

# **Preliminary Stormwater Management Plan (SWMP)**

Harmony Storage BESS Project  
Cass County, North Dakota

June 23, 2026

Prepared for:

Harmony Storage, LLC

8400 Normandale Lake Blvd. Suite 120  
Bloomington, MN 55437

Prepared by:

Stantec Consulting Services Inc.

12308 Corporate Pkwy, Suite 600  
Mequon, WI 53092-3386

Project/File:

193711746

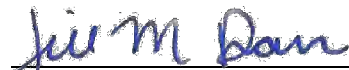


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Prepared by

  
Signature

Jill Dam, PE

Civil Engineer

Reviewed by

Twete, Jordan

Digitally signed by Twete, Jordan  
DN: CN="Twete, Jordan", OU=Internal,  
OU=users, OU=stantec, DC=corp, DC=ads  
Location: Williston, North Dakota  
Reason: I am approving this document  
Contact Info: Jordan.Twete@Stantec.com  
Date: 2026.06.25 14:14:23-05'00'

Signature

Jordan Twete, PE (ND)

Civil Engineer

Approved by

  
Signature

John Wiater

Principal, Senior Scientist



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# Executive Summary

Harmony Storage, LLC (Harmony Storage), a subsidiary of Geronimo Power, LLC, is a proposed 200-megawatt (MW) battery energy storage system (BESS) with a four-hour (800 MWh) duration to store excess energy in the Township of Harmony, Cass County, North Dakota. This Preliminary Stormwater Management Plan (SWMP) analyzes the impact the project will have on stormwater management for the project area. The report is preliminary in nature and will be revised once a final project engineering design is developed.

Per conversations with county officials, Cass County does not have specific stormwater management requirements. Since the project is within 10 miles of Fargo, the City of Fargo Policy on Stormwater Discharge and Treatment Requirements (2023 Update) was referenced for guidance, along with the North Dakota Department of Environmental Quality (ND DEQ) General Permit for Stormwater Discharge (Permit No. NDR04-0000) guidelines. The project will not have a net decrease in stormwater runoff from the project area without stormwater best management practices. It is recommended that a wet pond or extended dry pond shall be used to reduce the post stormwater runoff to the pre stormwater runoff amount, which also provides water quality volume to capture the first flush of stormwater runoff. These results are discussed further in the report.

This report is a preliminary analysis of the proposed conditions for North Dakota Public Service Commission application approval. Once the project advances to final design, construction level documents will be prepared and this report shall be revised to reflect the final design conditions.



# 1 Introduction and Purpose

Harmony Storage, LLC (Harmony Storage), a subsidiary of Geronimo Power, LLC, is a proposed 200-megawatt (MW) battery energy storage system (BESS) with a four-hour (800 MWh) duration to store excess energy in the Township of Harmony, Cass County, North Dakota. The Site's current primary land use is agricultural.

The Project Area is designed for 157 BESS units placed on concrete foundation pads with gravel access roads. The Project will connect to the existing Harmony Solar 230-kilovolt (kV) collector substation via underground 34.5 kV collection lines.

The purpose of this Stormwater Management Plan (SWMP) is to review the stormwater management requirements for the Project and provide guidance on adhering to local and state performance standards for stormwater management.

## 2 Site Information and Description

### 2.1 Site Location and Vicinity Map

The Project is located approximately 5 miles north of I-94 and 6 miles west of Fargo in Cass County, North Dakota. The site is situated on the Northeast corner of 162<sup>nd</sup> Ave SE and 32<sup>nd</sup> St SE. The existing Harmony Solar collector substation the project connects to is located immediately west of 162<sup>nd</sup> Ave SE.

Refer to Appendix A.1 for a location map of the Project. The Project Area, or Boundary, is defined as the area within the fenced in project area.

### 2.2 Existing Conditions

#### 2.2.1 Current/Existing Land Use

The Project Area is primarily comprised of cultivated agricultural crop fields. An Existing Land Use and Drainage Map is included in Appendix A.5.1. The data sources used to determine the land cover was the 2024 National Land Cover Database.

A review of CroplandCROS by the U.S. Department of Agriculture (USDA) database confirms the Project Area was used primarily for agricultural purposes, typically as soybeans or corn.

#### 2.2.2 Topography

Existing topographic information used in this analysis was obtained from North Dakota Geological Survey: 1:24,000 Scale Maps. The LiDAR elevation data was collected in 2016.



The Site is generally flat across the project area. The natural terrain slopes slightly to the east across the parcel. Site elevations range from approximately 910 feet above mean sea level (amsl) along the west edge to approximately 905 feet amsl along the eastern portion of the Project.

### **2.2.3 Drainage Patterns**

The Site is located within the Outlet Rush River hydrologic unit code (HUC) watershed designation. The Site discharges to the east. The watershed in relation to the Project are shown in Appendix A.2.

### **2.2.4 Site Soils**

Soil data for the Project was obtained from the National Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO). The Site is predominately hydrologic soil group (HSG) C/D, with some HSC C soils. HSG D soils and HSG C soils make up approximately 96 percent and 4 percent of the Project area, respectively. The soil was primarily classified as silty clay soils.

See Appendix A.4 for NRCS Soil Map and Report.

The soil data is used to determine the hydrologic soil groups (HSG) which provide information on the runoff potential and infiltration potential. HSGs are assigned a letter classification where:

- 'A' soils have the highest infiltration potential (lowest runoff potential),
- 'B' soils have a moderate infiltration potential (middling runoff potential),
- 'C' soils have a low infiltration potential (high runoff potential), and;
- 'D' soils have a very low infiltration potential (very high runoff potential).

Some soils are assigned a dual-letter classification, such as A/D, B/D, or C/D, meaning these soils behave as the first lettered soil in drained conditions and a HSG D soil in undrained conditions. Dual-letter classification soils were assumed to be undrained when determining infiltration potential.

### **2.2.5 Environmental Constraints**

#### **2.2.5.1 Wetlands/Waterbodies**

In March 2026, a Wetland Delineation Report was prepared for the Project. A total of six (6) wetlands were identified within the Project. See Sheets C2.01 on the Preliminary Erosion Control Plan Set in Appendix A.6 for the Delineated Wetlands located within the Project area.

No wetlands within the Project are anticipated to need construction matting during construction. Temporary matting, if needed, would be used during construction to prevent rutting, and any impacted wetlands would be revegetated with native vegetation following construction. Updated layouts throughout the design phase will be completed to try and avoid wetlands within the Project. If wetlands cannot be avoided, permit coordination with United States of Army Corp of Engineers (USACE) and other regulating authorities shall be required. Collector lines that cross wetlands would be spanned or directionally drilled.



Appropriate sediment barriers shall be installed and maintained adjacent to wetlands and within workspace areas as necessary to minimize the potential for sediment runoff. Temporary sediment barriers will be installed in appropriate locations to protect the wetlands. Any barriers disturbed during construction will be immediately repaired upon discovery of damage. Once revegetation is successful, the temporary sediment barriers will be permanently removed and disposed of properly.

#### **2.2.5.2 Floodplains**

FEMA has one classified flood zone within the Project Area, however, the proposed Project design locates all BESS facilities outside of this zone. A Floodplain Map of the Project Area is provided in Appendix A.3.

### **2.3 Construction Activity Description and Sequencing**

Harmony Storage, LLC is a proposed 200-megawatt (MW) battery energy storage system (BESS) with a four-hour (800 MWh) duration to store excess energy in Township of Harmony, Cass County, North Dakota. The Project includes the construction of a new BESS pad and a 34.5-kilovolt (kV) underground collection line. The Point of Interconnection (POI) will be at the Harmony Solar 230-kV collector substation via underground 34.5 kV collection lines. The BESS units will be placed on concrete pad foundations. Access roads will be required and will be constructed to minimize grading to the extent possible from adjacent existing county and town roads. Other facilities include inverter/transformer stations, collector cabling, perimeter fencing, and stormwater features located within perimeter fence. The Client will be submitting a North Dakota Public Service Commission application.

The following provides a description of the staging and construction sequence for the project:

- A. Pre-construction identification of clearing and grading limits, sensitive areas, and wetlands;
- B. Installation of sediment and erosion controls as identified by project plans/approvals including any necessary site-specific modifications identified;
- C. Earthwork, drain tile adjustment, access roads, and initial stabilization of exposed soils, temporary seeding;
- D. Construction and installation of permanent stormwater facilities (as necessary);
- E. Installation of solar array and electrical components (concurrent with above);
- F. Application of permanent seeding and stabilization; and
- G. Site cleanup and final stabilization.



## **3 Stormwater Management**

Stormwater management standards are set to protect water resources by minimizing the impacts from land use change and development. The following sections analyze the proposed improvements with respect to the requirements of the regulating jurisdictions.

### **3.1 Stormwater Management Requirements**

The Project is located in Cass County, North Dakota with the regulating jurisdictions being Cass County and the State of North Dakota. Through discussions with County Officials, no specific stormwater requirements have been adopted. The City of Fargo Policy on Stormwater Discharge and Treatment Requirements (2023 Update) was referenced for general guidance. Upon review of that ordinance, the project will adhere to the design guidance that the maximum proposed stormwater runoff rate is not greater than the existing condition's runoff rate from the parcel for the 1-, 10- and 100-year, 24-hour synthetic rainfall events. City of Fargo uses the 2-year, in lieu of the 1-year, but we have decided to use the 1-year for a more conservative analysis.

North Dakota Department of Environmental Quality (ND DEQ) has published and approved a General Permit for Small Municipal Separate Storm Sewer Systems (Permit No.NDR04-0000) which was also referenced by County officials to use for design guidance. According to the North Dakota Environmental Quality, a stormwater discharge permit is required if construction activities disturb one (1) or more acres. Harmony Storage will meet the State requirements for a SWMP.

#### **3.1.1 State Code**

North Dakota Department of Environmental Quality has published and approved a General Permit for Stormwater Discharge (Permit No. NDR04-0000) (State Code) which shall be followed upon final plan development. As previously mentioned, any disturbance greater than one (1) acres will require adherence to the State Regulations. A project specific Stormwater Pollution Prevention Plan (SWPPP) and Erosion Control Plans will be developed to satisfy the requirements within No. NDR04-0000.

### **3.2 Methodology**

The software used to model the existing and proposed conditions is HydroCAD version 10.20-5c, which is a computer-aided design program for modeling the hydrology and hydraulics of stormwater runoff. The analysis used SCS TR-20 for the runoff calculation methodology.

#### **3.2.1 Storm Events**

HydroCAD software utilizes NOAA Atlas 14 data for the 1-year, 10-year, and 100-year 24-hour storm events, which were 1.90 inch, 3.46 inch and 5.18 inch, respectively. See Appendix B for the rainfall data obtained and used for analysis in HydroCAD.



Hydrologic modeling was performed using the HydroCAD® Version 10.20- software developed by HydroCAD Software Solutions LLC. This model uses the Soil Conservation Service (SCS) TR-20 methodology to determine peak flows and runoff volumes.

A Type II 24-hour storm type was selected to model the rainfall distribution across each rainfall event. This distribution is appropriate because a localized design storm was not required by local or state code. The antecedent moisture condition was set to “normal” (an AMC value of 2) and the time span for the analysis was set to 72 hours.

### 3.2.2 Curve Number

Curve Numbers (CN) are values ranging from 0 to 100 based on soil types, plant cover, amount of impervious areas, interception and surface storage. The curve numbers (CN) used for the Project area are shown below in Table 1 in relation to land use and HSGs.

**Table 1. Curve Numbers**

| Land Use Description     | Hydrologic Soil Group (HSG) |     |
|--------------------------|-----------------------------|-----|
|                          | C                           | C/D |
| Cultivated Crops         | 82                          | 86  |
| Developed, Low Intensity | 80                          | 85  |
| Developed, Open Space    | 74                          | 80  |
| Gravel within Fence      | 96                          | 96  |
| Access Road              | 98                          | 98  |
| Aug Electrical Equipment | 98                          | 98  |
| Electrical Equipment     | 96                          | 96  |
| Stormwater Basin         | 98                          | 98  |



## 3.3 Modeling Analysis

### 3.3.1 Existing Land Use

The existing land use consists mainly of cultivated crop which is approximately 91 percent of the Project. Table 2 shows the summary of the land use and soil types for the Project. See Appendix A.4 and A.5 for exhibits showing the NRCS Soil Map (hydrological soil groups) and Existing Land Cover within the Project boundary.

**Table 2. Existing Conditions Land Cover**

| Land Use Description     | Hydrologic Soil Group (HSG) |       | Total (acres) | Percent |
|--------------------------|-----------------------------|-------|---------------|---------|
|                          | C                           | C/D   |               |         |
| Cultivated Crops         | 1.61                        | 66.27 | 67.87         | 91.4%   |
| Developed, Low Intensity | 0.49                        | 2.03  | 2.53          | 3.4%    |
| Developed, Open Space    | 0.16                        | 3.68  | 3.85          | 5.2%    |
| Total                    | 2.26                        | 71.99 | 74.25         | 100.0%  |

### 3.3.2 Proposed Land Use

The Site will consist of approximately 1.49 acres of Battery Energy Storage electrical equipment. In addition, approximately 10.87 acres of additional impervious area is proposed that consists of gravel, access roads and stormwater basin.

Table 3 below provides a summary of the land use under proposed conditions. See Appendix A.4 and A.5 for exhibits showing the NRCS Soil Map (hydrological soil groups) and Proposed Land Cover within the Project boundary.



**Table 3. Proposed Conditions Land Cover**

| Land Use Description     | Hydrologic Soil Group (HSG) |              | Total (acres) | Percent        |
|--------------------------|-----------------------------|--------------|---------------|----------------|
|                          | C                           | C/D          |               |                |
| Cultivated Crops         | 1.61                        | 54.15        | 55.76         | 75.10%         |
| Developed, Low Intensity | 0.49                        | 1.83         | 2.32          | 3.12%          |
| Developed, Open Space    | 0.16                        | 3.64         | 3.81          | 5.13%          |
| Gravel within the Fence  | 0.00                        | 6.30         | 6.30          | 8.49%          |
| Access Road              | 0.00                        | 1.93         | 1.93          | 2.60%          |
| Aug Electrical Equipment | 0.00                        | 0.23         | 0.23          | 0.31%          |
| Electrical Equipment     | 0.00                        | 1.26         | 1.26          | 1.69%          |
| Stormwater Basin         | 0.00                        | 2.64         | 2.64          | 3.55%          |
| <b>Total</b>             | <b>2.26</b>                 | <b>71.99</b> | <b>74.25</b>  | <b>100.00%</b> |

### 3.3.3 Composite Curve Numbers and Time of Concentration

A composite CN value was calculated for each drainage basin based on the land cover and soil type. The composite is a weighted average of each CN value and shown below in Table 4 for both the existing and proposed conditions. Also included is the difference between the Composite CNs for each drainage basin.

The time of concentration (TC) was calculated based on TR-20 criteria. The existing and proposed TC for each drainage basin is also shown in Table 4.

**Table 4. Composite CN and Time of Concentration (TC) Summary**

| Drainage Basin | Area (ac)    | Composite CN |           |           | TC (min)     |             | Proposed Impervious |              |
|----------------|--------------|--------------|-----------|-----------|--------------|-------------|---------------------|--------------|
|                |              | Existing     | Proposed  | Diff.     | Existing     | Proposed    | Area (ac)           | Percent      |
| <b>S1</b>      | <b>66.45</b> | <b>86</b>    | <b>--</b> | <b>--</b> | <b>117.2</b> | <b>--</b>   | <b>9.7</b>          | <b>14.6%</b> |
| S1*            | 52.96        | --           | 86        | 0         | --           | 117.2       | 0                   | 0.0%         |
| S1-P1*         | 6.86         | --           | 97        | 11        | --           | 6.0         | 4.8                 | 70.2%        |
| S1-P2*         | 6.63         | --           | 94        | 8         | --           | 6.0         | 4.9                 | 74.0%        |
| <b>S2</b>      | <b>7.79</b>  | <b>84</b>    | <b>84</b> | <b>0</b>  | <b>23.5</b>  | <b>23.5</b> | <b>0.0</b>          | <b>0.0%</b>  |

\*S1 is comprised of three sub-basins as the drainage basin was divided to account for drainage to the stormwater basins. The sub-basins to S1 are S1, S1-P1, and S1-P2.



The proposed development shows an increase in the composite CN, which can primarily be attributed to the increase in impervious areas for the electrical equipment and access roads in the final developed condition.

### 3.3.4 Runoff Analysis

Stormwater discharge runoff rates for each drainage basin were calculated in HydroCAD. Table 5 shows a summary of the discharge runoff rates for each storm event and drainage basin. See Appendix B for the existing and proposed HydroCAD reports.

**Table 5. Runoff Rate Summary**

| Drainage Basin | 1-year Runoff (cfs) |             | 10-year Runoff (cfs) |             | 100-year Runoff (cfs) |              |
|----------------|---------------------|-------------|----------------------|-------------|-----------------------|--------------|
|                | Existing            | Proposed    | Existing             | Proposed    | Existing              | Proposed     |
| <b>S1</b>      | <b>16.0</b>         | <b>45.1</b> | <b>44.4</b>          | <b>99.0</b> | <b>78.1</b>           | <b>159.8</b> |
| S1*            | --                  | 12.7        | --                   | 35.4        | --                    | 62.3         |
| S1-P1*         | --                  | 17.5        | --                   | 33.2        | --                    | 50.3         |
| S1-P2*         | --                  | 14.9        | --                   | 30.4        | --                    | 47.3         |
| <b>S2</b>      | <b>5.1</b>          | <b>5.1</b>  | <b>15.0</b>          | <b>15.0</b> | 26.9                  | 26.9         |

\*S1 is comprised of three sub-basins as the drainage basin was divided to account for drainage to the stormwater basins. The sub-basins to S1 are S1, S1-P1, and S1-P2.

Similar to the CN table, there was an increase in the runoff rate from pre to post conditions as shown in this analysis. To meet the State Code's runoff rate requirement, a stormwater pond or other stormwater best management practice (BMP) is recommended to be used to reduce the runoff rate from the developed project area.

### 3.3.5 Water quality

State Code includes a water quality design consideration based on the BMP used for post-construction controls. The site plan included either a wet or dry detention pond (stormwater basin) used to manage the first flush of stormwater runoff. A wet detention pond shall have a minimum drawdown time of 12 hours while the dry detention pond shall have a drawdown time between 24 to 72 hours. The water quality design volume needed at a minimum for the two (2) stormwater basins is shown in Table 6.



**Table 6. Water Quality Design Requirements**

| Description                        | Pond 1 (S1-P1) | Pond 2 (S1-P2) | Total  |
|------------------------------------|----------------|----------------|--------|
| Impervious Area (ac)               | 4.81           | 4.91           | 9.72   |
| Water Quality Volume (cf) Required | 8,664          | 8,835          | 17,499 |

## **3.4 Proposed Stormwater Management Practices**

The goal is to design and construct the Project with minimum impact to the site and existing drainage patterns. The work included in the Harmony Storage project includes installing Battery Energy Storage Systems, primarily at-grade gravel access roads, and other electrical equipment necessary for plant operation. By maintaining the existing drainage patterns, the stormwater impacts are minimized.

### **3.4.1 Temporary Stormwater Management Practices**

The proposed temporary stormwater management practices developed at this time are related to stormwater quality control (erosion and sediment runoff). The primary control devices will be silt fence and stabilized construction entrances. Drawing C2.10 of the Preliminary Construction Drawings included in Appendix A.6 contains these details. As the project develops further, these will be refined as needed to meet state and county guidelines for erosion and sediment control.

### **3.4.2 Permanent Practices**

The proposed Project layout has minimized the proposed impervious surfaces to the extent practicable (gravel roads and pads, and other electrical equipment pads. Disturbed areas will be seeded with a native low-maintenance, low growing grass seed mix or returned to their previous use (cultivated cropland). The mix will be specified on construction documents and appropriate for the region. This acts as a permanent BMP and allows for runoff, sediment, and other pollutants to be infiltrated or captured by the vegetation.

## **4 Temporary and Permanent BMPs**

Temporary or permanent BMPs will be initiated prior soil disturbing, further details about each kind are present below. If a BMP was determined as failed, became ineffective, or no longer functions as designed, the BMP shall be restored, repaired, replaced, or reestablished as soon as practicable, but no later than seven (7) calendar days following identification of the failure. If conditions beyond the permittee's control prevents completion within seven (7) days, temporary measures shall be implemented to minimize pollutant discharge and erosion until permanent repairs can be completed. Documentation of the failure, corrective actions taken, and the date of restoration shall be maintained as part of the project records.



## **4.1 Soil Management and Compaction Minimization**

After clearing and grubbing, the operator(s) will strip and stockpile topsoil material for reapplication only where there is a permanent foundation like the electrical equipment, temporary laydown yard would be reclaimed, graded areas would be stripped and the topsoil respread. During grading and utility construction the subsoils may become compacted when using typical excavation techniques. During final grading, reapplication of the preserved topsoil should be completed by a low pressure wide-tracked dozer or other equipment to minimize compaction of the topsoil. The operator(s) should restrict vehicle and equipment use to avoid soil compaction where feasible; techniques such as soil ripping for sub-soil decompaction should be completed prior to topsoil placement, final seeding or other final restoration activities.

## **4.2 Natural Buffers and No-Disturbance Areas**

### **4.2.1 Natural Buffers**

Any undisturbed buffer zone should be preserved for all surface waters (including wetlands) on site. Linear sediment controls will be installed upgradient of waterway buffers (assumed to be a minimum of 25 feet) and wetland buffers (assumed to be 20 feet from field delineated wetland boundaries) to provide sediment control and delineate the buffer. Delineation of the buffer around these resources is critical to minimizing the potential for inadvertent disturbance during construction. The following activities are prohibited from taking place within the buffer area:

- Placing soil stockpiles or sediment basins;
- Disturbing vegetation;
- Placing construction material; and
- Storing gas, oils, or other potentially polluting material.

In areas where undisturbed buffer zones are not feasible, redundant sediment control BMPs will be installed.

### **4.2.2 No-disturbance Areas**

No-disturbance areas will be delineated upon final design.

## **4.3 Erosion Prevention Practices**

The following erosion and sedimentation controls are anticipated to minimize soil loss from active construction areas. The controls will help to minimize soil from being transported via surface water runoff during precipitation events and wind action. They will also aid in establishment of temporary and permanent vegetation. Prior to grading and during clearing and grubbing, the areas of vegetation preservation, wetland and waterway buffers and other areas of no-disturbance will be flagged, staked or otherwise delineated.



### 4.3.1 Soil Stabilization Timing

Temporary or permanent soil erosion prevention practices will be initiated immediately after soil disturbing activities cease for a period of fourteen days. The application of temporary or permanent erosion control management practices should be completed prior to the 21st day of temporarily or permanently ceasing construction activity in an area of the project.

Areas of steep slope (slopes 20 percent or greater) which cannot be avoided during construction must have temporary or permanent erosion control BMPs installed immediately upon the close of the working day or when construction activities will cease for a period exceeding seven calendar days.

The erosion control BMPs listed in Table 7 will be utilized to minimize soil loss when completed according to applicable notes.

**Table 7. Erosion Controls**

| Potential BMPs          | Construction Phase or Activity |              |                 |              | Application Notes                                                                                                 |                                                                                             |
|-------------------------|--------------------------------|--------------|-----------------|--------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
|                         | Grading                        | Access Roads | Collection Line | Laydown Area |                                                                                                                   |                                                                                             |
| Construction Phasing    | T                              | T            | T               | T            | Minimize soil disturbance, as feasible, per phase. Stake/flag areas that are to be left undisturbed.              |                                                                                             |
| Buffer Strips           | T                              | T            | T               | T            | See Section 4.2 for more information.                                                                             |                                                                                             |
| Erosion Control Blanket | T                              | T            | T               | T            | NDDOT Type 3 ECB (biodegradable netting). Install per manufacturer's recommendations.                             |                                                                                             |
| Hydroseed               | T                              | T            | T               | T            | Apply at a minimum of 1,800 pounds per acre from two directions to prevent shadowing. Could use in lieu of mulch. |                                                                                             |
| Temporary Seed Mix      | T                              | T            | T               | T            | Application Rate = See mix.                                                                                       | Prepare soil prior to seeding. Broadcast and rake seed into soil prior to mulch or blanket. |
| Permanent Seed Mix      | P                              | P            | P               | P            | Application Rate = See mix.                                                                                       |                                                                                             |

T= Temporary BMPs which will be removed following construction completion and final stabilization.

P= Permanent BMPs which will provide vegetative, non-vegetative stabilization or will not be removed following completion of construction.

## 4.4 Sediment Control Practices

The following controls are anticipated to minimize sediment discharge, capture sediment in suspension and minimize sedimentation off site.



**Table 8. Sediment Controls**

| Potential BMPs        | Construction Phase or Activity |              |                 |              | Application Notes                                                                                                                                                                                                          |
|-----------------------|--------------------------------|--------------|-----------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       | Grading                        | Access Roads | Collection Line | Laydown Area |                                                                                                                                                                                                                            |
| Silt Fence            | T                              | T            | T               | T            | Install silt fence along contours and above identified natural resources. Remove perimeter silt fence                                                                                                                      |
| Riprap Stilling Basin | T/P                            | T/P          | T               | T            | Installed within silt fence at swale or confined flow areas to prevent silt fence failure. Installed within swale areas as permanent sediment control/water dissipator at locations specified on plans and when necessary. |
| Straw Waddles         | T                              | T            | T               | T            | Install with maximum ground surface contact using wooden stakes driven through waddle. Remove accumulated sediment upslope and replace waddle when necessary.                                                              |
| Straw Bales           | T                              | T            | T               | T            | Weed free straw bales installed in conjunction with silt fence (reinforcement), rock check dams and straw waddles. Installed with maximum ground surface contact using wooden stakes driven through straw bale.            |
| Stockpile             | T                              | T            | T               | T            | Stockpile location to be determined in the field. No fill should be placed in ditches, surface waters, or wetlands.                                                                                                        |

T= Temporary BMPs which will be removed following construction completion and final stabilization.

P= Permanent BMPs which will provide vegetative, non-vegetative stabilization or will not be removed following completion of construction.



## 4.5 Tracking Controls

The following controls are anticipated to minimize or prevent sediment track-out from construction site exits to paved surfaces. Controls presented below will also minimize material being washed into surface waters or stormwater inlets.

**Table 9. Tracking Controls**

| Potential BMPs                | Construction Phase or Activity |              |                 |              | Application Notes                                                                                  |
|-------------------------------|--------------------------------|--------------|-----------------|--------------|----------------------------------------------------------------------------------------------------|
|                               | Grading                        | Access Roads | Collection Line | Laydown Area |                                                                                                    |
| Rock Pad                      | T                              | T            | T               | T            | See detail in plans. Install at all site exits prior to grading. Maintain for duration of project. |
| Gravel or Aggregate Road Base | T                              | T            | T               | T            | Detail will be provided in final construction plans.                                               |
| Street Scraping               | T                              | T            | T               | T            | Scrape large clumps/amounts of material with soft tracked or wheeled equipment prior to sweeping.  |
| Street Sweeping               | T                              | T            | T               | T            | Sweep paved surfaces within twenty-four hours of discovery.                                        |

T= Temporary BMPs which will be removed following construction completion and final stabilization.

P= Permanent BMPs which will provide vegetative, non-vegetative stabilization or will not be removed following completion of construction.

## 4.6 Dewatering and Basin Draining Practices

Dewatering of turbid water (water that is visibly cloudy or brown in color) should be discharged via pump and hose or overland flow (via temporary ditch or grade cuts) to a constructed dewatering basin, upland, vegetated area or sediment basin. The use of a riprap apron (energy dissipation) should be used for the discharge location. If riprap is not used, an alternative form of energy dissipation should be used to prevent scour and re-suspension of soil at the discharge point. If discharge to a sediment basin is not feasible, the use of dewatering dumpsters, dewatering bags or other prefabricated product should be used. The use of rock checks, erosion control blanket and sumps or traps shall be considered for overland flow dewatering. The discharge of water from the site should be visibly clear in appearance.

The discharge of accumulated water should not:

- Contain oil, grease, a sheen, odor, or concrete washout (use an oil-water separator or suitable filtration device if material is found);
- Adversely impact adjacent properties with water or sediment;
- Adversely impact waters of the state (wetland or waterways);
- Cause erosion of slopes and channels; or



- Cause nuisance conditions.

## **5 Conclusion**

Cass County North Dakota has not developed any specific criteria for runoff rate control. However, the project will be designed so that the proposed stormwater runoff rates do not exceed the pre-construction rates for the 1-year, 10-year, and 100-year storm events. As confirmed in this report, the Harmony Storage Project will meet the stormwater requirements by implementing two (2) stormwater basins. .



## **Appendix A Exhibits**

## **A.1 Location Map**



## **A.2 Drainage Pattern Map**



### **A.3 Floodplain Location Map to Project Boundary**

U:\WORK\19371174602\_data\map\_data\p193711746\_HarmonyBESS\_ESP\_3MMP.aprx  
Revised: 2025-05-17 By: jpm



Figure No.  
**A.3**

Title  
**Floodplain Location Map to Project Boundary**

Client/Project  
Geronomo Power  
Harmony BESS  
NDPSC Siting Application

193711746

Project Location  
T140N, R51W, S12  
T. Harmony, Cass Co., ND

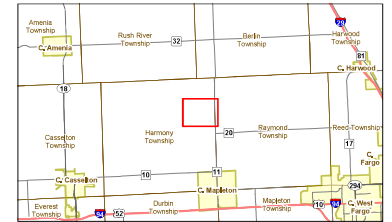
Prepared by JMD on 2025-06-04  
TR by JLT on 2025-06-10  
IR by JMT on 2025-06-11



0 400 800 Feet  
(At original document size of 11x17)  
1:9,600

Legend

- Project Boundary
- Parcels
- Existing Electric Transmission Line
  - 230 kV Transmission Line
  - 345 kV Transmission Line
- Existing Substation
- FIRM Panels
- FEMA Flood Zones
  - 100 Year Floodplain (Zone A)
  - 500 Year Floodplain (Zone X)
- Proposed Layout
  - Fence



Notes  
1. Coordinate System: NAD 1983 StatePlane North Dakota South FIPS 3302 Feet  
2. Data Sources: Geronomo Power, Stantec, NDOT, NDSWC, USGS, FEMA  
3. Background: 2021-2022 NAIP



## **A.4 NRCS Soil Map and Report**

U:\WORK\19371174602\_atape\_atape\193711746\_HarmonyBESS\_ESP\_SAMP.aprx Revised: 2025-05-17 By: jlan



Figure No.  
**A.4**

Title  
**NRCS Soil Map**

Client/Project  
Geronomo Power  
Harmony BESS  
NDPSC Siting Application  
193711746

Project Location  
T140N, R51W, S12  
T. Harmony, Cass Co., ND

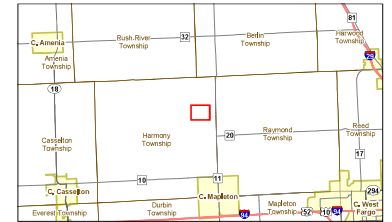
Prepared by JMD on 2025-05-04  
TR by JLT on 2025-05-10  
IR by JMT on 2025-05-11



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Feet  
(At original document size of 11x17)  
1:4,800

**Legend**

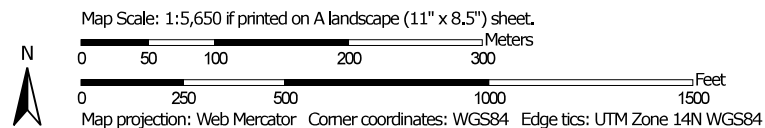
- Project Boundary
- Parcels
- Existing Electric Transmission Line
  - 230 kV Transmission Line
  - 345 kV Transmission Line
- Existing Substation
- Proposed Layout
  - Fence
  - HSG
    - C
    - C/D



**Notes**  
1. Coordinate System: NAD 1983 StatePlane North Dakota South FIPS 3302 Feet  
2. Data Sources: Geronomo Power, Stantec, NDDOT, NDSWC, USGS, NRCS  
3. Background: 2021-2022 NAIP



# Hydrologic Soil Group—Cass County, North Dakota (s\_project\_boundary\_50ft\_buff)



Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey

6/1/2026  
Page 1 of 4

## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons

 A  
 A/D  
 B  
 B/D  
 C  
 C/D  
 D  
 Not rated or not available

#### Soil Rating Lines

 A  
 A/D  
 B  
 B/D  
 C  
 C/D  
 D  
 Not rated or not available

#### Soil Rating Points

 A  
 A/D  
 B  
 B/D

 C  
 C/D  
 D  
 Not rated or not available

### Water Features

 Streams and Canals

### Transportation

 Rails  
 Interstate Highways  
 US Routes  
 Major Roads  
 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL:  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cass County, North Dakota  
Survey Area Data: Version 26, May 4, 2026

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

Date(s) aerial images were photographed: May 24, 2021—Jun 12, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Hydrologic Soil Group

| Map unit symbol                    | Map unit name                                       | Rating | Acres in AOI | Percent of AOI |
|------------------------------------|-----------------------------------------------------|--------|--------------|----------------|
| I229A                              | Fargo silty clay, 0 to 1 percent slopes             | C/D    | 71.9         | 84.4%          |
| I238A                              | Fargo-Hegne silty clays, 0 to 1 percent slopes      | C/D    | 2.3          | 2.7%           |
| I473A                              | Hegne-Fargo silty clay loams, 0 to 1 percent slopes | C/D    | 7.8          | 9.1%           |
| I482A                              | Overly-Bearden silt loams, 0 to 2 percent slopes    | C      | 3.2          | 3.8%           |
| <b>Totals for Area of Interest</b> |                                                     |        | <b>85.2</b>  | <b>100.0%</b>  |

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher

## **A.5 Land Cover and Drainage Maps**

U:\WORK\19371174602\_02\shape\_cadd\p01\193711746\_HarmonyBESS\_EBP\_SAMP.aprx  
Revised: 2025-05-17 By: jlam



Figure No.  
**A.5.1**

Title  
**Existing Land Cover and Drainage Map**

---

Client/Project  
Geronimo Power  
Harmony BESS  
NDPSC Siting Application

Project Location  
T140N, R51W, S12  
T. Harmony, Cass Co., ND

Prepared by JMD on 2025-05-04  
TR by JLT on 2025-05-10  
IR by JMT on 2025-05-11

193711746

N

0 200 400 Feet  
(At original document size of 11x17)  
1:4,800

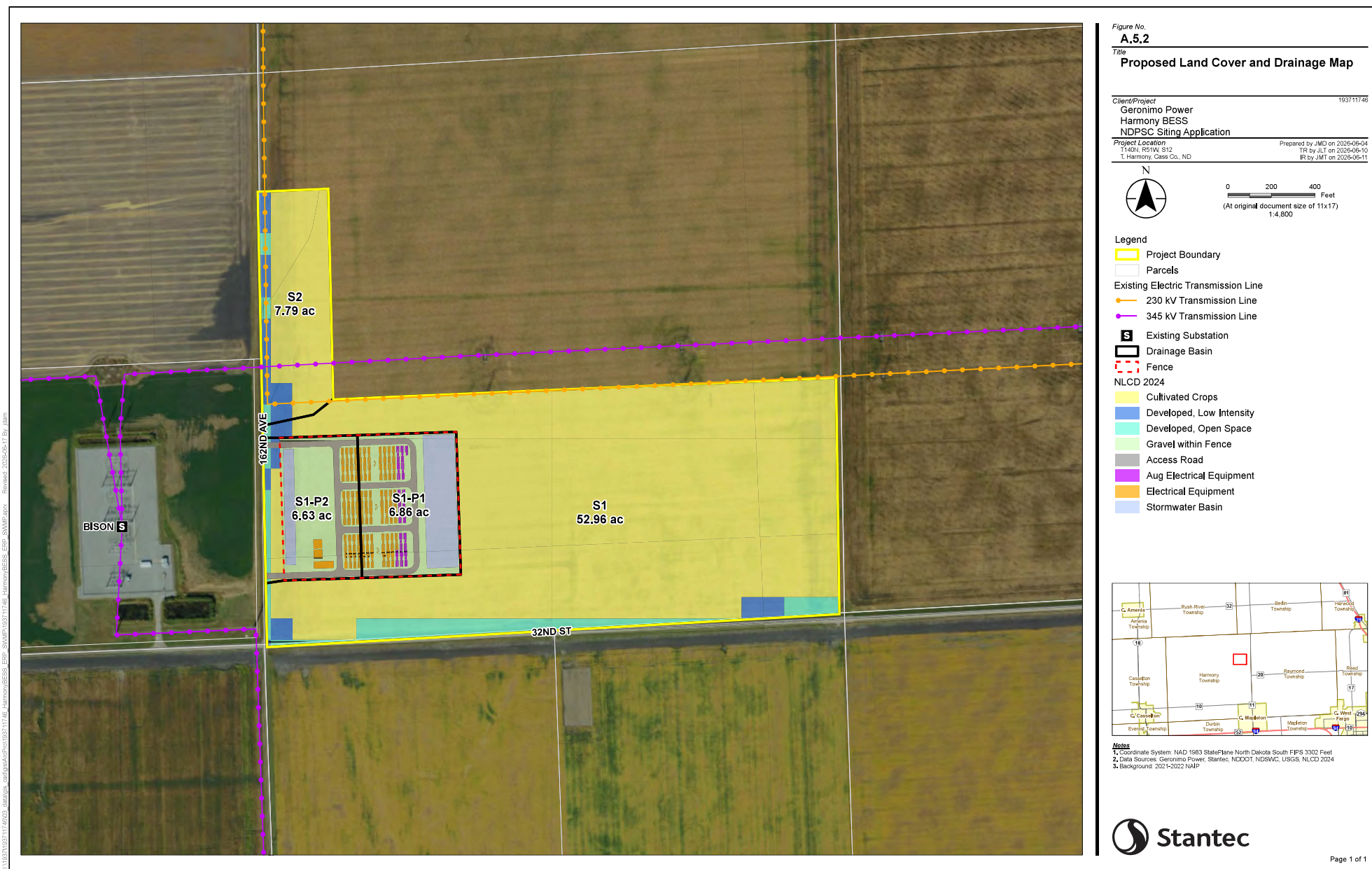
Legend

- Project Boundary
- Parcels
- Existing Electric Transmission Line
  - 230 kV Transmission Line
  - 345 kV Transmission Line
- Existing Substation
- Drainage Basin
- NLCD 2024
  - Cultivated Crops
  - Developed, Low Intensity
  - Developed, Open Space

Notes

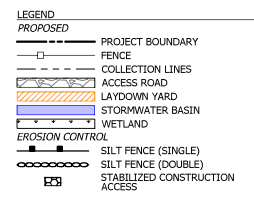
- Coordinate System: NAD 1983 StatePlane North Dakota South: FIPS 3302 Feet
- Data Sources: Geronimo Power, Stantec, NDOT, NDSWG, USGS, NLCD 2024
- Background: 2021-2022 NAIP

Stantec

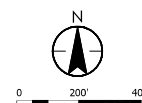


## **A.6 Preliminary Erosion Control Plan and Details**

Print Date: 6/6/17 20:26:34 - 334pm  
Drawing Name: CA\_A0321242\_50\_C\_B002\_10mmx18000\_100\_CAD.dwg  
Drawing Path: C:\Users\j124\OneDrive\Documents\B002\_10mmx18000\_100\_CAD.dwg



- GENERAL NOTES:
1. EXISTING CONTOURS SHOWN ARE FROM A LIDAR COMPLETED BY NORTH DAKOTA GEOLOGICAL SURVEY: 1:24,000 SCALE MAPS, DATED 2016.
  2. EXISTING CONDITIONS AND SITE LAYOUT SHOWN ARE FROM THE CLIENT. EXISTING FEATURES MAY NOT BE EXACT TO THEIR LOCATION. CONTRACTOR RESPONSIBLE FOR VERIFYING THE CONDITIONS OF THE SITE AND MUST IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF DISCREPANCIES OR VARIATIONS FROM THE DRAWINGS.
  3. PRELIMINARY DRAWINGS TO BE USED FOR PLANNING PURPOSES ONLY. ACCURACY OF DRAWINGS BASED ON FILES PROVIDED BY THE CLIENT.
  4. SEE C210 FOR DETAILS AND NOTES ON EROSION AND SEDIMENT CONTROL.
  5. FENCE IS OFFSET 10' FROM PROJECT FACE.
  6. TRACKING PAD IS LOCATED AT EACH INTERSECTION OF ACCESS ROADS AND EXISTING ROADWAY. TRACKING PAD DIMENSIONS ARE 26' WIDE X 50' LONG.
  7. ACCESS ROADS ARE 26' WIDE.
  8. STORMWATER BASINS SHALL BE USED AS SEDIMENTATION BASINS.





## **Appendix B Reports**

## **B.1 Existing HydroCAD Report**



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 S1: S1 Runoff Area=66.451 ac 0.00% Impervious Runoff Depth=0.77"  
Flow Length=3,353' Tc=117.2 min CN=86 Runoff=15.95 cfs 4,286 af

Subcatchment S2: S2 Runoff Area=7.794 ac 0.00% Impervious Runoff Depth=0.67"  
Flow Length=762' Tc=23.5 min CN=84 Runoff=5.09 cfs 0.438 af

Link RR: Outlet Rush River Inflow=16.49 cfs 4,724 af  
Primary=16.49 cfs 4,724 af

Total Runoff Area = 74.245 ac Runoff Volume = 4,724 af Average Runoff Depth = 0.76"  
100.00% Pervious = 74.245 ac 0.00% Impervious = 0,000 ac

Rainfall Events Listing (selected events)

| Event# | Event Name | Storm Type    | Curve | Mode    | Duration (hours) | B/B | Depth (inches) | AMC |
|--------|------------|---------------|-------|---------|------------------|-----|----------------|-----|
| 1      | 1-Year     | Type II 24-hr |       | Default | 24.00            | 1   | 1.90           | 2   |
| 2      | 10-Year    | Type II 24-hr |       | Default | 24.00            | 1   | 3.46           | 2   |
| 3      | 100-Year   | Type II 24-hr |       | Default | 24.00            | 1   | 5.18           | 2   |

Summary for Subcatchment S1: S1

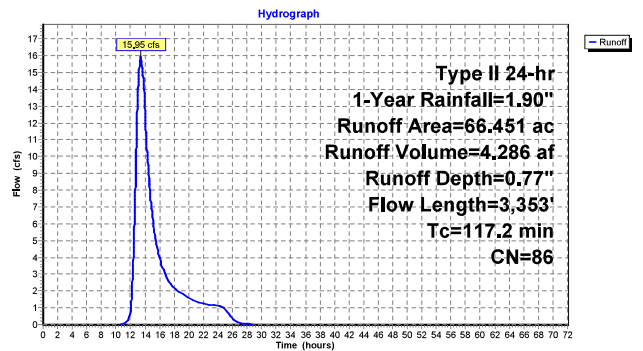
Runoff = 15.95 cfs @ 13.41 hrs, Volume= 4,286 af, Depth= 0.77"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 1-Year Rainfall=1.90"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 61.687  | 86 | Cultivated Crops, HSG C/D         |
| * 1.237   | 85 | Developed, Low Intensity, HSG C/D |
| * 3.527   | 80 | Developed, Open Space, HSG C/D    |
| 66.451    | 86 | Weighted Average                  |
| 66.451    |    | 100.00% Pervious Area             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 10.9     | 103           | 0.0324        | 0.16              |                | Sheet Flow, Cultivated; Residue>20% n= 0.170 P2= 2.25"          |
| 94.2     | 2,042         | 0.0016        | 0.36              |                | Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps |
| 12.1     | 1,208         | 0.0009        | 1.67              | 90.08          | Channel Flow, Area= 54.0 sf Perim= 72.3' r= 0.75' n= 0.022      |
| 117.2    | 3,353         | Total         |                   |                |                                                                 |

Subcatchment S1: S1



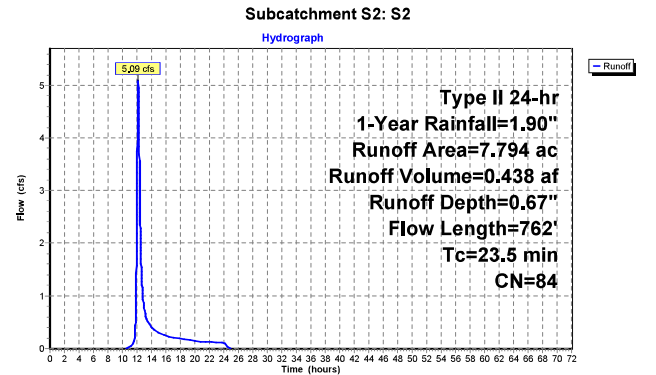
Summary for Subcatchment S2: S2

Runoff = 5.09 cfs @ 12.19 hrs, Volume= 0.438 af, Depth= 0.67"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 1-Year Rainfall=1.90"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 1.606   | 82 | Cultivated Crops, HSG C           |
| * 4.579   | 86 | Cultivated Crops, HSG C/D         |
| * 0.492   | 80 | Developed, Low Intensity, HSG C   |
| * 0.798   | 85 | Developed, Low Intensity, HSG C/D |
| * 0.162   | 74 | Developed, Open Space, HSG C      |
| * 0.157   | 80 | Developed, Open Space, HSG C/D    |
| 7.794     | 84 | Weighted Average                  |
| 7.794     |    | 100.00% Pervious Area             |

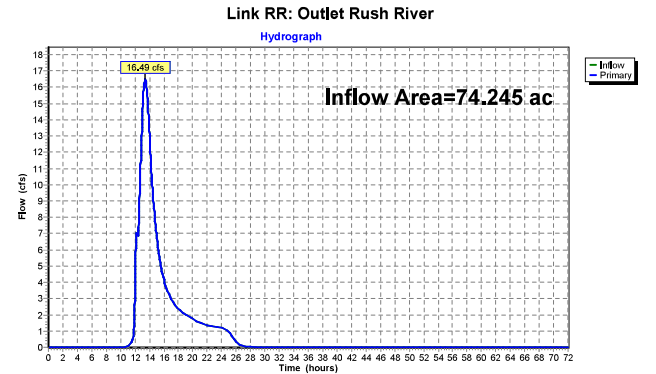
| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------|
| 11.4     | 99            | 0.0271        | 0.15              |                | Sheet Flow,<br>Cultivated: Residue>20% n= 0.170 P2= 2.25"          |
| 8.7      | 274           | 0.0034        | 0.53              |                | Shallow Concentrated Flow,<br>Cultivated Straight Rows Kv= 9.0 fps |
| 3.4      | 389           | 0.0020        | 1.88              | 80.87          | Channel Flow,<br>Area= 43.0 sf Perim= 55.4' r= 0.78' n= 0.030      |
| 23.5     | 762           |               |                   |                | Total                                                              |



Summary for Link RR: Outlet Rush River

Inflow Area = 74.245 ac, 0.00% Impervious, Inflow Depth = 0.76" for 1-Year event  
Inflow = 16.49 cfs @ 13.41 hrs, Volume= 4.724 af  
Primary = 16.49 cfs @ 13.41 hrs, Volume= 4.724 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentS1: S1

Runoff Area=66.451 ac 0.00% Impervious Runoff Depth=2.06"  
Flow Length=3,353' Tc=117.2 min CN=86 Runoff=44.38 cfs 11,424 af

SubcatchmentS2: S2

Runoff Area=7.794 ac 0.00% Impervious Runoff Depth=1.90"  
Flow Length=762' Tc=23.5 min CN=84 Runoff=14.99 cfs 1,236 af

Link RR: Outlet Rush River

Inflow=45.70 cfs 12,659 af  
Primary=45.70 cfs 12,659 af

Total Runoff Area = 74.245 ac Runoff Volume = 12,659 af Average Runoff Depth = 2.05"  
100.00% Pervious = 74.245 ac 0.00% Impervious = 0,000 ac

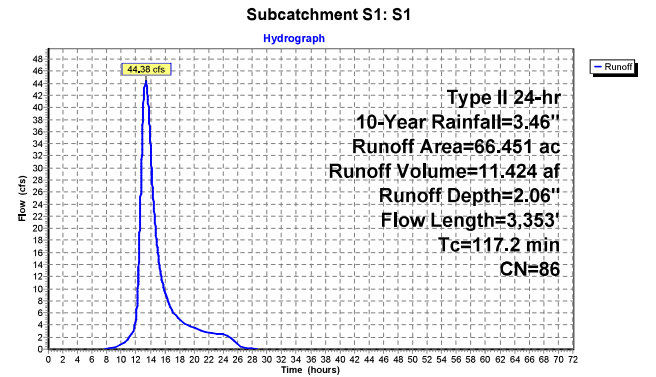
Summary for Subcatchment S1: S1

Runoff = 44.38 cfs @ 13.41 hrs, Volume= 11,424 af, Depth= 2.06"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-Year Rainfall=3.46"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 61.687  | 86 | Cultivated Crops, HSG C/D         |
| * 1.237   | 85 | Developed, Low Intensity, HSG C/D |
| * 3.527   | 80 | Developed, Open Space, HSG C/D    |
| 66.451    | 86 | Weighted Average                  |
| 66.451    |    | 100.00% Pervious Area             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------|
| 10.9     | 103           | 0.0324        | 0.16              |                | Sheet Flow,<br>Cultivated: Residue>20% n= 0.170 P2= 2.25"          |
| 94.2     | 2,042         | 0.0016        | 0.36              |                | Shallow Concentrated Flow,<br>Cultivated Straight Rows Kv= 9.0 fps |
| 12.1     | 1,208         | 0.0009        | 1.67              | 90.08          | Channel Flow,<br>Area= 54.0 sf Perim= 72.3' r= 0.75' n= 0.022      |
| 117.2    | 3,353         | Total         |                   |                |                                                                    |



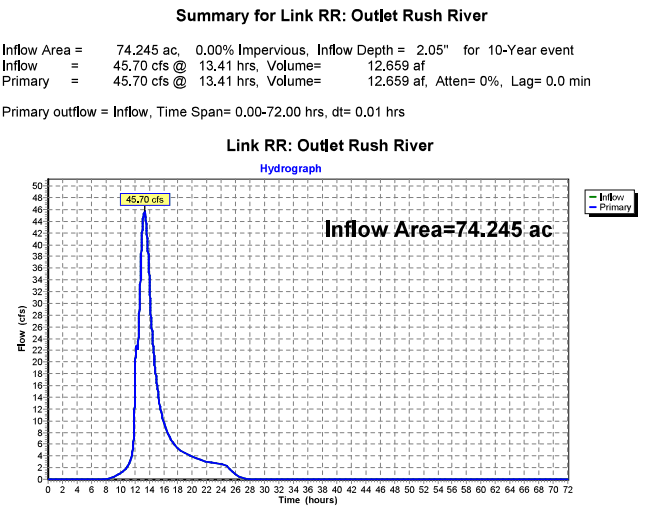
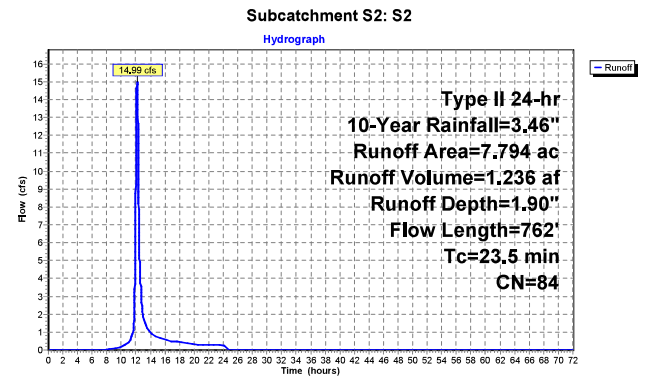
Summary for Subcatchment S2: S2

Runoff = 14.99 cfs @ 12.17 hrs, Volume= 1,236 af, Depth= 1.90"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-Year Rainfall=3.46"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 1.606   | 82 | Cultivated Crops, HSG C           |
| * 4.579   | 86 | Cultivated Crops, HSG C/D         |
| * 0.492   | 80 | Developed, Low Intensity, HSG C   |
| * 0.798   | 85 | Developed, Low Intensity, HSG C/D |
| * 0.162   | 74 | Developed, Open Space, HSG C      |
| * 0.157   | 80 | Developed, Open Space, HSG C/D    |
| 7.794     | 84 | Weighted Average                  |
| 7.794     |    | 100.00% Pervious Area             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------|
| 11.4     | 99            | 0.0271        | 0.15              |                | Sheet Flow,<br>Cultivated: Residue>20% n= 0.170 P2= 2.25"          |
| 8.7      | 274           | 0.0034        | 0.53              |                | Shallow Concentrated Flow,<br>Cultivated Straight Rows Kv= 9.0 fps |
| 3.4      | 389           | 0.0020        | 1.88              | 80.87          | Channel Flow,<br>Area= 43.0 sf Perim= 55.4' r= 0.78' n= 0.030      |
| 23.5     | 762           | Total         |                   |                |                                                                    |



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentS1: S1  
Runoff Area=66.451 ac 0.00% Impervious Runoff Depth=3.64"  
Flow Length=3,353' Tc=117.2 min CN=86 Runoff=78.12 cfs 20.131 af

SubcatchmentS2: S2  
Runoff Area=7.794 ac 0.00% Impervious Runoff Depth=3.44"  
Flow Length=762' Tc=23.5 min CN=84 Runoff=26.92 cfs 2.231 af

Link RR: Outlet Rush River  
Inflow=80.34 cfs 22.362 af  
Primary=80.34 cfs 22.362 af

Total Runoff Area = 74,245 ac Runoff Volume = 22.362 af Average Runoff Depth = 3.61"  
100,00% Pervious = 74,245 ac 0.00% Impervious = 0,000 ac

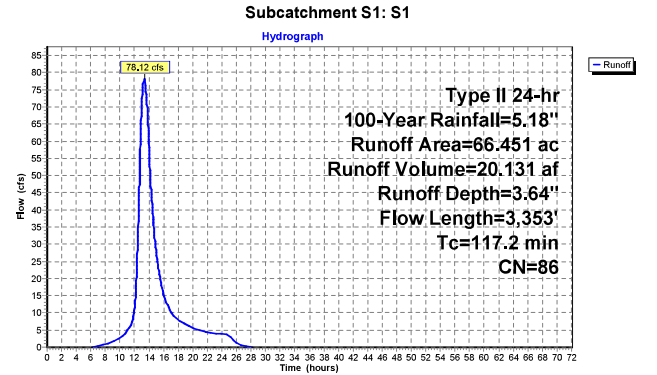
Summary for Subcatchment S1: S1

Runoff = 78.12 cfs @ 13.41 hrs, Volume= 20.131 af, Depth= 3.64"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-Year Rainfall=5.18"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 61.687  | 86 | Cultivated Crops, HSG C/D         |
| * 1.237   | 85 | Developed, Low Intensity, HSG C/D |
| * 3.527   | 80 | Developed, Open Space, HSG C/D    |
| 66.451    | 86 | Weighted Average                  |
| 66.451    |    | 100.00% Pervious Area             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------|
| 10.9     | 103           | 0.0324        | 0.16              |                | Sheet Flow,<br>Cultivated: Residue>20% n= 0.170 P2= 2.25"          |
| 94.2     | 2,042         | 0.0016        | 0.36              |                | Shallow Concentrated Flow,<br>Cultivated Straight Rows Kv= 9.0 fps |
| 12.1     | 1,208         | 0.0009        | 1.67              | 90.08          | Channel Flow,<br>Area= 54.0 sf Perim= 72.3' r= 0.75' n= 0.022      |
| 117.2    | 3,353         | Total         |                   |                |                                                                    |



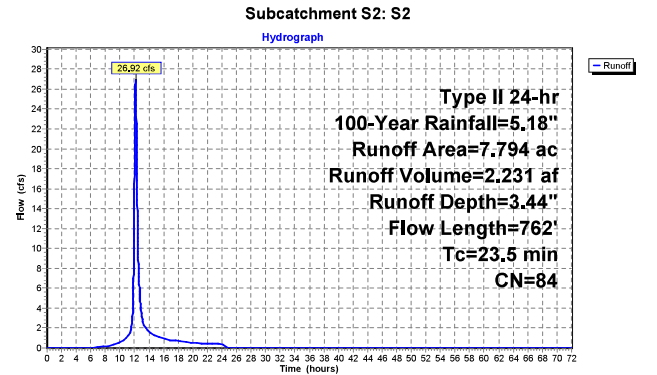
Summary for Subcatchment S2: S2

Runoff = 26.92 cfs @ 12.16 hrs, Volume= 2.231 af, Depth= 3.44"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-Year Rainfall=5.18"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 1.606   | 82 | Cultivated Crops, HSG C           |
| * 4.579   | 86 | Cultivated Crops, HSG C/D         |
| * 0.492   | 80 | Developed, Low Intensity, HSG C   |
| * 0.798   | 85 | Developed, Low Intensity, HSG C/D |
| * 0.162   | 74 | Developed, Open Space, HSG C      |
| * 0.157   | 80 | Developed, Open Space, HSG C/D    |
| 7.794     | 84 | Weighted Average                  |
| 7.794     |    | 100.00% Pervious Area             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------|
| 11.4     | 99            | 0.0271        | 0.15              |                | Sheet Flow,<br>Cultivated: Residue>20% n= 0.170 P2= 2.25"          |
| 8.7      | 274           | 0.0034        | 0.53              |                | Shallow Concentrated Flow,<br>Cultivated Straight Rows Kv= 9.0 fps |
| 3.4      | 389           | 0.0020        | 1.88              | 80.87          | Channel Flow,<br>Area= 43.0 sf Perim= 55.4' r= 0.78' n= 0.030      |
| 23.5     | 762           | Total         |                   |                |                                                                    |

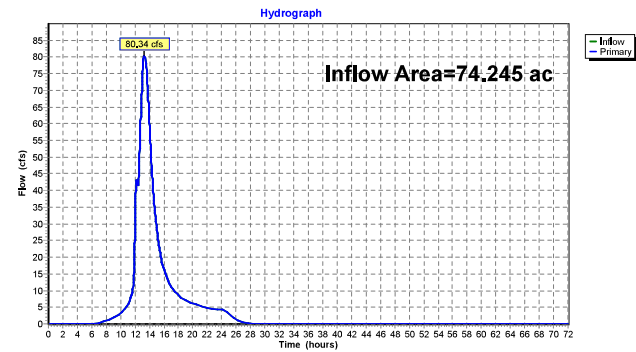


Summary for Link RR: Outlet Rush River

Inflow Area = 74,245 ac, 0.00% Impervious, Inflow Depth = 3.61" for 100-Year event  
Inflow = 80.34 cfs @ 13.29 hrs, Volume= 22.362 af  
Primary = 80.34 cfs @ 13.29 hrs, Volume= 22.362 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link RR: Outlet Rush River



## **B.2 Proposed HydroCAD Report**



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 S1: S1 Runoff Area=52.957 ac 0.00% Impervious Runoff Depth=0.77"  
Flow Length=3,353' Tc=117.2 min CN=86 Runoff=12.71 cfs 3,416 af

Subcatchment S1-P1: S1-P1 Runoff Area=6.860 ac 46.84% Impervious Runoff Depth=1.57"  
Flow Length=301' Slope=0.0050 '/' Tc=6.0 min CN=97 Runoff=17.52 cfs 0.899 af

Subcatchment S1-P2: S1-P2 Runoff Area=6.635 ac 23.90% Impervious Runoff Depth=1.30"  
Flow Length=296' Slope=0.0050 '/' Tc=6.0 min CN=94 Runoff=14.87 cfs 0.720 af

Subcatchment S2: S2 Runoff Area=7.794 ac 0.00% Impervious Runoff Depth=0.67"  
Flow Length=762' Tc=23.5 min CN=84 Runoff=5.09 cfs 0.438 af

Link RR: Outlet Rush River Inflow=34.96 cfs 5,474 af  
Primary=34.96 cfs 5,474 af

Total Runoff Area = 74.246 ac Runoff Volume = 5,474 af Average Runoff Depth = 0.88"  
93.54% Pervious = 69.447 ac 6.46% Impervious = 4,799 ac

Rainfall Events Listing (selected events)

| Event# | Event Name | Storm Type    | Curve | Mode    | Duration (hours) | B/B | Depth (inches) | AMC |
|--------|------------|---------------|-------|---------|------------------|-----|----------------|-----|
| 1      | 1-Year     | Type II 24-hr |       | Default | 24.00            | 1   | 1.90           | 2   |
| 2      | 10-Year    | Type II 24-hr |       | Default | 24.00            | 1   | 3.46           | 2   |
| 3      | 100-Year   | Type II 24-hr |       | Default | 24.00            | 1   | 5.18           | 2   |

Summary for Subcatchment S1: S1

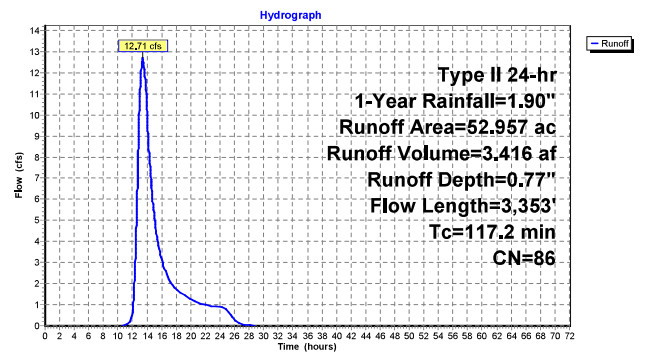
Runoff = 12.71 cfs @ 13.41 hrs, Volume= 3,416 af, Depth= 0.77"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 1-Year Rainfall=1.90"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 48.972  | 86 | Cultivated Crops, HSG C/D         |
| * 0.841   | 85 | Developed, Low Intensity, HSG C/D |
| * 3.144   | 80 | Developed, Open Space, HSG C/D    |
| 52.957    | 86 | Weighted Average                  |
| 52.957    |    | 100.00% Pervious Area             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                        |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------|
| 10.9     | 103           | 0.0324        | 0.16              |                | Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.25"                             |
| 94.2     | 2,042         | 0.0016        | 0.36              |                | Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps                    |
| 12.1     | 1,208         | 0.0009        | 1.67              | 90.08          | Channel Flow, Area= 54.0 sf Perim= 72.3' r= 0.75' n= 0.022 Earth, clean & straight |
| 117.2    | 3,353         | Total         |                   |                |                                                                                    |

Subcatchment S1: S1



Summary for Subcatchment S1-P1: S1-P1

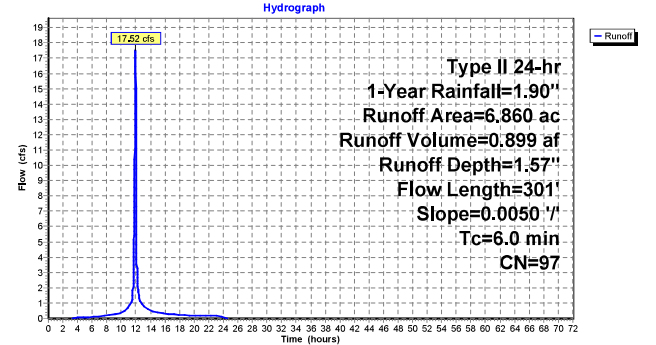
Runoff = 17.52 cfs @ 11.97 hrs, Volume= 0.899 af, Depth= 1.57"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 1-Year Rainfall=1.90"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 0.935   | 98 | Access Road, HSG C/D              |
| * 0.231   | 98 | Aug Electrical Equipment, HSG C/D |
| * 0.705   | 96 | Electrical Equipment, HSG C/D     |
| * 2.942   | 96 | Fence Gravel, HSG C/D             |
| * 2.047   | 98 | Stormwater Basin, HSG C/D         |
| 6.860     | 97 | Weighted Average                  |
| 3.647     |    | 53.16% Pervious Area              |
| 3.213     |    | 46.84% Impervious Area            |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 2.5      | 97            | 0.0050        | 0.66              |                | Sheet Flow,<br>Smooth surfaces n= 0.011 P2= 2.25"  |
| 3.0      | 204           | 0.0050        | 1.14              |                | Shallow Concentrated Flow,<br>Unpaved Kv= 16.1 fps |
| 5.5      | 301           | Total         |                   |                | Increased to minimum Tc = 6.0 min                  |

Subcatchment S1-P1: S1-P1



Summary for Subcatchment S1-P2: S1-P2

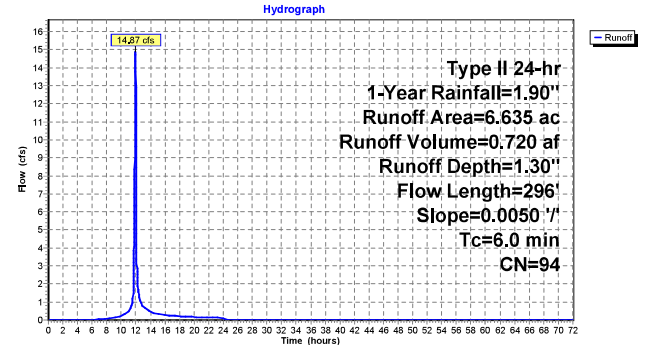
Runoff = 14.87 cfs @ 11.97 hrs, Volume= 0.720 af, Depth= 1.30"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 1-Year Rainfall=1.90"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 0.996   | 98 | Access Road, HSG C/D              |
| * 0.604   | 86 | Cultivated Crops, HSG C/D         |
| * 0.189   | 85 | Developed, Low Intensity, HSG C/D |
| * 0.343   | 80 | Developed, Open Space, HSG C/D    |
| * 0.551   | 96 | Electrical Equipment, HSG C/D     |
| * 3.362   | 96 | Fence Gravel, HSG C/D             |
| * 0.590   | 98 | Stormwater Basin, HSG C/D         |
| 6.635     | 94 | Weighted Average                  |
| 5.049     |    | 76.10% Pervious Area              |
| 1.586     |    | 23.90% Impervious Area            |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 2.0      | 76            | 0.0050        | 0.63              |                | Sheet Flow,<br>Smooth surfaces n= 0.011 P2= 2.25"  |
| 3.2      | 220           | 0.0050        | 1.14              |                | Shallow Concentrated Flow,<br>Unpaved Kv= 16.1 fps |
| 5.2      | 296           | Total         |                   |                | Increased to minimum Tc = 6.0 min                  |

Subcatchment S1-P2: S1-P2



Summary for Subcatchment S2: S2

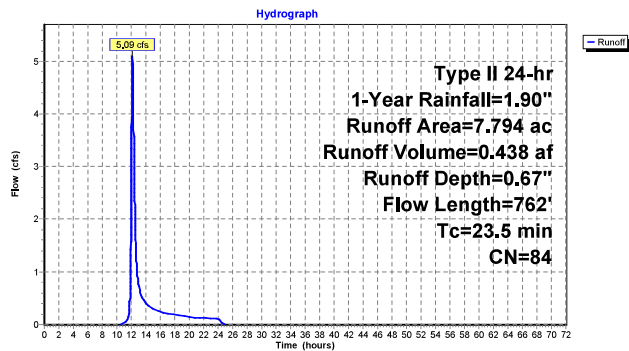
Runoff = 5.09 cfs @ 12.19 hrs, Volume= 0.438 af, Depth= 0.67"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 1-Year Rainfall=1.90"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 1.606   | 82 | Cultivated Crops, HSG C           |
| * 4.579   | 86 | Cultivated Crops, HSG C/D         |
| * 0.492   | 80 | Developed, Low Intensity, HSG C   |
| * 0.798   | 85 | Developed, Low Intensity, HSG C/D |
| * 0.162   | 74 | Developed, Open Space, HSG C      |
| * 0.157   | 80 | Developed, Open Space, HSG C/D    |
| 7.794     | 84 | Weighted Average                  |
| 7.794     |    | 100.00% Pervious Area             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------|
| 11.4     | 99            | 0.0271        | 0.15              |                | Sheet Flow,<br>Cultivated: Residue>20% n= 0.170 P2= 2.25"          |
| 8.7      | 274           | 0.0034        | 0.53              |                | Shallow Concentrated Flow,<br>Cultivated Straight Rows Kv= 9.0 fps |
| 3.4      | 389           | 0.0020        | 1.88              | 80.87          | Channel Flow,<br>Area= 43.0 sf Perim= 55.4' r= 0.78' n= 0.030      |
| 23.5     | 762           | Total         |                   |                |                                                                    |

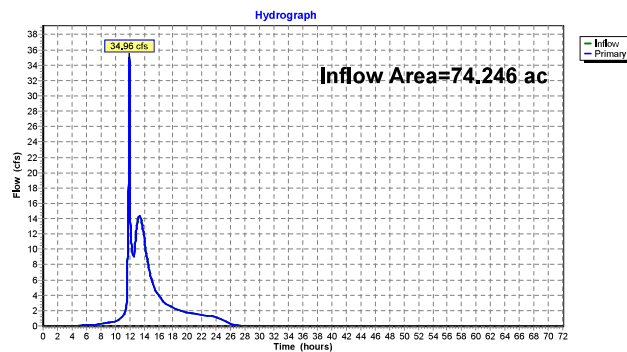
Subcatchment S2: S2



Summary for Link RR: Outlet Rush River

Inflow Area = 74.246 ac, 6.46% Impervious, Inflow Depth = 0.88" for 1-Year event  
Inflow = 34.96 cfs @ 11.97 hrs, Volume= 5.474 af  
Primary = 34.96 cfs @ 11.97 hrs, Volume= 5.474 af, Atten= 0%, Lag= 0.0 min  
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link RR: Outlet Rush River



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 S1: S1 Runoff Area=52.957 ac 0.00% Impervious Runoff Depth=2.06"  
Flow Length=3,353' Tc=117.2 min CN=86 Runoff=35.37 cfs 9,104 af

Subcatchment S1-P1: S1-P1 Runoff Area=6.860 ac 46.84% Impervious Runoff Depth=3.11"  
Flow Length=301' Slope=0.0050 '/' Tc=6.0 min CN=97 Runoff=33.21 cfs 1,781 af

Subcatchment S1-P2: S1-P2 Runoff Area=6.635 ac 23.90% Impervious Runoff Depth=2.80"  
Flow Length=296' Slope=0.0050 '/' Tc=6.0 min CN=94 Runoff=30.42 cfs 1,546 af

Subcatchment S2: S2 Runoff Area=7.794 ac 0.00% Impervious Runoff Depth=1.90"  
Flow Length=762' Tc=23.5 min CN=84 Runoff=14.99 cfs 1,236 af

Link RR: Outlet Rush River Inflow=74.51 cfs 13,666 af  
Primary=74.51 cfs 13,666 af

Total Runoff Area = 74.246 ac Runoff Volume = 13,666 af Average Runoff Depth = 2.21"  
93.54% Pervious = 69.447 ac 6.46% Impervious = 4,799 ac

Summary for Subcatchment S1: S1

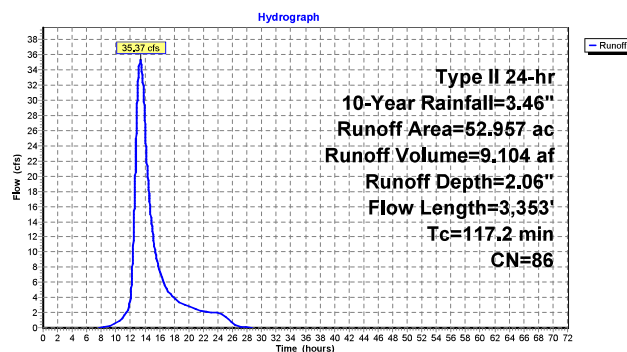
Runoff = 35.37 cfs @ 13.41 hrs, Volume= 9,104 af, Depth= 2.06"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-Year Rainfall=3.46"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 48.972  | 86 | Cultivated Crops, HSG C/D         |
| * 0.841   | 85 | Developed, Low Intensity, HSG C/D |
| * 3.144   | 80 | Developed, Open Space, HSG C/D    |
| 52.957    | 86 | Weighted Average                  |
| 52.957    |    | 100.00% Pervious Area             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                        |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------|
| 10.9     | 103           | 0.0324        | 0.16              |                | Sheet Flow, Cultivated, Residue>20% n= 0.170 P2= 2.25"                             |
| 94.2     | 2,042         | 0.0016        | 0.36              |                | Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps                    |
| 12.1     | 1,208         | 0.0009        | 1.67              | 90.08          | Channel Flow, Area= 54.0 sf Perim= 72.3' r= 0.75' n= 0.022 Earth, clean & straight |
| 117.2    | 3,353         | Total         |                   |                |                                                                                    |

Subcatchment S1: S1



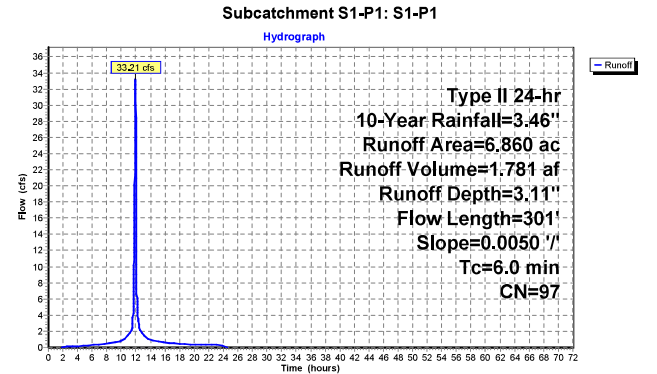
Summary for Subcatchment S1-P1: S1-P1

Runoff = 33.21 cfs @ 11.97 hrs, Volume= 1.781 af, Depth= 3.11"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-Year Rainfall=3.46"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 0.935   | 98 | Access Road, HSG C/D              |
| * 0.231   | 98 | Aug Electrical Equipment, HSG C/D |
| * 0.705   | 96 | Electrical Equipment, HSG C/D     |
| * 2.942   | 96 | Fence Gravel, HSG C/D             |
| * 2.047   | 98 | Stormwater Basin, HSG C/D         |
| 6.860     | 97 | Weighted Average                  |
| 3.647     |    | 53.16% Pervious Area              |
| 3.213     |    | 46.84% Impervious Area            |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 2.5      | 97            | 0.0050        | 0.66              |                | Sheet Flow,<br>Smooth surfaces n= 0.011 P2= 2.25"  |
| 3.0      | 204           | 0.0050        | 1.14              |                | Shallow Concentrated Flow,<br>Unpaved Kv= 16.1 fps |
| 5.5      | 301           |               |                   |                | Total, Increased to minimum Tc = 6.0 min           |



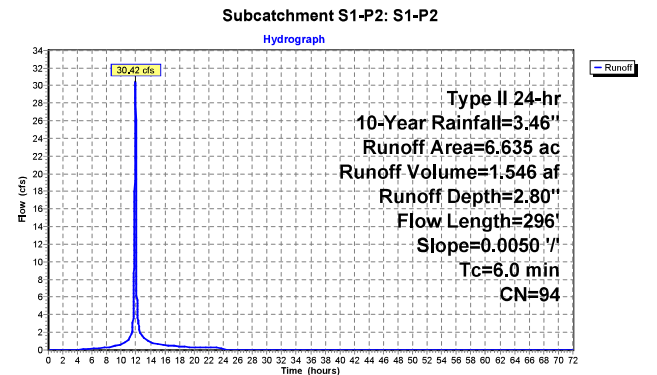
Summary for Subcatchment S1-P2: S1-P2

Runoff = 30.42 cfs @ 11.97 hrs, Volume= 1.546 af, Depth= 2.80"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-Year Rainfall=3.46"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 0.996   | 98 | Access Road, HSG C/D              |
| * 0.604   | 86 | Cultivated Crops, HSG C/D         |
| * 0.189   | 85 | Developed, Low Intensity, HSG C/D |
| * 0.343   | 80 | Developed, Open Space, HSG C/D    |
| * 0.551   | 96 | Electrical Equipment, HSG C/D     |
| * 3.362   | 96 | Fence Gravel, HSG C/D             |
| * 0.590   | 98 | Stormwater Basin, HSG C/D         |
| 6.635     | 94 | Weighted Average                  |
| 5.049     |    | 76.10% Pervious Area              |
| 1.586     |    | 23.90% Impervious Area            |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 2.0      | 76            | 0.0050        | 0.63              |                | Sheet Flow,<br>Smooth surfaces n= 0.011 P2= 2.25"  |
| 3.2      | 220           | 0.0050        | 1.14              |                | Shallow Concentrated Flow,<br>Unpaved Kv= 16.1 fps |
| 5.2      | 296           |               |                   |                | Total, Increased to minimum Tc = 6.0 min           |



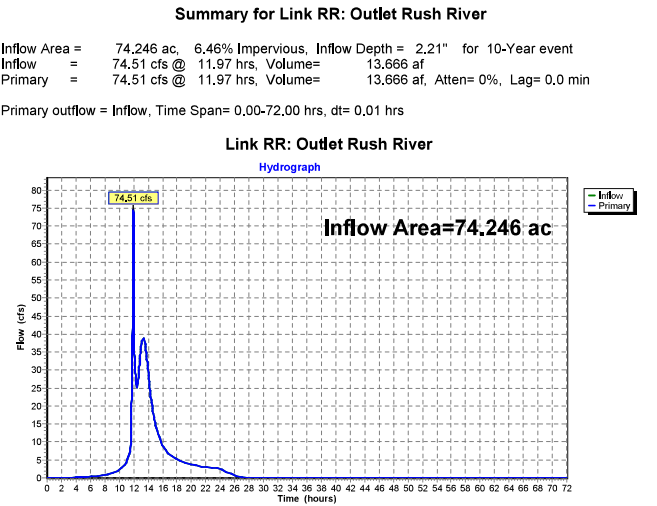
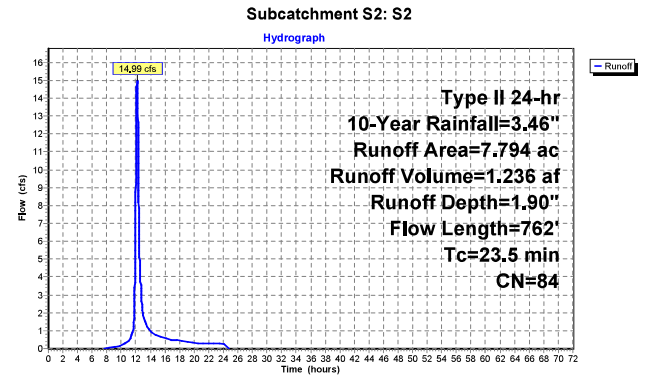
Summary for Subcatchment S2: S2

Runoff = 14.99 cfs @ 12.17 hrs, Volume= 1.236 af, Depth= 1.90"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-Year Rainfall=3.46"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 1.606   | 82 | Cultivated Crops, HSG C           |
| * 4.579   | 86 | Cultivated Crops, HSG C/D         |
| * 0.492   | 80 | Developed, Low Intensity, HSG C   |
| * 0.798   | 85 | Developed, Low Intensity, HSG C/D |
| * 0.162   | 74 | Developed, Open Space, HSG C      |
| * 0.157   | 80 | Developed, Open Space, HSG C/D    |
| 7.794     | 84 | Weighted Average                  |
| 7.794     |    | 100.00% Pervious Area             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------|
| 11.4     | 99            | 0.0271        | 0.15              |                | Sheet Flow,<br>Cultivated: Residue>20% n= 0.170 P2= 2.25"          |
| 8.7      | 274           | 0.0034        | 0.53              |                | Shallow Concentrated Flow,<br>Cultivated Straight Rows Kv= 9.0 fps |
| 3.4      | 389           | 0.0020        | 1.88              | 80.87          | Channel Flow,<br>Area= 43.0 sf Perim= 55.4' r= 0.78' n= 0.030      |
| 23.5     | 762           |               |                   |                | Total                                                              |



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 S1: S1** Runoff Area=52.957 ac 0.00% Impervious Runoff Depth=3.64"  
Flow Length=3,353' Tc=117.2 min CN=86 Runoff=62.25 cfs 16,043 af

**Subcatchment S1-P1: S1-P1** Runoff Area=6.860 ac 46.84% Impervious Runoff Depth=4.83"  
Flow Length=301' Slope=0.0050 '/' Tc=6.0 min CN=97 Runoff=50.30 cfs 2,759 af

**Subcatchment S1-P2: S1-P2** Runoff Area=6.635 ac 23.90% Impervious Runoff Depth=4.49"  
Flow Length=296' Slope=0.0050 '/' Tc=6.0 min CN=94 Runoff=47.29 cfs 2,480 af

**Subcatchment S2: S2** Runoff Area=7.794 ac 0.00% Impervious Runoff Depth=3.44"  
Flow Length=762' Tc=23.5 min CN=84 Runoff=26.92 cfs 2,231 af

**Link RR: Outlet Rush River** Inflow=119.60 cfs 23,514 af  
Primary=119.60 cfs 23,514 af

**Total Runoff Area = 74.246 ac Runoff Volume = 23,514 af Average Runoff Depth = 3.80"**  
**93.54% Pervious = 69.447 ac 6.46% Impervious = 4.799 ac**

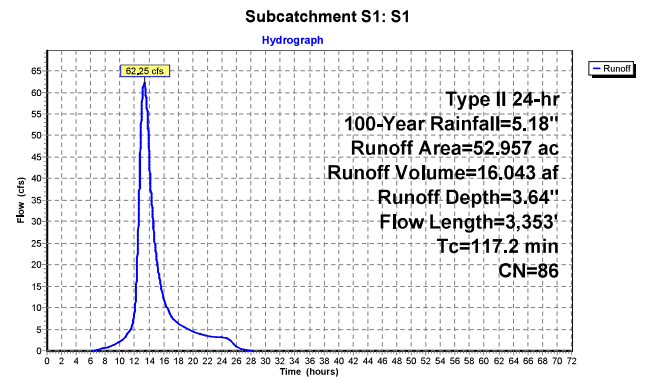
Summary for Subcatchment S1: S1

Runoff = 62.25 cfs @ 13.41 hrs, Volume= 16.043 af, Depth= 3.64"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-Year Rainfall=5.18"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 48.972  | 86 | Cultivated Crops, HSG C/D         |
| * 0.841   | 85 | Developed, Low Intensity, HSG C/D |
| * 3.144   | 80 | Developed, Open Space, HSG C/D    |
| 52.957    | 86 | Weighted Average                  |
| 52.957    |    | 100.00% Pervious Area             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                        |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------|
| 10.9     | 103           | 0.0324        | 0.16              |                | Sheet Flow, Cultivated: Residue>20% n= 0.170 P2= 2.25"                             |
| 94.2     | 2,042         | 0.0016        | 0.36              |                | Shallow Concentrated Flow, Cultivated Straight Rows Kv= 9.0 fps                    |
| 12.1     | 1,208         | 0.0009        | 1.67              | 90.08          | Channel Flow, Area= 54.0 sf Perim= 72.3' r= 0.75' n= 0.022 Earth, clean & straight |
| 117.2    | 3,353         | Total         |                   |                |                                                                                    |



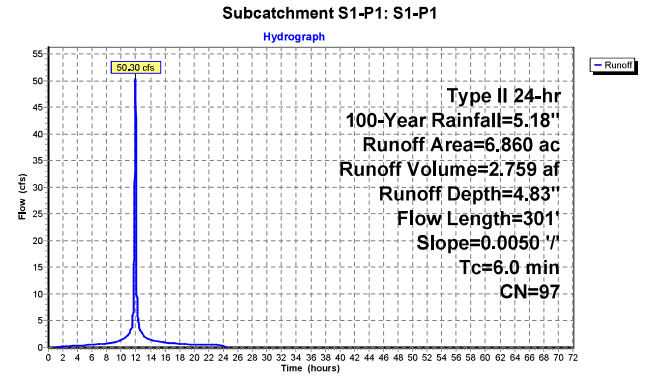
Summary for Subcatchment S1-P1: S1-P1

Runoff = 50.30 cfs @ 11.97 hrs, Volume= 2.759 af, Depth= 4.83"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-Year Rainfall=5.18"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 0.935   | 98 | Access Road, HSG C/D              |
| * 0.231   | 98 | Aug Electrical Equipment, HSG C/D |
| * 0.705   | 96 | Electrical Equipment, HSG C/D     |
| * 2.942   | 96 | Fence Gravel, HSG C/D             |
| * 2.047   | 98 | Stormwater Basin, HSG C/D         |
| 6.860     | 97 | Weighted Average                  |
| 3.647     |    | 53.16% Pervious Area              |
| 3.213     |    | 46.84% Impervious Area            |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 2.5      | 97            | 0.0050        | 0.66              |                | Sheet Flow,<br>Smooth surfaces n= 0.011 P2= 2.25"  |
| 3.0      | 204           | 0.0050        | 1.14              |                | Shallow Concentrated Flow,<br>Unpaved Kv= 16.1 fps |
| 5.5      | 301           | Total         |                   |                | Increased to minimum Tc = 6.0 min                  |



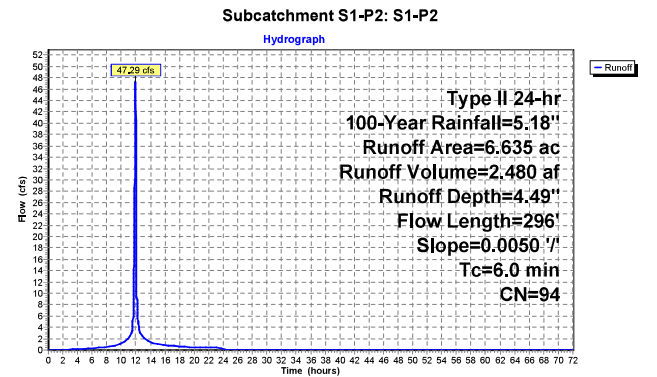
Summary for Subcatchment S1-P2: S1-P2

Runoff = 47.29 cfs @ 11.97 hrs, Volume= 2.480 af, Depth= 4.49"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-Year Rainfall=5.18"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 0.996   | 98 | Access Road, HSG C/D              |
| * 0.604   | 86 | Cultivated Crops, HSG C/D         |
| * 0.189   | 85 | Developed, Low Intensity, HSG C/D |
| * 0.343   | 80 | Developed, Open Space, HSG C/D    |
| * 0.551   | 96 | Electrical Equipment, HSG C/D     |
| * 3.362   | 96 | Fence Gravel, HSG C/D             |
| * 0.590   | 98 | Stormwater Basin, HSG C/D         |
| 6.635     | 94 | Weighted Average                  |
| 5.049     |    | 76.10% Pervious Area              |
| 1.586     |    | 23.90% Impervious Area            |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 2.0      | 76            | 0.0050        | 0.63              |                | Sheet Flow,<br>Smooth surfaces n= 0.011 P2= 2.25"  |
| 3.2      | 220           | 0.0050        | 1.14              |                | Shallow Concentrated Flow,<br>Unpaved Kv= 16.1 fps |
| 5.2      | 296           | Total         |                   |                | Increased to minimum Tc = 6.0 min                  |



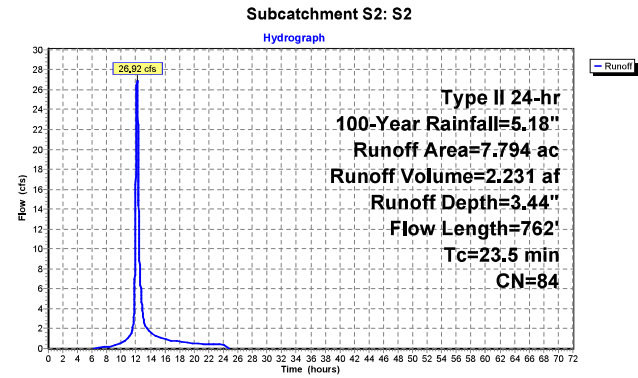
Summary for Subcatchment S2: S2

Runoff = 26.92 cfs @ 12.16 hrs, Volume= 2.231 af, Depth= 3.44"  
Routed to Link RR : Outlet Rush River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-Year Rainfall=5.18"

| Area (ac) | CN | Description                       |
|-----------|----|-----------------------------------|
| * 1.606   | 82 | Cultivated Crops, HSG C           |
| * 4.579   | 86 | Cultivated Crops, HSG C/D         |
| * 0.492   | 80 | Developed, Low Intensity, HSG C   |
| * 0.788   | 85 | Developed, Low Intensity, HSG C/D |
| * 0.162   | 74 | Developed, Open Space, HSG C      |
| * 0.157   | 80 | Developed, Open Space, HSG C/D    |
| 7.794     | 84 | Weighted Average                  |
| 7.794     |    | 100.00% Pervious Area             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------|
| 11.4     | 99            | 0.0271        | 0.15              |                | Sheet Flow,<br>Cultivated: Residue>20% n= 0.170 P2= 2.25"          |
| 8.7      | 274           | 0.0034        | 0.53              |                | Shallow Concentrated Flow,<br>Cultivated Straight Rows Kv= 9.0 fps |
| 3.4      | 389           | 0.0020        | 1.88              | 80.87          | Channel Flow,<br>Area= 43.0 sf Perim= 55.4' r= 0.78' n= 0.030      |
| 23.5     | 762           | Total         |                   |                |                                                                    |



Summary for Link RR: Outlet Rush River

Inflow Area = 74.246 ac, 6.46% Impervious, Inflow Depth = 3.80" for 100-Year event  
Inflow = 119.60 cfs @ 11.97 hrs, Volume= 23.514 af  
Primary = 119.60 cfs @ 11.97 hrs, Volume= 23.514 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

