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# Stormwater Management Plan

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Hermantown Industrial  
Hermantown, MN

City of Hermantown

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Prepared for:  
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Prepared On: August 11, 2025  
Revised On: July 17, 2026

**Stormwater Management Report**

for

**Hermantown Industrial**

Prepared for:

**Harmony Group, LLC**  
60 S. 6th Street, Suite 3400  
Minneapolis, MN 55402

**July 17, 2026**

Prepared By:

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I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

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Jason Scrimshaw, PE

Date: 7-17-2026 Registration No. 53203

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## **1.0 Introduction**

The Hermantown Industrial development encompasses approximately 234 acres located in the City of Hermantown Minnesota. The project site is bordered by Morris Thomas Road to the north, Midway Road to the east, an existing Minnesota Power substation to the west and a wetland area to the south. The site has topographic relief with elevations ranging from approximately 1340 feet on the north end of the site to 1270 feet on the south and east side of the site. The site generally drains to the south with a small portion of the northeast corner draining to the east.

Hermantown Industrial will be constructed in phases; this report analyses the stormwater requirements of the full build out (Day-N) conditions and verifies the interim (Day-1) conditions meet the applicable stormwater standards.

Kimley-Horn and Associates, Inc. (Kimley-Horn) has analyzed the existing and proposed drainage conditions of the site, and this report provides computations for all applicable City of Hermantown and MPCA stormwater requirements. The analysis of the existing and proposed drainage systems was completed with the assistance of HydroCAD, Version 10, a computer aided design system for modeling the hydrology and hydraulics of stormwater runoff. These calculations are largely based on the hydrology techniques developed by the Soil Conservation Service (SCS/NRCS), combined with other hydrology and hydraulics calculations. For a given rainfall event, these techniques are used to generate hydrographs throughout a watershed.

Atlas 14 precipitation frequency data (PFD) was used as a basis for the design frequency events, with PFD retrieved from the nearest weather station for the project.

## **2.0 Pre-development Conditions**

The existing project site includes single-family residential areas along with significant wooded regions wetlands. There are two main discharge points analyzed for the site. Discharge point 1 is defined as the area of the site that drains northeast and leaves the site through a culvert under Midway Rd near the intersection with Morris Thomas Rd. Discharge point 1 receives drainage from approximately 60 acres of the site flowing through wetlands before ponding and flowing through the existing culvert. Discharge point 2 is defined at the stormwater leaving the site at an existing culvert in the southeast portion of the site. About 174 acres of this site drains to discharge point 2 through existing wetlands before crossing Midway Rd through the existing culvert. Both discharge points eventually converge and flow into the Midway River at the same location, through an existing culvert under the railroad tracks approximately 1,450 feet north of St. Louis River Road. No on-site detention or water treatment facilities are present in the existing conditions. Refer to the appendix for the Existing Drainage Map.

A preliminary geotechnical investigation was conducted by Braun Intertec and completed on December 20, 2024. This investigation included 11 soil borings. The soil type found throughout the site is classified as CL (Sandy Lean Clay) according to ASTM standards. These clayey soils are categorized as Type C/D soils and have an estimated infiltration rate of 0.06 inches per hour, based on the Minnesota Stormwater

Manual. Practically, the current site soils are not suitable for infiltration as a stormwater management option. Refer to the appendix for the full Geotechnical Report.

A summary of the pervious and impervious coverage for existing conditions is included below:

- *Total modeled area = 234.0 acres*
  - *Existing Pervious Area = 228.3 acres (98%)*
  - *Existing Impervious Area = 5.7 acres (2%)*
  - *Weighted Curve Number (CN) = 71*

To accurately represent existing vs proposed conditions, the modeled area in existing conditions was sized to the extent of the disturbed area in proposed conditions. See the appendix for the Existing Conditions HydroCAD report.

### **3.0 Post-development Conditions**

In proposed conditions, stormwater will be managed in seven (7) onsite filtration and detention ponds located throughout the property. Filtration with underdrains is used due to the inability to infiltrate with the presence of poor soils. The proposed system will maintain existing drainage patterns with treated stormwater discharges to the northeast wetland complex (W1) and the southeast wetland complex (W7).

Each pond will be designed to fully treat the required Water Quality Volume (WQv) for its respective drainage areas utilizing the full bottom area of each pond for filtration. Additionally, each pond will include storage capacity to manage discharge rates for the 2-, 10-, and 100-year, 24-hour storm. The design aims to efficiently manage water quality treatment and flood control across the site, while also optimizing the performance and longevity of the filtration media.

The Day-1 scenario includes the development of approximately 66.3 acres of the western and southern portions of the site. Three (3) ponds will be constructed for Day-1 treatment and detention. Each pond will be routed to the existing wetland complex in the southeast (W7).

- Pond 1: ± 2.7-acre pond located in the southwest portion of the site that serves 33.19 acres of drainage area. Pond 1 equalizes with Pond 2 to the east before flowing into W7 to the east.
- Pond 2: ± 3.1 acre pond located in the southwest portion of the site that serves 51.39 acres of drainage area. Pond 1&2 discharges to W7 to the east through an outlet control structure designed to manage the water quality volume and rate control.
- Pond 3: ± 0.7-acre pond located in the southeast portion of the site serving 7.74 acres of drainage area. Pond 3 discharges to W7 to the east through an outlet control structure designed to manage the water quality volume and rate control.

The Day-N scenario includes the development of the remaining 167.7 acres of the northern and eastern portions of the site. Four (4) additional ponds will be constructed in the Day-N scenario to manage the treatment and detention of the fully developed site. One pond will be routed to the existing wetland

complex in the southeast (W7) and three ponds will be routed to the existing wetland complex in the northeast (W1).

- Pond 4:  $\pm$  1.9-acre pond located in the southeast portion of the site that serves 13.97 acres of drainage area. Pond 4 discharges to the south into W7 through an outlet control structure designed to manage the water quality volume and rate control.
- Pond 5:  $\pm$  2.0-acre pond located in the northeast portion of the site that serves 27.85 acres of drainage area. Pond 5 discharges to the east into W1 through an outlet control structure designed to manage the water quality volume and rate control.
- Pond 6:  $\pm$  1.1-acre pond located in the northeast portion of the site that serves 18.28 acres of drainage area. Pond 6 discharges to the northeast into W1 through an outlet control structure designed to manage the water quality volume and rate control.
- Pond 7:  $\pm$  3.0-acre pond located in the northeast portion of the site that serves 21.46 acres of drainage area. Pond 7 discharges to the north into W1 through an outlet control structure designed to manage the water quality volume and rate control.

A summary of the pervious and impervious coverage for proposed conditions is included below.

- *Total Day-N modeled area = 234.0 acres*
  - *Proposed Day-N Pervious Area = 140.28 acres (60%)*
  - *Proposed Day-N Impervious Area = 93.72 acres (40%)*
  - *Weighted Curve Number (CN) = 83*

*Table 1: Proposed Conditions Summary*

| Discharge Point | Existing Onsite Drainage Area (ac) | Proposed Onsite Drainage Area (ac) | Description                         |
|-----------------|------------------------------------|------------------------------------|-------------------------------------|
| #1              | 60.10                              | 92.87                              | Northeast Culvert, across Midway Rd |
| #2              | 173.9                              | 141.13                             | Southeast culvert, across Midway Rd |

## 4.0 Rate Attenuation Summary

Land development inherently increases impervious surfaces, leading to a substantial rise in total runoff rate and volume. The City requires that the runoff rate does not exceed the existing runoff rates for the 2-, 10- and 100-year, 24-hour storm events. The proposed development achieves this requirement using multi-stage outlet control structures in each pond. Discharge Point #1 is the culvert crossing Midway Road in the northeast corner of the property. Discharge Point #2 is the culvert crossing Midway Road in the southeast corner of the property.

The 100-year post-construction peak runoff rates are reduced to far below existing conditions to mitigate the excess runoff volume discharging into the receiving wetland. Over-detaining the peak flows regulates the release of this increased volume, preventing high-energy, erosive surges from disrupting the wetland's delicate hydrologic balance. Reducing the peak discharge rate also addresses infrastructure vulnerabilities

by mitigating the roadway overtopping observed at discharge point 2 during the 100-year existing conditions analysis. The existing and proposed rate control results are listed in Table 2. See Appendix for detailed HydroCAD analysis.

*Table 2: Rate Attenuation*

|                                | 2 Year<br>(2.88 in.) | 10 Year<br>(4.29in.) | 100 Year<br>(7.42 in.) |
|--------------------------------|----------------------|----------------------|------------------------|
| <b>Discharge Point #1 - NE</b> |                      |                      |                        |
| Pre-Development Rate (CFS)     | 16.77                | 21.29                | 26.51                  |
| Post-Development Rate (CFS)    | 16.02                | 19.11                | 25.24                  |
| <b>Discharge Point #2 - SE</b> |                      |                      |                        |
| Pre-Development Rate (CFS)     | 26.87                | 59.09                | 207.44                 |
| Post-Development Rate (CFS)    | 14.84                | 30.29                | 62.82                  |

## 5.0 Water Quality Summary

The City of Hermantown minimum stormwater management requirements state that new developments must treat stormwater for 9,100 SF per lot plus the stormwater from additional impervious surfaces. Since the development is >> 9,100 SF, the treatment volume uses the MPCA guidance of 1" over the proposed impervious surfaces. Biofiltration with underdrain is the treatment method for stormwater throughout the site. Treatment depth is limited to 1.6' to comply with the more stringent drawdown times for discharges to trout streams. The maximum drawdown time is 24-hours and the design filtration rate is assumed to be 0.8 in/hr based on guidance from the Minnesota Stormwater Manual.

Ponds 1 and 2 will work as a single system since they are controlled by the same outlet structure. All other ponds will have their own outlet control structure and will manage the water quality for their respective drainage areas.

Pre-treatment will be provided upstream of each pond to increase the longevity of the filter media and increase sitewide pollutant removal rates. Tier 1 pretreatment structures based on the Minnesota stormwater manual are anticipated to be used.

See Table 3 below for a summary of required water quality volume and proposed filtration volume.

*Table 3: Water Quality Volume Summary*

| Day 1        |                                  |                                          |                                       |
|--------------|----------------------------------|------------------------------------------|---------------------------------------|
|              | Proposed<br>Impervious Area (ac) | Required Water<br>Quality Volume (ac-ft) | Filtration Volume<br>Provided (ac-ft) |
| Pond 1       | 12.03                            | 1.00                                     | 7.32                                  |
| Pond 2       | 36.80                            | 3.07                                     |                                       |
| Pond 3       | 3.57                             | 0.30                                     | 0.65                                  |
| <b>Total</b> | <b>52.40</b>                     | <b>4.37</b>                              | <b>7.97</b>                           |

| Day N        |                                  |                                          |                                       |
|--------------|----------------------------------|------------------------------------------|---------------------------------------|
|              | Proposed<br>Impervious Area (ac) | Required Water<br>Quality Volume (ac-ft) | Filtration Volume<br>Provided (ac-ft) |
| Pond 4       | 7.18                             | 0.60                                     | 2.30                                  |
| Pond 5       | 13.10                            | 1.09                                     | 2.38                                  |
| Pond 6       | 9.24                             | 0.77                                     | 1.22                                  |
| Pond 7       | 11.80                            | 0.98                                     | 3.62                                  |
| <b>Total</b> | <b>41.32</b>                     | <b>3.44</b>                              | <b>9.52</b>                           |

Additionally, the City of Hermantown requires no net increase in Total Suspended Solids (TSS) and no net increase in Total Phosphorous (TP) on an annual basis when compared to existing conditions. The existing and proposed water quality was modeled using MIDS version 4.

The water quality model utilizes specific Event Mean Concentrations (EMCs) to estimate the pollutant runoff for both existing and proposed site conditions, aligned with guidance from the Minnesota Stormwater Manual.

- The proposed conditions model applies a lower EMC for phosphorus compared to the existing conditions. This reduction reflects the shift away from the site's previous land use, which was more prone to exporting organic debris and vegetative waste. The proposed layout minimizes these sources, resulting in a lower expected concentration of phosphorus runoff.
- Conversely, a higher EMC for TSS is used for the proposed conditions. This adjustment accounts for the increase in post-construction impervious surfaces, such as roadways and parking areas. These surfaces naturally accumulate higher amounts of vehicle grit, sediment, and airborne dust, which are easily washed off during rain events and increase the overall concentration of suspended solids leaving the site.

By adjusting these values to match the specific land-use changes rather than relying strictly on standard defaults, the model provides a more realistic assessment of post-development runoff and ensures that the downstream water quality Ponds are sized appropriately. See Table 4 for a summary of existing and proposed TSS and TP loading on an annual basis.

*Table 4: Water Quality Modeling Results*

|                             | <i>TSS EMC<br/>(mg/l)</i> | <i>Phosphorous<br/>EMC (mg/l)</i> | <i>Annual TSS<br/>Discharge (lbs)</i> | <i>Annual TP<br/>Discharge (lbs)</i> |
|-----------------------------|---------------------------|-----------------------------------|---------------------------------------|--------------------------------------|
| Pre-Development Conditions  | 54.5                      | 0.3                               | 6952.9                                | 38.27                                |
| Post Development Conditions | 75                        | 0.2                               | 2563.3                                | 28.39                                |

## 6.0 Receiving Waters Impacts Summary

The MPCA NPDES Construction Stormwater Permit outlines requirements for discharge to trout streams. The permanent stormwater treatment system must minimize any increase in the temperature of trout

streams resulting from the one and two year 24-hour precipitation events. This includes all tributaries of designated trout streams located within the same Public Land Survey System (PLSS) Section. Permittees must incorporate one or more of the following measures, in order of MPCA's preference:

- a) Provide stormwater infiltration or other volume reduction practices.
- b) Filtration systems must discharge all stormwater routed to the system within 24 hours.**
- c) Minimize the discharge from connected impervious surfaces by discharging to vegetated areas, or grass swales, and using other non-structural controls.
- d) If ponding is used, the design must include an appropriate combination of measures such as shading, vegetated swale discharge or constructed wetland treatment cells that limit temperature increases. The pond must be designed as a dry pond and should drawdown in 24 hours or less. Additionally, outlet controls would be designed to draw from the bottom of pond.
- e) Other methods that minimize any increase in the temperature of the trout streams.

The stormwater management system incorporates these mitigation measures to the greatest extent practicable. Each filtration pond is engineered to drain the WQv within 24 hours, utilizing native plantings to promote evapotranspiration and provide shading during warmer seasons. Rather than discharging directly into the trout stream, the runoff flows into an established wetland complexes with dense vegetation for approximately 1,000 feet prior to discharging to a trout stream or tributary, further reducing temperature impacts before reaching the river.

The post-construction peak runoff rates are reduced to far below existing conditions to mitigate the excess runoff volume discharging into the receiving wetland. Over-detaining the peak flows regulates the release of this increased volume, preventing high-energy, erosive surges from disrupting the wetland's delicate hydrologic balance and reducing temperature surges.

According to the MPCA's 2025 Midway River Watershed Protection Study, trout and several other fish and macroinvertebrates in the Midway River Watershed depend on cold-water temperatures (7.8°C to 20.0°C) for survival. They thrive in clean water with minimal silt, sediment, and low nitrate and phosphate levels. The project strives to reduce impacts to the Midway River by reducing the total sediment load and nutrient loads to the midway river and implementing green infrastructure, such as biofiltration basins, pretreatment systems, and maintaining vegetative buffers around wetlands and tributaries.

A hydrogeological analysis in relation to the wetlands to the southeast and northeast of the Study Area is planned. This study will quantify how proposed land-use changes affect groundwater recharge rates and offsite hydrology. The primary goal of this analysis is to ensure the protection of nearby groundwater drinking water resources and the adjacent trout stream. Should potential impacts be identified, a formal groundwater mitigation plan will be developed and implemented to maintain existing thermal and hydrologic conditions. This study will quantify to what degree proposed land use changes affect groundwater recharge rates and offsite hydrology and assesses the significance of the impact.

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# Appendices

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|             |                                          |
|-------------|------------------------------------------|
| Appendix 1. | Existing Conditions Drainage Map         |
| Appendix 2. | Proposed Conditions Drainage Map         |
| Appendix 3. | Stormwater Summary Table                 |
| Appendix 4. | Pre Development HydroCAD Model Analysis  |
| Appendix 5. | Post Development HydroCAD Model Analysis |
| Appendix 6. | MIDs Calculator Results                  |
| Appendix 7. | Soil Boring Logs                         |

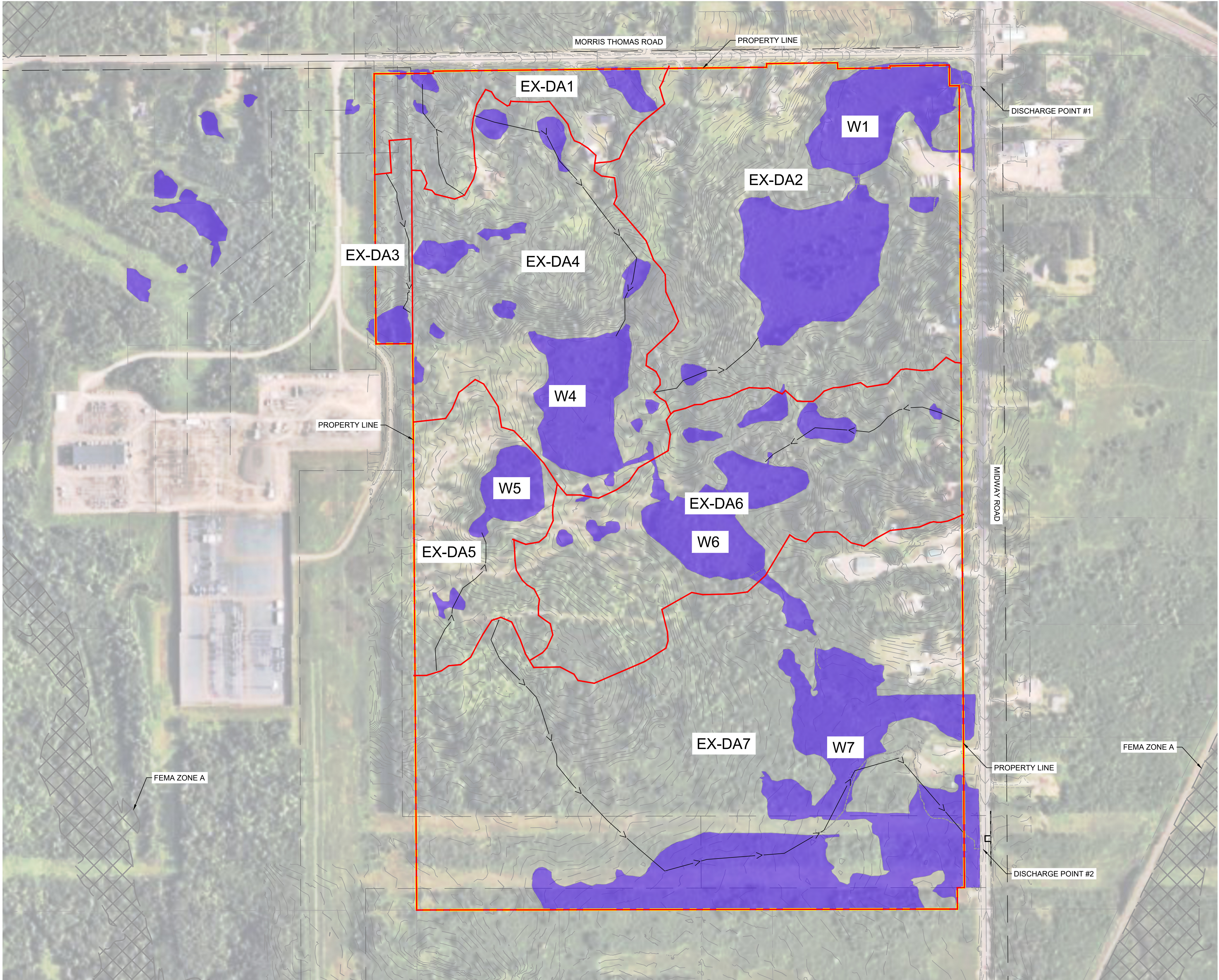
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## **Appendix 1. Existing Conditions Drainage Map**

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# HERMANTOWN INDUSTRIAL - EXISTING CONDITIONS DRAINAGE MAP

HERMANTOWN, MN  
ST. LOUIS COUNTY



EXISTING DRAINAGE AREAS

TIME OF CONCENTRATION FLOWPATH

EXISTING WETLAND DELINEATION

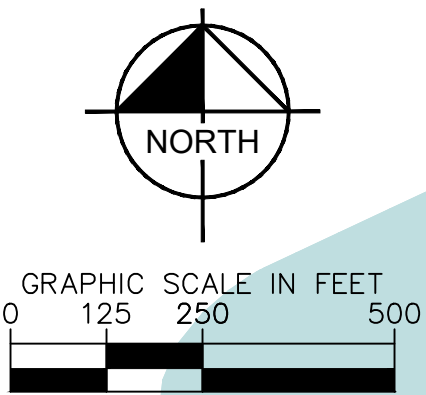
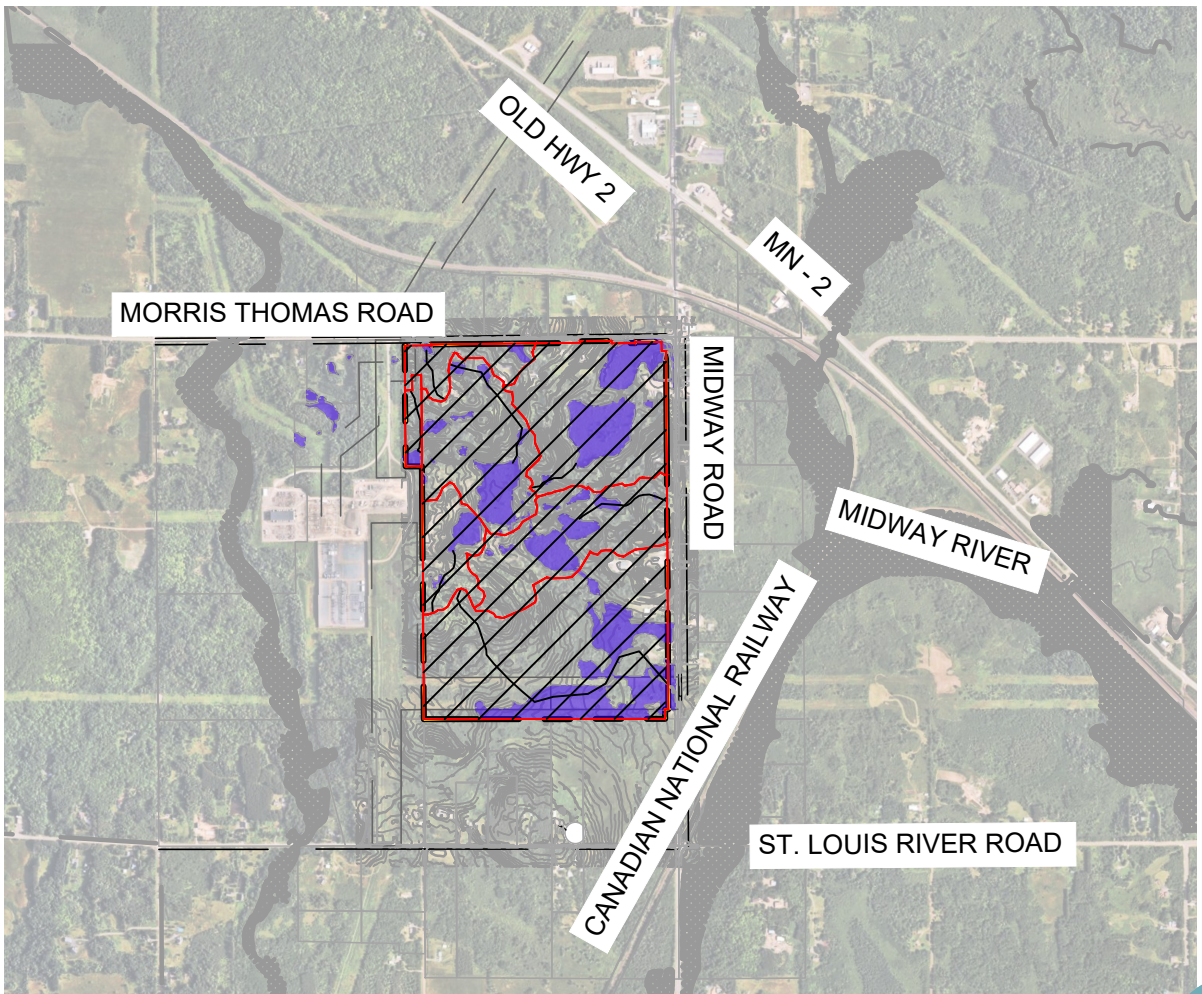
EXISTING 2FT LiDAR CONTOURS

EXISTING PARCEL LINES

\*NOTE:

- FEMA FLOODZONE INFORMATION SHOWN PER FEMA FLOOD MAP #2707080010B
- WETLAND AND WATERWAY INFORMATION SHOWN PER U.S. FISH & WILDLIFE SERVICE NATIONAL WETLANDS INVENTORY

VICINITY MAP: NOT TO SCALE



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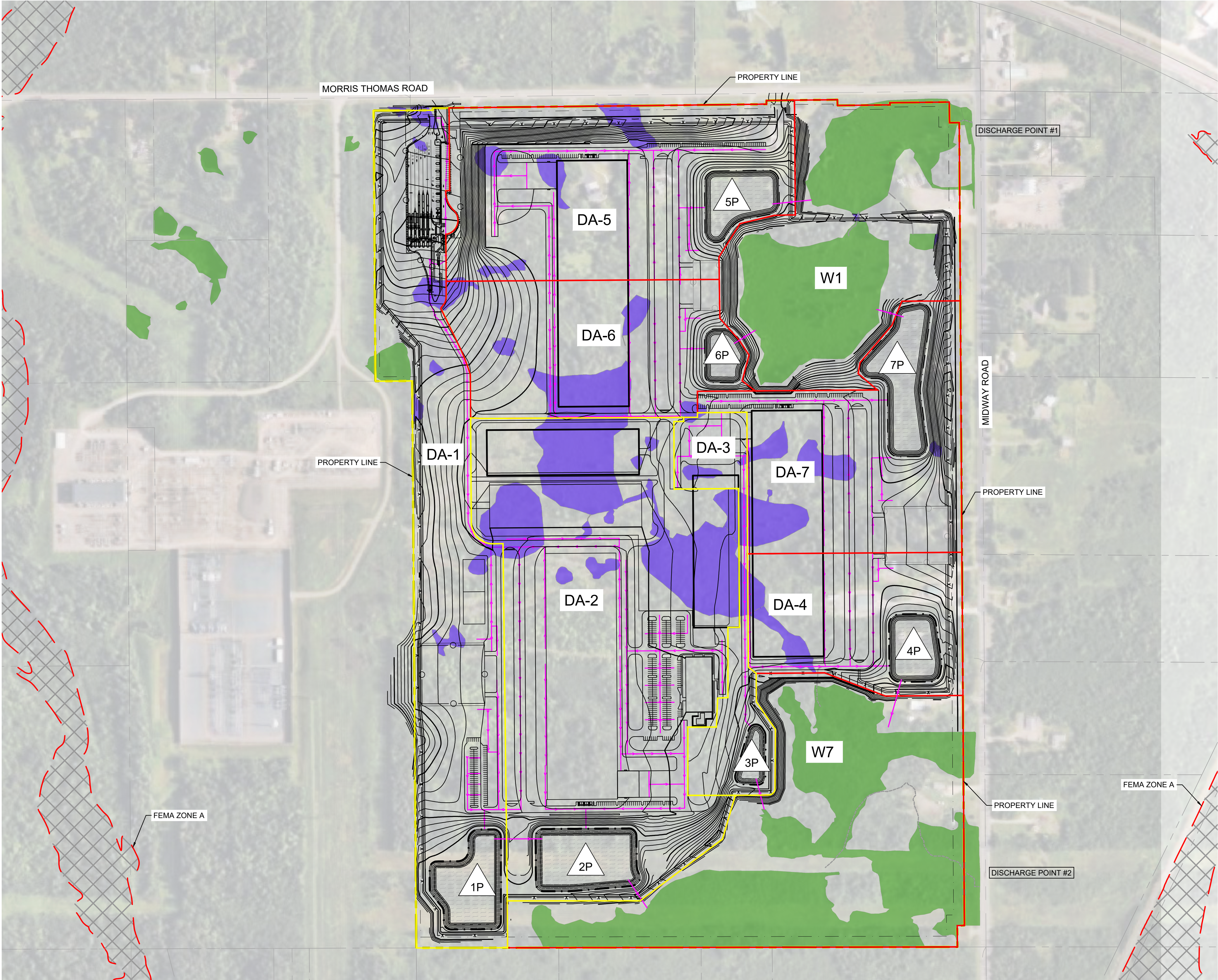
## **Appendix 2. Proposed Conditions Drainage Map**

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# HERMANTOWN INDUSTRIAL - PROPOSED CONDITIONS

## DRAINAGE MAP

HERMANTOWN, MN  
ST. LOUIS COUNTY

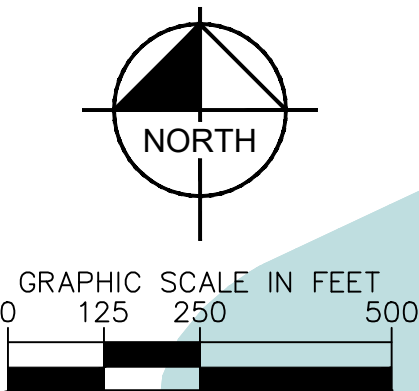
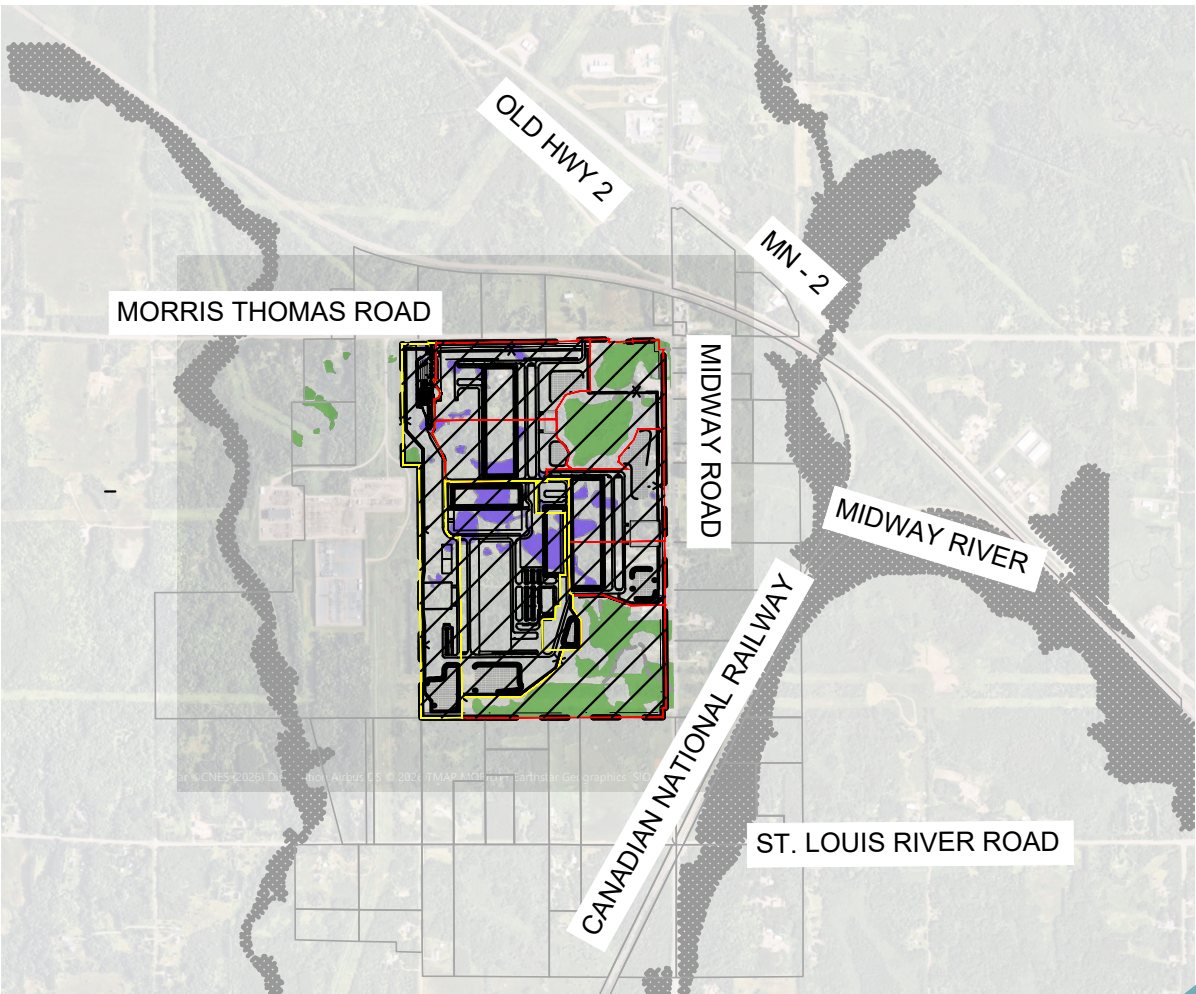


### LEGEND

|                                |  |
|--------------------------------|--|
| DRAINAGE AREAS - DAY 1         |  |
| DRAINAGE AREAS - DAY N         |  |
| PROPOSED STORMWATER POND       |  |
| PROPOSED STORMWATER CONVEYANCE |  |
| IMPACTED WETLAND               |  |
| UN-IMPACTED WETLAND            |  |
| EXISTING LIDAR CONTOURS        |  |
| PROPOSED CONTOURS              |  |
| EXISTING PARCEL LINES          |  |

\*NOTE:  
• STORMWATER CONVEYANCE AND TREATMENT IS SCHEMATIC AND WILL BE FURTHER REFINED  
• FEMA FLOODZONE INFORMATION SHOWN PER FEMA FLOOD MAP #2707080010B

### VICINITY MAP: NOT TO SCALE



Kimley»Horn

07.17.2026

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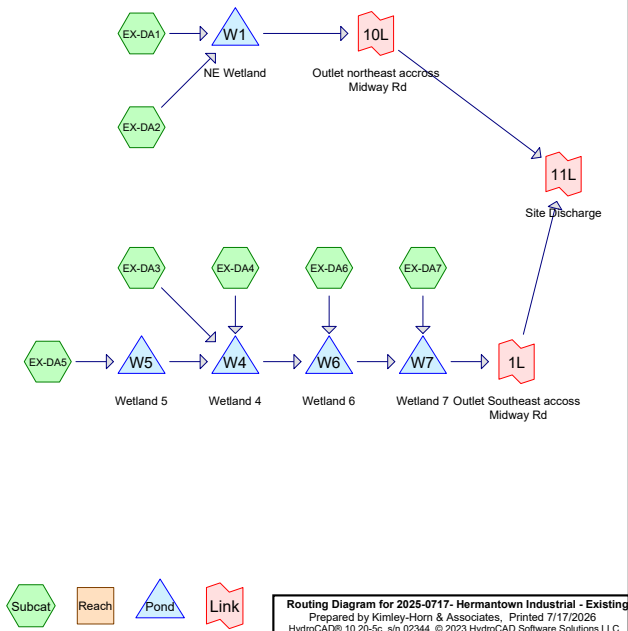
## **Appendix 3. Pre Development HydroCAD Model Analysis**

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Rainfall Events Listing (selected events)

| Event# | Event Name | Storm Type | Curve | Mode    | Duration (hours) | B/B | Depth (inches) | AMC |
|--------|------------|------------|-------|---------|------------------|-----|----------------|-----|
| 1      | 2-yr       | MSE 24-hr  | 3     | Default | 24.00            | 1   | 2.70           | 2   |
| 2      | 10-yr      | MSE 24-hr  | 3     | Default | 24.00            | 1   | 4.00           | 2   |
| 3      | 100-yr     | MSE 24-hr  | 3     | Default | 24.00            | 1   | 6.40           | 2   |

Existing Conditions



2025-0717- Hermantown Industrial - Existing

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Area Listing (selected nodes)

| Area (acres) | CN | Description (subcatchment-numbers)                                          |
|--------------|----|-----------------------------------------------------------------------------|
| 5.730        | 98 | Unconnected pavement, HSG C (EX-DA1, EX-DA2, EX-DA4, EX-DA6, EX-DA7)        |
| 228.270      | 70 | Woods, Good, HSG C (EX-DA1, EX-DA2, EX-DA3, EX-DA4, EX-DA5, EX-DA6, EX-DA7) |
| 234.000      | 71 | TOTAL AREA                                                                  |

2025-0717- Hermantown Industrial - Existing

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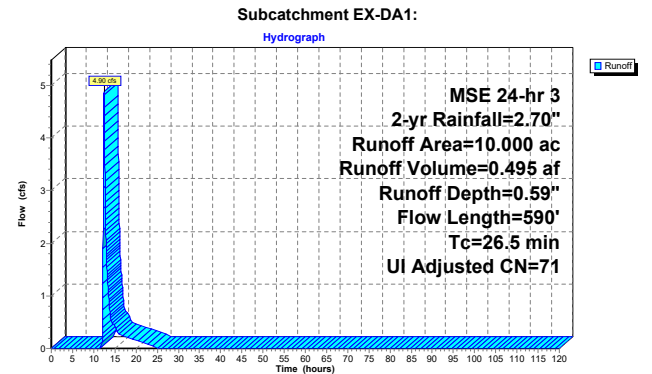
Soil Listing (selected nodes)

| Area (acres) | Soil Group | Subcatchment Numbers                                   |
|--------------|------------|--------------------------------------------------------|
| 0.000        | HSG A      |                                                        |
| 0.000        | HSG B      |                                                        |
| 234.000      | HSG C      | EX-DA1, EX-DA2, EX-DA3, EX-DA4, EX-DA5, EX-DA6, EX-DA7 |
| 0.000        | HSG D      |                                                        |
| 0.000        | Other      |                                                        |
| 234.000      |            | TOTAL AREA                                             |

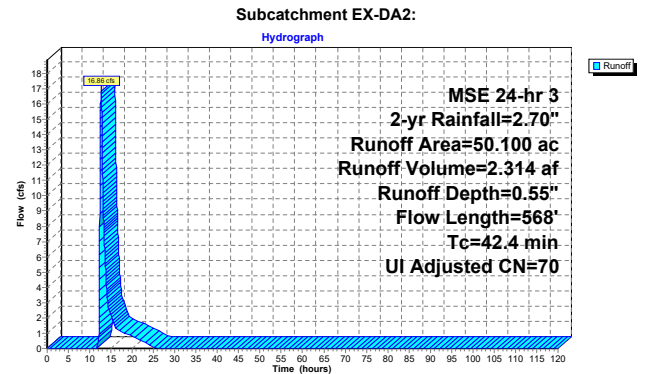
| Ground Covers (selected nodes) |                  |                  |                  |                  |                  |                      |                                                                          |
|--------------------------------|------------------|------------------|------------------|------------------|------------------|----------------------|--------------------------------------------------------------------------|
| HSG-A<br>(acres)               | HSG-B<br>(acres) | HSG-C<br>(acres) | HSG-D<br>(acres) | Other<br>(acres) | Total<br>(acres) | Ground<br>Cover      | Subcatchment<br>Numbers                                                  |
| 0.000                          | 0.000            | 5.730            | 0.000            | 0.000            | 5.730            | Unconnected pavement | EX-DA1,<br>EX-DA2,<br>EX-DA4,<br>EX-DA6,<br>EX-DA7                       |
| 0.000                          | 0.000            | 228.270          | 0.000            | 0.000            | 228.270          | Woods, Good          | EX-DA1,<br>EX-DA2,<br>EX-DA3,<br>EX-DA4,<br>EX-DA5,<br>EX-DA6,<br>EX-DA7 |
| 0.000                          | 0.000            | 234.000          | 0.000            | 0.000            | 234.000          | TOTAL AREA           |                                                                          |

|                                                                                                                                                   |                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Time span=0.00-120.00 hrs, dt=0.02 hrs, 6001 points x 3                                                                                           |                                                                                                                                          |
| Runoff by SCS TR-20 method, UH=SCS, Weighted-CN                                                                                                   |                                                                                                                                          |
| Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method                                                                        |                                                                                                                                          |
| SubcatchmentEX-DA1:                                                                                                                               | Runoff Area=10.000 ac 7.30% Impervious Runoff Depth=0.59"<br>Flow Length=590' Tc=26.5 min UI Adjusted CN=71 Runoff=4.90 cfs 0.495 af     |
| SubcatchmentEX-DA2:                                                                                                                               | Runoff Area=50.100 ac 3.19% Impervious Runoff Depth=0.55"<br>Flow Length=568' Tc=42.4 min UI Adjusted CN=70 Runoff=16.86 cfs 2.314 af    |
| SubcatchmentEX-DA3:                                                                                                                               | Runoff Area=3.500 ac 0.00% Impervious Runoff Depth=0.55"<br>Flow Length=330' Tc=32.4 min CN=70 Runoff=1.38 cfs 0.162 af                  |
| SubcatchmentEX-DA4:                                                                                                                               | Runoff Area=36.000 ac 0.78% Impervious Runoff Depth=0.55"<br>Flow Length=1,450' Tc=76.4 min CN=70 Runoff=8.20 cfs 1.662 af               |
| SubcatchmentEX-DA5:                                                                                                                               | Runoff Area=14.900 ac 0.00% Impervious Runoff Depth=0.55"<br>Flow Length=720' Tc=40.4 min CN=70 Runoff=5.17 cfs 0.688 af                 |
| SubcatchmentEX-DA6:                                                                                                                               | Runoff Area=36.200 ac 0.97% Impervious Runoff Depth=0.55"<br>Flow Length=1,000' Tc=92.4 min CN=70 Runoff=7.19 cfs 1.672 af               |
| SubcatchmentEX-DA7:                                                                                                                               | Runoff Area=83.300 ac 3.33% Impervious Runoff Depth=0.55"<br>Flow Length=3,350' Tc=108.0 min UI Adjusted CN=70 Runoff=15.04 cfs 3.847 af |
| Pond W1: NE Wetland                                                                                                                               | Peak Elev=1,273.13' Storage=0.131 af Inflow=20.29 cfs 2.809 af<br>Outflow=16.77 cfs 2.808 af                                             |
| Pond W4: Wetland 4                                                                                                                                | Peak Elev=1,296.16' Storage=32,332 cf Inflow=12.30 cfs 2.512 af<br>Outflow=7.11 cfs 2.512 af                                             |
| Pond W5: Wetland 5                                                                                                                                | Peak Elev=1,299.07' Storage=5,119 cf Inflow=5.17 cfs 0.688 af<br>Outflow=3.93 cfs 0.688 af                                               |
| Pond W6: Wetland 6                                                                                                                                | Peak Elev=1,285.24' Storage=38,459 cf Inflow=13.65 cfs 4.183 af<br>Outflow=9.94 cfs 4.182 af                                             |
| Pond W7: Wetland 7                                                                                                                                | Peak Elev=1,258.65' Storage=0.346 af Inflow=22.75 cfs 8.029 af<br>Outflow=22.02 cfs 8.012 af                                             |
| Link 1L: Outlet Southeast accross Midway Rd                                                                                                       | Inflow=22.02 cfs 8.012 af<br>Primary=22.02 cfs 8.012 af                                                                                  |
| Link 10L: Outlet northeast accross Midway Rd                                                                                                      | Inflow=16.77 cfs 2.808 af<br>Primary=16.77 cfs 2.808 af                                                                                  |
| Link 11L: Site Discharge                                                                                                                          | Inflow=26.48 cfs 10.821 af<br>Primary=26.48 cfs 10.821 af                                                                                |
| Total Runoff Area = 234.000 ac Runoff Volume = 10.839 af Average Runoff Depth = 0.56"<br>97.55% Pervious = 228.270 ac 2.45% Impervious = 5.730 ac |                                                                                                                                          |

| Summary for Subcatchment EX-DA1:                                                          |               |               |                               |                |                                                                        |
|-------------------------------------------------------------------------------------------|---------------|---------------|-------------------------------|----------------|------------------------------------------------------------------------|
| Runoff = 4.90 cfs @ 12.44 hrs, Volume= 0.495 af, Depth= 0.59"                             |               |               |                               |                |                                                                        |
| Routed to Pond W1 : NE Wetland                                                            |               |               |                               |                |                                                                        |
| Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs |               |               |                               |                |                                                                        |
| MSE 24-hr 3 2-yr Rainfall=2.70"                                                           |               |               |                               |                |                                                                        |
| Area (ac)                                                                                 | CN            | Adj           | Description                   |                |                                                                        |
| 0.730                                                                                     | 98            |               | Unconnected pavement, HSG C   |                |                                                                        |
| 9.270                                                                                     | 70            |               | Woods, Good, HSG C            |                |                                                                        |
| 10.000                                                                                    | 72            | 71            | Weighted Average, UI Adjusted |                |                                                                        |
| 9.270                                                                                     |               |               | 92.70% Pervious Area          |                |                                                                        |
| 0.730                                                                                     |               |               | 7.30% Impervious Area         |                |                                                                        |
| 0.730                                                                                     |               |               | 100.00% Unconnected           |                |                                                                        |
| Tc (min)                                                                                  | Length (feet) | Slope (ft/ft) | Velocity (ft/sec)             | Capacity (cfs) | Description                                                            |
| 9.3                                                                                       | 100           | 0.0730        | 0.18                          |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 2.70"                  |
| 17.2                                                                                      | 490           | 0.0360        | 0.47                          |                |                                                                        |
| 26.5                                                                                      | 590           | Total         |                               |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |



| Summary for Subcatchment EX-DA2:                                                          |               |               |                               |                |                                                                        |
|-------------------------------------------------------------------------------------------|---------------|---------------|-------------------------------|----------------|------------------------------------------------------------------------|
| Runoff = 16.86 cfs @ 12.68 hrs, Volume= 2.314 af, Depth= 0.55"                            |               |               |                               |                |                                                                        |
| Routed to Pond W1 : NE Wetland                                                            |               |               |                               |                |                                                                        |
| Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs |               |               |                               |                |                                                                        |
| MSE 24-hr 3 2-yr Rainfall=2.70"                                                           |               |               |                               |                |                                                                        |
| Area (ac)                                                                                 | CN            | Adj           | Description                   |                |                                                                        |
| 1.600                                                                                     | 98            |               | Unconnected pavement, HSG C   |                |                                                                        |
| 48.500                                                                                    | 70            |               | Woods, Good, HSG C            |                |                                                                        |
| 50.100                                                                                    | 71            | 70            | Weighted Average, UI Adjusted |                |                                                                        |
| 48.500                                                                                    |               |               | 96.81% Pervious Area          |                |                                                                        |
| 1.600                                                                                     |               |               | 3.19% Impervious Area         |                |                                                                        |
| 1.600                                                                                     |               |               | 100.00% Unconnected           |                |                                                                        |
| Tc (min)                                                                                  | Length (feet) | Slope (ft/ft) | Velocity (ft/sec)             | Capacity (cfs) | Description                                                            |
| 28.2                                                                                      | 100           | 0.0500        | 0.06                          |                | <b>Sheet Flow,</b><br>Woods: Dense underbrush n= 0.800 P2= 2.70"       |
| 14.2                                                                                      | 468           | 0.0480        | 0.55                          |                |                                                                        |
| 42.4                                                                                      | 568           | Total         |                               |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |



Summary for Subcatchment EX-DA3:

Runoff = 1.38 cfs @ 12.52 hrs, Volume= 0.162 af, Depth= 0.55"  
 Routed to Pond W4 : Wetland 4

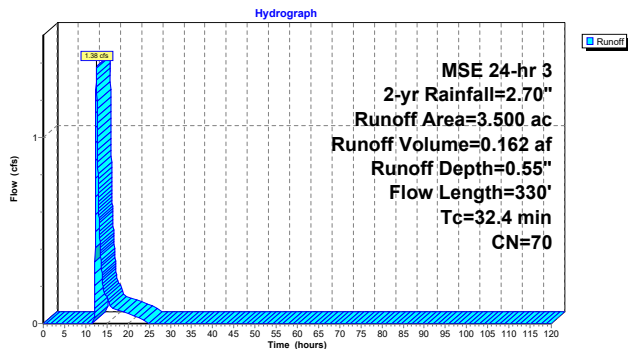
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Description                 |
|-----------|----|-----------------------------|
| 0.000     | 98 | Unconnected pavement, HSG C |
| 3.500     | 70 | Woods, Good, HSG C          |
| 3.500     | 70 | Weighted Average            |
| 3.500     |    | 100.00% Pervious Area       |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 27.8     | 100           | 0.0520        | 0.06              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70"       |
| 4.6      | 230           | 0.1100        | 0.83              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 32.4     | 330           |               |                   |                | Total                                                           |

Subcatchment EX-DA3:



Summary for Subcatchment EX-DA4:

Runoff = 8.20 cfs @ 13.17 hrs, Volume= 1.662 af, Depth= 0.55"  
 Routed to Pond W4 : Wetland 4

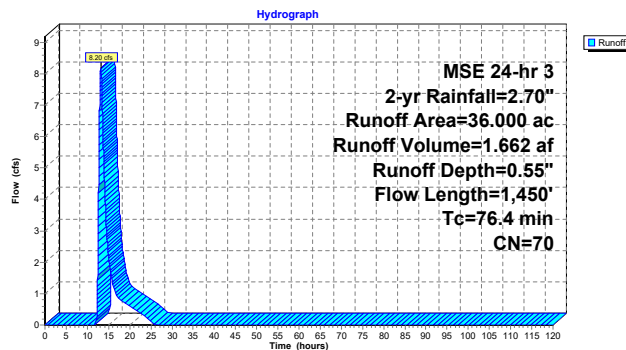
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Description                 |
|-----------|----|-----------------------------|
| 0.280     | 98 | Unconnected pavement, HSG C |
| 35.720    | 70 | Woods, Good, HSG C          |
| 36.000    | 70 | Weighted Average            |
| 35.720    |    | 99.22% Pervious Area        |
| 0.280     |    | 0.78% Impervious Area       |
| 0.280     |    | 100.00% Unconnected         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 30.8     | 100           | 0.0100        | 0.05              |                | Sheet Flow,<br>Woods: Light underbrush n= 0.400 P2= 2.70"       |
| 45.6     | 1,350         | 0.0390        | 0.49              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 76.4     | 1,450         |               |                   |                | Total                                                           |

Subcatchment EX-DA4:



Summary for Subcatchment EX-DA5:

Runoff = 5.17 cfs @ 12.64 hrs, Volume= 0.688 af, Depth= 0.55"  
 Routed to Pond W5 : Wetland 5

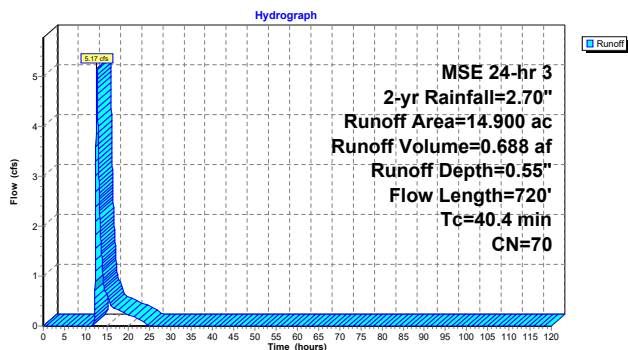
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Description                 |
|-----------|----|-----------------------------|
| 0.000     | 98 | Unconnected pavement, HSG C |
| 14.900    | 70 | Woods, Good, HSG C          |
| 14.900    | 70 | Weighted Average            |
| 14.900    |    | 100.00% Pervious Area       |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                               |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------|
| 31.5     | 100           | 0.0380        | 0.05              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70" |
| 8.9      | 620           | 0.0540        | 1.16              |                | Shallow Concentrated Flow,<br>Woodland Kv= 5.0 fps        |
| 40.4     | 720           |               |                   |                | Total                                                     |

Subcatchment EX-DA5:



Summary for Subcatchment EX-DA6:

Runoff = 7.19 cfs @ 13.44 hrs, Volume= 1.672 af, Depth= 0.55"  
 Routed to Pond W6 : Wetland 6

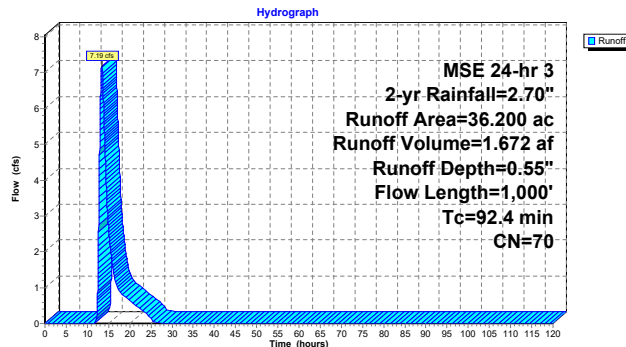
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Description                 |
|-----------|----|-----------------------------|
| 0.350     | 98 | Unconnected pavement, HSG C |
| 35.850    | 70 | Woods, Good, HSG C          |
| 36.200    | 70 | Weighted Average            |
| 35.850    |    | 99.03% Pervious Area        |
| 0.350     |    | 0.97% Impervious Area       |
| 0.350     |    | 100.00% Unconnected         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 53.7     | 100           | 0.0100        | 0.03              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70"       |
| 38.7     | 900           | 0.0240        | 0.39              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 92.4     | 1,000         |               |                   |                | Total                                                           |

Subcatchment EX-DA6:



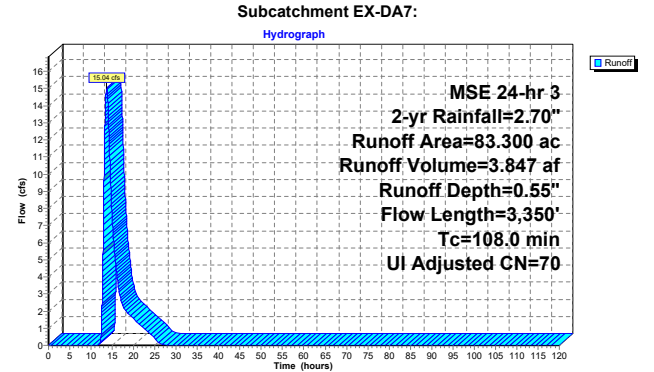
Summary for Subcatchment EX-DA7:

Runoff = 15.04 cfs @ 13.68 hrs, Volume= 3.847 af, Depth= 0.55"  
Routed to Pond W7 : Wetland 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Adj | Description                   |
|-----------|----|-----|-------------------------------|
| 2.770     | 98 |     | Unconnected pavement, HSG C   |
| 80.530    | 70 |     | Woods, Good, HSG C            |
| 83.300    | 71 | 70  | Weighted Average, UI Adjusted |
| 80.530    |    |     | 96.67% Pervious Area          |
| 2.770     |    |     | 3.33% Impervious Area         |
| 2.770     |    |     | 100.00% Unconnected           |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 39.2     | 100           | 0.0220        | 0.04              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70"       |
| 51.4     | 1,400         | 0.0330        | 0.45              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 17.4     | 1,850         | 0.0140        | 1.77              |                | Shallow Concentrated Flow,<br>Grassed Waterway Kv= 15.0 fps     |
| 108.0    | 3,350         | Total         |                   |                |                                                                 |



Summary for Pond W1: NE Wetland

Inflow Area = 60.100 ac, 3.88% Impervious, Inflow Depth = 0.56" for 2-yr event  
Inflow = 20.29 cfs @ 12.64 hrs, Volume= 2.809 af  
Outflow = 16.77 cfs @ 12.87 hrs, Volume= 2.808 af, Atten= 17%, Lag= 13.8 min  
Primary = 16.77 cfs @ 12.87 hrs, Volume= 2.808 af  
Routed to Link 10L : Outlet northeast across Midway Rd

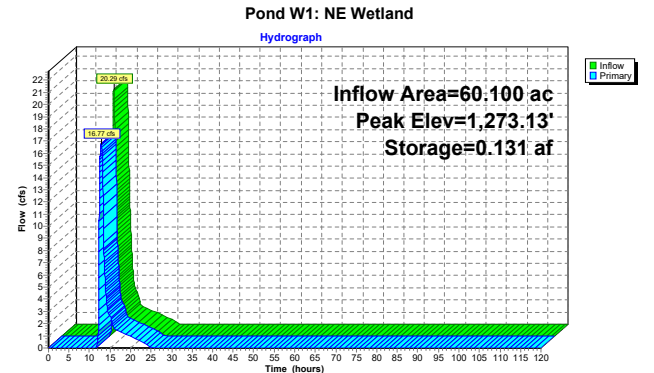
Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3  
Peak Elev= 1,273.13' @ 12.87 hrs Surf.Area= 0.757 ac Storage= 0.131 af

Plug-Flow detention time= 2.3 min calculated for 2.808 af (100% of inflow)  
Center-of-Mass det. time= 1.7 min ( 881.8 - 880.0 )

| Volume           | Invert            | Avail.Storage         | Storage Description                                 |
|------------------|-------------------|-----------------------|-----------------------------------------------------|
| #1               | 1,270.00'         | 28.430 af             | Custom Stage Data (Prismatic) Listed below (Recalc) |
| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet)                               |
| 1,270.00         | 0.001             | 0.000                 | 0.000                                               |
| 1,271.99         | 0.001             | 0.002                 | 0.002                                               |
| 1,272.00         | 0.005             | 0.000                 | 0.002                                               |
| 1,273.00         | 0.140             | 0.072                 | 0.075                                               |
| 1,274.00         | 5.026             | 2.583                 | 2.658                                               |
| 1,275.00         | 6.415             | 5.721                 | 8.378                                               |
| 1,276.00         | 8.449             | 7.432                 | 15.810                                              |
| 1,277.00         | 16.790            | 12.620                | 28.430                                              |

| Device | Routing | Invert    | Outlet Devices                                                                                                                                                                                                              |
|--------|---------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 1,270.32' | 24.0" Round Culvert<br>L= 82.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,270.32' / 1,270.01' S= 0.0038 '/ S= 0.0038 '/ Cc= 0.900<br>n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf |
| #2     | Primary | 1,276.80' | 42.0' long + 10.0' SideZ x 50.0' breadth Broad-Crested Rectangular Weir<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63                                   |

Primary OutFlow Max=16.77 cfs @ 12.87 hrs HW=1,273.13' TW=0.00' (Dynamic Tailwater)  
1=Culvert (Barrel Controls 16.77 cfs @ 5.34 fps)  
2=Broad-Crested Rectangular Weir (Weir Controls 0.00 cfs)



Summary for Pond W4: Wetland 4

Inflow Area = 54.400 ac, 0.51% Impervious, Inflow Depth = 0.55" for 2-yr event  
Inflow = 12.30 cfs @ 13.07 hrs, Volume= 2.512 af  
Outflow = 7.11 cfs @ 13.91 hrs, Volume= 2.512 af, Atten= 42%, Lag= 50.5 min  
Primary = 7.11 cfs @ 13.91 hrs, Volume= 2.512 af  
Routed to Pond W6 : Wetland 6

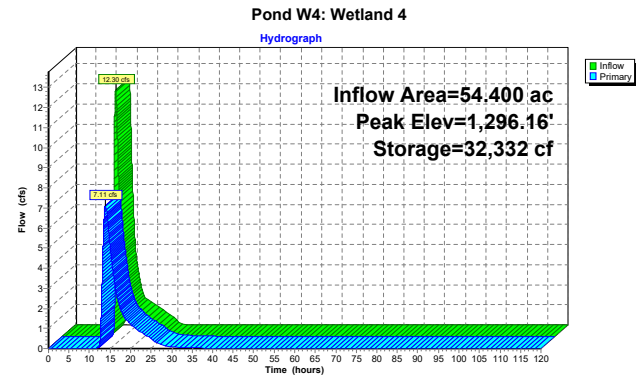
Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3  
Peak Elev= 1,296.16' @ 13.91 hrs Surf.Area= 206,173 sf Storage= 32,332 cf

Plug-Flow detention time= 113.8 min calculated for 2.511 af (100% of inflow)  
Center-of-Mass det. time= 114.2 min ( 1,027.0 - 912.8 )

| Volume           | Invert            | Avail.Storage          | Storage Description                                 |
|------------------|-------------------|------------------------|-----------------------------------------------------|
| #1               | 1,296.00'         | 226,046 cf             | Custom Stage Data (Prismatic) Listed below (Recalc) |
| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet)                              |
| 1,296.00         | 196,780           | 0                      | 0                                                   |
| 1,297.00         | 255,311           | 226,046                | 226,046                                             |

| Device | Routing | Invert    | Outlet Devices                                                                                                                                                                             |
|--------|---------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 1,296.00' | 40.0' long + 10.0' SideZ x 100.0' breadth Broad-Crested Rectangular Weir<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |

Primary OutFlow Max=7.11 cfs @ 13.91 hrs HW=1,296.16' TW=1,285.21' (Dynamic Tailwater)  
1=Broad-Crested Rectangular Weir (Weir Controls 7.11 cfs @ 1.07 fps)



Summary for Pond W5: Wetland 5

Inflow Area = 14,900 ac, 0.00% Impervious, Inflow Depth = 0.55" for 2-yr event

Inflow = 5.17 cfs @ 12.64 hrs, Volume= 0.688 af

Outflow = 3.93 cfs @ 12.91 hrs, Volume= 0.688 af, Atten= 24%, Lag= 16.2 min

Primary = 3.93 cfs @ 12.91 hrs, Volume= 0.688 af

Routed to Pond W4 : Wetland 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3

Peak Elev= 1,299.07' @ 12.91 hrs Surf.Area= 75,898 sf Storage= 5,119 cf

Plug-Flow detention time= 36.2 min calculated for 0.688 af (100% of inflow)

Center-of-Mass det. time= 35.9 min ( 917.2 - 881.3 )

Volume Invert Avail.Storage Storage Description

#1 1,299.00' 189,268 cf Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation Surf.Area Inc.Store Cum.Store

(feet) (sq-ft) (cubic-feet) (cubic-feet)

1,299.00 74,530 0 0

1,301.00 114,738 189,268 189,268

Device Routing Invert Outlet Devices

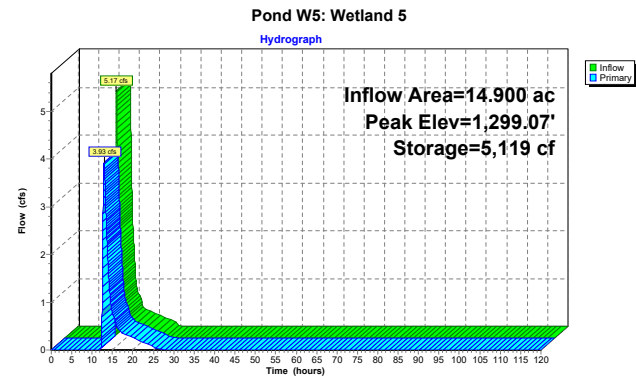
#1 Primary 1,299.00' 82.0' long + 10.0 ' /' SideZ x 48.0' breadth Broad-Crested Rectangular Weir

Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.93 cfs @ 12.91 hrs HW=1,299.07' TW=1,296.07' (Dynamic Tailwater)

1=Broad-Crested Rectangular Weir(Weir Controls 3.93 cfs @ 0.70 fps)



Summary for Pond W6: Wetland 6

Inflow Area = 90,600 ac, 0.70% Impervious, Inflow Depth = 0.55" for 2-yr event

Inflow = 13.65 cfs @ 13.64 hrs, Volume= 4.183 af

Outflow = 9.94 cfs @ 14.53 hrs, Volume= 4.182 af, Atten= 27%, Lag= 53.2 min

Primary = 9.94 cfs @ 14.53 hrs, Volume= 4.182 af

Routed to Pond W7 : Wetland 7

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3

Peak Elev= 1,285.24' @ 14.53 hrs Surf.Area= 176,295 sf Storage= 38,459 cf

Plug-Flow detention time= 93.7 min calculated for 4.182 af (100% of inflow)

Center-of-Mass det. time= 93.0 min ( 1,081.0 - 987.9 )

Volume Invert Avail.Storage Storage Description

#1 1,285.00' 208,642 cf Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation Surf.Area Inc.Store Cum.Store

(feet) (sq-ft) (cubic-feet) (cubic-feet)

1,285.00 146,915 0 0

1,286.00 270,368 208,642 208,642

Device Routing Invert Outlet Devices

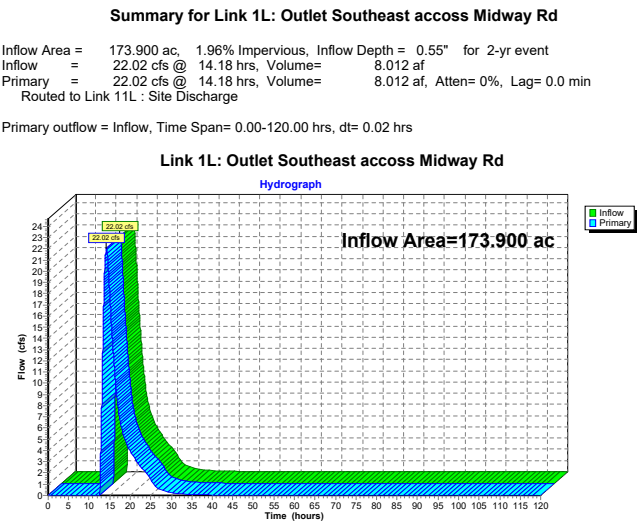
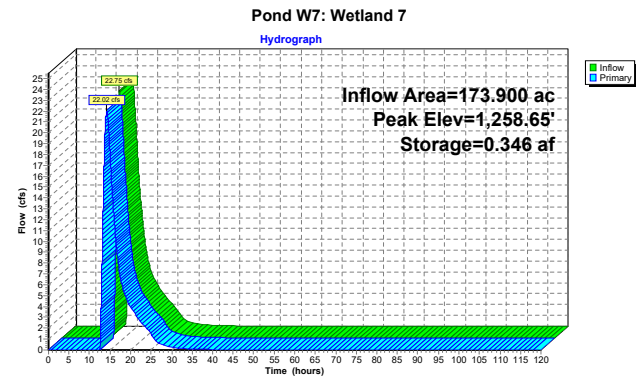
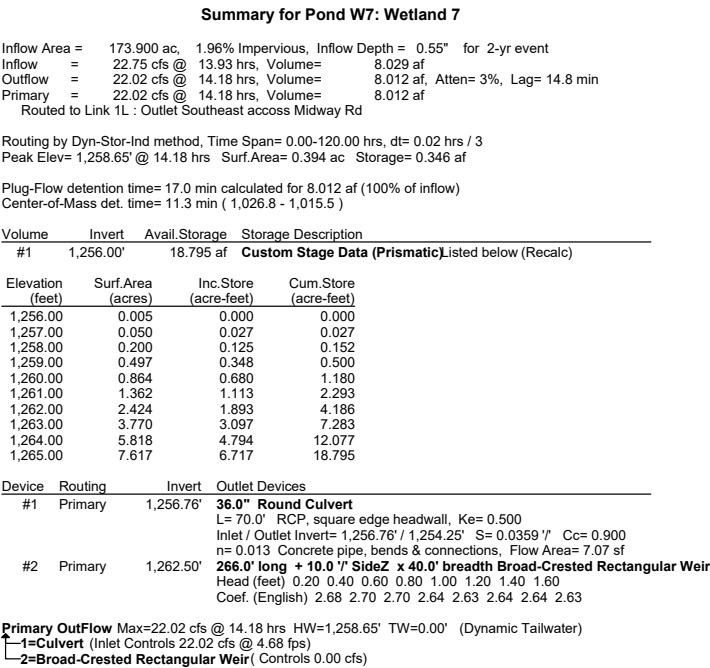
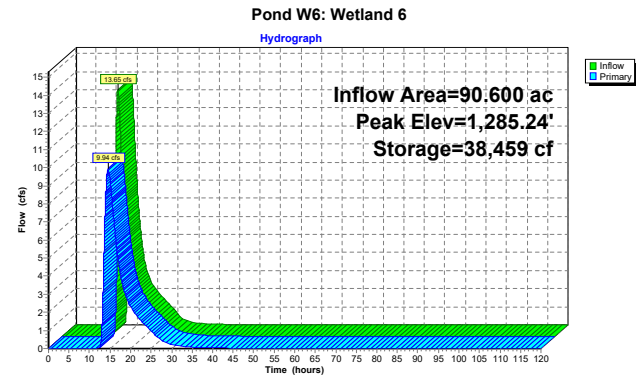
#1 Primary 1,285.00' 30.0' long + 10.0 ' /' SideZ x 100.0' breadth Broad-Crested Rectangular Weir

Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=9.94 cfs @ 14.53 hrs HW=1,285.24' TW=1,258.60' (Dynamic Tailwater)

1=Broad-Crested Rectangular Weir(Weir Controls 9.94 cfs @ 1.29 fps)

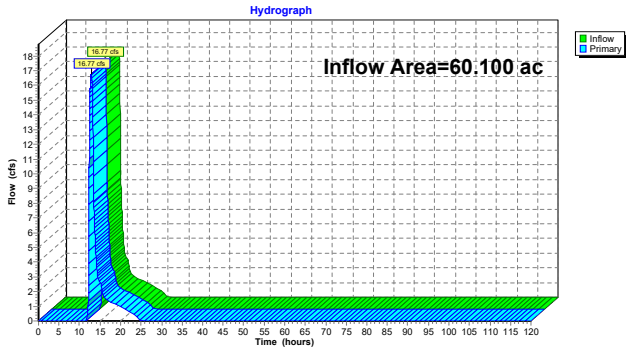


Summary for Link 10L: Outlet northeast accross Midway Rd

Inflow Area = 60.100 ac, 3.88% Impervious, Inflow Depth = 0.56" for 2-yr event  
Inflow = 16.77 cfs @ 12.87 hrs, Volume= 2.808 af  
Primary = 16.77 cfs @ 12.87 hrs, Volume= 2.808 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 11L : Site Discharge

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs

Link 10L: Outlet northeast accross Midway Rd

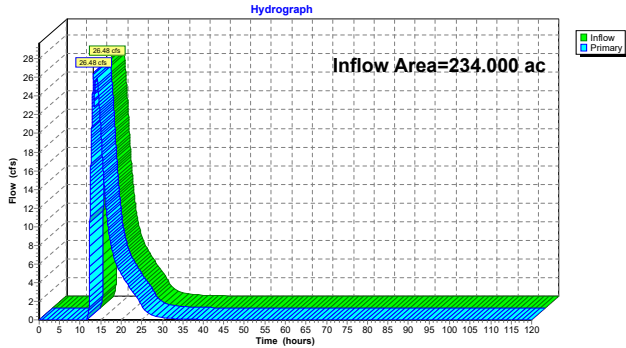


Summary for Link 11L: Site Discharge

Inflow Area = 234.000 ac, 2.45% Impervious, Inflow Depth = 0.55" for 2-yr event  
Inflow = 26.48 cfs @ 13.21 hrs, Volume= 10.821 af  
Primary = 26.48 cfs @ 13.21 hrs, Volume= 10.821 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs

Link 11L: Site Discharge



Time span=0.00-120.00 hrs, dt=0.02 hrs, 6001 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX-DA1: Runoff Area=10.000 ac 7.30% Impervious Runoff Depth=1.39"  
Flow Length=590' Tc=26.5 min UI Adjusted CN=71 Runoff=12.90 cfs 1.162 af

SubcatchmentEX-DA2: Runoff Area=50.100 ac 3.19% Impervious Runoff Depth=1.33"  
Flow Length=568' Tc=42.4 min UI Adjusted CN=70 Runoff=45.74 cfs 5.551 af

SubcatchmentEX-DA3: Runoff Area=3.500 ac 0.00% Impervious Runoff Depth=1.33"  
Flow Length=330' Tc=32.4 min CN=70 Runoff=3.79 cfs 0.388 af

SubcatchmentEX-DA4: Runoff Area=36.000 ac 0.78% Impervious Runoff Depth=1.33"  
Flow Length=1,450' Tc=76.4 min CN=70 Runoff=45.74 cfs 5.551 af

SubcatchmentEX-DA5: Runoff Area=14.900 ac 0.00% Impervious Runoff Depth=1.33"  
Flow Length=720' Tc=40.4 min CN=70 Runoff=14.10 cfs 1.651 af

SubcatchmentEX-DA6: Runoff Area=36.200 ac 0.97% Impervious Runoff Depth=1.33"  
Flow Length=1,000' Tc=92.4 min CN=70 Runoff=19.28 cfs 4.011 af

SubcatchmentEX-DA7: Runoff Area=83.300 ac 3.33% Impervious Runoff Depth=1.33"  
Flow Length=3,350' Tc=108.0 min UI Adjusted CN=70 Runoff=40.11 cfs 9.230 af

Pond W1: NE Wetland Peak Elev=1,273.81' Storage=1.782 af Inflow=55.21 cfs 6.713 af  
Outflow=21.29 cfs 6.713 af

Pond W4: Wetland 4 Peak Elev=1,296.34' Storage=69,981 cf Inflow=33.67 cfs 6.028 af  
Outflow=22.67 cfs 6.027 af

Pond W5: Wetland 5 Peak Elev=1,299.14' Storage=10,848 cf Inflow=14.10 cfs 1.651 af  
Outflow=12.02 cfs 1.651 af

Pond W6: Wetland 6 Peak Elev=1,285.50' Storage=87,905 cf Inflow=41.38 cfs 10.039 af  
Outflow=31.96 cfs 10.038 af

Pond W7: Wetland 7 Peak Elev=1,260.86' Storage=2.103 af Inflow=68.81 cfs 19.268 af  
Outflow=54.84 cfs 19.251 af

Link 1L: Outlet Southeast accross Midway Rd Inflow=54.84 cfs 19.251 af  
Primary=54.84 cfs 19.251 af

Link 10L: Outlet northeast accross Midway Rd Inflow=21.29 cfs 6.713 af  
Primary=21.29 cfs 6.713 af

Link 11L: Site Discharge Inflow=74.75 cfs 25.964 af  
Primary=74.75 cfs 25.964 af

Total Runoff Area = 234.000 ac Runoff Volume = 25.982 af Average Runoff Depth = 1.33"  
97.55% Pervious = 228.270 ac 2.45% Impervious = 5.730 ac

Summary for Subcatchment EX-DA1:

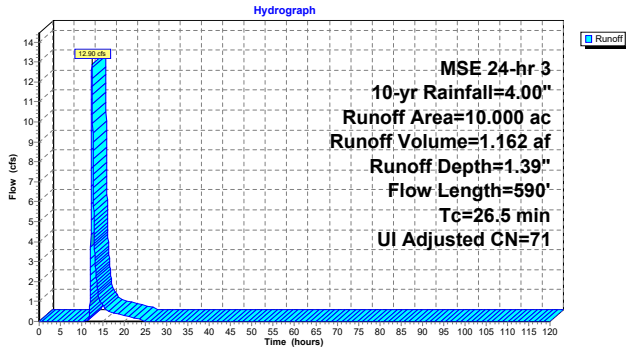
Runoff = 12.90 cfs @ 12.40 hrs, Volume= 1.162 af, Depth= 1.39"  
Routed to Pond W1 : NE Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Adj | Description                   |
|-----------|----|-----|-------------------------------|
| 0.730     | 98 |     | Unconnected pavement, HSG C   |
| 9.270     | 70 |     | Woods, Good, HSG C            |
| 10.000    | 72 | 71  | Weighted Average, UI Adjusted |
| 9.270     |    |     | 92.70% Pervious Area          |
| 0.730     |    |     | 7.30% Impervious Area         |
| 0.730     |    |     | 100.00% Unconnected           |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                  |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------|
| 9.3      | 100           | 0.0730        | 0.18              |                | Sheet Flow, Grass: Dense n= 0.240 P2= 2.70"                  |
| 17.2     | 490           | 0.0360        | 0.47              |                | Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps |
| 26.5     | 590           | Total         |                   |                |                                                              |

Subcatchment EX-DA1:



## Summary for Subcatchment EX-DA2:

Runoff = 45.74 cfs @ 12.63 hrs, Volume= 5.551 af, Depth= 1.33"  
 Routed to Pond W1 : NE Wetland

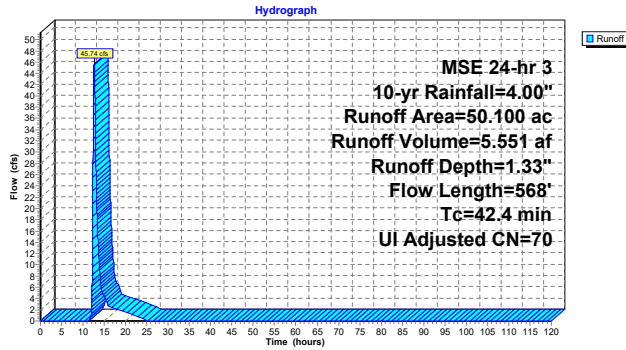
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Adj | Description                   |
|-----------|----|-----|-------------------------------|
| 1.600     | 98 |     | Unconnected pavement, HSG C   |
| 48.500    | 70 |     | Woods, Good, HSG C            |
| 50.100    | 71 | 70  | Weighted Average, UI Adjusted |
| 48.500    |    |     | 96.81% Pervious Area          |
| 1.600     |    |     | 3.19% Impervious Area         |
| 1.600     |    |     | 100.00% Unconnected           |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 28.2     | 100           | 0.0500        | 0.06              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70"       |
| 14.2     | 468           | 0.0480        | 0.55              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 42.4     | 568           |               |                   |                | Total                                                           |

## Subcatchment EX-DA2:



## Summary for Subcatchment EX-DA3:

Runoff = 3.79 cfs @ 12.49 hrs, Volume= 0.388 af, Depth= 1.33"  
 Routed to Pond W4 : Wetland 4

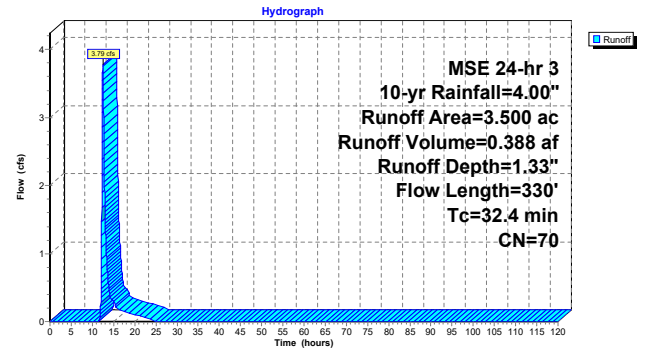
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description                 |
|-----------|----|-----------------------------|
| 0.000     | 98 | Unconnected pavement, HSG C |
| 3.500     | 70 | Woods, Good, HSG C          |
| 3.500     | 70 | Weighted Average            |
| 3.500     |    | 100.00% Pervious Area       |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 27.8     | 100           | 0.0520        | 0.06              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70"       |
| 4.6      | 230           | 0.1100        | 0.83              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 32.4     | 330           |               |                   |                | Total                                                           |

## Subcatchment EX-DA3:



## Summary for Subcatchment EX-DA4:

Runoff = 22.02 cfs @ 13.14 hrs, Volume= 3.989 af, Depth= 1.33"  
 Routed to Pond W4 : Wetland 4

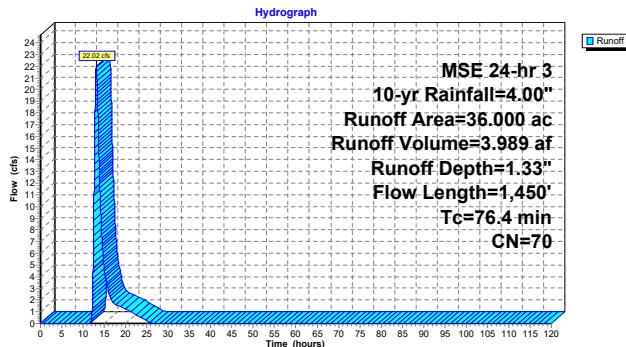
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description                 |
|-----------|----|-----------------------------|
| 0.280     | 98 | Unconnected pavement, HSG C |
| 35.720    | 70 | Woods, Good, HSG C          |
| 36.000    | 70 | Weighted Average            |
| 35.720    |    | 99.22% Pervious Area        |
| 0.280     |    | 0.78% Impervious Area       |
| 0.280     |    | 100.00% Unconnected         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 30.8     | 100           | 0.0100        | 0.05              |                | Sheet Flow,<br>Woods: Light underbrush n= 0.400 P2= 2.70"       |
| 45.6     | 1,350         | 0.0390        | 0.49              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 76.4     | 1,450         |               |                   |                | Total                                                           |

## Subcatchment EX-DA4:



## Summary for Subcatchment EX-DA5:

Runoff = 14.10 cfs @ 12.61 hrs, Volume= 1.651 af, Depth= 1.33"  
 Routed to Pond W5 : Wetland 5

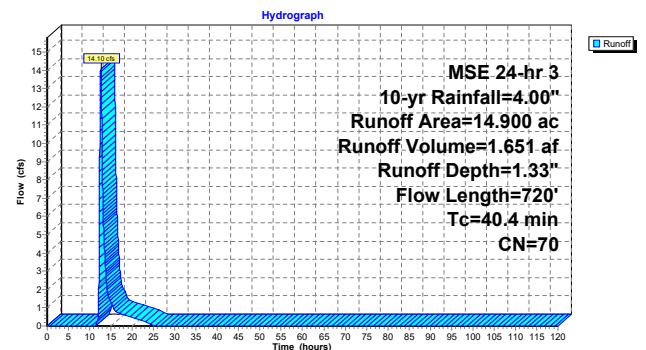
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description                 |
|-----------|----|-----------------------------|
| 0.000     | 98 | Unconnected pavement, HSG C |
| 14.900    | 70 | Woods, Good, HSG C          |
| 14.900    | 70 | Weighted Average            |
| 14.900    |    | 100.00% Pervious Area       |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                               |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------|
| 31.5     | 100           | 0.0380        | 0.05              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70" |
| 8.9      | 620           | 0.0540        | 1.16              |                | Shallow Concentrated Flow,<br>Woodland Kv= 5.0 fps        |
| 40.4     | 720           |               |                   |                | Total                                                     |

## Subcatchment EX-DA5:



Summary for Subcatchment EX-DA6:

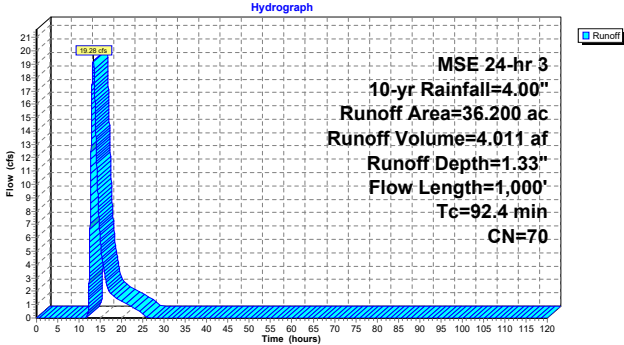
Runoff = 19.28 cfs @ 13.32 hrs, Volume= 4.011 af, Depth= 1.33"  
Routed to Pond W6 : Wetland 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description                 |
|-----------|----|-----------------------------|
| 0.350     | 98 | Unconnected pavement, HSG C |
| 35.850    | 70 | Woods, Good, HSG C          |
| 36.200    | 70 | Weighted Average            |
| 35.850    |    | 99.03% Pervious Area        |
| 0.350     |    | 0.97% Impervious Area       |
| 0.350     |    | 100.00% Unconnected         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 53.7     | 100           | 0.0100        | 0.03              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70"       |
| 38.7     | 900           | 0.0240        | 0.39              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 92.4     | 1,000         |               |                   |                | Total                                                           |

Subcatchment EX-DA6:



Summary for Subcatchment EX-DA7:

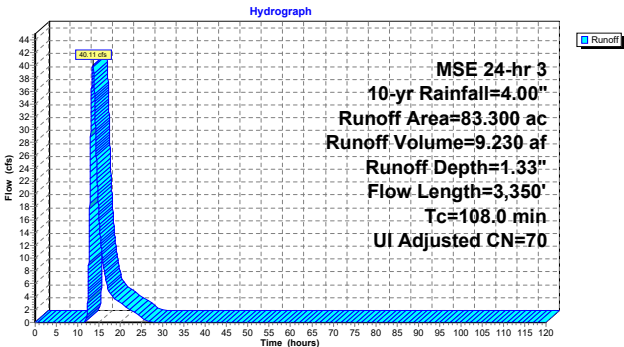
Runoff = 40.11 cfs @ 13.56 hrs, Volume= 9.230 af, Depth= 1.33"  
Routed to Pond W7 : Wetland 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Adj | Description                   |
|-----------|----|-----|-------------------------------|
| 2.770     | 98 |     | Unconnected pavement, HSG C   |
| 80.530    | 70 |     | Woods, Good, HSG C            |
| 83.300    | 71 | 70  | Weighted Average, UI Adjusted |
| 80.530    |    |     | 96.67% Pervious Area          |
| 2.770     |    |     | 3.33% Impervious Area         |
| 2.770     |    |     | 100.00% Unconnected           |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 39.2     | 100           | 0.0220        | 0.04              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70"       |
| 51.4     | 1,400         | 0.0330        | 0.45              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 17.4     | 1,850         | 0.0140        | 1.77              |                | Shallow Concentrated Flow,<br>Grassed Waterway Kv= 15.0 fps     |
| 108.0    | 3,350         |               |                   |                | Total                                                           |

Subcatchment EX-DA7:



Summary for Pond W1: NE Wetland

Inflow Area = 60.100 ac, 3.88% Impervious, Inflow Depth = 1.34" for 10-yr event  
Inflow = 55.21 cfs @ 12.58 hrs, Volume= 6.713 af  
Outflow = 21.29 cfs @ 13.29 hrs, Volume= 6.713 af, Atten= 61%, Lag= 42.6 min  
Primary = 21.29 cfs @ 13.29 hrs, Volume= 6.713 af  
Routed to Link 10L : Outlet northeast across Midway Rd

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3  
Peak Elev= 1,273.81' @ 13.29 hrs Surf.Area= 4.087 ac Storage= 1.782 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
Center-of-Mass det. time= 29.0 min ( 887.1 - 858.1 )

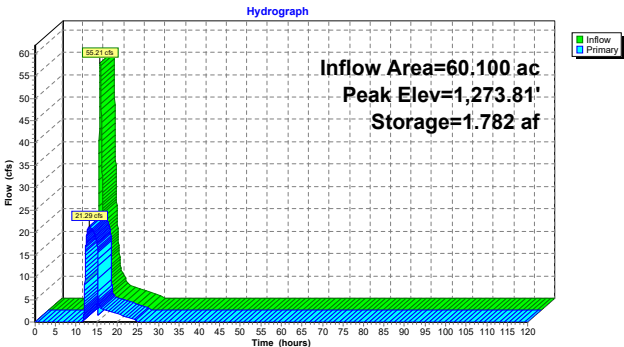
| Volume | Invert    | Avail.Storage | Storage Description                                  |
|--------|-----------|---------------|------------------------------------------------------|
| #1     | 1,270.00' | 28.430 af     | Custom Stage Data (Prismatic), Listed below (Recalc) |

| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 1,270.00         | 0.001             | 0.000                 | 0.000                 |
| 1,271.99         | 0.001             | 0.002                 | 0.002                 |
| 1,272.00         | 0.005             | 0.000                 | 0.002                 |
| 1,273.00         | 0.140             | 0.072                 | 0.075                 |
| 1,274.00         | 5.026             | 2.583                 | 2.658                 |
| 1,275.00         | 6.415             | 5.721                 | 8.378                 |
| 1,276.00         | 8.449             | 7.432                 | 15.810                |
| 1,277.00         | 16.790            | 12.620                | 28.430                |

| Device | Routing | Invert    | Outlet Devices                                                                                                                                                                                                |
|--------|---------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 1,270.32' | 24.0" Round Culvert<br>L= 82.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,270.32' / 1,270.01' S= 0.0038 ' Cc= 0.900<br>n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf |
| #2     | Primary | 1,276.80' | 42.0' long + 10.0' SideZ x 50.0' breadth Broad-Crested Rectangular Weir<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63                     |

Primary OutFlow Max=21.29 cfs @ 13.29 hrs HW=1,273.81' TW=0.00' (Dynamic Tailwater)  
1=Culvert (Barrel Controls 21.29 cfs @ 6.78 fps)  
2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

Pond W1: NE Wetland



Summary for Pond W4: Wetland 4

Inflow Area = 54.400 ac, 0.51% Impervious, Inflow Depth = 1.33" for 10-yr event

Inflow = 33.67 cfs @ 12.95 hrs, Volume= 6.028 af

Outflow = 22.67 cfs @ 13.56 hrs, Volume= 6.027 af, Atten= 33%, Lag= 36.6 min

Primary = 22.67 cfs @ 13.56 hrs, Volume= 6.027 af

Routed to Pond W6 : Wetland 6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3

Peak Elev= 1,296.34' @ 13.56 hrs Surf.Area= 216,598 sf Storage= 69,981 cf

Plug-Flow detention time= 79.6 min calculated for 6.026 af (100% of inflow)

Center-of-Mass det. time= 80.1 min ( 967.9 - 887.8 )

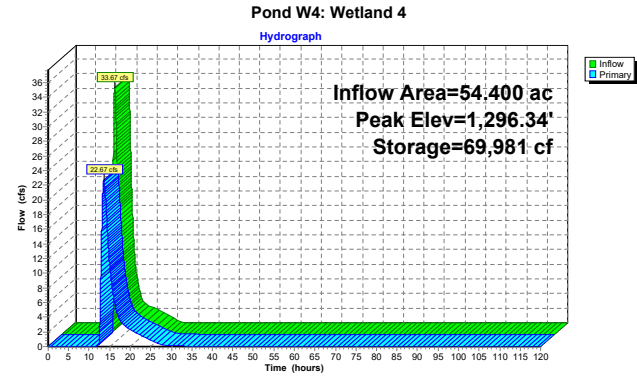
| Volume | Invert    | Avail.Storage | Storage Description                                 |
|--------|-----------|---------------|-----------------------------------------------------|
| #1     | 1,296.00' | 226,046 cf    | Custom Stage Data (Prismatic) Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 1,296.00         | 196,780           | 0                      | 0                      |
| 1,297.00         | 255,311           | 226,046                | 226,046                |

| Device                                                  | Routing | Invert    | Outlet Devices                                                            |
|---------------------------------------------------------|---------|-----------|---------------------------------------------------------------------------|
| #1                                                      | Primary | 1,296.00' | 40.0' long + 10.0 ' SideZ x 100.0' breadth Broad-Crested Rectangular Weir |
| Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60     |         |           |                                                                           |
| Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |         |           |                                                                           |

Primary OutFlow Max=22.67 cfs @ 13.56 hrs HW=1,296.34' TW=1,285.44' (Dynamic Tailwater)

1=Broad-Crested Rectangular Weir (Weir Controls 22.67 cfs @ 1.54 fps)



Summary for Pond W5: Wetland 5

Inflow Area = 14.900 ac, 0.00% Impervious, Inflow Depth = 1.33" for 10-yr event

Inflow = 14.10 cfs @ 12.61 hrs, Volume= 1.651 af

Outflow = 12.02 cfs @ 12.79 hrs, Volume= 1.651 af, Atten= 15%, Lag= 10.7 min

Primary = 12.02 cfs @ 12.79 hrs, Volume= 1.651 af

Routed to Pond W4 : Wetland 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3

Peak Elev= 1,299.14' @ 12.79 hrs Surf.Area= 77,401 sf Storage= 10,848 cf

Plug-Flow detention time= 25.4 min calculated for 1.651 af (100% of inflow)

Center-of-Mass det. time= 25.6 min ( 884.7 - 859.1 )

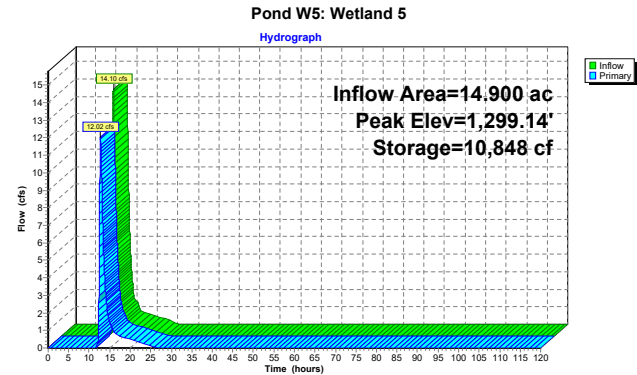
| Volume | Invert    | Avail.Storage | Storage Description                                 |
|--------|-----------|---------------|-----------------------------------------------------|
| #1     | 1,299.00' | 189,268 cf    | Custom Stage Data (Prismatic) Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 1,299.00         | 74,530            | 0                      | 0                      |
| 1,301.00         | 114,738           | 189,268                | 189,268                |

| Device                                                  | Routing | Invert    | Outlet Devices                                                           |
|---------------------------------------------------------|---------|-----------|--------------------------------------------------------------------------|
| #1                                                      | Primary | 1,299.00' | 82.0' long + 10.0 ' SideZ x 48.0' breadth Broad-Crested Rectangular Weir |
| Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60     |         |           |                                                                          |
| Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |         |           |                                                                          |

Primary OutFlow Max=12.02 cfs @ 12.79 hrs HW=1,299.14' TW=1,296.17' (Dynamic Tailwater)

1=Broad-Crested Rectangular Weir (Weir Controls 12.02 cfs @ 1.01 fps)



### Summary for Pond W6: Wetland 6

Inflow Area = 90.600 ac, 0.70% Impervious, Inflow Depth = 1.33" for 10-yr event  
 Inflow = 41.38 cfs @ 13.45 hrs, Volume= 10.039 af  
 Outflow = 31.96 cfs @ 14.07 hrs, Volume= 10.038 af, Atten= 23%, Lag= 36.9 min  
 Primary = 31.96 cfs @ 14.07 hrs, Volume= 10.038 af  
 Routed to Pond W7 : Wetland 7

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3  
 Peak Elev= 1,285.50' @ 14.07 hrs Surf.Area= 208,059 sf Storage= 87,905 cf

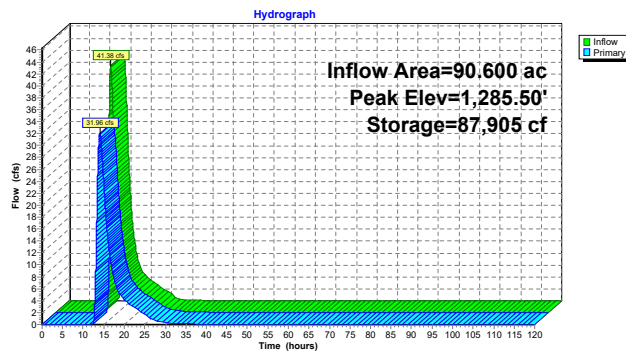
Plug-Flow detention time= 67.1 min calculated for 10.038 af (100% of inflow)  
 Center-of-Mass det. time= 66.7 min ( 1,010.3 - 943.6 )

| Volume           | Invert            | Avail.Storage          | Storage Description                                 |
|------------------|-------------------|------------------------|-----------------------------------------------------|
| #1               | 1,285.00'         | 208,642 cf             | Custom Stage Data (Prismatic) Listed below (Recalc) |
| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet)                              |
| 1,285.00         | 146,915           | 0                      | 0                                                   |
| 1,286.00         | 270,368           | 208,642                | 208,642                                             |

| Device | Routing | Invert    | Outlet Devices                                                           |
|--------|---------|-----------|--------------------------------------------------------------------------|
| #1     | Primary | 1,285.00' | 30.0' long + 10.0' SideZ x 100.0' breadth Broad-Crested Rectangular Weir |
|        |         |           | Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60                      |
|        |         |           | Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63                  |

Primary OutFlow Max=31.96 cfs @ 14.07 hrs HW=1,285.50' TW=1,260.71' (Dynamic Tailwater)  
 1=Broad-Crested Rectangular Weir (Weir Controls 31.96 cfs @ 1.85 fps)

### Pond W6: Wetland 6



### Summary for Pond W7: Wetland 7

Inflow Area = 173.900 ac, 1.96% Impervious, Inflow Depth = 1.33" for 10-yr event  
 Inflow = 68.81 cfs @ 13.80 hrs, Volume= 19.268 af  
 Outflow = 54.84 cfs @ 14.45 hrs, Volume= 19.251 af, Atten= 20%, Lag= 39.1 min  
 Primary = 54.84 cfs @ 14.45 hrs, Volume= 19.251 af  
 Routed to Link 1L : Outlet Southeast access Midway Rd

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3  
 Peak Elev= 1,260.86' @ 14.45 hrs Surf.Area= 1,290 ac Storage= 2.103 af

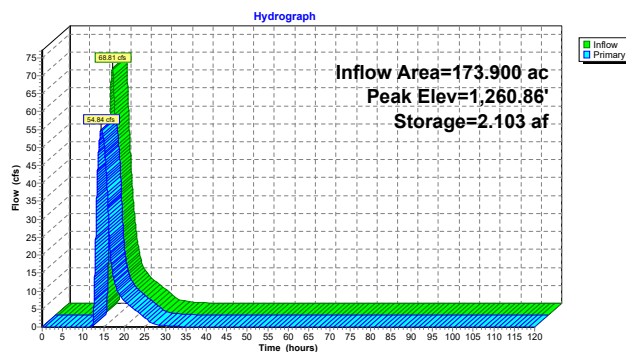
Plug-Flow detention time= 19.8 min calculated for 19.248 af (100% of inflow)  
 Center-of-Mass det. time= 17.8 min ( 986.0 - 968.1 )

| Volume           | Invert            | Avail.Storage         | Storage Description                                 |
|------------------|-------------------|-----------------------|-----------------------------------------------------|
| #1               | 1,256.00'         | 18,795 af             | Custom Stage Data (Prismatic) Listed below (Recalc) |
| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet)                               |
| 1,256.00         | 0.005             | 0.000                 | 0.000                                               |
| 1,257.00         | 0.050             | 0.027                 | 0.027                                               |
| 1,258.00         | 0.200             | 0.125                 | 0.152                                               |
| 1,259.00         | 0.497             | 0.348                 | 0.500                                               |
| 1,260.00         | 0.864             | 0.680                 | 1.180                                               |
| 1,261.00         | 1.362             | 1.113                 | 2.293                                               |
| 1,262.00         | 2.424             | 1.893                 | 4.186                                               |
| 1,263.00         | 3.770             | 3.097                 | 7.283                                               |
| 1,264.00         | 5.818             | 4.794                 | 12.077                                              |
| 1,265.00         | 7.617             | 6.717                 | 18.795                                              |

| Device | Routing | Invert    | Outlet Devices                                                           |
|--------|---------|-----------|--------------------------------------------------------------------------|
| #1     | Primary | 1,256.76' | 36.0" Round Culvert                                                      |
|        |         |           | L= 70.0' RCP, square edge headwall, Ke= 0.500                            |
|        |         |           | Inlet / Outlet Invert= 1,256.76' / 1,254.25' S= 0.0359' / Cc= 0.900      |
|        |         |           | n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf          |
| #2     | Primary | 1,262.50' | 266.0' long + 10.0' SideZ x 40.0' breadth Broad-Crested Rectangular Weir |
|        |         |           | Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60                      |
|        |         |           | Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63                  |

Primary OutFlow Max=54.84 cfs @ 14.45 hrs HW=1,260.86' TW=0.00' (Dynamic Tailwater)  
 1=Culvert (Inlet Controls 54.84 cfs @ 7.76 fps)  
 2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

### Pond W7: Wetland 7

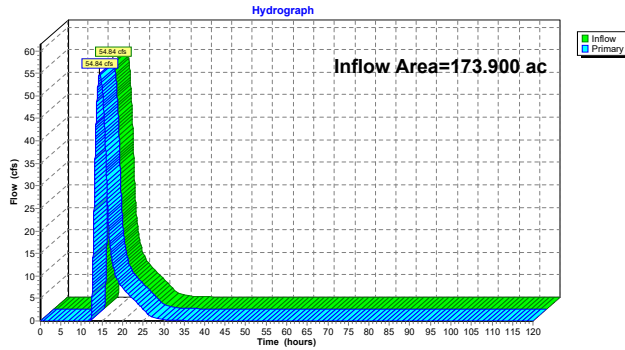


## Summary for Link 1L: Outlet Southeast accross Midway Rd

Inflow Area = 173.900 ac, 1.96% Impervious, Inflow Depth = 1.33" for 10-yr event  
Inflow = 54.84 cfs @ 14.45 hrs, Volume= 19.251 af  
Primary = 54.84 cfs @ 14.45 hrs, Volume= 19.251 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 11L : Site Discharge

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs

## Link 1L: Outlet Southeast accross Midway Rd

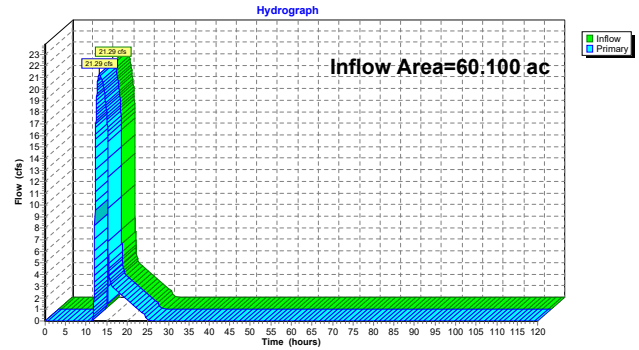


## Summary for Link 10L: Outlet northeast accross Midway Rd

Inflow Area = 60.100 ac, 3.88% Impervious, Inflow Depth = 1.34" for 10-yr event  
Inflow = 21.29 cfs @ 13.29 hrs, Volume= 6.713 af  
Primary = 21.29 cfs @ 13.29 hrs, Volume= 6.713 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 11L : Site Discharge

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs

## Link 10L: Outlet northeast accross Midway Rd

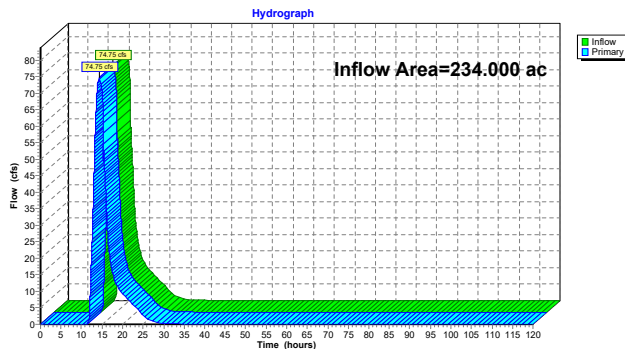


## Summary for Link 11L: Site Discharge

Inflow Area = 234.000 ac, 2.45% Impervious, Inflow Depth = 1.33" for 10-yr event  
Inflow = 74.75 cfs @ 14.34 hrs, Volume= 25.964 af  
Primary = 74.75 cfs @ 14.34 hrs, Volume= 25.964 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs

## Link 11L: Site Discharge



Time span=0.00-120.00 hrs, dt=0.02 hrs, 6001 points x 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentEX-DA1:** Runoff Area=10.000 ac 7.30% Impervious Runoff Depth=3.22"  
Flow Length=590' Tc=26.5 min UI Adjusted CN=71 Runoff=30.95 cfs 2.687 af

**SubcatchmentEX-DA2:** Runoff Area=50.100 ac 3.19% Impervious Runoff Depth=3.13"  
Flow Length=568' Tc=42.4 min UI Adjusted CN=70 Runoff=113.11 cfs 13.051 af

**SubcatchmentEX-DA3:** Runoff Area=3.500 ac 0.00% Impervious Runoff Depth=3.13"  
Flow Length=330' Tc=32.4 min CN=70 Runoff=9.32 cfs 0.912 af

**SubcatchmentEX-DA4:** Runoff Area=36.000 ac 0.78% Impervious Runoff Depth=3.13"  
Flow Length=1,450' Tc=76.4 min CN=70 Runoff=54.59 cfs 9.378 af

**SubcatchmentEX-DA5:** Runoff Area=14.900 ac 0.00% Impervious Runoff Depth=3.13"  
Flow Length=720' Tc=40.4 min CN=70 Runoff=34.70 cfs 3.881 af

**SubcatchmentEX-DA6:** Runoff Area=36.200 ac 0.97% Impervious Runoff Depth=3.13"  
Flow Length=1,000' Tc=92.4 min CN=70 Runoff=48.19 cfs 9.430 af

**SubcatchmentEX-DA7:** Runoff Area=83.300 ac 3.33% Impervious Runoff Depth=3.13"  
Flow Length=3,350' Tc=108.0 min UI Adjusted CN=70 Runoff=98.87 cfs 21.699 af

**Pond W1: NE Wetland** Peak Elev=1,274.80' Storage=7.113 af Inflow=135.69 cfs 15.738 af  
Outflow=26.51 cfs 15.737 af

**Pond W4: Wetland 4** Peak Elev=1,296.66' Storage=141,758 cf Inflow=84.11 cfs 14,171 af  
Outflow=64.56 cfs 14,170 af

**Pond W5: Wetland 5** Peak Elev=1,299.27' Storage=20,897 cf Inflow=34.70 cfs 3.881 af  
Outflow=31.82 cfs 3.881 af

**Pond W6: Wetland 6** Peak Elev=1,285.95' Storage=195,313 cf Inflow=112.31 cfs 23,600 af  
Outflow=91.67 cfs 23,599 af

**Pond W7: Wetland 7** Peak Elev=1,262.79' Storage=6,505 af Inflow=187.05 cfs 45,298 af  
Outflow=182.34 cfs 45,282 af

**Link 1L: Outlet Southeast accross Midway Rd** Inflow=182.34 cfs 45,282 af  
Primary=182.34 cfs 45,282 af

**Link 10L: Outlet northeast accross Midway Rd** Inflow=26.51 cfs 15,737 af  
Primary=26.51 cfs 15,737 af

**Link 11L: Site Discharge** Inflow=208.84 cfs 61,019 af  
Primary=208.84 cfs 61,019 af

**Total Runoff Area = 234.000 ac Runoff Volume = 61.037 af Average Runoff Depth = 3.13"**  
**97.55% Pervious = 228.270 ac 2.45% Impervious = 5.730 ac**

Summary for Subcatchment EX-DA1:

Runoff = 30.95 cfs @ 12.39 hrs, Volume= 2.687 af, Depth= 3.22"  
 Routed to Pond W1 : NE Wetland

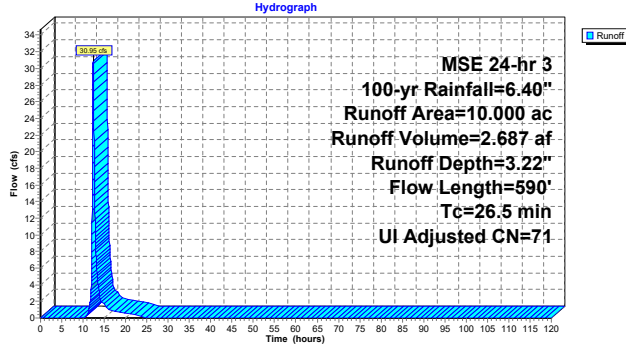
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Adj | Description                   |
|-----------|----|-----|-------------------------------|
| 0.730     | 98 |     | Unconnected pavement, HSG C   |
| 9.270     | 70 |     | Woods, Good, HSG C            |
| 10.000    | 72 | 71  | Weighted Average, UI Adjusted |
| 9.270     |    |     | 92.70% Pervious Area          |
| 0.730     |    |     | 7.30% Impervious Area         |
| 0.730     |    |     | 100.00% Unconnected           |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 9.3      | 100           | 0.0730        | 0.18              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 2.70"                  |
| 17.2     | 490           | 0.0360        | 0.47              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 26.5     | 590           |               |                   |                | Total                                                           |

Subcatchment EX-DA1:



Summary for Subcatchment EX-DA2:

Runoff = 113.11 cfs @ 12.59 hrs, Volume= 13.051 af, Depth= 3.13"  
 Routed to Pond W1 : NE Wetland

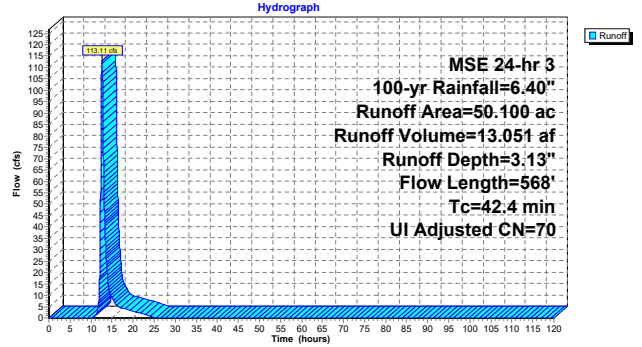
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Adj | Description                   |
|-----------|----|-----|-------------------------------|
| 1.600     | 98 |     | Unconnected pavement, HSG C   |
| 48.500    | 70 |     | Woods, Good, HSG C            |
| 50.100    | 71 | 70  | Weighted Average, UI Adjusted |
| 48.500    |    |     | 96.81% Pervious Area          |
| 1.600     |    |     | 3.19% Impervious Area         |
| 1.600     |    |     | 100.00% Unconnected           |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 28.2     | 100           | 0.0500        | 0.06              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70"       |
| 14.2     | 468           | 0.0480        | 0.55              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 42.4     | 568           |               |                   |                | Total                                                           |

Subcatchment EX-DA2:



Summary for Subcatchment EX-DA3:

Runoff = 9.32 cfs @ 12.47 hrs, Volume= 0.912 af, Depth= 3.13"  
 Routed to Pond W4 : Wetland 4

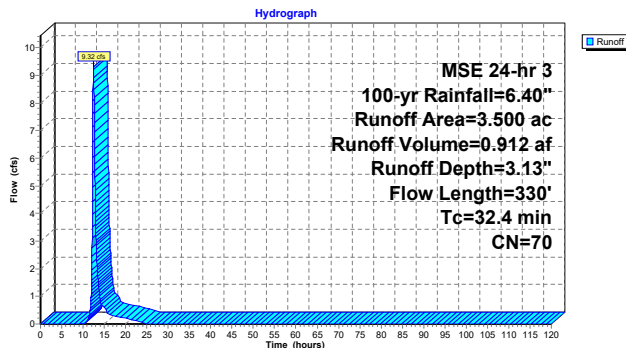
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description                 |
|-----------|----|-----------------------------|
| 0.000     | 98 | Unconnected pavement, HSG C |
| 3.500     | 70 | Woods, Good, HSG C          |
| 3.500     | 70 | Weighted Average            |
| 3.500     |    | 100.00% Pervious Area       |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 27.8     | 100           | 0.0520        | 0.06              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70"       |
| 4.6      | 230           | 0.1100        | 0.83              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 32.4     | 330           |               |                   |                | Total                                                           |

Subcatchment EX-DA3:



Summary for Subcatchment EX-DA4:

Runoff = 54.59 cfs @ 13.06 hrs, Volume= 9.378 af, Depth= 3.13"  
 Routed to Pond W4 : Wetland 4

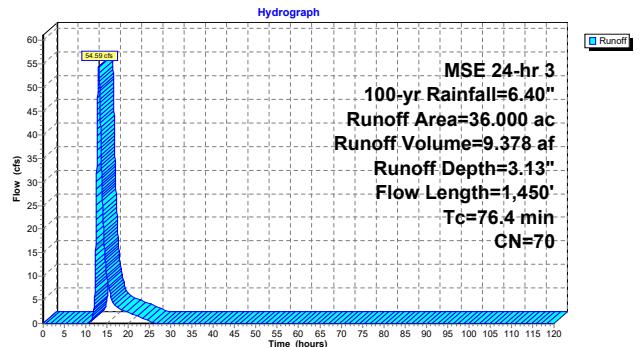
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description                 |
|-----------|----|-----------------------------|
| 0.280     | 98 | Unconnected pavement, HSG C |
| 35.720    | 70 | Woods, Good, HSG C          |
| 36.000    | 70 | Weighted Average            |
| 35.720    |    | 99.22% Pervious Area        |
| 0.280     |    | 0.78% Impervious Area       |
| 0.280     |    | 100.00% Unconnected         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 30.8     | 100           | 0.0100        | 0.05              |                | Sheet Flow,<br>Woods: Light underbrush n= 0.400 P2= 2.70"       |
| 45.6     | 1,350         | 0.0390        | 0.49              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 76.4     | 1,450         |               |                   |                | Total                                                           |

Subcatchment EX-DA4:



Summary for Subcatchment EX-DA5:

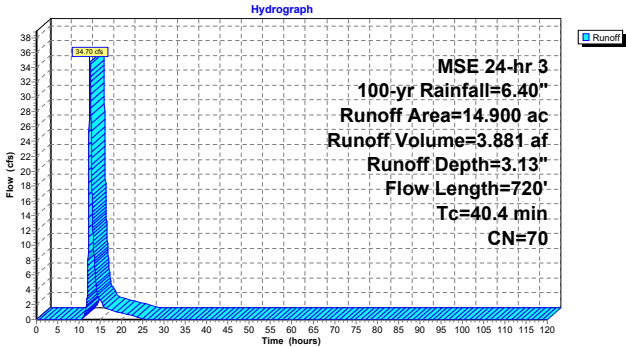
Runoff = 34.70 cfs @ 12.57 hrs, Volume= 3.881 af, Depth= 3.13"  
Routed to Pond W5 : Wetland 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description                 |
|-----------|----|-----------------------------|
| 0.000     | 98 | Unconnected pavement, HSG C |
| 14.900    | 70 | Woods, Good, HSG C          |
| 14.900    | 70 | Weighted Average            |
| 14.900    |    | 100.00% Pervious Area       |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                               |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------|
| 31.5     | 100           | 0.0380        | 0.05              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70" |
| 8.9      | 620           | 0.0540        | 1.16              |                | Shallow Concentrated Flow,<br>Woodland Kv= 5.0 fps        |
| 40.4     | 720           |               |                   |                | Total                                                     |

Subcatchment EX-DA5:



Summary for Subcatchment EX-DA6:

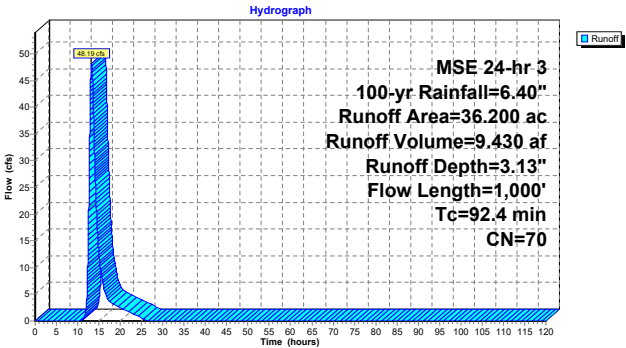
Runoff = 48.19 cfs @ 13.25 hrs, Volume= 9.430 af, Depth= 3.13"  
Routed to Pond W6 : Wetland 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description                 |
|-----------|----|-----------------------------|
| 0.350     | 98 | Unconnected pavement, HSG C |
| 35.850    | 70 | Woods, Good, HSG C          |
| 36.200    | 70 | Weighted Average            |
| 35.850    |    | 99.03% Pervious Area        |
| 0.350     |    | 0.97% Impervious Area       |
| 0.350     |    | 100.00% Unconnected         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 53.7     | 100           | 0.0100        | 0.03              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70"       |
| 38.7     | 900           | 0.0240        | 0.39              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 92.4     | 1,000         |               |                   |                | Total                                                           |

Subcatchment EX-DA6:



Summary for Subcatchment EX-DA7:

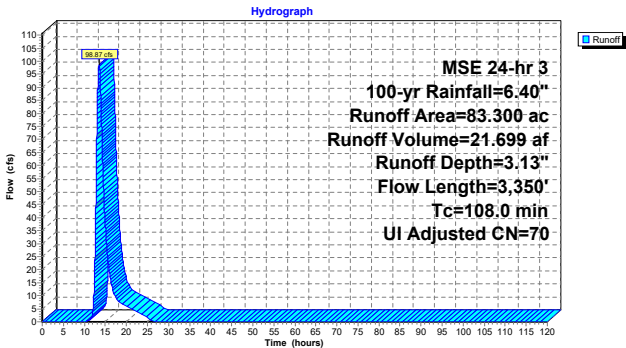
Runoff = 98.87 cfs @ 13.55 hrs, Volume= 21.699 af, Depth= 3.13"  
Routed to Pond W7 : Wetland 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Adj | Description                   |
|-----------|----|-----|-------------------------------|
| 2.770     | 98 |     | Unconnected pavement, HSG C   |
| 80.530    | 70 |     | Woods, Good, HSG C            |
| 83.300    | 71 | 70  | Weighted Average, UI Adjusted |
| 80.530    |    |     | 96.67% Pervious Area          |
| 2.770     |    |     | 3.33% Impervious Area         |
| 2.770     |    |     | 100.00% Unconnected           |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------|
| 39.2     | 100           | 0.0220        | 0.04              |                | Sheet Flow,<br>Woods: Dense underbrush n= 0.800 P2= 2.70"       |
| 51.4     | 1,400         | 0.0330        | 0.45              |                | Shallow Concentrated Flow,<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 17.4     | 1,850         | 0.0140        | 1.77              |                | Shallow Concentrated Flow,<br>Grassed Waterway Kv= 15.0 fps     |
| 108.0    | 3,350         |               |                   |                | Total                                                           |

Subcatchment EX-DA7:



Summary for Pond W1: NE Wetland

Inflow Area = 60.100 ac, 3.88% Impervious, Inflow Depth = 3.14" for 100-yr event  
Inflow = 135.69 cfs @ 12.55 hrs, Volume= 15.738 af  
Outflow = 26.51 cfs @ 13.74 hrs, Volume= 15.737 af, Atten= 80%, Lag= 71.2 min  
Primary = 26.51 cfs @ 13.74 hrs, Volume= 15.737 af  
Routed to Link 10L : Outlet northeast across Midway Rd

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3  
Peak Elev= 1,274.80' @ 13.74 hrs Surf.Area= 6.135 ac Storage= 7.113 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
Center-of-Mass det. time= 109.5 min ( 949.4 - 839.8 )

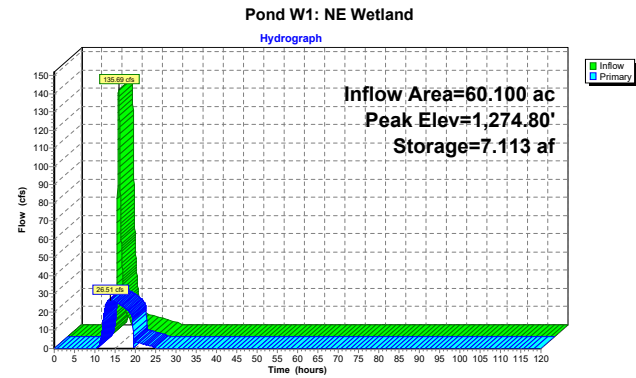
| Volume | Invert    | Avail.Storage | Storage | Description                                          |
|--------|-----------|---------------|---------|------------------------------------------------------|
| #1     | 1,270.00' | 28.430 af     |         | Custom Stage Data (Prismatic), listed below (Recalc) |

| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 1,270.00         | 0.001             | 0.000                 | 0.000                 |
| 1,271.99         | 0.001             | 0.002                 | 0.002                 |
| 1,272.00         | 0.005             | 0.000                 | 0.002                 |
| 1,273.00         | 0.140             | 0.072                 | 0.075                 |
| 1,274.00         | 5.026             | 2.583                 | 2.658                 |
| 1,275.00         | 6.415             | 5.721                 | 8.378                 |
| 1,276.00         | 8.449             | 7.432                 | 15.810                |
| 1,277.00         | 16.790            | 12.620                | 28.430                |

| Device | Routing | Invert    | Outlet Devices                                                                                                                                                                                                            |
|--------|---------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 1,270.32' | 24.0" Round Culvert<br>L= 82.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,270.32' / 1,270.01' S= 0.0038 ' S= 0.0038 ' Cc= 0.900<br>n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf |
| #2     | Primary | 1,276.80' | 42.0' long x 10.0' SideZ x 50.0' breadth Broad-Crested Rectangular Weir<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63                                 |

Primary OutFlow Max=26.51 cfs @ 13.74 hrs HW=1,274.80' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Barrel Controls 26.51 cfs @ 8.44 fps)
- 2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)



Summary for Pond W4: Wetland 4

Inflow Area = 54.400 ac, 0.51% Impervious, Inflow Depth = 3.13" for 100-yr event

Inflow = 84.11 cfs @ 12.83 hrs, Volume= 14.171 af

Outflow = 64.56 cfs @ 13.34 hrs, Volume= 14.170 af, Atten= 23%, Lag= 30.3 min

Primary = 64.56 cfs @ 13.34 hrs, Volume= 14.170 af

Routed to Pond W6 : Wetland 6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3

Peak Elev= 1,296.66' @ 13.34 hrs Surf.Area= 235,195 sf Storage= 141,758 cf

Plug-Flow detention time= 57.1 min calculated for 14.168 af (100% of inflow)

Center-of-Mass det. time= 57.5 min ( 925.0 - 867.6 )

Volume Invert Avail.Storage Storage Description

#1 1,296.00' 226,046 cf Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet) Surf.Area (sq-ft) Inc.Store (cubic-feet) Cum.Store (cubic-feet)

1,296.00 196,780 0 0

1,297.00 255,311 226,046 226,046

Device Routing Invert Outlet Devices

#1 Primary 1,296.00' 40.0' long + 10.0 ' SideZ x 100.0' breadth Broad-Crested Rectangular Weir

Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=64.55 cfs @ 13.34 hrs HW=1,296.66' TW=1,285.84' (Dynamic Tailwater)

1=Broad-Crested Rectangular Weir(Weir Controls 64.55 cfs @ 2.11 fps)

2025-0717- Hermantown Industrial - Existing  
Prepared by Kimley-Horn & Associates  
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MSE 24-hr 3 100-yr Rainfall=6.40"  
Printed 7/17/2026  
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Pond W4: Wetland 4

Hydrograph

Inflow Area=54.400 ac  
Peak Elev=1,296.66'  
Storage=141,758 cf

Flow (cfs)

Time (hours)

Inflow  
Primary

2025-0717- Hermantown Industrial - Existing  
Prepared by Kimley-Horn & Associates  
HydroCAD® 10.20-5c s/n 02344 © 2023 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Rainfall=6.40"  
Printed 7/17/2026  
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Summary for Pond W5: Wetland 5

Inflow Area = 14.900 ac, 0.00% Impervious, Inflow Depth = 3.13" for 100-yr event

Inflow = 34.70 cfs @ 12.57 hrs, Volume= 3.881 af

Outflow = 31.82 cfs @ 12.71 hrs, Volume= 3.881 af, Atten= 8%, Lag= 8.0 min

Primary = 31.82 cfs @ 12.71 hrs, Volume= 3.881 af

Routed to Pond W4 : Wetland 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3

Peak Elev= 1,299.27' @ 12.71 hrs Surf.Area= 79,968 sf Storage= 20,897 cf

Plug-Flow detention time= 19.3 min calculated for 3.881 af (100% of inflow)

Center-of-Mass det. time= 18.9 min ( 859.6 - 840.7 )

Volume Invert Avail.Storage Storage Description

#1 1,299.00' 189,268 cf Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet) Surf.Area (sq-ft) Inc.Store (cubic-feet) Cum.Store (cubic-feet)

1,299.00 74,530 0 0

1,301.00 114,738 189,268 189,268

Device Routing Invert Outlet Devices

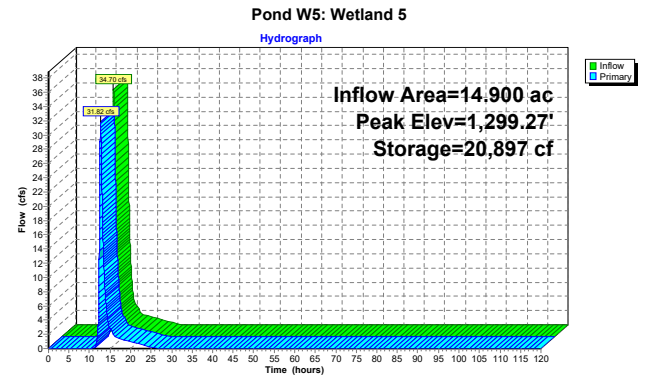
#1 Primary 1,299.00' 82.0' long + 10.0 ' SideZ x 48.0' breadth Broad-Crested Rectangular Weir

Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

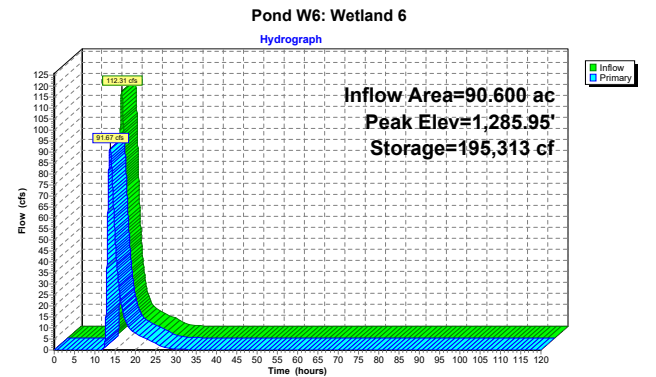
Primary OutFlow Max=31.80 cfs @ 12.71 hrs HW=1,299.27' TW=1,296.41' (Dynamic Tailwater)

1=Broad-Crested Rectangular Weir(Weir Controls 31.80 cfs @ 1.39 fps)



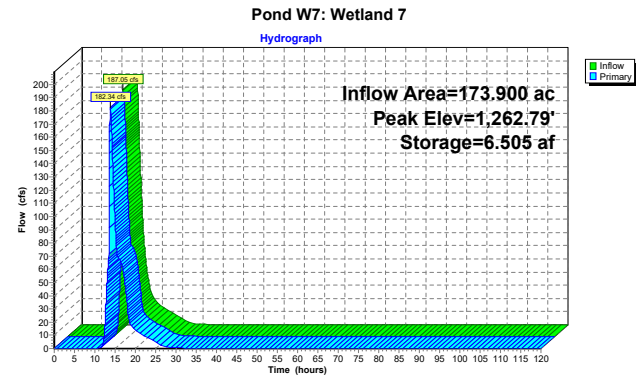
Summary for Pond W6: Wetland 6

Inflow Area = 90.600 ac, 0.70% Impervious, Inflow Depth = 3.13" for 100-yr event  
Inflow = 112.31 cfs @ 13.29 hrs, Volume= 23.600 af  
Outflow = 91.67 cfs @ 13.78 hrs, Volume= 23.599 af, Atten= 18%, Lag= 29.4 min  
Primary = 91.67 cfs @ 13.78 hrs, Volume= 23.599 af  
Routed to Pond W7 : Wetland 7  
  
Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3  
Peak Elev= 1,285.95' @ 13.78 hrs Surf.Area= 264,212 sf Storage= 195,313 cf  
  
Plug-Flow detention time= 50.2 min calculated for 23.599 af (100% of inflow)  
Center-of-Mass det. time= 50.0 min ( 960.5 - 910.5 )  
  
Volume Invert Avail.Storage Storage Description  
#1 1,285.00' 208,642 cf Custom Stage Data (Prismatic) Listed below (Recalc)  
  
Elevation Surf.Area Inc.Store Cum.Store  
(feet) (sq-ft) (cubic-feet) (cubic-feet)  
1,285.00 146,915 0 0  
1,286.00 270,368 208,642 208,642  
  
Device Routing Invert Outlet Devices  
#1 Primary 1,285.00' 30.0' long x 10.0 'I' SideZ x 100.0' breadth Broad-Crested Rectangular Weir  
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60  
Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63  
  
Primary OutFlow Max=91.67 cfs @ 13.78 hrs HW=1,285.95' TW=1,262.78' (Dynamic Tailwater)  
1=Broad-Crested Rectangular Weir (Weir Controls 91.67 cfs @ 2.44 fps)



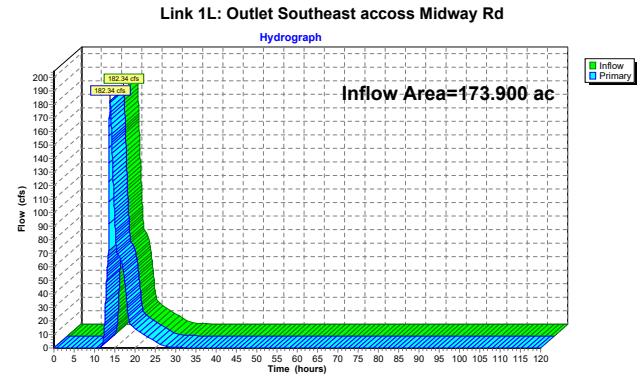
Summary for Pond W7: Wetland 7

Inflow Area = 173.900 ac, 1.96% Impervious, Inflow Depth = 3.13" for 100-yr event  
Inflow = 187.05 cfs @ 13.64 hrs, Volume= 45.298 af  
Outflow = 182.34 cfs @ 13.82 hrs, Volume= 45.282 af, Atten= 3%, Lag= 11.0 min  
Primary = 182.34 cfs @ 13.82 hrs, Volume= 45.282 af  
Routed to Link 1L : Outlet Southeast accross Midway Rd  
  
Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 3  
Peak Elev= 1,262.79' @ 13.82 hrs Surf.Area= 3.481 ac Storage= 6.505 af  
  
Plug-Flow detention time= 32.3 min calculated for 45.274 af (100% of inflow)  
Center-of-Mass det. time= 31.6 min ( 964.9 - 933.4 )  
  
Volume Invert Avail.Storage Storage Description  
#1 1,256.00' 18,795 af Custom Stage Data (Prismatic) Listed below (Recalc)  
  
Elevation Surf.Area Inc.Store Cum.Store  
(feet) (acres) (acre-feet) (acre-feet)  
1,256.00 0.005 0.000 0.000  
1,257.00 0.050 0.027 0.027  
1,258.00 0.200 0.125 0.152  
1,259.00 0.497 0.348 0.500  
1,260.00 0.864 0.680 1.180  
1,261.00 1.362 1.113 2.293  
1,262.00 2.424 1.893 4.186  
1,263.00 3.770 3.097 7.283  
1,264.00 5.818 4.794 12.077  
1,265.00 7.617 6.717 18.795  
  
Device Routing Invert Outlet Devices  
#1 Primary 1,256.76' 36.0" Round Culvert  
L= 70.0' RCP, square edge headwall, Ke= 0.500  
Inlet / Outlet Invert= 1,256.76' / 1,254.25' S= 0.0359 'I' Cc= 0.900  
n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf  
#2 Primary 1,262.50' 266.0' long x 10.0 'I' SideZ x 40.0' breadth Broad-Crested Rectangular Weir  
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60  
Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63  
  
Primary OutFlow Max=182.31 cfs @ 13.82 hrs HW=1,262.79' TW=0.00' (Dynamic Tailwater)  
1=Culvert (Inlet Controls 72.40 cfs @ 10.24 fps)  
2=Broad-Crested Rectangular Weir (Weir Controls 109.91 cfs @ 1.43 fps)



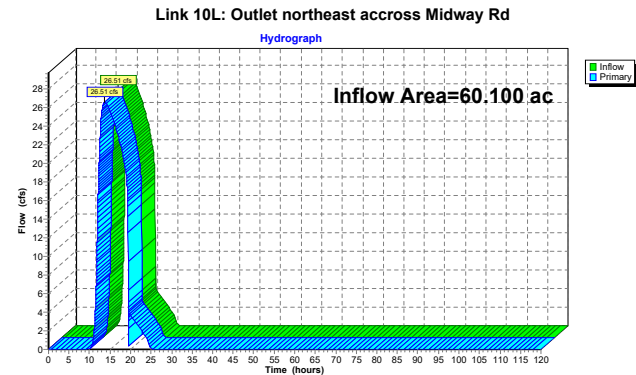
Summary for Link 1L: Outlet Southeast access Midway Rd

Inflow Area = 173.900 ac, 1.96% Impervious, Inflow Depth = 3.12" for 100-yr event  
Inflow = 182.34 cfs @ 13.82 hrs, Volume= 45.282 af  
Primary = 182.34 cfs @ 13.82 hrs, Volume= 45.282 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 11L : Site Discharge  
Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs



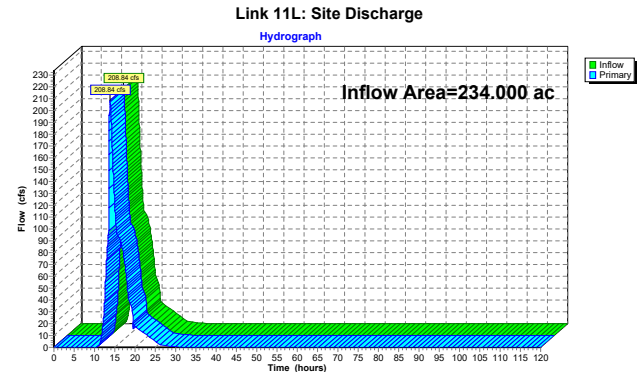
Summary for Link 10L: Outlet northeast accross Midway Rd

Inflow Area = 60.100 ac, 3.88% Impervious, Inflow Depth = 3.14" for 100-yr event  
Inflow = 26.51 cfs @ 13.74 hrs, Volume= 15.737 af  
Primary = 26.51 cfs @ 13.74 hrs, Volume= 15.737 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 11L : Site Discharge  
Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs



Summary for Link 11L: Site Discharge

Inflow Area = 234.000 ac, 2.45% Impervious, Inflow Depth = 3.13" for 100-yr event  
Inflow = 208.84 cfs @ 13.82 hrs, Volume= 61.019 af  
Primary = 208.84 cfs @ 13.82 hrs, Volume= 61.019 af, Atten= 0%, Lag= 0.0 min  
Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs



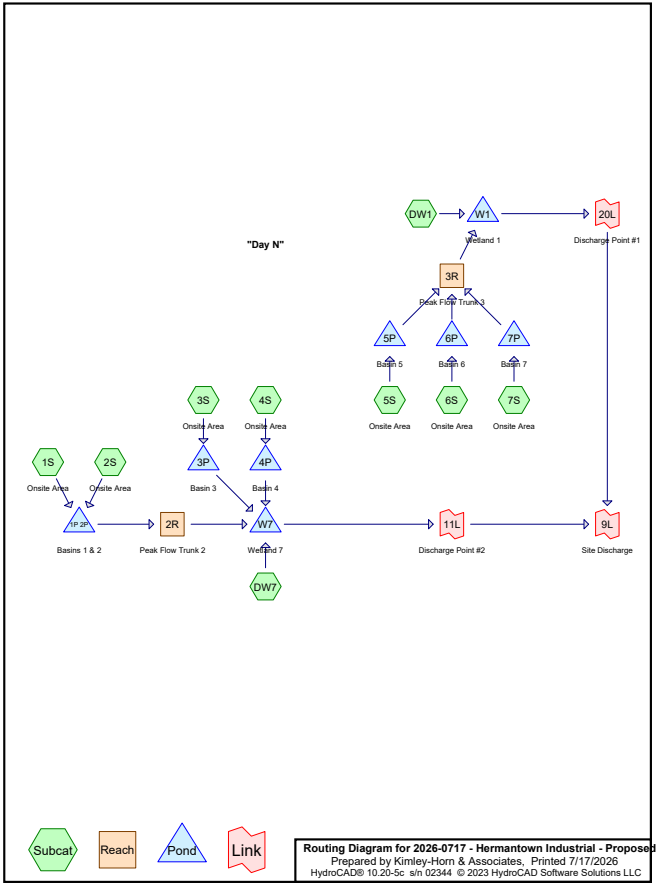
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## **Appendix 4. Post Development HydroCAD Model Analysis**

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Rainfall Events Listing (selected events)

| Event# | Event Name | Storm Type | Curve | Mode    | Duration (hours) | B/B | Depth (inches) | AMC |
|--------|------------|------------|-------|---------|------------------|-----|----------------|-----|
| 1      | 2-yr       | MSE 24-hr  | 3     | Default | 24.00            | 1   | 2.70           | 2   |
| 2      | 10-yr      | MSE 24-hr  | 3     | Default | 24.00            | 1   | 4.00           | 2   |
| 3      | 100-yr     | MSE 24-hr  | 3     | Default | 24.00            | 1   | 6.40           | 2   |



Area Listing (selected nodes)

| Area (acres) | CN | Description (subcatchment-numbers)                          |
|--------------|----|-------------------------------------------------------------|
| 93.720       | 98 | Paved parking, HSG D (1S, 2S, 3S, 4S, 5S, 6S, 7S)           |
| 60.120       | 70 | Woods, Good, HSG C (DW1, DW7)                               |
| 80.160       | 76 | Woods/grass comb., Fair, HSG C (1S, 2S, 3S, 4S, 5S, 6S, 7S) |
| 234.000      | 83 | TOTAL AREA                                                  |

Soil Listing (selected nodes)

| Area (acres) | Soil Group | Subcatchment Numbers                 |
|--------------|------------|--------------------------------------|
| 0.000        | HSG A      |                                      |
| 0.000        | HSG B      |                                      |
| 140.280      | HSG C      | 1S, 2S, 3S, 4S, 5S, 6S, 7S, DW1, DW7 |
| 93.720       | HSG D      | 1S, 2S, 3S, 4S, 5S, 6S, 7S           |
| 0.000        | Other      |                                      |
| 234.000      |            | TOTAL AREA                           |

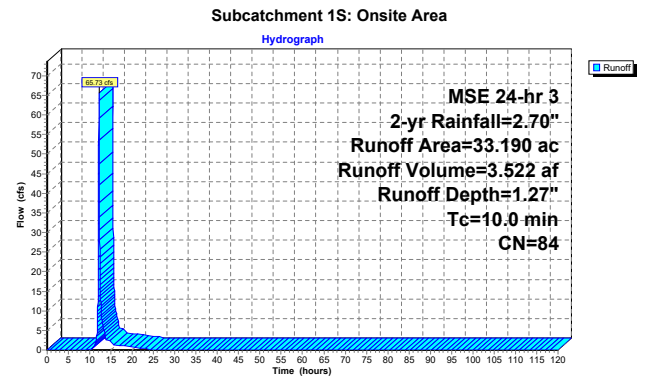
| Ground Covers (selected nodes) |                  |                  |                  |                  |                  |                         |                                     |
|--------------------------------|------------------|------------------|------------------|------------------|------------------|-------------------------|-------------------------------------|
| HSG-A<br>(acres)               | HSG-B<br>(acres) | HSG-C<br>(acres) | HSG-D<br>(acres) | Other<br>(acres) | Total<br>(acres) | Ground<br>Cover         | Subcatchment<br>Numbers             |
| 0.000                          | 0.000            | 0.000            | 93.720           | 0.000            | 93.720           | Paved parking           | 1S, 2S,<br>3S, 4S,<br>5S, 6S,<br>7S |
| 0.000                          | 0.000            | 60.120           | 0.000            | 0.000            | 60.120           | Woods, Good             | DW1,<br>DW7                         |
| 0.000                          | 0.000            | 80.160           | 0.000            | 0.000            | 80.160           | Woods/grass comb., Fair | 1S, 2S,<br>3S, 4S,<br>5S, 6S,<br>7S |
| 0.000                          | 0.000            | 140.280          | 93.720           | 0.000            | 234.000          | TOTAL AREA              |                                     |

|                                                                            |                                                                                                                             |
|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Time span=0.00-120.00 hrs, dt=0.02 hrs, 6001 points x 2                    |                                                                                                                             |
| Runoff by SCS TR-20 method, UH=SCS, Weighted-CN                            |                                                                                                                             |
| Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method |                                                                                                                             |
| Subcatchment1S: Onsite Area                                                | Runoff Area=33.190 ac 36.25% Impervious Runoff Depth=1.27"<br>Tc=10.0 min CN=84 Runoff=65.73 cfs 3.522 af                   |
| Subcatchment2S: Onsite Area                                                | Runoff Area=51.390 ac 71.61% Impervious Runoff Depth=1.88"<br>Tc=10.0 min CN=92 Runoff=146.27 cfs 8.048 af                  |
| Subcatchment3S: Onsite Area                                                | Runoff Area=7.740 ac 46.12% Impervious Runoff Depth=1.41"<br>Tc=10.0 min CN=86 Runoff=16.95 cfs 0.909 af                    |
| Subcatchment4S: Onsite Area                                                | Runoff Area=13.970 ac 51.40% Impervious Runoff Depth=1.48"<br>Tc=10.0 min CN=87 Runoff=32.10 cfs 1.723 af                   |
| Subcatchment5S: Onsite Area                                                | Runoff Area=27.850 ac 47.04% Impervious Runoff Depth=1.41"<br>Tc=10.0 min CN=86 Runoff=61.00 cfs 3.269 af                   |
| Subcatchment6S: Onsite Area                                                | Runoff Area=18.280 ac 50.55% Impervious Runoff Depth=1.48"<br>Tc=10.0 min CN=87 Runoff=42.00 cfs 2.255 af                   |
| Subcatchment7S: Onsite Area                                                | Runoff Area=21.460 ac 54.99% Impervious Runoff Depth=1.55"<br>Tc=10.0 min CN=88 Runoff=51.65 cfs 2.779 af                   |
| SubcatchmentDW1:                                                           | Runoff Area=25.280 ac 0.00% Impervious Runoff Depth=0.55"<br>Tc=7.0 min CN=70 Runoff=22.29 cfs 1.167 af                     |
| SubcatchmentDW7:                                                           | Runoff Area=34.840 ac 0.00% Impervious Runoff Depth=0.55"<br>Flow Length=2,600' Tc=47.3 min CN=70 Runoff=10.92 cfs 1.609 af |
| Reach 2R: Peak Flow Trunk 2                                                | Inflow=3.70 cfs 11.523 af<br>Outflow=3.70 cfs 11.523 af                                                                     |
| Reach 3R: Peak Flow Trunk 3                                                | Inflow=3.52 cfs 6.645 af<br>Outflow=3.52 cfs 6.645 af                                                                       |
| Pond 1P 2P: Basins 1 & 2                                                   | Peak Elev=1,291.83' Storage=8.760 af Inflow=211.92 cfs 11.569 af<br>Outflow=3.70 cfs 11.523 af                              |
| Pond 3P: Basin 3                                                           | Peak Elev=1,286.76' Storage=0.665 af Inflow=16.95 cfs 0.909 af<br>Outflow=0.32 cfs 0.908 af                                 |
| Pond 4P: Basin 4                                                           | Peak Elev=1,285.29' Storage=1.153 af Inflow=32.10 cfs 1.723 af<br>Outflow=1.07 cfs 1.719 af                                 |
| Pond 5P: Basin 5                                                           | Peak Elev=1,286.62' Storage=2.499 af Inflow=61.00 cfs 3.269 af<br>Outflow=1.19 cfs 1.621 af                                 |
| Pond 6P: Basin 6                                                           | Peak Elev=1,287.26' Storage=1.724 af Inflow=42.00 cfs 2.255 af<br>Outflow=0.63 cfs 2.253 af                                 |

|                              |                                                                                                                                            |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Pond 7P: Basin 7             | Peak Elev=1,285.39' Storage=81,999 cf Inflow=51.65 cfs 2.779 af<br>Outflow=1.70 cfs 2.771 af                                               |
| Pond W1: Wetland 1           | Peak Elev=1,273.03' Storage=0.081 af Inflow=24.42 cfs 7.812 af<br>24.0" Round Culvert n=0.013 L=82.0' S=0.0038 ' Inflow=16.02 cfs 7.812 af |
| Pond W7: Wetland 7           | Peak Elev=1,258.27' Storage=0.216 af Inflow=15.94 cfs 15.760 af<br>Outflow=14.84 cfs 15.742 af                                             |
| Link 9L: Site Discharge      | Inflow=22.12 cfs 23.554 af<br>Primary=22.12 cfs 23.554 af                                                                                  |
| Link 11L: Discharge Point #2 | Inflow=14.84 cfs 15.742 af<br>Primary=14.84 cfs 15.742 af                                                                                  |
| Link 20L: Discharge Point #1 | Inflow=16.02 cfs 7.812 af<br>Primary=16.02 cfs 7.812 af                                                                                    |

Total Runoff Area = 234.000 ac Runoff Volume = 25.280 af Average Runoff Depth = 1.30"  
59.95% Pervious = 140.280 ac 40.05% Impervious = 93.720 ac

| Summary for Subcatchment 1S: Onsite Area                                                  |               |                                |                   |                |               |
|-------------------------------------------------------------------------------------------|---------------|--------------------------------|-------------------|----------------|---------------|
| Runoff                                                                                    | =             | 65.73 cfs @ 12.18 hrs, Volume= | 3.522 af, Depth=  | 1.27"          |               |
| Routed to Pond 1P 2P : Basins 1 & 2                                                       |               |                                |                   |                |               |
| Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs |               |                                |                   |                |               |
| MSE 24-hr 3 2-yr Rainfall=2.70"                                                           |               |                                |                   |                |               |
| Area (ac)                                                                                 | CN            | Description                    |                   |                |               |
| 12.030                                                                                    | 98            | Paved parking, HSG D           |                   |                |               |
| 21.160                                                                                    | 76            | Woods/grass comb., Fair, HSG C |                   |                |               |
| 33.190                                                                                    | 84            | Weighted Average               |                   |                |               |
| 21.160                                                                                    |               | 63.75% Pervious Area           |                   |                |               |
| 12.030                                                                                    |               | 36.25% Impervious Area         |                   |                |               |
| Tc (min)                                                                                  | Length (feet) | Slope (ft/ft)                  | Velocity (ft/sec) | Capacity (cfs) | Description   |
| 10.0                                                                                      |               |                                |                   |                | Direct Entry, |



### Summary for Subcatchment 2S: Onsite Area

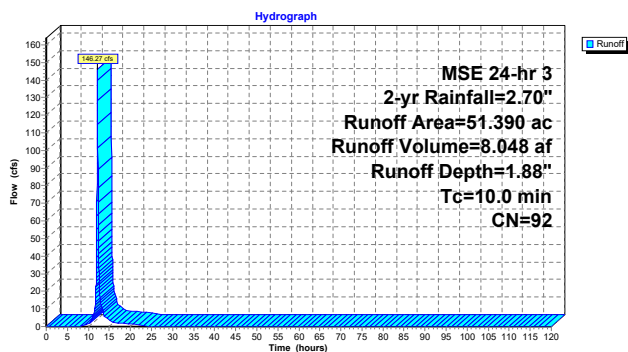
Runoff = 146.27 cfs @ 12.17 hrs, Volume= 8.048 af, Depth= 1.88"  
 Routed to Pond 1P 2P : Basins 1 & 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 36.800    | 98 | Paved parking, HSG D           |
| 14.590    | 76 | Woods/grass comb., Fair, HSG C |
| 51.390    | 92 | Weighted Average               |
| 14.590    |    | 28.39% Pervious Area           |
| 36.800    |    | 71.61% Impervious Area         |

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

### Subcatchment 2S: Onsite Area



### Summary for Subcatchment 3S: Onsite Area

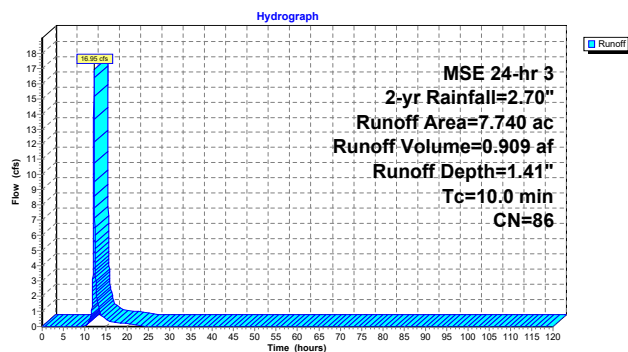
Runoff = 16.95 cfs @ 12.18 hrs, Volume= 0.909 af, Depth= 1.41"  
 Routed to Pond 3P : Basin 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 3.570     | 98 | Paved parking, HSG D           |
| 4.170     | 76 | Woods/grass comb., Fair, HSG C |
| 7.740     | 86 | Weighted Average               |
| 4.170     |    | 53.88% Pervious Area           |
| 3.570     |    | 46.12% Impervious Area         |

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

### Subcatchment 3S: Onsite Area



### Summary for Subcatchment 4S: Onsite Area

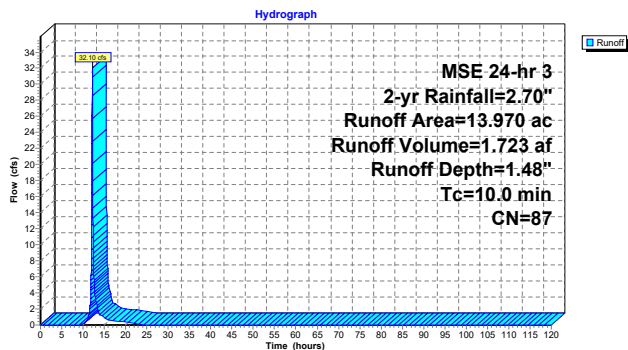
Runoff = 32.10 cfs @ 12.18 hrs, Volume= 1.723 af, Depth= 1.48"  
 Routed to Pond 4P : Basin 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 7.180     | 98 | Paved parking, HSG D           |
| 6.790     | 76 | Woods/grass comb., Fair, HSG C |
| 13.970    | 87 | Weighted Average               |
| 6.790     |    | 48.60% Pervious Area           |
| 7.180     |    | 51.40% Impervious Area         |

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

### Subcatchment 4S: Onsite Area



### Summary for Subcatchment 5S: Onsite Area

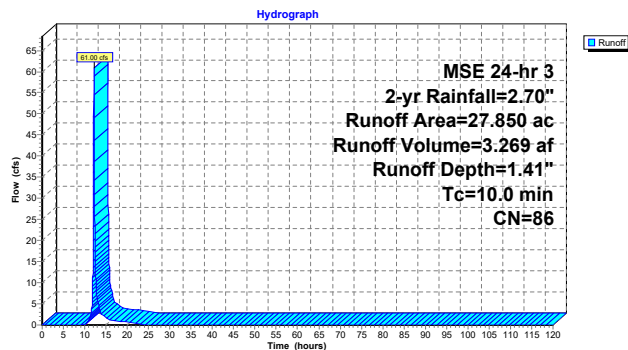
Runoff = 61.00 cfs @ 12.18 hrs, Volume= 3.269 af, Depth= 1.41"  
 Routed to Pond 5P : Basin 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 13.100    | 98 | Paved parking, HSG D           |
| 14.750    | 76 | Woods/grass comb., Fair, HSG C |
| 27.850    | 86 | Weighted Average               |
| 14.750    |    | 52.96% Pervious Area           |
| 13.100    |    | 47.04% Impervious Area         |

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

### Subcatchment 5S: Onsite Area



Summary for Subcatchment 6S: Onsite Area

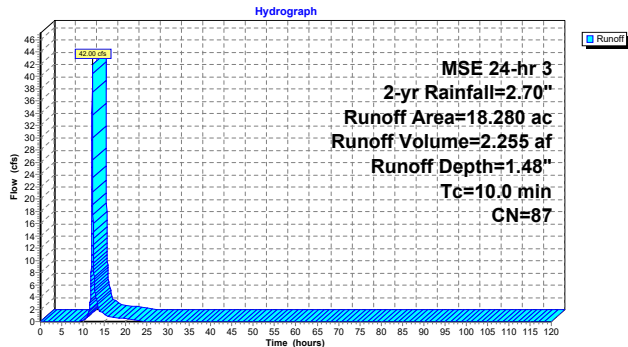
Runoff = 42.00 cfs @ 12.18 hrs, Volume= 2.255 af, Depth= 1.48"  
 Routed to Pond 6P : Basin 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 9.240     | 98 | Paved parking, HSG D           |
| 9.040     | 76 | Woods/grass comb., Fair, HSG C |
| 18.280    | 87 | Weighted Average               |
| 9.040     |    | 49.45% Pervious Area           |
| 9.240     |    | 50.55% Impervious Area         |

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

Subcatchment 6S: Onsite Area



Summary for Subcatchment 7S: Onsite Area

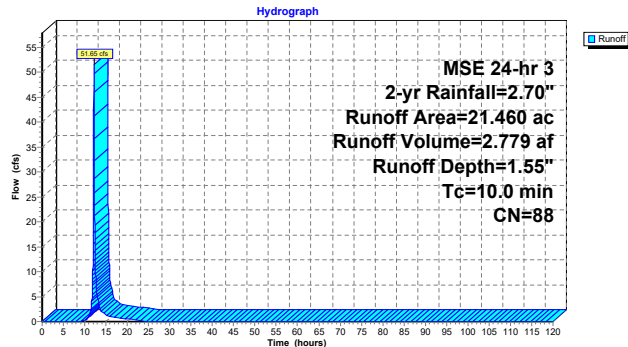
Runoff = 51.65 cfs @ 12.18 hrs, Volume= 2.779 af, Depth= 1.55"  
 Routed to Pond 7P : Basin 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 11.800    | 98 | Paved parking, HSG D           |
| 9.660     | 76 | Woods/grass comb., Fair, HSG C |
| 21.460    | 88 | Weighted Average               |
| 9.660     |    | 45.01% Pervious Area           |
| 11.800    |    | 54.99% Impervious Area         |

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

Subcatchment 7S: Onsite Area



Summary for Subcatchment DW1:

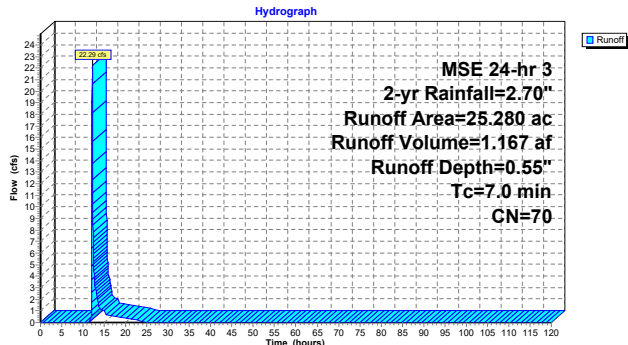
Runoff = 22.29 cfs @ 12.16 hrs, Volume= 1.167 af, Depth= 0.55"  
 Routed to Pond W1 : Wetland 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Description           |
|-----------|----|-----------------------|
| 25.280    | 70 | Woods, Good, HSG C    |
| 25.280    |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 7.0      |               |               |                   |                | Direct Entry, |

Subcatchment DW1:



Summary for Subcatchment DW7:

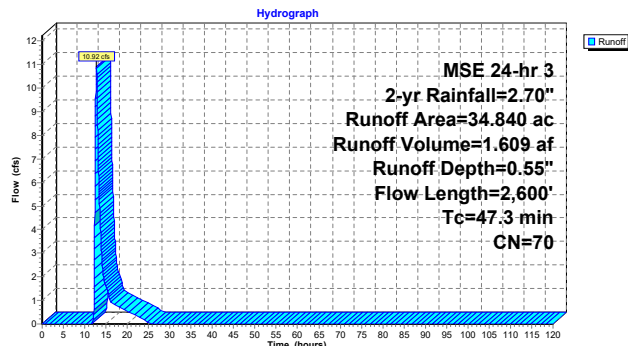
Runoff = 10.92 cfs @ 12.76 hrs, Volume= 1.609 af, Depth= 0.55"  
 Routed to Pond W7 : Wetland 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 2-yr Rainfall=2.70"

| Area (ac) | CN | Description           |
|-----------|----|-----------------------|
| 34.840    | 70 | Woods, Good, HSG C    |
| 34.840    |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                              |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------|
| 16.2     | 100           | 0.0500        | 0.10              |                | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.70"   |
| 13.7     | 650           | 0.0250        | 0.79              |                | Shallow Concentrated Flow, Woodland Kv= 5.0 fps          |
| 17.4     | 1,850         | 0.0140        | 1.77              |                | Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps |
| 47.3     | 2,600         | Total         |                   |                |                                                          |

Subcatchment DW7:

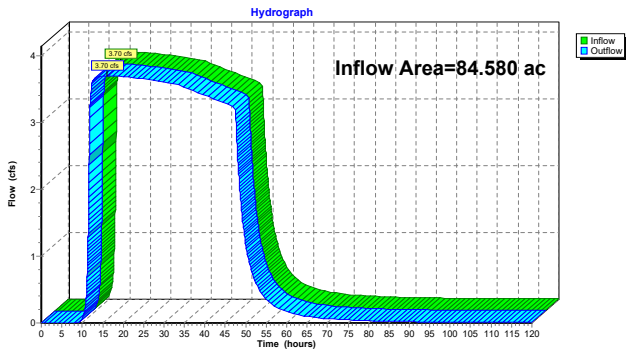


Summary for Reach 2R: Peak Flow Trunk 2

Inflow Area = 84.580 ac, 57.73% Impervious, Inflow Depth > 1.63" for 2-yr event  
Inflow = 3.70 cfs @ 16.06 hrs, Volume= 11.523 af  
Outflow = 3.70 cfs @ 16.06 hrs, Volume= 11.523 af, Atten= 0%, Lag= 0.0 min  
Routed to Pond W7 : Wetland 7

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Reach 2R: Peak Flow Trunk 2

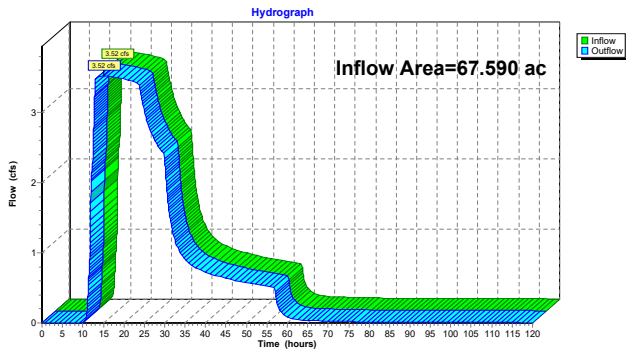


Summary for Reach 3R: Peak Flow Trunk 3

Inflow Area = 67.590 ac, 50.51% Impervious, Inflow Depth > 1.18" for 2-yr event  
Inflow = 3.52 cfs @ 15.14 hrs, Volume= 6.645 af  
Outflow = 3.52 cfs @ 15.14 hrs, Volume= 6.645 af, Atten= 0%, Lag= 0.0 min  
Routed to Pond W1 : Wetland 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Reach 3R: Peak Flow Trunk 3



Summary for Pond 1P 2P: Basins 1 & 2

Inflow Area = 84.580 ac, 57.73% Impervious, Inflow Depth = 1.64" for 2-yr event  
Inflow = 211.92 cfs @ 12.18 hrs, Volume= 11.569 af  
Outflow = 3.70 cfs @ 16.06 hrs, Volume= 11.523 af, Atten= 98%, Lag= 232.9 min  
Primary = 3.70 cfs @ 16.06 hrs, Volume= 11.523 af  
Routed to Reach 2R : Peak Flow Trunk 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,291.83' @ 16.06 hrs Surf.Area= 4.582 ac Storage= 8.760 af

Plug-Flow detention time= 1,081.0 min calculated for 11.523 af (100% of inflow)  
Center-of-Mass det. time= 1,078.5 min ( 1,876.5 - 797.9 )

| Volume | Invert    | Avail.Storage | Storage Description                      |
|--------|-----------|---------------|------------------------------------------|
| #1     | 1,288.00' | 18.916 af     | Pond 1 (Prismatic) Listed below (Recalc) |
| #2     | 1,288.00' | 21.728 af     | Pond 2 (Prismatic) Listed below (Recalc) |
|        |           |               | 40.644 af Total Available Storage        |

| Elevation (feet) | Surf.Area (acres) | Voids (%) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------|-----------------------|-----------------------|
| 1,288.00         | 1.775             | 0.0       | 0.000                 | 0.000                 |
| 1,288.01         | 1.775             | 40.0      | 0.007                 | 0.007                 |
| 1,290.99         | 2.041             | 40.0      | 2.274                 | 2.281                 |
| 1,291.00         | 2.041             | 100.0     | 0.020                 | 2.302                 |
| 1,298.00         | 2.706             | 100.0     | 16.614                | 18.916                |

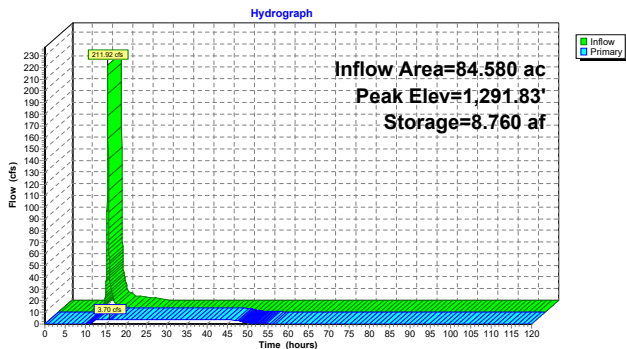
| Elevation (feet) | Surf.Area (acres) | Voids (%) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------|-----------------------|-----------------------|
| 1,288.00         | 2.115             | 0.0       | 0.000                 | 0.000                 |
| 1,288.01         | 2.115             | 40.0      | 0.008                 | 0.008                 |
| 1,290.99         | 2.382             | 40.0      | 2.680                 | 2.689                 |
| 1,291.00         | 2.382             | 100.0     | 0.024                 | 2.712                 |
| 1,298.00         | 3.051             | 100.0     | 19.015                | 21.728                |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                                          |
|--------|----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,288.00' | 42.0" Round Culvert<br>L= 180.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,288.00' / 1,284.00' S= 0.0222 ' S= 0.0222 ' Cc= 0.900<br>n= 0.012, Flow Area= 9.62 sf |
| #2     | Device 1 | 1,292.60' | 18.0" Vert. WQv Orifice C= 0.600 Limited to weir flow at low heads                                                                                                                      |
| #3     | Device 1 | 1,294.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                                |
| #4     | Device 1 | 1,296.00' | 4.0' long OCS RIM X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                                         |
| #5     | Device 1 | 1,288.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                              |

Primary OutFlow Max=3.70 cfs @ 16.06 hrs HW=1,291.83' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 3.70 cfs of 66.84 cfs potential flow)
- 2=WQv Orifice ( Controls 0.00 cfs)
- 3=Weir Wall ( Controls 0.00 cfs)
- 4=OCS RIM ( Controls 0.00 cfs)
- 5=Exfiltration (Exfiltration Controls 3.70 cfs)

Pond 1P 2P: Basins 1 & 2



Summary for Pond 3P: Basin 3

Inflow Area = 7.740 ac, 46.12% Impervious, Inflow Depth = 1.41" for 2-yr event  
Inflow = 16.95 cfs @ 12.18 hrs, Volume= 0.909 af  
Outflow = 0.32 cfs @ 15.86 hrs, Volume= 0.908 af, Atten= 98%, Lag= 221.1 min  
Primary = 0.32 cfs @ 15.86 hrs, Volume= 0.908 af  
Routed to Pond W7 : Wetland 7

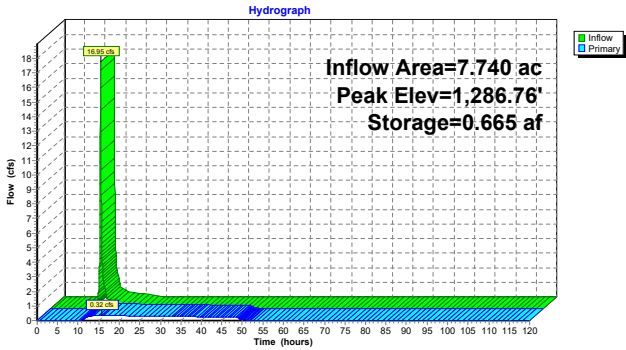
Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,286.76' @ 15.86 hrs Surf.Area= 0.402 ac Storage= 0.665 af  
Plug-Flow detention time= 958.2 min calculated for 0.908 af (100% of inflow)  
Center-of-Mass det. time= 957.8 min ( 1,766.9 - 809.1 )

| Volume           | Invert            | Avail.Storage | Storage Description                                 |                       |
|------------------|-------------------|---------------|-----------------------------------------------------|-----------------------|
| #1               | 1,283.00'         | 4.058 af      | Custom Stage Data (Prismatic).Listed below (Recalc) |                       |
| Elevation (feet) | Surf.Area (acres) | Voids (%)     | Inc.Store (acre-feet)                               | Cum.Store (acre-feet) |
| 1,283.00         | 0.252             | 0.0           | 0.000                                               | 0.000                 |
| 1,283.01         | 0.252             | 40.0          | 0.001                                               | 0.001                 |
| 1,285.99         | 0.368             | 40.0          | 0.370                                               | 0.371                 |
| 1,286.00         | 0.368             | 100.0         | 0.004                                               | 0.374                 |
| 1,293.00         | 0.684             | 100.0         | 3.683                                               | 4.058                 |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                              |
|--------|----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,283.00' | 24.0" Round Culvert<br>L= 355.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,283.00' / 1,281.00' S= 0.0056 ' Cc= 0.900<br>n= 0.012, Flow Area= 3.14 sf |
| #2     | Device 1 | 1,287.60' | 15.0" Vert. WQv Orifice C= 0.600 Limited to weir flow at low heads                                                                                                          |
| #3     | Device 1 | 1,290.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                    |
| #4     | Device 1 | 1,292.00' | 4.0' long OCS RIM X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                             |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                  |

Primary OutFlow Max=0.32 cfs @ 15.86 hrs HW=1,286.76' TW=1,257.70' (Dynamic Tailwater)  
1=Culvert (Passes 0.32 cfs of 21.28 cfs potential flow)  
2=WQv Orifice ( Controls 0.00 cfs)  
3=Weir Wall ( Controls 0.00 cfs)  
4=OCS RIM ( Controls 0.00 cfs)  
5=Exfiltration (Exfiltration Controls 0.32 cfs)

Pond 3P: Basin 3



Summary for Pond 4P: Basin 4

Inflow Area = 13.970 ac, 51.40% Impervious, Inflow Depth = 1.48" for 2-yr event  
Inflow = 32.10 cfs @ 12.18 hrs, Volume= 1.723 af  
Outflow = 1.07 cfs @ 14.68 hrs, Volume= 1.719 af, Atten= 97%, Lag= 150.3 min  
Primary = 1.07 cfs @ 14.68 hrs, Volume= 1.719 af  
Routed to Pond W7 : Wetland 7

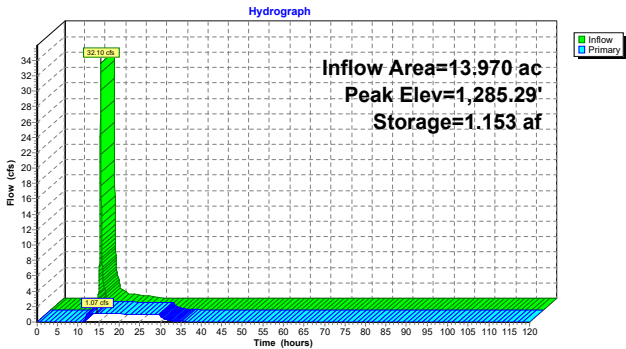
Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,285.29' @ 14.68 hrs Surf.Area= 1.332 ac Storage= 1.153 af  
Plug-Flow detention time= 522.3 min calculated for 1.719 af (100% of inflow)  
Center-of-Mass det. time= 521.8 min ( 1,328.1 - 806.3 )

| Volume           | Invert            | Avail.Storage | Storage Description                                 |                       |
|------------------|-------------------|---------------|-----------------------------------------------------|-----------------------|
| #1               | 1,283.00'         | 12.935 af     | Custom Stage Data (Prismatic).Listed below (Recalc) |                       |
| Elevation (feet) | Surf.Area (acres) | Voids (%)     | Inc.Store (acre-feet)                               | Cum.Store (acre-feet) |
| 1,283.00         | 1.184             | 0.0           | 0.000                                               | 0.000                 |
| 1,283.01         | 1.184             | 40.0          | 0.005                                               | 0.005                 |
| 1,285.99         | 1.378             | 40.0          | 1.527                                               | 1.532                 |
| 1,286.00         | 1.378             | 100.0         | 0.014                                               | 1.545                 |
| 1,293.00         | 1.876             | 100.0         | 11.389                                              | 12.935                |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                              |
|--------|----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,283.00' | 36.0" Round Culvert<br>L= 200.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,283.00' / 1,279.00' S= 0.0200 ' Cc= 0.900<br>n= 0.012, Flow Area= 7.07 sf |
| #2     | Device 1 | 1,287.60' | 15.0" Vert. WQv Orifice C= 0.600 Limited to weir flow at low heads                                                                                                          |
| #3     | Device 1 | 1,289.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                    |
| #4     | Device 1 | 1,290.00' | 4.0' long OCS Rim X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                             |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                  |

Primary OutFlow Max=1.07 cfs @ 14.68 hrs HW=1,285.29' TW=1,257.76' (Dynamic Tailwater)  
1=Culvert (Passes 1.07 cfs of 29.85 cfs potential flow)  
2=WQv Orifice ( Controls 0.00 cfs)  
3=Weir Wall ( Controls 0.00 cfs)  
4=OCS Rim ( Controls 0.00 cfs)  
5=Exfiltration (Exfiltration Controls 1.07 cfs)

Pond 4P: Basin 4



Summary for Pond 5P: Basin 5

Inflow Area = 27.850 ac, 47.04% Impervious, Inflow Depth = 1.41" for 2-yr event

Inflow = 61.00 cfs @ 12.18 hrs, Volume= 3.269 af

Outflow = 1.19 cfs @ 15.70 hrs, Volume= 1.621 af, Atten= 98%, Lag= 211.3 min

Primary = 1.19 cfs @ 15.70 hrs, Volume= 1.621 af

Routed to Reach 3R : Peak Flow Trunk 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 1,286.62' @ 15.70 hrs Surf.Area= 1.470 ac Storage= 2.499 af

Plug-Flow detention time= 723.6 min calculated for 1.621 af (50% of inflow)

Center-of-Mass det. time= 637.3 min ( 1,446.4 - 809.1 )

| Volume | Invert    | Avail.Storage | Storage Description                                 |
|--------|-----------|---------------|-----------------------------------------------------|
| #1     | 1,283.00' | 13.459 af     | Custom Stage Data (Prismatic).Listed below (Recalc) |

| Elevation (feet) | Surf.Area (acres) | Voids (%) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------|-----------------------|-----------------------|
| 1,283.00         | 1.245             | 0.0       | 0.000                 | 0.000                 |
| 1,283.01         | 1.245             | 40.0      | 0.005                 | 0.005                 |
| 1,285.99         | 1.421             | 40.0      | 1.589                 | 1.594                 |
| 1,286.00         | 1.423             | 100.0     | 0.014                 | 1.608                 |
| 1,293.00         | 1.963             | 100.0     | 11.851                | 13.459                |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                              |
|--------|----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,286.00' | 36.0" Round Culvert<br>L= 150.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,286.00' / 1,285.00' S= 0.0067 ' Cc= 0.900<br>n= 0.012, Flow Area= 7.07 sf |
| #2     | Device 1 | 1,287.60' | 15.0" Vert. WQv Orifice C= 0.600 Limited to weir flow at low heads                                                                                                          |
| #3     | Device 1 | 1,289.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                    |
| #4     | Device 1 | 1,290.00' | 4.0' long OCS RIM X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                             |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                  |

Primary OutFlow Max=1.19 cfs @ 15.70 hrs HW=1,286.62' TW=0.00' (Dynamic Tailwater)

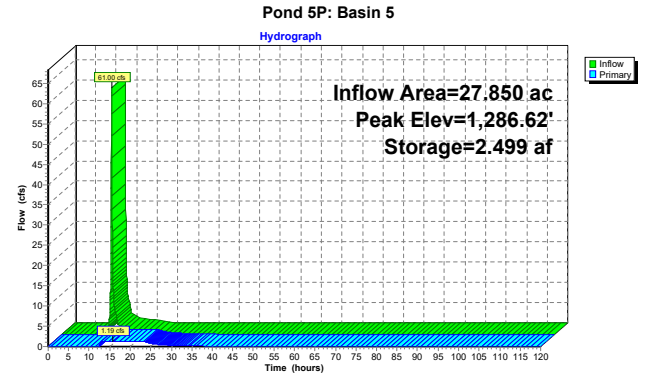
1=Culvert (Passes 1.19 cfs of 2.70 cfs potential flow)

2=WQv Orifice ( Controls 0.00 cfs)

3=Weir Wall ( Controls 0.00 cfs)

4=OCS RIM ( Controls 0.00 cfs)

5=Exfiltration (Exfiltration Controls 1.19 cfs)



Summary for Pond 6P: Basin 6

Inflow Area = 18.280 ac, 50.55% Impervious, Inflow Depth = 1.48" for 2-yr event

Inflow = 42.00 cfs @ 12.18 hrs, Volume= 2.255 af

Outflow = 0.63 cfs @ 17.77 hrs, Volume= 2.253 af, Atten= 98%, Lag= 335.3 min

Primary = 0.63 cfs @ 17.77 hrs, Volume= 2.253 af

Routed to Reach 3R : Peak Flow Trunk 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 1,287.26' @ 17.77 hrs Surf.Area= 0.787 ac Storage= 1.724 af

Plug-Flow detention time= 1,222.4 min calculated for 2.253 af (100% of inflow)

Center-of-Mass det. time= 1,222.1 min ( 2,028.4 - 806.3 )

| Volume | Invert    | Avail.Storage | Storage Description                                 |
|--------|-----------|---------------|-----------------------------------------------------|
| #1     | 1,283.00' | 7.152 af      | Custom Stage Data (Prismatic).Listed below (Recalc) |

| Elevation (feet) | Surf.Area (acres) | Voids (%) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------|-----------------------|-----------------------|
| 1,283.00         | 0.573             | 0.0       | 0.000                 | 0.000                 |
| 1,283.01         | 0.573             | 40.0      | 0.002                 | 0.002                 |
| 1,285.99         | 0.718             | 40.0      | 0.769                 | 0.772                 |
| 1,286.00         | 0.718             | 100.0     | 0.007                 | 0.779                 |
| 1,293.00         | 1.103             | 100.0     | 6.374                 | 7.152                 |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                              |
|--------|----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,283.00' | 36.0" Round Culvert<br>L= 100.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,283.00' / 1,279.00' S= 0.0400 ' Cc= 0.900<br>n= 0.012, Flow Area= 7.07 sf |
| #2     | Primary  | 1,287.60' | 15.0" Vert. WQv Orifice C= 0.600 Limited to weir flow at low heads                                                                                                          |
| #3     | Device 1 | 1,289.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                    |
| #4     | Device 1 | 1,290.00' | 4.0' long OCS RIM X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                             |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                  |

Primary OutFlow Max=0.63 cfs @ 17.77 hrs HW=1,287.26' TW=0.00' (Dynamic Tailwater)

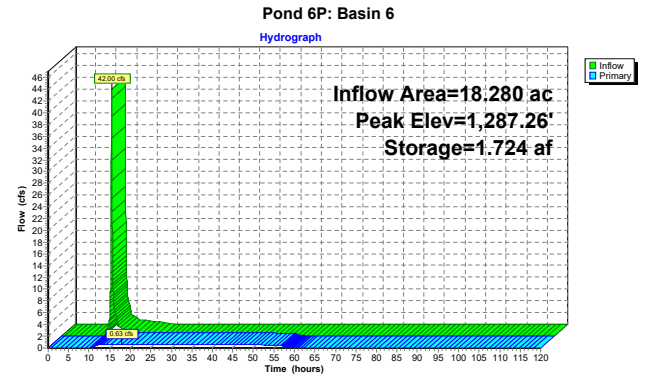
1=Culvert (Passes 0.63 cfs of 56.49 cfs potential flow)

3=Weir Wall ( Controls 0.00 cfs)

4=OCS RIM ( Controls 0.00 cfs)

5=Exfiltration (Exfiltration Controls 0.63 cfs)

2=WQv Orifice ( Controls 0.00 cfs)



Summary for Pond 7P: Basin 7

Inflow Area = 21.460 ac, 54.99% Impervious, Inflow Depth = 1.55" for 2-yr event

Inflow = 51.65 cfs @ 12.18 hrs, Volume= 2.779 af

Outflow = 1.70 cfs @ 14.66 hrs, Volume= 2.771 af, Atten= 97%, Lag= 148.9 min

Primary = 1.70 cfs @ 14.66 hrs, Volume= 2.771 af

Routed to Reach 3R : Peak Flow Trunk 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 1,285.39' @ 14.66 hrs Surf.Area= 91,657 sf Storage= 81,999 cf

Plug-Flow detention time= 548.5 min calculated for 2.770 af (100% of inflow)

Center-of-Mass det. time= 547.4 min ( 1,351.0 - 803.5 )

| Volume | Invert    | Avail.Storage | Storage Description                                 |
|--------|-----------|---------------|-----------------------------------------------------|
| #1     | 1,283.00' | 891,814 cf    | Custom Stage Data (Prismatic) Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Voids (%) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|-----------|------------------------|------------------------|
| 1,283.00         | 80,194            | 0.0       | 0                      | 0                      |
| 1,283.01         | 80,194            | 40.0      | 321                    | 321                    |
| 1,285.99         | 94,569            | 40.0      | 104,159                | 104,479                |
| 1,286.00         | 94,569            | 100.0     | 946                    | 105,425                |
| 1,293.00         | 130,114           | 100.0     | 786,389                | 891,814                |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                                 |
|--------|----------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,283.00' | 42.0" Round Culvert<br>L= 100.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,283.00' / 1,279.00' S= 0.0400 ' /' Cc= 0.900<br>n= 0.012, Flow Area= 9.62 sf |
| #3     | Device 1 | 1,287.60' | 15.0" Vert. WQV Orifice C= 0.600 Limited to weir flow at low heads                                                                                                             |
| #3     | Device 1 | 1,289.00' | 4.0' long Weir Wall 2 End Contractions                                                                                                                                         |
| #4     | Device 1 | 1,290.00' | 4.0' long OCS RIM X 4.00 2 End Contractions 0.5' Crest Height                                                                                                                  |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                     |

Primary OutFlow Max=1.70 cfs @ 14.66 hrs HW=1,285.39' TW=0.00' (Dynamic Tailwater)

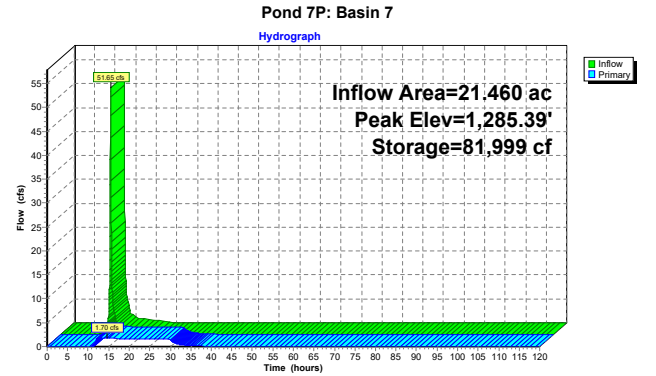
1=Culvert (Passes 1.70 cfs of 36.75 cfs potential flow)

2=WQV Orifice ( Controls 0.00 cfs)

3=Weir Wall ( Controls 0.00 cfs)

4=OCS RIM ( Controls 0.00 cfs)

5=Exfiltration (Exfiltration Controls 1.70 cfs)



Summary for Pond W1: Wetland 1

Inflow Area = 92.870 ac, 36.76% Impervious, Inflow Depth > 1.01" for 2-yr event

Inflow = 24.42 cfs @ 12.16 hrs, Volume= 7.812 af

Outflow = 16.02 cfs @ 12.24 hrs, Volume= 7.812 af, Atten= 34%, Lag= 5.1 min

Primary = 16.02 cfs @ 12.24 hrs, Volume= 7.812 af

Routed to Link 20L : Discharge Point #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 1,273.03' @ 12.24 hrs Surf.Area= 0.280 ac Storage= 0.081 af

Plug-Flow detention time= 0.7 min calculated for 7.811 af (100% of inflow)

Center-of-Mass det. time= 0.4 min ( 1,491.8 - 1,491.4 )

| Volume | Invert    | Avail.Storage | Storage Description                                 |
|--------|-----------|---------------|-----------------------------------------------------|
| #1     | 1,270.00' | 23.725 af     | Custom Stage Data (Prismatic) Listed below (Recalc) |
| #2     | 1,275.00' | 4.145 af      | Custom Stage Data (Prismatic) Listed below (Recalc) |
|        |           | 27.870 af     | Total Available Storage                             |

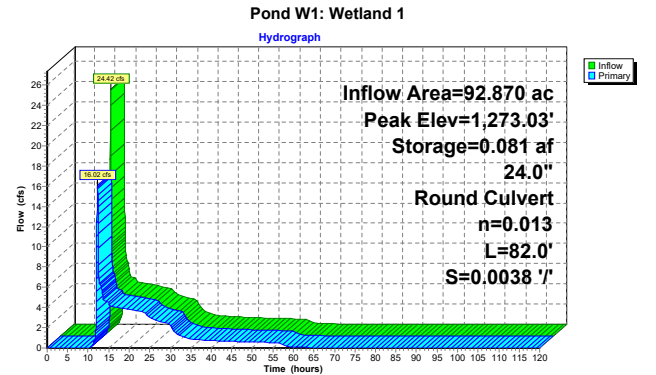
| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 1,270.00         | 0.001             | 0.000                 | 0.000                 |
| 1,271.99         | 0.001             | 0.002                 | 0.002                 |
| 1,272.00         | 0.005             | 0.000                 | 0.002                 |
| 1,273.00         | 0.140             | 0.072                 | 0.075                 |
| 1,274.00         | 5.000             | 2.570                 | 2.645                 |
| 1,275.00         | 6.180             | 5.590                 | 8.235                 |
| 1,276.00         | 7.970             | 7.075                 | 15.310                |
| 1,277.00         | 8.860             | 8.415                 | 23.725                |

| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 1,275.00         | 0.170             | 0.000                 | 0.000                 |
| 1,276.00         | 0.370             | 0.270                 | 0.270                 |
| 1,277.00         | 7.380             | 3.875                 | 4.145                 |

| Device | Routing | Invert    | Outlet Devices                                                                                                                                                                |
|--------|---------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 1,270.32' | 24.0" Round Culvert<br>L= 82.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,270.32' / 1,270.01' S= 0.0038 ' /' Cc= 0.900<br>n= 0.013, Flow Area= 3.14 sf |

Primary OutFlow Max=16.02 cfs @ 12.24 hrs HW=1,273.03' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 16.02 cfs @ 5.10 fps)



Summary for Pond W7: Wetland 7

Inflow Area = 141.130 ac, 42.22% Impervious, Inflow Depth > 1.34" for 2-yr event

Inflow = 15.94 cfs @ 12.76 hrs, Volume= 15.760 af

Outflow = 14.84 cfs @ 12.92 hrs, Volume= 15.742 af, Atten= 7%, Lag= 9.7 min

Primary = 14.84 cfs @ 12.92 hrs, Volume= 15.742 af

Routed to Link 11L : Discharge Point #2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 1,258.27' @ 12.92 hrs Surf.Area= 0.279 ac Storage= 0.216 af

Plug-Flow detention time= 16.6 min calculated for 15.742 af (100% of inflow)

Center-of-Mass det. time= 11.1 min ( 1,720.5 - 1,709.4 )

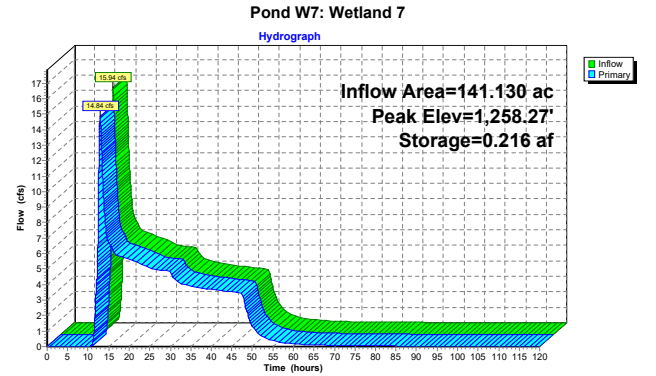
| Volume           | Invert            | Avail.Storage         | Storage Description                                 |
|------------------|-------------------|-----------------------|-----------------------------------------------------|
| #1               | 1,256.00'         | 18.795 af             | Custom Stage Data (Prismatic).Listed below (Recalc) |
| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet)                               |
| 1,256.00         | 0.005             | 0.000                 | 0.000                                               |
| 1,257.00         | 0.050             | 0.027                 | 0.027                                               |
| 1,258.00         | 0.200             | 0.125                 | 0.152                                               |
| 1,259.00         | 0.497             | 0.348                 | 0.500                                               |
| 1,260.00         | 0.864             | 0.680                 | 1.180                                               |
| 1,261.00         | 1.362             | 1.113                 | 2.293                                               |
| 1,262.00         | 2.424             | 1.893                 | 4.186                                               |
| 1,263.00         | 3.770             | 3.097                 | 7.283                                               |
| 1,264.00         | 5.818             | 4.794                 | 12.077                                              |
| 1,265.00         | 7.617             | 6.717                 | 18.795                                              |

| Device | Routing | Invert    | Outlet Devices                                                                                                                                                                                                            |
|--------|---------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 1,256.76' | 36.0" Round Culvert<br>L= 70.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,256.76' / 1,254.25' S= 0.0359 ' S= 0.0359 ' Cc= 0.900<br>n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf |
| #2     | Primary | 1,262.50' | 256.0' long + 10.0 ' SideZ x 40.0' breadth Broad-Crested Rectangular Weir<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63                               |

Primary OutFlow Max=14.84 cfs @ 12.92 hrs HW=1,258.27' TW=0.00' (Dynamic Tailwater)

1=Culvert (Inlet Controls 14.84 cfs @ 4.18 fps)

2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)



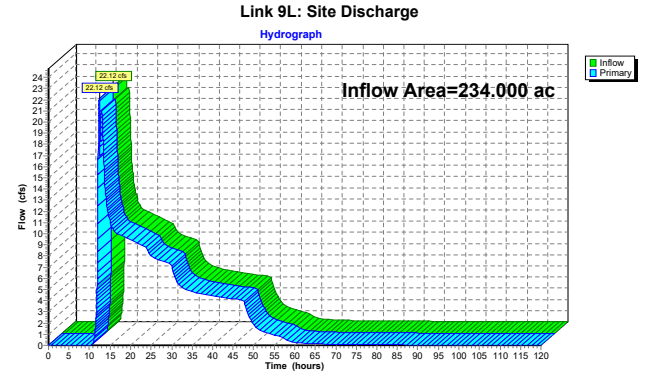
Summary for Link 9L: Site Discharge

Inflow Area = 234.000 ac, 40.05% Impervious, Inflow Depth > 1.21" for 2-yr event

Inflow = 22.12 cfs @ 12.36 hrs, Volume= 23.554 af

Primary = 22.12 cfs @ 12.36 hrs, Volume= 23.554 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs



Summary for Link 11L: Discharge Point #2

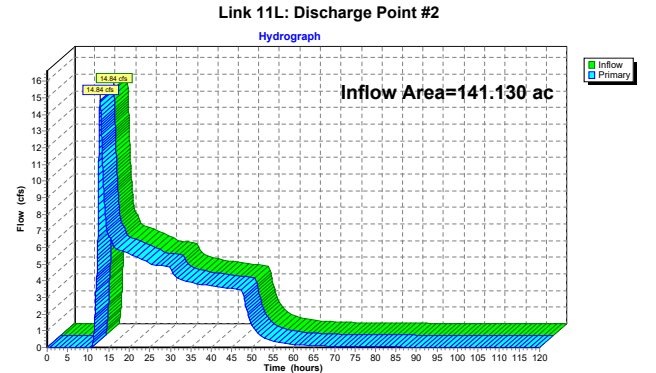
Inflow Area = 141.130 ac, 42.22% Impervious, Inflow Depth > 1.34" for 2-yr event

Inflow = 14.84 cfs @ 12.92 hrs, Volume= 15.742 af

Primary = 14.84 cfs @ 12.92 hrs, Volume= 15.742 af, Atten= 0%, Lag= 0.0 min

Routed to Link 9L : Site Discharge

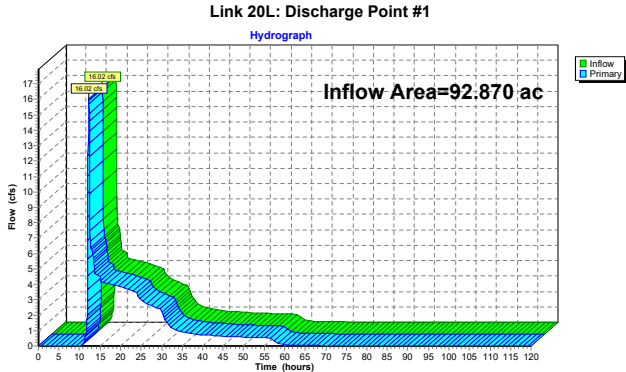
Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs



Summary for Link 20L: Discharge Point #1

Inflow Area = 92.870 ac, 36.76% Impervious, Inflow Depth > 1.01" for 2-yr event  
Inflow = 16.02 cfs @ 12.24 hrs, Volume= 7.812 af  
Primary = 16.02 cfs @ 12.24 hrs, Volume= 7.812 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 9L : Site Discharge

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs



|                                                                            |                                                                                                                             |
|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Time span=0.00-120.00 hrs, dt=0.02 hrs, 6001 points x 2                    |                                                                                                                             |
| Runoff by SCS TR-20 method, UH=SCS, Weighted-CN                            |                                                                                                                             |
| Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method |                                                                                                                             |
| Subcatchment1S: Onsite Area                                                | Runoff Area=33.190 ac 36.25% Impervious Runoff Depth=2.37"<br>Tc=10.0 min CN=84 Runoff=121.62 cfs 6.558 af                  |
| Subcatchment2S: Onsite Area                                                | Runoff Area=51.390 ac 71.61% Impervious Runoff Depth=3.12"<br>Tc=10.0 min CN=92 Runoff=236.22 cfs 13.351 af                 |
| Subcatchment3S: Onsite Area                                                | Runoff Area=7.740 ac 46.12% Impervious Runoff Depth=2.55"<br>Tc=10.0 min CN=86 Runoff=30.25 cfs 1.642 af                    |
| Subcatchment4S: Onsite Area                                                | Runoff Area=13.970 ac 51.40% Impervious Runoff Depth=2.64"<br>Tc=10.0 min CN=87 Runoff=56.28 cfs 3.070 af                   |
| Subcatchment5S: Onsite Area                                                | Runoff Area=27.850 ac 47.04% Impervious Runoff Depth=2.55"<br>Tc=10.0 min CN=86 Runoff=108.84 cfs 5.910 af                  |
| Subcatchment6S: Onsite Area                                                | Runoff Area=18.280 ac 50.55% Impervious Runoff Depth=2.64"<br>Tc=10.0 min CN=87 Runoff=73.64 cfs 4.017 af                   |
| Subcatchment7S: Onsite Area                                                | Runoff Area=21.460 ac 54.99% Impervious Runoff Depth=2.73"<br>Tc=10.0 min CN=88 Runoff=89.01 cfs 4.880 af                   |
| SubcatchmentDW1:                                                           | Runoff Area=25.280 ac 0.00% Impervious Runoff Depth=1.33"<br>Tc=7.0 min CN=70 Runoff=58.78 cfs 2.801 af                     |
| SubcatchmentDW7:                                                           | Runoff Area=34.840 ac 0.00% Impervious Runoff Depth=1.33"<br>Flow Length=2,600' Tc=47.3 min CN=70 Runoff=29.76 cfs 3.860 af |
| Reach 2R: Peak Flow Trunk 2                                                | Inflow=6.03 cfs 19.846 af<br>Outflow=6.03 cfs 19.846 af                                                                     |
| Reach 3R: Peak Flow Trunk 3                                                | Inflow=7.18 cfs 13.138 af<br>Outflow=7.18 cfs 13.138 af                                                                     |
| Pond 1P 2P: Basins 1 & 2                                                   | Peak Elev=1,293.27' Storage=15.532 af Inflow=357.78 cfs 19.909 af<br>Outflow=6.03 cfs 19.846 af                             |
| Pond 3P: Basin 3                                                           | Peak Elev=1,287.96' Storage=1.182 af Inflow=30.25 cfs 1.642 af<br>Outflow=0.96 cfs 1.642 af                                 |
| Pond 4P: Basin 4                                                           | Peak Elev=1,286.51' Storage=2.261 af Inflow=56.28 cfs 3.070 af<br>Outflow=1.14 cfs 3.065 af                                 |
| Pond 5P: Basin 5                                                           | Peak Elev=1,288.03' Storage=4.649 af Inflow=108.84 cfs 5.910 af<br>Outflow=2.09 cfs 4.252 af                                |
| Pond 6P: Basin 6                                                           | Peak Elev=1,288.49' Storage=2.741 af Inflow=73.64 cfs 4.017 af<br>Outflow=3.71 cfs 4.015 af                                 |

|                              |                                                                                                                                                 |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Pond 7P: Basin 7             | Peak Elev=1,286.54' Storage=157,474 cf Inflow=89.01 cfs 4.880 af<br>Outflow=1.80 cfs 4.870 af                                                   |
| Pond W1: Wetland 1           | Peak Elev=1,273.46' Storage=0.649 af Inflow=61.23 cfs 15.939 af<br>24.0" Round Culvert n=0.013 L=82.0' S=0.0038 'ft Outflow=19.11 cfs 15.938 af |
| Pond W7: Wetland 7           | Peak Elev=1,259.07' Storage=0.538 af Inflow=35.16 cfs 28.414 af<br>Outflow=30.29 cfs 28.395 af                                                  |
| Link 9L: Site Discharge      | Inflow=48.77 cfs 44.334 af<br>Primary=48.77 cfs 44.334 af                                                                                       |
| Link 11L: Discharge Point #2 | Inflow=30.29 cfs 28.395 af<br>Primary=30.29 cfs 28.395 af                                                                                       |
| Link 20L: Discharge Point #1 | Inflow=19.11 cfs 15.938 af<br>Primary=19.11 cfs 15.938 af                                                                                       |

Total Runoff Area = 234.000 ac Runoff Volume = 46.089 af Average Runoff Depth = 2.36"  
59.95% Pervious = 140.280 ac 40.05% Impervious = 93.720 ac

Summary for Subcatchment 1S: Onsite Area

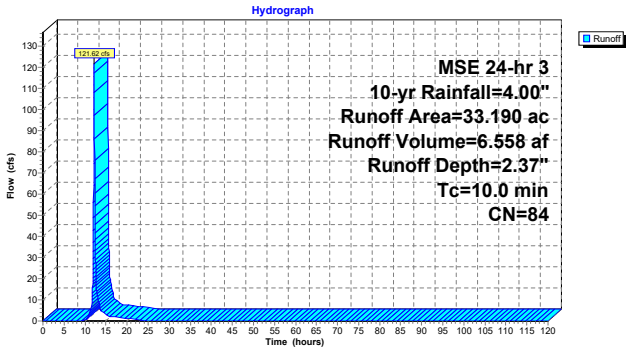
Runoff = 121.62 cfs @ 12.18 hrs, Volume= 6.558 af, Depth= 2.37"  
Routed to Pond 1P 2P : Basins 1 & 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 12.030    | 98 | Paved parking, HSG D           |
| 21.160    | 76 | Woods/grass comb., Fair, HSG C |
| 33.190    | 84 | Weighted Average               |
| 21.160    |    | 63.75% Pervious Area           |
| 12.030    |    | 36.25% Impervious Area         |

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

Subcatchment 1S: Onsite Area



### Summary for Subcatchment 2S: Onsite Area

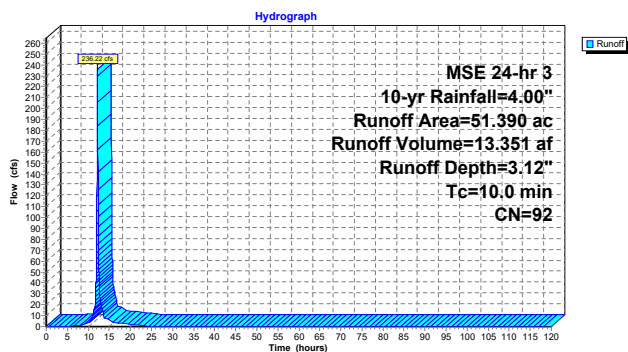
Runoff = 236.22 cfs @ 12.17 hrs, Volume= 13.351 af, Depth= 3.12"  
 Routed to Pond 1P 2P : Basins 1 & 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 36.800    | 98 | Paved parking, HSG D           |
| 14.590    | 76 | Woods/grass comb., Fair, HSG C |
| 51.390    | 92 | Weighted Average               |
| 14.590    |    | 28.39% Pervious Area           |
| 36.800    |    | 71.61% Impervious Area         |

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

### Subcatchment 2S: Onsite Area



### Summary for Subcatchment 3S: Onsite Area

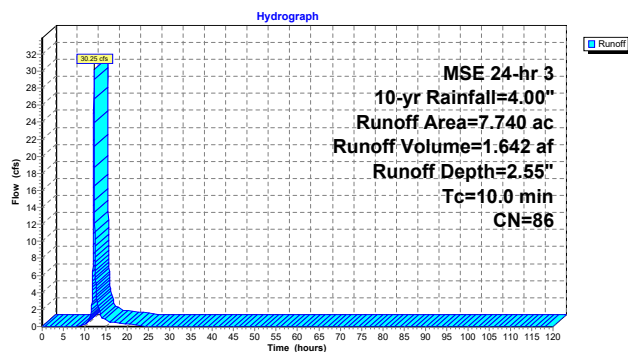
Runoff = 30.25 cfs @ 12.18 hrs, Volume= 1.642 af, Depth= 2.55"  
 Routed to Pond 3P : Basin 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 3.570     | 98 | Paved parking, HSG D           |
| 4.170     | 76 | Woods/grass comb., Fair, HSG C |
| 7.740     | 86 | Weighted Average               |
| 4.170     |    | 53.88% Pervious Area           |
| 3.570     |    | 46.12% Impervious Area         |

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

### Subcatchment 3S: Onsite Area



### Summary for Subcatchment 4S: Onsite Area

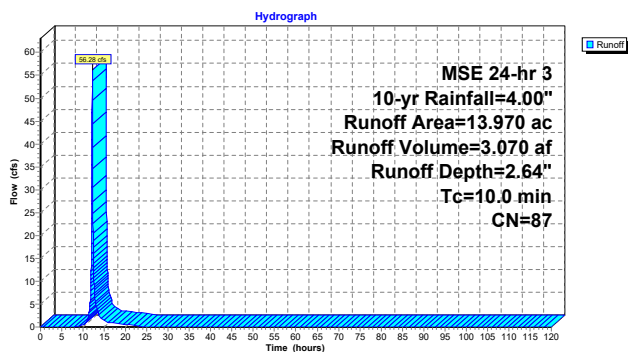
Runoff = 56.28 cfs @ 12.17 hrs, Volume= 3.070 af, Depth= 2.64"  
 Routed to Pond 4P : Basin 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 7.180     | 98 | Paved parking, HSG D           |
| 6.790     | 76 | Woods/grass comb., Fair, HSG C |
| 13.970    | 87 | Weighted Average               |
| 6.790     |    | 48.60% Pervious Area           |
| 7.180     |    | 51.40% Impervious Area         |

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

### Subcatchment 4S: Onsite Area



### Summary for Subcatchment 5S: Onsite Area

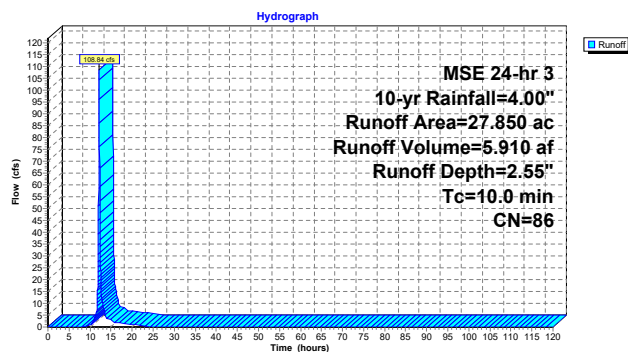
Runoff = 108.84 cfs @ 12.18 hrs, Volume= 5.910 af, Depth= 2.55"  
 Routed to Pond 5P : Basin 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 13.100    | 98 | Paved parking, HSG D           |
| 14.750    | 76 | Woods/grass comb., Fair, HSG C |
| 27.850    | 86 | Weighted Average               |
| 14.750    |    | 52.96% Pervious Area           |
| 13.100    |    | 47.04% Impervious Area         |

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

### Subcatchment 5S: Onsite Area



Summary for Subcatchment 6S: Onsite Area

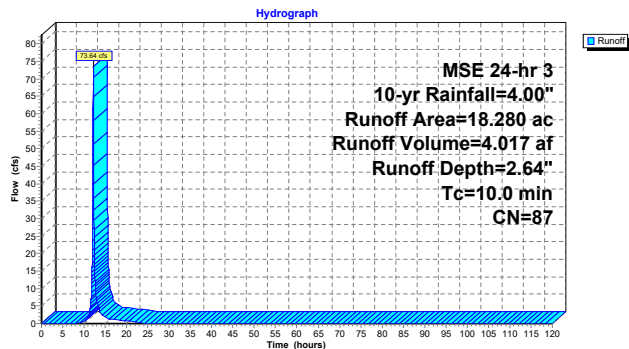
Runoff = 73.64 cfs @ 12.17 hrs, Volume= 4.017 af, Depth= 2.64"  
 Routed to Pond 6P : Basin 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 9.240     | 98 | Paved parking, HSG D           |
| 9.040     | 76 | Woods/grass comb., Fair, HSG C |
| 18.280    | 87 | Weighted Average               |
| 9.040     |    | 49.45% Pervious Area           |
| 9.240     |    | 50.55% Impervious Area         |

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

Subcatchment 6S: Onsite Area



Summary for Subcatchment 7S: Onsite Area

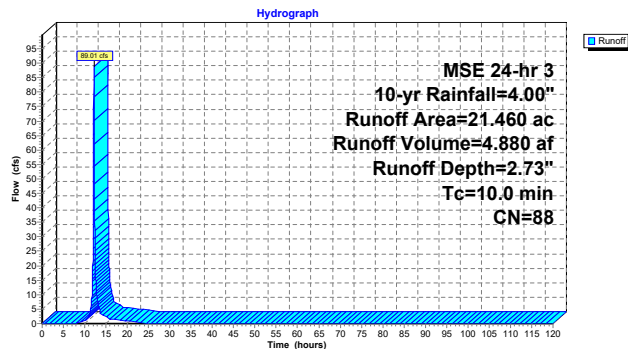
Runoff = 89.01 cfs @ 12.17 hrs, Volume= 4.880 af, Depth= 2.73"  
 Routed to Pond 7P : Basin 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 11.800    | 98 | Paved parking, HSG D           |
| 9.660     | 76 | Woods/grass comb., Fair, HSG C |
| 21.460    | 88 | Weighted Average               |
| 9.660     |    | 45.01% Pervious Area           |
| 11.800    |    | 54.99% Impervious Area         |

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

Subcatchment 7S: Onsite Area



Summary for Subcatchment DW1:

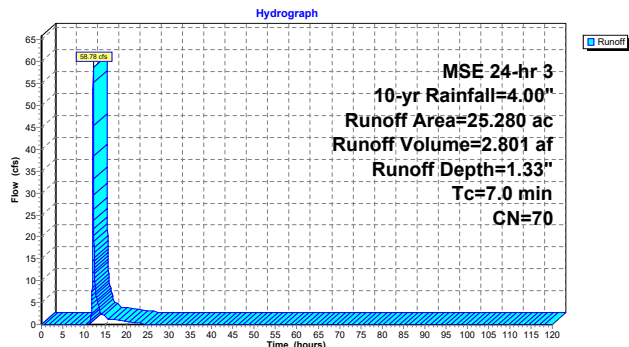
Runoff = 58.78 cfs @ 12.15 hrs, Volume= 2.801 af, Depth= 1.33"  
 Routed to Pond W1 : Wetland 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description           |
|-----------|----|-----------------------|
| 25.280    | 70 | Woods, Good, HSG C    |
| 25.280    |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 7.0      |               |               |                   |                | Direct Entry, |

Subcatchment DW1:



Summary for Subcatchment DW7:

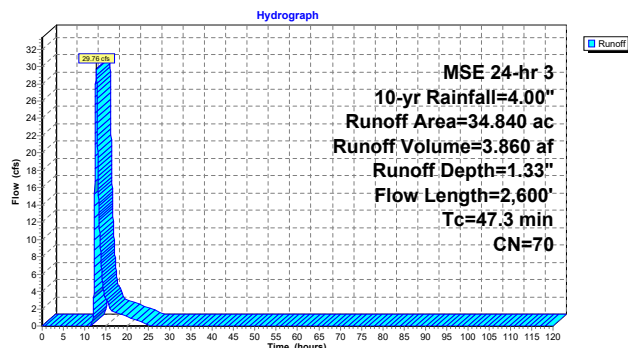
Runoff = 29.76 cfs @ 12.68 hrs, Volume= 3.860 af, Depth= 1.33"  
 Routed to Pond W7 : Wetland 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 10-yr Rainfall=4.00"

| Area (ac) | CN | Description           |
|-----------|----|-----------------------|
| 34.840    | 70 | Woods, Good, HSG C    |
| 34.840    |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                              |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------|
| 16.2     | 100           | 0.0500        | 0.10              |                | Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.70"   |
| 13.7     | 650           | 0.0250        | 0.79              |                | Shallow Concentrated Flow, Woodland Kv= 5.0 fps          |
| 17.4     | 1,850         | 0.0140        | 1.77              |                | Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps |
| 47.3     | 2,600         | Total         |                   |                |                                                          |

Subcatchment DW7:

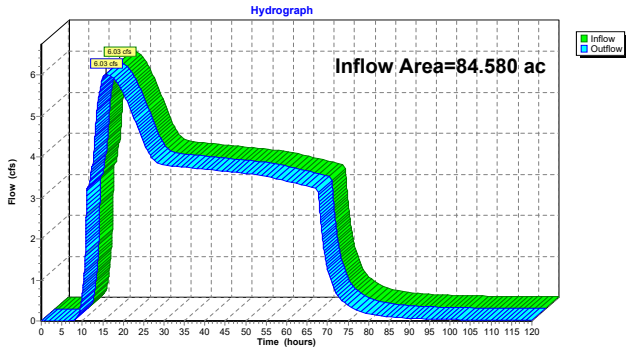


Summary for Reach 2R: Peak Flow Trunk 2

Inflow Area = 84.580 ac, 57.73% Impervious, Inflow Depth > 2.82" for 10-yr event  
Inflow = 6.03 cfs @ 15.74 hrs, Volume= 19.846 af  
Outflow = 6.03 cfs @ 15.74 hrs, Volume= 19.846 af, Atten= 0%, Lag= 0.0 min  
Routed to Pond W7 : Wetland 7

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Reach 2R: Peak Flow Trunk 2

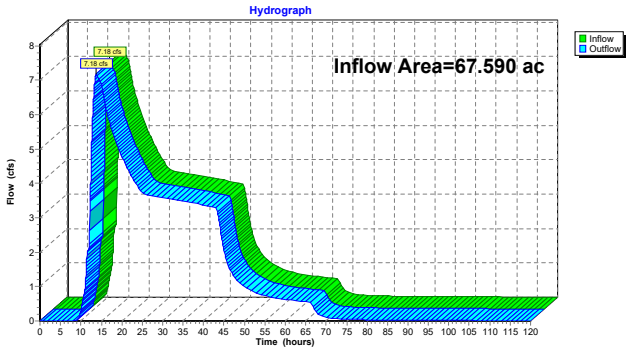


Summary for Reach 3R: Peak Flow Trunk 3

Inflow Area = 67.590 ac, 50.51% Impervious, Inflow Depth > 2.33" for 10-yr event  
Inflow = 7.18 cfs @ 13.68 hrs, Volume= 13.138 af  
Outflow = 7.18 cfs @ 13.68 hrs, Volume= 13.138 af, Atten= 0%, Lag= 0.0 min  
Routed to Pond W1 : Wetland 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Reach 3R: Peak Flow Trunk 3



Summary for Pond 1P 2P: Basins 1 & 2

Inflow Area = 84.580 ac, 57.73% Impervious, Inflow Depth = 2.82" for 10-yr event  
Inflow = 357.78 cfs @ 12.17 hrs, Volume= 19.909 af  
Outflow = 6.03 cfs @ 15.74 hrs, Volume= 19.846 af, Atten= 98%, Lag= 214.0 min  
Primary = 6.03 cfs @ 15.74 hrs, Volume= 19.846 af  
Routed to Reach 2R : Peak Flow Trunk 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,293.27' @ 15.74 hrs Surf.Area= 4.855 ac Storage= 15.532 af

Plug-Flow detention time= 1,525.5 min calculated for 19.846 af (100% of inflow)  
Center-of-Mass det. time= 1,523.4 min ( 2,311.1 - 787.6 )

| Volume | Invert    | Avail.Storage | Storage Description                      |
|--------|-----------|---------------|------------------------------------------|
| #1     | 1,288.00' | 18.916 af     | Pond 1 (Prismatic) Listed below (Recalc) |
| #2     | 1,288.00' | 21.728 af     | Pond 2 (Prismatic) Listed below (Recalc) |
|        |           | 40.644 af     | Total Available Storage                  |

| Elevation (feet) | Surf.Area (acres) | Voids (%) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------|-----------------------|-----------------------|
| 1,288.00         | 1.775             | 0.0       | 0.000                 | 0.000                 |
| 1,288.01         | 1.775             | 40.0      | 0.007                 | 0.007                 |
| 1,290.99         | 2.041             | 40.0      | 2.274                 | 2.281                 |
| 1,291.00         | 2.041             | 100.0     | 0.020                 | 2.302                 |
| 1,298.00         | 2.706             | 100.0     | 16.614                | 18.916                |

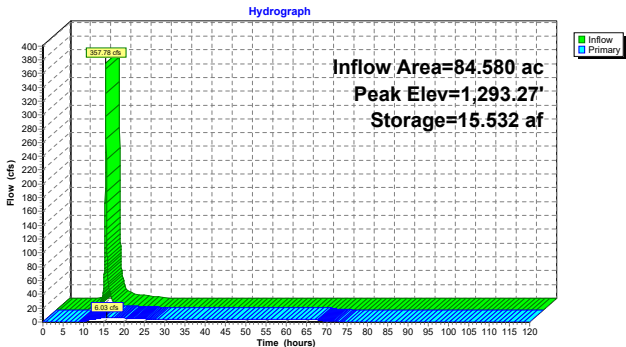
| Elevation (feet) | Surf.Area (acres) | Voids (%) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------|-----------------------|-----------------------|
| 1,288.00         | 2.115             | 0.0       | 0.000                 | 0.000                 |
| 1,288.01         | 2.115             | 40.0      | 0.008                 | 0.008                 |
| 1,290.99         | 2.382             | 40.0      | 2.680                 | 2.689                 |
| 1,291.00         | 2.382             | 100.0     | 0.024                 | 2.712                 |
| 1,298.00         | 3.051             | 100.0     | 19.015                | 21.728                |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                                |
|--------|----------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,288.00' | 42.0" Round Culvert<br>L= 180.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,288.00' / 1,284.00' S= 0.0222' /' Cc= 0.900<br>n= 0.012, Flow Area= 9.62 sf |
| #2     | Device 1 | 1,292.60' | 18.0" Vert. WQv Orifice C= 0.600 Limited to weir flow at low heads                                                                                                            |
| #3     | Device 1 | 1,294.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                      |
| #4     | Device 1 | 1,296.00' | 4.0' long OCS RIM X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                               |
| #5     | Device 1 | 1,288.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                    |

Primary OutFlow Max=6.03 cfs @ 15.74 hrs HW=1,293.27' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 6.03 cfs of 86.88 cfs potential flow)
- 2=WQv Orifice (Orifice Controls 2.11 cfs @ 2.78 fps)
- 3=Weir Wall ( Controls 0.00 cfs)
- 4=OCS RIM ( Controls 0.00 cfs)
- 5=Exfiltration (Exfiltration Controls 3.92 cfs)

Pond 1P 2P: Basins 1 & 2



Summary for Pond 3P: Basin 3

Inflow Area = 7.740 ac, 46.12% Impervious, Inflow Depth = 2.55" for 10-yr event

Inflow = 30.25 cfs @ 12.18 hrs, Volume= 1.642 af

Outflow = 0.96 cfs @ 14.56 hrs, Volume= 1.642 af, Atten= 97%, Lag= 143.3 min

Primary = 0.96 cfs @ 14.56 hrs, Volume= 1.642 af

Routed to Pond W7 : Wetland 7

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 1,287.96' @ 14.56 hrs Surf.Area= 0.457 ac Storage= 1.182 af

Plug-Flow detention time= 1,203.8 min calculated for 1.641 af (100% of inflow)

Center-of-Mass det. time= 1,204.2 min ( 2,001.4 - 797.2 )

| Volume           | Invert            | Avail.Storage | Storage Description                                 |                       |
|------------------|-------------------|---------------|-----------------------------------------------------|-----------------------|
| #1               | 1,283.00'         | 4.058 af      | Custom Stage Data (Prismatic).Listed below (Recalc) |                       |
| Elevation (feet) | Surf.Area (acres) | Voids (%)     | Inc.Store (acre-feet)                               | Cum.Store (acre-feet) |
| 1,283.00         | 0.252             | 0.0           | 0.000                                               | 0.000                 |
| 1,283.01         | 0.252             | 40.0          | 0.001                                               | 0.001                 |
| 1,285.99         | 0.368             | 40.0          | 0.370                                               | 0.371                 |
| 1,286.00         | 0.368             | 100.0         | 0.004                                               | 0.374                 |
| 1,293.00         | 0.684             | 100.0         | 3.683                                               | 4.058                 |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                               |
|--------|----------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,283.00' | 24.0" Round Culvert<br>L= 355.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,283.00' / 1,281.00' S= 0.0056' / Cc= 0.900<br>n= 0.012, Flow Area= 3.14 sf |
| #3     | Device 1 | 1,287.60' | 15.0" Vert. WQv Orifice C= 0.600 Limited to weir flow at low heads                                                                                                           |
| #4     | Device 1 | 1,290.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                     |
| #5     | Device 1 | 1,292.00' | 4.0' long OCS RIM X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                              |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                   |

Primary OutFlow Max=0.96 cfs @ 14.56 hrs HW=1,287.96' TW=1,258.11' (Dynamic Tailwater)

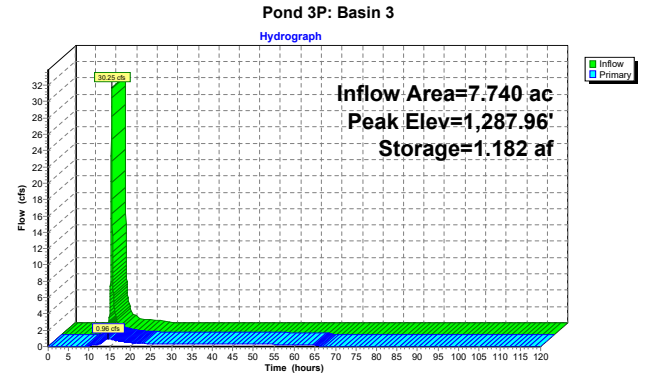
1=Culvert (Passes 0.96 cfs of 24.46 cfs potential flow)

2=WQv Orifice (Orifice Controls 0.59 cfs @ 2.04 fps)

3=Weir Wall ( Controls 0.00 cfs)

4=OCS RIM ( Controls 0.00 cfs)

5=Exfiltration (Exfiltration Controls 0.37 cfs)



Summary for Pond 4P: Basin 4

Inflow Area = 13.970 ac, 51.40% Impervious, Inflow Depth = 2.64" for 10-yr event

Inflow = 56.28 cfs @ 12.17 hrs, Volume= 3.070 af

Outflow = 1.14 cfs @ 15.21 hrs, Volume= 3.065 af, Atten= 98%, Lag= 182.1 min

Primary = 1.14 cfs @ 15.21 hrs, Volume= 3.065 af

Routed to Pond W7 : Wetland 7

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 1,286.51' @ 15.21 hrs Surf.Area= 1.414 ac Storage= 2.261 af

Plug-Flow detention time= 892.0 min calculated for 3.065 af (100% of inflow)

Center-of-Mass det. time= 891.0 min ( 1,685.8 - 794.8 )

| Volume           | Invert            | Avail.Storage | Storage Description                                 |                       |
|------------------|-------------------|---------------|-----------------------------------------------------|-----------------------|
| #1               | 1,283.00'         | 12.935 af     | Custom Stage Data (Prismatic).Listed below (Recalc) |                       |
| Elevation (feet) | Surf.Area (acres) | Voids (%)     | Inc.Store (acre-feet)                               | Cum.Store (acre-feet) |
| 1,283.00         | 1.184             | 0.0           | 0.000                                               | 0.000                 |
| 1,283.01         | 1.184             | 40.0          | 0.005                                               | 0.005                 |
| 1,285.99         | 1.378             | 40.0          | 1.527                                               | 1.532                 |
| 1,286.00         | 1.378             | 100.0         | 0.014                                               | 1.545                 |
| 1,293.00         | 1.876             | 100.0         | 11.389                                              | 12.935                |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                                |
|--------|----------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,283.00' | 36.0" Round Culvert<br>L= 200.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,283.00' / 1,279.00' S= 0.0200 ' / Cc= 0.900<br>n= 0.012, Flow Area= 7.07 sf |
| #2     | Device 1 | 1,287.60' | 15.0" Vert. WQv Orifice C= 0.600 Limited to weir flow at low heads                                                                                                            |
| #3     | Device 1 | 1,289.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                      |
| #4     | Device 1 | 1,290.00' | 4.0' long OCS Rim X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                               |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                    |

Primary OutFlow Max=1.14 cfs @ 15.21 hrs HW=1,286.51' TW=1,258.05' (Dynamic Tailwater)

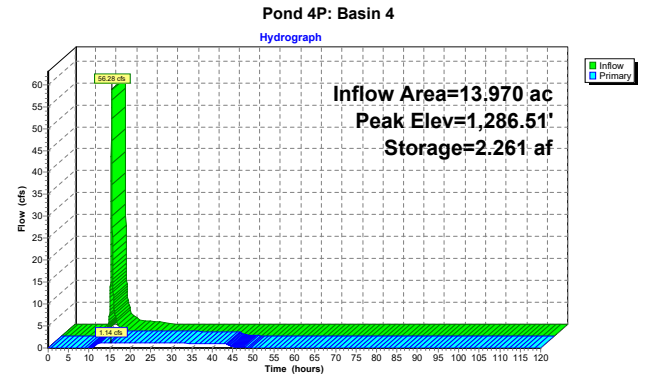
1=Culvert (Passes 1.14 cfs of 48.28 cfs potential flow)

2=WQv Orifice ( Controls 0.00 cfs)

3=Weir Wall ( Controls 0.00 cfs)

4=OCS Rim ( Controls 0.00 cfs)

5=Exfiltration (Exfiltration Controls 1.14 cfs)



Summary for Pond 5P: Basin 5

Inflow Area = 27.850 ac, 47.04% Impervious, Inflow Depth = 2.55" for 10-yr event  
Inflow = 108.84 cfs @ 12.18 hrs, Volume= 5.910 af  
Outflow = 2.09 cfs @ 15.27 hrs, Volume= 4.252 af, Atten= 98%, Lag= 185.9 min  
Primary = 2.09 cfs @ 15.27 hrs, Volume= 4.252 af  
Routed to Reach 3R : Peak Flow Trunk 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,288.03' @ 15.27 hrs Surf.Area= 1.579 ac Storage= 4.649 af

Plug-Flow detention time= 1,082.2 min calculated for 4.252 af (72% of inflow)  
Center-of-Mass det. time= 1,012.8 min ( 1,810.0 - 797.2 )

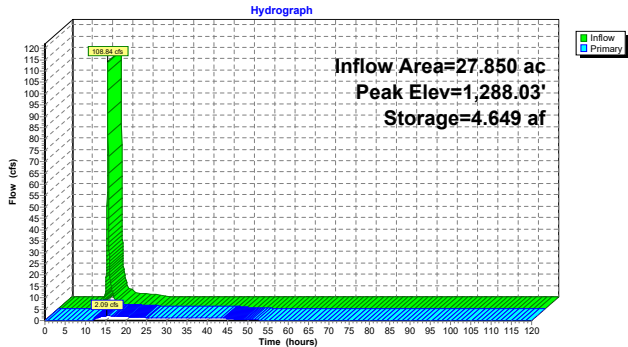
| Volume           | Invert            | Avail.Storage | Storage Description                                 |                       |
|------------------|-------------------|---------------|-----------------------------------------------------|-----------------------|
| #1               | 1,283.00'         | 13.459 af     | Custom Stage Data (Prismatic).Listed below (Recalc) |                       |
| Elevation (feet) | Surf.Area (acres) | Voids (%)     | Inc.Store (acre-feet)                               | Cum.Store (acre-feet) |
| 1,283.00         | 1.245             | 0.0           | 0.000                                               | 0.000                 |
| 1,283.01         | 1.245             | 40.0          | 0.005                                               | 0.005                 |
| 1,285.99         | 1.421             | 40.0          | 1.589                                               | 1.594                 |
| 1,286.00         | 1.423             | 100.0         | 0.014                                               | 1.608                 |
| 1,293.00         | 1.963             | 100.0         | 11.851                                              | 13.459                |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                                     |
|--------|----------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,286.00' | <b>36.0" Round Culvert</b><br>L= 150.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,286.00' / 1,285.00' S= 0.0067 ' Cc= 0.900<br>n= 0.012, Flow Area= 7.07 sf |
| #2     | Device 1 | 1,287.60' | <b>15.0" Vert. WQV Orifice</b> C= 0.600 Limited to weir flow at low heads                                                                                                          |
| #3     | Device 1 | 1,289.00' | <b>4.0' long Weir Wall</b> 2 End Contraction(s)                                                                                                                                    |
| #4     | Device 1 | 1,290.00' | <b>4.0' long OCS RIM X 4.00</b> 2 End Contraction(s) 0.5' Crest Height                                                                                                             |
| #5     | Device 1 | 1,283.00' | <b>0.800 in/hr Exfiltration over Surface area</b>                                                                                                                                  |

Primary OutFlow Max=2.09 cfs @ 15.27 hrs HW=1,288.03' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 2.09 cfs of 22.75 cfs potential flow)
- 2=WQV Orifice (Orifice Controls 0.82 cfs @ 2.22 fps)
- 3=Weir Wall ( Controls 0.00 cfs)
- 4=OCS RIM ( Controls 0.00 cfs)
- 5=Exfiltration (Exfiltration Controls 1.27 cfs)

Pond 5P: Basin 5



Summary for Pond 6P: Basin 6

Inflow Area = 18.280 ac, 50.55% Impervious, Inflow Depth = 2.64" for 10-yr event  
Inflow = 73.64 cfs @ 12.17 hrs, Volume= 4.017 af  
Outflow = 3.71 cfs @ 13.59 hrs, Volume= 4.015 af, Atten= 95%, Lag= 85.0 min  
Primary = 3.71 cfs @ 13.59 hrs, Volume= 4.015 af  
Routed to Reach 3R : Peak Flow Trunk 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,288.49' @ 13.59 hrs Surf.Area= 0.855 ac Storage= 2.741 af

Plug-Flow detention time= 1,091.9 min calculated for 4.015 af (100% of inflow)  
Center-of-Mass det. time= 1,091.6 min ( 1,886.4 - 794.8 )

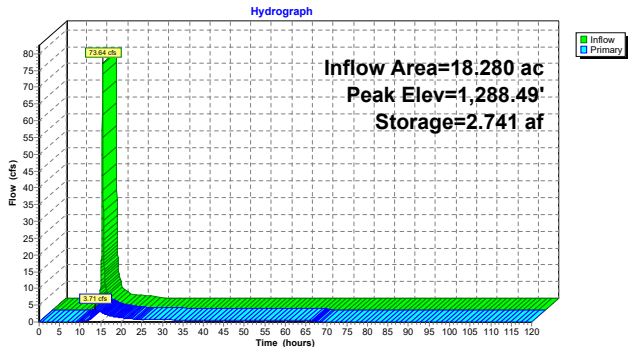
| Volume           | Invert            | Avail.Storage | Storage Description                                 |                       |
|------------------|-------------------|---------------|-----------------------------------------------------|-----------------------|
| #1               | 1,283.00'         | 7.152 af      | Custom Stage Data (Prismatic).Listed below (Recalc) |                       |
| Elevation (feet) | Surf.Area (acres) | Voids (%)     | Inc.Store (acre-feet)                               | Cum.Store (acre-feet) |
| 1,283.00         | 0.573             | 0.0           | 0.000                                               | 0.000                 |
| 1,283.01         | 0.573             | 40.0          | 0.002                                               | 0.002                 |
| 1,285.99         | 0.718             | 40.0          | 0.769                                               | 0.772                 |
| 1,286.00         | 0.718             | 100.0         | 0.007                                               | 0.779                 |
| 1,293.00         | 1.103             | 100.0         | 6.374                                               | 7.152                 |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                                     |
|--------|----------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,283.00' | <b>36.0" Round Culvert</b><br>L= 100.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,283.00' / 1,279.00' S= 0.0400 ' Cc= 0.900<br>n= 0.012, Flow Area= 7.07 sf |
| #2     | Primary  | 1,287.60' | <b>15.0" Vert. WQV Orifice</b> C= 0.600 Limited to weir flow at low heads                                                                                                          |
| #3     | Device 1 | 1,289.00' | <b>4.0' long Weir Wall</b> 2 End Contraction(s)                                                                                                                                    |
| #4     | Device 1 | 1,290.00' | <b>4.0' long OCS RIM X 4.00</b> 2 End Contraction(s) 0.5' Crest Height                                                                                                             |
| #5     | Device 1 | 1,283.00' | <b>0.800 in/hr Exfiltration over Surface area</b>                                                                                                                                  |

Primary OutFlow Max=3.71 cfs @ 13.59 hrs HW=1,288.49' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.69 cfs of 68.02 cfs potential flow)
- 2=WQV Orifice (Orifice Controls 3.02 cfs @ 3.22 fps)
- 3=Weir Wall ( Controls 0.00 cfs)
- 4=OCS RIM ( Controls 0.00 cfs)
- 5=Exfiltration (Exfiltration Controls 0.69 cfs)

Pond 6P: Basin 6



Summary for Pond 7P: Basin 7

Inflow Area = 21.460 ac, 54.99% Impervious, Inflow Depth = 2.73" for 10-yr event  
Inflow = 89.01 cfs @ 12.17 hrs, Volume= 4.880 af  
Outflow = 1.80 cfs @ 15.20 hrs, Volume= 4.870 af, Atten= 98%, Lag= 181.6 min  
Primary = 1.80 cfs @ 15.20 hrs, Volume= 4.870 af  
Routed to Reach 3R : Peak Flow Trunk 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,286.54' @ 15.20 hrs Surf.Area= 97,323 sf Storage= 157,474 cf

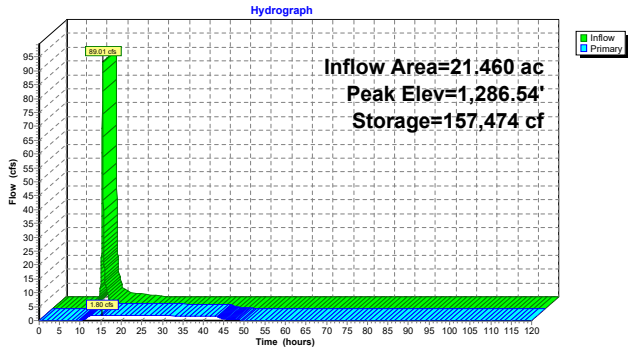
Plug-Flow detention time= 907.9 min calculated for 4.870 af (100% of inflow)  
Center-of-Mass det. time= 906.7 min ( 1,698.9 - 792.3 )

| Volume           | Invert            | Avail.Storage | Storage Description                                 |                        |
|------------------|-------------------|---------------|-----------------------------------------------------|------------------------|
| #1               | 1,283.00'         | 891,814 cf    | Custom Stage Data (Prismatic) Listed below (Recalc) |                        |
| Elevation (feet) | Surf.Area (sq-ft) | Voids (%)     | Inc.Store (cubic-feet)                              | Cum.Store (cubic-feet) |
| 1,283.00         | 80,194            | 0.0           | 0                                                   | 0                      |
| 1,283.01         | 80,194            | 40.0          | 321                                                 | 321                    |
| 1,285.99         | 94,569            | 40.0          | 104,159                                             | 104,479                |
| 1,286.00         | 94,569            | 100.0         | 946                                                 | 105,425                |
| 1,293.00         | 130,114           | 100.0         | 786,389                                             | 891,814                |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                               |
|--------|----------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,283.00' | 42.0" Round Culvert<br>L= 100.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,283.00' / 1,279.00' S= 0.0400 '/ Cc= 0.900<br>n= 0.012, Flow Area= 9.62 sf |
| #2     | Device 1 | 1,287.60' | 15.0" Vert. WQV Orifice C= 0.600 Limited to weir flow at low heads                                                                                                           |
| #3     | Device 1 | 1,289.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                     |
| #4     | Device 1 | 1,290.00' | 4.0' long OCS RIM X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                              |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                   |

Primary OutFlow Max=1.80 cfs @ 15.20 hrs HW=1,286.54' TW=0.00' (Dynamic Tailwater)  
1=Culvert (Passes 1.80 cfs of 62.02 cfs potential flow)  
2=WQV Orifice ( Controls 0.00 cfs)  
3=Weir Wall ( Controls 0.00 cfs)  
4=OCS RIM ( Controls 0.00 cfs)  
5=Exfiltration (Exfiltration Controls 1.80 cfs)

Pond 7P: Basin 7



Summary for Pond W1: Wetland 1

Inflow Area = 92.870 ac, 36.76% Impervious, Inflow Depth > 2.06" for 10-yr event  
Inflow = 61.23 cfs @ 12.15 hrs, Volume= 15.939 af  
Outflow = 19.11 cfs @ 12.43 hrs, Volume= 15.938 af, Atten= 69%, Lag= 16.8 min  
Primary = 19.11 cfs @ 12.43 hrs, Volume= 15.938 af  
Routed to Link 20L : Discharge Point #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,273.46' @ 12.43 hrs Surf.Area= 2,367 ac Storage= 0.649 af

Plug-Flow detention time= 2.8 min calculated for 15.936 af (100% of inflow)  
Center-of-Mass det. time= 2.7 min ( 1,625.4 - 1,622.8 )

| Volume | Invert    | Avail.Storage | Storage Description                                 |  |
|--------|-----------|---------------|-----------------------------------------------------|--|
| #1     | 1,270.00' | 23.725 af     | Custom Stage Data (Prismatic) Listed below (Recalc) |  |
| #2     | 1,275.00' | 4.145 af      | Custom Stage Data (Prismatic) Listed below (Recalc) |  |
|        |           | 27.870 af     | Total Available Storage                             |  |

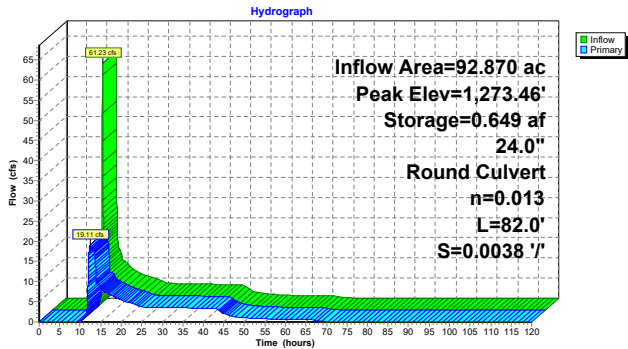
| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 1,270.00         | 0.001             | 0.000                 | 0.000                 |
| 1,271.99         | 0.001             | 0.002                 | 0.002                 |
| 1,272.00         | 0.005             | 0.000                 | 0.002                 |
| 1,273.00         | 0.140             | 0.072                 | 0.075                 |
| 1,274.00         | 5.000             | 2.570                 | 2.645                 |
| 1,275.00         | 6.180             | 5.590                 | 8.235                 |
| 1,276.00         | 7.970             | 7.075                 | 15.310                |
| 1,277.00         | 8.860             | 8.415                 | 23.725                |

| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 1,275.00         | 0.170             | 0.000                 | 0.000                 |
| 1,276.00         | 0.370             | 0.270                 | 0.270                 |
| 1,277.00         | 7.380             | 3.875                 | 4.145                 |

| Device | Routing | Invert    | Outlet Devices                                                                                                                                                              |
|--------|---------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 1,270.32' | 24.0" Round Culvert<br>L= 82.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,270.32' / 1,270.01' S= 0.0038 '/ Cc= 0.900<br>n= 0.013, Flow Area= 3.14 sf |

Primary OutFlow Max=19.10 cfs @ 12.43 hrs HW=1,273.46' TW=0.00' (Dynamic Tailwater)  
1=Culvert (Barrel Controls 19.10 cfs @ 6.08 fps)

Pond W1: Wetland 1



Summary for Pond W7: Wetland 7

Inflow Area = 141.130 ac, 42.22% Impervious, Inflow Depth > 2.42" for 10-yr event  
Inflow = 35.16 cfs @ 12.69 hrs, Volume= 28.414 af  
Outflow = 30.29 cfs @ 12.93 hrs, Volume= 28.395 af, Atten= 14%, Lag= 14.7 min  
Primary = 30.29 cfs @ 12.93 hrs, Volume= 28.395 af  
Routed to Link 11L : Discharge Point #2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,259.07' @ 12.93 hrs Surf.Area= 0.523 ac Storage= 0.538 af

Plug-Flow detention time= 13.7 min calculated for 28.391 af (100% of inflow)  
Center-of-Mass det. time= 10.8 min ( 2,040.1 - 2,029.3 )

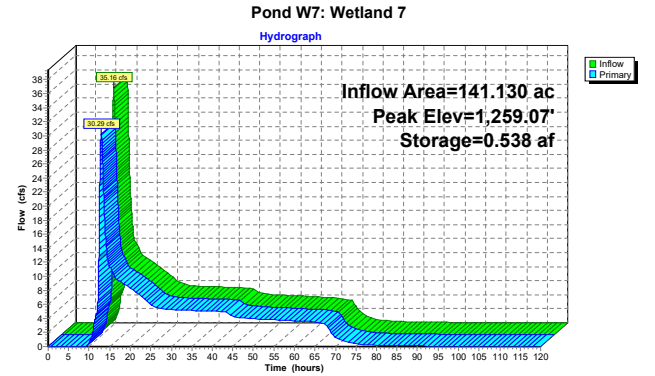
| Volume           | Invert            | Avail.Storage         | Storage Description                                 |
|------------------|-------------------|-----------------------|-----------------------------------------------------|
| #1               | 1,256.00'         | 18.795 af             | Custom Stage Data (Prismatic).Listed below (Recalc) |
| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet)                               |
| 1,256.00         | 0.005             | 0.000                 | 0.000                                               |
| 1,257.00         | 0.050             | 0.027                 | 0.027                                               |
| 1,258.00         | 0.200             | 0.125                 | 0.152                                               |
| 1,259.00         | 0.497             | 0.348                 | 0.500                                               |
| 1,260.00         | 0.864             | 0.680                 | 1.180                                               |
| 1,261.00         | 1.362             | 1.113                 | 2.293                                               |
| 1,262.00         | 2.424             | 1.893                 | 4.186                                               |
| 1,263.00         | 3.770             | 3.097                 | 7.283                                               |
| 1,264.00         | 5.818             | 4.794                 | 12.077                                              |
| 1,265.00         | 7.617             | 6.717                 | 18.795                                              |

| Device | Routing | Invert    | Outlet Devices                                                                                                                                                                                                     |
|--------|---------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 1,256.76' | 36.0" Round Culvert<br>L= 70.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Inverts= 1,256.76' / 1,254.25' S= 0.0359 ' / - Cc= 0.900<br>n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf |
| #2     | Primary | 1,262.50' | 256.0' long + 10.0' / SideZ x 40.0' breadth Broad-Crested Rectangular Weir<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63                       |

Primary OutFlow Max=30.28 cfs @ 12.93 hrs HW=1,259.07' TW=0.00' (Dynamic Tailwater)

1=Culvert (Inlet Controls 30.28 cfs @ 5.18 fps)

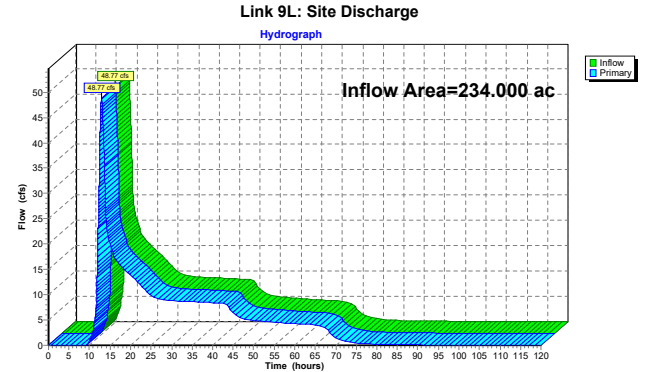
2=Broad-Crested Rectangular Weir( Controls 0.00 cfs)



Summary for Link 9L: Site Discharge

Inflow Area = 234.000 ac, 40.05% Impervious, Inflow Depth > 2.27" for 10-yr event  
Inflow = 48.77 cfs @ 12.92 hrs, Volume= 44.334 af  
Primary = 48.77 cfs @ 12.92 hrs, Volume= 44.334 af, Atten= 0%, Lag= 0.0 min

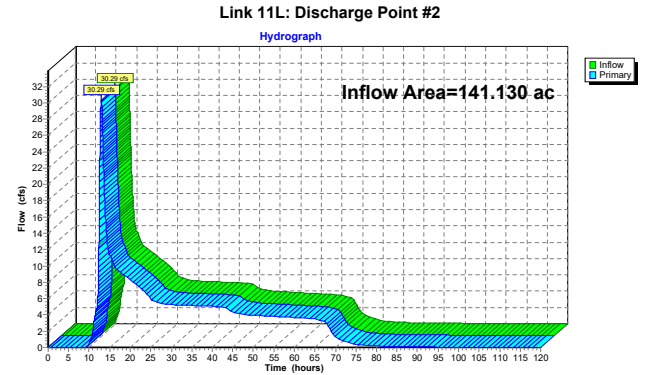
Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs



Summary for Link 11L: Discharge Point #2

Inflow Area = 141.130 ac, 42.22% Impervious, Inflow Depth > 2.41" for 10-yr event  
Inflow = 30.29 cfs @ 12.93 hrs, Volume= 28.395 af  
Primary = 30.29 cfs @ 12.93 hrs, Volume= 28.395 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 9L : Site Discharge

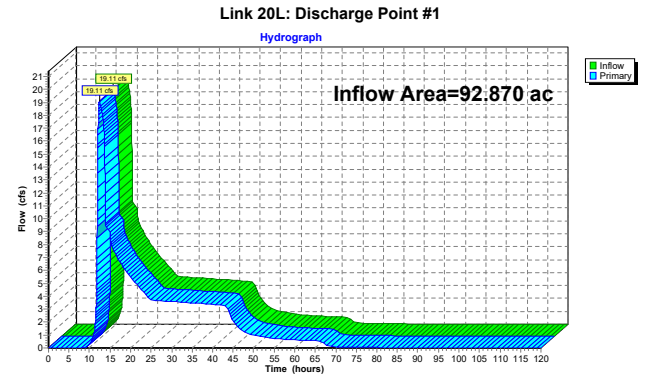
Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs



Summary for Link 20L: Discharge Point #1

Inflow Area = 92.870 ac, 36.76% Impervious, Inflow Depth > 2.06" for 10-yr event  
Inflow = 19.11 cfs @ 12.43 hrs, Volume= 15.938 af  
Primary = 19.11 cfs @ 12.43 hrs, Volume= 15.938 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 9L : Site Discharge

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs



Time span=0.00-120.00 hrs, dt=0.02 hrs, 6001 points x 2  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment1S: Onsite Area** Runoff Area=33.190 ac 36.25% Impervious Runoff Depth=4.57"  
Tc=10.0 min CN=84 Runoff=228.69 cfs 12.646 af

**Subcatchment2S: Onsite Area** Runoff Area=51.390 ac 71.61% Impervious Runoff Depth=5.46"  
Tc=10.0 min CN=92 Runoff=400.10 cfs 23.396 af

**Subcatchment3S: Onsite Area** Runoff Area=7.740 ac 46.12% Impervious Runoff Depth=4.79"  
Tc=10.0 min CN=86 Runoff=55.29 cfs 3.090 af

**Subcatchment4S: Onsite Area** Runoff Area=13.970 ac 51.40% Impervious Runoff Depth=4.90"  
Tc=10.0 min CN=87 Runoff=101.47 cfs 5.705 af

**Subcatchment5S: Onsite Area** Runoff Area=27.850 ac 47.04% Impervious Runoff Depth=4.79"  
Tc=10.0 min CN=86 Runoff=198.93 cfs 11.118 af

**Subcatchment6S: Onsite Area** Runoff Area=18.280 ac 50.55% Impervious Runoff Depth=4.90"  
Tc=10.0 min CN=87 Runoff=132.77 cfs 7.466 af

**Subcatchment7S: Onsite Area** Runoff Area=21.460 ac 54.99% Impervious Runoff Depth=5.01"  
Tc=10.0 min CN=88 Runoff=158.35 cfs 8.963 af

**SubcatchmentDW1:** Runoff Area=25.280 ac 0.00% Impervious Runoff Depth=3.13"  
Tc=7.0 min CN=70 Runoff=140.39 cfs 6.585 af

**SubcatchmentDW7:** Runoff Area=34.840 ac 0.00% Impervious Runoff Depth=3.13"  
Flow Length=2,600' Tc=47.3 min CN=70 Runoff=73.74 cfs 9.076 af

**Reach 2R: Peak Flow Trunk 2** Inflow=31.64 cfs 35.970 af  
Outflow=31.64 cfs 35.970 af

**Reach 3R: Peak Flow Trunk 3** Inflow=41.23 cfs 25.872 af  
Outflow=41.23 cfs 25.872 af

**Pond 1P 2P: Basins 1 & 2** Peak Elev=1,295.19' Storage=25.200 af Inflow=628.75 cfs 36.042 af  
Outflow=31.64 cfs 35.970 af

**Pond 3P: Basin 3** Peak Elev=1,289.29' Storage=1.832 af Inflow=55.29 cfs 3.090 af  
Outflow=6.53 cfs 3.089 af

**Pond 4P: Basin 4** Peak Elev=1,287.97' Storage=4.395 af Inflow=101.47 cfs 5.705 af  
Outflow=1.85 cfs 5.699 af

**Pond 5P: Basin 5** Peak Elev=1,289.69' Storage=7.390 af Inflow=198.93 cfs 11.118 af  
Outflow=15.83 cfs 9.459 af

**Pond 6P: Basin 6** Peak Elev=1,290.13' Storage=4.218 af Inflow=132.77 cfs 7.466 af  
Outflow=26.49 cfs 7.464 af

**Pond 7P: Basin 7** Peak Elev=1,287.99' Storage=303,156 cf Inflow=158.35 cfs 8.963 af  
Outflow=2.62 cfs 8.949 af

**Pond W1: Wetland 1** Peak Elev=1,274.54' Storage=5.503 af Inflow=145.89 cfs 32.457 af  
24.0" Round Culvert n=0.013 L=82.0' S=0.0038 ' Inflow=25.24 cfs 32.457 af  
Outflow=25.24 cfs 32.457 af

**Pond W7: Wetland 7** Peak Elev=1,261.67' Storage=3.439 af Inflow=106.78 cfs 53.834 af  
Outflow=62.82 cfs 53.816 af

**Link 9L: Site Discharge** Inflow=87.78 cfs 86.273 af  
Primary=87.78 cfs 86.273 af

**Link 11L: Discharge Point #2** Inflow=62.82 cfs 53.816 af  
Primary=62.82 cfs 53.816 af

**Link 20L: Discharge Point #1** Inflow=25.24 cfs 32.457 af  
Primary=25.24 cfs 32.457 af

Total Runoff Area = 234.000 ac Runoff Volume = 88.044 af Average Runoff Depth = 4.52"  
59.95% Pervious = 140.280 ac 40.05% Impervious = 93.720 ac

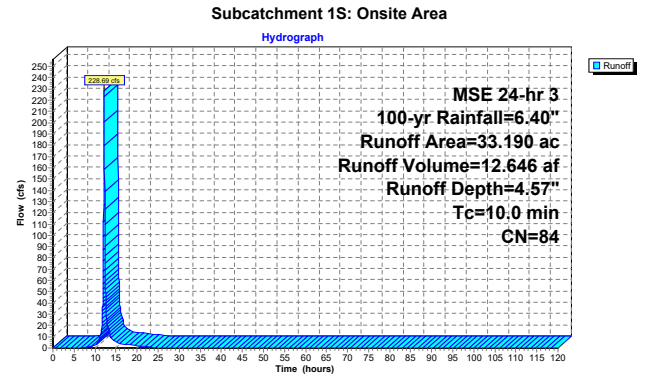
Summary for Subcatchment 1S: Onsite Area

Runoff = 228.69 cfs @ 12.17 hrs, Volume= 12.646 af, Depth= 4.57"  
Routed to Pond 1P 2P : Basins 1 & 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 12.030    | 98 | Paved parking, HSG D           |
| 21.160    | 76 | Woods/grass comb., Fair, HSG C |
| 33.190    | 84 | Weighted Average               |
| 21.160    |    | 63.75% Pervious Area           |
| 12.030    |    | 36.25% Impervious Area         |

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



### Summary for Subcatchment 2S: Onsite Area

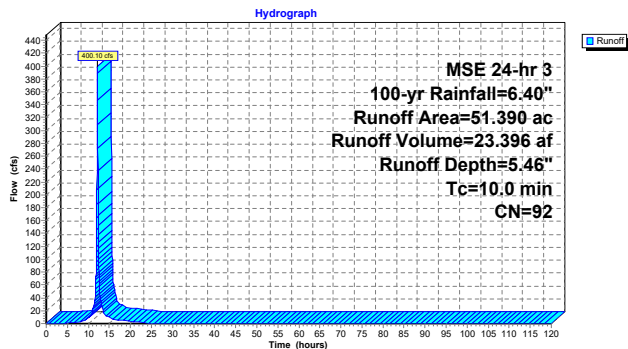
Runoff = 400.10 cfs @ 12.17 hrs, Volume= 23.396 af, Depth= 5.46"  
 Routed to Pond 1P 2P : Basins 1 & 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 36.800    | 98 | Paved parking, HSG D           |
| 14.590    | 76 | Woods/grass comb., Fair, HSG C |
| 51.390    | 92 | Weighted Average               |
| 14.590    |    | 28.39% Pervious Area           |
| 36.800    |    | 71.61% Impervious Area         |

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

### Subcatchment 2S: Onsite Area



### Summary for Subcatchment 3S: Onsite Area

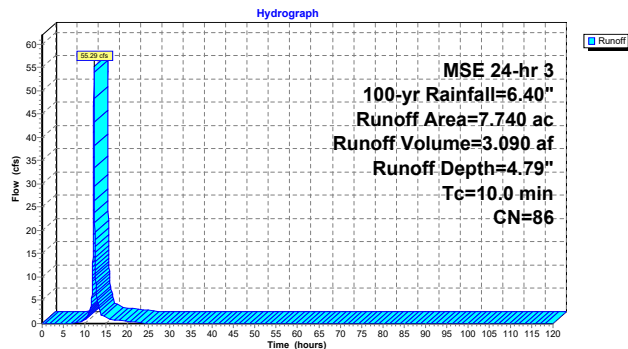
Runoff = 55.29 cfs @ 12.17 hrs, Volume= 3.090 af, Depth= 4.79"  
 Routed to Pond 3P : Basin 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 3.570     | 98 | Paved parking, HSG D           |
| 4.170     | 76 | Woods/grass comb., Fair, HSG C |
| 7.740     | 86 | Weighted Average               |
| 4.170     |    | 53.88% Pervious Area           |
| 3.570     |    | 46.12% Impervious Area         |

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

### Subcatchment 3S: Onsite Area



### Summary for Subcatchment 4S: Onsite Area

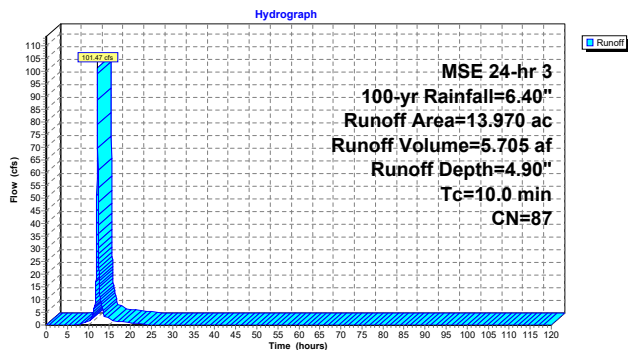
Runoff = 101.47 cfs @ 12.17 hrs, Volume= 5.705 af, Depth= 4.90"  
 Routed to Pond 4P : Basin 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 7.180     | 98 | Paved parking, HSG D           |
| 6.790     | 76 | Woods/grass comb., Fair, HSG C |
| 13.970    | 87 | Weighted Average               |
| 6.790     |    | 48.60% Pervious Area           |
| 7.180     |    | 51.40% Impervious Area         |

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

### Subcatchment 4S: Onsite Area



### Summary for Subcatchment 5S: Onsite Area

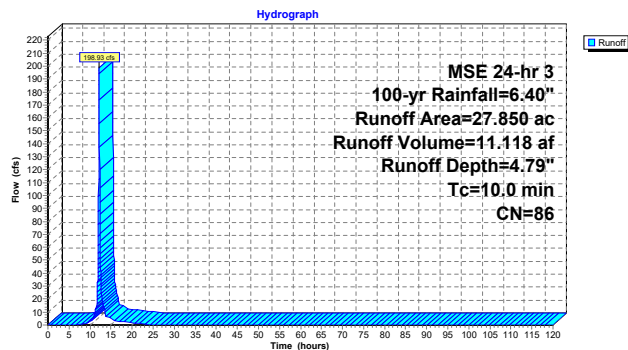
Runoff = 198.93 cfs @ 12.17 hrs, Volume= 11.118 af, Depth= 4.79"  
 Routed to Pond 5P : Basin 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 13.100    | 98 | Paved parking, HSG D           |
| 14.750    | 76 | Woods/grass comb., Fair, HSG C |
| 27.850    | 86 | Weighted Average               |
| 14.750    |    | 52.96% Pervious Area           |
| 13.100    |    | 47.04% Impervious Area         |

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

### Subcatchment 5S: Onsite Area



Summary for Subcatchment 6S: Onsite Area

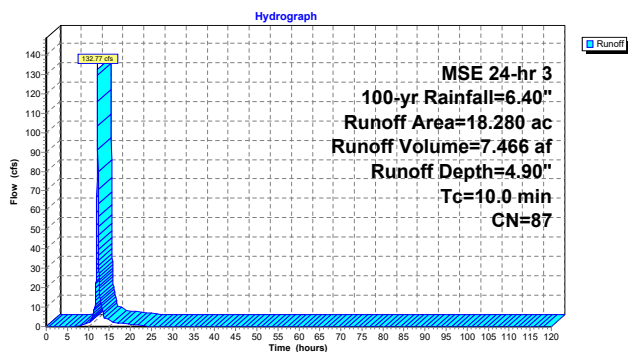
Runoff = 132.77 cfs @ 12.17 hrs, Volume= 7.466 af, Depth= 4.90"  
 Routed to Pond 6P : Basin 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 9.240     | 98 | Paved parking, HSG D           |
| 9.040     | 76 | Woods/grass comb., Fair, HSG C |
| 18.280    | 87 | Weighted Average               |
| 9.040     |    | 49.45% Pervious Area           |
| 9.240     |    | 50.55% Impervious Area         |

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

Subcatchment 6S: Onsite Area



Summary for Subcatchment 7S: Onsite Area

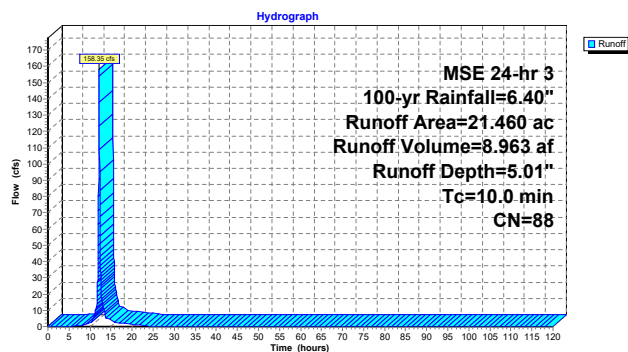
Runoff = 158.35 cfs @ 12.17 hrs, Volume= 8.963 af, Depth= 5.01"  
 Routed to Pond 7P : Basin 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description                    |
|-----------|----|--------------------------------|
| 11.800    | 98 | Paved parking, HSG D           |
| 9.660     | 76 | Woods/grass comb., Fair, HSG C |
| 21.460    | 88 | Weighted Average               |
| 9.660     |    | 45.01% Pervious Area           |
| 11.800    |    | 54.99% Impervious Area         |

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

Subcatchment 7S: Onsite Area



Summary for Subcatchment DW1:

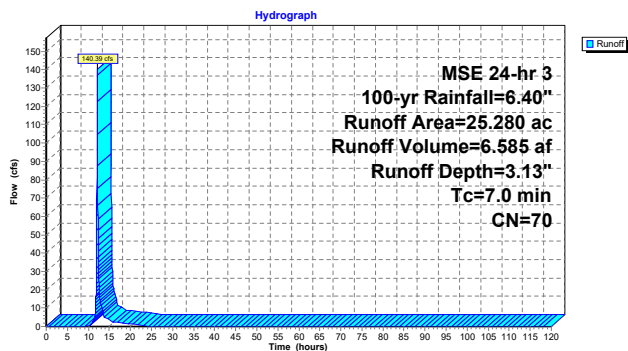
Runoff = 140.39 cfs @ 12.14 hrs, Volume= 6.585 af, Depth= 3.13"  
 Routed to Pond W1 : Wetland 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description           |
|-----------|----|-----------------------|
| 25.280    | 70 | Woods, Good, HSG C    |
| 25.280    |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 7.0      |               |               |                   |                | Direct Entry, |

Subcatchment DW1:



Summary for Subcatchment DW7:

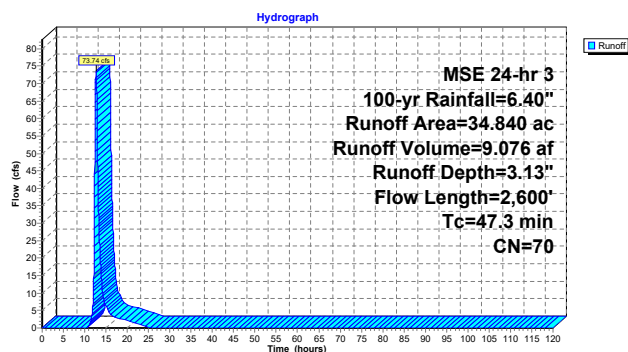
Runoff = 73.74 cfs @ 12.66 hrs, Volume= 9.076 af, Depth= 3.13"  
 Routed to Pond W7 : Wetland 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs  
 MSE 24-hr 3 100-yr Rainfall=6.40"

| Area (ac) | CN | Description           |
|-----------|----|-----------------------|
| 34.840    | 70 | Woods, Good, HSG C    |
| 34.840    |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                 |
|----------|---------------|---------------|-------------------|----------------|-------------------------------------------------------------|
| 16.2     | 100           | 0.0500        | 0.10              |                | Sheet Flow,<br>Woods: Light underbrush n= 0.400 P2= 2.70"   |
| 13.7     | 650           | 0.0250        | 0.79              |                | Shallow Concentrated Flow,<br>Woodland Kv= 5.0 fps          |
| 17.4     | 1,850         | 0.0140        | 1.77              |                | Shallow Concentrated Flow,<br>Grassed Waterway Kv= 15.0 fps |
| 47.3     | 2,600         | Total         |                   |                |                                                             |

Subcatchment DW7:

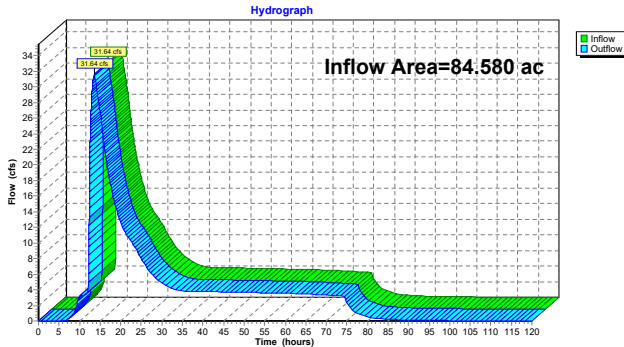


Summary for Reach 2R: Peak Flow Trunk 2

Inflow Area = 84.580 ac, 57.73% Impervious, Inflow Depth > 5.10" for 100-yr event  
Inflow = 31.64 cfs @ 13.56 hrs, Volume= 35.970 af  
Outflow = 31.64 cfs @ 13.56 hrs, Volume= 35.970 af, Atten= 0%, Lag= 0.0 min  
Routed to Pond W7 : Wetland 7

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Reach 2R: Peak Flow Trunk 2

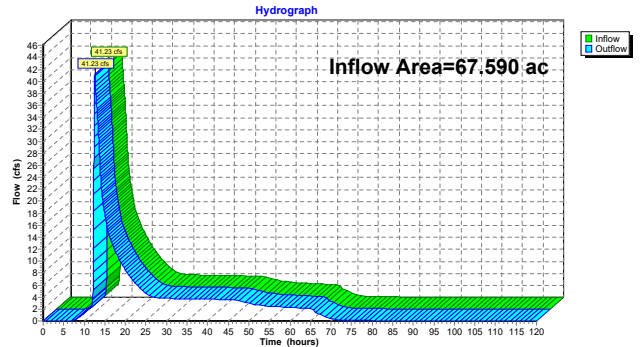


Summary for Reach 3R: Peak Flow Trunk 3

Inflow Area = 67.590 ac, 50.51% Impervious, Inflow Depth > 4.59" for 100-yr event  
Inflow = 41.23 cfs @ 12.58 hrs, Volume= 25.872 af  
Outflow = 41.23 cfs @ 12.58 hrs, Volume= 25.872 af, Atten= 0%, Lag= 0.0 min  
Routed to Pond W1 : Wetland 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Reach 3R: Peak Flow Trunk 3



Summary for Pond 1P 2P: Basins 1 & 2

Inflow Area = 84.580 ac, 57.73% Impervious, Inflow Depth = 5.11" for 100-yr event  
Inflow = 628.75 cfs @ 12.17 hrs, Volume= 36.042 af  
Outflow = 31.64 cfs @ 13.56 hrs, Volume= 35.970 af, Atten= 95%, Lag= 83.1 min  
Primary = 31.64 cfs @ 13.56 hrs, Volume= 35.970 af  
Routed to Reach 2R : Peak Flow Trunk 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,295.19' @ 13.56 hrs Surf.Area= 5.221 ac Storage= 25.200 af

Plug-Flow detention time= 1,150.3 min calculated for 35.964 af (100% of inflow)  
Center-of-Mass det. time= 1,149.8 min ( 1,926.3 - 776.5 )

| Volume | Invert    | Avail.Storage | Storage Description                      |
|--------|-----------|---------------|------------------------------------------|
| #1     | 1,288.00' | 18.916 af     | Pond 1 (Prismatic) Listed below (Recalc) |
| #2     | 1,288.00' | 21.728 af     | Pond 2 (Prismatic) Listed below (Recalc) |
|        |           |               | 40.644 af Total Available Storage        |

| Elevation (feet) | Surf.Area (acres) | Voids (%) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------|-----------------------|-----------------------|
| 1,288.00         | 1.775             | 0.0       | 0.000                 | 0.000                 |
| 1,288.01         | 1.775             | 40.0      | 0.007                 | 0.007                 |
| 1,290.99         | 2.041             | 40.0      | 2.274                 | 2.281                 |
| 1,291.00         | 2.041             | 100.0     | 0.020                 | 2.302                 |
| 1,298.00         | 2.706             | 100.0     | 16.614                | 18.916                |

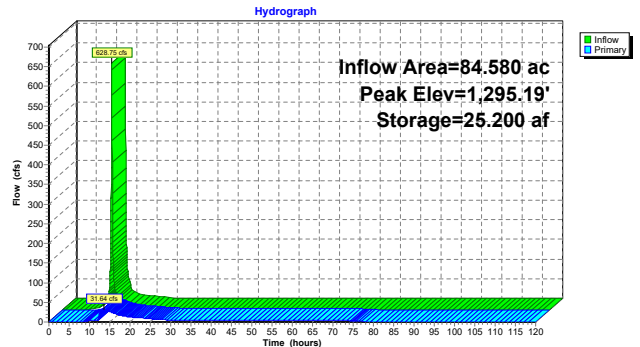
| Elevation (feet) | Surf.Area (acres) | Voids (%) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------|-----------------------|-----------------------|
| 1,288.00         | 2.115             | 0.0       | 0.000                 | 0.000                 |
| 1,288.01         | 2.115             | 40.0      | 0.008                 | 0.008                 |
| 1,290.99         | 2.382             | 40.0      | 2.680                 | 2.689                 |
| 1,291.00         | 2.382             | 100.0     | 0.024                 | 2.712                 |
| 1,298.00         | 3.051             | 100.0     | 19.015                | 21.728                |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                                |
|--------|----------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,288.00' | 42.0" Round Culvert<br>L= 180.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,288.00' / 1,284.00' S= 0.0222' /' Cc= 0.900<br>n= 0.012, Flow Area= 9.62 sf |
| #2     | Device 1 | 1,292.60' | 18.0" Vert. WQv Orifice C= 0.600 Limited to weir flow at low heads                                                                                                            |
| #3     | Device 1 | 1,294.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                      |
| #4     | Device 1 | 1,296.00' | 4.0' long OCS RIM X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                               |
| #5     | Device 1 | 1,288.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                    |

Primary OutFlow Max=31.64 cfs @ 13.56 hrs HW=1,295.19' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 31.64 cfs of 108.01 cfs potential flow)
- 2=WQv Orifice (Orifice Controls 11.53 cfs @ 6.52 fps)
- 3=Weir Wall (Weir Controls 15.90 cfs @ 3.56 fps)
- 4=OCS RIM ( Controls 0.00 cfs)
- 5=Exfiltration (Exfiltration Controls 4.21 cfs)

Pond 1P 2P: Basins 1 & 2



Summary for Pond 3P: Basin 3

Inflow Area = 7.740 ac, 46.12% Impervious, Inflow Depth = 4.79" for 100-yr event

Inflow = 55.29 cfs @ 12.17 hrs, Volume= 3.090 af

Outflow = 6.53 cfs @ 12.70 hrs, Volume= 3.089 af, Atten= 88%, Lag= 31.6 min

Primary = 6.53 cfs @ 12.70 hrs, Volume= 3.089 af

Routed to Pond W7 : Wetland 7

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 1,289.29' @ 12.70 hrs Surf.Area= 0.517 ac Storage= 1.832 af

Plug-Flow detention time= 720.6 min calculated for 3.089 af (100% of inflow)

Center-of-Mass det. time= 721.1 min ( 1,505.7 - 784.6 )

| Volume           | Invert            | Avail.Storage | Storage Description                                 |                       |
|------------------|-------------------|---------------|-----------------------------------------------------|-----------------------|
| #1               | 1,283.00'         | 4.058 af      | Custom Stage Data (Prismatic) Listed below (Recalc) |                       |
| Elevation (feet) | Surf.Area (acres) | Voids (%)     | Inc.Store (acre-feet)                               | Cum.Store (acre-feet) |
| 1,283.00         | 0.252             | 0.0           | 0.000                                               | 0.000                 |
| 1,283.01         | 0.252             | 40.0          | 0.001                                               | 0.001                 |
| 1,285.99         | 0.368             | 40.0          | 0.370                                               | 0.371                 |
| 1,286.00         | 0.368             | 100.0         | 0.004                                               | 0.374                 |
| 1,293.00         | 0.684             | 100.0         | 3.683                                               | 4.058                 |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                               |
|--------|----------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,283.00' | 24.0" Round Culvert<br>L= 355.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,283.00' / 1,281.00' S= 0.0056' / Cc= 0.900<br>n= 0.012, Flow Area= 3.14 sf |
| #2     | Device 1 | 1,287.60' | 15.0" Vert. WQv Orifice C= 0.600 Limited to weir flow at low heads                                                                                                           |
| #3     | Device 1 | 1,290.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                     |
| #4     | Device 1 | 1,292.00' | 4.0' long OCS RIM X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                              |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                   |

Primary OutFlow Max=6.53 cfs @ 12.70 hrs HW=1,289.29' TW=1,260.73' (Dynamic Tailwater)

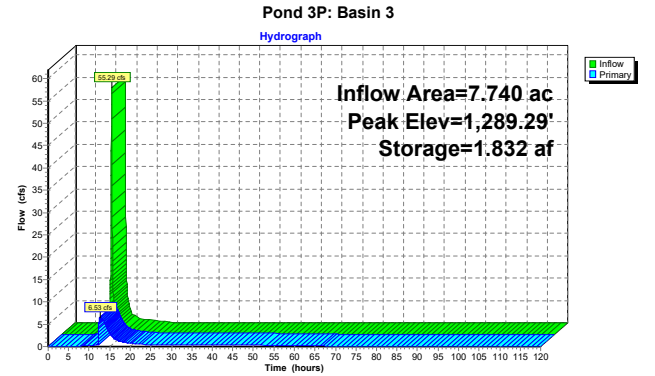
1=Culvert (Passes 6.53 cfs of 27.55 cfs potential flow)

2=WQv Orifice (Orifice Controls 6.11 cfs @ 4.98 fps)

3=Weir Wall ( Controls 0.00 cfs)

4=OCS RIM ( Controls 0.00 cfs)

5=Exfiltration (Exfiltration Controls 0.42 cfs)



Summary for Pond 4P: Basin 4

Inflow Area = 13.970 ac, 51.40% Impervious, Inflow Depth = 4.90" for 100-yr event

Inflow = 101.47 cfs @ 12.17 hrs, Volume= 5.705 af

Outflow = 1.85 cfs @ 15.24 hrs, Volume= 5.699 af, Atten= 98%, Lag= 184.3 min

Primary = 1.85 cfs @ 15.24 hrs, Volume= 5.699 af

Routed to Pond W7 : Wetland 7

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 1,287.97' @ 15.24 hrs Surf.Area= 1.518 ac Storage= 4.395 af

Plug-Flow detention time= 1,412.7 min calculated for 5.698 af (100% of inflow)

Center-of-Mass det. time= 1,412.7 min ( 2,195.2 - 782.5 )

| Volume           | Invert            | Avail.Storage | Storage Description                                 |                       |
|------------------|-------------------|---------------|-----------------------------------------------------|-----------------------|
| #1               | 1,283.00'         | 12.935 af     | Custom Stage Data (Prismatic) Listed below (Recalc) |                       |
| Elevation (feet) | Surf.Area (acres) | Voids (%)     | Inc.Store (acre-feet)                               | Cum.Store (acre-feet) |
| 1,283.00         | 1.184             | 0.0           | 0.000                                               | 0.000                 |
| 1,283.01         | 1.184             | 40.0          | 0.005                                               | 0.005                 |
| 1,285.99         | 1.378             | 40.0          | 1.527                                               | 1.532                 |
| 1,286.00         | 1.378             | 100.0         | 0.014                                               | 1.545                 |
| 1,293.00         | 1.876             | 100.0         | 11.389                                              | 12.935                |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                                |
|--------|----------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,283.00' | 36.0" Round Culvert<br>L= 200.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,283.00' / 1,279.00' S= 0.0200 ' / Cc= 0.900<br>n= 0.012, Flow Area= 7.07 sf |
| #2     | Device 1 | 1,287.60' | 15.0" Vert. WQv Orifice C= 0.600 Limited to weir flow at low heads                                                                                                            |
| #3     | Device 1 | 1,289.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                      |
| #4     | Device 1 | 1,290.00' | 4.0' long OCS Rim X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                               |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                    |

Primary OutFlow Max=1.85 cfs @ 15.24 hrs HW=1,287.97' TW=1,260.45' (Dynamic Tailwater)

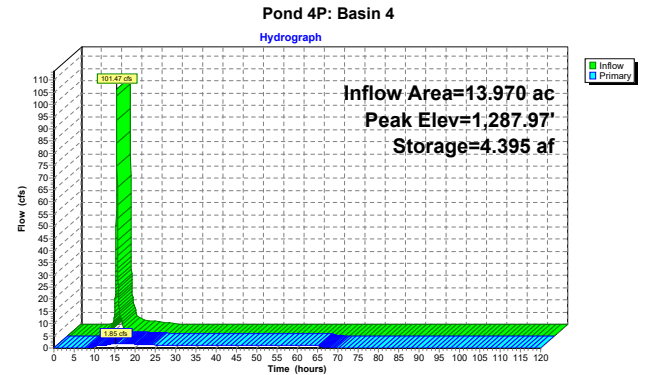
1=Culvert (Passes 1.85 cfs of 63.38 cfs potential flow)

2=WQv Orifice (Orifice Controls 0.62 cfs @ 2.06 fps)

3=Weir Wall ( Controls 0.00 cfs)

4=OCS Rim ( Controls 0.00 cfs)

5=Exfiltration (Exfiltration Controls 1.22 cfs)



Summary for Pond 5P: Basin 5

Inflow Area = 27.850 ac, 47.04% Impervious, Inflow Depth = 4.79" for 100-yr event  
Inflow = 198.93 cfs @ 12.17 hrs, Volume= 11,118 af  
Outflow = 15.83 cfs @ 13.12 hrs, Volume= 9,459 af, Atten= 92%, Lag= 56.9 min  
Primary = 15.83 cfs @ 13.12 hrs, Volume= 9,459 af  
Routed to Reach 3R : Peak Flow Trunk 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,289.69' @ 13.12 hrs Surf.Area= 1,708 ac Storage= 7,390 af

Plug-Flow detention time=686.1 min calculated for 9,457 af (85% of inflow)  
Center-of-Mass det. time= 634.5 min ( 1,419.1 - 784.6 )

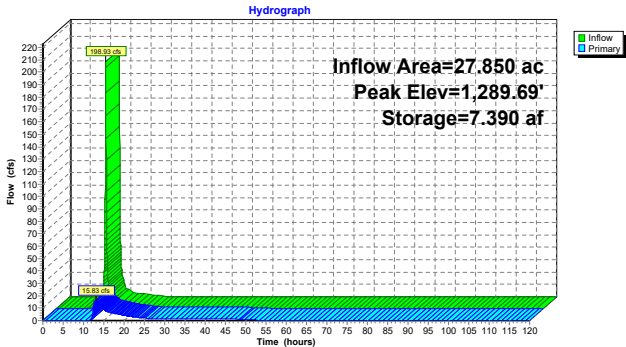
| Volume           | Invert            | Avail.Storage | Storage Description                                 |                       |
|------------------|-------------------|---------------|-----------------------------------------------------|-----------------------|
| #1               | 1,283.00'         | 13,459 af     | Custom Stage Data (Prismatic).Listed below (Recalc) |                       |
| Elevation (feet) | Surf.Area (acres) | Voids (%)     | Inc.Store (acre-feet)                               | Cum.Store (acre-feet) |
| 1,283.00         | 1.245             | 0.0           | 0.000                                               | 0.000                 |
| 1,283.01         | 1.245             | 40.0          | 0.005                                               | 0.005                 |
| 1,285.99         | 1.421             | 40.0          | 1.589                                               | 1.594                 |
| 1,286.00         | 1.423             | 100.0         | 0.014                                               | 1.608                 |
| 1,293.00         | 1.963             | 100.0         | 11.851                                              | 13.459                |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                                          |
|--------|----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,286.00' | 36.0" Round Culvert<br>L= 150.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,286.00' / 1,285.00' S= 0.0067 ' S= 0.0067 ' Cc= 0.900<br>n= 0.012, Flow Area= 7.07 sf |
| #2     | Device 1 | 1,287.60' | 15.0" Vert. WQV Orifice C= 0.600 Limited to weir flow at low heads                                                                                                                      |
| #3     | Device 1 | 1,289.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                                |
| #4     | Device 1 | 1,290.00' | 4.0' long OCS RIM X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                                         |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                              |

Primary OutFlow Max=15.83 cfs @ 13.12 hrs HW=1,289.69' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 15.83 cfs of 50.41 cfs potential flow)
- 2=WQV Orifice (Orifice Controls 7.16 cfs @ 5.84 fps)
- 3=Weir Wall (Weir Controls 7.29 cfs @ 2.72 fps)
- 4=OCS RIM ( Controls 0.00 cfs)
- 5=Exfiltration (Exfiltration Controls 1.38 cfs)

Pond 5P: Basin 5



Summary for Pond 6P: Basin 6

Inflow Area = 18,280 ac, 50.55% Impervious, Inflow Depth = 4.90" for 100-yr event  
Inflow = 132.77 cfs @ 12.17 hrs, Volume= 7,466 af  
Outflow = 26.49 cfs @ 12.53 hrs, Volume= 7,464 af, Atten= 80%, Lag= 21.5 min  
Primary = 26.49 cfs @ 12.53 hrs, Volume= 7,464 af  
Routed to Reach 3R : Peak Flow Trunk 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,290.13' @ 12.53 hrs Surf.Area= 0,945 ac Storage= 4,218 af

Plug-Flow detention time=662.0 min calculated for 7,464 af (100% of inflow)  
Center-of-Mass det. time= 661.8 min ( 1,444.3 - 782.5 )

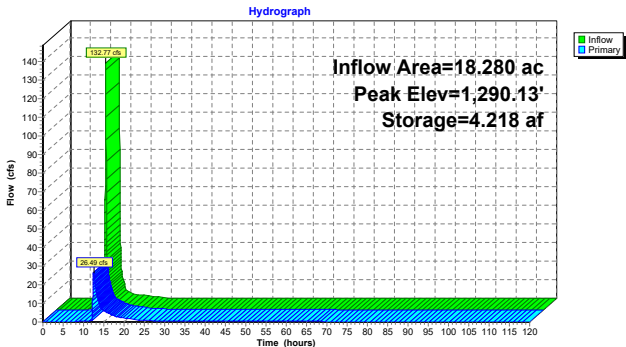
| Volume           | Invert            | Avail.Storage | Storage Description                                 |                       |
|------------------|-------------------|---------------|-----------------------------------------------------|-----------------------|
| #1               | 1,283.00'         | 7,152 af      | Custom Stage Data (Prismatic).Listed below (Recalc) |                       |
| Elevation (feet) | Surf.Area (acres) | Voids (%)     | Inc.Store (acre-feet)                               | Cum.Store (acre-feet) |
| 1,283.00         | 0.573             | 0.0           | 0.000                                               | 0.000                 |
| 1,283.01         | 0.573             | 40.0          | 0.002                                               | 0.002                 |
| 1,285.99         | 0.718             | 40.0          | 0.769                                               | 0.772                 |
| 1,286.00         | 0.718             | 100.0         | 0.007                                               | 0.779                 |
| 1,293.00         | 1.103             | 100.0         | 6.374                                               | 7.152                 |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                                          |
|--------|----------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,283.00' | 36.0" Round Culvert<br>L= 100.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,283.00' / 1,279.00' S= 0.0400 ' S= 0.0400 ' Cc= 0.900<br>n= 0.012, Flow Area= 7.07 sf |
| #2     | Primary  | 1,287.60' | 15.0" Vert. WQV Orifice C= 0.600 Limited to weir flow at low heads                                                                                                                      |
| #3     | Device 1 | 1,289.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                                |
| #4     | Device 1 | 1,290.00' | 4.0' long OCS RIM X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                                         |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                              |

Primary OutFlow Max=26.48 cfs @ 12.53 hrs HW=1,290.13' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 18.31 cfs of 80.79 cfs potential flow)
- 2=WQV Orifice (Orifice Controls 8.16 cfs @ 6.65 fps)
- 3=Weir Wall (Weir Controls 14.91 cfs @ 3.48 fps)
- 4=OCS RIM (Weir Controls 2.64 cfs @ 1.24 fps)
- 5=Exfiltration (Exfiltration Controls 0.76 cfs)

Pond 6P: Basin 6



Summary for Pond 7P: Basin 7

Inflow Area = 21.460 ac, 54.99% Impervious, Inflow Depth = 5.01" for 100-yr event

Inflow = 158.35 cfs @ 12.17 hrs, Volume= 8.963 af

Outflow = 2.62 cfs @ 15.49 hrs, Volume= 8.949 af, Atten= 98%, Lag= 199.1 min

Primary = 2.62 cfs @ 15.49 hrs, Volume= 8.949 af

Routed to Reach 3R : Peak Flow Trunk 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 1,287.99' @ 15.49 hrs Surf.Area= 104,649 sf Storage= 303,156 cf

Plug-Flow detention time= 1,447.6 min calculated for 8.949 af (100% of inflow)

Center-of-Mass det. time= 1,446.6 min ( 2,226.8 - 780.2 )

| Volume | Invert    | Avail.Storage | Storage Description                                 |
|--------|-----------|---------------|-----------------------------------------------------|
| #1     | 1,283.00' | 891,814 cf    | Custom Stage Data (Prismatic) Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Voids (%) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|-----------|------------------------|------------------------|
| 1,283.00         | 80,194            | 0.0       | 0                      | 0                      |
| 1,283.01         | 80,194            | 40.0      | 321                    | 321                    |
| 1,285.99         | 94,569            | 40.0      | 104,159                | 104,479                |
| 1,286.00         | 94,569            | 100.0     | 946                    | 105,425                |
| 1,293.00         | 130,114           | 100.0     | 786,389                | 891,814                |

| Device | Routing  | Invert    | Outlet Devices                                                                                                                                                                |
|--------|----------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 1,283.00' | 42.0" Round Culvert<br>L= 100.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,283.00' / 1,279.00' S= 0.0400 ' / Cc= 0.900<br>n= 0.012, Flow Area= 9.62 sf |
| #2     | Device 1 | 1,287.60' | 15.0" Vert. WQV Orifice C= 0.600 Limited to weir flow at low heads                                                                                                            |
| #3     | Device 1 | 1,289.00' | 4.0' long Weir Wall 2 End Contraction(s)                                                                                                                                      |
| #4     | Device 1 | 1,290.00' | 4.0' long OCS RIM X 4.00 2 End Contraction(s) 0.5' Crest Height                                                                                                               |
| #5     | Device 1 | 1,283.00' | 0.800 in/hr Exfiltration over Surface area                                                                                                                                    |

Primary OutFlow Max=2.62 cfs @ 15.49 hrs HW=1,287.99' TW=0.00' (Dynamic Tailwater)

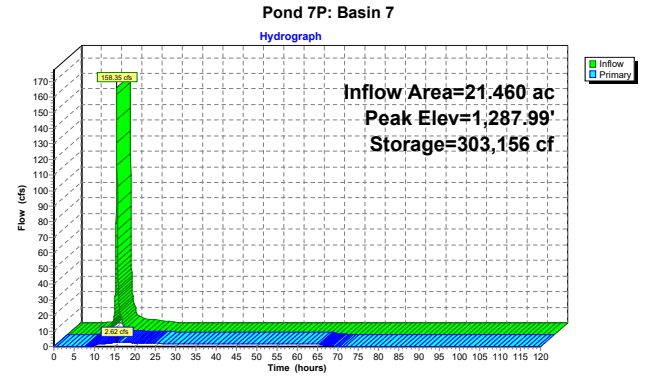
1=Culvert (Passes 2.62 cfs of 83.32 cfs potential flow)

2=WQV Orifice (Orifice Controls 0.68 cfs @ 2.11 fps)

3=Weir Wall ( Controls 0.00 cfs)

4=OCS RIM ( Controls 0.00 cfs)

5=Exfiltration (Exfiltration Controls 1.94 cfs)



Summary for Pond W1: Wetland 1

Inflow Area = 92.870 ac, 36.76% Impervious, Inflow Depth = 4.19" for 100-yr event

Inflow = 145.89 cfs @ 12.15 hrs, Volume= 32.457 af

Outflow = 25.24 cfs @ 14.38 hrs, Volume= 32.457 af, Atten= 83%, Lag= 134.3 min

Primary = 25.24 cfs @ 14.38 hrs, Volume= 32.457 af

Routed to Link 20L : Discharge Point #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 1,274.54' @ 14.38 hrs Surf.Area= 5.634 ac Storage= 5.503 af

Plug-Flow detention time= 61.6 min calculated for 32.452 af (100% of inflow)

Center-of-Mass det. time= 61.5 min ( 1,585.5 - 1,524.0 )

| Volume | Invert    | Avail.Storage | Storage Description                                 |
|--------|-----------|---------------|-----------------------------------------------------|
| #1     | 1,270.00' | 23.725 af     | Custom Stage Data (Prismatic) Listed below (Recalc) |
| #2     | 1,275.00' | 4.145 af      | Custom Stage Data (Prismatic) Listed below (Recalc) |
|        |           | 27.870 af     | Total Available Storage                             |

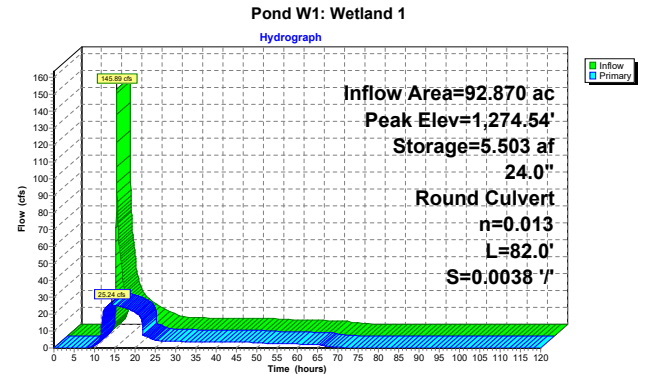
| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 1,270.00         | 0.001             | 0.000                 | 0.000                 |
| 1,271.99         | 0.001             | 0.002                 | 0.002                 |
| 1,272.00         | 0.005             | 0.000                 | 0.002                 |
| 1,273.00         | 0.140             | 0.072                 | 0.075                 |
| 1,274.00         | 5.000             | 2.570                 | 2.645                 |
| 1,275.00         | 6.180             | 5.590                 | 8.235                 |
| 1,276.00         | 7.970             | 7.075                 | 15.310                |
| 1,277.00         | 8.860             | 8.415                 | 23.725                |

| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 1,275.00         | 0.170             | 0.000                 | 0.000                 |
| 1,276.00         | 0.370             | 0.270                 | 0.270                 |
| 1,277.00         | 7.380             | 3.875                 | 4.145                 |

| Device | Routing | Invert    | Outlet Devices                                                                                                                                                               |
|--------|---------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 1,270.32' | 24.0" Round Culvert<br>L= 82.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,270.32' / 1,270.01' S= 0.0038 ' / Cc= 0.900<br>n= 0.013, Flow Area= 3.14 sf |

Primary OutFlow Max=25.24 cfs @ 14.38 hrs HW=1,274.54' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 25.24 cfs @ 8.03 fps)



**Summary for Pond W7: Wetland 7**

Inflow Area = 141.130 ac, 42.22% Impervious, Inflow Depth > 4.58" for 100-yr event  
Inflow = 106.78 cfs @ 12.68 hrs, Volume= 53.834 af  
Outflow = 62.82 cfs @ 13.51 hrs, Volume= 53.816 af, Atten= 41%, Lag= 49.6 min  
Primary = 62.82 cfs @ 13.51 hrs, Volume= 53.816 af  
Routed to Link 11L : Discharge Point #2

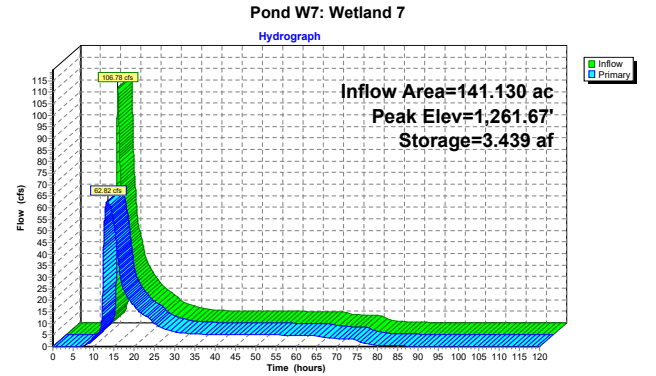
Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs / 2  
Peak Elev= 1,261.67' @ 13.51 hrs Surf.Area= 2.071 ac Storage= 3.439 af

Plug-Flow detention time= 18.5 min calculated for 53.816 af (100% of inflow)  
Center-of-Mass det. time= 16.7 min ( 1,765.4 - 1,748.7 )

| Volume           | Invert            | Avail.Storage         | Storage Description                                 |
|------------------|-------------------|-----------------------|-----------------------------------------------------|
| #1               | 1,256.00'         | 18.795 af             | Custom Stage Data (Prismatic).Listed below (Recalc) |
| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet)                               |
| 1,256.00         | 0.005             | 0.000                 | 0.000                                               |
| 1,257.00         | 0.050             | 0.027                 | 0.027                                               |
| 1,258.00         | 0.200             | 0.125                 | 0.152                                               |
| 1,259.00         | 0.497             | 0.348                 | 0.500                                               |
| 1,260.00         | 0.864             | 0.680                 | 1.180                                               |
| 1,261.00         | 1.362             | 1.113                 | 2.293                                               |
| 1,262.00         | 2.424             | 1.893                 | 4.186                                               |
| 1,263.00         | 3.770             | 3.097                 | 7.283                                               |
| 1,264.00         | 5.818             | 4.794                 | 12.077                                              |
| 1,265.00         | 7.617             | 6.717                 | 18.795                                              |

| Device | Routing | Invert    | Outlet Devices                                                                                                                                                                                                         |
|--------|---------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 1,256.76' | <b>36.0" Round Culvert</b><br>L= 70.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 1,256.76' / 1,254.25' S= 0.0359 ' / Cc= 0.900<br>n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf |
| #2     | Primary | 1,262.50' | <b>256.0' long + 10.0 'SideZ x 40.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63                      |

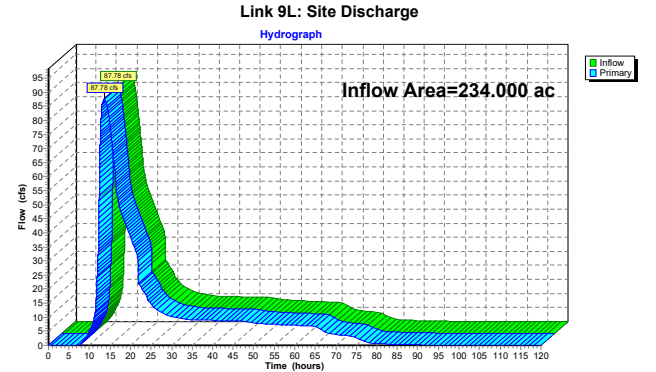
**Primary OutFlow** Max=62.82 cfs @ 13.51 hrs HW=1,261.67' TW=0.00' (Dynamic Tailwater)  
1=Culvert (Inlet Controls 62.82 cfs @ 8.89 fps)  
2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)



**Summary for Link 9L: Site Discharge**

Inflow Area = 234.000 ac, 40.05% Impervious, Inflow Depth > 4.42" for 100-yr event  
Inflow = 87.78 cfs @ 13.59 hrs, Volume= 86.273 af  
Primary = 87.78 cfs @ 13.59 hrs, Volume= 86.273 af, Atten= 0%, Lag= 0.0 min

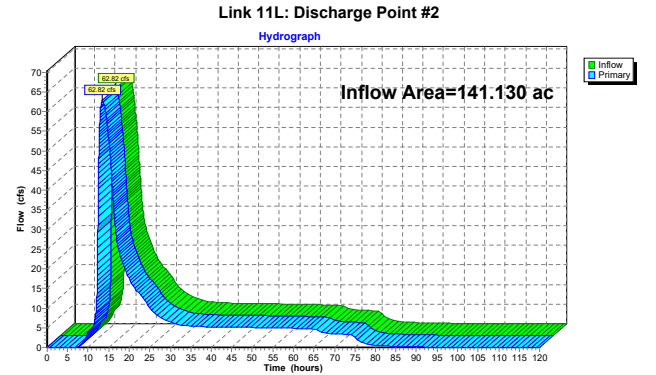
Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs



**Summary for Link 11L: Discharge Point #2**

Inflow Area = 141.130 ac, 42.22% Impervious, Inflow Depth > 4.58" for 100-yr event  
Inflow = 62.82 cfs @ 13.51 hrs, Volume= 53.816 af  
Primary = 62.82 cfs @ 13.51 hrs, Volume= 53.816 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 9L : Site Discharge

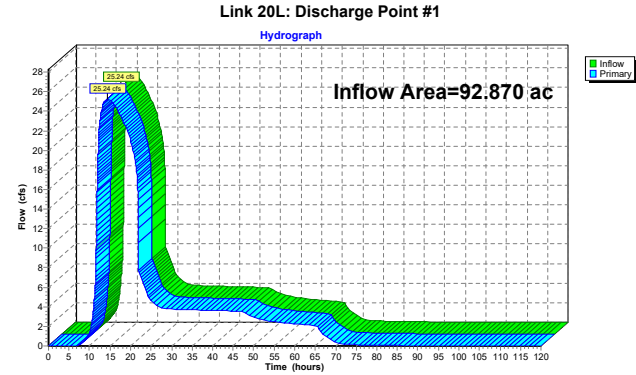
Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs



Summary for Link 20L: Discharge Point #1

Inflow Area = 92.870 ac, 36.76% Impervious, Inflow Depth > 4.19" for 100-yr event  
Inflow = 25.24 cfs @ 14.38 hrs, Volume= 32.457 af  
Primary = 25.24 cfs @ 14.38 hrs, Volume= 32.457 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 9L : Site Discharge

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.02 hrs



---

## **Appendix 5. MIDs Calculator Results**

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## Project Information

|                           |                                                                           |
|---------------------------|---------------------------------------------------------------------------|
| Calculator Version:       | Version 4: July 2020                                                      |
| Project Name:             | Project Loon                                                              |
| User Name / Company Name: |                                                                           |
| Date:                     | 07-02-2025                                                                |
| Project Description:      | Existing Conditions Project Loon Day N - Baseline for TSS and TP effluent |
| Construction Permit?:     | No                                                                        |

## Site Information

|                                 |       |
|---------------------------------|-------|
| Retention Requirement (inches): | 1.1   |
| Site's Zip Code:                | 55810 |
| Annual Rainfall (inches):       | 30    |
| Phosphorus EMC (mg/l):          | 0.3   |
| TSS EMC (mg/l):                 | 54.5  |

## Total Site Area

| Land Cover                                                                      | A Soils<br>(acres) | B Soils<br>(acres) | C Soils<br>(acres)      | D Soils<br>(acres) | Total<br>(acres) |
|---------------------------------------------------------------------------------|--------------------|--------------------|-------------------------|--------------------|------------------|
| Forest/Open Space - Undisturbed, protected forest/open space or reforested land |                    |                    | 136.63                  | 60.14              | 196.77           |
| Managed Turf - disturbed, graded for yards or other turf to be mowed/managed    |                    |                    | 31.5                    |                    | 31.5             |
|                                                                                 |                    |                    | Impervious Area (acres) |                    | 5.73             |
|                                                                                 |                    |                    | Total Area (acres)      |                    | 234              |

## Site Areas Routed to BMPs

| Land Cover                                                                      | A Soils<br>(acres) | B Soils<br>(acres) | C Soils<br>(acres)      | D Soils<br>(acres) | Total<br>(acres) |
|---------------------------------------------------------------------------------|--------------------|--------------------|-------------------------|--------------------|------------------|
| Forest/Open Space - Undisturbed, protected forest/open space or reforested land |                    |                    |                         |                    | 0                |
| Managed Turf - disturbed, graded for yards or other turf to be mowed/managed    |                    |                    |                         |                    | 0                |
|                                                                                 |                    |                    | Impervious Area (acres) |                    |                  |
|                                                                                 |                    |                    | Total Area (acres)      |                    | 0                |

## Summary Information

### Performance Goal Requirement

Performance goal volume retention requirement: 22880 ft<sup>3</sup>  
Volume removed by BMPs towards performance goal: ft<sup>3</sup>  
**Percent volume removed towards performance goal** %

### Annual Volume and Pollutant Load Reductions

Post development annual runoff volume 46.9028 acre-ft  
Annual runoff volume removed by BMPs: acre-ft  
**Percent annual runoff volume removed:** %

Post development annual particulate P load: 21.05 lbs  
Annual particulate P removed by BMPs: lbs  
Post development annual dissolved P load: 17.223 lbs  
Annual dissolved P removed by BMPs: 0 lbs  
Total P removed by BMPs 0 lbs  
**Percent annual total phosphorus removed:** %

Post development annual TSS load: 6952.9 lbs  
Annual TSS removed by BMPs: lbs  
**Percent annual TSS removed:** %

## BMP Summary

### Performance Goal Summary

| BMP Name | BMP Volume Capacity (ft <sup>3</sup> ) | Volume Recieved (ft <sup>3</sup> ) | Volume Retained (ft <sup>3</sup> ) | Volume Outflow (ft <sup>3</sup> ) | Percent Retained (%) |
|----------|----------------------------------------|------------------------------------|------------------------------------|-----------------------------------|----------------------|
|----------|----------------------------------------|------------------------------------|------------------------------------|-----------------------------------|----------------------|

### Annual Volume Summary

| BMP Name | Volume From Direct Watershed (acre-ft) | Volume From Upstream BMPs (acre-ft) | Volume Retained (acre-ft) | Volume outflow (acre-ft) | Percent Retained (%) |
|----------|----------------------------------------|-------------------------------------|---------------------------|--------------------------|----------------------|
|----------|----------------------------------------|-------------------------------------|---------------------------|--------------------------|----------------------|

### Particulate Phosphorus Summary

| BMP Name | Load From Direct Watershed (lbs) | Load From Upstream BMPs (lbs) | Load Retained (lbs) | Outflow Load (lbs) | Percent Retained (%) |
|----------|----------------------------------|-------------------------------|---------------------|--------------------|----------------------|
|----------|----------------------------------|-------------------------------|---------------------|--------------------|----------------------|

### Dissolved Phosphorus Summary

| BMP Name | Load From<br>Direct<br>Watershed<br>(lbs) | Load From<br>Upstream<br>BMPs<br>(lbs) | Load<br>Retained<br>(lbs) | Outflow<br>Load<br>(lbs) | Percent<br>Retained (%) |
|----------|-------------------------------------------|----------------------------------------|---------------------------|--------------------------|-------------------------|
|----------|-------------------------------------------|----------------------------------------|---------------------------|--------------------------|-------------------------|

**Total Phosphorus Summary**

| BMP Name | Load From<br>Direct<br>Watershed<br>(lbs) | Load From<br>Upstream<br>BMPs<br>(lbs) | Load<br>Retained<br>(lbs) | Outflow<br>Load<br>(lbs) | Percent<br>Retained (%) |
|----------|-------------------------------------------|----------------------------------------|---------------------------|--------------------------|-------------------------|
|----------|-------------------------------------------|----------------------------------------|---------------------------|--------------------------|-------------------------|

**TSS Summary**

| BMP Name | Load From<br>Direct<br>Watershed<br>(lbs) | Load From<br>Upstream<br>BMPs<br>(lbs) | Load<br>Retained<br>(lbs) | Outflow<br>Load<br>(lbs) | Percent<br>Retained (%) |
|----------|-------------------------------------------|----------------------------------------|---------------------------|--------------------------|-------------------------|
|----------|-------------------------------------------|----------------------------------------|---------------------------|--------------------------|-------------------------|

**BMP Schematic**

## Project Information

|                           |                                                                                                                 |
|---------------------------|-----------------------------------------------------------------------------------------------------------------|
| Calculator Version:       | Version 4: July 2020                                                                                            |
| Project Name:             | Hermantown Industrial                                                                                           |
| User Name / Company Name: |                                                                                                                 |
| Date:                     | 07/17/2026                                                                                                      |
| Project Description:      | Proposed Conditions with EMC adjustments Using tier 1 manufactured treatment devices for pre-treatment to ponds |
| Construction Permit?:     | No                                                                                                              |

## Site Information

|                                 |       |
|---------------------------------|-------|
| Retention Requirement (inches): | 1.1   |
| Site's Zip Code:                | 55810 |
| Annual Rainfall (inches):       | 30    |
| Phosphorus EMC (mg/l):          | 0.2   |
| TSS EMC (mg/l):                 | 75    |

## Total Site Area

| Land Cover                                                                      | A Soils<br>(acres) | B Soils<br>(acres) | C Soils<br>(acres)      | D Soils<br>(acres) | Total<br>(acres) |
|---------------------------------------------------------------------------------|--------------------|--------------------|-------------------------|--------------------|------------------|
| Forest/Open Space - Undisturbed, protected forest/open space or reforested land |                    |                    |                         | 60.14              | 60.14            |
| Managed Turf - disturbed, graded for yards or other turf to be mowed/managed    |                    |                    | 80.14                   |                    | 80.14            |
|                                                                                 |                    |                    | Impervious Area (acres) |                    | 93.72            |
|                                                                                 |                    |                    | Total Area (acres)      |                    | 234              |

## Site Areas Routed to BMPs

| Land Cover                                                                      | A Soils<br>(acres) | B Soils<br>(acres) | C Soils<br>(acres)      | D Soils<br>(acres) | Total<br>(acres) |
|---------------------------------------------------------------------------------|--------------------|--------------------|-------------------------|--------------------|------------------|
| Forest/Open Space - Undisturbed, protected forest/open space or reforested land |                    |                    |                         |                    | 0                |
| Managed Turf - disturbed, graded for yards or other turf to be mowed/managed    |                    |                    | 80.14                   |                    | 80.14            |
|                                                                                 |                    |                    | Impervious Area (acres) |                    | 93.72            |
|                                                                                 |                    |                    | Total Area (acres)      |                    | 173.86           |

## Summary Information

### Performance Goal Requirement

|                                                        |          |                 |
|--------------------------------------------------------|----------|-----------------|
| Performance goal volume retention requirement:         | 374222   | ft <sup>3</sup> |
| Volume removed by BMPs towards performance goal:       | 33039    | ft <sup>3</sup> |
| <b>Percent volume removed towards performance goal</b> | <b>9</b> | <b>%</b>        |

### Annual Volume and Pollutant Load Reductions

|                                              |          |          |
|----------------------------------------------|----------|----------|
| Post development annual runoff volume        | 246.7616 | acre-ft  |
| Annual runoff volume removed by BMPs:        | 0        | acre-ft  |
| <b>Percent annual runoff volume removed:</b> | <b>0</b> | <b>%</b> |

|                                                 |           |          |
|-------------------------------------------------|-----------|----------|
| Post development annual particulate P load:     | 73.8311   | lbs      |
| Annual particulate P removed by BMPs:           | 66.023    | lbs      |
| Post development annual dissolved P load:       | 60.407    | lbs      |
| Annual dissolved P removed by BMPs:             | 39.822    | lbs      |
| Total P removed by BMPs                         | 105.845   | lbs      |
| <b>Percent annual total phosphorus removed:</b> | <b>79</b> | <b>%</b> |

|                                    |           |          |
|------------------------------------|-----------|----------|
| Post development annual TSS load:  | 50339.4   | lbs      |
| Annual TSS removed by BMPs:        | 47776.1   | lbs      |
| <b>Percent annual TSS removed:</b> | <b>95</b> | <b>%</b> |

## BMP Summary

### Performance Goal Summary

| BMP Name                                       | BMP Volume Capacity (ft <sup>3</sup> ) | Volume Recieved (ft <sup>3</sup> ) | Volume Retained (ft <sup>3</sup> ) | Volume Outflow (ft <sup>3</sup> ) | Percent Retained (%) |
|------------------------------------------------|----------------------------------------|------------------------------------|------------------------------------|-----------------------------------|----------------------|
| 1 and 2 - Bioretention basin (with underdrain) | 14450                                  | 194977                             | 14450                              | 180528                            | 7                    |
| 3 - Bioretention basin (with underdrain)       | 0                                      | 0                                  | 0                                  | 0                                 | 0                    |
| 4 - Bioretention basin (with underdrain)       | 4502                                   | 28670                              | 4502                               | 24168                             | 16                   |
| 5 - Bioretention basin (with underdrain)       | 4649                                   | 52308                              | 4649                               | 47659                             | 9                    |
| 6 - Bioretention basin (with underdrain)       | 2346                                   | 36895                              | 2346                               | 34549                             | 6                    |
| 7 - Bioretention basin (with underdrain)       | 7093                                   | 61372                              | 7093                               | 54279                             | 12                   |
| 1-Pre-treatment                                | 0                                      | 48036                              | 0                                  | 48036                             | 0                    |
| 2-Pre-treatment                                | 0                                      | 146942                             | 0                                  | 146942                            | 0                    |
| 3-Pre-treatment                                | 0                                      | 14255                              | 0                                  | 14255                             | 0                    |
| 4-Pre-treatment                                | 0                                      | 28670                              | 0                                  | 28670                             | 0                    |
| 5-Pre-treatment                                | 0                                      | 52308                              | 0                                  | 52308                             | 0                    |
| 6-Pre-treatment                                | 0                                      | 36895                              | 0                                  | 36895                             | 0                    |
| 7-Pre-treatment                                | 0                                      | 47117                              | 0                                  | 47117                             | 0                    |

## Annual Volume Summary

| BMP Name                                       | Volume From Direct Watershed (acre-ft) | Volume From Upstream BMPs (acre-ft) | Volume Retained (acre-ft) | Volume outflow (acre-ft) | Percent Retained (%) |
|------------------------------------------------|----------------------------------------|-------------------------------------|---------------------------|--------------------------|----------------------|
| 1 and 2 - Bioretention basin (with underdrain) | 0                                      | 0                                   | 0                         | 0                        | 17                   |
| 3 - Bioretention basin (with underdrain)       | 0                                      | 0                                   | 0                         | 0                        | 0                    |
| 4 - Bioretention basin (with underdrain)       | 0                                      | 0                                   | 0                         | 0                        | 31                   |
| 5 - Bioretention basin (with underdrain)       | 0                                      | 0                                   | 0                         | 0                        | 19                   |
| 6 - Bioretention basin (with underdrain)       | 0                                      | 0                                   | 0                         | 0                        | 14                   |
| 7 - Bioretention basin (with underdrain)       | 0                                      | 0                                   | 0                         | 0                        | 24                   |
| 1-Pre-treatment                                | 36.1883                                | 0                                   | 0                         | 36.1883                  | 0                    |
| 2-Pre-treatment                                | 85.8722                                | 0                                   | 0                         | 85.8722                  | 0                    |
| 3-Pre-treatment                                | 9.695                                  | 0                                   | 0                         | 9.695                    | 0                    |
| 4-Pre-treatment                                | 18.7083                                | 0                                   | 0                         | 18.7083                  | 0                    |
| 5-Pre-treatment                                | 35.3025                                | 0                                   | 0                         | 35.3025                  | 0                    |
| 6-Pre-treatment                                | 24.2253                                | 0                                   | 0                         | 24.2253                  | 0                    |
| 7-Pre-treatment                                | 30.0042                                | 0                                   | 0                         | 30.0042                  | 0                    |

#### Particulate Phosphorus Summary

| BMP Name                                       | Load From Direct Watershed (lbs) | Load From Upstream BMPs (lbs) | Load Retained (lbs) | Outflow Load (lbs) | Percent Retained (%) |
|------------------------------------------------|----------------------------------|-------------------------------|---------------------|--------------------|----------------------|
| 1 and 2 - Bioretention basin (with underdrain) | 0                                | 18.2601                       | 15.2341             | 3.026              | 83                   |
| 3 - Bioretention basin (with underdrain)       | 0                                | 0                             | 0                   | 0                  | 0                    |
| 4 - Bioretention basin (with underdrain)       | 0                                | 2.7987                        | 2.4119              | 0.3868             | 86                   |
| 5 - Bioretention basin (with underdrain)       | 0                                | 5.2812                        | 4.4298              | 0.8514             | 84                   |
| 6 - Bioretention basin (with underdrain)       | 0                                | 3.6241                        | 3.0041              | 0.62               | 83                   |
| 7 - Bioretention basin (with underdrain)       | 0                                | 5.939                         | 5.0393              | 0.8997             | 85                   |
| 1-Pre-treatment                                | 10.8275                          | 0                             | 5.4138              | 5.4137             | 50                   |
| 2-Pre-treatment                                | 25.6929                          | 0                             | 12.8465             | 12.8464            | 50                   |
| 3-Pre-treatment                                | 2.9008                           | 0                             | 1.4504              | 1.4504             | 50                   |
| 4-Pre-treatment                                | 5.5975                           | 0                             | 2.7988              | 2.7987             | 50                   |
| 5-Pre-treatment                                | 10.5625                          | 0                             | 5.2813              | 5.2812             | 50                   |
| 6-Pre-treatment                                | 7.2482                           | 0                             | 3.6241              | 3.6241             | 50                   |
| 7-Pre-treatment                                | 8.9773                           | 0                             | 4.4887              | 4.4886             | 50                   |

#### Dissolved Phosphorus Summary

| BMP Name                                       | Load From Direct Watershed (lbs) | Load From Upstream BMPs (lbs) | Load Retained (lbs) | Outflow Load (lbs) | Percent Retained (%) |
|------------------------------------------------|----------------------------------|-------------------------------|---------------------|--------------------|----------------------|
| 1 and 2 - Bioretention basin (with underdrain) | 0                                | 14.9401                       | 5.0368              | 9.9033             | 34                   |
| 3 - Bioretention basin (with underdrain)       | 0                                | 0                             | 0                   | 0                  | 0                    |
| 4 - Bioretention basin (with underdrain)       | 0                                | 2.2899                        | 1.0238              | 1.2661             | 45                   |
| 5 - Bioretention basin (with underdrain)       | 0                                | 4.321                         | 1.5345              | 2.7865             | 36                   |
| 6 - Bioretention basin (with underdrain)       | 0                                | 2.9652                        | 0.9361              | 2.0291             | 32                   |
| 7 - Bioretention basin (with underdrain)       | 0                                | 4.8591                        | 1.9147              | 2.9444             | 39                   |
| 1-Pre-treatment                                | 8.8589                           | 0                             | 4.4295              | 4.4294             | 50                   |
| 2-Pre-treatment                                | 21.0215                          | 0                             | 10.5108             | 10.5107            | 50                   |
| 3-Pre-treatment                                | 2.3733                           | 0                             | 1.1867              | 1.1866             | 50                   |
| 4-Pre-treatment                                | 4.5798                           | 0                             | 2.2899              | 2.2899             | 50                   |
| 5-Pre-treatment                                | 8.6421                           | 0                             | 4.3211              | 4.321              | 50                   |
| 6-Pre-treatment                                | 5.9304                           | 0                             | 2.9652              | 2.9652             | 50                   |
| 7-Pre-treatment                                | 7.345                            | 0                             | 3.6725              | 3.6725             | 50                   |

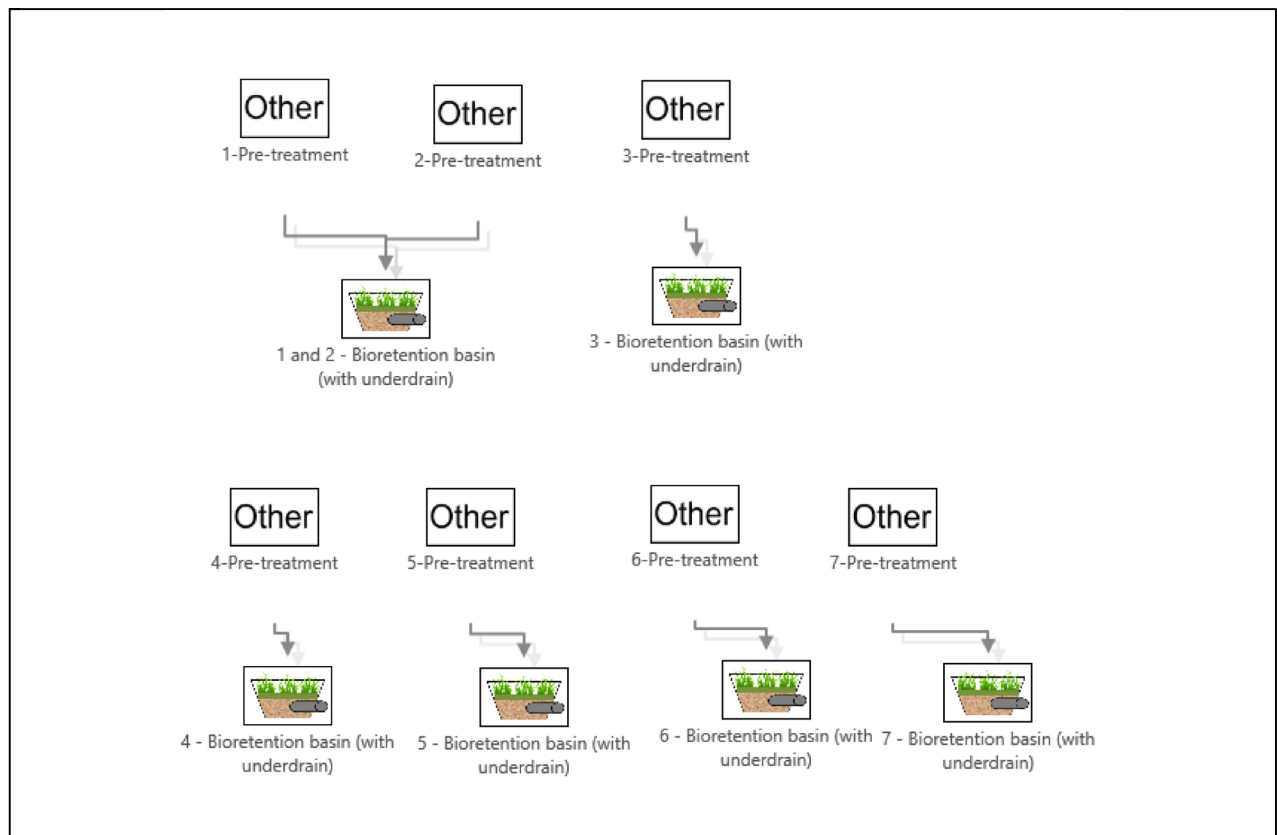
#### Total Phosphorus Summary

| BMP Name                                       | Load From Direct Watershed (lbs) | Load From Upstream BMPs (lbs) | Load Retained (lbs) | Outflow Load (lbs) | Percent Retained (%) |
|------------------------------------------------|----------------------------------|-------------------------------|---------------------|--------------------|----------------------|
| 1 and 2 - Bioretention basin (with underdrain) | 0                                | 33.2002                       | 20.2709             | 12.9293            | 58                   |
| 3 - Bioretention basin (with underdrain)       | 0                                | 0                             | 0                   | 0                  | 0                    |
| 4 - Bioretention basin (with underdrain)       | 0                                | 5.0886                        | 3.4357              | 1.6529             | 66                   |
| 5 - Bioretention basin (with underdrain)       | 0                                | 9.6022                        | 5.9643              | 3.6379             | 60                   |
| 6 - Bioretention basin (with underdrain)       | 0                                | 6.5893                        | 3.9402              | 2.6491             | 58                   |
| 7 - Bioretention basin (with underdrain)       | 0                                | 10.7981                       | 6.954               | 3.8441             | 62                   |
| 1-Pre-treatment                                | 19.6864                          | 0                             | 9.8433              | 9.8431             | 50                   |
| 2-Pre-treatment                                | 46.7144                          | 0                             | 23.3573             | 23.3571            | 50                   |
| 3-Pre-treatment                                | 5.2741                           | 0                             | 2.6371              | 2.637              | 50                   |
| 4-Pre-treatment                                | 10.1773                          | 0                             | 5.0887              | 5.0886             | 50                   |
| 5-Pre-treatment                                | 19.2046                          | 0                             | 9.6024              | 9.6022             | 50                   |
| 6-Pre-treatment                                | 13.1786                          | 0                             | 6.5893              | 6.5893             | 50                   |
| 7-Pre-treatment                                | 16.3223                          | 0                             | 8.1612              | 8.1611             | 50                   |

#### TSS Summary

| BMP Name                                    | Load From Direct Watershed (lbs) | Load From Upstream BMPs (lbs) | Load Retained (lbs) | Outflow Load (lbs) | Percent Retained (%) |
|---------------------------------------------|----------------------------------|-------------------------------|---------------------|--------------------|----------------------|
| 1 and 2 - Bioretention basin (with underdr) | 0                                | 3735.05                       | 3116.09             | 618.95999999       | 83                   |
| 3 - Bioretention basin (with underdrain)    | 0                                | 0                             | 0                   | 0                  | 0                    |
| 4 - Bioretention basin (with underdrain)    | 0                                | 572.47                        | 493.34              | 79.1299999999      | 86                   |
| 5 - Bioretention basin (with underdrain)    | 0                                | 1080.26                       | 906.1               | 174.16             | 84                   |
| 6 - Bioretention basin (with underdrain)    | 0                                | 741.29                        | 614.48              | 126.81             | 83                   |
| 7 - Bioretention basin (with underdrain)    | 0                                | 1214.8                        | 1030.77             | 184.03             | 85                   |
| 1-Pre-treatment                             | 7382.42                          | 0                             | 6275.06             | 1107.36            | 85                   |
| 2-Pre-treatment                             | 17517.92                         | 0                             | 14890.23            | 2627.69            | 85                   |
| 3-Pre-treatment                             | 1977.79                          | 0                             | 1681.12             | 296.67             | 85                   |
| 4-Pre-treatment                             | 3816.49                          | 0                             | 3244.02             | 572.47             | 85                   |
| 5-Pre-treatment                             | 7201.71                          | 0                             | 6121.45             | 1080.26            | 85                   |
| 6-Pre-treatment                             | 4941.96                          | 0                             | 4200.67             | 741.29             | 85                   |
| 7-Pre-treatment                             | 6120.86                          | 0                             | 5202.73             | 918.13             | 85                   |

## BMP Schematic



---

## Appendix 6. Soil Boring Logs

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# **Updated Revised Preliminary Geotechnical Evaluation Report**

Hermantown Site  
3589 Midway Road  
Hermantown, Minnesota

*Prepared for*

**Kimley-Horn and Associates, Inc.**

**Mortenson Development, Inc.**

**and**

**Harmony Group LLC**

## **Professional Certification:**

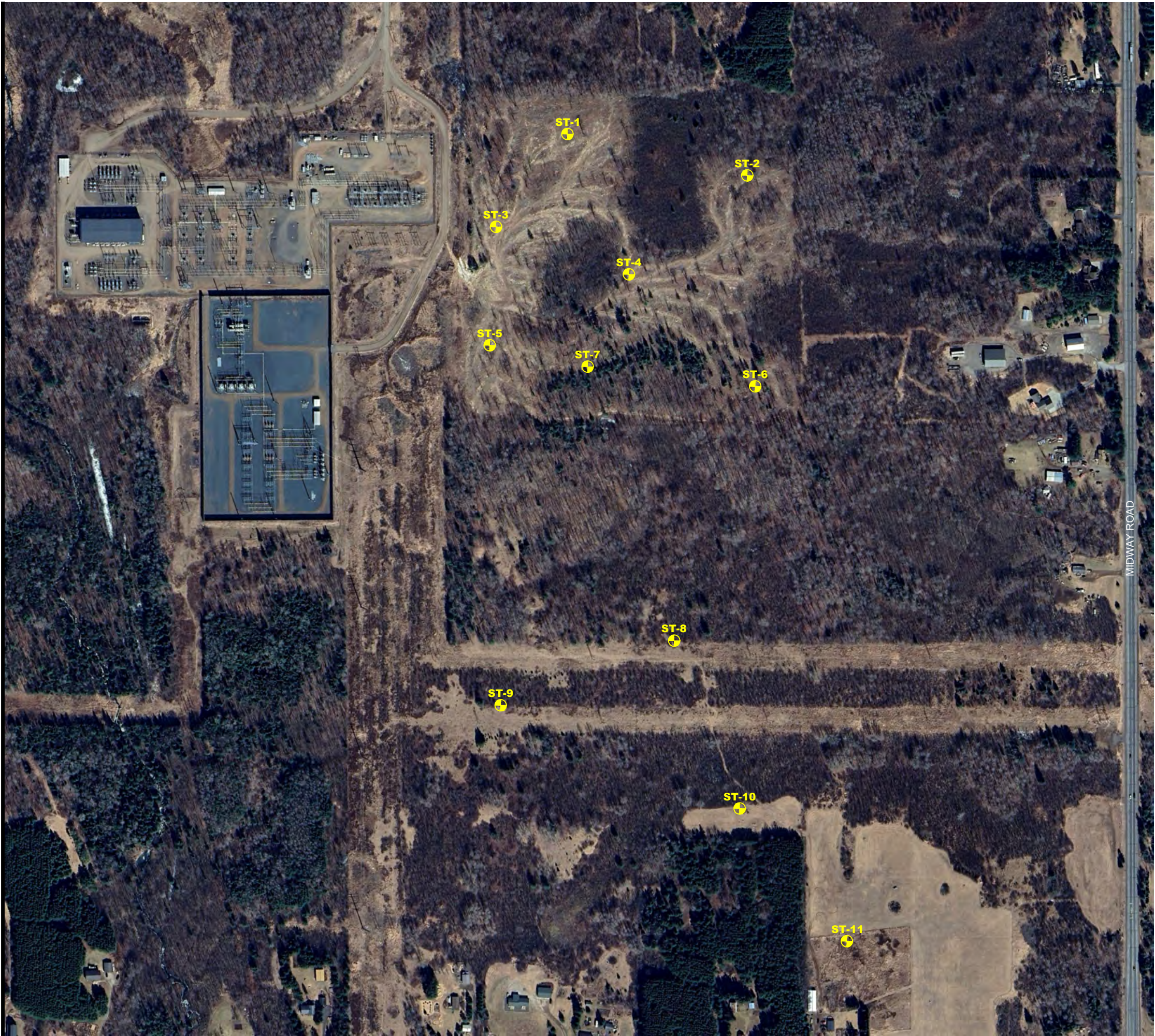
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Minnesota.

Ryan M. Benson, PE  
Director, Principal Engineer  
License Number: 42724  
March 19, 2025

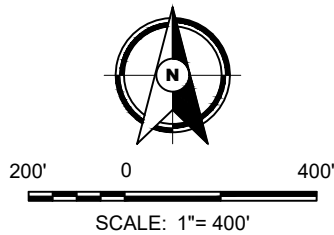
Project B2409404

Braun Intertec Corporation

F:\2024\B2409404\CAD\B2409404.dwg, Geotech, 11/15/2024 10:28:53 AM



**DENOTES APPROXIMATE LOCATION OF  
STANDARD PENETRATION TEST BORING**



Drawing Information

Project No:  
B2409404

Drawing No:  
B2409404

Drawn By: JAG  
Date Drawn: 10/14/24  
Checked By: BR  
Last Modified: 11/15/24

Project Information

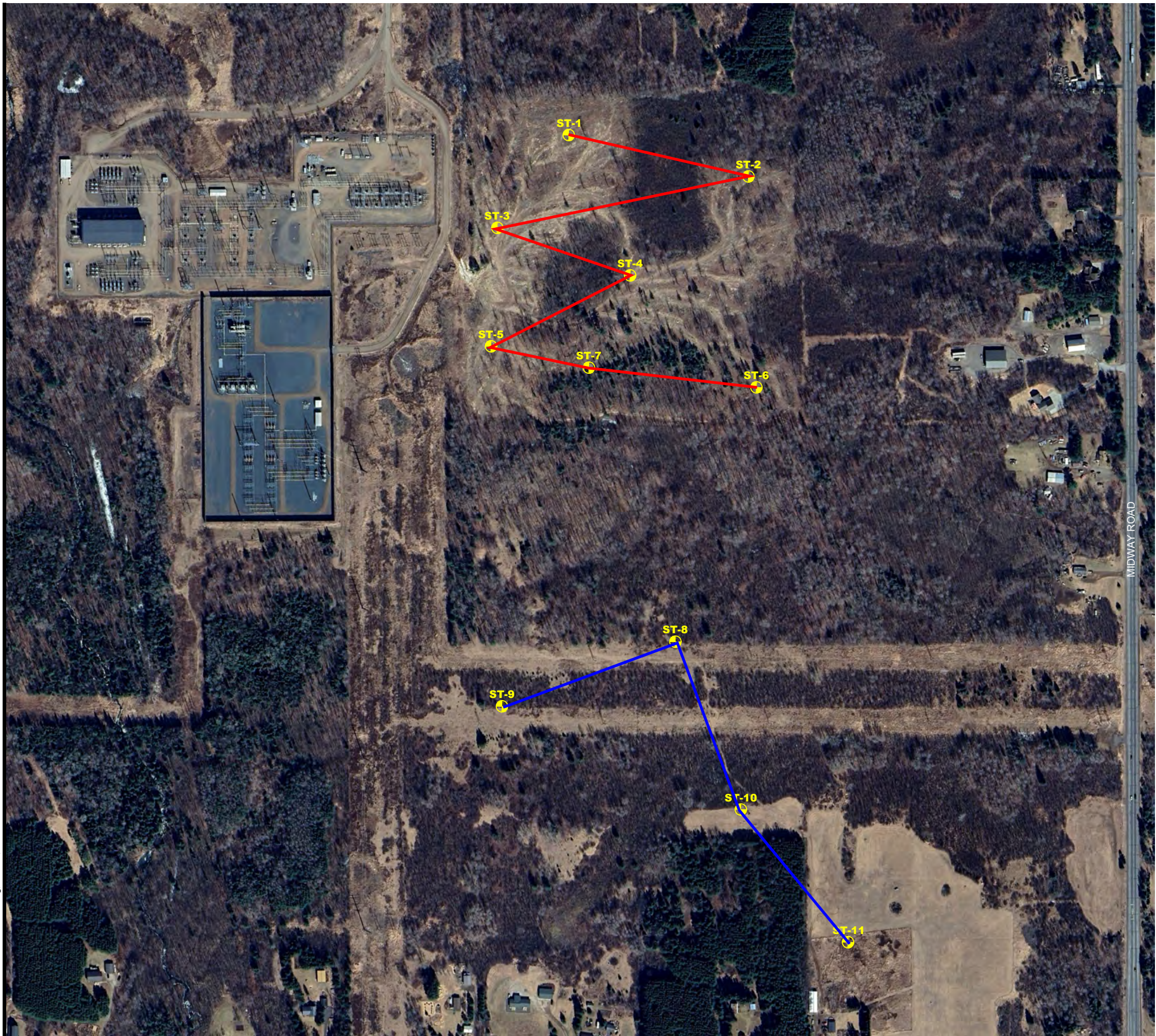
Hermantown Site

3589 Midway Road

Hermantown, Minnesota

**Soil Boring  
Location Sketch**

F:\2024\B2409404\CAD\B2409404.dwg, Geotech, 11/15/2024 10:28:53 AM



Fence Diagram Sketch:  
— Fence 1  
— Fence 2

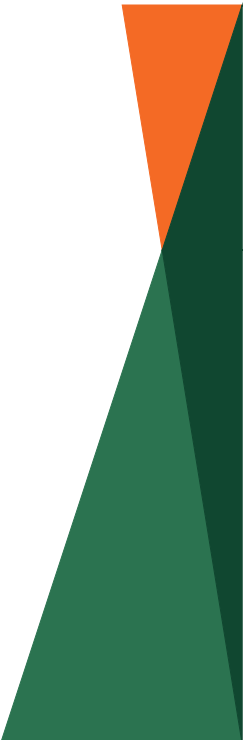


**DENOTES APPROXIMATE LOCATION OF  
STANDARD PENETRATION TEST BORING**



200' 0 400'

SCALE: 1"= 400'



Drawing Information

Project No:  
B2409404

Drawing No:  
B2409404

Drawn By: JAG  
Date Drawn: 10/14/24  
Checked By: BR  
Last Modified: 11/15/24

Project Information

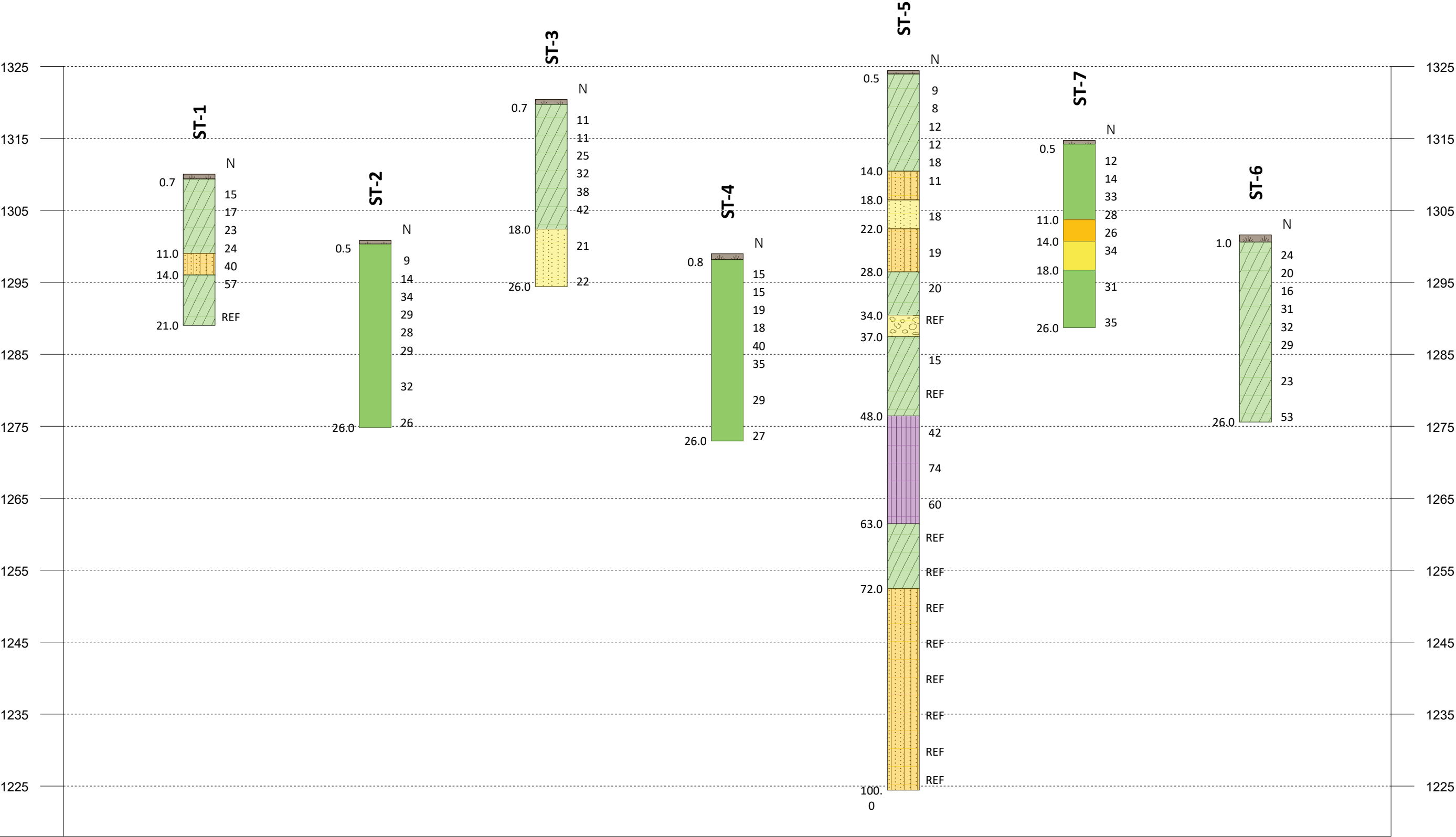
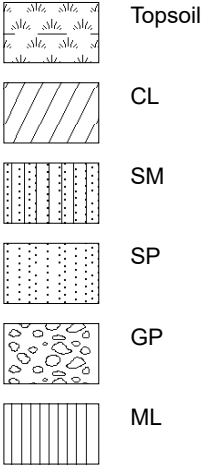
Hermantown Site

3589 Midway Road

Hermantown, Minnesota

**Soil Boring  
Location Sketch**

Legend Key



Fence Diagram #1

Fence Diagram  
Geotechnical Evaluation

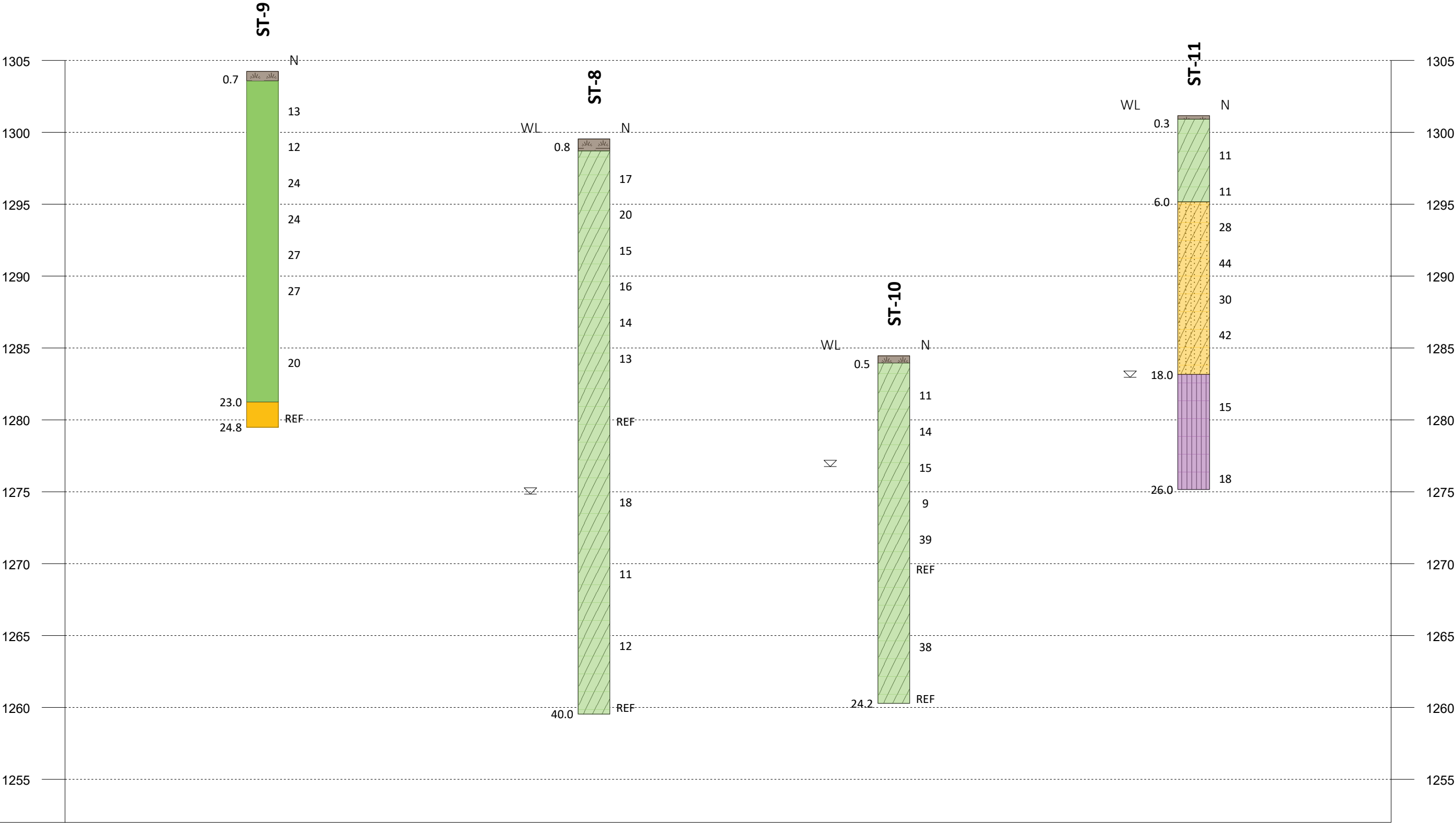
3589 Midway Road  
Hermantown, Minnesota

Project ID: B2409404  
Vert. Scale: 1"= 10'  
Hor. Scale: NTS  
Date: 01/06/2025

Legend Key

-  Topsoil
-  CL
-  SC
-  ML
-  SM

1252.00



Project ID: B2409404  
Vert. Scale: 1"= 5'  
Hor. Scale: NTS  
Date: 01/06/2025

Fence Diagram #2  
Fence Diagram  
Geotechnical Evaluation  
3589 Midway Road  
Hermantown, Minnesota

B2409404 Braun Intertec Corporation Print Date:01/06/2025 ST-1 page 1 of 1

See Descriptive Terminology sheet for explanation of abbreviations

|                                                                                                                                 |           |                       |  |                      |                                                      |  |  |
|---------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------|--|----------------------|------------------------------------------------------|--|--|
| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |           |                       |  |                      | BORING: <b>ST-2</b>                                  |  |  |
|                                                                                                                                 |           |                       |  |                      | LOCATION: Captured with RTK GPS.                     |  |  |
|                                                                                                                                 |           |                       |  |                      | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |  |  |
| DRILLER: M. Hoppe                                                                                                               |           | LOGGED BY: S. Niraula |  | START DATE: 10/22/24 | END DATE: 10/22/24                                   |  |  |
| SURFACE ELEVATION: 1300.8 ft                                                                                                    | RIG: 7504 | METHOD: 3 1/4" HSA    |  | SURFACING: Soil      | WEATHER: Cloudy                                      |  |  |

| Elev./ Depth ft | Water Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)       | Sample | Blows (N-Value) Recovery | q <sub>p</sub> tsf | MC % | Tests or Remarks                   |
|-----------------|-------------|----------------------------------------------------------------------------------------|--------|--------------------------|--------------------|------|------------------------------------|
| 1300.3          |             | SANDY LEAN CLAY (CL), trace roots, trace Gravel, reddish brown, moist (TOPSOIL)        |        |                          |                    |      |                                    |
| 0.5             |             | SANDY LEAN CLAY (CL), trace Gravel, reddish brown, moist, stiff to hard (GLACIAL TILL) |        | 3-4-5<br>(9)<br>14"      |                    |      |                                    |
|                 |             |                                                                                        | 5      | 3-6-8<br>(14)<br>16"     |                    |      |                                    |
|                 |             |                                                                                        |        | 14-16-18<br>(34)<br>14"  |                    |      |                                    |
|                 |             | With Silty Sand at 10 feet                                                             | 10     | 8-12-17<br>(29)<br>14"   |                    |      |                                    |
|                 |             |                                                                                        |        | 6-12-16<br>(28)<br>16"   |                    |      |                                    |
|                 |             |                                                                                        | 15     | 12-14-15<br>(29)<br>16"  |                    |      |                                    |
|                 |             |                                                                                        | 20     | 6-14-18<br>(32)<br>16"   |                    |      |                                    |
|                 |             |                                                                                        | 25     | 11-11-15<br>(26)<br>14"  |                    |      |                                    |
| 1274.8          |             | END OF BORING                                                                          |        |                          |                    |      | Auger chatter at 22 to 23 feet     |
| 26.0            |             | Boring immediately grouted                                                             |        |                          |                    |      | Water not observed while drilling. |
|                 |             |                                                                                        | 30     |                          |                    |      |                                    |

See Descriptive Terminology sheet for explanation of abbreviations

| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |                |                                                                                                       |                    |                                | BORING: <b>ST-3</b>                                  |                   |                                    |
|---------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|------------------------------------------------------|-------------------|------------------------------------|
|                                                                                                                                 |                |                                                                                                       |                    |                                | LOCATION: Captured with RTK GPS.                     |                   |                                    |
|                                                                                                                                 |                |                                                                                                       |                    |                                | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |                   |                                    |
|                                                                                                                                 |                |                                                                                                       |                    |                                | NORTHING: 145099.3                                   | EASTING: 540021.9 |                                    |
| DRILLER: M. Hoppe                                                                                                               |                | LOGGED BY: S. Niraula                                                                                 |                    | START DATE: 10/21/24           | END DATE: 10/21/24                                   |                   |                                    |
| SURFACE ELEVATION: 1320.4 ft                                                                                                    |                | RIG: 7504                                                                                             | METHOD: 3 1/4" HSA | SURFACING: Soil                |                                                      | WEATHER: Sunny    |                                    |
| Elev./<br>Depth<br>ft                                                                                                           | Water<br>Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM<br>1110-1-2908)                   | Sample             | Blows<br>(N-Value)<br>Recovery | q <sub>p</sub><br>tsf                                | MC<br>%           | Tests or Remarks                   |
| 1319.7<br>0.7                                                                                                                   |                | SANDY LEAN CLAY (CL), trace roots, trace Gravel, brown, moist (TOPSOIL)                               |                    |                                |                                                      |                   |                                    |
|                                                                                                                                 |                | SANDY LEAN CLAY (CL), trace Gravel, reddish brown, moist, stiff to hard (GLACIAL TILL)                |                    | 4-5-6<br>(11)<br>12"           |                                                      |                   |                                    |
|                                                                                                                                 |                |                                                                                                       | 5                  | 5-5-6<br>(11)<br>14"           |                                                      |                   |                                    |
|                                                                                                                                 |                |                                                                                                       |                    | 7-12-13<br>(25)<br>16"         |                                                      |                   |                                    |
|                                                                                                                                 |                |                                                                                                       | 10                 | 10-14-18<br>(32)<br>14"        |                                                      |                   |                                    |
|                                                                                                                                 |                |                                                                                                       |                    | 12-16-22<br>(38)<br>14"        |                                                      |                   |                                    |
|                                                                                                                                 |                |                                                                                                       | 15                 | 7-19-23<br>(42)<br>16"         |                                                      |                   |                                    |
| 1302.4<br>18.0                                                                                                                  |                | POORLY GRADED SAND (SP), fine-grained, brown and reddish brown, moist, medium dense (GLACIAL OUTWASH) |                    | 8-10-11<br>(21)<br>14"         |                                                      |                   |                                    |
|                                                                                                                                 |                |                                                                                                       | 25                 | 10-10-12<br>(22)<br>16"        |                                                      |                   |                                    |
| 1294.4<br>26.0                                                                                                                  |                | END OF BORING                                                                                         |                    |                                |                                                      |                   | Water not observed while drilling. |
|                                                                                                                                 |                | Boring immediately grouted                                                                            |                    |                                |                                                      |                   |                                    |
|                                                                                                                                 |                |                                                                                                       | 30                 |                                |                                                      |                   |                                    |

See Descriptive Terminology sheet for explanation of abbreviations

|                                                                                                                                 |  |                       |                    |                      |                                                      |                 |  |
|---------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--------------------|----------------------|------------------------------------------------------|-----------------|--|
| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |  |                       |                    |                      | BORING: <b>ST-4</b>                                  |                 |  |
|                                                                                                                                 |  |                       |                    |                      | LOCATION: Captured with RTK GPS.                     |                 |  |
|                                                                                                                                 |  |                       |                    |                      | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |                 |  |
| DRILLER: M. Hoppe                                                                                                               |  | LOGGED BY: S. Niraula |                    | START DATE: 10/22/24 | END DATE: 10/22/24                                   |                 |  |
| SURFACE ELEVATION: 1299.0 ft                                                                                                    |  | RIG: 7504             | METHOD: 3 1/4" HSA | SURFACING: Soil      |                                                      | WEATHER: Cloudy |  |

| Elev./<br>Depth<br>ft | Water<br>Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM<br>1110-1-2908)              | Sample | Blows<br>(N-Value)<br>Recovery | q <sub>p</sub><br>tsf | MC<br>% | Tests or Remarks                   |
|-----------------------|----------------|--------------------------------------------------------------------------------------------------|--------|--------------------------------|-----------------------|---------|------------------------------------|
| 1298.1                |                | SANDY LEAN CLAY (CL), trace roots, trace Gravel, dark brown, moist (TOPSOIL)                     |        |                                |                       |         |                                    |
| 0.8                   |                | SANDY LEAN CLAY (CL), trace Gravel, reddish brown and brown, moist, stiff to hard (GLACIAL TILL) |        | 6-7-8<br>(15)<br>12"           |                       |         |                                    |
|                       |                |                                                                                                  | 5      | 4-7-8<br>(15)<br>14"           |                       |         |                                    |
|                       |                |                                                                                                  |        | 7-9-10<br>(19)<br>16"          |                       |         |                                    |
|                       |                |                                                                                                  | 10     | 6-9-9<br>(18)<br>14"           |                       |         |                                    |
|                       |                |                                                                                                  |        | 14-16-24<br>(40)<br>12"        |                       |         |                                    |
|                       |                |                                                                                                  | 15     | 12-16-19<br>(35)<br>16"        |                       |         |                                    |
|                       |                |                                                                                                  | 20     | 12-14-15<br>(29)<br>16"        |                       |         |                                    |
|                       |                |                                                                                                  | 25     | 8-12-15<br>(27)<br>16"         |                       |         |                                    |
| 1273.0                |                | END OF BORING                                                                                    |        |                                |                       |         | Water not observed while drilling. |
| 26.0                  |                | Boring immediately grouted                                                                       |        |                                |                       |         |                                    |
|                       |                |                                                                                                  | 30     |                                |                       |         |                                    |

|                                                                                                                                 |  |                       |                    |                      |                                                      |                    |                 |
|---------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--------------------|----------------------|------------------------------------------------------|--------------------|-----------------|
| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |  |                       |                    |                      | BORING: <b>ST-5</b>                                  |                    |                 |
|                                                                                                                                 |  |                       |                    |                      | LOCATION: Captured with RTK GPS.                     |                    |                 |
|                                                                                                                                 |  |                       |                    |                      | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |                    |                 |
|                                                                                                                                 |  |                       |                    |                      | NORTHING: 144622.7                                   | EASTING: 539996.1  |                 |
| DRILLER: M. Hoppe                                                                                                               |  | LOGGED BY: S. Niraula |                    | START DATE: 10/22/24 |                                                      | END DATE: 10/22/24 |                 |
| SURFACE ELEVATION: 1324.4 ft                                                                                                    |  | RIG: 7504             | METHOD: 3 1/4" HSA |                      | SURFACING: Soil                                      |                    | WEATHER: Cloudy |

| Elev./<br>Depth<br>ft | Water<br>Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM<br>1110-1-2908)               | Sample | Blows<br>(N-Value)<br>Recovery | q <sub>p</sub><br>tsf | MC<br>% | Tests or Remarks |
|-----------------------|----------------|---------------------------------------------------------------------------------------------------|--------|--------------------------------|-----------------------|---------|------------------|
| 1323.9                |                | LEAN CLAY (CL), trace Sand, brown, moist (TOPSOIL)                                                |        |                                |                       |         |                  |
| 0.5                   |                | SANDY LEAN CLAY (CL), trace Gravel, reddish brown, moist, medium to very stiff (GLACIAL TILL)     |        | 3-4-5<br>(9)<br>12"            |                       |         |                  |
|                       |                |                                                                                                   | 5      | 2-4-4<br>(8)<br>14"            |                       |         |                  |
|                       |                |                                                                                                   |        | 4-5-7<br>(12)<br>16"           |                       |         |                  |
|                       |                |                                                                                                   | 10     | 5-6-6<br>(12)<br>14"           |                       |         |                  |
|                       |                |                                                                                                   |        | 7-8-10<br>(18)<br>12"          |                       |         |                  |
| 1310.4                |                | SILTY SAND (SM), fine-grained, reddish brown, moist, medium dense (GLACIAL TILL)                  | 15     | 4-5-6<br>(11)<br>16"           |                       |         |                  |
| 1306.4                |                | POORLY GRADED SAND (SP), with Gravel, dark brown and brown, moist, medium dense (GLACIAL OUTWASH) | 20     | 7-8-10<br>(18)<br>12"          |                       |         |                  |
| 1302.4                |                | SILTY SAND (SM), fine-grained, reddish brown, moist, medium dense (GLACIAL TILL)                  | 25     | 5-9-10<br>(19)<br>14"          |                       |         |                  |
| 1296.4                |                | SANDY LEAN CLAY (CL), contains seams of Silt, reddish brown, moist, very stiff (GLACIAL TILL)     | 30     | 4-8-12<br>(20)<br>12"          |                       |         |                  |

Continued on next page

|                                                                                                                                 |  |                       |                    |                      |                                                      |                 |  |
|---------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--------------------|----------------------|------------------------------------------------------|-----------------|--|
| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |  |                       |                    |                      | BORING: <b>ST-5</b>                                  |                 |  |
|                                                                                                                                 |  |                       |                    |                      | LOCATION: Captured with RTK GPS.                     |                 |  |
|                                                                                                                                 |  |                       |                    |                      | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |                 |  |
| DRILLER: M. Hoppe                                                                                                               |  | LOGGED BY: S. Niraula |                    | START DATE: 10/22/24 | END DATE: 10/22/24                                   |                 |  |
| SURFACE ELEVATION: 1324.4 ft                                                                                                    |  | RIG: 7504             | METHOD: 3 1/4" HSA | SURFACING: Soil      |                                                      | WEATHER: Cloudy |  |

| Elev./<br>Depth<br>ft | Water<br>Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM<br>1110-1-2908)           | Sample | Blows<br>(N-Value)<br>Recovery | q <sub>p</sub><br>tsf | MC<br>% | Tests or Remarks                                   |
|-----------------------|----------------|-----------------------------------------------------------------------------------------------|--------|--------------------------------|-----------------------|---------|----------------------------------------------------|
| 1290.4                |                | SANDY LEAN CLAY (CL), contains seams of Silt, reddish brown, moist, very stiff (GLACIAL TILL) |        |                                |                       |         |                                                    |
| 34.0                  |                | POORLY GRADED GRAVEL (GP), gray, very dense (GLACIAL TILL)                                    | 35     | 50/2"<br>(REF)<br>2"           |                       |         | Probable Boulder.                                  |
| 1287.4                |                | SANDY LEAN CLAY (CL), trace to with Gravel, reddish brown, wet, stiff to hard (GLACIAL TILL)  | 40     | 8-7-8<br>(15)<br>16"           |                       |         | Switched to mud rotary drilling method at 35 feet. |
| 37.0                  |                | <i>Little Gravel at 45 feet</i>                                                               | 45     | 36-50/3"<br>(REF)<br>10"       |                       |         |                                                    |
|                       |                | <i>Boulder at 46 feet</i>                                                                     |        |                                |                       |         |                                                    |
|                       |                | <i>Boulder at 47 feet</i>                                                                     |        |                                |                       |         |                                                    |
| 1276.4                |                | SANDY SILT (ML), trace Clay lenses, reddish brown, wet, very dense (GLACIAL TILL)             | 50     | 20-23-19<br>(42)<br>12"        |                       |         |                                                    |
| 48.0                  |                |                                                                                               | 55     | 27-36-38<br>(74)<br>16"        |                       |         |                                                    |
|                       |                |                                                                                               | 60     | 24-27-33<br>(60)<br>10"        |                       |         |                                                    |
|                       |                | <i>A 2 foot Boulder at 61 to 62 feet</i>                                                      |        |                                |                       |         |                                                    |
| 1261.4                |                | SANDY LEAN CLAY (CL), contains seams of Silt, reddish brown, wet, hard (GLACIAL TILL)         |        |                                |                       |         |                                                    |
| 63.0                  |                |                                                                                               |        |                                |                       |         |                                                    |

See Descriptive Terminology sheet for explanation of abbreviations

|                                                                                                                                 |  |                       |                    |                      |                                                      |  |
|---------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--------------------|----------------------|------------------------------------------------------|--|
| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |  |                       |                    |                      | BORING: <b>ST-5</b>                                  |  |
|                                                                                                                                 |  |                       |                    |                      | LOCATION: Captured with RTK GPS.                     |  |
|                                                                                                                                 |  |                       |                    |                      | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |  |
| DRILLER: M. Hoppe                                                                                                               |  | LOGGED BY: S. Niraula |                    | START DATE: 10/22/24 | END DATE: 10/22/24                                   |  |
| SURFACE ELEVATION: 1324.4 ft                                                                                                    |  | RIG: 7504             | METHOD: 3 1/4" HSA | SURFACING: Soil      | WEATHER: Cloudy                                      |  |

| Elev./<br>Depth<br>ft                                                                     | Water<br>Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM<br>1110-1-2908)   | Sample                | Blows<br>(N-Value)<br>Recovery | q <sub>p</sub><br>tsf | MC<br>% | Tests or Remarks |
|-------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------|-----------------------|--------------------------------|-----------------------|---------|------------------|
| <div style="text-align: center;">1252.4</div> <div style="text-align: center;">72.0</div> |                | SANDY LEAN CLAY (CL), contains seams of Silt, reddish brown, wet, hard (GLACIAL TILL) | 65                    | 45-50/3"<br>(REF)<br>10"       |                       |         |                  |
|                                                                                           |                |                                                                                       |                       |                                |                       |         |                  |
|                                                                                           |                |                                                                                       |                       |                                |                       |         |                  |
|                                                                                           |                | 70                                                                                    | 50/4"<br>(REF)<br>10" |                                |                       |         |                  |
|                                                                                           |                | <i>Little Gravel at 70 feet</i>                                                       |                       |                                |                       |         |                  |
|                                                                                           |                |                                                                                       |                       |                                |                       |         |                  |
|                                                                                           |                | SILTY SAND (SM), fine to coarse-grained, little Gravel, very dense (GLACIAL OUTWASH)  | 75                    | 50/3"<br>(REF)<br>4"           |                       |         |                  |
|                                                                                           |                |                                                                                       |                       |                                |                       |         |                  |
|                                                                                           |                |                                                                                       |                       |                                |                       |         |                  |
| 80                                                                                        |                | 50/2"<br>(REF)<br>2"                                                                  |                       |                                |                       |         |                  |
|                                                                                           |                |                                                                                       |                       |                                |                       |         |                  |
| 85                                                                                        |                | 50/2"<br>(REF)<br>2"                                                                  |                       |                                |                       |         |                  |
|                                                                                           |                |                                                                                       |                       |                                |                       |         |                  |
|                                                                                           |                |                                                                                       | 90                    | 50/2"<br>(REF)<br>0"           |                       |         |                  |
|                                                                                           |                |                                                                                       |                       |                                |                       |         |                  |
|                                                                                           |                |                                                                                       |                       |                                |                       |         |                  |
|                                                                                           |                |                                                                                       | 95                    | 50/2"<br>(REF)<br>0"           |                       |         |                  |
|                                                                                           |                |                                                                                       |                       |                                |                       |         |                  |
|                                                                                           |                | <i>Probable Boulder at 92 to 93 feet</i>                                              |                       |                                |                       |         |                  |
|                                                                                           |                |                                                                                       |                       |                                |                       |         |                  |

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See Descriptive Terminology sheet for explanation of abbreviations

|                                                                                                                                    |             |                                                                                      |                       |                    |                      |                                                      |                                |                       |                                                         |                  |
|------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------------------------------------------------------------------|-----------------------|--------------------|----------------------|------------------------------------------------------|--------------------------------|-----------------------|---------------------------------------------------------|------------------|
| <div>Project Number B2409404</div> <div>Geotechnical Evaluation</div> <div>3589 Midway Road</div> <div>Hermantown, Minnesota</div> |             |                                                                                      |                       |                    |                      | BORING:                                              |                                | ST-5                  |                                                         |                  |
|                                                                                                                                    |             |                                                                                      |                       |                    |                      | LOCATION: Captured with RTK GPS.                     |                                |                       |                                                         |                  |
|                                                                                                                                    |             |                                                                                      |                       |                    |                      | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |                                |                       |                                                         |                  |
|                                                                                                                                    |             |                                                                                      |                       |                    |                      | NORTHING: 144622.7                                   |                                | EASTING: 539996.1     |                                                         |                  |
| DRILLER: M. Hoppe                                                                                                                  |             |                                                                                      | LOGGED BY: S. Niraula |                    |                      | START DATE: 10/22/24                                 |                                | END DATE: 10/22/24    |                                                         |                  |
| SURFACE ELEVATION: 1324.4 ft                                                                                                       |             | RIG: 7504                                                                            |                       | METHOD: 3 1/4" HSA |                      | SURFACING: Soil                                      |                                | WEATHER: Cloudy       |                                                         |                  |
| Elev./ Depth<br>ft                                                                                                                 | Water Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)     |                       |                    |                      | Sample                                               | Blows<br>(N-Value)<br>Recovery | q <sub>p</sub><br>tsf | MC %                                                    | Tests or Remarks |
| 1224.4<br>100.0                                                                                                                    |             | SILTY SAND (SM), fine to coarse-grained, little Gravel, very dense (GLACIAL OUTWASH) | 100                   | =                  | 50/2"<br>(REF)<br>0" |                                                      |                                |                       | Water level obscured due to mud rotary drilling method. |                  |
|                                                                                                                                    |             | Probable Boulder at 96 to 98 feet                                                    |                       |                    |                      |                                                      |                                |                       |                                                         |                  |
|                                                                                                                                    |             | END OF BORING                                                                        |                       |                    |                      |                                                      |                                |                       |                                                         |                  |
|                                                                                                                                    |             | Boring immediately grouted                                                           |                       |                    |                      |                                                      |                                |                       |                                                         |                  |
|                                                                                                                                    |             |                                                                                      | 105                   |                    |                      |                                                      |                                |                       |                                                         |                  |
|                                                                                                                                    |             |                                                                                      | 110                   |                    |                      |                                                      |                                |                       |                                                         |                  |
|                                                                                                                                    |             |                                                                                      | 115                   |                    |                      |                                                      |                                |                       |                                                         |                  |
|                                                                                                                                    |             |                                                                                      | 120                   |                    |                      |                                                      |                                |                       |                                                         |                  |
|                                                                                                                                    |             |                                                                                      | 125                   |                    |                      |                                                      |                                |                       |                                                         |                  |

See Descriptive Terminology sheet for explanation of abbreviations

|                                                                                                                                 |           |                       |                 |                                                      |                    |
|---------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------|-----------------|------------------------------------------------------|--------------------|
| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |           |                       |                 | BORING: <b>ST-6</b>                                  |                    |
|                                                                                                                                 |           |                       |                 | LOCATION: Captured with RTK GPS.                     |                    |
|                                                                                                                                 |           |                       |                 | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |                    |
| DRILLER: M. Hoppe                                                                                                               |           | LOGGED BY: S. Niraula |                 | START DATE: 10/22/24                                 | END DATE: 10/22/24 |
| SURFACE ELEVATION: 1301.6 ft                                                                                                    | RIG: 7504 | METHOD: 3 1/4" HSA    | SURFACING: Soil |                                                      | WEATHER: Cloudy    |

| Elev./<br>Depth<br>ft | Water<br>Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM<br>1110-1-2908)                   | Sample | Blows<br>(N-Value)<br>Recovery | q <sub>p</sub><br>tsf | MC<br>% | Tests or Remarks                   |
|-----------------------|----------------|-------------------------------------------------------------------------------------------------------|--------|--------------------------------|-----------------------|---------|------------------------------------|
| 1300.6                |                | SANDY LEAN CLAY (CL), trace roots, trace Gravel, reddish brown, moist (TOPSOIL)                       |        |                                |                       |         |                                    |
| 1.0                   |                | SANDY LEAN CLAY (CL), trace Gravel, reddish brown and brown, moist, very stiff to hard (GLACIAL TILL) |        | 10-12-12<br>(24)<br>12"        |                       |         |                                    |
|                       |                |                                                                                                       | 5      | 8-10-10<br>(20)<br>14"         |                       |         |                                    |
|                       |                |                                                                                                       |        | 7-6-10<br>(16)<br>16"          |                       |         |                                    |
|                       |                |                                                                                                       | 10     | 8-12-19<br>(31)<br>14"         |                       |         |                                    |
|                       |                |                                                                                                       |        | 7-14-18<br>(32)<br>16"         |                       |         |                                    |
|                       |                |                                                                                                       | 15     | 16-14-15<br>(29)<br>14"        |                       |         |                                    |
|                       |                |                                                                                                       | 20     | 9-12-11<br>(23)<br>16"         |                       |         |                                    |
|                       |                |                                                                                                       | 25     | 12-37-16<br>(53)<br>14"        |                       |         |                                    |
| 1275.6<br>26.0        |                | END OF BORING<br><br>Boring immediately backfilled                                                    |        |                                |                       |         | Water not observed while drilling. |
|                       |                |                                                                                                       | 30     |                                |                       |         |                                    |

See Descriptive Terminology sheet for explanation of abbreviations

|                                                                                                                                 |  |                       |                    |                      |                                                      |                   |  |
|---------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--------------------|----------------------|------------------------------------------------------|-------------------|--|
| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |  |                       |                    |                      | BORING: <b>ST-7</b>                                  |                   |  |
|                                                                                                                                 |  |                       |                    |                      | LOCATION: Captured with RTK GPS.                     |                   |  |
|                                                                                                                                 |  |                       |                    |                      | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |                   |  |
|                                                                                                                                 |  |                       |                    |                      | NORTHING: 144536.9                                   | EASTING: 540390.1 |  |
| DRILLER: M. Hoppe                                                                                                               |  | LOGGED BY: S. Niraula |                    | START DATE: 10/22/24 | END DATE: 10/22/24                                   |                   |  |
| SURFACE ELEVATION: 1314.7 ft                                                                                                    |  | RIG: 7504             | METHOD: 3 1/4" HSA | SURFACING: Soil      |                                                      | WEATHER: Cloudy   |  |

| Elev./<br>Depth<br>ft | Water<br>Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM<br>1110-1-2908)               | Sample | Blows<br>(N-Value)<br>Recovery | q <sub>p</sub><br>tsf | MC<br>% | Tests or Remarks                   |
|-----------------------|----------------|---------------------------------------------------------------------------------------------------|--------|--------------------------------|-----------------------|---------|------------------------------------|
| 1314.2<br>0.5         |                | LEAN CLAY (CL), trace roots, trace Sand, dark brown, moist (TOPSOIL)                              |        |                                |                       |         |                                    |
|                       |                | SANDY LEAN CLAY (CL), trace Gravel, reddish brown, moist, stiff to hard (GLACIAL TILL)            |        | 5-6-6<br>(12)<br>14"           |                       |         |                                    |
|                       |                |                                                                                                   | 5      | 4-6-8<br>(14)<br>12"           |                       |         |                                    |
|                       |                |                                                                                                   |        | 12-17-16<br>(33)<br>16"        |                       |         |                                    |
|                       |                |                                                                                                   | 10     | 14-12-16<br>(28)<br>16"        |                       |         |                                    |
| 1303.7<br>11.0        |                | SILTY SAND (SM), fine-grained, trace Gravel, reddish brown, moist, medium dense (GLACIAL OUTWASH) |        | 8-12-14<br>(26)<br>16"         |                       |         |                                    |
| 1300.7<br>14.0        |                | POORLY GRADED SAND (SP), fine-grained, reddish brown, moist, dense (GLACIAL OUTWASH)              | 15     | 12-16-18<br>(34)<br>16"        |                       |         |                                    |
| 1296.7<br>18.0        |                | SANDY LEAN CLAY (CL), trace Gravel, reddish brown, moist, hard (GLACIAL TILL)                     | 20     | 14-15-16<br>(31)<br>14"        |                       |         |                                    |
|                       |                |                                                                                                   | 25     | 14-16-19<br>(35)<br>16"        |                       |         |                                    |
| 1288.7<br>26.0        |                | END OF BORING                                                                                     |        |                                |                       |         | Water not observed while drilling. |
|                       |                | Boring immediately grouted                                                                        |        |                                |                       |         |                                    |
|                       |                |                                                                                                   | 30     |                                |                       |         |                                    |

See Descriptive Terminology sheet for explanation of abbreviations

|                                                                                                                                 |           |                       |  |                      |                                                      |  |  |
|---------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------|--|----------------------|------------------------------------------------------|--|--|
| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |           |                       |  |                      | BORING: <b>ST-8</b>                                  |  |  |
|                                                                                                                                 |           |                       |  |                      | LOCATION: Captured with RTK GPS.                     |  |  |
|                                                                                                                                 |           |                       |  |                      | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |  |  |
| DRILLER: M. Hoppe                                                                                                               |           | LOGGED BY: S. Niraula |  | START DATE: 10/24/24 | END DATE: 10/24/24                                   |  |  |
| SURFACE ELEVATION: 1299.5 ft                                                                                                    | RIG: 7504 | METHOD: 3 1/4" HSA    |  | SURFACING: Soil      | WEATHER: Sunny                                       |  |  |

| Elev./Depth ft | Water Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)              | Sample | Blows (N-Value) Recovery | q <sub>p</sub> tsf | MC % | Tests or Remarks       |
|----------------|-------------|-----------------------------------------------------------------------------------------------|--------|--------------------------|--------------------|------|------------------------|
| 1298.7         |             | LEAN CLAY (CL), trace Sand, trace roots, brown, moist (TOPSOIL)                               |        |                          |                    |      |                        |
| 0.8            |             | SANDY LEAN CLAY (CL), trace Gravel, reddish brown, moist to wet, stiff to hard (GLACIAL TILL) |        | 7-8-9 (17) 14"           |                    |      |                        |
|                |             |                                                                                               | 5      | 7-8-12 (20) 16"          |                    |      |                        |
|                |             |                                                                                               |        | 5-7-8 (15) 16"           |                    |      |                        |
|                |             |                                                                                               | 10     | 10-8-8 (16) 16"          |                    |      |                        |
|                |             |                                                                                               |        | 6-7-7 (14) 0"            |                    |      | No recovery at 12 feet |
|                |             |                                                                                               | 15     | 4-5-8 (13) 10"           |                    |      |                        |
|                |             |                                                                                               | 20     | 50/3" (REF) 6"           |                    |      |                        |
|                |             | Probable Boulder at 21 feet                                                                   |        |                          |                    |      |                        |
|                |             |                                                                                               | 25     | 4-6-12 (18) 6"           |                    |      |                        |
|                |             |                                                                                               | 30     | 5-6-5 (11) 14"           |                    |      |                        |

Continued on next page

|                                                                                                                                 |  |                       |                    |                      |                                                      |                    |                |
|---------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--------------------|----------------------|------------------------------------------------------|--------------------|----------------|
| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |  |                       |                    |                      | BORING: <b>ST-8</b>                                  |                    |                |
|                                                                                                                                 |  |                       |                    |                      | LOCATION: Captured with RTK GPS.                     |                    |                |
|                                                                                                                                 |  |                       |                    |                      | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |                    |                |
|                                                                                                                                 |  |                       |                    |                      | NORTHING: 143434.4                                   | EASTING: 540738.2  |                |
| DRILLER: M. Hoppe                                                                                                               |  | LOGGED BY: S. Niraula |                    | START DATE: 10/24/24 |                                                      | END DATE: 10/24/24 |                |
| SURFACE ELEVATION: 1299.5 ft                                                                                                    |  | RIG: 7504             | METHOD: 3 1/4" HSA |                      | SURFACING: Soil                                      |                    | WEATHER: Sunny |

| Elev./<br>Depth<br>ft | Water<br>Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM<br>1110-1-2908)                 | Sample | Blows<br>(N-Value)<br>Recovery | q <sub>p</sub><br>tsf | MC<br>% | Tests or Remarks                               |
|-----------------------|----------------|-----------------------------------------------------------------------------------------------------|--------|--------------------------------|-----------------------|---------|------------------------------------------------|
|                       |                | SANDY LEAN CLAY (CL), trace Gravel,<br>reddish brown, moist to wet, stiff to hard<br>(GLACIAL TILL) |        |                                |                       |         |                                                |
|                       |                | <i>Probable Boulder at 36 feet</i>                                                                  | 35     | 4-5-7<br>(12)<br>14"           |                       |         |                                                |
| 1259.5<br>40.0        |                | END OF BORING                                                                                       | 40     | 50/1"<br>(REF)<br>0"           |                       |         | Water observed at 24.5 feet<br>while drilling. |
|                       |                | Boring immediately grouted                                                                          |        |                                |                       |         |                                                |
|                       |                |                                                                                                     | 45     |                                |                       |         |                                                |
|                       |                |                                                                                                     | 50     |                                |                       |         |                                                |
|                       |                |                                                                                                     | 55     |                                |                       |         |                                                |
|                       |                |                                                                                                     | 60     |                                |                       |         |                                                |

See Descriptive Terminology sheet for explanation of abbreviations

|                                                                                                                                 |  |                       |                    |                      |                                                      |                    |                 |
|---------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--------------------|----------------------|------------------------------------------------------|--------------------|-----------------|
| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |  |                       |                    |                      | BORING: <b>ST-9</b>                                  |                    |                 |
|                                                                                                                                 |  |                       |                    |                      | LOCATION: Captured with RTK GPS.                     |                    |                 |
|                                                                                                                                 |  |                       |                    |                      | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |                    |                 |
|                                                                                                                                 |  |                       |                    |                      | NORTHING: 143174.4                                   | EASTING: 540040.7  |                 |
| DRILLER: M. Hoppe                                                                                                               |  | LOGGED BY: S. Niraula |                    | START DATE: 10/24/24 |                                                      | END DATE: 10/24/24 |                 |
| SURFACE ELEVATION: 1304.2 ft                                                                                                    |  | RIG: 7504             | METHOD: 3 1/4" HSA |                      | SURFACING: Soil                                      |                    | WEATHER: Cloudy |

| Elev./Depth ft | Water Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)             | Sample | Blows (N-Value) Recovery   | q <sub>p</sub> tsf | MC % | Tests or Remarks                   |
|----------------|-------------|----------------------------------------------------------------------------------------------|--------|----------------------------|--------------------|------|------------------------------------|
| 1303.6         |             | SANDY LEAN CLAY (CL), trace roots, trace Gravel, brown, moist (TOPSOIL)                      |        |                            |                    |      |                                    |
| 0.7            |             | SANDY LEAN CLAY (CL), trace Gravel, reddish brown, moist, stiff to very stiff (GLACIAL TILL) |        | 4-5-8<br>(13)<br>14"       |                    |      |                                    |
|                |             |                                                                                              | 5      | 3-5-7<br>(12)<br>14"       |                    |      |                                    |
|                |             |                                                                                              |        | 7-10-14<br>(24)<br>16"     |                    |      |                                    |
|                |             |                                                                                              | 10     | 8-10-14<br>(24)<br>12"     |                    |      |                                    |
|                |             | With Gravel at 12 1/2 feet                                                                   |        | 9-12-15<br>(27)<br>10"     |                    |      |                                    |
|                |             |                                                                                              | 15     | 12-11-16<br>(27)<br>14"    |                    |      |                                    |
|                |             |                                                                                              |        | 7-8-12<br>(20)<br>14"      |                    |      |                                    |
| 1281.2         |             | Probable Boulder at 22 feet                                                                  |        |                            |                    |      |                                    |
| 23.0           |             | SILTY SAND (SM), fine-grained, trace Gravel, reddish brown, moist, very dense (GLACIAL TILL) |        | 9-19-50/3"<br>(REF)<br>14" |                    |      |                                    |
| 1279.5         |             |                                                                                              | 25     |                            |                    |      |                                    |
| 24.8           |             | END OF BORING                                                                                |        |                            |                    |      |                                    |
|                |             | Boring immediately grouted                                                                   |        |                            |                    |      |                                    |
|                |             |                                                                                              | 30     |                            |                    |      |                                    |
|                |             |                                                                                              |        |                            |                    |      | Water not observed while drilling. |

|                                                                                                                                 |           |                       |                   |                                                      |                    |
|---------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------|-------------------|------------------------------------------------------|--------------------|
| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |           |                       |                   | BORING: <b>ST-10</b>                                 |                    |
|                                                                                                                                 |           |                       |                   | LOCATION: Captured with RTK GPS.                     |                    |
|                                                                                                                                 |           |                       |                   | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |                    |
| DRILLER: M. Hoppe                                                                                                               |           | LOGGED BY: S. Niraula |                   | START DATE: 10/24/24                                 | END DATE: 10/24/24 |
| SURFACE ELEVATION: 1284.5 ft                                                                                                    | RIG: 7504 | METHOD: 3 1/4" HSA    | SURFACING: Cloudy |                                                      | WEATHER: Cloudy    |

| Elev./ Depth ft | Water Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)              | Sample | Blows (N-Value) Recovery | q <sub>p</sub> tsf | MC % | Tests or Remarks                           |
|-----------------|-------------|-----------------------------------------------------------------------------------------------|--------|--------------------------|--------------------|------|--------------------------------------------|
| 1284.0          |             | SANDY LEAN CLAY (CL), trace roots, trace Gravel, brown, moist (TOPSOIL)                       |        |                          |                    |      |                                            |
| 0.5             |             | SANDY LEAN CLAY (CL), trace Gravel, reddish brown, moist to wet, stiff to hard (GLACIAL TILL) |        | 4-5-6<br>(11)<br>12"     |                    |      |                                            |
|                 |             |                                                                                               | 5      | 5-6-8<br>(14)<br>12"     |                    |      |                                            |
|                 |             |                                                                                               |        | 7-8-7<br>(15)<br>14"     |                    |      |                                            |
|                 |             |                                                                                               | 10     | 4-4-5<br>(9)<br>16"      |                    |      |                                            |
|                 |             |                                                                                               |        | 7-9-30<br>(39)<br>14"    |                    |      |                                            |
|                 |             |                                                                                               | 15     | 25-50/2"<br>(REF)<br>6"  |                    |      | Probable Boulder                           |
|                 |             |                                                                                               | 20     | 12-18-20<br>(38)<br>0"   |                    |      | No recovery                                |
| 1260.3          |             |                                                                                               |        | 18-50/2"<br>(REF)<br>0"  |                    |      | No recovery                                |
| 24.2            |             | END OF BORING                                                                                 | 25     |                          |                    |      | Water observed at 7.5 feet while drilling. |
|                 |             | Boring immediately grouted                                                                    |        |                          |                    |      |                                            |
|                 |             |                                                                                               | 30     |                          |                    |      |                                            |

See Descriptive Terminology sheet for explanation of abbreviations

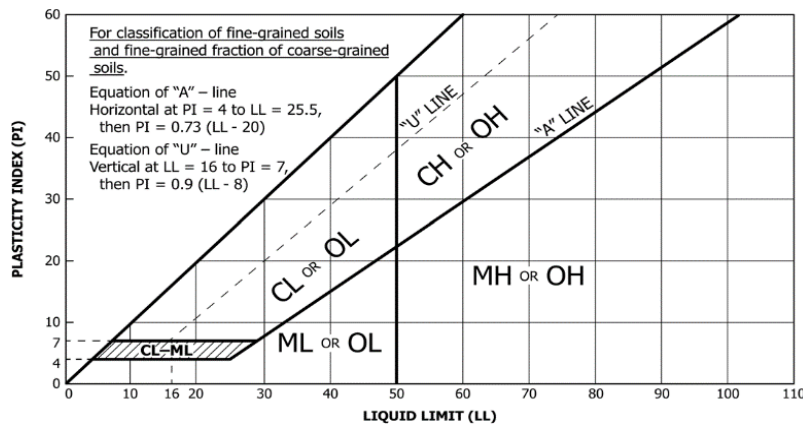
|                                                                                                                                 |           |                       |  |                      |                                                      |  |
|---------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------|--|----------------------|------------------------------------------------------|--|
| <b>Project Number B2409404</b><br><b>Geotechnical Evaluation</b><br><br><b>3589 Midway Road</b><br><b>Hermantown, Minnesota</b> |           |                       |  |                      | BORING: <b>ST-11</b>                                 |  |
|                                                                                                                                 |           |                       |  |                      | LOCATION: Captured with RTK GPS.                     |  |
|                                                                                                                                 |           |                       |  |                      | DATUM: NAD 1983 HARN Adj MN St Louis South (US Feet) |  |
| DRILLER: M. Hoppe                                                                                                               |           | LOGGED BY: S. Niraula |  | START DATE: 11/04/24 | END DATE: 11/04/24                                   |  |
| SURFACE ELEVATION: 1301.2 ft                                                                                                    | RIG: 7504 | METHOD: 3 1/4" HSA    |  | SURFACING: Soil      | WEATHER: Rain                                        |  |

| Elev./Depth ft | Water Level | Description of Materials<br>(Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)                              | Sample | Blows (N-Value) Recovery | q <sub>p</sub> tsf | MC % | Tests or Remarks                            |
|----------------|-------------|---------------------------------------------------------------------------------------------------------------|--------|--------------------------|--------------------|------|---------------------------------------------|
| 1300.9<br>0.3  |             | SANDY LEAN CLAY (CL), reddish brown, moist (TOPSOIL)                                                          |        |                          |                    |      |                                             |
|                |             | SANDY LEAN CLAY (CL), trace Gravel, reddish brown, moist, stiff (GLACIAL TILL)                                |        | 4-5-6<br>(11)<br>12"     |                    |      |                                             |
|                |             |                                                                                                               | 5      | 7-6-5<br>(11)<br>14"     |                    |      |                                             |
| 1295.2<br>6.0  |             | CLAYEY SAND (SC), trace Gravel, intermixed with Silt, reddish brown, moist, very stiff to hard (GLACIAL TILL) |        | 7-8-20<br>(28)<br>16"    |                    |      |                                             |
|                |             |                                                                                                               | 10     | 12-28-16<br>(44)<br>14"  |                    |      |                                             |
|                |             |                                                                                                               |        | 14-15-15<br>(30)<br>14"  |                    |      |                                             |
|                |             |                                                                                                               | 15     | 16-23-19<br>(42)<br>16"  |                    |      |                                             |
| 1283.2<br>18.0 | Σ           | SANDY SILT (ML), contains lenses of Lean Clay, brown, wet, medium dense (GLACIAL TILL)                        | 20     | 6-7-8<br>(15)<br>14"     |                    |      |                                             |
|                |             |                                                                                                               | 25     | 6-8-10<br>(18)<br>16"    |                    |      |                                             |
| 1275.2<br>26.0 |             | END OF BORING                                                                                                 |        |                          |                    |      | Water observed at 18.0 feet while drilling. |
|                |             | Boring immediately grouted                                                                                    |        |                          |                    |      |                                             |
|                |             |                                                                                                               | 30     |                          |                    |      |                                             |

| Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup> |                                                                       |                                                           |                                                             | Group Symbol               | Soil Classification                                          |
|------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------|----------------------------|--------------------------------------------------------------|
|                                                                                          |                                                                       |                                                           |                                                             |                            | Group Name <sup>B</sup>                                      |
| Coarse-grained Soils<br>(more than 50% retained on No. 200 sieve)                        | Gravels<br>(More than 50% of coarse fraction retained on No. 4 sieve) | Clean Gravels<br>(Less than 5% fines <sup>C</sup> )       | $C_u \geq 4$ and $1 \leq C_c \leq 3^D$                      | GW                         | Well-graded gravel <sup>E</sup>                              |
|                                                                                          |                                                                       |                                                           | $C_u < 4$ and/or ( $C_c < 1$ or $C_c > 3$ ) <sup>D</sup>    | GP                         | Poorly graded gravel <sup>E</sup>                            |
|                                                                                          |                                                                       | Gravels with Fines<br>(More than 12% fines <sup>C</sup> ) | Fines classify as ML or MH                                  | GM                         | Silty gravel <sup>EFG</sup>                                  |
|                                                                                          |                                                                       |                                                           | Fines Classify as CL or CH                                  | GC                         | Clayey gravel <sup>EFG</sup>                                 |
|                                                                                          | Sands<br>(50% or more coarse fraction passes No. 4 sieve)             | Clean Sands<br>(Less than 5% fines <sup>H</sup> )         | $C_u \geq 6$ and $1 \leq C_c \leq 3^D$                      | SW                         | Well-graded sand <sup>I</sup>                                |
|                                                                                          |                                                                       |                                                           | $C_u < 6$ and/or ( $C_c < 1$ or $C_c > 3$ ) <sup>D</sup>    | SP                         | Poorly graded sand <sup>I</sup>                              |
| Sands with Fines<br>(More than 12% fines <sup>H</sup> )                                  |                                                                       | Fines classify as ML or MH                                | SM                                                          | Silty sand <sup>FGI</sup>  |                                                              |
|                                                                                          |                                                                       | Fines classify as CL or CH                                | SC                                                          | Clayey sand <sup>FGI</sup> |                                                              |
| Fine-grained Soils<br>(50% or more passes the No. 200 sieve)                             | Silts and Clays<br>(Liquid limit less than 50)                        | Inorganic                                                 | PI > 7 and plots on or above "A" line <sup>J</sup>          | CL                         | Lean clay <sup>KLM</sup>                                     |
|                                                                                          |                                                                       |                                                           | PI < 4 or plots below "A" line <sup>J</sup>                 | ML                         | Silt <sup>KLM</sup>                                          |
|                                                                                          |                                                                       | Organic                                                   | Liquid Limit – oven dried<br>Liquid Limit – not dried <0.75 | OL                         | Organic clay <sup>KLMN</sup><br>Organic silt <sup>KLMQ</sup> |
|                                                                                          |                                                                       |                                                           | PI plots on or above "A" line                               | CH                         | Fat clay <sup>KLM</sup>                                      |
|                                                                                          | Silts and Clays<br>(Liquid limit 50 or more)                          | Inorganic                                                 | PI plots below "A" line                                     | MH                         | Elastic silt <sup>KLM</sup>                                  |
|                                                                                          |                                                                       |                                                           | Liquid Limit – oven dried<br>Liquid Limit – not dried <0.75 | OH                         | Organic clay <sup>KLMP</sup><br>Organic silt <sup>KLMQ</sup> |
|                                                                                          |                                                                       | Organic                                                   | Liquid Limit – oven dried<br>Liquid Limit – not dried <0.75 | OH                         | Organic clay <sup>KLMP</sup><br>Organic silt <sup>KLMQ</sup> |
|                                                                                          |                                                                       |                                                           |                                                             |                            |                                                              |
| Highly Organic Soils                                                                     |                                                                       | Primarily organic matter, dark in color, and organic odor |                                                             | PT                         | Peat                                                         |

- A. Based on the material passing the 3-inch (75-mm) sieve.  
B. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.  
C. Gravels with 5 to 12% fines require dual symbols:  
GW-GM well-graded gravel with silt  
GW-GC well-graded gravel with clay  
GP-GM poorly graded gravel with silt  
GP-GC poorly graded gravel with clay  
D.  $C_u = D_{60} / D_{10}$   $C_c = (D_{30})^2 / (D_{10} \times D_{60})$   
E. If soil contains  $\geq 15\%$  sand, add "with sand" to group name.  
F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.  
G. If fines are organic, add "with organic fines" to group name.  
H. Sands with 5 to 12% fines require dual symbols:  
SW-SM well-graded sand with silt  
SW-SC well-graded sand with clay  
SP-SM poorly graded sand with silt  
SP-SC poorly graded sand with clay  
I. If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.  
J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.  
K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.  
L. If soil contains  $\geq 30\%$  plus No. 200, predominantly sand, add "sandy" to group name.  
M. If soil contains  $\geq 30\%$  plus No. 200 predominantly gravel, add "gravelly" to group name.  
N. PI  $\geq 4$  and plots on or above "A" line.  
O. PI < 4 or plots below "A" line.  
P. PI plots on or above "A" line.  
Q. PI plots below "A" line.



| Laboratory Tests |                      |       |                                   |
|------------------|----------------------|-------|-----------------------------------|
| DD               | Dry density, pcf     | $q_p$ | Pocket penetrometer strength, tsf |
| WD               | Wet density, pcf     | $q_u$ | Unconfined compression test, tsf  |
| P200             | % Passing #200 sieve | LL    | Liquid limit                      |
| MC               | Moisture content, %  | PL    | Plastic limit                     |
| OC               | Organic content, %   | PI    | Plasticity index                  |

## Particle Size Identification

|               |                                          |
|---------------|------------------------------------------|
| Boulders..... | over 12"                                 |
| Cobbles.....  | 3" to 12"                                |
| Gravel        |                                          |
| Coarse.....   | 3/4" to 3" (19.00 mm to 75.00 mm)        |
| Fine.....     | No. 4 to 3/4" (4.75 mm to 19.00 mm)      |
| Sand          |                                          |
| Coarse.....   | No. 10 to No. 4 (2.00 mm to 4.75 mm)     |
| Medium.....   | No. 40 to No. 10 (0.425 mm to 2.00 mm)   |
| Fine.....     | No. 200 to No. 40 (0.075 mm to 0.425 mm) |
| Silt.....     | No. 200 (0.075 mm) to .005 mm            |
| Clay.....     | < .005 mm                                |

## Relative Proportions<sup>L M</sup>

|             |             |
|-------------|-------------|
| trace.....  | 0 to 5%     |
| little..... | 6 to 14%    |
| with.....   | $\geq 15\%$ |

## Inclusion Thicknesses

|            |            |
|------------|------------|
| lens.....  | 0 to 1/8"  |
| seam.....  | 1/8" to 1" |
| layer..... | over 1"    |

## Apparent Relative Density of Cohesionless Soils

|                   |              |
|-------------------|--------------|
| Very loose .....  | 0 to 4 BPF   |
| Loose .....       | 5 to 10 BPF  |
| Medium dense..... | 11 to 30 BPF |
| Dense.....        | 31 to 50 BPF |
| Very dense.....   | over 50 BPF  |

## Consistency of Cohesive Soils

| Blows Per Foot  | Approximate Unconfined Compressive Strength |
|-----------------|---------------------------------------------|
| Very soft.....  | 0 to 1 BPF..... < 0.25 tsf                  |
| Soft.....       | 2 to 4 BPF..... 0.25 to 0.5 tsf             |
| Medium.....     | 5 to 8 BPF..... 0.5 to 1 tsf                |
| Stiff.....      | 9 to 15 BPF..... 1 to 2 tsf                 |
| Very Stiff..... | 16 to 30 BPF..... 2 to 4 tsf                |
| Hard.....       | over 30 BPF..... > 4 tsf                    |

## Moisture Content:

**Dry:** Absence of moisture, dusty, dry to the touch.

**Moist:** Damp but no visible water.

**Wet:** Visible free water, usually soil is below water table.

## Drilling Notes:

**Blows/N-value:** Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

**Partial Penetration:** If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

**Recovery:** Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

**WOH:** Indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

**WOR:** Indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

**Water Level:** Indicates the water level measured by the drillers either while drilling ( , at the end of drilling ( , or at some time after drilling ( ).

## Sample Symbols

|                                                                                      |                           |                                                                                       |                                |
|--------------------------------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------|--------------------------------|
|  | Standard Penetration Test |  | Rock Core                      |
|  | Modified California (MC)  |  | Thinwall (TW)/Shelby Tube (SH) |
|  | Auger                     |  | Texas Cone Penetrometer        |
|  | Grab Sample               |  | Dynamic Cone Penetrometer      |