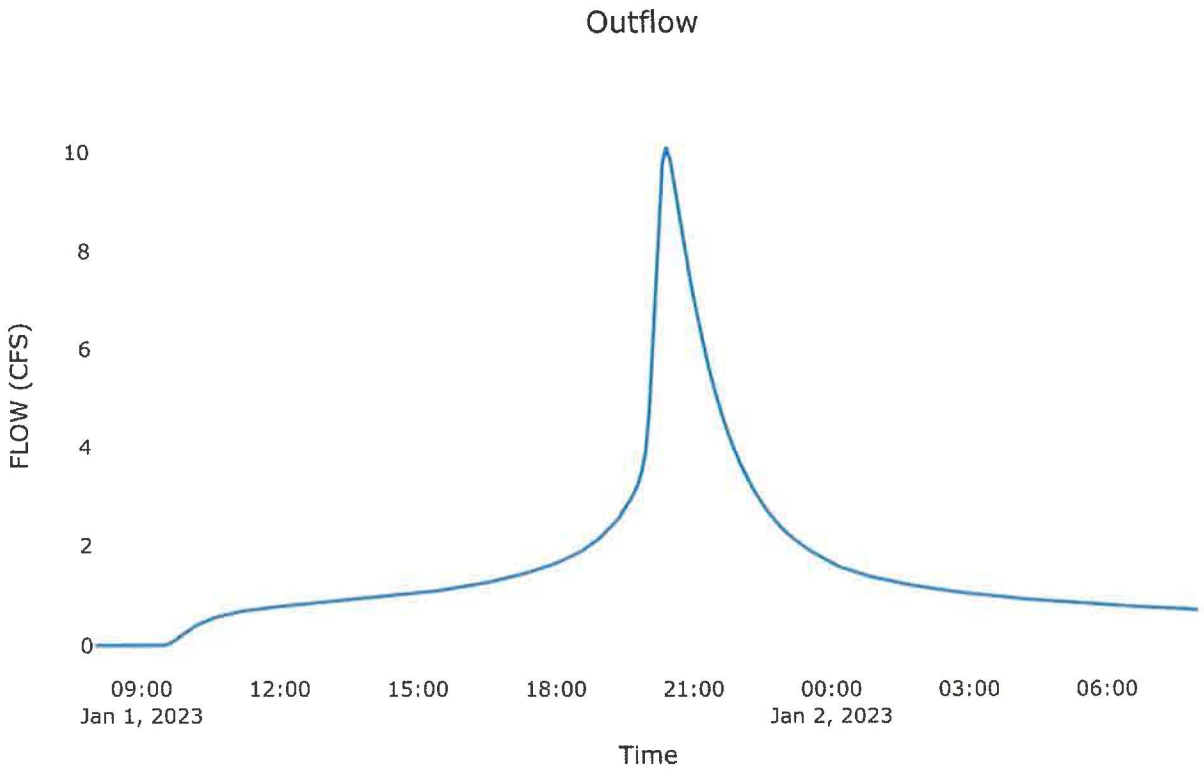
Direct Runoff



Sink: Sink-3

Results: Sink-3

Peak Discharge (CFS)	10.11
Time of Peak Discharge	01Jan2023, 20:30
Volume (IN)	6.95



Project: Double_T_Ranch__Proposed_
Simulation Run: Basin C-2 (Proposed)
Simulation Start: 1 January 2023, 08:00
Simulation End: 2 January 2023, 08:00

HMS Version: 4.10
Executed: 09 June 2023, 16:36

Global Parameter Summary - Subbasin

	Location	
Element Name	Longitude Degrees	Latitude Degrees
Subbasin C - 2	-122.05	38.38

	Area (MI2)
Element Name	Area (MI2)
Subbasin C - 2	0.02

	Downstream
Element Name	Downstream
Subbasin C - 2	Sink - 5

	Loss Rate: Initial + Constant		
Element Name	Percent Impervious Area	Initial Loss	Constant Loss Rate
Subbasin C - 2	0.01	0.2	0.02

	Transform: Snyder		
Element Name	Snyder Method	Snyder Tp	Snyder Cp
Subbasin C - 2	Standard	0.57	0.45

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin C - 2	0.02	20.51	01Jan2023, 20:35	6.91
Sink - 5	0.02	20.51	01Jan2023, 20:35	6.91

Subbasin: Subbasin C-2

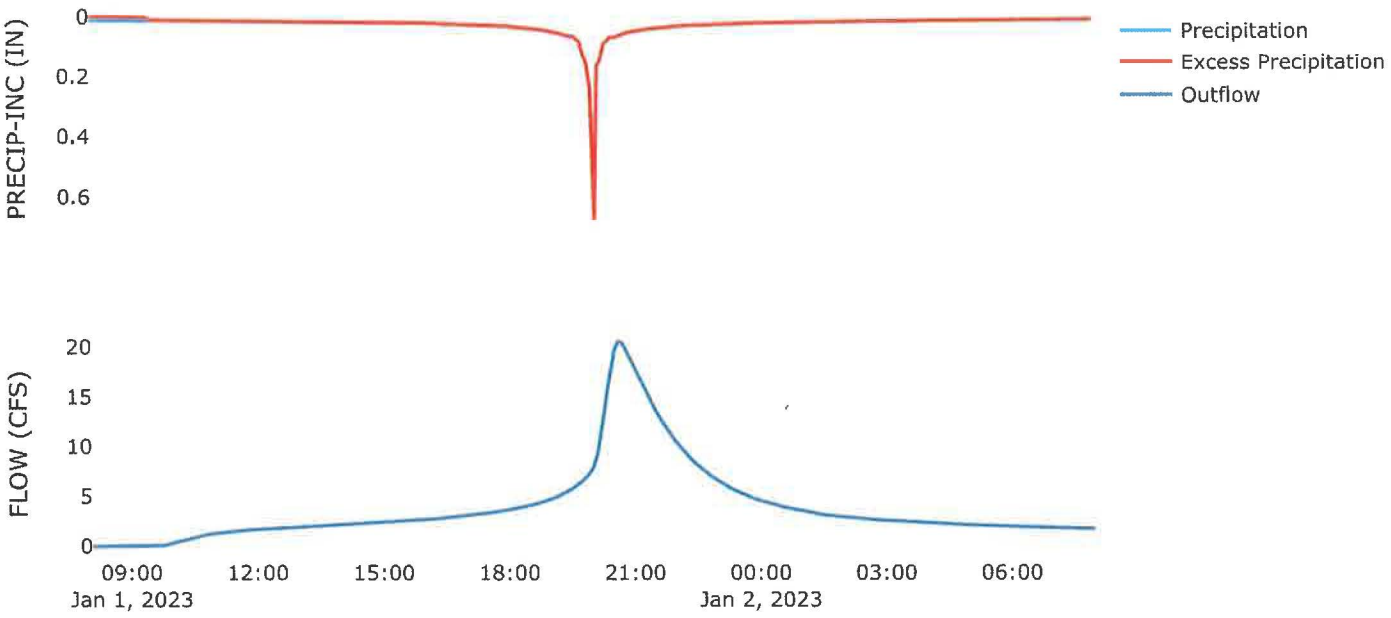
Area (MI2) : 0.02
Latitude Degrees : 38.38
Longitude Degrees : -122.05
Downstream : Sink - 5

Loss Rate: Initial + Constant	
Percent Impervious Area	0.01
Initial Loss	0.2
Constant Loss Rate	0.02

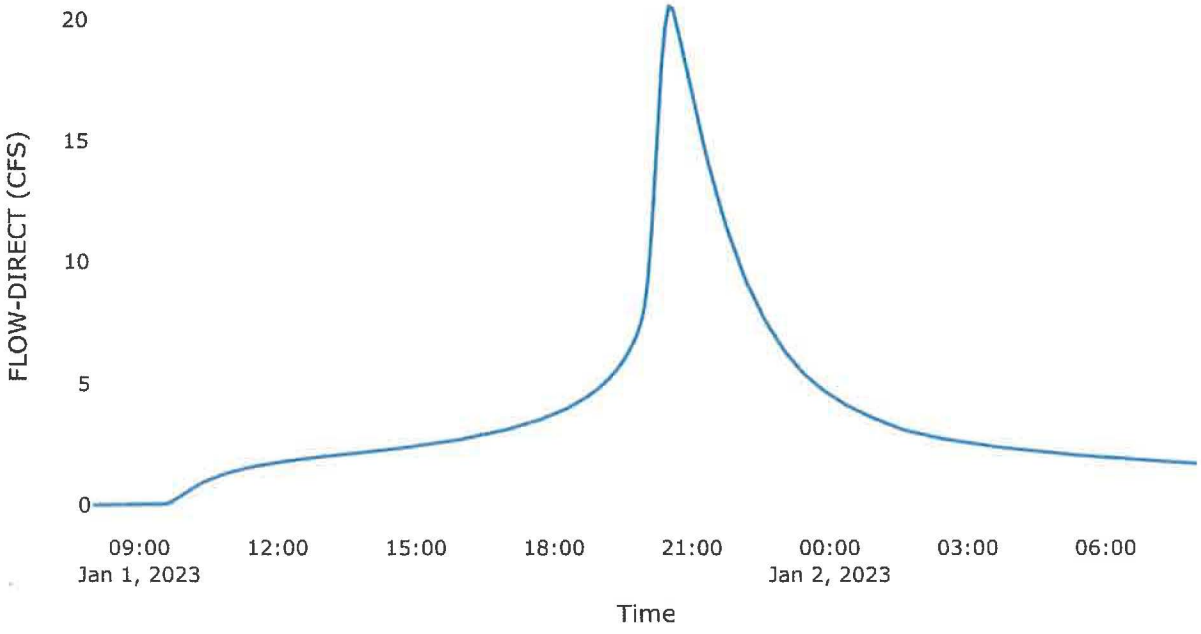
Transform: Snyder	
Snyder Method	Standard
Snyder Tp	0.57
Snyder Cp	0.45

Results: Subbasin C-2	
Peak Discharge (CFS)	20.51
Time of Peak Discharge	01Jan2023, 20:35
Volume (IN)	6.91
Precipitation Volume (AC - FT)	8.47
Loss Volume (AC - FT)	0.72
Excess Volume (AC - FT)	7.75
Direct Runoff Volume (AC - FT)	7.59
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



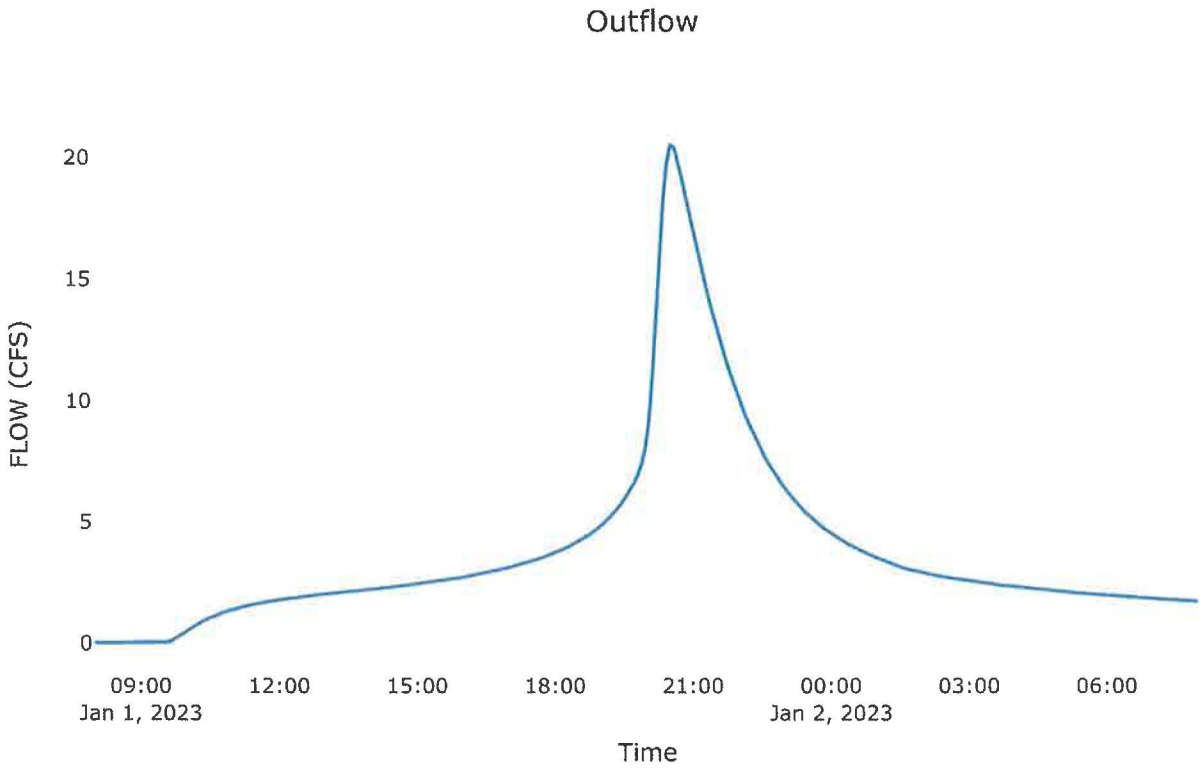
Direct Runoff



Sink: Sink-5

Results: Sink-5

Peak Discharge (CFS)	20.51
Time of Peak Discharge	01Jan2023, 20:35
Volume (IN)	6.91



Project: Double_T_Ranch__Proposed_
Simulation Run: Basin C-3 (Proposed)
Simulation Start: 1 January 2023, 08:00
Simulation End: 2 January 2023, 08:00

HMS Version: 4.10
Executed: 09 June 2023, 16:36

Global Parameter Summary - Subbasin

	Location	
Element Name	**Longitude Degrees**	**Latitude Degrees**
Subbasin C - 3	-122.05	38.38

	Area (MI2)
Element Name	**Area (MI2)**
Subbasin C - 3	0.02

	Downstream
Element Name	**Downstream**
Subbasin C - 3	Sink - 6

	Loss Rate: Initial + Constant		
Element Name	**Percent Impervious Area**	**Initial Loss**	**Constant Loss Rate**
Subbasin C - 3	0	0.2	0.02

	Transform: Snyder		
Element Name	**Snyder Method**	**Snyder Tp**	**Snyder Cp**
Subbasin C - 3	Standard	0.53	0.45

Global Results Summary

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Subbasin C - 3	0.02	22.7	01Jan2023, 20:35	6.92
Sink - 6	0.02	22.7	01Jan2023, 20:35	6.92

Subbasin: Subbasin C-3

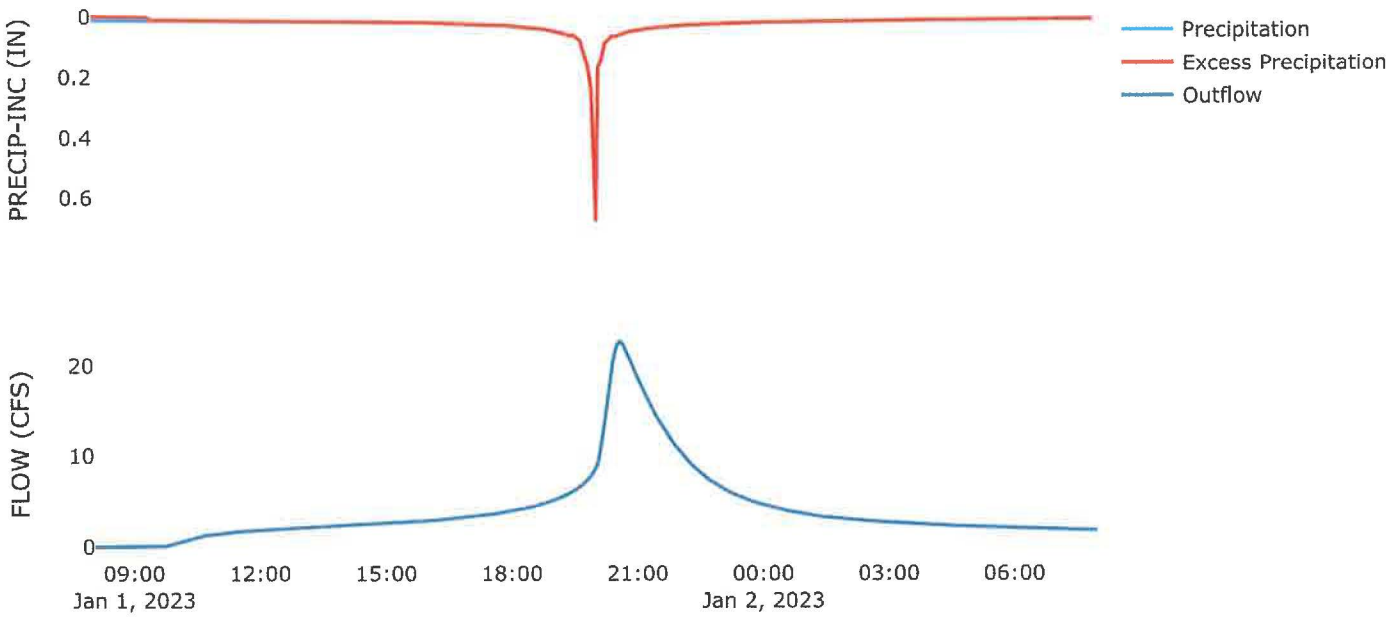
Area (MI2) : 0.02
Latitude Degrees : 38.38
Longitude Degrees : -122.05
Downstream : Sink - 6

Loss Rate: Initial + Constant	
Percent Impervious Area	0
Initial Loss	0.2
Constant Loss Rate	0.02

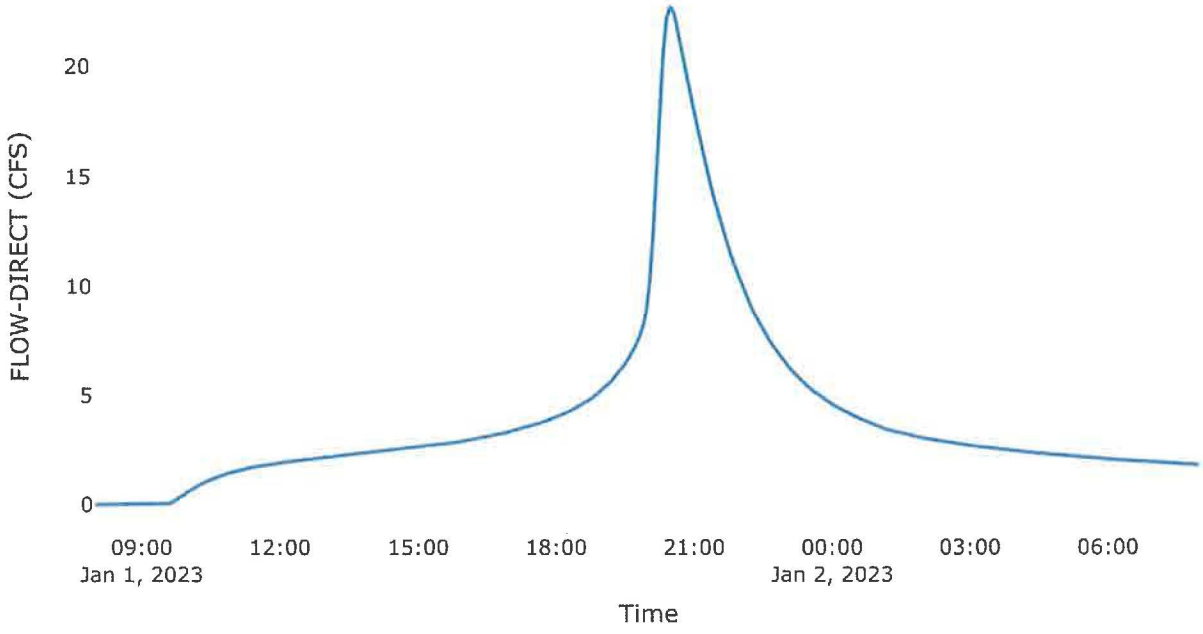
Transform: Snyder	
Snyder Method	Standard
Snyder Tp	0.53
Snyder Cp	0.45

Results: Subbasin C-3	
Peak Discharge (CFS)	22.7
Time of Peak Discharge	01Jan2023, 20:35
Volume (IN)	6.92
Precipitation Volume (AC - FT)	8.94
Loss Volume (AC - FT)	0.76
Excess Volume (AC - FT)	8.18
Direct Runoff Volume (AC - FT)	8.02
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



Direct Runoff



Sink: Sink-6

Results: Sink-6

Peak Discharge (CFS)	22.7
Time of Peak Discharge	01Jan2023, 20:35
Volume (IN)	6.92