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October 12, 2015

VIA ELECTRONIC MAIL AND OVERNIGHT DELIVERY

Mr. Robert Stein, Chairman
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

Re: Petition No. 1192 – SolarCity Corporation petition for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required for the proposed construction and operation of a 2.74 Megawatt Community Shared Solar Photovoltaic Electric Generating facility located at two City of Norwich-owned parcels on Rogers Road, Norwich, Connecticut -- Department of Energy and Environmental Protection Application for Disruption of Solid Waste Disposal Area

Dear Chairman Stein:

On behalf of SolarCity Corporation ("SolarCity"), enclosed, as a bulk filing, is one hard copy and a disk of SolarCity's Application for Disruption of a Solid Waste Disposal Area, which was recently filed with the Connecticut Department of Energy and Environmental Protection.

Please contact me at 860-509-6575 with any questions or if you need additional information.

Very truly yours,

BROWN RUDNICK LLP

By: _____
Philip M. Small
Counsel for SolarCity Corporation

PMS/jmb
Enclosure

62199196 v1-WorksiteUS-031819/0001

brownrudnick.com

Authorization Application for Disruption of a Solid Waste Disposal Area

Please complete this form in accordance with RCSA Section 22a-209-7(u) in order to ensure the proper handling of your application. Print or type unless otherwise noted.

DEP Use Only

Part I: Applicant Information

1. Applicant's Name and Contact Information:

   Name: **SolarCity Corporation**

   Mailing Address: **1 Chapin Road**

   City/Town: **Pine Brook** State: **NJ** Zip Code: **07058**

   Business Phone: **914-606-2252** ext. Fax:

   Contact Person: **Paul Platt** Title: **Commercial Operations Manager - E.Coast**

   ☐ Check if any co-applicants. If so, attach additional sheet(s) with the required information as supplied above.

2. List the owner of the site where the solid waste disposal area is located.

   Owner: **City of Norwich**

   Site Name: **Rodgers Road Landfill**

   Mailing Address: **50 Clinton Avenue**

   City/Town: **Norwich** State: **CT** Zip Code: **06360**

   Business Phone: **860-823-3798** ext. Fax:

3. List the name and location of the permitted site/disposal facility retained to dispose of such waste.

   Name:

   Mailing Address:

   City/Town: State: Zip Code:

   Business Phone: ext. Fax:

   Contact Person: Title:

4. List any engineer(s) or other consultant(s) employed or retained to assist in preparing the application or to assist in the disposal of the waste. Check here if additional sheets are necessary, and label and attach them to this sheet. ☒ Site Engineer

   Name: **Boundaries LLC**

   Mailing Address: **PO Box 184**

   City/Town: **Griswold** State: **CT** Zip Code: **06351**

   Business Phone: **860-376-2006** ext. **N/A** Fax: **860-376-2006**

   Contact Person: **David McKay** Title: **Project Engineer**

Authorization Application for Disruption of a Solid Waste Disposal Area

Please complete this form in accordance with RCSA Section 22a-209-7(u) in order to ensure the proper handling of your application. Print or type unless otherwise noted.

DEP Use Only

Part I: Applicant Information

1. Applicant's Name and Contact Information:

   Name:

   Mailing Address:

   City/Town: State: Zip Code:

   Business Phone: ext. Fax:

   Contact Person: Title:

   ☐ Check if any co-applicants. If so, attach additional sheet(s) with the required information as supplied above.

2. List the owner of the site where the solid waste disposal area is located.

   Owner:

   Site Name:

   Mailing Address:

   City/Town: State: Zip Code:

   Business Phone: ext. Fax:

3. List the name and location of the permitted site/disposal facility retained to dispose of such waste.

   Name:

   Mailing Address:

   City/Town: State: Zip Code:

   Business Phone: ext. Fax:

   Contact Person: Title:

4. List any engineer(s) or other consultant(s) employed or retained to assist in preparing the application or to assist in the disposal of the waste. Check here if additional sheets are necessary, and label and attach them to this sheet. ☒ Preparer of Application Package

   Name: **Weston & Sampson Engineers**

   Mailing Address: **273 Dividend Road**

   City/Town: **Rocky Hill** State: **CT** Zip Code: **06067**

   Business Phone: **860-513-1473** ext. **N/A** Fax: **860-513-1483**

   Contact Person: **Duane Himes, PE** Title: **Associate**

Part II: Site Information

1. Location of the solid waste disposal area:

   Street Address or Description of Location: **Rodgers Road Landfill Rogers Road**

   City/Town: **Norwich**

   Assesor's Map No.: **81** Block No.: **1** Lot No.: **3**

   Latitude and Longitude of the approximate "center of the site" in degrees, minutes and seconds:

   Latitude: **41.539614** Longitude: **-72.123279**

   Method of determination (check one):

   ☐ GPS ☐ USGS Map ☒ Other (specify): **Google Maps**

2. Is the Solid Waste Disposal Area permitted? ☒ Yes ☐ No

   If permitted, Permit Number: **104-1-0** Year Issued: **1986**

3. Describe the solid waste disposal area: ☐ Active ☐ Inactive ☒ Closed

4. Ground water classification of the site: **GA**

5. Acreage of site: **75 acre parcel - approx. 16 acres of former landfill**

Part III: Activity Information

1. Type of waste (e.g., municipal solid waste, bulky waste, construction and demolition, etc.) to be removed or disrupted:
   No waste is anticipated to be encountered or removed

2. Identify the quantity of waste (i.e., tons, cubic yards) to be removed or disrupted:

   No waste is anticipated to encountered or removed

3. Provide a detailed description of the material to be removed or disrupted:

   A Materials Handeling plan is provided in the case waste is encountered

4. Has a waste characterization been conducted? ☐ Yes ☒ No

   If yes, describe:

5. Depending on the extent of the disruption, you may be required to also obtain DEP authorization under the *General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities*. Information and registration forms for this general permit are available at the DEP website at www.ct.gov/dep/permits&licenses or by calling 860-424-3018.

   Have you already obtained such authorization? ☐ Yes ☒ No

   If yes, list registration number:

Part IV: Supporting Documents

Please check the attachments submitted as verification that *all applicable* attachments have been submitted with this authorization application form.

- ☒ Detailed site map(s), *prepared by a professional engineer licensed by the State Of Connecticut*, at a scale of one inch equals one hundred feet depicting: topographic contours (i.e., existing and final grades); all existing and proposed test pit and/or boring locations; areal extent of the solid waste disposal area; type and location of existing and proposed sedimentation/erosion controls; existing and proposed locations of water quality monitoring locations (e.g., surface water, ground water); locations of on-site structures including buildings, roads, fences, etc. and any other pertinent information that provides an accurate depiction of the site and the immediate surroundings.
- ☒ A detailed report describing the measures that will be implemented during disruption activities to protect the public health and the environment, including the control of dust, odors, fires, vectors and blowing litter. The report should also include a proposed schedule for the completion of disruption activities and any other pertinent information that provides an accurate description of the site and the proposed disruption activities.
- ☒ Site Health and Safety Plan that complies with all applicable requirements of the Occupational Safety and Health Administration's (OSHA) 29 CFR Part 1910.120.

Part V: Application Certifications

The applicant(s) *and* the individual(s) responsible for actually preparing the application must sign this part. An application will be considered insufficient unless *all* required signatures are provided.

"I have personally examined and am familiar with the information submitted in this document and all attachments thereto, and I certify that based on reasonable investigation, including my inquiry of the individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that a false statement in the submitted information may be punishable as a criminal offense, in accordance with Section 22a-6 of the Connecticut General Statutes, pursuant to Section 53a-157b of the Connecticut General Statutes, and in accordance with any other applicable statute.

I certify that this application is on complete and accurate forms as prescribed by the Commissioner without alteration of the text."

Signature of Applicant	Eric Schutter Name of Applicant	10/1/15 Date
Signature of Owner	John Bilda Name of Owner	10-7-15 Date
Signature of Engineer	David C. McKay Name of Engineer	10/1/15 Date
Signature of Preparer	DUANE C HIMES Name of Preparer	9/25/15 Date

Please submit this form and any supporting documentation to:

CENTRAL PERMIT PROCESSING UNIT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
79 ELM ST
HARTFORD, CT 06106-5127



When it's essential...it's Weston&Sampson.®
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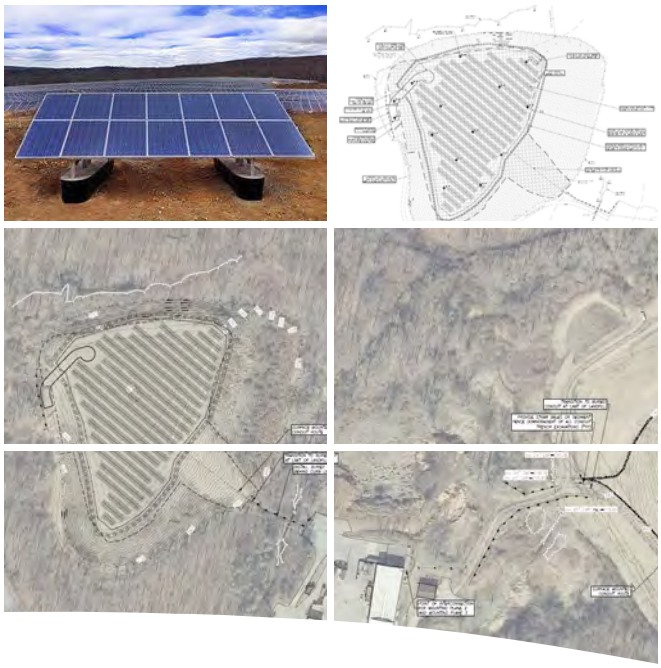
273 Dividend Road, Rocky Hill, CT 06067
tel: 860-513-1473 fax: 860-513-1483

report



City of
Norwich
CONNECTICUT

Rodgers Road Landfill Solar Project
Authorized Application for Disruption of a Solid Waste Disposal Area

September 2015

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1.0 INTRODUCTION

1.1 Purpose

This Authorization Application for Disruption of a Solid Waste Disposal Area (DEEP-WEED-APP-700) is being submitted to the Connecticut Department of Energy and Environmental Protection (CT DEEP), Bureau of Materials Management and Compliance Assurance's Waste Engineering and Enforcement Division (WEED) pursuant to Section 22a-209-97(u) of the Regulations of Connecticut State Agencies (RCSA). This permit application summarizes activities associated with the proposed installation of an approximately 1.49 megawatt (MW) solar photovoltaic array on two closed former landfills along Rogers Road, Norwich, Connecticut. Please note, the intent of this document is to provide a general sense of the design considerations and construction activities. The design (civil, electrical, structural, etc.) will continue to progress to a higher level of detail in order to provide the contractor a complete "construction set" of plans. If the design progress results in changes that impact the landfill containment system, which are significantly different from what is included in this permit application, a "construction set" will be submitted for review to the CT DEEP.

1.2 Scope of Work

The proposed development consists of an approximately 2.8 MW DC solar photovoltaic development on two distinct lots (four locations/mounting planes). One lot contains the former Norwich landfills and one lot contains two parcels that are vacant property. The scope of work involves the installation of a total of 1.49 MW Photovoltaic (PV) solar arrays on the former Bulky Waste and MSW closed landfills identified on the site design plans as mounting plane No. 2 (former Bulky Waste Landfill) and mounting plane No. 3 (former MSW landfill). The proposed development makes use of low impact development techniques in order to limit the impacts to stormwater flow patterns and utilize the existing stormwater management systems that were designed for the landfills

The new construction includes solar panels mounted on posts or concrete ballasts, electrical equipment installed on concrete pads and improvements to the existing gravel access roadway for maintenance access to the landfill sites. The landfill solar panels will be anchored on plastic tubs filled with concrete set on top of the landfill cover.

The footprint of the array located on the former Bulky Waste Landfill, will cover approximately 2.5 acres and include:

- Placement of approximately 265 concrete foundation ballasts;
- Installation of approximately 2,500 PV modules;
- Installation of one pad-mounted inverter station with transformer (1 transformer only);
- Connection of the DC output from the PV modules to the inverter/transformer via above-ground conduit;
- Connection of the inverter/transformer output to the required electrical protective devices and then to the utility owned existing three phase utility distribution circuit that abuts the landfill via above ground conduit; and
- Construction of on-landfill access road.

The footprint of the array located on the former MSW Landfill, will cover approximately 2.6 acres and include:

- Placement of approximately 280 concrete foundation ballasts;
- Installation of approximately 2,320 PV modules;
- Installation of one pad-mounted inverter station with transformer (1 transformer only);
- Connection of the DC output from the PV modules to the inverter/transformer via above-ground conduit;
- Connection of the inverter/transformer output to the required electrical protective devices and then to the utility owned existing three phase utility distribution circuit that abuts the landfill via above ground conduit; and
- Construction of on-landfill access road.

1.3 Site Lease Agreement

In April of 2015, the City of Norwich entered into a Solar Power Site License with SolarCity Corporation to utilize approximately 7.95 acres of landfill property located on Rodgers road in Norwich Connecticut. The site is the current location of the former Norwich bulky waste landfill and former Norwich Municipal Solid Waste (MSW) landfill. A copy of the lease is included as Appendix A.

1.4 Post Closure Use Request

In accordance with Regulations of Connecticut State Agencies (RCSA) Section 22a-209-13(d) a request for post closure use is necessary for the development of a solar facility on the former Norwich landfills as described within Section 3 of this request for disruption authorization. The City of Norwich has submitted a request for post closure use to the Solid Waste Permitting, Waste Engineering and Enforcement Division of the Bureau of Materials Management and Compliance Assurance at the Connecticut Department of Energy and Environmental Protection (CT DEEP).

A copy of this request is presented in Appendix B.

2.0 BACKGROUND AND LANDFILL HISTORY

The background and historical information presented in this Permit Application was obtained from the documents listed in Section 8.0. Weston & Sampson performed a review of historical documents regarding landfill details pertinent to this application. The documents were utilized to obtain information with respect to following:

- Current site conditions
- Site history
- Environmental monitoring
- Landfill closure details

2.1 Site Location and Description

The property is located at the Rogers Road Landfill north of the property at 82 Rogers Road, Norwich, Connecticut. The property is 75 acres in total and is occupied by the former bulky waste landfill, the former municipal waste landfill, and the Norwich Transfer Station. A portion of the property is currently utilized as the City of Norwich Transfer Station.

Closure of the former bulky waste landfill approved by the CT Department of Environmental Protection in a letter dated was capped on May 3, 1999. According to the closure report prepared by Fuss & O'Neill the capping of the former bulky waste landfill began on June of 1999 and was completed in October of 1999. Final as-built plans were completed in January of 2000 and final CT DEP approval of the closure was noted in a CT DEP letter to the City in April 2000. Information obtained regarding the closure is included in Appendix C. According to information contained in a Landfill Closure Report prepared by Fuss & O'Neill, Inc. prior to installation of the capping system, the top of the landfill was regraded to meet a minimum slope of 4 percent and then compacted. The thickness and composition of the bulky waste landfill material was not provided to us. The final capping system for the Bulky Waste Landfill consisted of the following layers from the landfill waste to the ground surface:

- Minimum of 6-inches compacted sand gravel soil. The degree of compaction (if any) is not known;
- Minimum of 18-inches of silty sand cover soil containing between 38 and 48 percent material passing the No. 200 sieve. The first lift was approximately 12-inches thick and the second lift was approximately 6-inch thick. Both lifts were compacted to a minimum of 90 percent of the materials maximum dry density as determined from ASTM D698 (Standard Proctor); and
- Minimum 24-inches of compost material containing a mixture of sewage sludge, sand, leaves, and wood chips. This material was placed in one lift. The degree of compaction (if any) is not known.

The landfill surface is currently covered with high grass and weeds. The top of the landfill is accessed from a compacted gravel road located along the southwest side of the landfill. According to a topographic survey plan prepared by Boundaries, LLC, ground surface elevations on the landfill cap and within the proposed development area range between approximately El. 300 ft. and El. 310 ft. (NAVD83 datum). The ground surface is generally sloped at less than 5 percent; however, the south section of the development area is sloped at approximately 13 percent.

Based on CT DEEP listings, the former MSW landfill was first permitted in 1974 and closed in 1991. The CT DEP issued an authorization for closure in a June 25, 1996 letter and approved the completed closure in a September 4, 1997 letter to the Norwich Director of Public Works. The 12 acre landfill was capped with a combination of soil a soil cap on the side slopes of the landfill and a flexible membrane liner (FML) on the top portion of the landfill. Construction plans prepared for the final closure of the MSW landfill were prepared by Fuss & O'Neill in April of 1996 and included details of the soil and FML cap. Generally two acres of the existing approximately 11.4 acre landfill were regraded, covered with a six-inch subbase layer; overlain, by a LLDPE textured geo-membrane liner; overlain by a geo-composite draining layer consisting of an HPDE drainage net heat bonded between two layers of geo-textile; overlain by 18 inches of cover soil having a permeability greater than 1 X 10-5 cm/sec and a six-inch vegetative support layer. The slopes along the southern and western slopes, (6.4 acres of the landfill) was regraded, covered with a six-inch subbase layer; overlain by 18 inches of final cover soil having a permeability of less than 1 X 10-6 cm/sec; and a six-inch vegetative layer. An existing soil cap covers the remaining approximately three acres along the northern and northeastern slopes of the landfill. Information obtained regarding the closure is included in Appendix C.

Site design plans included in Appendix D show the existing conditions and layouts of each of the landfills. Refer to sheet 8 for the overall layout of the property and sheets 4 and 6 which illustrate existing conditions.

2.2 Current Environmental Monitoring

The City received approval of the landfill closure of the MSW landfill from the CT Department of Environmental Protection in September of 1997 and approval of closure of the bulky waste landfill in April of 2000. The closure approvals and acceptance of closure letters only reference that the city should continue to inspect the landfill on a regular basis and correct any problems (i.e., erosion of side slopes, maintenance of drainage swales, etc.) that may occur at the landfill. These inspections should be an integral part of the landfills thirty (30) year post-closure maintenance and monitoring program Implemented by the property owner, in accordance with RCSA Section 22a-209-13(h). The City has indicated that no formal inspection program is currently ongoing other than at times when general maintenance (mowing) of the landfills occurs on a bi-annual basis.

Groundwater and surface water are currently monitored on a yearly basis in accordance with Consent order SW-405 issued in July of 1998, a September 2001 Revised Water Quality Monitoring Program and subsequent 2013 modifications to the program approved by the CT DEEP. The current monitoring program at the Rodgers Road Landfill consists of annual groundwater, surface water and domestic well sampling. Groundwater sampling is conducted in monitoring wells that circle the two landfills.

3.0 PROPOSED PHOTOVOLTAIC (PV) SYSTEM

Upon receipt of the Disruption Permit and other required City permits (building, electrical, etc.), the Developer (SolarCity), through a lease arrangement with the City of Norwich, will construct an approximate 1.49 MW (DC) passive solar array on the former Rogers Road Landfills. The 1.49 MW array will use PV modules, mounted on racks, or assemblies, of approximately nineteen (19) modules each. Rows of assemblies, called sub-arrays, are connected to pad-mounted inverter/transformers. The design calls one (1) 750 kW central inverter for each landfill. The modules are mounted on racks above the ground and are tilted at an angle of approximately 15 degrees to optimize the yearly electric output and minimize wind loading on the structures. Concrete foundation ballasts at grade will provide stability to each assembly. Details of the elements of the solar array are provided on the attached Design Drawings and are discussed in the following sections.

3.1 Electrical Design

PV modules will be connected in a series of strings. Groups of strings will be connected in series through combiner boxes. Combiner boxes will be connected to a pad-mounted inverter station. A dedicated centralized inverter will service the proposed array. The layout of the PV modules, racks and other electrical elements are shown on the design drawings in Appendix D.

Inverters convert the DC output of the PV modules to AC power. The inverters will be located on concrete pads located on the landfill surface as shown on the plans. The concrete pads will not penetrate either of the Bulky Waste landfill's low permeability soil layer or the MSW landfill's geomembrane layer by staying six (6) inches above this barrier layer.

The output from each of the solar arrays will be connected to the electrical distribution grid via a single interconnection point. The solar arrays will be metered on the AC side of the transformer(s). All electrical work will be designed per the most recent version of the Connecticut Electric Code (CEC), which includes and incorporates the requirements of the National Electric Code (NEC). Prior to construction, an electrical permit will be obtained from the City building officials and the project will incorporate any additional electrical requirements stipulated by the building official.

3.2 Solar Generation Equipment

Energy produced by the solar array will be generated using fixed-tilt PV modules. The major plant equipment consists of PV modules, inverters, the support racks, and the interconnection switchgear. Anticipated equipment sourcing is summarized below:

Table 1: Major System Components	
Equipment	**Anticipated Provider**
Photovoltaic Module	Canadian Solar 310W module
Module Racking	Gamechange Ballasted Array, 15 deg tilt
Module Racking	RBI Solar
Inverter	Solectria 500 kW & 750 kW inverters
Transformer	Cooper Power Systems750 kVa & 1000 kVa

Manufacturers "cut sheets" on-the above components are provided in Appendix E. The cut sheets are provided for informational purposes only and are representative of the equipment that is proposed. Final equipment selection may vary based on availability and other factors at the time of construction. If components do change, the Developer will seek DEEP approval accordingly.

3.3 Mounting Equipment and Foundation

Support racks will hold up to approximately Nineteen (18) PV modules per rack and house all the wiring between the modules. The developer anticipates installing approximately 600 GameChange support rack assemblies for this project. The GameChange design involves simple concrete foundation ballasts as shown in the Design Drawings. Concrete ballasts will be placed two (2) per support rack. The ballasts will be placed on top of the existing vegetative support layer. GameChange racks have the option of connecting to adjacent racks, allowing for each row to be continuous up to a 9% slope. Racks deployed in areas that exceed a 9% slope will be "tabled" or deployed individually. In order to level and maximize the number of racks continuously connected, stone may be added below the ballast to elevate and/or level the racks. The centralized inverters will be located on concrete pads. This design allows for assembly with minimal impact on the landfill.

The foundation ballasts must be of adequate size and weight to prevent the assemblies from moving or tipping due to wind, ice and snow loads. These requirements are outlined in the Connecticut Building Code (Code). The Developer's structural engineer will perform geotechnical settlement and slope stability calculations based on the final equipment selection.

3.4 Cable Conduits

Cable conduits will be above grade, mounted on the rack assemblies where applicable, or mounted on block assemblies above grade to keep the cables off of the ground surface. Once off the landfill cap, high voltage lines will be buried per NEC depth requirements. Any buried conduit may require gas tight fittings at the off cap transition points, which will be determined during the final electrical design. On-cap conduit may enter the concrete equipment pads from beneath the pad using stone to elevate the concrete pad. As an alternative, conduit may enter the side of the concrete equipment pad through poured in place conduits, terminated in "box outs." The choice of conduit pad entry will be determined as part of the final electrical and structural design.

3.5 Interconnection

Surface mounted conduit containing Medium Voltage (MV) cable from the center of Plane No. 2 will run parallel to the existing access road to an off-cap utility pole with riser. From Plane No. 3, a surface mounted conduit will extend from a location south of the Array and run along the existing access road west of the array transition to a buried conduit at this point. The two underground conduits will meet at an interconnection by the existing building.

3.6 Array Area

The PV array will be placed on the top of the landfill surface in areas with slopes of 15 percent or less. The sub-arrays will be oriented east-west along their long dimension. Because the landfill contours are not aligned with the east-west axis of the racks, the sub-arrays will be at a slight cross-slope angle.

3.7 Landfill Gas Vents

Two above grade passive gas vents situated within a four foot concrete riser and 5 subgrade gas collection wells are located within the proposed array area. No array equipment will be located within a ten (10) foot radius around the above grade passive gas vents and no array equipment will be placed within a five (5) foot radius around the subgrade gas collection points. Additionally measures will be taken during construction to protect the passive vents from damage due to construction activities.

4.0 STORMWATER EVALUATION

Boundaries prepared a Stormwater Management Report that has been prepared as part of the submittal to the Siting Council for a Certificate of Environmental Compatibility and Public Need (Declaratory Ruling). The report assumed an analogous system, layout, and equipment as being proposed in this permit application. The report concluded that stormwater impacts from the proposed project are negligible when considering these differences over the size of these subareas.

The total area of impervious surfaces (racking system, concrete pads/ ballasts, and gravel/crushed stone access paths) proposed within the PV development area amounts to 9,901 SF in Mounting Plane No. 2 and 6,586 SF in Mounting Plane No. 3. This impervious area accounts for 8.2% and 3.9% of the total area in Mounding Plane No. 2 and No. 3, respectively. In certain subareas, the peak flow slightly increased under post-development conditions as a result of the installation of the gravel access roads and PV array ballasts.

In Mounting Plane No. 2, the stormwater discharges to wooded areas and wetlands/watercourses. The slight increase in runoff should not negatively impact down gradient areas.

In Mounting Plane No. 3, stormwater is collected by riprap swales and is discharged to an existing detention basin. The post development peak runoff rate ranges from 5.4 CFS to 7.3 CFS during the 100-year storm event, and the existing stormwater management system has capacity for flows greater than 8.6 CFS, so the existing stormwater system should still be effective.

A copy of the Stormwater Management Report is included in Appendix F.

The Stormwater Management Report will be reviewed by the City as part of local Land Use Approval Process (e.g. Site Plan Review and/or Inland Wetland Permitting). As previously stated in Section 1.1, any design change that significantly different from this permit application will be submitted for review to the CT DEEP, including changes due stormwater management requirements set forth by the local permitting authority .

5.0 GEOTECHNICAL EVALUATION

Weston & Sampson has prepared a Geotechnical Assessment Memorandum for both the former Bulky Waste and MSW landfills. Each of the memorandums outline key engineering concepts and calculations that should be considered when placing a ballasted PV system on a landfill. A site specific evaluation involving wind/snow loads and bearing pressure was also conducted by GameChange Racking (the racking manufacturer) on the landfill. Weston & Sampson additionally evaluated current conditions, bearing pressures and stress, waste compression and sliding. This evaluation was based on the existing conditions and equipment selected to be used on-site. A copy of the Geotechnical Assessment Memorandums is included in Appendix G.

As discussed in Section 3.3, in general, it is expected the ballasts will be placed on the existing grade, with material (stone or crushed stone) to level the ballasts (where necessary). Minimal excavation of the vegetative support layer may be required. In general the geotechnical assessment concluded that the relatively low additional stresses imposed by the ballasts and equipment pad are not expected to affect the ongoing waste compression and settlement. Additionally, geomembrane manufacturers typically recommend limiting the stress on the FML to less than 7 psi during and after construction. The evaluated stresses on the FML from the existing soil cover and the potential increase on the FML due to the ballasts and concrete equipment pads are also anticipated to be below the 7 psi threshold and are considered within acceptable ranges for the proposed construction on the MSW landfill.

6.0 CONSTRUCTION ACTIVITIES

6.1 Site Preparation

Limited clearing for placement of erosion control devices will occur prior to the final clearing/mowing for construction of the solar array. All vegetation from clearing activities will be removed and disposed of off-site.

6.2 Erosion and Sediment Control Measures

Erosion control measures, such as straw wattles, will be deployed along the limit of work. The intent of these measures is to reduce migration of material from the landfill off site to adjacent areas. Additional means and methods that will be implemented to prevent material migration include:

- All excavations will be exposed for a short period of time;
- All excavated soil will be stockpiled off the landfill with the appropriate erosion and sediment controls; and
- Any rutting or exposed soil on the cap will be promptly filled, covered and/or stabilized.

Straw wattles shall be held in place by weighted ballasts or stakes into the vegetative support layer penetrating no more than 3 inches below grade. All stakes must be clearly marked to verify that maximum penetration depth of 3-inches, into the vegetative support layer has not been exceeded. The marking on the stakes must be set up to include the 3-inch depth, plus the thickness of the wattle, and 1-inch above the wattle.

The erosion of soil below the lower drip edge of the PV modules has been identified as a possible location for erosion of the landfill cap. The theory is that the falling water from the modules could damage the grass, cause soil to be exposed, and then eroded. Based on Weston & Sampson's and the project developer's experience (over 100 MW installed and/or being permitted), erosion below the modules has not been seen at existing PV installations in the Northeast US. There are several factors that would limit the likelihood or severity of such erosion. These include:

- The good vegatative grass cover present on both landfills;
- Flat landfill slopes below where the modules are being proposed; and,
- The larger grass buffer strips between sub-arrays.

An option to limit erosion would be to install mulch or gravel splash strips below each module drip edge; however, this activity would be highly disruptive to the cap. The strips would also significantly increase infiltration into the vegetative support layer as the strips would be perpendicular to the contours potentially causing changes in surface runoff patterns leading to erosion..

Rather than undertaking such a large scale, and possibly unnecessary disruption of the landfill surface, the developer will monitor the landfill surface for erosion during the first year of operation. If localized areas of erosion or damage are noted, stabilizing of the surface using

organic materials such as wood chips, mulch, coconut fiber matting or other long life organic erosion control material will be used.

The partial shading of the grass beneath the PV assemblies could result in vegetative die-off and exposure of the soil surface to erosion. The quality of the grass cover will be observed during the first year of operation. If adverse conditions as stated above are seen developing, a landscape professional will be consulted and reseeding of impacted areas with more shade tolerant grasses will be implemented.

6.3 Excavation and Material Handling

PV system components and construction methodology are designed to protect the integrity of the landfill cap. Excavation for inverter/transformer pads may be required. All excavation shall not exceed a depth of six (6) inches above the low permeability soil cap layer. Existing landfill waste is not anticipated to be encountered or disturbed. If waste is encountered, the waste will be properly handled and disposed of at an off-site licensed solid waste disposal facility. For additional detail, see the attached Materials Management Report in Appendix H.

6.4 Access Fence and Site Security

Each Landfill has a single access point via an access road located off of Rogers Road. The Developer proposes to install galvanized chain-link fencing across the access roads at the base of each landfill. A gate at each mounting plane will provide access to the arrays. Details of the access point fencing are shown in the design drawings attached as Appendix D. If unauthorized access proves to be a problem, additional security measures will be considered and evaluated.

6.5 Temporary and Permanent Access Road

During construction of the solar array, on-highway vehicles such as pick-up trucks, trailer trucks, ready-mix concrete and concrete pump trucks may need to travel on limited portions of the landfill. Damage to the landfill cap will likely occur if large on-highway vehicles travel over the grass covered surface. Therefore, the construction of access roads has been planned to minimize the impact to the landfill cap.

Temporary and permanent gravel roads will be used to minimize the potential impact of truck traffic. The design includes eighteen (18) inches of gravel overlying a woven geotextile, as shown on the design drawings. Confirmation will be performed by an engineer of the existing conditions.

If necessary, the locations of the temporary access roads on the landfill will be at the discretion of the construction contractor. This will prevent the temporary roads from acting as water bars in the event of heavy rainfall/runoff. Temporary road locations will require approval from the engineer. The contractor will be required to minimize the number of temporary roads installed. Temporary roads will also be constructed in a manner that does not affect the functionality of the existing stormwater drainage system. After completion of the construction, the temporary access roads will be removed within 6 months of the completion of the project and the cap will be re-vegetated in these road locations. Given the smaller array areas proposed for each of the landfill caps, we do not anticipate the need to construct temporary access roads at this time.

In certain instances, conduit may be required to cross temporary and permanent access roads. The depth of placement of conduits beneath permanent and temporary access roads will vary depending on location, cover, quantity, type of conduit and NEC code requirments

6.6 Nuisance Mitigation

Construction on a landfill has the potential to cause nuisance conditions. These conditions may include excess dust, vectors from exposed waste, and wind-blown litter. Vectors are not expected to be a problem because the construction of the PV array will not expose any landfilled waste. Wind-blown litter, dust, and vector control is the responsibility of the contractor and shall be performed on an as needed basis. It is expected the contractor will utilize water trucks if dust becomes a problem. The Contractor shall clean up any trash generated from PV construction (boxes, etc.) to prevent any wind-blown waste.

6.7 Project Schedule

The following Table shows a project milestone schedule for the Rogers Road Landfill Solar Project.

Table 2: Anticipated Project Schedule

Project Milestone	Anticipated Completion Date
Mobilization	11/15
Start of Construction	11/15
Mechanical and Electrical Completion & Testing	2/16
Commercial Operation	3/16

7.0 POST-CONTRUCTION ACITIVIES

7.1 Operation and Maintenance Plan

Modifications to the existing landfill monitoring and maintenance plan are not anticipated based on the proposed addition of the solar panels. Current monitoring and maintenance of the groundwater system and annual sampling and analysis of groundwater and surface water is currently conducted by the City and will continue to be the responsibility of the City of Norwich. The PV array will not interfere with those activities. Inspections within the PV array area will be conducted at times when vegetative maintenance is conducted or as required by the CT DEEP.

7.2 Decommissioning

The solar project is expected to remain at the landfill for at least 20 years, and perhaps longer if the Owner of the system wishes to continue operating it. PV modules in Japan have been documented to be operating reliably for 50 years after installation. However, as with any commercial venture, a decommissioning plan is required. Decommissioning and site restoration will include dismantling and removal of all panels and supporting equipment, transformers, overhead cables, foundations, and buildings and restoration of the roads and module sites to substantially the same physical condition that existed immediately before construction of the facility. To the extent possible, the site will be restored and reclaimed to the topography and topsoil quality that existed prior to the construction of the solar array. Disturbed earth will be graded and reseeded.

8.0 GENERAL REFERENCES

Department of Environmental Protection, Bureau of Materials Management and Compliance, Assurance Waste Engineering and Enforcement Division. Environmental Program Guidance Document - Guidance for Disruption Activities, Closure Activities, and/or Post-Closure Use at Solid Waste Disposal Areas. Dated 10/01/09.

All Points Technology Corporation, P.C. Solar Facility Installation 82 Rogers Road Norwich, Connecticut - Environmental Assessment. Dated August 2015.

Boundaries. Stormwater Management Report. Dated August 2015.

R:\Brightfields\Norwich\Permitting\Disruption Permit\Rogers Road Facility Report.docx

APPENDIX A

Norwich Landfill Lease Agreement

EXECUTION VERSION

SolarCity

Solar Power Site License (Commercial)

This Solar Power Site License (this "**License**") is entered into by the parties listed below (each a "**Party**" and collectively the "**Parties**") as of the date signed by Licensee below (the "**Effective Date**").

Licensor:	**City of Norwich, Connecticut**[1]	**Licensee:**	**SolarCity Corporation**
Name and Address	**City of Norwich Connecticut** 100 Broadway Norwich, CT06360	Name and Address	**SolarCity Corporation** 3055 Clearview Way San Mateo, CA 94402 Attention: Legal Department
Phone	(860) 823-3700	Phone	(650) 638-1028
E-mail	JohnBilda@cpumail.com	E-mail	Contracts@solarcity.com

This License sets forth the terms and conditions on which Licensor is granting a non-exclusive license to Licensee for the installation and operation of a solar panel system described in Exhibit 1 (the "**System**") on and above, but not under, the surface of the Licensor's premises described in **Exhibit 1** (the "**Premises**") for the purpose of generating and selling electricity and associated attributes and incentives under a power purchase agreement entered into between Licensee and the Connecticut Municipal Electric Energy Cooperative dated as of September 17, 2014 (the "**PPA**"). For avoidance of doubt, the rights granted to and the obligation imposed by this License with respect to the Premises shall not include any rights or obligations with respect to the subsurface of the Premises.

The exhibits listed below are incorporated by reference and made part of this License.

Exhibit 1	System and Premises Description
Exhibit 2	Terms and Conditions
Exhibit A	Permits
Exhibit B	Permit Matrix

City of Norwich, Connecticut

Signature: _____

Printed Name: John Bilda

Title: Acting City Manager

Date: April 29, 2015

SolarCity Corporation

Signature: _____

Printed Name: Lyndon Rive

Title: CEO

Date: 04/29/15

LEGAL APPROVED
TAF/TMG
4-30-15

[1] The term "Licensor" as used in this Agreement means the City of Norwich solely in its capacity as owner of the Premises as defined in Exhibit 1. The term "Licensor" does not include the City of Norwich in any other capacity, including as a taxing authority, a planning and zoning authority or any other capacity except as owner of the Premises nor does the term "Licensor" include any of the city's public water, sewer, electric or gas utilities.

Exhibit 1
System and Premises Description

1. **Premises:** Consists of two parcels of land, all owned by Licensor, the City of Norwich, CT, specifically:

   a. The approximately 4.16 acre parcel located at Rogers Rd., Parcel ID 073-001-031.000-0000, Norwich CT. 06360, ("Landfill Parcel #1") as shown on the attached map.

   b. The approximately 3.79 acre parcel located at Rogers Rd., Parcel ID 073-001-031.000-0000, Norwich CT. 06360, ("Landfill Parcel #2") as shown on the attached map

2. **System:** (DC kW): The approximately 1.614 megawatt direct current ("MWdc") solar panel electric generating system, including associated equipment, to be installed and operated by Licensee on the Premises.

3. The following sketch indicates project staging areas by yellow shading or by areas in red that are not hatched. Red hatching indicates areas where the solar array and related equipment will be installed and operated.



Exhibit 2

Terms and Conditions

Revised June 19, 2014

1. **Definitions and Interpretation**: Unless otherwise defined or required by the context in which any term appears: (a) the singular includes the plural and vice versa; (b) the words "herein," "hereof" and "hereunder" refer to this License as a whole and not to any particular section or subsection of this License; (c) references to any agreement, document or instrument mean such agreement, document or instrument as amended, modified, supplemented or replaced from time to time; and (d) the words "include," "includes" and "including" mean include, includes and including "without limitation." The captions or headings in this License are strictly for convenience and shall not be considered in interpreting this Lieense.

2. License. For the Lieense Term , (as defined below), Licensor grants to Licensee and to Lieensee's agents, employees and contractors an irrevocable non-exclusive license running with the Premises (the "**License**") for access to, on, over, and across, but not under, the surfaee of the Premises for the sole purposes of (a) installing, constructing, operating, owning, maintaining, accessing, removing and replaeing the System, all in a good and workmanlike manner in eompliance with all laws and permits; (b) performing all of Licensee's obligations and enforcing all of Licensee's rights set forth in the PPA and this License; and (c) installing, using and maintaining electric lines and equipment, ineluding inverters and meters, necessary to interconneet the System to the loeal electric utility's eleetric distribution system or that otherwise may from time to time be useful or neeessary in eonneetion with the construetion, installation, operation, maintenance or repair of the System. Licensee shall notify Licensor prior to entering the Premises except in situations where there is imminent risk of damage to persons or property. The term of the License shall commenee on the date hereof and shall continue until the date that is one hundred and twenty (120) days following the date of expiration or termination of the PPA (including any extensions thereof, provided, however, that any such extensions shall be approved in writing by the Lieensor acting in its sole discretion and in the same time and manner as is speeified for the Purchaser under the PPA) (the "**License Term**"). During the License Tenn, Lieensor shall ensure that Licensee's rights under the License and Licensee's access to the Premises are preserved and protected and shall not interfere with or permit any third parties to interfere with such rights or aecess. Licensee shall ensure that its activities do not interfere with Licensor's or Licensor's agents', contractors', lessees', or employees' activities at the Premises relating to Licensor's Transfer Station and the existing and foreseeable reeyeling operations. Licensor reserves the right to revoke aceess privileges to any person employed or eontraeted by Lieensee or Licensee's contractors, agents, or assigns that Licensor determines to be disruptive, unsafe, or who violates any law or unreasonably disobeys any Licensor directive. Lieensor shall provide up to Fifty thousand (50,000) sq. ft. of spaee for the temporary storage and staging of tools, materials and equipment and for the parking of up to Twenty (20) construction erew vehicles and One (1) temporary eonstruction trailer and facilities reasonably necessary during construction. Licensor agrees that Lieensee, upon request to Lieensor, may reeord a memorandum of lieense in the land records respeeting the License in form and substance reasonably acceptable to the Parties. Within thirty (30) days after the end of each calendar month during the Lieense Term, Licensee shall pay in arrears to Lieensor one-twelfth of the produet of $15,000 per MWdc multiplied by the aetual MWde electric capacity of the System as installed (the "**Monthly Fee**") as a fee for the License with a 2% escalator applied to eaeh calendar year through the end of the Term. Notwithstanding anything to the contrary herein, Licensee may terminate this License upon written notice to the Licensor within thirty (30) days after receipt of DEEP approval of the [Land Re-Use Permit].

3. **Construction of System, Maintenance of Premises, Compliance with Law, Permitting and Utilities**. Licensee shall, at its sole cost and expense, maintain the Premises in good condition and repair. Licensee shall pay the costs of repairing damage to the Premises occasioned by negligent acts or omissions or willful miseonduet of Lieensee, the Licensee's officers, agents, employees, elients, invitees, licensees, visitors, guests or servants. Lieensee shall at its sole eost be responsible for ensuring that utilities and other services it requires in order to develop, construct, own, operate, and maintain the System are present at the Premises.

   Before proceeding with construction of, or in conneetion with, the System, Licensee shall submit to Licensor, at Licensee's sole cost and expense, at least two (2) copies of detailed plans and specifications therefor for Licensor's review and written comment. Lieensor shall use its best efforts to review Lieensee's plans and specifications and provide Licensee its written comments within ten (10) business days of its reeeipt of said plans and specifieations. Licensee shall consider all comments provided by Licensor and either accept or respond to Licensor's comments prior to the commencement of construetion of the System. Any improvements for which Licensor's comments have been obtained shall be performed in accordance with such plans and specifications and no material changes thereto shall he made without the providing Licensor with the opportunity to provide meaningful comment as provided in this Section 3.

   Onee Lieensee has interconnected the System to the local utility grid, exeept as otherwise provided, Licensor will not directly cause the System to no longer be interconneeted to the loeal utility grid and will not directly cause cessation of electric service to the System from the local utility, except where the failure to remain intereonnected and/or the eessation of electric

service is beyond the control of the Licensor. Licensee expressly acknowledges, however, that Licensor's ongoing use of the Premises and the surrounding property may require that the System be temporarily offline for safety or other reasons. To the extent that these situations exceed 48 hours in a calendar year, Licensee may proceed under Section 4 of this Agreement. Licensor shall fully comply with all statutes, regulations, orders, permits and other governmental requirements (collectively "Laws"), applicable to the Premises or to Licensor as the owner of the Premises, including but not limited any to any Laws relating to operation and maintenance of the Premises as a closed municipal landfill and brownfield site. Licensee shall prepare the applications for any permits necessary for the installation and operation of System as a result of the System's location on a closed municipal landfill and brownfield site; Licensor shall coopcrate fully with Licensee with the preparation of such applications and shall, subject to reasonable or necessary modifications, sign all such applications as owner of the Premises. Licensor shall also fully cooperate with Licensee's efforts to obtain any permits necessary for the construction, operation, maintenance, and grid connection of the System. Lieensee, at Licensee's sole expense, operate the System in a commercially reasonable manner throughout the Term and maintain the System in good order, condition and repair, including the cost of capital repairs and replacement and in compliance with all laws and permit conditions.

4. No Alteration of Premises. Licensor shall not make any alterations or repairs to the Premises which are likely to adversely affect tbe operation and maintenance of the System without Licensee's prior written consent, such eonsent shall not be unreasonably withheld. If Lieensor wishes to make such alterations or repairs, Licensor shall give prior written notiee to Licensee, setting forth the work to be undertaken (exeept for emergency repairs, for which notice may be given by telephone), and give Licensee the opportunity to advise Licensor in making such alterations or repairs in a manner that avoids damage to the System, but, notwithstanding any such advice, Lieensor shall be responsible for all damage to the System caused by Licensor or its contraetors. To the extent that temporary cessalion of operation, diseonnection or removal of the System is necessary to perform such alterations or repairs, results from Pre-Existing Environmental Conditions not exacerbated by Licensee, or results from any action taken by Licensor in complianee with Environmental Laws, (a) such work and any replaeement of the System after completion of Lieensor's alterations and repairs shall be done by Licensee or its contractors at Licensor's cost, and (b) to the extent (i) Licensor or Licensor's contraetors caused such temporary cessation of operation or diseonnection and (ii) such temporary eessation of operation or disconnection as eaused by Licensor or Licensor's eontractors exeeeds 48 hours in any calendar year, Licensee may reasonably estimate the amount of electrieity that would have been delivered to Connecticut Municipal Electric Energy Cooperative or other party purchasing electricity under the PPA ("Purchaser") during the period of time in which the System is not operational. Thereafter during the term of the PPA, if such alteration/repairs adversely affect ongoing operation and maintenance of the System, Lieensee shall invoiee Lieensor for sueh amount and any associated lost or recaptured revenues attributable to monetized Environmental Incentives (as defined in the PPA) and lost sales (and penalty payments associated with the same) of associated Environmental Attributes (as defined in the PPA). All of Licensor's alterations and repairs will be done in a good and workmanlike manner and in eomplianee with all applicable laws, codes and permits.

5. Liens. Except as otherwise provided in Seetion 8, Licensor shall not directly or indireetly cause, ereate, incur, assume or allow to exist any mortgage, pledge, lien, eharge, security interest, encumbrance or other elaim of any nature on or with respect to the System or any interest therein. Lieensor shall immediately notify Lieensee in writing of the existence of any such mortgage, pledge, lien, eharge, security interest, encumbrance or other claim, shall promptly cause the same to be discharged and released of record without cost to Licensee, and to the extent permitted by law shall indemnify Licensee against all costs and expenses (including reasonable attorneys' fees) incurred in discharging and releasing any such mortgage, pledge, lien, charge, security interest, encumbrance or other elaim.

6. Security. Licensee shall be responsible for using commercially reasonable efforts to maintain the physical security of the Premises the System against known risks. Licensor will not conduct activities on, in or about the Premises that have a reasonable likelihood of causing damage, impairment or otherwise adversely affecting the System's electrical output. Licensee shall promptly report all security incidents occurring in, on, or at the Licensed Premises to the Licensor and to the local or State Police, as applicable, with a follow up written report to the Lieensor.

7. Insolation. Licensor understands that unobstructed access to sunlight ("Insolation") is essential to Licensee's performance of its obligations and a material term of this License. Licensor shall not in any way cause and, where possible, shall not in any way permit any reduction of the System's Insolation as measured at the beginning of the Term. If Licensor becomes aware of any activity or condition that could diminish the Insolation of the System, Licensor shall notify Licensee immediately and shall cooperate with Licensee in preserving the System's existing Insolation levels; however, all costs of preserving Insolation levels, shall be the responsibility of the Licensee, except to the extent Insolation levels are diminished as a result of Licensor's acts. Licensee shall also be responsible for costs associated with tree trimming and other similar maintenance activities in order to preserve existing Insolation levels. If such Insolation levels are not or cannot be maintained as a result of Licensor's actions, and the reduction on Insolation can be reasonably documented by Licensee, then Licensee may reasonably estimate the amount of electricity that would have been delivered to Purchaser under the PPA but for the reduced insolation levels, and elect to invoice Lieensor for such amount and any associated lost or recaptured

Environmental Incentives (as defined in the PPA) and lost sales (and penalties payments associated with the same) of associated Environmental Attributes (as defined in the PPA).

8. **Impositions.** Licensee shall pay, before any fine, penalty, interest or cost may be added thereto, or become due or be imposed by operation of law for the non-payment thereof, all taxes, assessments, water and sewer rents, rates and charges, transit taxes, charges for public utilities, excises, levies, license and permit fees and other governmental charges, general and special, ordinary and extraordinary, unforeseen and foreseen, of any kind and nature whatsoever which at any time prior to or during the term of this License may be assessed, levied, confirmed, imposed upon, or grow or become due and payable out of or in respect of, or become a lien on, (i) the System or any part thereof or any appurtenances thereto, (ii) the income or other payments received by Licensee from the operation of the Licensee System, (iii) any use or operation of the Premises and the System, (iv) such franchises as may be appurtenant to the use of the Premises and the System, and (v) this transaction or any document to which Licensee is a party, creating or transferring an interest or estate in the Premises and/or the System (all such taxes, assessments, water and sewer rents, transit taxes, rates and charges, charges for public utilities, excises, levies, license fees and other governmental charges being hereinafter referred to as "**Impositions**.")

Nothing herein contained shall require Licensee to pay municipal, state or federal income taxes assessed against Licensor, nor municipal, state or federal capital levy, estate, succession, inheritance or transfer taxes required to be paid by Licensor, or corporation franchise taxes imposed upon any corporate owner of the fee of the Premises; provided, however, that if, at any time during the term of this License, the methods of taxation prevailing at the commencement of the term hereof shall be altered so that in lieu of or as a substitute for the whole or any part of the taxes, assessments, levies, impositions or charges now levied, assessed or imposed on real estate and the improvements thereon, there shall be levied, assessed and imposed (i) a tax, assessment, levy, imposition or charge, wholly or partially as a capital levy or otherwise, on the rents received from the Licensee, or (ii) a tax, assessment, levy (including but not limited to any municipal, state or federal levy), imposition or charge measured by or based in whole or in part upon the rents from the Premises and imposed upon Licensor, or (iii) a license fee measured by the license fee payable to Licensee under this License, then all such taxes, assessments, levies, impositions or charges or the part thereof so measured or based, shall be deemed to be included within the term "Impositions" for the purposes hereof to the extent such "Impositions" would be payable if the Premises were the only property of Licensor subject to such Impositions, and Licensee shall pay and discharge the same as herein provided with respect to the payment of Impositions.

Licensee, upon request of Licensor, will furnish to Licensor, within ten (10) days before the date when any Imposition assessed against the Licensee and/or the System would become delinquent, offieial receipts of the appropriate taxing authority, or other evidence satisfactory to Licensor, evidencing the payment thereof.

Licensee shall have the right to contest the amount or validity, in whole or in part, of any Imposition assessed solely against the Licensee and/or the System and against the Property or the Premises by appropriate proceedings diligently conducted in good faith, Licensor shall not be required to join in any proceedings referred to in this Section 8 unless the provisions of any law, rule or regulation at the time in effect shall require that such proceedings be brought by and/or in the name of Licensor or any owner of the Property, or Premises, and the System, in which event Licensor shall join in such proceedings or permit the same to be brought in its name. Licensor shall not be subjected to any liability for the payment of any costs or expenses in connection with any proceedings, and Licensee will indemnify and save Licensor harmless from any and all such costs and expenses.

9. **Removal of System at Expiration.**

Upon the expiration or earlier termination of this License (provided Licensor does not exercise its purchase option), Licensee shall, at its expense, remove all of its tangible property comprising the System from the Premises on a mutually eonvenient date, but in no event later than ninety (90) days after the expiration of the Term. Licensee shall ensure that such removal complies with all applieable Laws and permits, including ensuring that the caps in place over the closed landfill areas are not disturbed. Excluding ordinary wear and tear, the Premises shall be returned to its original condition including the removal of System mounting pads or other support structures Licensee shall leave the Premises in neat and clean order. If Licensee fails to remove or commence substantial efforts to remove the System by such agreed upon date, Licensor shall have the right, at its option, to remove the System to a public warehouse and restore the Premises to its original condition (other than ordinary wear and tear) at Licensee's cost. Licensee shall, on or before Commercial Operation Date of the System, provide financial assurance in the form of an annually-renewing irrevocable Letter of Credit from a financial institution acceptable to Licensor, in the form of financial assurance agreeable to the Licensor to be in place prior to the start issuance of building permit naming Lieensor as the beneficiary and to be drawn upon by Licensor in the event that Licensee fails to timely perform all of its obligations concerning removal of the System as required by this License. Such Letter of Credit shall remain effective and in foree until such time as the System is fully removed and the Premises restored in accordance with this License or until such time that Licensor exercises its purchase option. Licensor shall provide up to Fifty thousand (50,000) sq. ft of space for

the temporary storage and staging of tools, materials and equipment and for the parking of up to Twenty (20) construction crew vehicles and one (1) temporary construction trailer and facilities reasonably necessary during System removal.

10. **Default, Remedies and Damages.**

a. **Default.** Any Party that fails to perform its responsibilities as listed below or experiences any of the eireumstances listed below shall be deemed a "**Defaulting Party**", the other Party shall be the "**Non-Defaulting Party**" and eaeh event of default shall be a "**Default Event**":

(1) failure of a Party to substantially perform any material obligation. other than those deseribed in subseetions (2) to (5) of this Section 10(a), under this License within thirty (30) days following reeeipt of written notiee from the Non-Defaulting Party demanding sueh eure; provided, that such thirty (30) day eure period shall be extended (but not beyond ninety (90) days) if and to the extent reasonably necessary to cure the Default Event, if (i) the Defaulting Party initiates such cure within the thirty (30) day period and eontinues sueh eure to completion and (ii) there is no material adverse effect on the Non-Defaulting Party resulting from the failure to eure the Default Event;

(2) if any representation or warranty or eovenant of a Party proves at any time to have been ineorreet in any material respeet when made and is material to the transaetions eontemplated hereby, if the effect of sueh incorreetness is not cured within thirty (30) days following reeeipt of written notice from the Non-Defaulting Party demanding sueh eure;

(3) Licensor loses its rights to oeeupy and enjoy the Premises;

(4) a Party, or its guarantor (if any) becomes insolvent or is a party to a bankruptey, reorganization, insolveney, liquidation, reeeivership, dissolution, winding-up or relief of debtors, or any general assignment for the benefit of creditors or other similar arrangement or any event oeeurs or proceedings are taken in any jurisdiction with rcspeet to the Party whieh has a similar effeet (or, if any sueh aetions are initiated by a third party, sueh action(s) is(are) not dismissed within ninety (90) days); or

(5) Lieensor prevents Lieensee from installing the System or otherwise failing to perform in a way that prevents the delivery of eleetric energy from the System, if such Default Event is not eured within thirty (30) days following receipt of written notice from Licensee demanding sueh eure. Sueh Default Event shall not excuse Lieensor's obligations to make payments that otherwise would have been due under this License.

b. **Remedies**. On the oeeurrence of a Default Event, the Non-Defaulting Party may pursue any remedy under this Lieense, at law or in equity, ineluding an action for damages (with respeet to any Default Event by Lieensor, including but not limited to an action for specific performance, and an action for damages related to the loss or recapture of federal or State tax credits and incentives and all lost revenue from the System (for the avoidance of doubt, the Parties agree that all such damages shall be deemed to be direet damages)) and termination of this Lieense, upon five (5) days prior written notice to the Defaulting Party following the occurrenee of the Default Event. Nothing herein shall limit either Party's right to eollect damages upon the oeeurrence of a breach or a default by the other Party that does not beeome a Default Event. If a Non-Defaulting Party terminates this License pursuant to this Section 10(b), then following sueh termination, Licensee shall, at the sole cost and expense of the Defaulting Party, remove the equipment constituting the System. The Non-Defaulting Party shall take all eommercially reasonable efforts to mitigate its damages as the result of a Default Event.

11. Representations and Warranties.

a. **General Representations and Warranties.** Each Party represents and warrants to the other the following:

(1) Such Party is duly organized, validly existing and in good standing under the laws of the jurisdiction of its formation; the execution, delivery and performanee by sueh Party of this License have been duly authorized by all necessary corporate, partnership or limited liability company aetion, as applieable, and do not and shall not violate any law; and this License is valid obligation of sueh Party, enforeeable against such Party in accordance with its terms (except as may be limited by applieable bankruptcy, insolveney, reorganization, moratorium and otber similar laws now or hereafter in effect rclating to ereditors' rights generally).

(2) Such Party has obtained all licenses, authorizations, consents and approvals required by any governmental authority or other third party and necessary for such Party to own its assets, carry on its business and to execute and deliver this License; and such Party is in compliance with all laws that relate to this License in all material respects.

b. **Licensor's Representations and Warranties**. Licensor represents and warrants to Licensee the following:

(1) License. Licensor has title to or a leasehold or other property interest in the Premises. Licensor has the full right, power and authority to grant the License. Such grant of the License does not violate any law, ordinance, rule or other governmental restriction applicable to Licensor or the Premises and is not inconsistent with and will not result in a breach or default under any agreement by which Lieensor is bound or that affects the System. If Licensor does not own the Premises, Licensor has obtained all required consents from the owner of the Premises to grant the License and enter into and perform its obligations under this License.

(2) Other Agreements. Neither the execution and delivery of this License by Licensor nor the performanee by Licensor of any of its obligations under this License conflicts with or will result in a breach or default under any agreement or obligation to which Licensor is a party or by which Licensor or the Premises is bound.

(3) Accuracy of Information. To Licensor's knowledge, all information provided by Licensor to Licensee, as it pertains to the Premises, is accurate in all material respects. Prior to DEEP approval of the [Landfill Re-Use Permit], Licensee will be provided access to the Premises in order to conduct feasibility and configuration assessments, environmental assessments, and other inspections of the Premiscs as Licensee deems necessary.

(4) Compliance with Law. Licensor is in compliance with, and for the License Term, Licensor shall fully comply with all applicable Laws, including but not limited any to any Environmental Laws relating to operation and maintenance of the Premises as a closed municipal landfill and brownfield site. Environmental Permits. Except to the extent (i) a permit filing specifically relates to the development or construction of the System and will not be made until after this Licensc Agreement is signed or (ii) is otherwise the responsibility of Licensee, Licensor has obtained, possesses, is in compliance with and has made all necessary filings for issuance or renewal of, all material Environmental Permits applicable to the Premises, and all such Environmental Permits as listed on Exhibit B.

(5) Environmental Complianee. Licensor is, and during the past five (5) years has been, in material compliance with Environmental Laws applicable to the Premises.

(6) No Environmental Proceedings. Except with respect to matters that have been settled or resolved with no ongoing liabilities or obligations, Licensor has not received any written notice of any proceeding regarding any aetual or alleged violation of, or liability under Environmental Laws, or any investigatory, remedial or correetive obligations under Environmental Laws, in each case with respect to the Premises, nor is any such proceeding threatened to Licensor's knowledge.

(7) No Environmental Releases. To Licensor's knowledge, the Licensor has not caused the release of Hazardous Substances at, on, about, under or from any of the Premises which would reasonably expected to give rise to material liability under Environmental Laws.

(8) No Environmental Events. To Licensor's knowledge, therc are no events: (i) that would prevent continued compliance by the Licensor with Environmental Laws and the requirements of Environmental Permits applicable to it or the operation of the Premises in the same manner as presently operated and as eontemplated by this Lieense, or (ii) based upon the acts or omissions of the Licensor, that would result in the liability of Licensor under any applicable Environmental Laws.

(9) Environmental Written Materials. Licensor has delivered to Licensee true, correct and eomplete copies of all Environmental Written Materials pertaining to the Premises in its possession, receipt, access or control.

c. **Licensee's Representations and Warranties.** Licensee represents and warrants, to the Licensor the following:

(1) Compliance with Law. Licensee is in compliance with, and for the License Term, Licensee shall fully comply with all applicable Laws, including all applicable Environmental Laws and Environmental Permits.

(2) Other Agreements. Neither the cxecution and delivery of this Lieense by Licensee nor the performance by Licensee of any of its obligations under this Lieense eonflicts with or will result in a breach or default under any agreement or obligation to which Licensee is a party or by which Licensee is bound

(3) Premises Condition. Prior to DEEP approval of the [Landfill Re-Use Permit], Licensee will inspect the Premises and every aspeet thereof and represent to Licensor that the Premises is then in an aeceptable condition for Licensee's anticipated use of the Premises as provided in this License.

(4) As-Is Condition. Except with respect to subsurface and groundwater conditions to the extent such conditions require remediation under Environmental Laws, Licensee accepts the Premises in its as-is condition and acknowledges that except as expressly stated in this License, Licensor has not made any statements or representations or warranties regarding the Premises and Licensee is not relying upon any statement or representation of warranty by Licensor or any third party regarding the Premises, the fitness of the Premises for any particular use by Licensee or any other matter. Licensor expressly diselaims and Lieensee hereby waives all implied warranties, including any warranty of merchantability or warranty of fitness for a particular use or purpose.

(5) Maintenance of System. All of Licensee's operating and maintenance personnel will be adequately qualified and trained throughout the Term.

d. **Environmental Conditions**. Lieensee states and Licensor represents, warrants, acknowledges, covenants and agrees that:

(1) The Parties acknowledge and agree that the Premises were previously operated by Licensor as municipal solid waste landfill(s), and as between the Parties the Licensor is legally responsible for Pre-Existing Environmental Conditions;

(2) Except to the extent exacerbated by Licensee or Licensee's employees, agents, contractors or assigns, Lieensee has no liability for claims of any nature that currently exist or may hereafter arise relating to the Pre-Existing Environmental Conditions;

(3) Licensee bears no responsibility for any Pre-Existing Environmental Conditions on the Premises whatsoever, except to the extent such Pre-Existing Environmental Conditions are exacerbated by the acts or omissions of Licensee or Licensee's employees, invitees, guests, agents, contractors, or assigns (collectively, "Licensee's Affiliates"). Licensor, for and on behalf of itself and all its successors in title and assigns, hereby waives, relinquishes, and releases Licensee, Licensee's Affiliates and its and their respective employees and agents from, and covenants not to sue Licensee, Licensee's Affiliates and its and their respective employees and agents for, any and all claims, demands, causes of action (including causes of action in tort), losses, damages, liabilities, costs and expenses (ineluding reasonable attorneys' fees) of any and every kind or character, known or unknown, whieh Licensor might assert or allege against Licensee (or Licensee's Affiliates and its and their respcctive employees or agents) at any time by reason of or arising out of Pre-Existing Environmental Conditions, except to the extent such Pre-Existing Environmental Conditions are exacerbated by the acts or omissions of Licensee or Licensee's Affiliates.

(4) As between Licensor and Licensee, Licensor is and shall be solely responsible for all Pre-Existing Environmental Conditions on the Premises. To the extent permitted by law, and except to the extent such Pre-Existing Environmental Condition is exacerbated by Licensee, Licensor hereby covenants and agrees to defend and pay any and all claims arising out of, related to or resulting from such Pre-Existing Environmental Conditions, ineluding, without limitation, costs of remediation and claims by any Person for property damage, bodily injury or death, except to the extent such Pre-Existing Environmental Conditions are exacerbated by, or claims arise from, the acts or omissions of Licensee.

(5) Environmental Written Materials. Each Party shall promptly furnish to the other Party, on an on-going basis throughout the Term and without necessity of request, all final Environmental Written Materials.

(6) Licensee shall be responsible for completing and filing all applications relating to any permit, approval, or condition required by any Governmental Authority or local utility service (collectively, "Authorizations") company in order to develop and construct the System. Prior to the Licensee filing any applications for Authorizations, Licensor shall have five (5) business days to review and provide meaningful comment on such applications. Licensor shall reasonably cooperate with Licensee throughout the application process, including providing information to Licensee which is reasonably known by Licensor and signing documents required to be signed by the property owner. To the extent any required Authorization places an undue, material burden on Licensor, as to be solely determined by Licensor, Licensor reserves the right, at its sole discretion, to require Licensee to continue to negotiate with the Governmental Authority issuing the Authorization and/or request that Licensee reimburse Licensor for any costs Licensee incurs as a result of such Authorization. If Licensor determines, no later than thirty (30) days after DEEP approval of the [Landfill Re-Use Permit], in its reasonably exercised discretion that such Authorization imposes an undue, material burden on Licensor, Licensor may then reimburse Licensee for half of its documented out-of-pocket costs incurred to date (up to maximum reimbursement amount of $25,000) and terminate this License.

(7) Licensee shall provide Licensor with copies of all Authorizations. A list of all Authorizations required to be obtained in order to develop, construct, and operate the System and a citation to relevant authority for such permit, approval, or condition is provided in Exhibit A

e. **Definitions.** For the purposes of Sections 11, 12, and this License, the following terms shall have the following meanings:

(1) "**Environmental Laws**" means all federal, state and local laws, regulations, by-laws and ordinances, including policies and guidelines, orders, consent orders, settlement agreements and judgments of any Governmental Authority relating to pollution, protection of the environment or human health or safety, now or hereafter in effect.

(2) "**Environmental Permits**" means all federal, state and local authorizations, certificates, permits, franchises, licenses, approvals required by, and any filings made to, any Governmental Authority pursuant to Environmental Laws regarding the Premises, Facility and the System, including, without limitation, a post-closure use permit for the Landfill.

(3) "**Environmental Written Materials**" means all information, data, studies, analyses, tests, monitoring, notices, reports, applications, approvals or other communications of any kind concerning the Premise's compliance with Environmental Laws and Environmental Permits as Licensor or Licensee may possess, receive, file or submit or to which it otherwise has access or control from time to time, including, without limitation, any release or suspected or threatened release of Hazardous Substances at, on, about, under or from the Premises, compliance with applicable Environmental Laws and Licensee's or Licensor's liability under applicable Environmental Laws including, but not limited to Landfill and/or waste site closure design, remediation requirements, operation and maintenance requirements, testing and monitoring or any proceeding initiated or threatened by any person alleging liability under Environmental Laws, or seeking or imposing investigatory, remedial or corrective obligations under Environmental Laws

(4) "**Governmental Authority**" means any national, state or local government (whether domestic or foreign), any political subdivision thereof or any other governmental, quasi-governmental, judicial, public or statutory instrumentality, authority, body, agency, bureau or entity , or any arbitrator with authority to bind a party at law.

(5) "**Hazardous Substance**" means any chemical, waste or other substance (a) which now or hereafter becomes defined as or included in the definition of "hazardous substances," "hazardous wastes," "hazardous materials," "extremely hazardous wastes," "restricted hazardous wastes," "toxic substances," "toxic pollutants," "pollution," "pollutants," "regulated substances," "petroleum," "petroleum product," or words of similar import under any laws pertaining to the environment, health, safety or welfare, (b) which is declared to be hazardous, toxic, or polluting by

any Governmental Authority, (c) exposure to which is now or hereafter prohibited, limited or regulated by any Governmental Authority, (d) the storage, use, handling, disposal or release of which is restricted or regulated by any Governmental Authority, or (e) for which remediation or cleanup is required by any Governmental Authority.

(6) "**Pre-Existing Environmental Conditions**" means the now closed Norwich Municipal Landfill located on the Premises and any and all Hazardous Substances which are on or under the Premises as of the Effective Date, whether or not sueh Hazardous Substances resulted from the operation or maintenance of such landfill.

12. Environmental Obligations

a. Each Party shall comply strictly an in all respects with all of the applicable requirements of Environmental Laws.

b. Licensee shall not use any Hazardous Substanee at, on, under, or about the Premises except as such Hazardous Substance use is approved in writing by Licensor, except for Hazardous Substances required in the ordinary course of System construction, installation and operation and which are used, stored, and disposed of in eompliance with Environmental Laws.

c. Lieensee shall remediate at ils sole cost and expense all Hazardous Substance contamination eaused by or exacerbated by Licensee or Licensee's Affiliates.

13. Insurance.

a. Insurance Coverage. At all times during the Term, Lieensee and Licensor shall maintain the following insurance:

i. Licensee's Insurance. Licensee shall maintain (i) commercial general liability insurance with eoverage of at least $1,000,000 per occurrenee and $2,000,000 annual aggregate, (ii) employer's liability insurance with coverage of at least $1,000,000; and (iii) workers' compensation insuranee as required by law.

ii. Licensor's Insurance. Licensor shall maintain eommercial general liability insurance with coverage of at least $1,000,000 per occurrence and $2,000,000 annual aggregate.

b. Policy Provisions. All insurance policies provided hereunder shall (i) contain a provision whereby the insurer agrees to give the party not providing the insurance thirty (30) days (ten (10) days in the event of non-payment of premiums) written notice before the insurance is eancelled, or terminated, (ii) be written on an oceurrenee basis, (iii) be maintained with companies either rated no less than A-VII as to Policy Holder's Rating in the current edition of A.M. Best's Insurance Guide or otherwise reasonably acceptable to the other party.

c. Certificates. Upon the other Party's request each Party shall deliver to the other Party certificates of insurance evidencing the above required coverage. A Party's receipt, review or acceptance of such eertificate shall in no way limit or relieve the other Party of the duties and responsibilities to maintain insurance as set forth in this License.

d. Deductibles. Unless and to the extent that a claim is covered by an indemnity set forth in this License, each Party shall be responsible for the payment of its own deductibles.

14. Ownersbip of System; Option to Purchase.

a. Throughout the Term, Licensee shall he the legal and beneficial owner of the System and all of the System's electric output and Environmental Attributes, and the System shall remain the personal property of Licensee and shall not attach to or be deemed a part of, or fixture to, the Premises. Each of the Licensee and Licensor agree that the Licensee is the tax owner of the System and all tax filings and reports will be filed in a manner consistent with this License. The System shall at all times retain the legal status of personal property as defined under Article 9 of the Uniform Commercial Code. Licensor covenants that it will use commercially reasonable efforts to place all parties having an interest in or a mortgage, pledge, lien, charge, security interest, encumbrance or other claim of any nature on the Premises on notice of the ownership of the System and the legal status or classification of the System as personal property. If there is any mortgage or fixture filing against the Premises which could reasonably be construed as prospectively attaching to the System as a fixture of the Premises, Licensor shall provide a disclaimer or release from such lienholder. If Licensor is the fee owner of the Premises, Lieensor consents to the filing of a disclaimer of the System as a fixture of the Premises in the office where real estate records are customarily filed in the jurisdiction where the Premises is located. If Licensor is not the fee owner, Lieensor will obtain such consent

from such owner. For the avoidance of doubt, in either circumstance Licensee shall file such disclaimer. Upon request, Licensor agrees to deliver to Licensee a non-disturbance agreement in a form reasonably acceptable to Licensee from the owner of the Premises, any mortgagee with a lien on the Premises, and other persons holding a similar interest in the Premises. To the extent that Licensor does not own the Premises, Licensor shall provide to Licensee immediate written notice of receipt of notice of eviction from the Premises or termination of Licensor's lease of the Premises.

b. At the end of the sixth (6th) and tenth (10th) Contract Years (as defined in the PPA) and at the end of the Initial Term and each Additional Term (each as defined in the PPA), so long as Licensor is not in default under this License, Licensor may purchase the System from Licensee on any such date for a purchase price equal to the Fair Market Value of the System . The "**Fair Market Value**" of the System shall be determined by mutual agreement of Licensor and Licensee; provided, however, if Licensor and Licensee cannot agree to a Fair Market Value within thirty (30) days after Licensor has exercised its option, the Parties shall select a nationally recognized independent appraiser with experience and expertise in the solar photovoltaic industry to determine the Fair Market Value of the System. Such appraiser shall act reasonably and in good faith to determine the Fair Market Value of the System on an installed basis and shall set forth such determination in a written opinion delivered to the Parties; provided that in no event shall the amount paid to purchase the System be less than the Termination Payment (as defined under the PPA) as of the date of System title transfer. The valuation made by the appraiser shall be binding upon the Parties in the absence of fraud or manifest error. The costs of the appraisal shall be borne by the Parties equally. Licensor must provide a notification to Licensee of its intent to purchase at least ninety (90) days and not more than one hundred eighty (180) days prior to the end of the applicable Contract Year or the Initial Term or Additional Term, as applicable, and the purchase shall be complete prior to the end of the applicable Contract Year or the Initial Term or Additional Term, as applicable. Licensee shall transfer good title to the System to Licensor upon Licensee's receipt of the Purchase Option Price but otherwise disclaims all warranties of any kind, express or implied, concerning the System, "as is, where is, with all faults"; provided that Licensee shall assign to Licensor any manufacturers warranties that are in effect as of the purchase, and which are assignable pursuant to their terms. Upon purchase of the System, Licensor will assume complete responsibility for the operation and maintenance of the System and liability for the performance of the System, and Licensee shall have no further liabilities or obligations hereunder.

15. **Indemnification and Limitations of Liability**.

a. **General**. To the extent permitted by law, Each Party (the "**Indemnifying Party**") shall defend, indemnify and hold harmless the other Party and the directors, officers, shareholders, partners, members, agents and employees of such other Party, and the respective affiliates of each thereof (collectively, the "**Indemnified Parties**"), from and against all loss, damage, expense, liability and other claims, including court costs and reasonable attorneys' fees (collectively, "**Liabilities**") resulting from any third party actions relating to the breach of any representation or warranty set forth in Section 11 and from injury to or death of persons, and damage to or loss of property to the extent caused by or arising out of the negligent acts or omissions of, or the willful misconduct of, the Indemnifying Party (or its contractors, agents or employees) in connection with this License; provided, however, that nothing herein shall require the Indemnifying Party to indemnify the Indemnified Party for any Liabilities to the extent caused by or arising out of the negligent acts or omissions of, or the willful misconduct of, the Indemnified Party. This Section 15(a) however, shall not apply to liability arising from any form of hazardous substances or other environmental contamination, such matters being addressed exclusively by Section 15(c).

b. **Notice and Participation in Third Party Claims**. The Indemnified Party shall give the Indemnifying Party written notice with respect to any Liability asserted by a third party (a "**Claim**"), as soon as possible upon the receipt of information of any possible Claim or of the commencement of such Claim. The Indemnifying Party may assume the defense of any Claim, at its sole cost and expense, with counsel designated by the Indemnifying Party and reasonably satisfactory to the Indemnified Party. The Indemnified Party may, however, select separate counsel if both Parties are defendants in the Claim and such defense or other form of participation is not reasonably available to the Indemnifying Party. The Indemnifying Party shall pay the reasonable attorneys' fees incurred by such separate counsel until such time as the need for separate counsel expires. The Indemnified Party may also, at the sole cost and expense of the Indemnifying Party, assume the defense of any Claim if the Indemnifying Party fails to assume the defense of the Claim within a reasonable time. Neither Party shall settle any Claim covered by this Section 15 unless it has obtained the prior written consent of the other Party, which consent shall not be unreasonably withheld or delayed. The Indemnifying Party shall have no liability under this Section 15(b) for any Claim for which such notice is not provided if the failure to give notice prejudices the Indemnifying Party.

c. **Environmental Indemnification**. Licensee shall indemnify, defend and hold harmless all of Licensor's Indemnified Parties from and against all Liabilities arising out of or relating to the existence at, on, above, below or near the Premises of any Hazardous Substance to the extent deposited, spilled or otherwise caused by or to the

extent any Pre-Existing Condition was exacerbated by Licensee or Licensee's Affiliates. To the extent permitted by law, Licensor shall indemnify, defend and hold harmless all of Licensee's Indemnified Parties from and against all Liabilities arising out of or relating to the existence at, on, above, below or near the Premises of any Hazardous Substance (including but not limited to any Hazardous Substance resulting from or relating to any Pre-Existing Conditions and any settling or subsidence of the Premises), except to the extent deposited, spilled or otherwise caused by or to the extent any Pre-Existing Condition was exacerbated by Licensee or any of its employees, contractors, or agents. Each Party shall promptly notify the other Party if it becomes aware of any Hazardous Substance on or about the Premises generally not previously disclosed or any deposit, spill or release of any Hazardous Substance.

d. **Limitations on Liability**.

i. No Consequential Damages. Except as specifically stated in this License, and except with respect to indemnification for Liabilities pursuant to this Section 15 and damages that result from the willful misconduct of a Party, neither Party nor its directors, officers, shareholders, partners, members, agents and employees subcontractors or suppliers shall be liable for any indireet, speeial, incidental, exemplary, punitive, statutory, or consequential loss or damage of any nature arising out of their performance or non-performance hereunder even if advised of such.

ii. Actual Damages. Except with respect to indemnification for Liabilities pursuant to this Section 15, damages that result from the willful misconduct of Licensee, and except with respect to Licensor's obligations under Sections 4 and 7 (which shall be capped at the Termination Payment as defined in the PPA), and with respect to any damage or loss of the System that results from the fault of Licensor or any third party for which Licensor is responsible (which shall be eapped at Fair Market Value), each Party's aggregate liability under this License arising out of or in connection with the performance or non-performance of this License shall not exceed $1,000,000. The provisions of this Section 15(d) shall apply whether such liability arises in contraet, tort (including negligence), strict liability or otherwise.

16. **Force Majeure**.

a. "**Force Majeure**" means any event or circumstances beyond the reasonable control of and without the fault or negligence of the Party claiming Force Majeure. It shall include, without limitation, failurc or interruption of the production, delivery or acceptance of electricity due to: an act of god; war (declared or undeclared); sabotage; riot; insurrection; civil unrest or disturbance; military or guerilla action; terrorism; eeonomie sanction or embargo; civil strike, work stoppage, slow-down, or lock-out; explosion; fire; earthquake; abnormal weather condition or actions of the elements; hurricane; flood; lightning; wind; drought; the binding order of any governmental authority (provided that such order has bcen rcsistcd in good faith by all reasonable legal means); the failure to act on the part of any governmental authority (provided that sueh action has been timely requested and diligently pursued); any Change in Law that makes it unlawful, impossible or materially impracticable for either Party to perform under this License; unavailability of electricity from the utility grid, equipment, supplies or products (but not to the extent that any such availability of any of the foregoing results from the failure of the Party claiming Force Majeure to have exercised reasonable diligence); and failure of equipment not utilized by or under the control of the Party claiming Force Majeure.

b. Except as otherwise expressly provided to the contrary in this License, if either Party is rendered wholly or partly unable to timely perform its obligations under this License because of a Foree Majeure event, that Party shall be excused from the performance affected by the Force Majeure event (but only to the extent so affected) and the time for performing such excused obligations shall be extended as reasonably necessary; provided, that: (i) the Party affected by such Force Majeure event, as soon as reasonably practicable after obtaining knowledge of the occurrence of the claimed Force Majeure event, gives the other Party prompt oral notice, followed by a written notice reasonably describing the event; (ii) the suspension of or extension of time for performance is of no greater seope and of no longer duration than is required by the Force Majeure event; and (iii) the Party affected by such Force Majeure event uses all reasonable efforts to mitigate or remedy its inability to perform as soon as reasonably possible. The Term shall be extended day for day for each day performance is suspended due to a Force Majeure event.

c. If a Force Majeure event continues for a period of thirty (30) days or more within a twelve (12) month period and prevents a material part of the performance by a Party hereunder, then the Parties shall, within thirty (30) days following receipt by the other Party of notice of such Force Majeure event, meet and attempt in good faith to negotiate amendments to this License. If the Parties are unable to agree upon such amendments within such thirty

(30) day period, then Licensee shall have the right to terminate this License without either Party having further liability to the other Party except with respect to payment of amounts accrued prior to termination.

d. "**Change in Law**" means (i) the enactment, adoption, promulgation, modification or repeal after the Effective Date of any applicable law or regulation; (ii) the imposition of any material conditions on the issuance or renewal of any applicable permit after the Effective Date of this License (notwithstanding the general requirements contained in any applicable Permit at the time of application or issue to comply with future laws, ordinances, codes, rules, regulations or similar legislation), or (iii) a change in any utility rate schedule or tariff approved by any governmental authority which in the case of any of (i), (ii) or (iii), establishes requirements affecting owning, supplying, constructing, installing, operating or maintaining the System, or other performance of the Licensee's obligations hereunder; provided, that a change in federal, state, county or any other tax law after the Effective Date of this License shall not be a Change in Law pursuant to this License.

17. **Assignment and Financing**.

a. **Assignment**. This License may not be assigned in whole or in part by either Party without the prior written consent of the other Party, which consent shall not be unreasonably withheld or delayed. Notwithstanding the previous sentence, Provided, Licensor may only assign this License to an owner of the Premises. Licensee may, without the prior written consent of Licensor, assign, mortgage, pledge or otherwise directly or indirectly assign its interests in this License to any Financing Party, any entity through which Licensee is obtaining financing from a Financing Party, any affiliate of Licensee or any person succeeding to all or substantially all of the assets of Licensee (provided that Licensee shall provide written notice of such assignment as soon as practicable to Licensor and Licensee shall be released from liability hereunder as a result of any of the foregoing permitted assignments only upon (i) Licensor receiving such notice of the assignment and (ii) assumption of Licensee's obligations hereunder by the assignee). This License shall be binding on and inure to the benefit of the successors and permitted assignees.

b. **Financing**. The Parties acknowledge that Licensee may obtain construction and long-term financing or other credit support from lenders or third parties (including tax equity or similar investors) ("**Financing Parties**") in connection with the installation, construction, ownership, operation and maintenance of the System. Both Parties agree in good faith to consider and to negotiate changes or additions to this License that may be reasonably requested by the Financing Parties; provided, that such changes do not alter the fundamental economic terms of this License. The Parties also agree that Licensee may assign this License to the Financing Parties as collateral, and in connection with any such assignment, Licensor agrees to execute a consent to assignment in customary form and reasonably acceptable to the Financing Parties.

18. **Confidentiality and Publicity**.

a. **Confidentiality**. If either Party provides confidential information, including business plans, strategies, financial information, proprietary, patented, licensed, copyrighted or trademarked information, and/or technical information regarding the design, operation and maintenance of the System or of Licensor's business ("**Confidential Information**") to the other or, if in the course of performing under this License or negotiating this License a Party learns Confidential Information regarding the facilities or plans of the other, the receiving Party shall (a) protect the Confidential Information from disclosure to third parties with the same degree of care accorded its own confidential and proprietary information, and (b) refrain from using such Confidential Information, except in the negotiation and performance of this License. Notwithstanding the above, a Party may provide such Confidential Information to its, officers, direetors, members, managers, employees, agents, contractors and consultants (collectively, "**Representatives**"), and affiliates, lenders, Financing Parties and potential assignees of this License (provided and on condition that such potential assignees be bound by a written agreement or legal obligation restricting use and disclosure of Confidential Information), in each case whose access is reasonably necessary to the negotiation and performance of this License. Each such recipient of Confidential Information shall be informed by the Party disclosing Confidential Information of its confidential nature and shall be directed to treat such information confidentially and shall agree to abide by these provisions. In any event, eaeh Party shall be liable (with respeet to the other Party) for any breach of this provision by any entity to whom that Party improperly discloses Confidential Information. The terms of this License (but not its execution or existence) shall be considered Confidential Information for purposes of this Seetion 18, except as set forth in Seetion 18. All Confidential Information shall remain the property of the disclosing Party and shall be returned to the disclosing Party or destroyed after the receiving Party's need for it has expired or upon the request of the disclosing Party. Each Party agrees that the disclosing Party would be irreparably injured by a breach of this Seetion 18 by the receiving Party or its Representatives or other person to whom the receiving Party discloses Confidential Information of the disclosing Party and that the disclosing Party may be entitled to equitable relief, including injunctive relief and specific performance, in the event of a breach of the provision of this Section 18. To the fullest extent permitted by applicable law, such remedies shall not be deemed to be the exclusive remedies for a breach of this Section 18 (, but shall be in addition to all other remedies available at law or in equity.

b. **Permitted Disclosures**. Notwithstanding any other provision in this License, neither Party shall be required to hold confidential any information that (i) becomes publicly available other than through the receiving Party, (ii) is required to be disclosed to a Governmental Authority under applicable law or pursuant to a validly issued subpoena (but a receiving Party subject to any such requirement shall promptly notify the disclosing Party of such requirement to the extent permitted by applicable law), (iii) is independently developed by the receiving Party, (iv) becomes available to the receiving Party without restriction from a third party under no obligation of confidentiality, or (v) requested and required to be provided under the Freedom of Information Act ("FOIA"), Conn. Gen. Stat. §§ 1-200, et. seq. If disclosure of information is required by a Governmental Authority or pursuant to FOIA, thc disclosing Party shall, to the extent permitted by applicable law, notify the other Party of such required disclosure promptly upon becoming aware of such required disclosure and shall cooperate with the other Party in efforts to limit the disclosure to the maximum extent permitted by law.

19. **Goodwill and Publicity**. Neither Party shall use any name, trade name, service mark or trademark of the other Party in any promotional or advertising material without the prior written consent of such other Party. The Parties shall coordinate and cooperate with each other when making public announcements related to the execution and existence of this License, and each Party shall have the right to promptly review, comment upon and approve any publicity materials, press releases or other public statements by the other Party that refer to, or that describe any aspect of, this License. Neither Party shall make any press release or public announcement of the specific terms of this License (except for filings or other statements or releases as may be required by applicable law) without the specific prior written eonsent of the other Party. Without limiting the generality of the foregoing, all public statements must accurately reflect the rights and obligations of the Parties under this License, including the ownership of Environmental Attributes and Environmental Incentives and any related reporting rights.

20. **General Provisions**

a. **Choice of Law**. The law of the State of Connecticut shall govern this License without giving effect to conflict of laws principles.

b. **Arbitration and Attorneys' Fees**. Any dispute arising from or relating to this License shall be arbitrated in Hartford, Connectieut. The arbitration shall be administered by the American Arbitration Association in accordance with its rules and procedures governing commereial arbitrations, and judgment on any award may be entered in any court of competent jurisdiction. If the Parties agree, a mediator may be consulted prior to arbitration. The prevailing party in any dispute arising out of this License shall be entitled to reasonable attorneys' fees and costs.

c. **Notices**. All notices under this License shall be in writing and shall be by personal delivery, electronic mail, overnight courier, or regular, certified, or registered mail, return receipt requested, and deemed received upon personal delivery, acknowledgment of receipt of electronic transmission, the promised delivery date after deposit with overnight courier, or five (5) days after deposit in the mail. Notices shall be sent to the person identified in this License at the addresses set forth in this License or such other address as either party may specify in writing. Each party shall deem a document emailed or electronically sent in PDF form to it as an original document.

d. **Survival**. Provisions of this License that should reasonably be considered to survive termination of this License shall survive. For the avoidance of doubt, surviving provisions shall include, without limitation, Section 11 (Representations and Warranties), Section 13 (Insurance Coverage), Section 12 (Licensee's Environmental Obligations), Section 15 (Indemnification and Limitations of Liability), Section 18 (Confidentiality and Publicity), Section 20(a) (Choice of Law), Section 20(b) (Arbitration and Attorneys' Fees), Section 20(c) (Notices), Section 20(g) (Comparative Negligence), Section 20(i) (No Partnership) Section 20(j) (Full Agreement, Modification, Invalidity, Counterparts, Captions) and Section 20(k) (No Third Party Beneficiaries).

e. **Further Assurances**. Each of the Parties hereto agree to provide such information, execute and deliver any instruments and documents and to take such other actions as may be necessary or reasonably requested by the other Party which are not inconsistent with the provisions of this License and which do not involve the assumptions of obligations other than those provided for in this License, to give full effect to this License and to carry out the intent of this License.

f. **Right of Waiver**. Each Party, in its sole discretion, shall have the right to waive, defer or reduce any of the requirements to which the other Party is subject under this License at any time; provided, however that neither Party shall be deemed to have waived, deferred or reduced any such requirements unless such action is in writing and signed by the waiving Party. No waiver will be implied by any usage of trade, course of dealing or course of performance. A Party's exercise of any rights hereunder shall apply only to such requirements and on such occasions as such Party may specify and shall in no event relieve the other Party of any requirements or other obligations not so specified. No failure of either Party to enforce any term of this License will be deemed to be a waiver. No exercise of any right or remedy under this License by Licensor or Licensee shall constitute a waiver of any other right or remedy contained or provided by law. Any delay or failure of a Party to exercise, or any partial exercise of, its rights and remedies under this License shall not operate to limit or otherwise affect such rights or remedies. Any waiver of performance under this License shall be limited to the specific performance waived and shall not, unless otherwise expressly stated in writing, constitute a continuous waiver or a waiver of future performance.

g. **Comparative Negligence**. It is the intent of the Parties that where negligence is determined to have been joint, contributory or concurrent, each Party shall bear the proportionate cost of any Liability.

h. **Estoppel**. Either Party hereto, without charge, at any time and from time to time, within five (5) business days after receipt of a written request by the other party hereto, shall deliver a written instrument, duly executed, certifying to such requesting party, or any other person specified by such requesting Party: (i) that this License is unmodified and in full force and effect, or if there has been any modification, that the same is in full force and effect as so modified, and identifying any such modification; (ii) whether or not to the knowledge of any such party there are then existing any offsets or defenses in favor of such party against enforcement of any of the terms, covenants and conditions of this License and, if so, specifying the same and also whether or not to the knowledge of such party the other party has observed and performed all of the terms, covenants and conditions on its part to be observed and performed, and if not, specifying the same; and (iii) such other information as may be reasonably requested by the requesting Party. Any written instrument given hereunder may be relied upon by the recipient of sueh instrument, except to the extent the recipient has aetual knowledge of facts contained in the certificate.

i. **No Partnership**. No provision of this License shall be construed or represented as creating a partnership, trust, joint venture, fiduciary or any similar relationship between the Parties. No Party is authorized to act on behalf of the other Party, and neither shall be considered the agent of the other.

j. **Full Agreement, Modification, Invalidity, Counterparts, Captions**. This License, together with any Exhibits, completely and exclusively states the agreement of the parties regarding its subject matter and supersedes all prior proposals, agreements, or other communications between the parties, oral or written, regarding its subject matter. This License may be modified only by a writing signed by both Parties. If any provision of this License is found unenforceable or invalid, such unenforceability or invalidity shall not render this License unenforceable or invalid as a whole. In such event, such provision shall be changed and interpreted so as to best accomplish the objectives of such unenforceable or invalid provision within the limits of applicable law. This License may be executed in any

number of separate eounterparts and each counterpart shall be considered an original and together shall comprise the same License. The captions or headings in this License are strictly for convenience and shall not be considered in interpreting this License.

k. **No Third Party Beneficiaries**. Except as otherwise expressly provided herein, this License and all rights hereunder are intended for the sole benefit of the Parties hereto and shall not imply or ereate any rights on the part of, or obligations to, any other Person.

Exhibit A

Permits

1. General Permit for a Municipal Transfer Station, Permit #1040888-MTSGP
2. General Permit for the Discharge of Stormwater Associated with Industrial Activity, Permit #GSI 000645
3. Current CT DEEP Consent Order No. SW-405

Exhibit B

Permits Matrix

Permit Name	Activity Requiring Permit	Authority
LOCAL		
Site Plan Review (TBD)	Proposed development requiring review for conformance with local Engineering and Construction Standards	City Planning and Zoning Commision
Inland Wetland and Watercourses Permit (Permission to Conduct a Regulated Activity)	Construction within 100' of an inland wetland or watercourse	C.G.S. Sections 22a-36 to 22a-45
Building Permit	Construction of PV System and Site Development	State Building Code and Zoning Regulations.
Electrical Permit	Construction of PV System will involve electrical elements	State Building Code and Zoning Regulations.
Sign Permit (TBD)	Construction of free-standing and/or mounted sign	State Building Code and Zoning Regulations.
Street Opening Permit (TBD)	All construction within a City ROW	State Building Code and Zoning Regulations.
STATE		
Authorization Application for Disruption of a Solid Waste Disposal Area	Disturbance (excavation, boring, regrading, etc.) or removal of deposited solid waste material, including cover material.	Regulations of Connecticut State Agencies (RSCA) Section 22a-209-7(u)
Post Closure Use	Redevelopment of a closed solid waste disposal areas for use as a renewable energy facility.	Regulations of Connecticut State Agencies (RSCA) Section 22a-209-13(d)
Certificate of Environmental Compatibility and Public Need - Declaratory Ruling (Connecticut Siting Council)	Construction of a renewable energy facility under CGS 16-50i (a) (3)	CGS 16-50g - 16-50aa CGS 16a-7c CGS 16-50j-1 - 16-50z-4

General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities	All discharges of stormwater and dewatering wastewater from construction activities which result in the disturbance of one or more total acres of land area on a site	C.G.S. Section 22a-430b
Connecticut Natural Diversity Database Endangered and Threatened Species	Activities within shaded area on CTDEEP Natural Diversity Database (NDDB) map or is less than 1/2-mile from a shaded area.	C.G.A.Section 26-310 (a)
State Historic Preservation Office	Cultural resources/historic properties, including those on or eligible for listing in the National Register of Historic Places, in the project's Identified Area of Potential Effect (APE)	CGS Section 10-392
FEDERAL		
FAA Form 7640-1 (TBD)	Construction of a structure which exceeds 200' in height	
U.S. Army Corps of Engineers General Permit (TBD)	Structures within jurisdictional limits	

APPENDIX B

Request for Post Closure Use

ESTABLISHED 1659
CITY OF NORWICH
CONNECTICUT

JOHN BILDA
ACTING CITY MANAGER
(860) 823-3747

100 Broadway
Norwich, CT 06360
Fax (860) 885-2131

October 7, 2015

David McKeegan
Solid Waste Permitting
Waste Engineering and Enforcement Division
Bureau of Materials Management and Compliance Assurance
Connecticut Department of Energy and Environmental Protection
79 Elm Street,
Hartford, CT 06106-5127

RE: Request for Post Closure Use
Rodgers Road Landfill
Norwich, Connecticut

In accordance with Regulations of Connecticut State Agencies (RCSA) Section 22a-209-13(d), the City of Norwich (City) is requesting a modification to the Post Closure Use for the former Norwich Bulky Waste landfill and the former Norwich Municipal Solid Waste (MSW) landfill both located on municipal property along Rodgers Road in Norwich, CT. The landfill closures were approved in April of 2000 (Bulky Waste landfill) and September of 1997 (MSW landfill). Since then the landfills have had restricted access by the public and have remained vacant and un-utilized. The City has maintained the landfills since their closure. An opportunity to develop portions of the inactive closed landfills for a source of renewable energy through ballast-mounted solar arrays has become available to the City via SolarCity's PPA with CMEEC. As a result of this unique opportunity, the City of Norwich is requesting a modification to their existing Post-Closure Use of the former bulky waste and MSW landfills located along Rodgers Road to include the solar development.

As part of Public Act 11-80 – Renewable Connections Program (RCP), SolarCity Corporation, through a lease arrangement with the City of Norwich is proposing the construction of an approximate 1.49 MW (DC) of fixed, passive solar arrays on the landfill caps. The footprint of the arrays will be located on the flattest areas of the landfills, encompassing approximately 2.5 acres of area on the bulky waste landfill and 2.6 acres of area on the MSW landfill. The 1.49 MW arrays will use approximately 4,800 photovoltaic (PV) modules mounted on a ballasted racking system set on concrete foundation ballasts placed on top of the existing vegetative cover of the landfills. Rows of assemblies will be connected to pad-mounted inverter/transformers. Based on the number of PV modules proposed, approximately 545 concrete

foundations are currently proposed. The arrays will ultimately connect to two pad-mounted inverter stations with transformers (one on each landfill), to be located within the central part of the solar array configuration. The concrete pads for the inverters will not penetrate the landfill's low permeability final geomembrane and/or soil caps. The area to be modified with the solar arrays is shown on the attached figure.

Access to the array will be through a locked gates located at the base of the landfill. An existing gravel road that currently extends to the top of the landfill will be upgraded and slightly extended in order to provide access to the landfill cap during the construction, and subsequent maintenance, of the solar arrays. The permanent roads will include a minimum of 18 inches of gravel overlying a woven geotextile.

The proposed modification to the landfill will not require any changes to the existing, approved Operations and Maintenance Plan. Current monitoring and maintenance includes maintenance of the final cover, inspections for signs of erosion, settling, subsidence, odors, integrity of the final cover and maintenance of the groundwater system and semiannual sampling and analysis of groundwater.

We appreciate all of your help to date and look forward to making this exciting project a reality in the near future.

Sincerely,

John Bilda
City of Norwich
Acting City Manager

APPENDIX C

Landfill Closure Documentation

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

November 4, 1997

Mr. Joseph Loyacano
Director of Public Works
50 Clinton Avenue
Norwich, CT 06360

Dear Mr. Loyacano:

By this letter, the DEP Waste Management Bureau approves the completed closure of the Norwich landfill located at Rogers Road in Norwich, CT. As indicated in the as-built site closure plans the closure was completed in accordance with the Norwich Landfill Closure Plan, approved by the DEP by issuance of solid waste permit no. 104-1-0 dated November 14, 1986. The site has been graded, covered and seeded and the proper recording made on the site deed of record.

This letter only approves the capping and closure of the municipal solid waste portion of the landfill in accordance with Solid Waste Management Regulations. As you are aware, corrective action for water quality problems may be necessary, and sludge compost storage issues and the bulky waste disposal area still need to be addressed.

As required by solid waste permit no. 104-1-0, the permittee shall continue to monitor ground and surface water quality at the site and submit those reports to the DEP, Waste Management Bureau.

Thank you for your cooperation in completing this closure in a timely manner. Should you have any further questions, please contact Mr. Gene MacGillis at (860) 424-3561.

Sincerely,

Richard J. Barlow

Richard J. Barlow
Chief
Bureau of Waste Management

RJB:JF:ds

FILE COPY

Fuss & O'Neill Inc. Consulting Engineers

146 Hartford Road Manchester CT 06040-5927
tel 860 646-2469 fax 860 643-6313

1200 Converse Street Longmeadow, MA 01106-1721
tel 413 567-9886 fax 413 567-8936

Providence, RI tel 401 828-3510

September 12, 1997

Mr. Richard Barlow
Department of Environmental Protection
Chief, Waste Management Bureau
Waste Engineering and Enforcement Division
79 Elm Street
Hartford, CT 06106-5127

Re: Certification of Closure
Rogers Road Municipal Solid Waste Landfill
Norwich, Connecticut

Dear Mr. Barlow,

In accordance with the requirements of the Solid Waste Management Regulations Section 22a-209-13 and your June 25, 1996 Authorization for Closure, please find enclosed the as-built map and certified true copy of the closure description of the referenced landfill filed with the Norwich City Clerk.

The grading and closure of the referenced landfill was constructed in general conformance with the Landfill Closure Plan and Addendum 1 Engineering Evaluation of Landfill Capping Alternatives, both documents dated April 1996, approved by the Connecticut Department of Environmental Protection (CTDEP), Waste Engineering and Enforcement Division on June 25, 1996.

The general contractor who performed the closure work for the City of Norwich, Nutmeg Gravel & Excavating, Inc., of Franklin, Connecticut, began the closure work on October 19, 1996 and was substantially complete on June 30, 1997. A representative from the City observed daily construction activities, while Fuss & O'Neill provided general construction observation and contract administration services.

Sincerely,

Richard D. Jones, P.E.
Senior Vice President, Director of
Solid Waste Services

Enclosures As-Built Map
Landfill Closure Description

c: Mr. Joseph Loyacano, City of Norwich

C:\WINDOWS\TEMP\FPP010A.WPD
Correl.

Fuss & O'Neill Inc.
146 Hartford Road, Manchester, CT 06040

LANDFILL CLOSURE DESCRIPTION

Norwich Municipal Solid Waste Landfill
Rogers Road
Norwich, Connecticut

August 1997

1. The landfill closure, set forth under Regulations of Connecticut State Agencies Section 22a-209-13, was constructed in general conformance with the Landfill Closure Plan and Addendum 1 Engineering Evaluation of Landfill Capping Alternatives, both documents dated April 1996, approved by the Connecticut Department of Environmental Protection (CTDEP), Waste Engineering and Enforcement Division on June 25, 1996.

2. In accordance with the Connecticut General Statutes, a permit was issued to Seymour Adelman, President of Seymour's Sand and Stone, Inc., by the CTDEP on August 19, 1974 for the establishment of a private solid waste disposal area north of Rogers Road. The disposal of solid waste within the subject landfill began in November 1974.

3. The disposal area footprint is approximately eleven (11) acres in area.

4. The disposal facility accepted municipal solid waste and wastewater treatment plant sludge from the City of Norwich, Connecticut.

5. The depth of waste materials below the landfill cover ranges from approximately 0 feet to a maximum 80 feet.

6. The side slopes of the landfill were covered with a minimum thickness of 24 inches of soil material which includes an 18-inch thick barrier soil layer having a hydraulic conductivity of 1×10^{-6} centimeters per second or less. The top of the landfill was covered with a 40-mil. thick, textured linear low-density polyethylene (LLDPE) geomembrane cap and a minimum thickness of 24 inches of soil materials, in accordance with the conditions of the Authorization for Closure.

7. As-built final grading of the closed landfill disposal area was prepared on plan entitled, "Plan prepared for Nutmeg Gravel & Excavating Inc., Record Drawing Final Condition, Norwich Landfill", Sheet 1 of 1, at a scale 1"=40', prepared by Anchor Engineering Services, Inc., 7/8/97, revised 8/12/97 and 8/21/97.

Prepared by:

Frederick P. Pike, P.E.
Senior Project Civil Engineer

September 4, 1997
Date

RECEIVED FOR RECORD AT NORWICH, CONN.
ON 9-8-97 AT 11:00 A.M.
ATTEST: BEVERLY D. MURDOCK, TOWN CLERK

Fuss & O'Neill Inc. *Consulting Engineers*

146 Hartford Road, Manchester, CT 06040-5921
TEL 860 646-2469 FAX 860 643-6313

1200 Converse Street, Longmeadow, MA 01106-1721
TEL 413 567-9886 FAX 413 567-8936

Providence, RI TEL 401 828-3510

July 3, 1997

Mr. Joseph Faryniarz, Environmental Analyst III
Waste Engineering and Enforcement Division
Waste Management Bureau
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

RECEIVED

JUL 07 1997

DEP-WASTE MANAGEMENT BUREA
WASTE ENGINEERING & ENFORCEMEN
SOLID WASTE

RE: Rogers Road Landfill Closure
Norwich, CT

Dear Mr. Faryniarz:

Please be advised the landfill was seeded and stablized as of June 30, 1997. The landfill was determined to be substantially complete following inspections undertaken on June 28, 1997 and June 30, 1997.

In accordance with Sec. 22a-209-13 RSCA and the Authorization for Closure of the landfill, closure documentation will be furnished to the Department within 90 days.

Sincerely,

Frederick P. Pike, P.E.
Senior Project Civil Engineer

c: Thomas O'Connor, Water Management Bureau
Steve Garstka, City of Norwich

F:\P90\90464\A2\FPP0703B.WPD
Corres.

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

AUTHORIZATION FOR CLOSURE
OF A SOLID WASTE DISPOSAL AREA
TOWN OF NORWICH, CONNECTICUT

Pursuant to Connecticut General Statutes (CGS) Section 22a-208-a and Regulations of Connecticut State Agencies (RCSA) Section 22a-209-13, the Department of Environmental Protection (DEP) hereby authorizes the Town of Norwich, Connecticut (applicant) to regrade and close a solid waste disposal area (facility) located off of Rogers Road, Norwich, CT. Two acres of the existing approximately 11.4 acre landfill are to be regraded, covered with a six-inch subbase layer; overlain, by a LLDPE textured geo-membrane liner; overlain by a geo-composite draining layer consisting of an HPDE drainage net heat bonded between two layers of geo-textile; overlain by 18 inches of cover soil having a permeability greater than 1×10^{-5} cm/sec and a six-inch vegetative support layer. 6.4 acres of the landfill, primarily slopes along the southern and western slopes, is to be regraded, covered with a six-inch subbase layer; overlain by 18 inches of final cover soil having a permeability of less than 1×10^{-6} cm/sec; and a six-inch vegetative layer. An existing soil cap covers the remaining approximately three acres along the northern and northeastern slopes of the landfill as specified in item 1.c. below.

1. The facility shall be closed in accordance with the following:

   a. A document entitled "Project Manual - Contract Documents for Landfill Closure Plan, City of Norwich, Rogers Road, Norwich, Connecticut - April 1996" prepared for the applicant by Fuss & O'Neill, Inc. Consulting Engineers, and received by Connecticut DEP, Waste Management Bureau (WMB) on April 17, 1996;

   b. A document entitled "Stormwater Pollution Control Plan for Closure Construction at the Municipal Solid Waste Landfill - Rogers Road, Norwich, Connecticut - April 1996" prepared by Fuss & O'Neill, Inc., and received by the WMB on May 22, 1996.

   c. A document entitled "Addendum 1 - Engineering Evaluation of Landfill Capping Alternatives for the Rogers Road Landfill - City of Norwich - Norwich, Connecticut April 1996," prepared by Fuss & O'Neill, Inc. and received by WMB on May 16, 1996.

2. The landfill closure, to be done in accordance withe the closure documents identified in paragraph 1. above, shall be completed and the area seeded and stabilized by October 9, 1996.

3. Initiation of site regrading and final cover activities shall not commence until the DEP WMB is notified in writing at least one week prior to the construction, so that a field inspector may be present during closure.

4. The Permittee shall apply with Section 22a-209-13 Regulations of Connecticut State Agencies (RCSA), for any post closure use of this property.

5. As-built site plans shall be provided upon the completion of the landfill closure in accordance with Section 22a-209-13 (f) RCSA. The as-built plan shall include certification by a professional engineer registered in the state of Connecticut that the grading and closure has been accomplished in accordance with the closure documents identified in paragraph 1. of this authorization.

   A detailed description of the disposal area shall also be filed at town hall with the property records in accordance with Section 22a-209-13 (g) RCSA and shall include a reference to restricted use per Section 22a-209-13(d) RCSA.

6. This authorization is subject to and in no way derogates any present or future property rights or powers of the State of Connecticut and conveys no property rights in real estate or material nor any exclusive privileges and is further subject to any and all public and private rights and to any federal, state or local laws or regulations pertinent to the property or activity affected hereby.

7. This authorization may be revoked, suspended or modified in accordance with law.

8. When this authorization requires that any document be submitted to the DEP, such document shall be delivered to: DEP, Waste Management Bureau, Waste Engineering and Enforcement Division, 79 Elm Street, Hartford, CT 06106-5127.

Dated in Hartford, Connecticut this 25TH day of JUNE, 1996

Richard J. Barlow
Chief
Waste Management Bureau

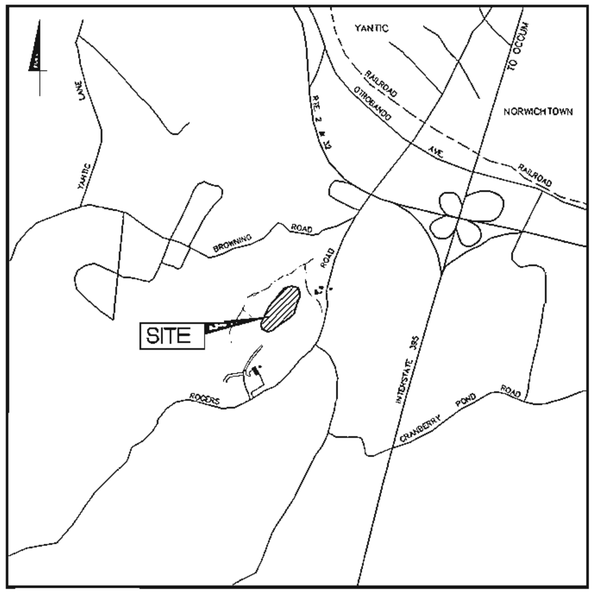
SJH:JF:ehd

CONSTRUCTION PLANS

FOR

NORWICH LANDFILL CLOSURE

APRIL 1996



LOCATION MAP

SCALE: 1"= 1000'

SHEET INDEX

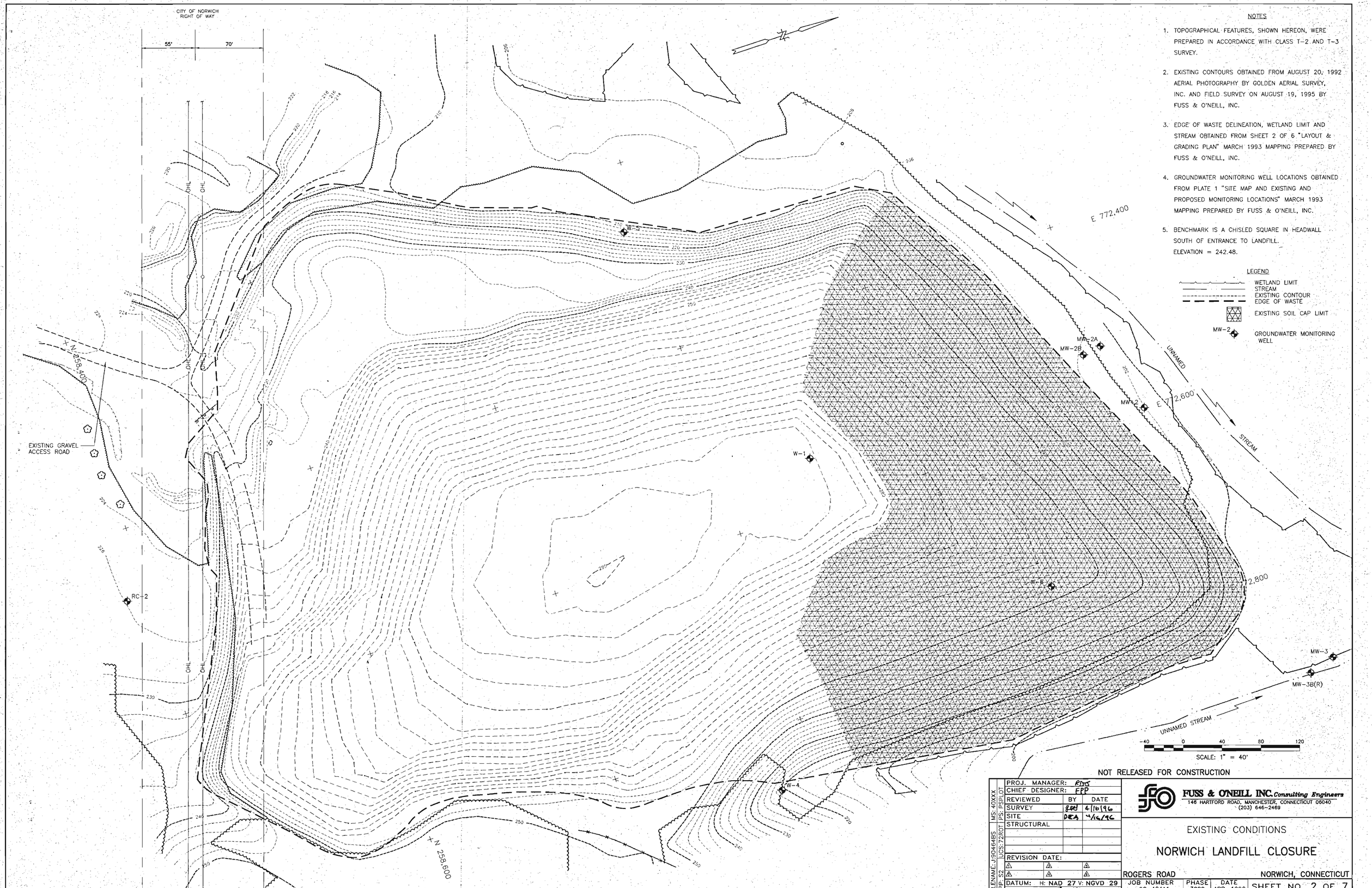
SHEET	TITLE
1	TITLE SHEET
2	EXISTING CONDITIONS
3	LAYOUT & GRADING PLAN
4–6	SITE DETAILS
7	EROSION CONTROL PLAN

TOWN OF NORWICH

ROGERS ROAD
NORWICH, CONNECTICUT 06360

FUSS&O'NEILL
consulting engineers
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040
(203) 646-2469

FILENAME: 90464COV.DWG



NOTES

1. TOPOGRAPHICAL FEATURES, SHOWN HEREON, WERE PREPARED IN ACCORDANCE WITH CLASS T-2 AND T-3 SURVEY.
2. EXISTING CONTOURS OBTAINED FROM AUGUST 20, 1992 AERIAL PHOTOGRAPHY BY GOLDEN AERIAL SURVEY, INC. AND FIELD SURVEY ON AUGUST 19, 1995 BY FUSS & O'NEILL, INC.
3. EDGE OF WASTE DELINEATION, WETLAND LIMIT AND STREAM OBTAINED FROM SHEET 2 OF 6 "LAYOUT & GRADING PLAN" MARCH 1993 MAPPING PREPARED BY FUSS & O'NEILL, INC.
4. GROUNDWATER MONITORING WELL LOCATIONS OBTAINED FROM PLATE 1 "SITE MAP AND EXISTING AND PROPOSED MONITORING LOCATIONS" MARCH 1993 MAPPING PREPARED BY FUSS & O'NEILL, INC.
5. BENCHMARK IS A CHISLED SQUARE IN HEADWALL SOUTH OF ENTRANCE TO LANDFILL. ELEVATION = 242.48.

LEGEND

- WETLAND LIMIT
- STREAM
- EXISTING CONTOUR
- EDGE OF WASTE
- EXISTING SOIL CAP LIMIT
- MW-2 GROUNDWATER MONITORING WELL

NOT RELEASED FOR CONSTRUCTION

PROJ. MANAGER: RDJ		
CHIEF DESIGNER: FPP		
REVIEWED	BY	DATE
SURVEY	RDJ	4/16/96
SITE	DEA	4/16/96
STRUCTURAL		
REVISION DATE:		
DATUM: H: NAD 27 V: NGVD 29		
SCALE: 1" = 40'		

FILENAME: J:90464BS MS: 40XXX
PPP: S2 UCS: 72ROT PS: PSPLOT

FUSS & O'NEILL INC. Consulting Engineers
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040
(203) 646-2469

EXISTING CONDITIONS

NORWICH LANDFILL CLOSURE

ROGERS ROAD NORWICH, CONNECTICUT

JOB NUMBER	PHASE	DATE	
90-464A1	3000	APR. 1996	SHEET NO. 2 OF 7

CONTRACTOR TO RELOCATE EXISTING WINDROW OF COMPOSED LEAVES PRIOR TO CONSTRUCTION OF DETENTION BASIN BERM AS DIRECTED BY THE OWNER.

CITY OF NORWICH RIGHT OF WAY

55' 70'

TOP OF BASIN ELEVATION 217.0 5' WIDE

50' WIDE EMERGENCY SPILLWAY, TOP ELEVATION 215.3

18" X 29" REINFORCED CONCRETE ARCH CULVERT INLET = 209.0, OUTLET = 208.0

STILLING BASIN, SEE DETAIL SHEET 6

LEVEL SPREADER, SEE DETAIL SHEET 6

PLACE MODIFIED RIPRAP L=15' ALONG BASIN SLOPE

PROPOSED DETENTION BASIN

OUTLET STRUCTURE (SEE DETAIL SHEET 6)

12" ACCMP CULVERT WITH FLARED END SECTION INLET 215.8 OUTLET 214.5

MW-102A MW-102B

END OF GRAVEL ROAD

BEGIN DIVERSION DITCH ELEVATION 226.5

ABANDON WELL

BEGIN 6' WIDE BOTTOM GRASS DITCH MODIFIED AFTER RIPRAP

APPROX. 500' TO PROPOSED ANTI-TRACKING APRON. SEE NOTE 5 THIS SHEET AND DETAIL ON SHEET 5.

PLACE MODIFIED RIPRAP, L=15' ALONG CHANNEL BOTTOM

BEGIN 2' WIDE GRASS BOTTOM DITCH

BEGIN 4' WIDE BOTTOM MODIFIED RIPRAP CHANNEL

BEGIN DIVERSION DITCH ELEVATION 250.0

BEGIN DIVERSION DITCH ELEVATION 275.0

TOE DRAIN OUTFALL 276.5

EXTEND CAP TOE DRAIN OUTFALL TO DIVERSION DITCH

ABANDON WELL

SUBSURFACE HDPE GAS COLLECTION PIPE

PERFORATED CAP TOE DRAIN

MW-101A

MW-2A MW-2B MW-2D MW-2

UNNAMED STREAM

E 772,400

E 772,600

N 258,400

REMOVE GATE

EXISTING GRAVEL ACCESS ROAD

BEGIN GRAVEL ACCESS DRIVE

30" ACCMP CULVERT WITH FLARED END SECTION INLET 221.0 OUTLET 220.0

24" ACCMP CULVERT WITH FLARED END SECTION INLET 223.5 OUTLET 220.0

BEGIN 4' WIDE BOTTOM GRASS DITCH

FC-2

BEGIN 2' WIDE BOTTOM GRASS DITCH AFTER MODIFIED RIPRAP CHANNEL ELEV. 226.0

PROPOSED GAS RISER VENT

PROPOSED GAS RISER VENT

END GRAVEL ACCESS ROAD

TOE DRAIN OUTFALL 276.0

EXTEND CAP TOE DRAIN OUTFALL TO DIVERSION DITCH

BEGIN DIVERSION DITCH ELEVATION 275.0

BEGIN 4' WIDE BOTTOM MODIFIED RIPRAP DITCH

PROPOSED SUBSURFACE GAS VENT SEE

PROPOSED GRAVEL ACCESS ROAD

BEGIN 2' WIDE BOTTOM MODIFIED RIPRAP DITCH ELEVATION 278.0

TOE DRAIN OUTFALL 278.5

INSTALL EROSION CONTROL MAT AT TOE DRAIN OUTFALL

PLACE MODIFIED RIPRAP, L = 10' ALONG CHANNEL BOTTOM

MW-4

MW-103A

MW-103D

ABANDON WELL

LIMIT OF WORK

BEGIN 2' WIDE BOTTOM MODIFIED RIPRAP DITCH ELEV. 246.0

BEGIN 2' WIDE BOTTOM GRASS DITCH ELEVATION 251.0

N 258,600

MW-3D MW-3 MW-3B(R)

UNNAMED STREAM

2,800

NOTES:

1. TOPOGRAPHICAL FEATURES, SHOWN HEREON, WERE PREPARED IN ACCORDANCE WITH CLASS T-2 AND T-3 SURVEY.
2. EXISTING CONTOURS OBTAINED FROM AUGUST 20, 1992 AERIAL PHOTOGRAPHY BY GOLDEN AERIAL SURVEY, INC. AND FIELD SURVEY ON AUGUST 19, 1995 BY FUSS & O'NEILL, INC.
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4. GROUNDWATER MONITORING WELL LOCATIONS OBTAINED FROM PLATE 1 "SITE MAP AND EXISTING AND PROPOSED MONITORING LOCATIONS" MARCH 1993 MAPPING PREPARED BY FUSS & O'NEILL, INC.
5. WORK LIMIT SHALL INCLUDE CONSTRUCTION AND MAINTENANCE OF ANTI-TRACKING APRON ALONG EXISTING ACCESS ROAD NORTH OF SCALE HOUSE.
6. BENCHMARK IS A CHISLED SQUARE IN HEADWALL SOUTH OF ENTRANCE TO LANDFILL. ELEVATION = 242.48.

LEGEND

- WETLAND LIMIT
- STREAM
- EXISTING CONTOUR
- EDGE OF WASTE
- EDGE OF LINER
- LIMIT OF WORK
- 260 PROPOSED FINAL CONTOUR
- FML CAP LIMIT
- EXISTING SOIL CAP LIMIT
- MW-2 GROUNDWATER MONITORING WELL
- SUBSURFACE GAS VENT
- GAS RISER VENT
- 276.5-X CAP TOE DRAIN INVERT ELEV.
- +275.0 DIVERSION DITCH FLOW ELEVATION
- MW-2D PROPOSED MONITORING WELL (UNDER SEPARATE CONTRACT)

-40 0 40 80 120

SCALE: 1" = 40'

PROJ. MANAGER: RDS			
CHIEF DESIGNER: FPP			
REVIEWED	BY	DATE	
SURVEY	EDS	4/16/96	
SITE	DEA	4/16/96	
STRUCTURAL			
REVISION DATE:			
DATUM: H: NAD 27 V: NGVD 29			
SCALE: 1" = 40'			

MS: MV40-T,B PS: PSPLOT UCS: 72ROT FILENAME: J:\90464BS PPP: S3

FUSS & O'NEILL INC. Consulting Engineers
148 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040
(203) 646-2469

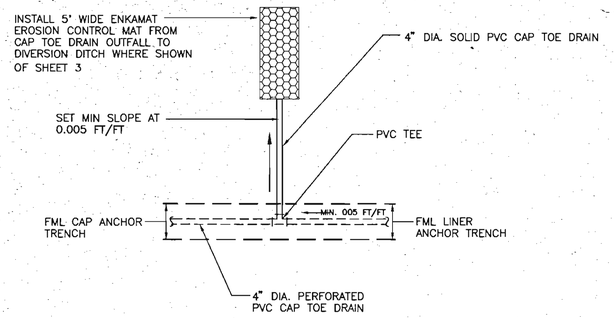
LAYOUT & GRADING PLAN

NORWICH LANDFILL CLOSURE

ROGERS ROAD NORWICH, CONNECTICUT

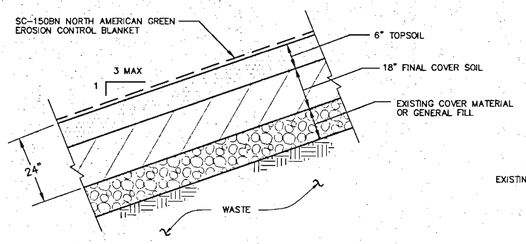
JOB NUMBER	PHASE	DATE
90-464A1	3000	APR. 1996

SHEET NO. 3 OF 7



CAP TOE DRAIN OUTFALL DETAIL

N.T.S.



TYPICAL SOIL CAP SECTION

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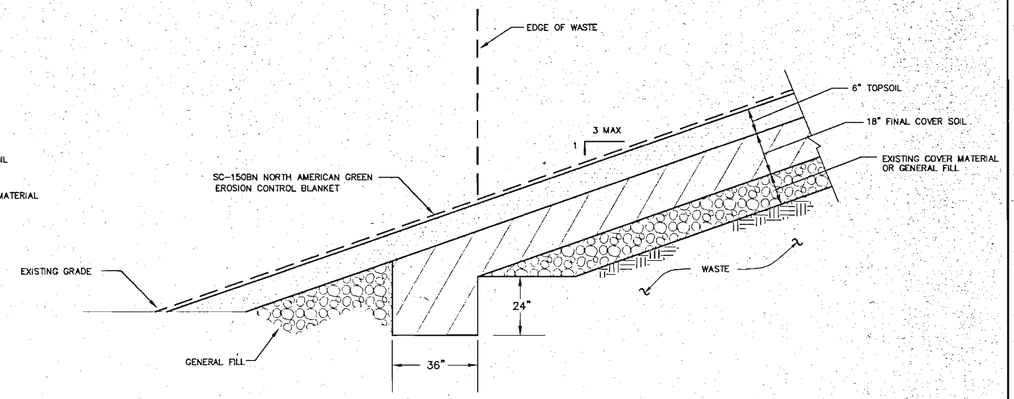

SOIL CAP "KEY IN" DETAIL

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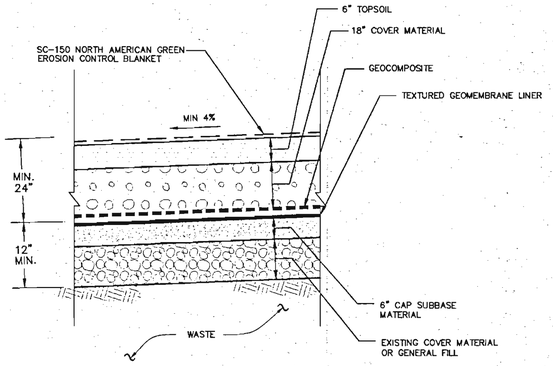
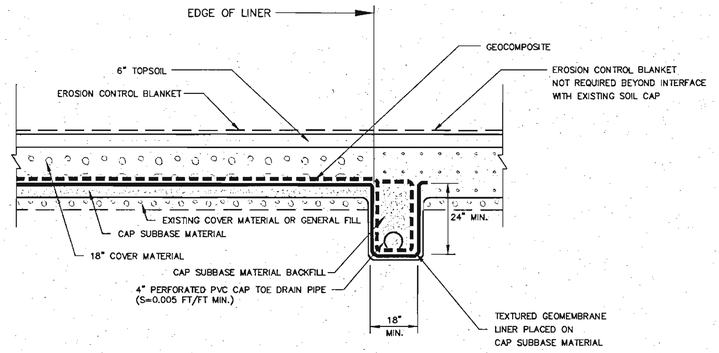


TYPICAL FML CAP SECTION

N.T.S.



FML CAP AND SOIL CAP INTERFACE

N.T.S.

FILENAME: J90464DL
PPP: S4
UCS: W
PS: PSPLOT
MS: S4XXX

PROJ. MANAGER: ROS		
CHIEF DESIGNER: FPP		
REVIEWED	BY	DATE
SURVEY		
SITE	DEA	4/16/96
STRUCTURAL		
REVISION DATE:		
DATUM: H: V:		
SCALE: AS NOTED		

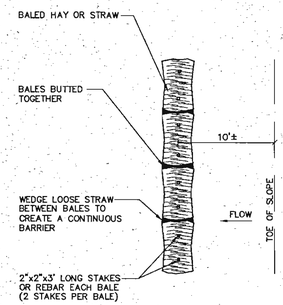
FUSS & O'NEILL INC. Consulting Engineers
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040
(203) 646-2469

SITE DETAILS

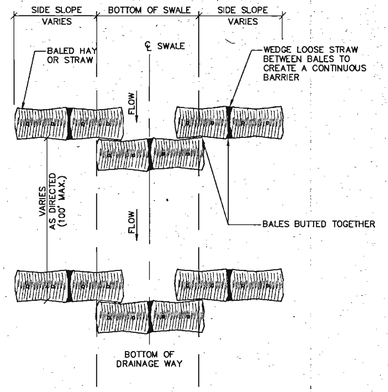
NORWICH LANDFILL CLOSURE

ROGERS ROAD — NORWICH, CONNECTICUT

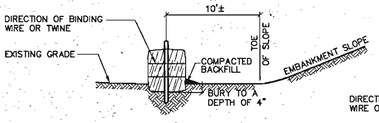
JOB NUMBER	PHASE	DATE	SHEET NO.
90-464A1	3000	APR. 1996	4 OF 7



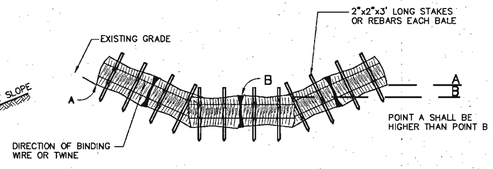
PLAN



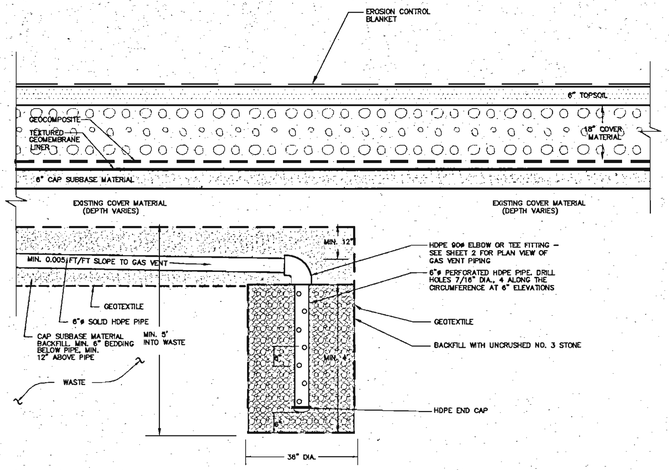
PLAN



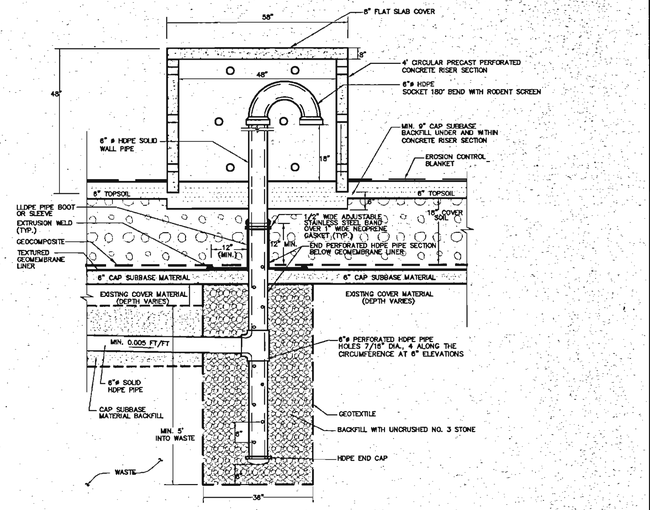
SECTION AT TOE OF SLOPE



SECTION AT SWALE

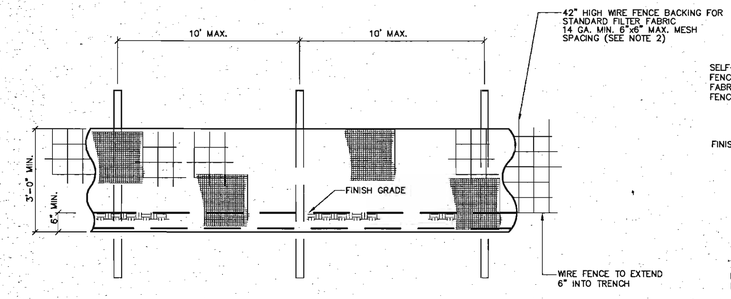


SUBSURFACE GAS VENT
N.T.S.

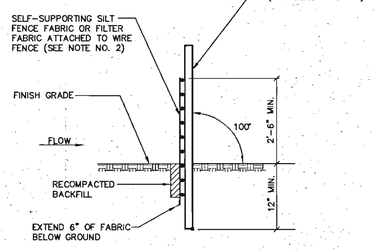


GAS RISER VENT
N.T.S.

HAYBALES
N.T.S.



ELEVATION



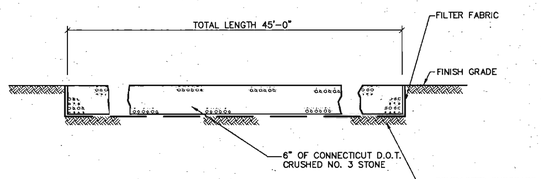
SECTION

NOTES:

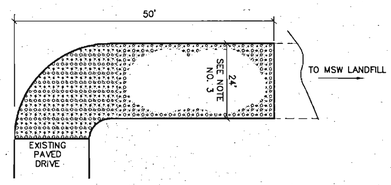
1.) INSTALL SILT FENCE & WOOD STAKES AS RECOMMENDED BY MANUFACTURER.

2.) SILT FENCE SUBJECT TO HEAVY LOADS SHALL BE REINFORCED WITH FARM FENCING & STEEL POSTS (0.5 POUNDS STEEL / LIN. FT.) THE MINIMUM POST LENGTH SHALL BE 5'-0".

SILT FENCE
N.T.S.



SECTION



LOCATION PLAN

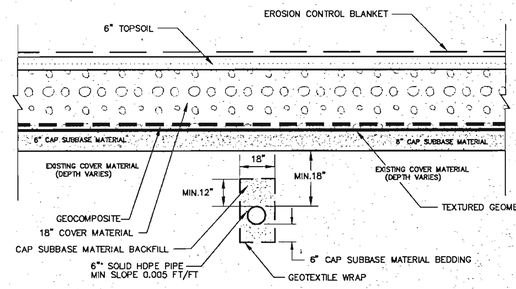
NOTES:

1.) MAINTAIN ANTI-TRACKING PAVEMENT IN GOOD CONDITION THROUGHOUT CONSTRUCTION PERIOD.

2.) ADJACENT ROADWAY PAVEMENT SHALL BE SWEPT DAILY TO REMOVE ANY MATERIAL THAT MAY BE TRACKED ONTO PAVEMENT.

3.) WIDTH OF APRON SHALL NOT BE LESS THAN WIDTH OF INGRESS OR EGRESS.

ANTI-TRACKING APRON
N.T.S.



TYPICAL SECTION – GAS VENTING COLLECTION PIPE
N.T.S.

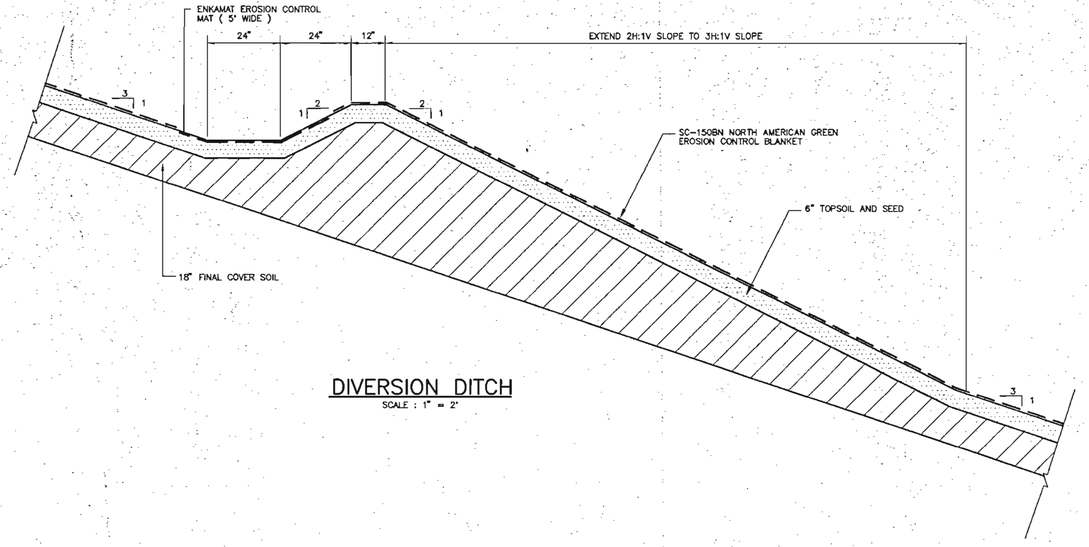
MS: PLOT PS:	PROJ. MANAGER: ROS		
	CHIEF DESIGNER: FPP		
	REVIEWED	BY	DATE
	SURVEY		
	SITE	DEA	4/16/96
	STRUCTURAL		
UCS:	REVISION DATE:		
	⚠	⚠	⚠
	⚠	⚠	⚠
FILENAME: J:90464D1.2 PPP: xxx	DATUM: H:	V:	
	SCALE: AS NOTED		

FUSS & O'NEILL INC. Consulting Engineers
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040
(203) 646-2469

SITE DETAILS
NORWICH LANDFILL CLOSURE

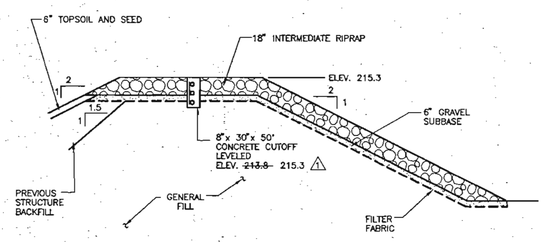
ROGERS ROAD — NORWICH, CONNECTICUT

JOB NUMBER	PHASE	DATE	SHEET NO.
90-464A1	3000	APR. 1996	5 OF 7



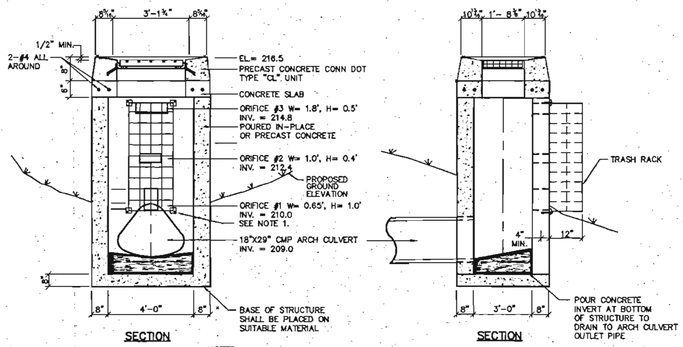
DIVERSION DITCH

SCALE : 1" = 2'



TYPICAL EMERGENCY SPILLWAY SECTION

N.T.S.

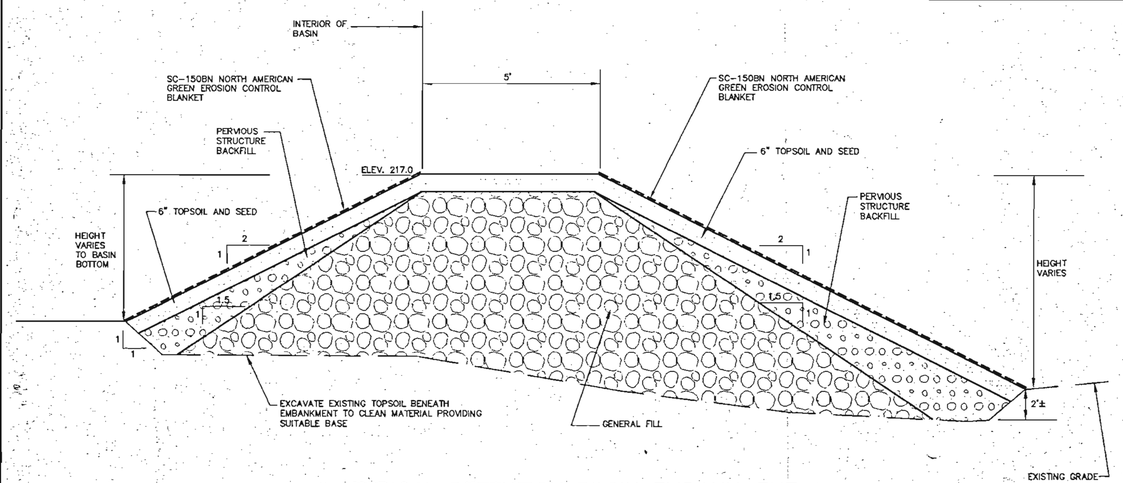


NOTES:

1. CONSTRUCT TRASH RACK 2'± x 5.3'± x 1' OVER ORIFICE OPENINGS. #3 BARS AT 6"±c. WELD TO ANGLES 2"x2"x1/4" AND BOLT TO STRUCTURE USING 3/8" EXPANSION ANCHORS. TACK WELD BARS.
2. ALL COMPONENTS SHALL BE MORTARED AND ALL METAL FITTINGS SHALL BE SET IN A FULL MORTAR BED.

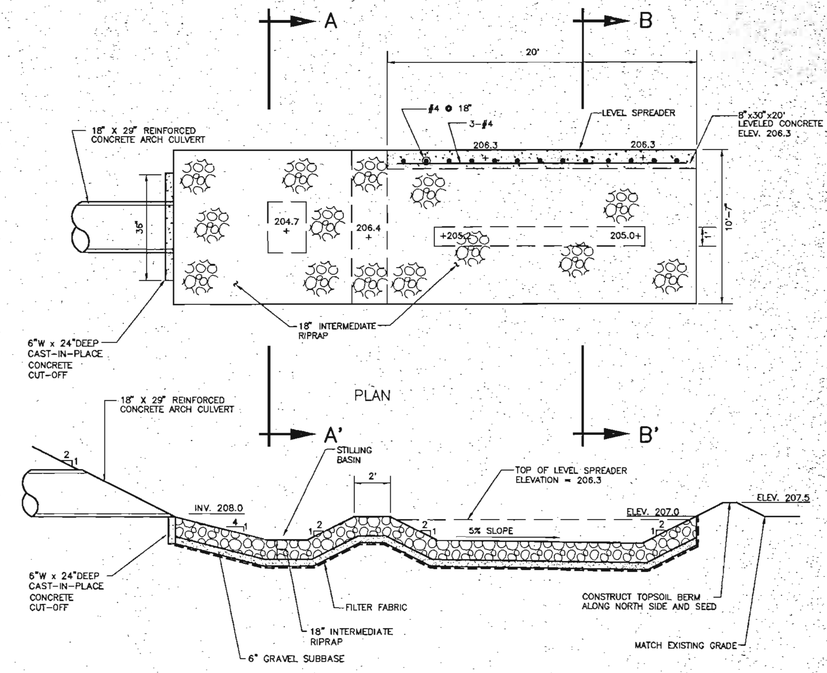
DETENTION BASIN OUTFALL STRUCTURE

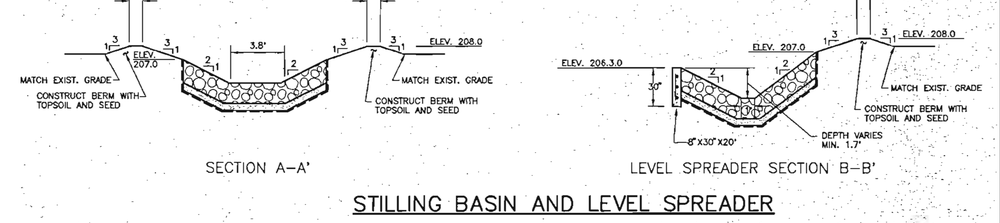
N.T.S.



TYPICAL DETENTION BASIN EMBANKMENT

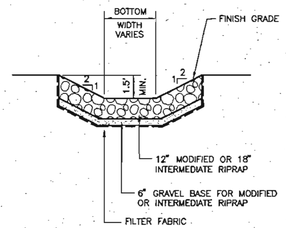
N.T.S.





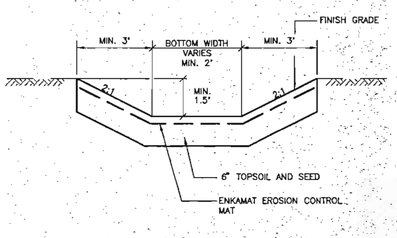
STILLING BASIN AND LEVEL SPREADER

N.T.S.



RIPRAP DITCH

N.T.S.



GRASS DITCH

N.T.S.

PROJ. MANAGER:	EOS		
CHIEF DESIGNER:	FPP		
REVIEWED	BY	DATE	
SURVEY			
SITE	DCA	8/5/96	
STRUCTURAL			
REVISION DATE:			
⚠ 8/2/96	⚠	⚠	
⚠	⚠	⚠	
DATUM: H:	V:		
SCALE: AS NOTED			

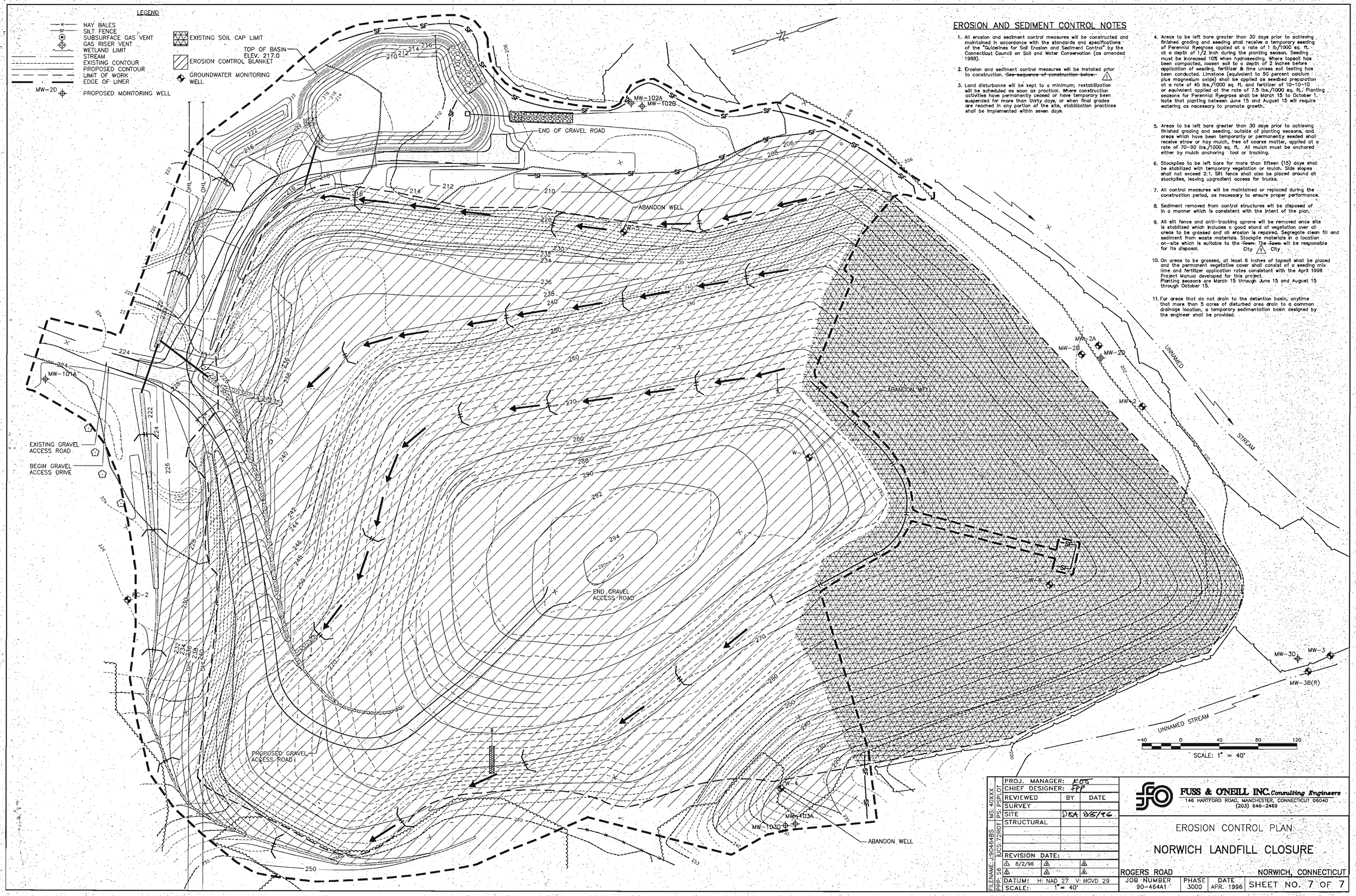
MS: PLOT
PS:
FILENAME: J:\90464D4
PPP: xxx
UCS:

FUSS & O'NEILL INC. Consulting Engineers
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040
(203) 646-2469

SITE DETAILS
NORWICH LANDFILL CLOSURE

ROGERS ROAD — NORWICH, CONNECTICUT

JOB NUMBER	PHASE	DATE	SHEET NO.
90-464A1	3000	APR. 1996	6 OF 7



EROSION AND SEDIMENT CONTROL NOTES

1. All erosion and sediment control measures will be constructed and maintained in accordance with the standards and specifications of the "Guidelines for Soil Erosion and Sediment Control" by the Connecticut Council on Soil and Water Conservation (as amended 1988).
2. Erosion and sediment control measures will be installed prior to construction. ~~See sequence of construction below.~~ 1
3. Land disturbance will be kept to a minimum; restabilization will be scheduled as soon as practical. Where construction activities have permanently ceased or have temporary been suspended for more than thirty days, or when final grades are reached in any portion of the site, stabilization practices shall be implemented within seven days.
4. Areas to be left bare greater than 30 days prior to achieving finished grading and seeding shall receive a temporary seeding of Perennial Ryegrass applied at a rate of 1 lb/1000 sq. ft. at a depth of 1/2 inch during the planting season. Seeding must be increased 10% when hydroseeding. Where topsoil has been compacted, loosen soil to a depth of 2 inches before application of seeding, fertilizer & lime unless soil testing has been conducted. Limstone (equivalent to 50 percent calcium plus magnesium oxide) shall be applied as seedbed preparation at a rate of 45 lbs./1000 sq. ft. and fertilizer of 10-10-10 or equivalent applied at the rate of 7.5 lbs./1000 sq. ft.. Planting seasons for Perennial Ryegrass shall be March 15 to October 1. Note that planting between June 15 and August 15 will require watering as necessary to promote growth.
5. Areas to be left bare greater than 30 days prior to achieving finished grading and seeding, outside of planting seasons, and areas which have been temporarily or permanently seeded shall receive straw or hay mulch, free of coarse matter, applied at a rate of 70-90 lbs./1000 sq. ft. All mulch must be anchored either by mulch anchoring tool or tracking.
6. Stockpiles to be left bare for more than fifteen (15) days shall be stabilized with temporary vegetation or mulch. Side slopes shall not exceed 2:1. Silt fence shall also be placed around all stockpiles, leaving upgradient access for trucks.
7. All control measures will be maintained or replaced during the construction period, as necessary to ensure proper performance.
8. Sediment removed from control structures will be disposed of in a manner which is consistent with the intent of the plan.
9. All silt fence and anti-tracking aprons will be removed once site is stabilized which includes a good stand of vegetation over all areas to be grassed and all erosion is repaired. Segregate clean fill and sediment from waste materials. Stockpile materials in a location on-site which is suitable to the ~~Town.~~ City 1 The ~~Town~~ City will be responsible for its disposal.
10. On areas to be grassed, at least 6 inches of topsoil shall be placed and the permanent vegetative cover shall consist of a seeding mix lime and fertilizer application rates consistant with the April 1996 Project Manual developed for this project.
Planting seasons are March 15 through June 15 and August 15 through October 15.
11. For areas that do not drain to the detention basin, anytime that more than 5 acres of disturbed area drain to a common drainage location, a temporary sedimentation basin designed by the engineer shall be provided.

PROJ. MANAGER:	EOS		
CHIEF DESIGNER:	FPP		
REVIEWED	BY	DATE	
SURVEY			
SITE	DEA	8/5/96	
STRUCTURAL			
REVISION DATE:			
1 8/2/96	2	3	
4	5	6	
DATUM: H: NAD 27 V: NGVD 29			
SCALE: 1" = 40'			

FILENAME: J:90464BS PPP: S6 UCS:72ROT MS: 40XXX PS: PSPLOT

FUSS & O'NEILL INC. *Consulting Engineers*
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040
(203) 646-2469

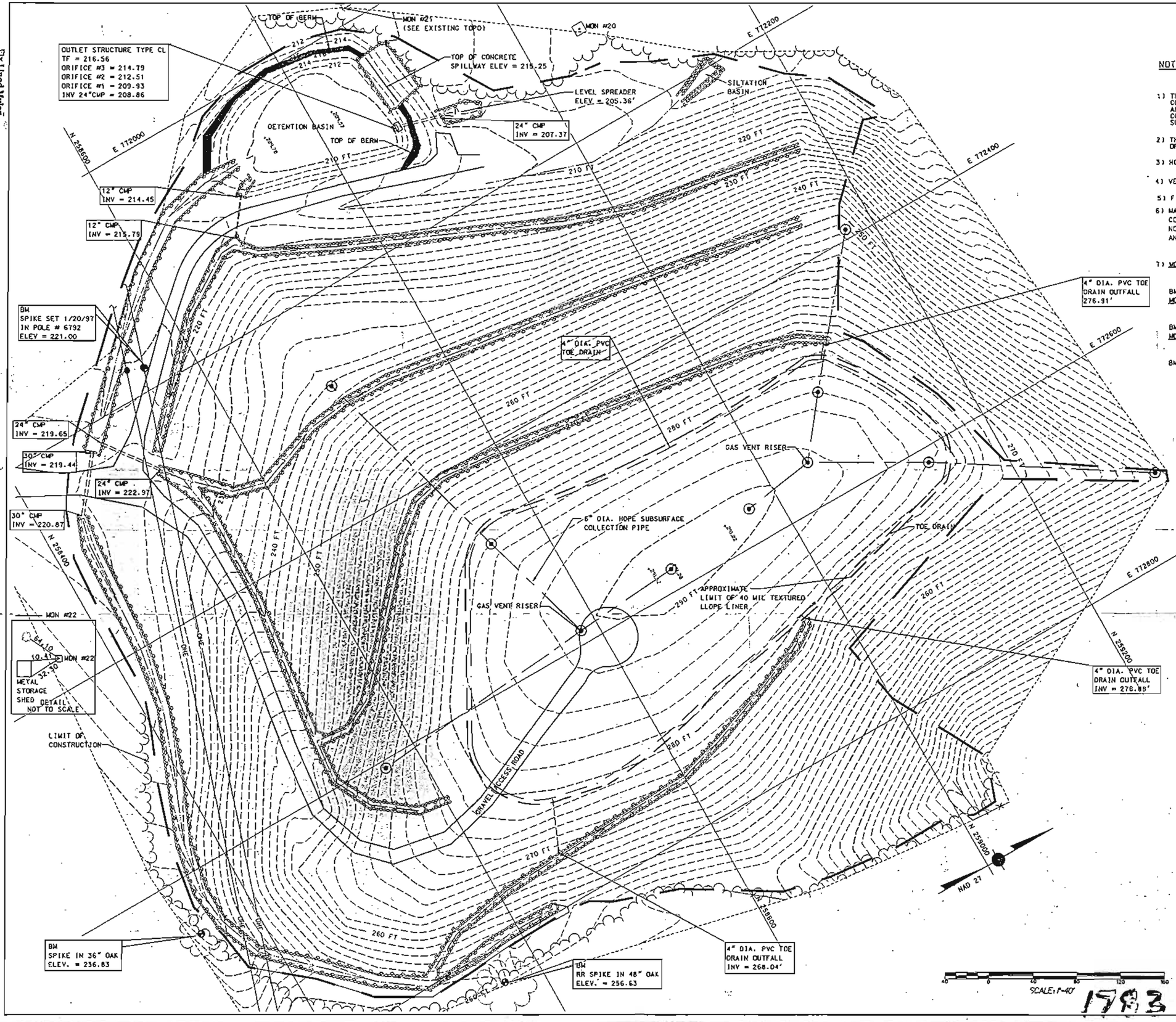
EROSION CONTROL PLAN

NORWICH LANDFILL CLOSURE

ROGERS ROAD NORWICH, CONNECTICUT

JOB NUMBER	PHASE	DATE	
90-464A1	3000	APR. 1996	SHEET NO. 7 OF 7

Tix Lined Mylar
Produced By
Action Blueprint
110 Center Street
Manchester, CT 06040



NOTES:

1) THIS SURVEY HAS BEEN PREPARED PURSUANT TO THE REGULATIONS OF CONNECTICUT STATE AGENCIES SECTION 20-300b-1 THROUGH 20-300b-20 AND THE "STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON SEPTEMBER 26, 1996.

2) THIS IS A TOPOGRAPHIC SURVEY CONFORMING TO T-2 STANDARDS OF ACCURACY

3) HORIZONTAL DATUM IS NAD 27 IN FEET.

4) VERTICAL DATUM IS NGVD 29 IN FEET.

5) FIELD SURVEY PERFORMED 7/7/97

6) MAP REFERENCE: PLAN PREPARED FOR NUTMEG SAND AND GRAVEL COMPANY EXISTING CONDITIONS AT NORWICH LANDFILL ROGERS ROAD NORWICH, CONNECTICUT. DATE 11/05/96, REVISED 12/16/97 BY ANCHOR ENGINEERING, SERVICES, INC.

7) MONUMENT #20
N 259054.02'
E 772111.13'
BM = TOP OF BRASS DISC = 205.38
MONUMENT #21
N 258880.45'
E 771982.21'
BM= TOP OF BRASS DISK = 211.66'
MONUMENT #22
N 258134.64'
E 772182.70'
BM = TOP OF BRASS DISK = 239.17

LEGEND

RIP RAP SWALE

SUBSURFACE GAS VENT LOCATION

6" DIA. HDPE SUBSURFACE GAS COLLECTION PIPE

TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON.

ROBERT L. SAUNDERS L.S. #17523

NO DECLARATION IS EXPRESSED OR IMPLIED UNLESS THIS MAP BEARS THE ORIGINAL SIGNATURE AND EMBOSSED SEAL OF THE ABOVE NAMED LAND SURVEYOR.

NOT RELEASED FOR CONSTRUCTION

Anchor Engineering Services, Inc.
75 Nutmeg Lane Glastonbury, CT 06033
TEL (860) 633-8770 FAX (860) 633-5971

PROJ. ENGINEER	SJB
PROJ. MANAGER	TVS
OFFICE REVIEW	PLS
FIELD BOOK # 30	

REVISIONS
8/12/97
8/21/97

PLAN PREPARED FOR
NUTMEG GRAVEL & EXCAVATING INC.
RECORD DRAWING FINAL CONDITION
NORWICH LANDFILL
ROGERS ROAD NORWICH, CONNECTICUT

SCALE:	PROJECT	DATE	SHEET
1" = 40'	266-01	1/8/97	SHEET NO. 1 OF 1

1783

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

April 4, 2000

Mr. Joseph N. Loyacano
Director of Public Works
City of Norwich
50 Clinton Avenue
Norwich, CT 06360

SITE NAME: Norwich Landfill - Rogers Rd
TOWN: Norwich
FILE TYPE: Surf Plans

Re: Norwich Bulky Waste Landfill Closure
Approval of as-built plans

Dear Mr. Loyacano:

By this letter, the Department of Environmental Protection's (DEP) Bureau of Waste Management approves the completed closure of the Norwich Bulky Waste Landfill located on Rogers Road, Norwich, Connecticut. As detailed in the Quality Assurance/Quality Control (QAC) final certification closure report prepared by Fuss & O'Neill Inc. and on the as-built engineering plan prepared by Anchor Engineering Services, Inc., and received by the DEP on March 16, 2000 and February 17, 2000, respectively, the City of Norwich has completed the landfill closure and made the necessary filing on the appropriate land records in accordance with Regulations of Connecticut State Agencies (RCSA) Section 22a-209-13.

The city should continue to inspect the landfill on a regular basis and correct any problems (i.e., erosion of side slopes, maintenance of drainage swales, etc.) that may occur at the landfill. These inspections should be an integral part of the landfill's thirty (30) year post-closure maintenance and monitoring program implemented by the property owner, in accordance with RCSA Section 22a-209-13(h).

If you have any questions regarding this letter, please contact David McKeegan of the Waste Engineering and Enforcement Division at (860) 424-3313.

Sincerely,

David A. Nash
Director
Waste Engineering & Enforcement Division
Bureau of Waste Management

DAN/dm
cc: E. MacGillis, DEP WEED
F. Pike, Fuss & O'Neill Inc.

VOL 1484 PAGE 056

Fuss & O'Neill Inc.
146 Hartford Road, Manchester, CT 06040

LANDFILL CLOSURE DESCRIPTION

Norwich Bulky Waste Landfill
Rogers Road
Norwich, Connecticut

February 2000

1. The landfill closure, set forth under Regulations of Connecticut State Agencies Section 22a-209-13, was constructed in general conformance with the Closure and Post-Closure Maintenance Plan dated March 1999, approved by the Connecticut Department of Environmental Protection (CTDEP), Waste Engineering and Enforcement Division on May 3, 1999.

2. The disposal area footprint is approximately five (5) acres in area.

3. The disposal facility accepted bulky waste from the City of Norwich, Connecticut.

to a maximum 40 feet.

5. As part of the landfill closure, the top of the landfill was covered with a minimum thickness of 48 inches of soil material which consists of a 6-inch thick layer of sandy soil over the bulky waste, an 18-inch thick final cover soil layer consisting of silty sand, and a 24-inch thick layer of compost material consisting of a mixture of sewage sludge, sand, leaves and wood chips. A portion of the east slope of the landfill is covered with a minimum thickness of 30 inches of soil material which consists of a minimum 6-inch thick layer of sandy soil over the bulky waste, an 18-inch thick final cover soil layer consisting of silty sand, and a 6-inch thick layer of topsoil. Numerous test pits were dug up to 30" in depth along the remaining side slopes of the landfill outside of the capping area, and no waste material was encountered.

6. As-built final grading of the closed landfill disposal area was prepared on plan entitled, "As Built Conditions, prepared for Nutmeg Sand and Gravel Company, Norwich Bulky Waste Site", Sheet 1 of 1, at a scale 1"=40', prepared by Anchor Engineering Services, Inc., 10/26/99.

Prepared by:

Frederick P. Pike, P.E.
Senior Civil Engineer I

February 11, 2000
Date

RECEIVED FOR RECORD AT NORWICH, CONN.

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

April 9, 1997

Mr. Steve Garstka
Assistant Director of Public Works
50 Clinton Ave.
Norwich, CT 06360

Dear Mr. Garstka:

This letter is in response to changes to the Norwich Landfill Closure Plan which the town has acknowledged in letters dated February 10, and 21, 1997 and March 7, 1997. The letters contain analytical results sent to DEP by Fuss & O'Neill, Inc. All conditions of the authorization for closure of a solid waste disposal area Town of Norwich, Connecticut dated June 25, 1996 shall remain in effect with the following changes:

1. The landfill closure shall be completed and the area seeded and stabilized by July 1, 1997.

2. The use of compost containing yard waste and sewage sludge as a topsoil substitute in the landfill final cover is hereby approved. This compost mix may not, however, be utilized as general fill at the Rogers Road Landfill.

Please be advised that this letter and closure authorization do not authorize continued stockpiling and composting of biosolids at the Norwich Landfill.

Very truly yours,

Richard J. Barlow
Chief
Waste Management Bureau

RJB:JF:ch

cc: Fred Pike, Fuss & O'Neill, Inc.

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

December 28, 1998

Mr. Joseph N. Loyacano, P.E.
Director of Public Works
City of Norwich
50 Clinton Avenue
Norwich, CT 06366

RE: Rogers Road Landfill, Norwich, Connecticut - Proposed Landfill Closure Plan

Dear Mr. Loyacano:

The Bureau of Waste Management's Waste Engineering and Enforcement Division (WEED) has completed the review of the submittal prepared by Fuss & O'Neill Inc. (on behalf of the City of Norwich), dated August 1998 and received by WEED on September 10, 1998, regarding the closure of the Norwich bulky waste disposal area located on Rogers Road. The proposed closure and post-closure maintenance plan for this facility has been prepared pursuant to paragraph 3.a of Consent Order SW-405, issued by the Commissioner on July 10, 1998, and describes the continued operation and management, proposed final grades, capping materials and closure schedule for this facility.

Conceptually, WEED staff do not have significant problems with the proposed closure and post-closure plans for this facility. However, based upon review of the submitted information and a site visit on December 22, 1998 the following comments and technical issues need to be addressed so that WEED staff can continue with their review:

1. Section 3.0 (Operational Plan) discusses the sequence of operations and Sheet No. 5 of 6 (Cross Section) gives a general progression for the continued filling of the bulky waste area. In addition to the information provided on the cross section, WEED staff will require that specific details on the daily/weekly filling progression be depicted on the plan view. The City should develop a sequencing plan that is easily understood and followed by the on-site operator and leaves no question as to where disposal activities should commence (south side of landform), progression of disposal activities (i.e., south to north) and where disposal activities are terminated (i.e., north side of landform).

2. Section 02170 (Cover Material) of the Material Specifications portion of the closure plan does not provide sufficient details on the specifications that will be followed for the final cover material used for

the closure. Information (i.e., sieve analysis or permeability measurements) on the proposed final cover soil materials should be forwarded to WEED staff for review and written approval.

3. There appears to be a slight discrepancy in the thickness of final cover and the proposed final grade at this site. Section 5.3 (Final Cover) outlines the placement of a 18" soil layer and a 24" layer of mixed sewage sludge, for a total final cover thickness of approximately 42" (3.5'). Section 02910 (Grading of Landfill Material) Part 3.02 describes the grading of the landfill "to two and one half feet (2.5') below the proposed final grade" and Sheet No. 3 of 6 (Final Grading Plan) depicts a final elevation of 314 at the top of the landform. Based upon this information it appears that either the final grades have to be adjusted to one foot higher or the landfill grading has to be adjusted to 3.5' below the final grade.

5. There is no indication in the closure plan that the City has evaluated landfill decomposition gas emissions or that any monitoring has been conducted on a routine basis.

6. Additional sedimentation/erosion controls should be proposed for this facility and detailed on the engineering plans. At a minimum, a double row of silt fencing should be installed around the closure area (possibly at the toe of slope, as well) and check dams should be installed in the drainage swale along the access road. Sedimentation/erosion controls should also be implemented for the temporary access road that transverses the eastern sideslope. It appears that there is some runoff from this road that is impacting the small stream at the toe of slope. The City should also determine if a general permit for the discharge of storm water related to construction activities is necessary for this site.

7. The closure plan should outline the quality assurance/quality control procedures and engineering oversight that will be implemented to ensure that the closure is progressing in accordance with approved plans. Additionally, the closure plan should specify that on-site workers are covered by site specific health and safety plans for activities associated with landfill closure. At a minimum, the plan(s) should comply with Occupational Safety and Health Act (OSHA) standards.

8. The sideslopes, below elevation 300, should be evaluated to determine that sufficient quantity and quality of final cover material has been applied. Soil boring information (locations and thickness) should be depicted on engineering plans for WEED staff review.

9. The City should make provisions for the cleanup and disposal of litter and other debris that is beyond the limits of the active working face and the landfill footprint.

WEED will also require that the City submit for review and written approval cost estimates for the proposed thirty (30) year post-closure maintenance and monitoring programs. The post-closure cost estimates should be based on the costs to the City of hiring a third party to conduct the post-closure care activities.

Pursuant to Section 22a-208a-1 RCSA (copy attached), the Department has established a fee schedule for landfill closures. The attached permit application form including the appropriate fee should be completed and returned to the Department.

Please contact me at (860) 424-3313 if you have any questions regarding this letter.

Sincerely,

David K. McKeegan
Waste Engineering & Enforcement Division
Bureau of Waste Management

DKM/dm
enclosure
cc: Fred Pike, Fuss & O'Neill Inc.

J & says
Yvonne signed
for him.

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

May 5, 1999

FILE COPY

Mr. William G. Tallman
City Manager
City Hall
Union Square
Norwich, CT 06360

Re: Norwich Bulky Waste Landfill
Authorization for Closure

Dear Mr. Tallman:

Enclosed please find a certified copy of the solid waste authorization for closure for the Norwich (Bulky Waste) Landfill located on Rogers Road.

If you have any questions concerning the closure authorization, please contact David McKeegan of the Waste Engineering and Enforcement Division (WEED) at (860) 424-3313.

Sincerely,

Richard J. Barlow

Richard J. Barlow
Chief
Bureau of Waste Management

RJB/dm

cc: Joseph Loyacano, City of Norwich DPW
Fred Pike, Fuss & O'Neill, Inc.

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

LANDFILL CLOSURE AUTHORIZATION

Municipality: Norwich
Site of Activity: Rogers Road
Authorization Holder: City of Norwich

In accordance with Connecticut General Statutes (CGS) Section 22a-208a, Regulations of Connecticut State Agencies (RCSA) Section 22a-209-13 and Consent Order No. SW-405, the Commissioner of Environmental Protection (Commissioner) hereby authorizes the City of Norwich to close the active bulky waste disposal area ("landfill") located on Rogers Road, Norwich, Connecticut. The closure shall be conducted in accordance with the following:

1. Report entitled "Closure and Post-Closure Maintenance Plan for Bulky Waste Landfill, City of Norwich, Rogers Road, Norwich, Connecticut" prepared by Fuss & O'Neill Inc., dated August 1998, revised March 1999 and received by the Waste Engineering and Enforcement Division (WEED) on September 10, 1998 and March 15, 1999, respectively.

2. Letter from Joseph N. Loyacano, City of Norwich Department of Public Works to Eugene MacGillis and Tom O'Connor, Department of Environmental Protection dated March 2, 1999 outlining a schedule for the completion of closure activities at the bulky waste disposal area.

3. In accordance with paragraph B.3.b of Consent Order No. SW-405 the City of Norwich shall cease all solid waste disposal on or before June 1, 1999 or when a 3:1 final grade on continued use and regraded slopes is reached, whichever is earlier.

4. In accordance with paragraph B.3.c of Consent Order No. SW-405 the City of Norwich shall complete landfill closure in accordance with the schedule identified in paragraph 2, above but in no event shall the completion of the landfill closure, including seeding, be later than November 1, 1999.

5. The DEP Bureau of Waste Management shall be notified in writing one week prior to the initiation of landfill closure construction activities so that a field inspector may be present.

6. The City shall submit as-built site plans to the Commissioner within ninety (90) days of completion of the landfill closure in accordance

with RCSA Section 22a-209-13(f). The as-built plan shall include certification by a professional engineer registered in the State of Connecticut that the grading and closure are as specified in the closure plan identified in paragraph one above. A detailed description of the solid waste disposal area shall also be filed in the municipal land records in accordance with RCSA Section 22a-209-13(g), including notice that use of the site following closure requires approval of the Commissioner in accordance with RCSA Section 22a-209-13(d). A certified copy of this recording shall be forwarded to the Commissioner.

8. At all times during landfill closure activities the City of Norwich shall retain the services of a Quality Assurance/Quality Control Consultant (QAC) to document (in writing) that site closure is being conducted in accordance with approved plans and specifications. The QAC shall be independent from the Town and the Contractor and shall have experience as the QAC for landfill closure projects. A copy of the QAC's final closure certification report shall be provided to the Commissioner, upon completion of landfill closure activities.

9. The City of Norwich shall ensure that all necessary odor controls are implemented and maintained during landfill closure activities.

10. The QAC shall ensure that all sedimentation and erosion controls are implemented and maintained for the duration of this landfill closure project. Prior to initiating landfill regrading and final cover application, the QAC shall certify, in writing, to the Commissioner that the sedimentation and erosion controls depicted in the closure plan have been installed.

11. The City of Norwich shall not use this site for any future waste disposal activity without first applying for and obtaining all required permits and approvals from the Commissioner.

12. No later than sixty (60) days after issuance of this landfill closure approval the City of Norwich shall submit, for the Commissioner's review and approval, cost estimates for thirty (30) year post-closure maintenance and monitoring programs. The post-closure cost estimates shall be based on the costs to the City of Norwich of hiring a third party to conduct post-closure care activities. Following the Commissioner's review and approval, the City shall post a surety for those costs in accordance with RCSA Section 22a-209-4(i). The City may substitute submittal of a justification that it meets the

terms of any local government financial test that may be promulgated by EPA under 40 CFR Part 258.74(f) of the landfill post-closure criteria.

13. The City of Norwich shall comply with the ground water, surface water and domestic water supply monitoring program specified in Attachment A to Consent Order No. SW-405. Landfill maintenance and monitoring shall continue for at least thirty (30) years after landfill closure.

14. Upon completion of landfill closure activities the City of Norwich shall install landfill limit markers, in accordance with RCSA Section 22a-209-7(w), to delineate the permitted lateral fill limits of the landfill. The location of these markers shall be depicted on the as-built site plans submitted to the Commissioner.

15. This approval is subject to and in no way derogates any present or future property rights or powers of the State of Connecticut and conveys no property rights in real estate or material nor any exclusive privileges and is further subject to any and all public and private rights and to any federal, state or local laws or regulations pertinent to the property or activity affected hereby.

16. This approval may be revoked, suspended or modified in accordance with law.

17. When this approval requires that any document be submitted to the Commissioner, such document shall be delivered to: David McKeegan, Bureau of Waste Management, Waste Engineering and Enforcement Division, 79 Elm Street, Hartford, CT, 06106-5127.

Issued this 3rd day of May, 1999.

Richard J. Barlow

Richard J. Barlow, Chief
Bureau of Waste Management

1.0 INTRODUCTION

This report serves as the Quality Assurance/Quality Control (QAC) final certification report required under Paragraph 8 of the Landfill Closure Authorization issued by the Department of Environmental Protection (DEP) dated May 3, 1999. This report describes the capping activities at the bulky waste landfill on Rogers Road in Norwich, Connecticut (Figure 1).

2.0 EXECUTIVE SUMMARY

The bulky waste landfill was capped in general conformance with the drawings and specifications approved by the DEP dated May 3, 1999. The final cover capping system consisted of the following layers from the bottom to the finished surface:

- minimum 6" of soil directly above the landfilled bulky waste
- minimum18" of final cover soil, and
- minimum 6" of vegetative support soil on the sideslopes, and 24" of compost material consisting of a mixture of sewage sludge, sand, leaves and wood chips on top of the landfill along the 4% slope as shown on the attached plans

The vegetative support soil was hydroseeded and an erosion control blanket was placed on top of the hydroseed to mitigate erosion and enhance germination of the seed.

Nutmeg Gravel & Excavating, Inc., Franklin, Connecticut (Contractor) contracted with the City of Norwich (City) to perform the capping construction. Fuss & O'Neill, Inc., Manchester, Connecticut, contracted with the City as the QAC Consultant to perform a majority of the construction administration services, including the review of material submittals, periodic inspection of the capping construction, and preparation of record documentation. Contract documents for the bulky waste landfill closure project were developed by Fuss & O'Neill dated April 1999 and incorporated the May 3, 1999 DEP-approved drawings and specifications.

The Contractor began capping the landfill on or about June 28, 1999, and substantially completed the cap after hydroseeding and placing erosion control blanket on October 21, 1999. A final as-built plan of the landfill was submitted by the Contractor on January 24, 2000, and is included as Attachment D of this report. Photographs of the site were taken on December 3, 1999 and have been included in this report as Attachment A.

3.0 SUBGRADE PREPARATION

After establishing the sedimentation control measures and clearing the cap area of brush, stumps and other debris, approximately 2,400 cubic yards of landfilled bulky waste within the capping area was regraded to meet a minimum 4% slope along the top of the landfill. The relocated and regraded bulky waste was compacted and covered with a minimum 6" thick layer of sandy gravel soil suitable as daily cover in accordance with RSCA 22a-207(l)(2) . Approximately

10,000 tons of sandy gravel soil was placed as general fill and compacted to meet a maximum 3 horizontal to 1 vertical (3H:1V) along the former equipment access road on the eastern slope of the landfill. Quality assurance/quality control testing of the soil used as general fill is attached to this report as Attachment B. The northern, southern and eastern landfill slopes outside of the capping area shown on the attached plan were left undisturbed, and remained well vegetated throughout the capping construction operation.

4.0 FINAL COVER SOIL LAYER

The 18" final cover soil layer was placed in two lifts. The first lift was approximately 12" thick and the second lift was 6" thick. The cover soil was classified as a silty sand (SM), and between 38% and 48% by weight passed the #200 sieve in accordance with the DEP-approved specification. The Contractor placed and compacted the cover soil at a minimum 90% compaction and wet of optimum as compared to the soil's Standard Proctor test results. Cover soil was hauled to the site from Northeast Industries, Montville Plant. Quality assurance/ quality control testing of the cover soil is attached to this report as Attachment B.

5.0 VEGETATIVE SUPPORT LAYER AND TURF ESTABLISHMENT

As described in the DEP-approved closure plan, a minimum 24" thick layer of compost material consisting of a mixture of sewage sludge, sand, leaves and wood chips was placed on top of the landfill where the final grades were constructed at a 4% slope. The compost material, which serves as the vegetative support layer, was obtained from Pile No. 4 located at the Rogers Road Landfill area. The 24" thick layer was placed in one lift.

The 3H:1V slopes of the landfill within the remaining cap area were covered with a minimum 6" layer of topsoil hauled from off site.

The surface of the compost and topsoil layers was hydroseeded with the approved turf establishment mixture with the addition of 40 pounds/acre of winter rye. The hydroseed was then covered with an erosion control blanket consisting of 100% straw between a photo degradable netting. Quality assurance/quality control testing of the compost material, topsoil, and turf establishment items is attached to this report as Attachment C.

Report Prepared by:

Frederick P. Pike, P.E., Fuss & O'Neill, Inc.
Richard D. Jones, P.E., Fuss & O'Neill, Inc.



NOTES

1) THIS SURVEY WAS PERFORMED ON THE GROUND ON OCTOBER 26, 1999 AND DECEMBER 6, 1999

2) ALL AREAS OUTSIDE THE "LIMIT OF SOIL CAP" AND "MIXED SEWAGE SLUDGE STOCKPILE NO. 4 AREA" WERE DIGITIZED FROM MAP REFERENCE: FINAL GRADING PLAN NORWICH BULKY WASTE LANDFILL ROGERS ROAD NORWICH CONNECTICUT SCALE 1"=40', APRIL 1999, BY FUSS AND O'NEILL SHEET 3 OF 4. THIS AREA WAS NOT DISTURBED DURING CONSTRUCTION ACTIVITIES UNDER THIS CONTRACT.

3) THIS SURVEY IS BASED ON HORIZONTAL (NAD 27) AND VERTICAL (NGVD 29) DATUM PROVIDED BY FUSS AND O'NEILL INC.

LEGEND

MAJOR CONTOUR

MINOR CONTOUR

SILT FENCE

LIMIT OF SOIL CAP

THIS SURVEY AND MAP HAS BEEN PREPARED IN ACCORDANCE WITH THE SECTIONS 20-300b-1 THRU 20-300b-20 OF THE REGULATIONS OF CONNECTICUT STATE AGENCIES - "MINIMUM STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ENDORSED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. IT IS A TOPOGRAPHIC SURVEY CONFORMING TO VERTICAL ACCURACY CLASS T-2.

TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON.

WILLIAM E. WERTZ L.S. # 70067

ANY ORIGINAL OR DUPLICATE OF THIS MAP IS NOT VALID UNLESS IT BEARS THE EMBOSSED SEAL OF THE SURVEYOR WHOSE REGISTRATION NUMBER AND SIGNATURE APPEAR ABOVE. NO OTHER CERTIFICATION OR WARRANTY IS EXPRESSED OR IMPLIED.

Anchor Engineering Services, Inc.
75 Nutmeg Lane Glastonbury, CT 06033
TEL (860) 633-8770 FAX (860) 633-5971

PROJ. ENGINEER	JAC
PROJ. MANAGER	WEW
OFFICE REVIEW	TVS

REVISIONS

SCALE: 1" = 40'

ASBUILT CONDITIONS

PREPARED FOR
NUTMEG SAND AND GRAVEL COMPANY
NORWICH BULKY WASTE SITE

ROGERS ROAD NORWICH CONNECTICUT

PROJECT	DATE	SHEET NO. 1 OF 1
266-12	10/26/99	

1815

Fix Lined Mylar
Produced By
Action Blueprint
130 Center Street
Manchester, CT 06040

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

STATE OF CONNECTICUT :
V. :
CITY OF NORWICH :

Order No. SW-405

CONSENT ORDER

A. With the agreement of the City of Norwich ("Respondent"), the Commissioner of Environmental Protection ("the Commissioner") finds:

1. Respondent is a municipality which owns, operates and maintains solid waste disposal areas at a site on Rogers Road in Norwich, Connecticut ("the site") more fully described as Lot #2, Block #2 on Map # 238 in the Norwich Tax Assessor's office.

2. Respondent operated a Municipal Solid Waste Disposal Area (MSWDA) at the site under permit to construct No. 104-1 issued to Seymour Adelman on August 19, 1974 and permit to operate No. 104-1-0 issued to the City of Norwich on November 14, 1986.

3. Respondent operates a Special Waste Disposal Area (SWDA) at the site for the disposal of construction and demolition wastes as defined by the Connecticut General Statutes (CGS) in Section 22a-208x, and other bulky wastes as defined by the Regulations of Connecticut State Agencies (RCSA) in Section 22a- 209-1. For purposes of this consent order, "construction and demolition waste" means waste building materials and packaging resulting from construction, remodeling, repair and demolition operation on houses, commercial buildings and other structures. "Bulky Waste" means land clearing debris and waste resulting directly from demolition activities other than clean fill.

4. Respondent, beginning in August of 1974 until this ceased on or about September 8, 1997, disposed of semi-solid sewage treatment sludge material at the site. The liquid fraction of the sewage sludge was allowed to run off into the surface waters or to infiltrate into site soils thus initiating a discharge to the waters of the State. A large volume, reportedly as much as 20,000 to 40,000 cubic yards of mixed sewage sludge, vegetative material and sand, described as composted and non-composted material (mixed sludge) has been disposed of by the Respondent at the site in various locations at the site. As defined in RCSA Section 22a-209-1, sewage treatment sludge is a special waste regulated under RCSA Section 22a-209-8, which is required to be disposed of in a permitted solid waste facility pursuant to RCSA Section 22a-209-2.

5. The sewage treatment sludge mixing operation and disposal of the resultant waste at the site is not included as part of the facility plan on which the permit was based. The limits and sequence of filling at the SWDA are not adequately delineated and no operation and management description of such operation has been filed with, or approved by the Commissioner. Respondent thus altered the facility as defined in CGS Section 22a-208a(d) without approval.

6. The requirements of Order No. 2793 were incorporated into the Stipulated Judgement issued on January 20, 1993 in Superior Court Case No. CV. 90-0094794-S, the Commissioner of Environmental Protection v. the City of Norwich. The Respondent submitted a closure plan pursuant to the requirements of the Stipulated Judgement. The Respondent then received authorization from the Department on June 25, 1996 to close the MSWDA portion of the site.

7. The operation of a solid waste disposal area at the site has resulted in a discharge of water, substance or materials, including but not limited to leachate, into the waters of the State, including but not limited to wetlands and surface waters adjacent to the site. Respondent has never applied for a discharge permit for the site, as required pursuant to CGS Section 22a-430.

8. By virtue of the above, Respondent has violated CGS Sections 22a-208a(d), 22a-208c, 22a-427, 22a-430, and 22a-432, and RCSA Section 22a-209-8(b) and is maintaining a facility or condition which reasonably can be expected to create a source of pollution to the waters of the State.

9. By agreeing to the issuance of this Consent Order, Respondent does not admit that findings A. 4., A. 5., A. 7., and A. 8., are correct.

B. With the agreement of the City of Norwich, The Commissioner, acting under CGS Sections 22a-6, 22a-208, 22a-225, 22a-424, 22a-425, 22a-427, 22a-428, 22a-430, 22a-431 and 22a-432 orders Respondent as follows:

1. Respondent shall operate the site in compliance with: (a) all terms of Solid Waste Permit No. 104-1 and Solid Waste Management Regulations RCSA Section 22a-209, as amended; (b) all applicable requirements of CGS Section 22a-430 and the regulations adopted thereunder; and (c) the requirements of this consent order.

2. Within thirty (30) days from the issuance of this consent order, Respondent shall retain one or more qualified consultants acceptable to the Commissioner to prepare the documents and implement or oversee the actions required by this consent order and shall, by that date, notify the Commissioner in writing of the identity of such consultants(s). Respondent shall retain one or more qualified consultants acceptable to the Commissioner until this consent order is fully complied with, and, within (10) ten days after retaining any consultant other than one originally identified under this paragraph, Respondent shall notify the Commissioner in writing of the identity of such other consultant. Nothing in this paragraph shall preclude the Commissioner from finding a previously acceptable consultant unacceptable.

3. Respondent shall close the SWDA in accordance with the following requirements and schedule:

a. Within sixty (60) days from the issuance of this consent order, Respondent shall submit for the Commissioner's review and written approval a closure plan and post-closure maintenance plan for the SWDA which shall include, but not be limited to, the current topography and the proposed final contours anticipating the cessation of waste disposal by the date specified in B.3.b; a detailed description of sequential filling; define lateral and vertical limits of continued disposal of waste; contemplate regrading existing steeper slopes to 3:1, however, steeper stabilized slopes may be proposed with proper justification; continued operation shall conform to 3:1 grades except for top surfaces which shall maintain a minimum 4% grade; the identification of each type and quantity of grading and capping materials and sedimentation/erosion plans to achieve completion of closure of the SWDA by the dates specified in B.3.c.

b. Respondent shall cease all solid waste disposal at the SWDA on or before June 1, 1999 or when a 3:1 final grade on continued use and regraded slopes is reached, whichever is earlier.

c. Upon approval of the closure plan for the SWDA, Respondent shall commence construction in conformance with said approval and shall complete landfill closure in accordance with the approved schedule,but in no event shall the completion of the SWDA closure, including seeding, postdate November 1, 1999.

4. Within sixty (60) days from the issuance of this consent order Respondent shall clearly identify any and all wastes disposed or appurtenances, if any, that may have been constructed or installed off-site. To the extent that any wastes have been disposed of off-site, within ninety (90) days from the issuance of this consent order, Respondent shall submit for review and written approval by the Commissioner, a disruption plan in accordance with the requirements of RCSA Section 22a-209-7(u) to remove such wastes, and any access agreement(s) necessary to carry out the disruption plan and implement corrective action(s). Respondent shall complete corrective actions in a timely manner as approved by the Commissioner, but in no event shall corrective actions be completed by later than November 1, 1998.

5. Respondent shall comply with RCSA Section 22a-209-13 requirements for filing information with the Commissioner and on municipal land records with respect to the closed MSWDA no later than December 1, 1998 and for the SWDA, no later than ninety (90) days after completion of the closure of the final landform.

6. Respondent shall implement ground water, surface water and domestic water supply monitoring at the site in accordance with the following requirements and schedule:

a. Within sixty (60) days from the issuance of this consent order, the Respondent shall submit for the Commissioner's review and written approval a plan for a surface water ground water and domestic water supply quality monitoring program at the site. The plan shall include at a minimum the following: (i) a map drawn to a scale no less than one inch equal to 100 feet showing all monitoring locations; (ii) the construction details of all existing and proposed ground water monitoring wells, their boring logs, and dedicated well sampling equipment and appurtenances; (iii) a schedule for the installation of proposed monitoring wells; (iv) a quality assurance and quality control program for the collection of all samples of surface water, ground water and domestic water supplies. At a minimum, the ground water, surface water and domestic water supply monitoring program shall incorporate the sampling locations and parameters and schedule(s) provided in Attachment A to this Consent Order; (v) a listing of all the parameters to be analyzed and the analytical methods to be used for such analyses; (vi) a schedule for the implementation of the surface water, ground water and domestic water supply quality monitoring program. The schedules to be included in the plan required by this paragraph shall provide for initiation of the specified actions as soon as possible, but in no event later than fifteen (15) days after the date the Commissioner approves the plan.

b. Respondent shall perform the approved ground, surface and domestic water monitoring program in accordance with the approved schedule referenced in paragraph B.6.a.

7. The Respondent shall abate the direct discharge of leachate to wetlands and surface waters adjacent to the site to the satisfaction of the Commissioner in accordance with the following:

a. Within sixty (60) days from issuance of this consent order, Resporient shall inspect the site and submit to the Commissioner for his review and written approval, a report and evaluation of the extent and quality of leachate seeps from the site which shall include, but not be limited to: (i) a map or plan drawn to a scale no less than one inch equal to 100 feet showing the locations and volumes of all the existing leachate outbreaks and seeps or iron oxide precipitation from the perimeter and side slopes of the site and the banks of surface waters and wetlands adjacent to the site; (ii) the results of any sampling of leachate outbreaks and seeps performed to date including at least the parameters tested, sampling and analytical methods, and the quality assurance and quality control procedures utilized;

b. No later than thirty (30) days after submission of the report described in paragraph B.7.a., except as may be provided in any additional investigation schedule approved by the Commissioner, the Respondent shall submit for the Commissioner's review and written approval a comprehensive and thorough remedial action report which describes in detail the following: (i) proposed remedial actions to eliminate such discharge with supporting justification therefore; (ii) proposed detailed program and schedule to perform the remedial actions; and (iii) a schedule for applying for and obtaining all permits and approvals required for such remedial actions, including but not limited to any permits required under Sections 22a-32, 22a-42a, 22a-342, 22a-361, 22a-368 or 22a-430 of the Connecticut General Statutes. The schedule shall provide for completion of installation of the remediation system as soon as possible, but in no event later than November 1, 1999. (iv) a proposed plan and schedule for subsequent inspection, monitoring and abatement of leachate outbreaks and seeps or iron oxide precipitation from the perimeter and side slopes of the site and the banks of surface waters and wetlands adjacent to the site.

c. Unless another deadline is specified in writing by the Commissioner, no later than thirty (30) days after submittal of the remedial action report described in paragraph B.7.b, the Respondent shall submit applications for all permits and approvals required in accordance with the preceding paragraph for such actions. The Respondent shall use best efforts to obtain all required permits and approvals.

d. The Respondent shall submit the following for the Commissioner's review and written approval no later than thirty (30) days after the issuance of permits or approvals described in paragraph B.7.c., unless another deadline is specified in writing by the Commissioner: (i) contract plans and specifications for the approved remedial actions, (ii) a ground water and surface water monitoring program to determine the degree to which the approved remedial actions have been effective, and a schedule for performing the approved monitoring program. Such monitoring program shall be incorporated as part of the surface water, ground water quality and domestic water supply monitoring program described in paragraph B.6.a.

e. The Respondent shall perform the approved remedial actions in accordance with the approved schedule(s). Within fifteen (15) days after completing such actions, the Respondent shall certify to the Commissioner in writing that the actions have been completed as approved.

f. The Respondent shall perform the approved monitoring program described in 8.7.d. to determine the effectiveness of the remedial actions in accordance with the approved schedule(s). If a permit has not been issued pursuant to CGS Section 22a-430 for the remedial action, and if the approved remedial actions do not result in the prevention and abatement of the leachate discharge to the satisfaction of the Commissioner, Respondent shall submit to the Commissioner for review and written approval a proposal for additional remedial actions and measures for monitoring and reporting on the effectiveness of those actions. Respondent shall perform such actions in accordance with a supplemental plan and schedule approved in writing by the Commissioner. Unless otherwise specified in writing by the Commissioner, the supplemental plan and schedule shall be submitted for the Commissioner's review and written approval no later than thirty (30) days after notice from the Commissioner that they are required.

g. On a schedule approved by the Commissioner or, if no such schedule is approved, on a annual basis beginning no later than November 1, 1999, the Respondent shall submit for the Commissioner's review and written approval reports describing the results to date of the monitoring program to determine the effectiveness of the remedial actions.

8. Respondent shall evaluate the on-site stockpiled sewage treatment sludge quality, control runoff and provide for its disposal in accordance with the following requirements and schedule:

a. Within sixty (60) days from issuance of this consent order, Respondent shall submit to the Commissioner for his review and written approval a plan for the characterization and the on-site usage and/or off-site removal to an appropriately permitted facility of the mixed sewage sludge piles on the site which shall include but not be limited to: (i) a plan showing the locations and volumes of the material; (ii) sedimentation and erosion control plans to ensure protection of wetlands and surface waters in proximity to mixed sewage sludge materials; (iii) the results of all mixed sewage sludge sampling performed to date including at least the parameters tested, sampling and analytical methods, and the quality assurance and quality control procedures utilized; (iv) proposed locations and depths for additional sampling of on-site sludge stockpiles; (v) the proposed sampling and analytical program including but not limited to the parameters to be analyzed, the sampling and analytical methods to be used, and quality assurance and quality control procedures; (vi) a schedule for conducting the investigation/evaluation. Such schedule shall provide for initiation of the investigation as soon as possible, but in no event later than fifteen (15) days after the date the Commissioner approves the scope of study required by this paragraph. The plan shall include a proposed schedule for usage onsite or offsite disposal at an approved facility fully permitted for the referenced materials and also a proposed date for the submittal of the investigation report, as soon as possible, but in no event later than ninety (90) days after the date the Commissioner approves the scope of study.

b. The Respondent shall perform the approved actions in accordance with the approved schedule(s). Within fifteen (15) days after completing such actions, the Respondent shall certify to the Commissioner in writing that the actions have been completed as approved.

9. Respondent shall investigate and determine the lateral and vertical extent of the zone of influence of the site to the satisfaction of the Commissioner in accordance with the following requirements. The zone of influence is defined as the area of soil and ground water within which the treatment of the leachate discharge by soil and mixing of leachate with ground water occurs, and could reasonably be expected to occur and, therefore, within which some degradation of ground water quality is anticipated to occur.

a. No later than sixty (60) days after issuance of this consent order, the Respondent shall submit for the Commissioner's review and written approval a scope of study for an investigation of: (a) the lateral and vertical extent of the zone of influence of the site including, but not limited to the impact on ground water quality of the MSWDA, the SWDA and mixed sludge disposal; Such scope of study shall include but not be limited to the following: (i) the proposed location and depths of ground water monitor wells; (ii) the proposed sampling and analytical program including but not limited to the parameters to be analyzed, the sampling and analytical methods to be used, and quality assurance and quality control procedures; and (iii) a schedule for conducting the investigation. The schedule shall provide for initiation of the investigation as soon as possible, but in no event later than fifteen (15) days after the date the Commissioner appproves the scope of study required by this paragraph.

b. If the investigation(s) carried out under the approved scope of study required by paragraph B.9.a. does not fully characterize the lateral and vertical extent of the zone of influence, to the satisfaction of the Commissioner, additional investigation shall be performed in accordance with a supplemental plan and schedule approved in writing by the Commissioner. Unless otherwise specified in writing by the Commissioner, the supplemental; plan and schedule shall be submitted for the Commissioner's review and written approval on or before thirty (30) days after notice from the Commissioner that they are required.

c. The Respondent shall perform the investigation and other actions specified in the approved scope of study and in any approved supplemental plan(s) in accordance with the approved schedule(s). The Respondent shall notify the Commissioner in writing of the date and time of installation of monitoring wells and of each sampling event at least five (5) full business days prior to such installation or sampling.

d. Except as may be provided in the schedule approved by the Commissioner, on or before forty-five (45) days after the approved date for completion of the plan, the Respondent shall submit for the Commissioner's review and written approval a comprehensive and thorough report developed in accordance with the approved scope of study and any supplemental plan(s) which describes in detail the investigation performed and defines the lateral and vertical extent of the zone of influence including but not limited to the following: (i) a compilation of the results of this and all previous investigations at the site; (ii) the results of all sampling performed to date including at least the parameters tested, sampling and analytical methods, and the quality assurance and quality control procedures utilized.

10. No later than sixty (60) days after approval of the report submitted under paragraph B.9.d. of this Consent Order, the Respondent shall submit for review and approval of the Commissioner copies of all instruments by which the Respondent proposes to acquire the right of possession of the zone of influence of the site by means of fee interest, easement, or mechanism(s). The instrument establishing any easement shall be in perpetuity and, at a minimum, provide the following: (i) the right to discharge pollutants to the ground water within the zone of influence; (ii) the exclusive right to withdraw ground water from within the zone of influence; and (iii) the right to access the area of easement for the purposes of characterizing, monitoring, and remediating the ground water within the zone of influence. All such instruments establishing the right of possession shall be recorded on the land records of the City of Norwich.

11. No later than one-hundred and eighty (180) days after the Commissioner's approval of the instruments required under paragraph B.10. of this Consent Order, the Respondent shall certify to the Commissioner that the Respondent has acquired the right of possession of the zone of influence of the site by means of fee interest or easement, or other mechanism acceptable to the Commissioner. The zone of influence is defined as the area of soil and ground water within which the treatment of the leachate discharge by soil and mixing of leachate with ground water occurs, and could reasonably be expected to occur and, therefore, within which some degradation of ground water quality is anticipated to occur.

12. Progress reports. On or before the last day of each month following issuance of this Order and continuing until all actions required by this order have been completed as approved and to the satisfaction of the Commissioner, Respondents shall submit a progress report to the Commissioner describing the actions which Respondent has taken to comply with this Order to date.

13. Full compliance. Respondent shall not be considered in full compliance with this order until all actions required by this order have been completed as approved and to the satisfaction of the Commissioner.

14. Approvals. Respondent shall use best efforts to submit to the Commissioner all documents required by this order in a complete and approvable form. If the Commissioner notifies the Respondent that any document or other action is deficient, and does not approve it with conditions or modifications, it is deemed disapproved, and Respondent shall correct the deficiencies and resubmit it within the time specified by the Commissioner or, if no time is specified by the Commissioner, within thirty days of the Commissioner's notice of deficiencies.

In approving any document or other action under this order, the Commissioner may approve the document or other action as submitted or performed or with such conditions or modifications as the Commissioner deems necessary to carry out the purposes of this order. Nothing in this paragraph shall excuse noncompliance or delay.

15. Definitions. As used in this order, "Commissioner" means the Commissioner or an agent of the Commissioner.

16. Dates. The date of submission to the Commissioner of any document required by this order shall be the date such document is received by the Commissioner. The date of any notice by the Commissioner under this order, including but not limited to notice of approval or disapproval of any document or other action, shall be the date such notice is personally delivered or the date three days after it is mailed by the Commissioner, whichever is earlier. Except as otherwise specified in this order, the word "day" as used in this order means calendar day. Any document or action which is required by this order to be submitted or performed by a date which falls on a Saturday, Sunday or a Connecticut or federal holiday shall be submitted or performed on or before the next day which is not a Saturday, Sunday, or Connecticut or federal holiday.

17. Notification of noncompliance. In the event that Respondent becomes aware that it did not or may not comply, or did not or may not comply on time, with any requirement of this order or of any document required hereunder, Respondent shall immediately notify the Commissioner and shall take all reasonable steps to ensure that any noncompliance or delay is avoided or, if unavoidable, is minimized to the greatest extent possible. In so notifying the Commissioner, Respondent shall state in writing the reasons for the noncompliance or delay and propose, for the review and written approval of the Commissioner, dates by which compliance will be achieved, and Respondent shall comply with any dates which may be approved in writing by the Commissioner. Notification by Respondent shall not excuse noncompliance or delay, and the Commissioner's approval of any compliance dates proposed shall not excuse noncompliance or delay unless specifically so stated by the Commissioner in writing.

18. Certification of documents. Any document, including but not limited to any notice, which is required to be submitted to the Commissioner under this order shall be signed by the Respondent or a duly authorized representative as those terms are defined in section 22a-430-3(b)(2) of the Regulations of Connecticut State Agencies and by the individual or individuals responsible for actually preparing such document, each of whom shall certify in writing as follows: "I have personally examined and am familiar with the information submitted in this document and all attachments and certify that based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief, and I understand that any false statement made in this document or its attachments may be punishable as a criminal offense."

19. Noncompliance. Failure to comply with this order may subject Respondent to an injunction and penalties under Chapters 439, and 445 or 446k of the Connecticut General Statutes.

20. False statements. Any false statement in any information submitted pursuant to this order may be punishable as a criminal offense under Section 22a-438 or 22a-131a of the Connecticut General Statutes or, in accordance with Section 22a-6, under Section 53a-157 of the Connecticut General Statutes.

21. Notice of transfer; liability of Respondent and others. Until Respondent has fully complied with this order, Respondent shall notify the Commissioner in writing no later than fifteen days after transferring all or any portion of the operations which are the subject of this order, the site or the business, or obtaining a new mailing or location address. Respondent's obligations under this order shall not be affected by the passage of title to any property to any other person or municipality. Any future owner of the site may be subject to the issuance of an order from the Commissioner.

22. Commissioner's powers. Nothing in this order shall affect the Commissioner's authority to institute any proceeding or take any other action to prevent or abate violations of law, prevent or abate pollution, recover costs and natural resource damages, and to impose penalties for violations of law, including but not limited to violations of any permit issued by the Commissioner. If at any time the Commissioner determines that the actions taken by Respondent pursuant to this order have not fully characterized the extent and degree of pollution or have not successfully abated or prevented pollution, the Commissioner may institute any proceeding to require Respondent to undertake further investigation or further action to prevent or abate pollution.

23. Respondent's obligations under law. Nothing in this order shall relieve Respondent of other obligations under applicable federal, state and local law.

24. No assurance by Commissioner. No provision of this order and no action or inaction by the Commissioner shall be construed to constitute an assurance by the Commissioner that the actions taken by Respondent pursuant to this order will result in compliance or prevent or abate pollution.

25. Access to site. Any representative of the Department of Environmental Protection may enter the site without prior notice for the purposes of enforcing the actions required or allowed by this consent order.

26. No effect on rights of other persons. This consent order shall neither create nor affect any rights of persons who or municipalities which are not parties to this consent order.

27. Notice to Commissioner of changes. Within fifteen days of the date Respondent becomes aware of a change in any information submitted to the Commissioner under this order, or that any such information was inaccurate or misleading or that any relevant information was omitted, Respondents shall submit the correct or omitted information to the Commissioner.

28. Submission of documents. Any document required to be submitted to the Commissioner under this order shall, unless otherwise specified in writing by the Commissioner, be directed to:

and Mr. Eugene MacGillis/Waste Management Bureau/WEED
Mr. Thomas O'Connor/ Water Management Bureau/PERD
Department of Environmental Protection
79 Elm Street
Hartford, Connecticut 06106-5127

Respondent consents to the issuance of this consent order without further notice. The undersigned certifies that he is fully authorized to enter into this consent order and to legally bind the Respondent to the terms and conditions of the consent order.

BY: W. Tallman
William G. Tallman
City Manager

June 24, 1998
Date

APPROVED AS TO FORM
And Legality On 6/22/98
Corporation Counsel
City of Norwich, Conn.

BY: Jane K. Stahl
Arthur J. Rocque, Jr.
Commissioner

7/10/98
Date

ORDER NO. SW- 405
CITY OF NORWICH LAND RECORDS

ATTACHMENT A

WATER QUALITY MONITORING PROGRAM

(A) **Surface Water Quality Monitoring**:

(I) Locations - Surface water quality monitoring shall be conducted at the following locations as shown on Plate 1, dated August, 1997, revised 9/27/97 and entitled "Existing and Proposed Monitoring Locations, Norwich Landfill", as described in correspondence dated December 3, 1997 from Mr. Joseph Loyacano, Public Works Director for the City of Norwich to Mr. Thomas O'Connor of the Department of Environmental Protection, Bureau of Water Management, and as described herein.

SWS-13: Unnamed stream at outfall from culvert under Rogers Road.

SWS-13A: Discharge to unnamed stream (if flowing) at outfall from surface water cutoff culvert running under Connecticut Carting parking lot.

SWS-9: Unnamed stream at confluence of intermittent stream located to north of Bulky Waste Disposal Area.

SWS-3: Tributary stream located to the east of the closed MSW landfill and north of MW-3D above confluence with unnamed stream.

SWS-15: Unnamed stream below confluence with tributary stream to the east of closed MSW landfill.

SWS-Mid: Unnamed stream midpoint between Browning Road culvert and SWS-15.

SWS-Pond: At the north bank near the west edge of the pond.

SWS-8R: Unnamed stream at outfall from culvert to north of Browning Road

(II) Each surface water sample collected from the stations designated shall be sampled quarterly in the months of December, March, June, and September.

(iii) Each surface water sample shall be analyzed for the following parameters:

	Parameter	MDL	
1.	SpecificConductance		
2.	pH		
3.	Total Dissolved Solids		
4.	Total Suspended Solids		
5.	Chloride		
6.	Alkalinity		
7.	Hardness as $CaCO_3$		
8.	BOD, 5-day		
9.	COD		
10.	Ammonia-N, total		
11.	Kjeldahl-N, total		
12.	Nitrate-N, total		
13.	Nitrite-N, total		
14.	Phosphorus, total		
15.	Aluminum, total	10	µg/L
16.	Arsenic, total	5	µg/L
17.	Barium, total	10	µg/L
18.	Cadmium, total	0.5	µg/L
19.	Chromium, total	5	µg/L
20.	Copper, total	5	µg/L
21.	Copper, dissolved	5	µg/L
22.	Iron, total	5	µg/L
23.	Iron, dissolved	5	µg/L
24.	Lead, total	5	µg/L
25.	Lead, dissolved	5	µg/L
26.	Manganese, total	1	µg/L
27.	Manganese, dissolved	1	µg/L
28.	Mercury, total	0.2	µg/L
29.	Nickel, total	5	µg/L
30.	Silver, total	1	µg/L
31.	Zinc, total	10	µg/L
32.	Zinc, dissolved	1	µg/L
33.	Temperature dissolved	°C	

Sampling Periods
December
March
June
September

30. Specific Conductance
32. Volatile Organic Compounds using EPA method 8021B.
33. Any supplemental parameters identified in accordance with the requirements of this consent order.

(iii) Schedule - The ground water quality monitoring locations shall be monitored four times per year in accordance with the following schedule:

Sampling Periods
December
March
June
September

(b) **Domestic Water Supply Wells:**

(I.)Locations:

DM-10: Richard N. & Catherine M. Oloff
105 Wawecus Street

DM-13: Edward L. & Marie G. Oloff
15 Browning Road

DM-16: Darrell M. & Stephanie L. Mattos
Rogers Road

DM-20: Florence Johnson
114 Rogers Road

DM-23: Norwich Fish & Game
44 Browning Road

DM-19: Peter & Diane Depizzol
35 Rogers Road

The following wells shall be tested annually in September for all parameters listed in (II) of this section.

DM-11: Paul Inguanti
124 Wawecus Street

DM-17: Fred G.& Beverly M. Rogers
12 Rogers Road

DM-18: Phillip L. & Beverly A. Miner
18 Rogers Road

DM-21: Albert & Susan Eyberse
20 Rogers Road

(ii) Perameter list:

1. Total Dissolved Solids
2. Total Suspended Solids
3. Alkalinity (as $CaCO_3$)
4. COD
5. Iron (Total)
6. Manganese (Total)
7. Specific Conductance
8. Nitrate (as N)
9. Chloride
10. pH
12. Ammonia (as N)
13. Sodium (Total)
14. Potassium (Total)
15. Arsenic
15. Barium
16. Cadmium
17. Chromium
18. Cyanide
19. Lead
20. Mercury
22. Selenium
23. Silver
24. Sulfate (Total)
25. Volatile Organic Compounds using EPA method 524.2

Sampling Periods
December
March
June
September

Connecticut Department of
ENERGY & ENVIRONMENTAL PROTECTION
79 Elm Street • Hartford, CT 06106-5127 www.ct.gov/deep Affirmative Action/Equal Opportunity Employer

APPROVAL

February 19, 2013

Mr. Patrick J. McLaughlin, P.E.
City Engineer
Public Works Department
City of Norwich
50 Clinton Avenue
Norwich, CT 06360

BUREAU OF MATERIALS MANAGEMENT
& COMPLIANCE ASSURANCE
SITE NAME Rogers Rd Landfill
SITE LOCATION Rogers Rd
TOWN Norwich
FILE TYPE SW: (GW) Water Monitoring

RE: Former Rogers Road Landfill
Rogers Road, Norwich, CT

Dear Mr. McLaughlin:

The Waste Engineering and Enforcement Division of the Bureau of Materials Management and Compliance Assurance has reviewed the letter dated December 10, 2012 from you to Mr. Mark Lewis of the Bureau of Water Protection and Land Reuse titled "2012 Annual Water Quality Monitoring Report, Former Rogers Road Landfill, Norwich, CT" (the "Letter"). The Letter was accompanied by a report titled "2012 Annual Water Quality Report, Former Rogers Road Landfill, Norwich, CT" (the "Report") dated October 2012, prepared for the City of Norwich by Fuss & O'Neill, Inc. The Letter and the Report are collectively referred to hereafter as the "Request". The Department received the Request on December 13, 2012. The Request was submitted pursuant to paragraph B.6 of Consent Order No. SW-405 issued on July 10, 1998.

The Request describes the results of monitoring of groundwater, surface water, and domestic wells conducted at the former Rogers Road Landfill in March and September 2012. The Request also recommends that the scope of the monitoring program be changed by: 1) reducing the sampling frequency in the monitoring wells, surface water monitoring points, and six domestic wells from two times per year to one time per year; and 2) removing cyanide from the parameter list for monitoring wells. No monitoring wells, surface water monitoring points, or domestic wells would be eliminated from the monitoring program.

The Request is hereby approved.

The next deliverable due from you is the 2013 groundwater monitoring report and it is due on or before December 1, 2013.

Nothing in this approval shall affect the Commissioner's Authority to institute any proceeding, or take any other action to prevent or abate pollution, to recover costs and natural resource damages, and to

1 Introduction

This Report summarizes the water quality monitoring conducted by Fuss & O'Neill at the Rogers Road Landfill during 2013. Fuss & O'Neill personnel collected groundwater, surface water, and domestic well samples in May 2013 in accordance with the September 2001 Revised Water Quality Monitoring Program and modifications approved by the Connecticut Department of Energy and Environmental Protection (DEEP) in 2013. Reduction of the monitoring frequency at the landfill from semi-annual to annual and elimination of cyanide analyses was approved by the DEEP on February 19, 2013.

2 Site Description

The Rogers Road Landfill is located near the intersection of Rogers and Browning Roads on approximately 79 acres of land owned by the City of Norwich (*Figure 1*). The landfill property is bordered to the south by Rogers Road, to the east by North Wawecus Hill Road, to the west by undeveloped forest land and to the north by the Norwich Fish and Game Club. The areas south and east of the landfill consist mainly of open fields, wetlands, and residential properties.

The site includes a closed municipal solid waste (MSW) landfill, a closed bulky waste landfill, and an active transfer and recycling station (*Figure 2*). The MSW landfill covers approximately 11 acres at the northern end of the property, and the bulky waste landfill occupies approximately 5 acres near the southern end of the property. Entrance to the landfill is located on Rogers Road.

Groundwater in the landfill area has historically been reported to flow to the northeast toward the Yantic River.

3 Water Quality Monitoring Program

The 2013 water quality monitoring program at the Rogers Road Landfill consisted of annual groundwater, surface water, and domestic well sampling as detailed in *Table 1*. Environmental samples were submitted under chain-of-custody to Phoenix Environmental Laboratories, Inc. The programs for groundwater, surface water, and potable wells are summarized in the following sections

3.1 Groundwater Monitoring Program

The 2013 groundwater monitoring program included 14 monitoring wells associated with the MSW Landfill and 5 monitoring wells associated with the Bulky Waste Landfill as summarized below:

Monitoring Well Network

MSW Landfill (14 Monitoring Wells)			Bulky Waste Landfill (5 Monitoring Wells)
MW-2A	MW-3D	MW-103A	MW-201D
MW-2B	MW-3DD	MW-103D	MW-202D
MW-2D	MW-102A	MW-105B	MW-204A
MW-3	MW-102B	MW-105D	MW-204D
MW-3B(R)	MW-102D		MW-205D

Seventeen monitoring wells are located within the landfill boundaries and two monitoring wells (MW-105B and -105D) are located adjacent to Wawecus Street, east of the landfill. Sampling locations are shown on *Figure 2*. The majority of the 14 groundwater monitoring wells associated with the MSW landfill are located north and east (downgradient or sidegradient) of the landfill area. At the Bulky Waste Landfill, monitoring wells MW-201D and -205D are located upgradient of the landfill, while MW-202D, -204A, and -204D are inferred to be located downgradient based on topography and historical groundwater flow direction.

Monitoring Wells Sampled

All 19 monitoring wells were sampled in May 2013.

Sampling Methods

Prior to sampling, depth to water was measured at each well. Depth to groundwater measurements are presented in *Table 2*. The average depth to groundwater in each aquifer zone in May 2013 is summarized below:

Aquifer	Average Depth to Groundwater (feet)
	May 2013
Shallow Overburden	9.14
Deep Overburden	11.47
Shallow Bedrock	11.74
Deep Bedrock	4.49

Groundwater samples were collected using low flow techniques. Six monitoring wells (MW-2B, -2D, -3D, 3DD, -105B and -105D) were sampled using dedicated bladder pumps. The remaining wells were sampled using peristaltic pumps and dedicated tubing. Field parameters (including pH, temperature, dissolved oxygen, turbidity, oxidation/reduction potential, and specific conductance) were monitored during purging, and groundwater samples were collected once the field parameters had stabilized

3.2 Surface Water Monitoring Program

The 2013 surface water monitoring program included three locations on an unnamed stream that runs through the landfill.

- SWS-13 is located on the upstream side of the landfill at an outfall from a culvert under Rogers Road.
- SWS-15 is located on the downstream side of the landfill, below the confluence with the tributary stream east of the closed MSW landfill.
- SWS-BR is located on the downstream side of the landfill at an outfall from a culvert north of Browning Road.

All three surface water locations were sampled in May. Only SWS-15 and SWS-BR were sampled in September. SWS-13 was dry. Surface water samples were collected using a long handle plastic scoop. Samples to be analyzed for dissolved metals were field filtered using a 0.45-micron filter.

3.3 Potable Well Monitoring Program

The 2013 domestic monitoring program includes six residential wells that are sampled annually.

Annual Wells (May)	
DM-13 (15 Browning Road)	DM-11 (124 Wawecus Road)
DM-20 (114 Rogers Road)	DM-17 (12 Rogers Road)
DM-23 (44 Browning Road)	DM-18 (18 Rogers Road)

The domestic well samples were collected from outside taps (or inside taps if no outside tap was available) after a five-minute purge.

4 Water Quality

Water quality data for May 2013 are summarized in *Tables 3* through *5*. Laboratory reports are included in *Appendix A*. 2013 sampling results discussed in the following subsections.

4.1 Groundwater Quality

Groundwater quality results for 2013 are generally consistent with historical data. The water quality data reflect leachate impacts to the groundwater in the area of both the bulky waste landfill and the MSW landfill. The greatest concentrations of leachate indicators were detected in the deep portions of the overburden and shallow bedrock directly downgradient of the landfills.

Results specific to the MSW landfill and bulky waste landfill are discussed in more detail in the following subsections. Time-trend graphs of the following key parameters are presented as *Figures 3A* through *7B*: ammonia, sodium, total dissolved solids, arsenic, and VOCs (with a separate graph for benzene). Groundwater analytical data were compared to U.S. EPA primary drinking water standards (NPDWS) and Connecticut Department of Health (CT DOH) public drinking water standards.

4.1.1 Municipal Solid Waste Landfill

Constituents detected in groundwater and criteria exceedances are summarized in *Table 3*. Laboratory reports are included in *Appendix A*. An overview of the average concentrations of key leachate indicator parameters for the MSW landfill since 2007 is provided below:

Municipal Solid Waste Landfill
Average Detected Concentrations Since 2007

Year		Average Detected Concentrations of Key Constituents						
		Total VOCs (ug/L)	Benzene (ug/L)	Arsenic (mg/L)	Sodium (mg/L)	Ammonia (mg/L)	TDS (mg/L)	Chloride (mg/L)
2007	March	28	8.3	0.240	79.5	30.5	492	90
	September	36	7.3	0.244	95.1	42.4	566	105
2008	March	18	11.0	0.218	81.3	31.2	479	98
	September	22	3.5	0.248	75.3	37.7	441	84
2009	March	9	7.6	0.237	83.5	28.0	469	90
	September	25	4.5	0.232	84.6	30.5	497	98
2010	March	25	6.4	0.232	70.6	29.1	437	81
	September	25	4.2	0.222	78.5	31.5	522	96
2011	March	23	6.1	0.227	66.3	25.4	461	90
	September	10	3.8	0.208	71.8	30.5	457	83
2012	March	22	6.3	0.249	72.9	31.6	444	77
	September	19	3.7	0.224	71.9	36.2	470	77
2013	May	17	4.9	0.243	65.7	28.0	450	83

As indicated by the data above and the time trend graphs, the concentrations of key indicator parameters in 2013 were consistent with historical results.

Based on the data in *Table 3*, groundwater samples from wells located northeast of the landfill (MW-103 and -105 clusters) exhibited lower concentrations of leachate indicator parameters than groundwater collected closer to the landfill (MW-2, -3, and -102 clusters). Groundwater in the deep bedrock also appears to exhibit significantly lower concentrations of leachate parameters then shallow bedrock and overburden groundwater as indicated by the MW-3/3B(R)/3D/3DD well cluster. Specific parameter results area discussed below.

VOCs

VOCs were detected in samples from six monitoring wells (MW-2A, -2B, -2D, -3B(R), -3D, and -102B) in the vicinity of the MSW landfill in 2013. Detected total VOC concentrations ranged from 0.83

micrograms per liter (ug/L) at MW-102B to 130 ug/L at MW-003D. As shown on *Figures 7A and 7B*, detected VOC concentrations in samples collected in 2013 were within historical ranges.

The benzene concentration at well MW-2B, exceeded the NPDWS and CTDOH criteria. Several other VOCs were detected at the site; however, the concentrations were below applicable standards.

Metals

Detected metals concentrations in samples collected in March and September 2012 were generally consistent with historical results. Specific results for metals exceeding applicable criteria are discussed below:

- **Sodium:** Sodium concentrations exceeded the CTDOH notification level at 10 monitoring wells (MW-2A, -2B, -2D, -3, -3B(R), -3D, -3DD, -102B, -105B, -105D). Time-trend graphs of sodium concentrations in the vicinity of the MSW landfill are included on *Figures 4A* and *4B*. Detections of sodium in MSW monitoring wells in 2013 appear to be consistent with historical results.

- **Arsenic:** Arsenic concentrations exceeded the NPDWS and CTDOH standards at seven locations (MW-2A, -2B, -2D, -3B(R), -3D, -102A, -102B). Time-trend graphs of arsenic concentrations in the vicinity of the MSW landfill are included on *Figures 6A* and *6B*. Detections of arsenic in MSW monitoring wells in 2013 appear to be consistent with historical results.

- **Lead:** The lead concentration (0.026 mg/l) at MW-2A exceeded the CTDOH standard. The detected lead concentration is consistent with historical results.

General Chemistry Parameters

As demonstrated by the data in *Table 3*, the greatest concentrations of inorganic parameters indicative of leachate were detected in the deep portions of the overburden and shallow bedrock at wells MW-2D, MW-3D and MW-3B(R). The time-trend graphs for ammonia and TDS are included as *Figures 3A, 3B, 5A, and 5B*. Inorganic parameter concentrations detected in samples collected in 2013 were generally consistent with historical ranges. Exceedances are discussed below:

- The chloride concentrations at monitoring well MW-3D exceeded CTDOH criteria.

4.1.2 Bulky Waste Landfill

Constituents detected in groundwater and criteria exceedances are summarized in *Table 3*. Laboratory reports are included in *Appendix A*. An overview of the average concentrations of key leachate indicator parameters for the bulky waste landfill since 2007 is provided below:

Bulky Waste Landfill
Average Detected Concentrations Since 2007

Year		Average Detected Concentrations of Key Constituents				
		Arsenic (mg/L)	Sodium (mg/L)	Ammonia (mg/L)	TDS (mg/L)	Lead (mg/L)
2007	March	0.010	28.2	3.3	546	0.003
	September	<0.004	25.0	0.8	502	0.006
2008	March	0.006	32.5	1.5	584	0.007
	September	0.010	28.5	1.5	518	0.004
2009	March	0.008	27.7	1.3	528	0.002
	September	0.030	26.9	1.5	536	0.007
2010	March	0.011	24.7	1.8	502	0.005
	September	0.010	24.2	0.6	428	0.019
2011	March	0.008	26.9	0.8	562	0.024
	September	0.007	27.6	1.4	538	0.037
2012	March	0.011	23.8	1.3	438	0.008
	September	0.01	20.8	0.8	458	0.097
2013	May	0.0065	25.7	1.3	488	<0.002

As indicated by the data above and the time trend graphs (*Figures 3C, 4C, 5C,* and *6C*), the concentrations of key indicator parameters in 2012 were consistent with historical results.

Based on the data in *Table 3*, reported concentrations of leachate indicator parameters were lower in upgradient wells (MW-201D and -205D) than in downgradient wells (MW-202D, -204A, and -204D) The greatest concentrations of leachate indicator parameters were generally detected in MW-204A and MW-204D, located directly downgradient from the bulky waste landfill.

Exceedances of the NPDWS and CTDOH MCLs in 2013 are summarized below:

- Sodium exceeded the CTDOH MCL at MW-204A.

4.2 Surface Water Quality

2013 surface water analytical results indicate that stream quality has been impacted by leachate. Analytical results were compared to the CTDOH MCLs and the Acute and Chronic Connecticut Freshwater Water Quality Standards (WQS). Detected parameters and criteria exceedances are summarized in *Table 4*. An overview of the average concentrations of key leachate indicator parameters for since 2007 is provided below:

Surface Water
Average Detected Concentrations Since 2007

Year		Average Detected Concentrations of Key Constituents				
		Arsenic (mg/L)	Diss Lead (mg/L)	Ammonia (mg/L)	TDS (mg/L)	Total Coliform (mg/L)
2007	March	0.005	ND	2.6	158	213
	September	0.057	0.014	26.9	345	5500
2008	March	ND	0.005	2.1	157	77
	September	0.021	ND	3.8	203	2000
2009	March	0.009	0.002	2.4	177	1107
	September	0.020	ND	6.8	250	1000
2010	March	ND	0.004	0.6	105	403
	September	0.076	ND	48.5	535	1000
2011	March	0.007	0.004	1.7	163	60
	September	0.010	0.005	1.6	159	2000
2012	March	0.012	0.004	2.9	169	227
	September	0.048	ND	30.2	415	1360
2013	May	0.015	0.002	4.4	200	577

As indicated by the above data, the 2013 results are consistent with historical concentrations. For most parameters, the concentrations of constituents in the fall appear to be higher than in the spring, likely because of low precipitation over the summer and early fall, which results in fall base flows consisting primarily of groundwater discharge. An overview of the 2013 surface water exceedances is presented below:

- **Upstream of the Landfill – SWS-13:** Bacteria concentrations in May were higher than CTDOH MCLs. The aluminum concentration was above the aquatic life freshwater acute and chronic criteria. Total lead and dissolved lead concentrations were above the aquatic life freshwater chronic criteria.

- **Downstream of the Landfill – SWS-15 and SWS-BR:** Arsenic, lead, aluminum and bacteria concentrations in 2013 were above applicable criteria. Ammonia was above the calculated chronic aquatic fresh water aquatic life criteria in May (see *Appendix B* for calculations based on temperature and pH).

4.3 Domestic Water Quality

2013 domestic well analytical results are summarized in *Table 5*. Domestic well water quality in 2013 was generally consistent with historical data. Domestic wells DM-11 and DM-17 were not sampled in May because no one was at home during the sampling event.

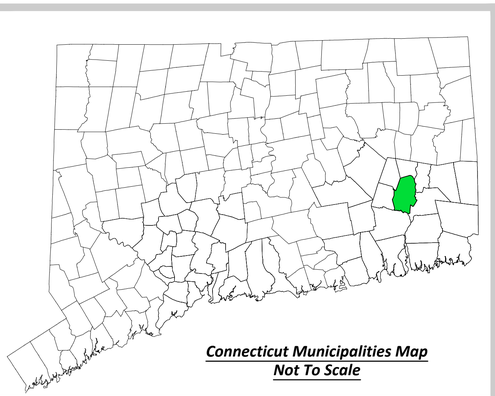
Discussions of DM-23 and DM-20, which have historically exhibited varying trends, are presented below followed by a comparison of domestic water quality data to applicable criteria.

APPENDIX D

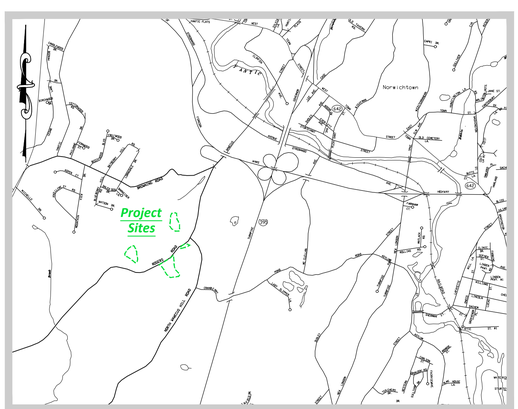
Design Drawings

ROGERS ROAD LANDFILL SOLAR PROJECT
SOLAR PHOTOVOLTAIC (PV) SYSTEM
Prepared For
SolarCity Corporation
82 Rogers Road - Norwich, Connecticut
September 2015

Revision A - Equipment Pad Details - 9/29/15



Connecticut Municipalities Map
Not To Scale



Site Location Map
Scale: 1"=2000'



Site Location Aerial View
Not To Scale

Project Information	
Developed By: *Brightfields Development, LLC* *41 Walnut Street, Suite 301* *Wellesley, MA 02481* *SolarCity Corporation* *714 Brook Street* *Rocky Hill, CT 06067* *Civil Engineer:* *Boundaries LLC* *179 Pachaug River Drive* *Griswold, CT 06351*	*Electrical Engineer:* *SolarCity Corporation* *714 Brook Street* *Rocky Hill, CT 06067* *Host:* *City of Norwich* *100 Broadway* *Norwich, CT 06360* *Utility:* *Connecticut Municipal Electric Energy Cooperative* *30 Stott Avenue* *Norwich, CT 06360*

Index To Drawings

Sheet	Sheet Title
1	Cover Sheet
	Mounting Plane #1 and Mounting Plane #4
2	Topographic Survey-Existing Conditions
3	Site Development Plan
	Mounting Plane #2
4	Topographic Survey-Existing Conditions
5	Site Development Plan
	Mounting Plane #3
6	Topographic Survey-Existing Conditions
7	Site Development Plan
8	Overall Site Utility Plan
9	Erosion & Sediment Control Narrative and Details
10	Site Details
11	Site Details
12	Structural Details for On-Cap Equipment Pads

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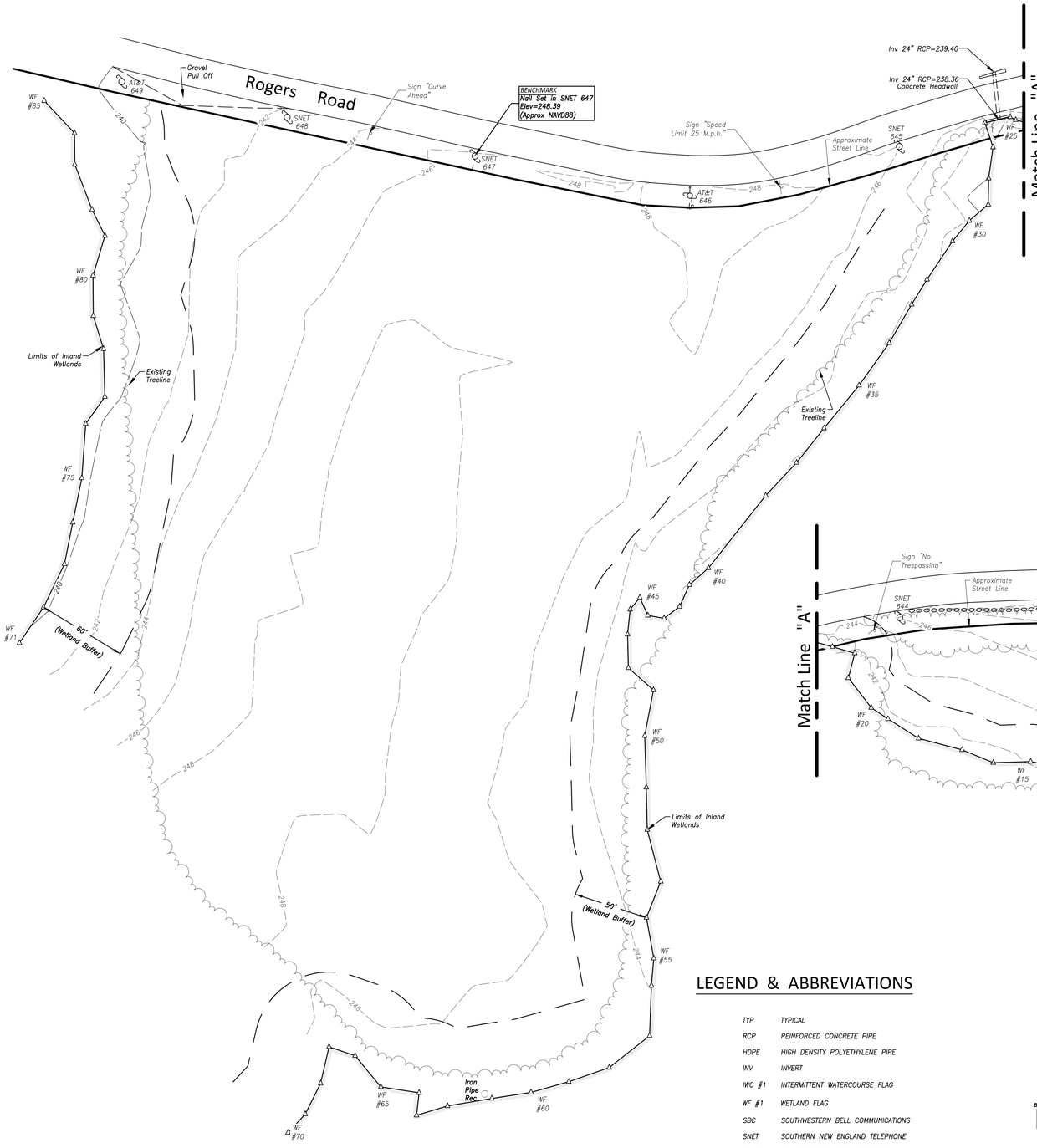

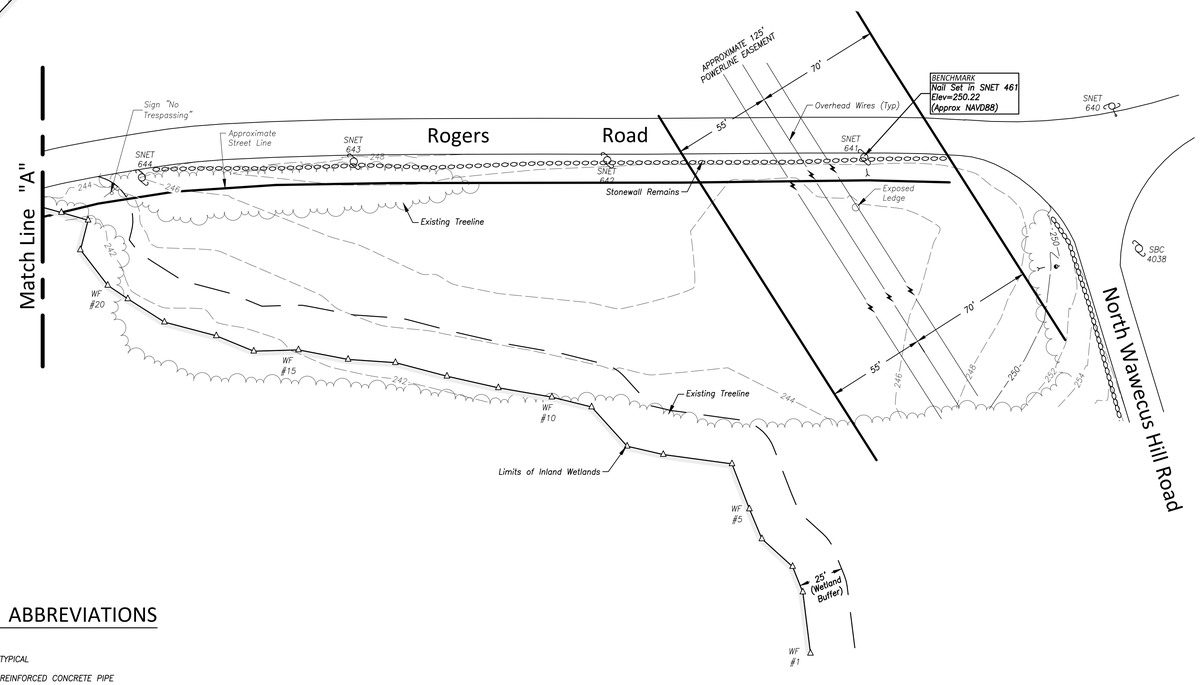

SURVEY NOTES

1. THIS SURVEY HAS BEEN PREPARED PURSUANT TO THE REGULATIONS OF CONNECTICUT STATE AGENCIES SECTIONS 20-300B-1 THROUGH 20-300B-20 AND THE "STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED FOR USE BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON SEPTEMBER 26, 1996. IT IS A TOPOGRAPHIC SURVEY AND CONFORMS TOPOGRAPHIC CLASS T-2 ACCURACY STANDARDS. IT IS INTENDED TO BE USED FOR SITE PLANNING.
2. NORTH ORIENTATION DEPICTED HEREON IS APPROXIMATE NORTH AMERICAN DATUM 1983 (NAD83) BASED UPON GLOBAL POSITIONING SYSTEM OBSERVATIONS, OBSERVED ON OCTOBER 03, 2014 THRU OCTOBER 07, 2014.
3. VERTICAL DATUM DEPICTED HERE ON IS APPROXIMATE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD83) BASED GLOBAL POSITIONING SYSTEM OBSERVATIONS USING GEOIDE12A ON OCTOBER 03, 2014 THRU OCTOBER 07, 2014.
3. ALL SUBTERRANEAN FEATURES AND IMPROVEMENTS MAY NOT BE DEPICTED OR NOTED HEREON.
4. THE FIELD SURVEY WAS COMPLETED ON OCTOBER 07, 2014
5. LIMITS OF INLAND WETLANDS DEPICTED HEREON WERE DELINEATED BY DEMIAN A. SORRENTINO, C.S.S., BOUNDARIES LLC. BUFFER AREAS DEPICTED HEREON ARE PREDICATED ON RECOMMENDED SETBACKS PROVIDED BY ALL POINTS TECHNOLOGY CORPORATION BASED EVALUATION OF SAID INLAND WETLANDS. THE CITY OF NORWICH INLAND WETLAND REGULATIONS REQUIRES AN UPLAND REGULATED AREA OF 100'.
6. THE LOCATIONS OF UNDERGROUND UTILITIES AS SHOWN HEREON ARE BASED ON THE LOCATION OF ABOVEGROUND STRUCTURES AND RECORD DRAWINGS PROVIDED TO THE SURVEYOR. LOCATIONS OF UNDERGROUND UTILITIES MAY VARY FROM LOCATIONS SHOWN HEREON. ADDITIONAL BURIED UTILITIES/STRUCTURES MAY BE ENCOUNTERED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS AND ELEVATIONS AND CONTACT "CALL BEFORE YOU DIG" AT LEAST 48 HOURS PRIOR TO ANY EARTHWORK OPERATIONS.

REFERENCE MAPS

1. AS-BUILT CONDITIONS, PREPARED FOR NUTMEG SAND AND GRAVEL COMPANY, NORWICH BULKY WASTE SITE, ROGERS ROAD, NORWICH, CONNECTICUT, SCALE: 1"=40', DATED: 10/26/99 SHEET No. 1 OF 1, PREPARED BY: ANCHOR ENGINEERING SERVICES, INC.
2. CONSTRUCTION PLANS FOR NORWICH LANDFILL CLOSURE, TOWN OF NORWICH, ROGERS ROAD, NORWICH, CONNECTICUT DATED: APRIL 1996, SHEETS 1 – 7, PREPARED BY: FUSS & O'NEILL

LEGEND & ABBREVIATIONS

TYP	TYPICAL
RCP	REINFORCED CONCRETE PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
INV	INVERT
IWC #1	INTERMITTENT WATERCOURSE FLAG
WF #1	WETLAND FLAG
SBC	SOUTHWESTERN BELL COMMUNICATIONS
SNET	SOUTHERN NEW ENGLAND TELEPHONE
CL&P	CONNECTICUT LIGHT AND POWER
AT&T	AMERICAN TELEPHONE AND TELEGRAPH
248	EXISTING CONTOUR
	IRON PIN
	UTILITY POLE
	GUY WIRE
	SIGN
	WETLAND FLAG

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)
1 inch = 40 ft.

I HAVE CONDUCTED AN ON-SITE SOIL INVESTIGATION OF THE PARCEL OF LAND DEPICTED HEREON. THE INTERMITTENT WATERCOURSES AND INLAND WETLAND BOUNDARIES AS PORTRAYED ARE AN ACCURATE REPRESENTATION OF THE DELINEATION PERFORMED IN THE FIELD.

DEMIAN A. SORRENTINO, C.S.S. DATE

"TO MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON."

70016
JOHN U. FAULISE JR. L.S. LICENSE NO. DATE

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BOUNDARIES
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T 860.376.2006 | www.boundariesllc.net

BRIGHTFIELDS DEVELOPMENT LLC
40 Walnut Street Suite 301
Wellesley, MA 02481
www.solarbrownfields.com

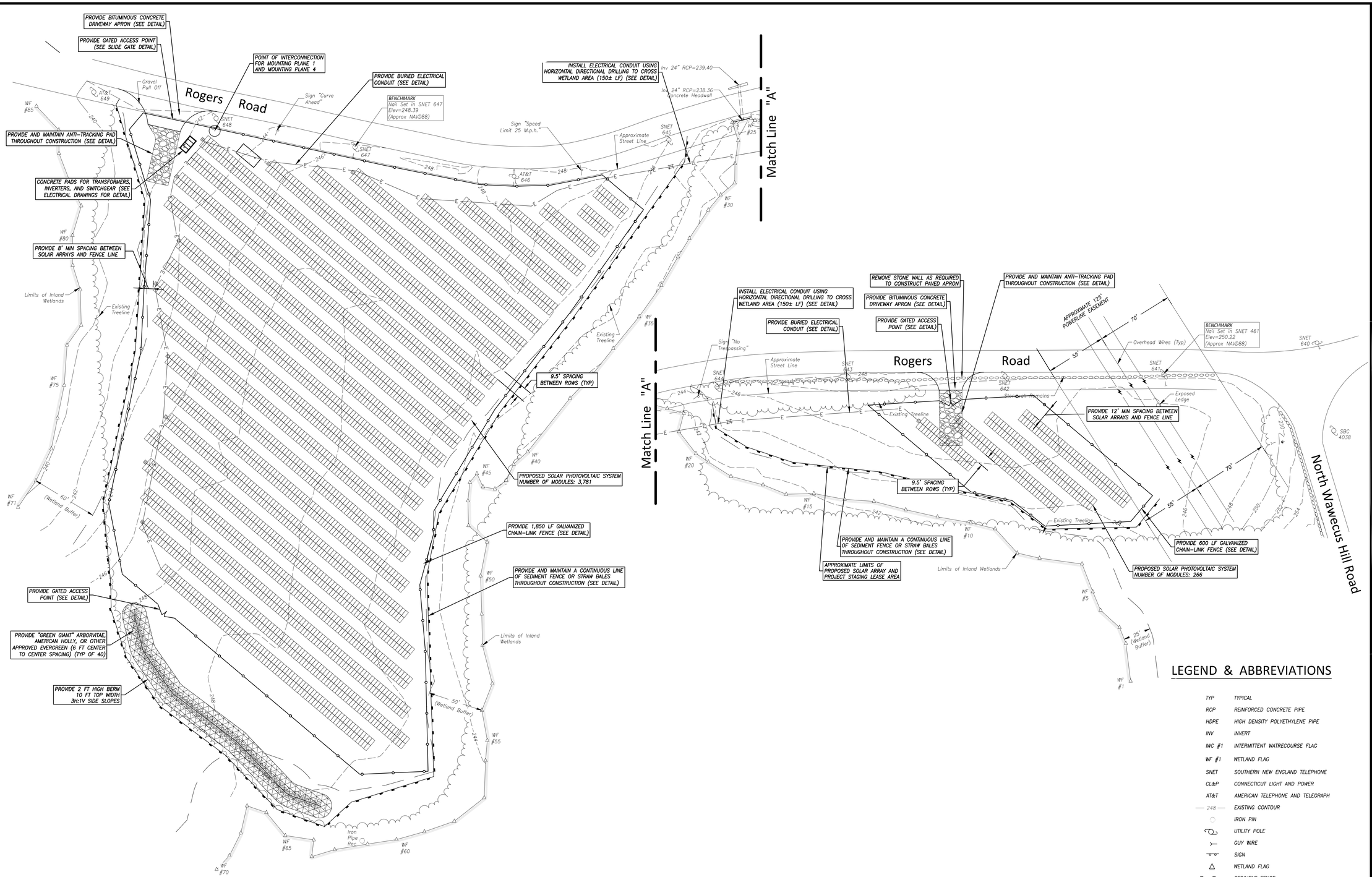
SolarCity
714 Brook Street
Rocky Hill, CT 06067
www.solarcity.com

SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Mounting Plane 1 and Mounting Plane 4
Topographic Survey - Existing Conditions

SCALE: 1" = 40'
DATE: September 2015
JOB I.D. NO. 14-2302

Revisions
Rev. A - Equipment Pad Details - 9/29/15

SHEET NO.
2
12



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(IN FEET)
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248	EXISTING CONTOUR
	IRON PIN
	UTILITY POLE
	GUY WIRE
	SIGN
	WETLAND FLAG
	SEDIMENT FENCE
	STRAW WATTLE
	CHAIN LINK FENCE
E	ELECTRICAL CONDUIT

29102
DAVID C. McKAY P.E., LICENSE NO. DATE

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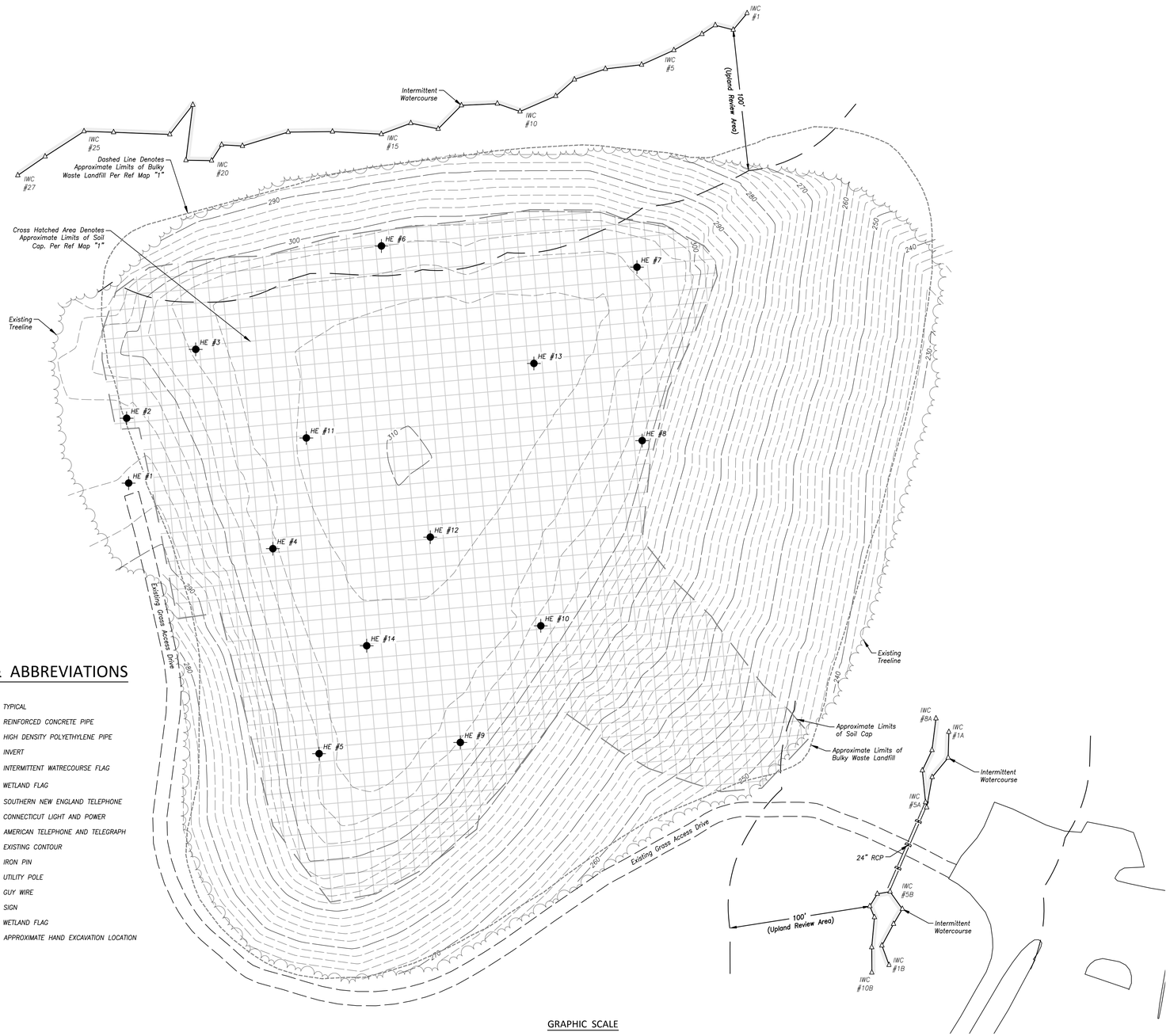

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	IRON PIN
	UTILITY POLE
	GUY WIRE
	SIGN
	WETLAND FLAG
HE #1	APPROXIMATE HAND EXCAVATION LOCATION

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)
1 inch = 40 ft.

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HAND EXCAVATION RESULTS

HAND EXCAVATION LOCATIONS ARE APPROXIMATE ONLY. HAND EXCAVATIONS WERE PERFORMED BY WESTON & SAMPSON ENGINEERS, INC. ON JULY 9, 2015.

HAND EXCAVATION #1

SURFACE	COMPACTED SAND/GRAVEL AT BEGINNING OF PROPOSED GRAVEL ACCESS DRIVE
0" – 11"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, SOME SMALL TO LARGE GRAVEL; MOIST. APPEARED TO BE DENSE TO VERY DENSE BASED ON HAND EXCAVATION EFFORT. COULD NOT EXCAVATE BEYOND 11" BELOW GROUND SURFACE.

END OF EXCAVATION AT 11" BELOW GROUND SURFACE.

HAND EXCAVATION #2

SURFACE	TALL FIELD GRASS ALONG PROPOSED GRAVEL ACCESS DRIVE AT BASE OF LANDFILL SLOPE
0" – 4"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
4" – 12"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, SOME MEDIUM TO LARGE GRAVELS. APPEARED TO BE MEDIUM DENSE TO DENSE BASED ON HAND EXCAVATION EFFORT.
12" – 19"	GRAY, GRAVEL FILL (UP TO 4 IN. DIAMETER) WITH FINE TO MEDIUM SILTY SAND; MOIST. APPEARED TO BE VERY DENSE BASED ON HAND EXCAVATION EFFORT. COULD NOT EXCAVATE BEYOND 19" BELOW GROUND SURFACE.

END OF EXCAVATION AT 19" BELOW GROUND SURFACE.

HAND EXCAVATION #3

SURFACE	TALL FIELD GRASS ALONG PROPOSED GRAVEL ACCESS DRIVE AT TOP OF LANDFILL
0" – 2"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS.
2" – 18"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 18" BELOW GROUND SURFACE, END OF EXCAVATION AT 18" BELOW GROUND SURFACE.

HAND EXCAVATION #4

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 3"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
3" – 23"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS), TRACE BRICK DEBRIS; MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 23" BELOW GROUND SURFACE, END OF EXCAVATION AT 23" BELOW GROUND SURFACE.

HAND EXCAVATION #5

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 4"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
4" – 15"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS), TRACE BRICK DEBRIS; MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 15" BELOW GROUND SURFACE, END OF EXCAVATION AT 15" BELOW GROUND SURFACE.

HAND EXCAVATION #6

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 3"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
3" – 17"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 17" BELOW GROUND SURFACE, END OF EXCAVATION AT 17" BELOW GROUND SURFACE.

HAND EXCAVATION #7

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 4"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
4" – 9"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 9" BELOW GROUND SURFACE, END OF EXCAVATION AT 9" BELOW GROUND SURFACE.

HAND EXCAVATION #8

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 4"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
4" – 15"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS), TRACE PLASTIC DEBRIS; MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 15" BELOW GROUND SURFACE, END OF EXCAVATION AT 15" BELOW GROUND SURFACE.

HAND EXCAVATION #9

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 6"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
6" – 15"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS), TRACE PLASTIC DEBRIS; MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 15" BELOW GROUND SURFACE, END OF EXCAVATION AT 15" BELOW GROUND SURFACE.

HAND EXCAVATION #10

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 5"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
5" – 14"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 14" BELOW GROUND SURFACE, END OF EXCAVATION AT 14" BELOW GROUND SURFACE.

HAND EXCAVATION #11

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 2"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
2" – 27"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. SMALL COBBLES AT APPROXIMATELY 15" BELOW GROUND SURFACE. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 27" BELOW GROUND SURFACE, END OF EXCAVATION AT 27" BELOW GROUND SURFACE.

HAND EXCAVATION #12

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 4"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
4" – 17"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 17" BELOW GROUND SURFACE, END OF EXCAVATION AT 17" BELOW GROUND SURFACE.

HAND EXCAVATION #13

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 6"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
6" – 21"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 21" BELOW GROUND SURFACE, END OF EXCAVATION AT 21" BELOW GROUND SURFACE.

HAND EXCAVATION #14

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 3"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
3" – 25"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS), TRACE PLASTIC DEBRIS; MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 25" BELOW GROUND SURFACE, END OF EXCAVATION AT 25" BELOW GROUND SURFACE.

I HAVE CONDUCTED AN ON-SITE SOIL INVESTIGATION OF THE PARCEL OF LAND DEPICTED HEREON. THE INTERMITTENT WATERCOURSES AND INLAND WETLAND BOUNDARIES AS PORTRAYED ARE AN ACCURATE REPRESENTATION OF THE DELINEATION PERFORMED IN THE FIELD.

DEMIAN A. SORRENTINO, C.S.S. — DATE

"TO MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON."

70016
JOHN U. FAULISE JR. L.S. — LICENSE NO. — DATE

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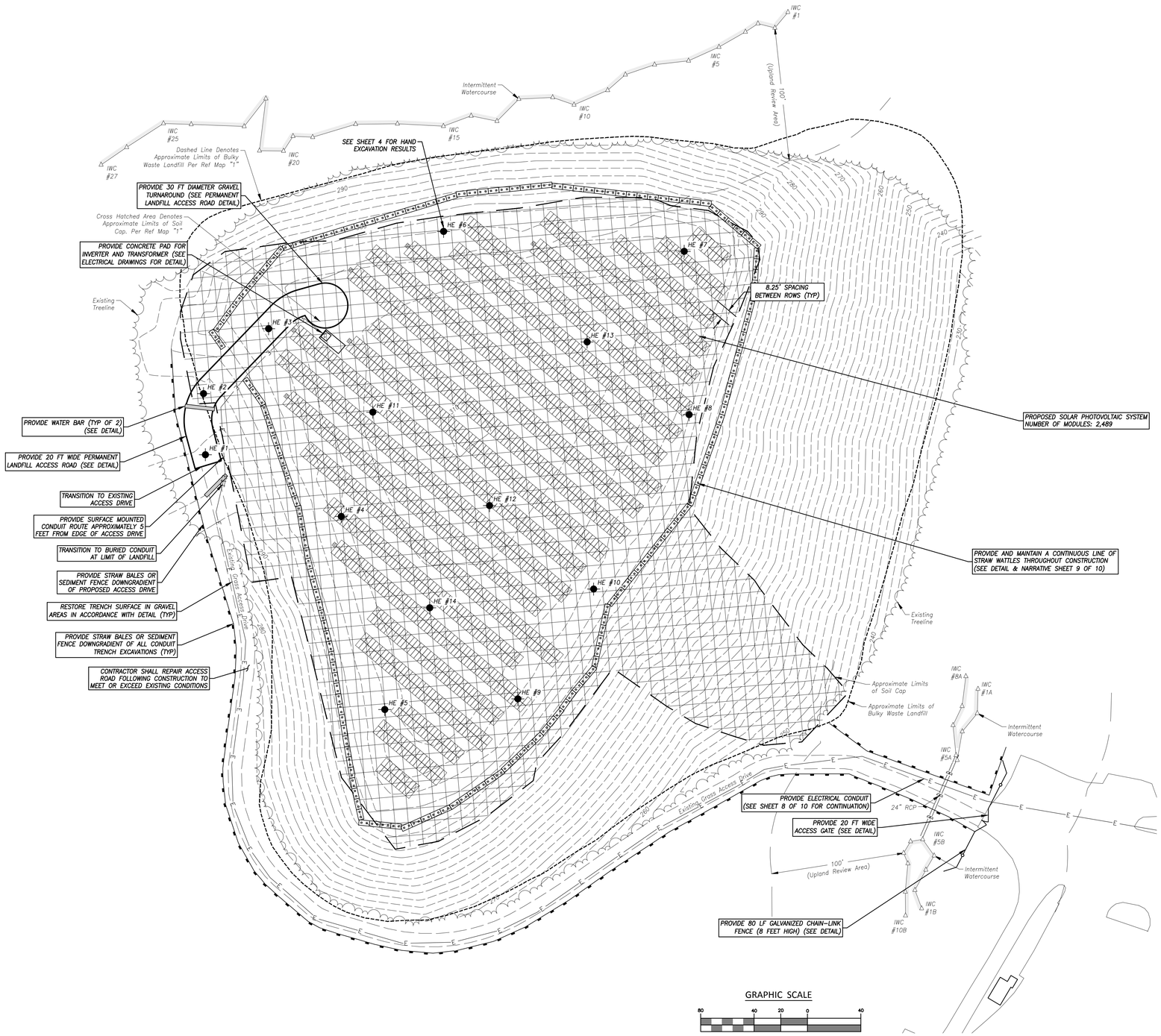
www.solarcity.com

SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Mounting Plane 2 - Bulky Waste Area
Topographic Survey - Existing Conditions

SCALE: 1" = 40'
DATE: September 2015
JOB I.D. NO. 14-2302

Revisions
Rev. A - Equipment Pad Details - 9/29/15

SHEET NO.
4
12



LEGEND & ABBREVIATIONS

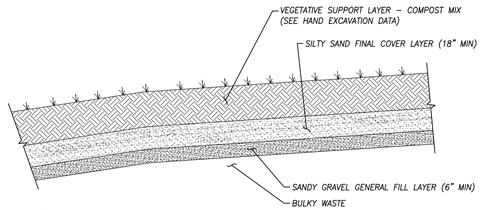
TYP	TYPICAL
RCP	REINFORCED CONCRETE PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
INV	INVERT
IWC #1	INTERMITTENT WATRECOURSE FLAG
WF #1	WETLAND FLAG
SNET	SOUTHERN NEW ENGLAND TELEPHONE
CL&P	CONNECTICUT LIGHT AND POWER
AT&T	AMERICAN TELEPHONE AND TELEGRAPH
248	EXISTING CONTOUR
	IRON PIN
	UTILITY POLE
	GUY WIRE
	SIGN
	WETLAND FLAG
	SEDIMENT FENCE
	STRAW WATTLE
	CHAIN LINK FENCE
E	ELECTRICAL CONDUIT
HE #1	APPROXIMATE HAND EXCAVATION LOCATION

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)

1 inch = 40 ft.



NOTE:
1. NO EXCAVATION WITHIN THE 18" SILTY SAND COVER LAYER.
2. CROSS SECTION DEVELOPED FROM LANDFILL CLOSURE REPORT PREPARED BY OTHERS AND MAY NOT REFLECT ACTUAL CONDITIONS.

BULKY WASTE LANDFILL SOIL CAP CROSS SECTION

NOT TO SCALE

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Mounting Plane 2 - Bulky Waste Area
Site Development Plan

SCALE: 1" = 40'

DATE: September 2015

JOB I.D. NO. 14-2302

Revisions

Rev. A - Equipment Pad Details - 9/29/15

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LEGEND & ABBREVIATIONS

TYP	TYPICAL
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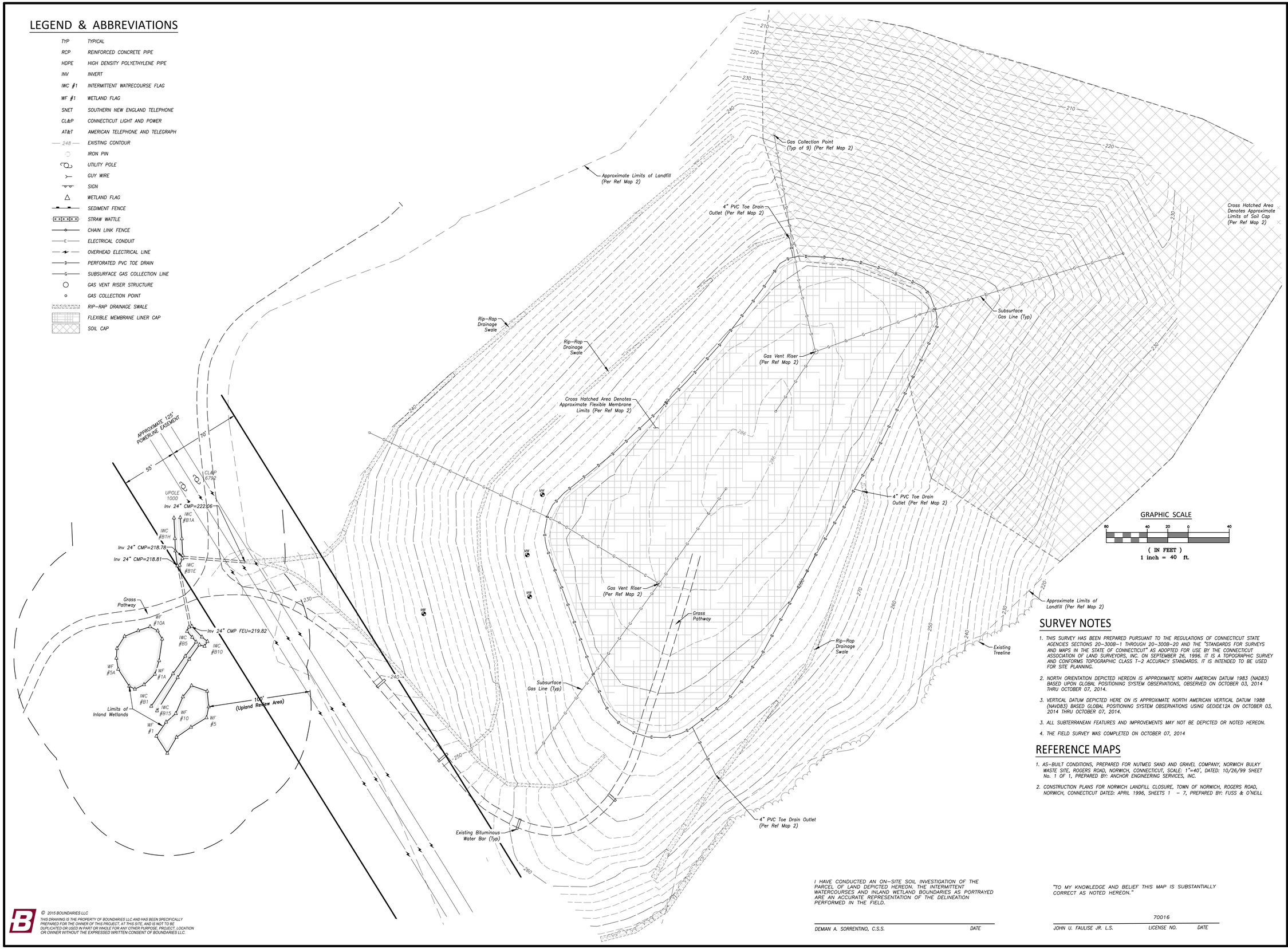
	SIGN
	WETLAND FLAG
	SEDIMENT FENCE
	STRAW WATTLE
	CHAIN LINK FENCE
E	ELECTRICAL CONDUIT
	OVERHEAD ELECTRICAL LINE
D	PERFORATED PVC TOE DRAIN
G	SUBSURFACE GAS COLLECTION LINE
	GAS VENT RISER STRUCTURE
	GAS COLLECTION POINT
	RIP-RAP DRAINAGE SWALE
	FLEXIBLE MEMBRANE LINER CAP
	SOIL CAP



SURVEY NOTES

1. THIS SURVEY HAS BEEN PREPARED PURSUANT TO THE REGULATIONS OF CONNECTICUT STATE AGENCIES SECTIONS 20-300B-1 THROUGH 20-300B-20 AND THE "STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED FOR USE BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON SEPTEMBER 26, 1996. IT IS A TOPOGRAPHIC SURVEY AND CONFORMS TOPOGRAPHIC CLASS T-2 ACCURACY STANDARDS. IT IS INTENDED TO BE USED FOR SITE PLANNING.
2. NORTH ORIENTATION DEPICTED HEREON IS APPROXIMATE NORTH AMERICAN DATUM 1983 (NADB3) BASED UPON GLOBAL POSITIONING SYSTEM OBSERVATIONS, OBSERVED ON OCTOBER 03, 2014 THRU OCTOBER 07, 2014.
3. VERTICAL DATUM DEPICTED HERE ON IS APPROXIMATE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD83) BASED GLOBAL POSITIONING SYSTEM OBSERVATIONS USING GEOIDE12A ON OCTOBER 03, 2014 THRU OCTOBER 07, 2014.
3. ALL SUBTERRANEAN FEATURES AND IMPROVEMENTS MAY NOT BE DEPICTED OR NOTED HEREON.
4. THE FIELD SURVEY WAS COMPLETED ON OCTOBER 07, 2014

REFERENCE MAPS

1. AS-BUILT CONDITIONS, PREPARED FOR NUTMEG SAND AND GRAVEL COMPANY, NORWICH BULKY WASTE SITE, ROGERS ROAD, NORWICH, CONNECTICUT, SCALE: 1"=40', DATED: 10/26/99 SHEET No. 1 OF 1, PREPARED BY: ANCHOR ENGINEERING SERVICES, INC.
2. CONSTRUCTION PLANS FOR NORWICH LANDFILL CLOSURE, TOWN OF NORWICH, ROGERS ROAD, NORWICH, CONNECTICUT DATED: APRIL 1996, SHEETS 1 - 7, PREPARED BY: FUSS & O'NEILL

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Mounting Plane 3 - Landfill
Topographic Survey - Existing Conditions

SCALE: 1" = 40'

DATE: September 2015

JOB I.D. NO. 14-2302

Revisions

Rev. A - Equipment Pad Details - 9/29/15

SHEET NO.

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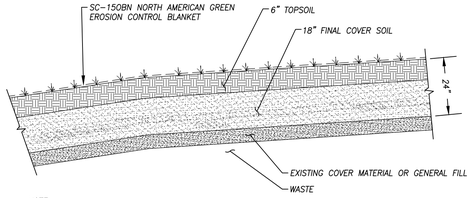
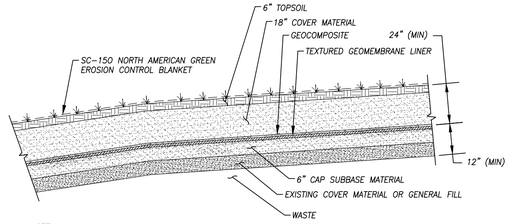


NOTE:
1. NO EXCAVATION WITHIN THE ORIGINAL COVER MATERIAL/GENERAL FILL LAYER.
2. CROSS SECTION DEVELOPED FROM LANDFILL CLOSURE PLANS PREPARED BY OTHERS AND MAY NOT REFLECT ACTUAL CONDITIONS.

NORWICH LANDFILL SOIL CAP CROSS SECTION

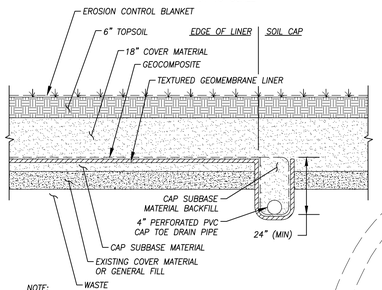
NOT TO SCALE



NOTE:
1. NO EXCAVATION WITHIN THE COVER MATERIAL LAYER.
2. CROSS SECTION DEVELOPED FROM LANDFILL CLOSURE PLANS PREPARED BY OTHERS AND MAY NOT REFLECT ACTUAL CONDITIONS.

NORWICH LANDFILL FLEXIBLE MEMBRANE LINER CAP CROSS SECTION

NOT TO SCALE



NOTE:
1. NO EXCAVATION WITHIN THE COVER MATERIAL LAYER.
2. CROSS SECTION DEVELOPED FROM LANDFILL CLOSURE PLANS PREPARED BY OTHERS AND MAY NOT REFLECT ACTUAL CONDITIONS.

FML CAP AND SOIL CAP INTERFACE CROSS SECTION

NOT TO SCALE

LEGEND & ABBREVIATIONS

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	GUY WIRE
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	OVERHEAD ELECTRICAL LINE
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	GAS VENT RISER STRUCTURE
	GAS COLLECTION POINT
	RIP-RAP DRAINAGE SWALE
	FLEXIBLE MEMBRANE LINER CAP
	SOIL CAP

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)
1 inch = 40 ft.

29102
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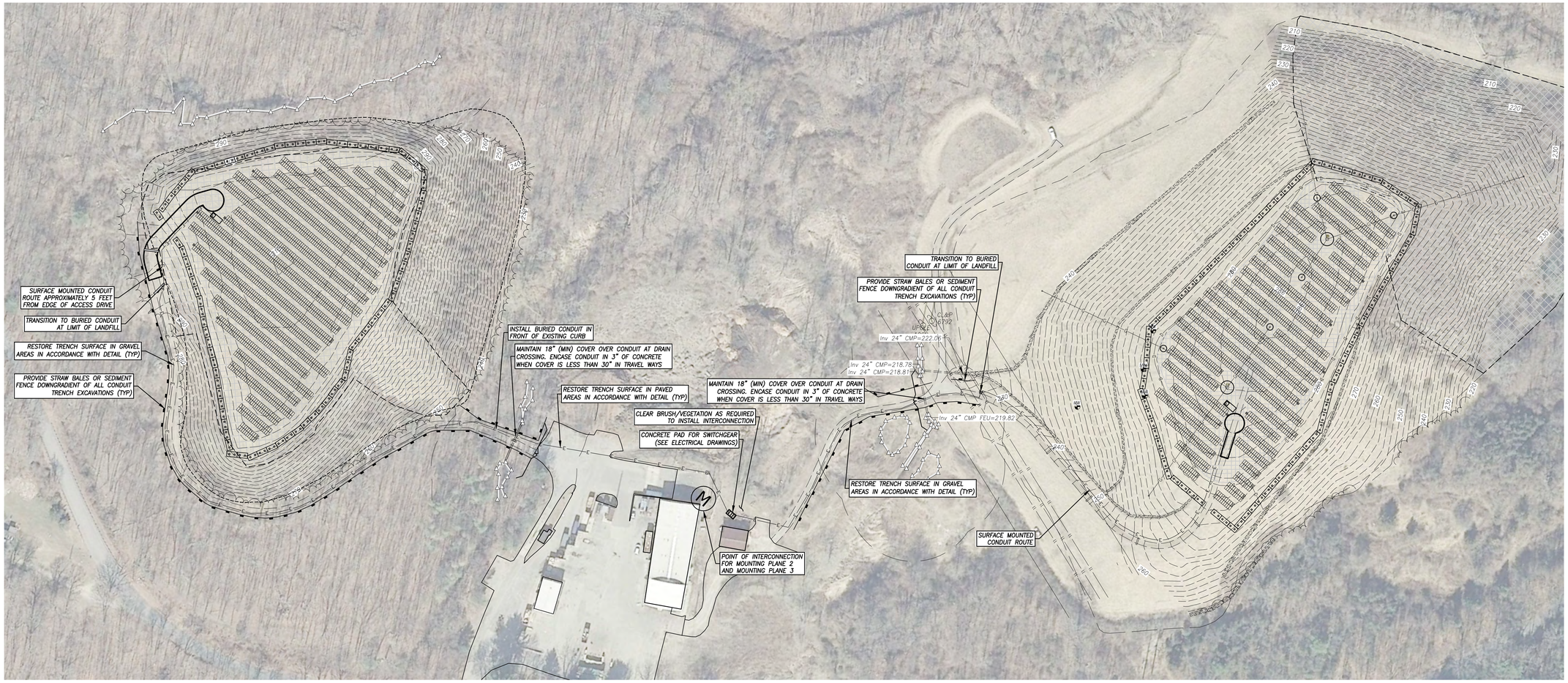

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	SIGN
	WETLAND FLAG
	SEDIMENT FENCE
	STRAW WATTLE
	CHAIN LINK FENCE
E	ELECTRICAL CONDUIT
U	OVERHEAD ELECTRICAL LINE

GRAPHIC SCALE

160 80 40 0 80

(IN FEET)
1 inch = 80 ft.

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SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Mounting Planes 2 & 3
Overall Site Utility Plan

SCALE: 1" = 80'
DATE: September 2015
JOB I.D. NO. 14-2302

Revisions
Rev. A - Equipment Pad Details - 9/29/15

SHEET NO.
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CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL CALL BEFORE YOU DIG AT 811 OR 1-800-922-4455 AT LEAST 72 HOURS, SATURDAY, SUNDAYS, AND HOLIDAYS EXCLUDED, PRIOR TO EXCAVATION AT ANY LOCATION. A COPY OF THE CALL BEFORE YOU DIG PROJECT REFERENCE NUMBER(S) SHALL BE GIVEN TO THE OWNER PRIOR TO EXCAVATION.
2. LOCATIONS OF EXISTING PIPES, CONDUITS, UTILITIES, FOUNDATIONS AND OTHER UNDERGROUND OBJECTS ARE NOT WARRANTED TO BE CORRECT AND THE CONTRACTOR SHALL HAVE NO CLAIM ON THAT ACCOUNT SHOULD THEY BE OTHER THAN THAT SHOWN.
3. STONE WALLS, FENCES, CURBS, ETC. SHALL BE REMOVED AND REPLACED AS NECESSARY TO PERFORM THE WORK. UNLESS OTHERWISE INDICATED, ALL SUCH WORK SHALL BE INCIDENTAL TO CONSTRUCTION OF THE PROJECT.
4. ALL OTHER DISTURBED BY THE CONTRACTOR BEYOND PAYMENT LIMITS SHALL BE RESTORED AT NO ADDITIONAL COST TO THE OWNER.
5. IF SURVEY CONTROL STAKING AND EROSION CONTROL MEASURES ARE REQUIRED, HAND DUG TEST HOLES WILL BE PERFORMED TO CONFIRM THE DEPTH TO THE LINER OR SOIL CAP, PRIOR TO INSTALLATION. ALL TEST HOLES SHALL BE VERIFIED BY THE ON-SITE ENGINEER.
6. ALL WORK SHALL BE DONE IN ACCORDANCE WITH OSHA REQUIREMENTS AND THE CONTRACTOR IS RESPONSIBLE FOR COMPLIANCE WITH THESE REQUIREMENTS. IN ADDITION, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE ANY EXCAVATION SAFEGUARDS, NECESSARY BARRICADES, FLAGMEN, ETC. FOR TRAFFIC CONTROL AND SITE SAFETY.
7. ALL EROSION & SEDIMENTATION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE START OF CONSTRUCTION.
8. ALL FUEL, OIL, PAINT OR OTHER HAZARDOUS MATERIALS USED DURING CONSTRUCTION SHOULD BE STORED IN A SECONDARY CONTAINER AND REMOVED TO A LOCKED INDOOR AREA WITH AN IMPERVIOUS FLOOR DURING NON-WORK HOURS.
9. NO WASTE MATERIALS (SUCH AS STUMPS) ARE ALLOWED TO BE BURIED ON SITE. ALL WASTE MATERIALS SHALL BE DISPOSED OF OFF-SITE AT AN APPROPRIATE LOCATION IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.

SPECIFICATIONS FOR WORK ON LANDFILL:

GENERAL:

1. THE CONTRACTOR SHALL BE AWARE THAT WORK IS LOCATED ON A LANDFILL AND IS SUBJECT TO THE CONNECTICUT SOLID WASTE REGULATIONS AND ANY REQUIREMENTS OUTLINED IN THE CT DEEP LANDFILL DISRUPTION AUTHORIZATION.
2. THE CONTRACTOR SHALL BE AWARE THAT THE WORK IS TO TAKE PLACE ABOVE A LANDFILL COVER SYSTEM, GENERALLY COMPRISED OF A VEGETATIVE SUPPORT LAYER, A SAND DRAINAGE LAYER, AND A LOW PERMEABILITY FLEXIBLE MEMBRANE LINER OR SOIL CAP. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO NOT DISRUPT THE LANDFILL CAP PROFILE OR TO DAMAGE THE LOW PERMEABILITY FLEXIBLE MEMBRANE LINER OR SOIL CAP.
3. WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE CONNECTICUT DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION'S PERMIT APPROVAL.
4. THE CONTRACTOR SHALL HAVE A HEALTH AND SAFETY PLAN WHILE WORKING ON THE LANDFILL.

EQUIPMENT:

1. THE CONTRACTOR SHALL PROVIDE A LIST OF ALL EQUIPMENT PROPOSED TO BE WORKING ON THE LANDFILL. THE LIST SHALL INCLUDE THE EQUIPMENT WEIGHT, GROUND PRESSURE, AND ANY RESTRICTIONS THAT WILL BE IMPOSED ON THE VEHICLE (I.E. LIMITED TO EXISTING ACCESS ROADS, LIMITED TO CARRYING ½ LOADS, ETC.)
2. ALL EQUIPMENT IS SUBJECT TO REVIEW AND APPROVAL BY THE ENGINEER. AS A GENERAL RULE, EQUIPMENT SHALL ADHERE TO THE FOLLOWING REQUIREMENTS:

Equipment Ground Pressure		Minimum Lift Thickness	
KPa	psi	meter	inches
<70	<10	0.30	12
70-140	10-20	0.60	24
>140	>20	0.90	36

SOURCE: GEOMEMBRANE PROTECTION DESIGN MANUAL, GSE; DHANI MAREJO, PH.D. AND GREG CORCORAN, P.E., FIRST EDITION.

EXCAVATIONS:

1. THE CONTRACTOR SHALL PROVIDE AN EXCAVATION PLAN DETAILING HOW THE CONTRACTOR WILL COMPLY WITH ALL PERTINENT PROVISIONS OF THE CONTRACT DOCUMENTS INCLUDING SITE RESTRICTIONS, WORK PROTOCOLS, TEMPORARY ROADS, ON-SITE PARKING AND STORAGE AREAS.
2. EXCAVATIONS ON THE LANDFILL AREA SHALL BE PERFORMED WITH THE GUIDANCE OF A LABORER OR "SPOTTER" AT ALL TIMES. THE LABORER SHALL IDENTIFY THE DEPTH OF THE LINER AND ENSURE THAT THE OPERATOR MAINTAINS A SAFE SEPARATING DISTANCE.
3. IT IS REQUIRED TO USE A SMOOTH BUCKET EXCAVATOR IN LIEU OF BUCKET WITH TEETH FOR EXCAVATIONS IN THE VICINITY OF THE LANDFILLS.

TEMPORARY EROSION CONTROL MEASURES:

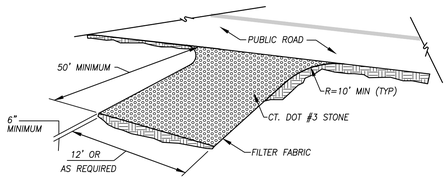
1. EROSION CONTROL MEASURES SHALL BE IMPLEMENTED AS DETERMINED BY THE ON-SITE ENGINEER.
2. THE SMALLEST PRACTICAL AREA OF LAND SHALL BE EXPOSED AT ANY ONE TIME.
3. SEDIMENT/EROSION CONTROL MEASURES SHALL BE INSTALLED AS SHOWN ON PLANS. EROSION CONTROL BARRIERS ARE TO BE MAINTAINED AND CLEANED UNTIL ALL SLOPES HAVE BEEN ADEQUATELY STABILIZED.
4. FILL MATERIAL SHALL BE FREE FROM STUMPS, WOOD, ROOTS, ETC.
5. THE TEMPORARY AND PERMANENT STORMWATER CONTROLS SHALL BE PERIODICALLY CLEANED OF SEDIMENT, AS REQUIRED BY THE ENGINEER. THE SEDIMENT WILL BE REMOVED TO A SECURE LOCATION SO AS TO PREVENT SILTATION OF NATURAL WATER WAYS.
6. STRAW WATTLES MUST BE A MINIMUM TUBE DIAMETER OF 12 INCHES (300MM) FOR SLOPES UP TO 50 FEET (15.24M) IN LENGTH WITH A SLOPE RATIO OF 3H:1V OR STEEPER. LONGER SLOPS OF 3H:1V MAY REQUIRE LARGER TUBE DIAMETER OR ADDITIONAL COURSING OF FILTER TUBES TO CREATE A FILTER BERM. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SITUATIONS WITH LONGER OR STEEPER SLOPES.
7. INSTALL TUBES ALONG CONTOURS AND PERPENDICULAR TO SHEET OR CONCENTRATED FLOW.
8. CONFIGURE TUBES AROUND EXISTING SITE FEATURES TO MINIMIZE SITE DISTURBANCE AND MAXIMIZE CAPTURE AREA OF STORMWATER RUN-OFF.
9. EROSION CONTROL MEASURES SHALL BE REMOVED WHEN DISTURBED AREA IS STABILIZED. DISTURBED AREA RESULTING FROM THE SILT FENCE REMOVAL OPERATION SHALL BE SEEDED IN ACCORDANCE WITH THE SPECIFICATIONS.
10. EROSION CONTROLS OTHER THAT AS SHOWN (I.E. HAY BALES) MUST BE APPROVED BY THE ENGINEER.

EROSION CONTROL NOTES:

1. THE RESPONSIBLE PARTY FOR THE INSTALLATION AND MAINTENANCE OF ALL EROSION CONTROL MEASURES IS ROBERT MILLER AT SOLARCITY AT 914-584-6894.
2. THE "2002 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL" BY THE CONNECTICUT COUNCIL ON SOIL AND WATER CONSERVATION IN COOPERATION WITH THE CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION, DEP BULLETIN 34, SHALL BE USED FOR INSTALLING AND MAINTAINING ALL EROSION CONTROL MEASURES. THE CONTRACTOR SHALL INSTALL ADDITIONAL MEASURES AS NECESSARY IF DIRECTED BY THE ENGINEER.
3. SEEDING FOR PERMANENT STABILIZATION SHALL BE DONE BETWEEN APRIL 15 THROUGH JUNE 15 OR BETWEEN AUGUST 15 THROUGH SEPTEMBER 15. IF SEEDING CANNOT BE DONE WITHIN THESE TIMES, APPLY TEMPORARY MULCH UNTIL NEXT SEEDING TIME. SEED MIXTURE SHALL BE AS FOLLOWS:

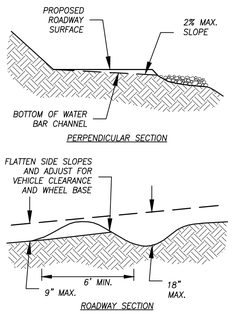
ALL 2:1 SLOPE AREAS			
CROWN VETCH	15 LBS/ACRE	OR	0.35 LBS/1,000 SF
PERENNIAL RYEGRASS	10 LBS/ACRE	OR	0.25 LBS/1,000 SF
ALL OTHER GRASSED AREAS			
CREEPING RED FESCUE	20 LBS/ACRE	OR	0.45 LBS/1,000 SF
REDTOP	2 LBS/ACRE	OR	0.05 LBS/1,000 SF
CROWN VETCH	15 LBS/ACRE	OR	0.35 LBS/1,000 SF

4. MULCH SHALL BE A GOOD QUALITY HAY OR STRAW AND SHALL BE APPLIED AT A RATE OF 2 BALES/1,000 SF.
5. ALL EROSION CONTROL MEASURES SHALL BE INSPECTED WITHIN 24 HOURS AFTER RAIN EVENTS AND REPAIRED OR REPLACED AS NECESSARY TO INSURE COMPLIANCE WITH THE APPROVED SOIL EROSION AND SEDIMENT CONTROL PLAN.
6. DUST CONTROL MEASURES WILL BE IMPLEMENTED DURING DRY CONDITIONS AND INCLUDE WATERING WITH A TANK TRUCK ON AN AS-NEEDED BASIS IN ORDER TO INSURE THAT NO AMBIENT DUST CONDITIONS ARE GENERATED FROM THE PROJECT.
7. THE ANTI-TRACKING PAD SHALL BE INSPECTED ON A WEEKLY BASIS AND MAINTAINED THROUGHOUT THE DURATION OF THE CONSTRUCTION FOR THIS PROJECT. WHEN THE ANTI-TRACKING PAD IS NO LONGER FUNCTIONING EFFICIENTLY OR ACCUMULATED SEDIMENT IS TO A DEPTH OF 2" BELOW THE STONE SURFACE, THE ANTI-TRACKING PAD SHALL BE REMOVED AND REPLACED AS PER THE DETAIL INDICATED ON THESE PLANS.



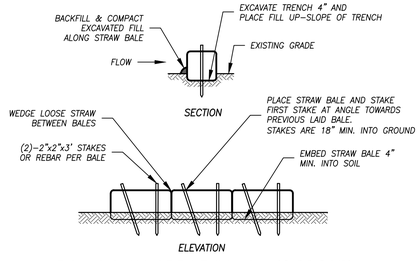
ANTI-TRACKING PAD

NOT TO SCALE



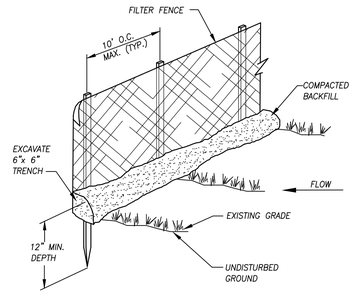
WATER BAR DETAIL

NOT TO SCALE



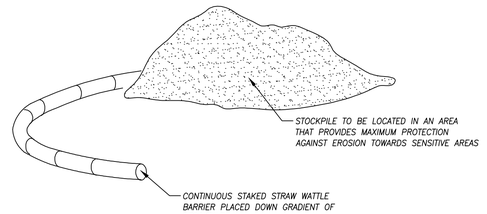
STRAW BALE BARRIER DETAIL (OFF CAP)

NOT TO SCALE



SEDIMENT FENCE DETAIL (OFF CAP)

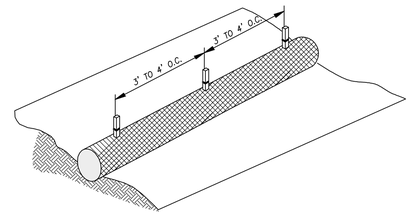
NOT TO SCALE



NOTE: LONG AXIS OF STOCKPILE TO BE PERPENDICULAR TO CONTOUR.

TEMPORARY STOCKPILE BARRIER DETAIL

NOT TO SCALE

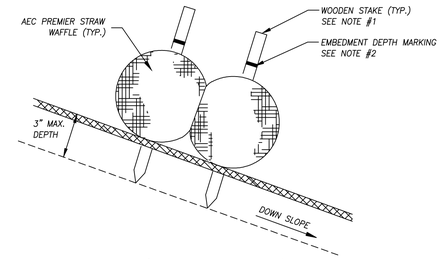


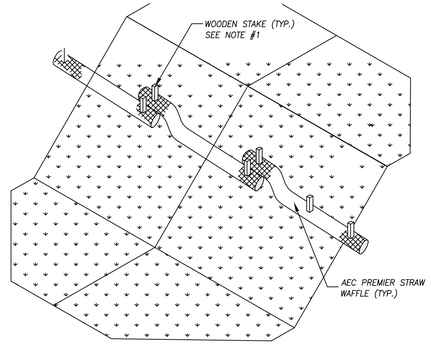
STRAW WATTLE INSTALLATION DETAIL (ON CAP)

NOT TO SCALE

NOTES:

1. PRIOR TO INSTALLATION OF WATTLES OR OTHER APPROVED EROSION CONTROL MEASURES, THE CONTRACTOR MUST PERFORM HAND DUG TEST HOLES UNDER THE SUPERVISION OF THE ON-SITE ENGINEER. IF SUFFICIENT CLEARANCE IS NOT FOUND, CONCRETE BLOCKS WILL BE USED AS A SUBSTITUTE FOR STAKES.
2. WATTLES CAN BE STAKED ON THE LANDFILL PROVIDED THE STAKES DO NOT EXCEED 3 INCHES INTO THE VEGETATIVE SUPPORT LAYER. STAKES SHALL BE CLEARLY MARKED 16 INCHES FROM THE TIP OF THE STAKE (3" MAX. EMBEDMENT DEPTH + 12" WATTLE) AND SHALL BE CLEARLY VISIBLE.





STRAW WATTLE SLOPE INSTALLATION DETAIL (ON CAP)

NOT TO SCALE

29102

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P:\CIVIL 3D PROJECTS\2014\14-2302 - BRIGHTFIELDS-NORWICH\DWG\DESIGN\(9) EROSION & SEDIMENT CTRL NARRATIVE & DETAILS.DWG

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SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Mounting Planes 1-3
Erosion & Sediment Control Narrative and Details

SCALE:

DATE: September 2015

JOB I.D. NO. 14-2302

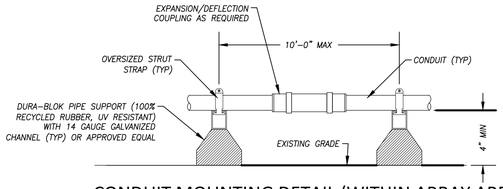
Revisions

Rev. A - Equipment Pad Details - 9/29/15

SHEET NO.

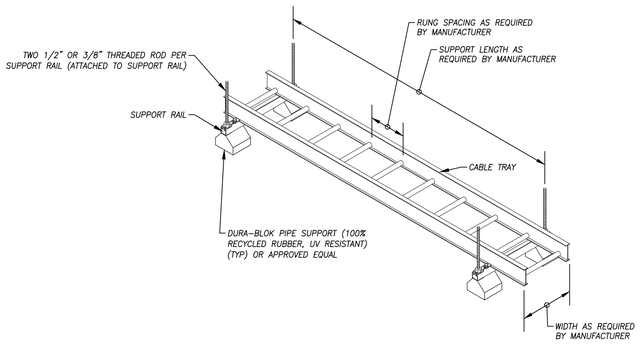
9

12



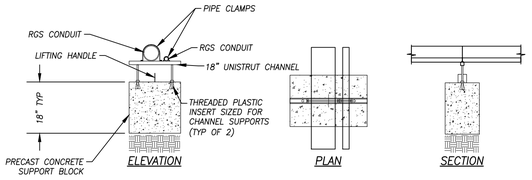
CONDUIT MOUNTING DETAIL (WITHIN ARRAY AREA)

NOT TO SCALE



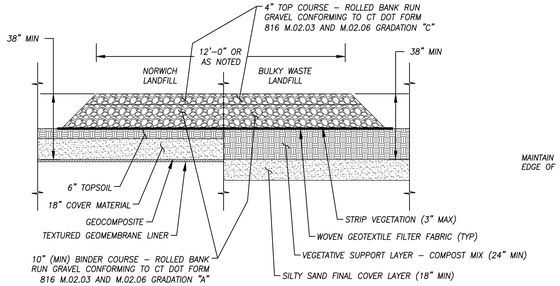
CABLE TRAY DETAIL (WITHIN ARRAY AREA)

NOT TO SCALE



CONCRETE BLOCK RACEWAY DETAIL (ON LANDFILL CAP)

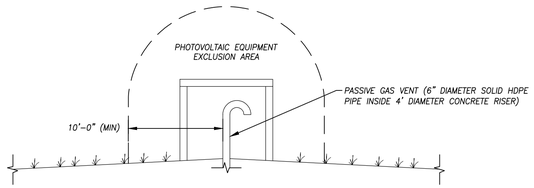
NOT TO SCALE



NOTE:
1. TEST PITS TO DETERMINE EXISTING ACCESS ROAD THICKNESS SHALL BE COMPLETED PRIOR TO UTILIZATION FOR CONSTRUCTION EQUIPMENT. IMPROVE AS REQUIRED FOR CONSTRUCTION EQUIPMENT USE.
2. ACCESS ROAD TO COMPLY WITH H-20 WHEEL LOADING.
3. TEST PITS TO DETERMINE CAPPING SYSTEM AND CONFIRM LAYER THICKNESS SHALL BE PERFORMED PRIOR TO INSTALLATION OF THE ACCESS ROAD.
4. ROADWAY DESIGN TO COMPLY WITH LOCAL EMERGENCY SERVICE REQUIREMENTS.
5. COMPACT PERMANENT ACCESS ROAD TO 95% MAXIMUM DENSITY IN LIFTS NOT TO EXCEED 12".

PERMANENT/TEMPORARY LANDFILL ACCESS ROAD

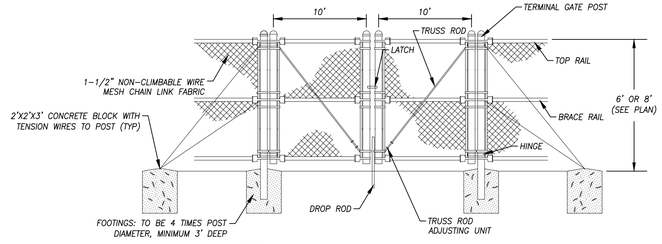
NOT TO SCALE



NOTE:
1. NO EQUIPMENT ASSOCIATED WITH THE PHOTOVOLTAIC SYSTEM SHALL BE LOCATED WITHIN A 10' EXCLUSION AREA OF PASSIVE GAS VENTS.
2. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING THE EXISTING GAS VENTS FROM DAMAGE FROM CONSTRUCTION EQUIPMENT/VEHICLES. ANY DAMAGE TO EXISTING GAS VENTS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER AND REPAIRED AT NO COST TO THE OWNER/DEVELOPER.

PASSIVE GAS VENT (EQUIPMENT FREE AREA) DETAIL

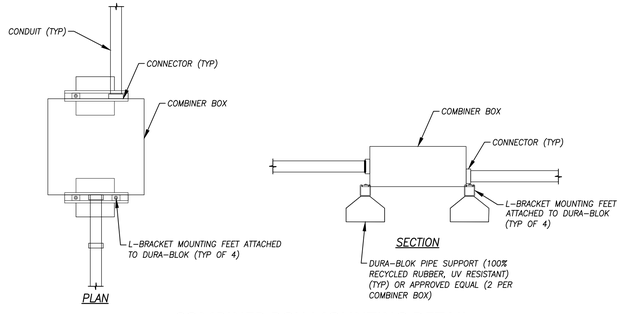
NOT TO SCALE



NOTE:
SWING GATES TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

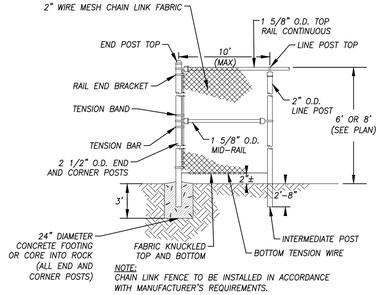
OFF CAP GALVANIZED SWING GATE DETAIL MOUNTING PLANE #1

NOT TO SCALE



COMBINER BOX MOUNTING DETAIL

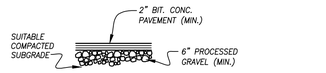
NOT TO SCALE



NOTE:
CHAIN LINK FENCE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

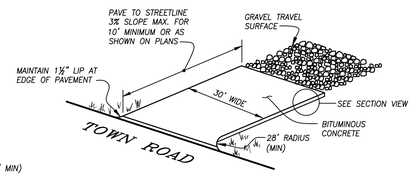
OFF CAP GALVANIZED CHAIN LINK FENCE DETAIL

NOT TO SCALE



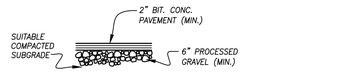
SECTION VIEW

NOT TO SCALE



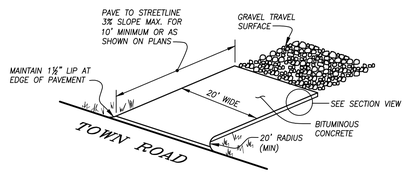
TYPICAL DRIVEWAY APRON MOUNTING PLANE #1

NOT TO SCALE



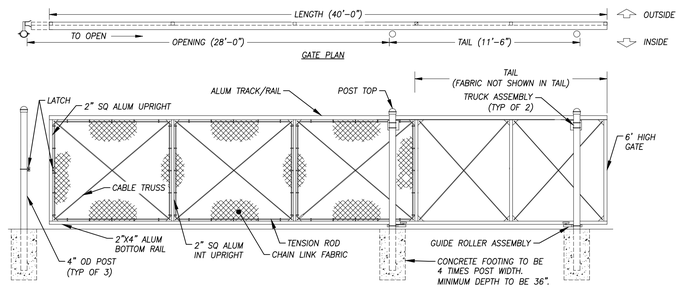
SECTION VIEW

NOT TO SCALE



TYPICAL DRIVEWAY APRON MOUNTING PLANE #4

NOT TO SCALE



NOTES:
1. SLIDE GATE BY MASTER HALCO OR APPROVED EQUAL.
2. SLIDE GATE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

ALUMINUM SINGLE-TRACK CANTILEVERED SLIDE GATE DETAIL

NOT TO SCALE



NOTE:
1. SIGNS MOUNTED ON GATES AT ALL ENTRANCES.
2. SIGNS TO BE RATED FOR OUTDOOR ENVIRONMENTS.

IDENTIFICATION SIGNAGE

NOT TO SCALE

29102

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JOB I.D. NO. 14-2302

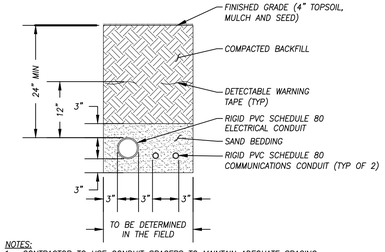
Revisions

Rev. A - Equipment Pad Details - 9/29/15

SHEET NO.

10

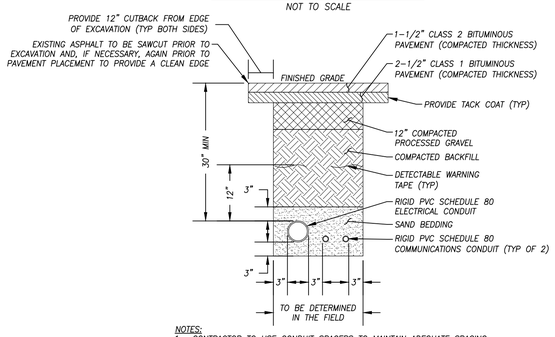
12



NOTES:
1. CONTRACTOR TO USE CONDUIT SPACERS TO MAINTAIN ADEQUATE SPACING.
2. MAINTAIN 3" SPACING BETWEEN OUTER WALLS OF CONDUITS.

OFF CAP TYPICAL MEDIUM VOLTAGE CONDUIT TRENCH DETAIL

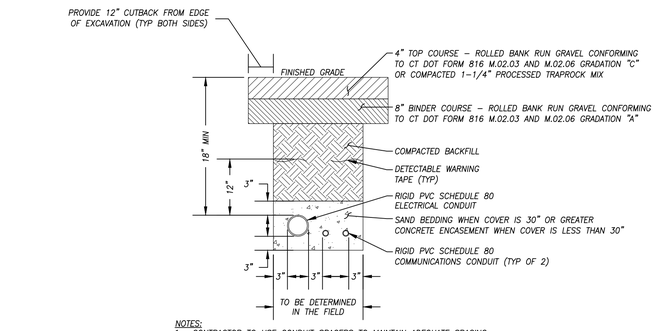
NOT TO SCALE



NOTES:
1. CONTRACTOR TO USE CONDUIT SPACERS TO MAINTAIN ADEQUATE SPACING.
2. MAINTAIN 3" SPACING BETWEEN OUTER WALLS OF CONDUITS.

TYPICAL MEDIUM VOLTAGE CONDUIT TRENCH (IN PAVED AREAS) DETAIL

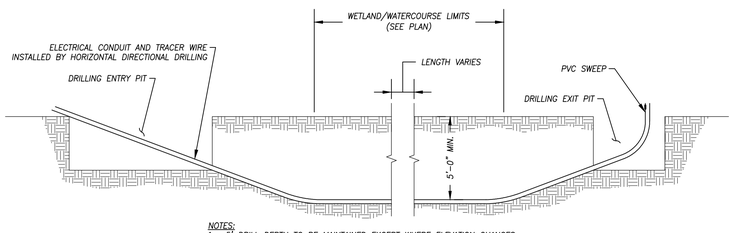
NOT TO SCALE



NOTES:
1. CONTRACTOR TO USE CONDUIT SPACERS TO MAINTAIN ADEQUATE SPACING.
2. MAINTAIN 3" SPACING BETWEEN OUTER WALLS OF CONDUITS.

TYPICAL MEDIUM VOLTAGE CONDUIT TRENCH (IN GRAVEL AREAS) DETAIL

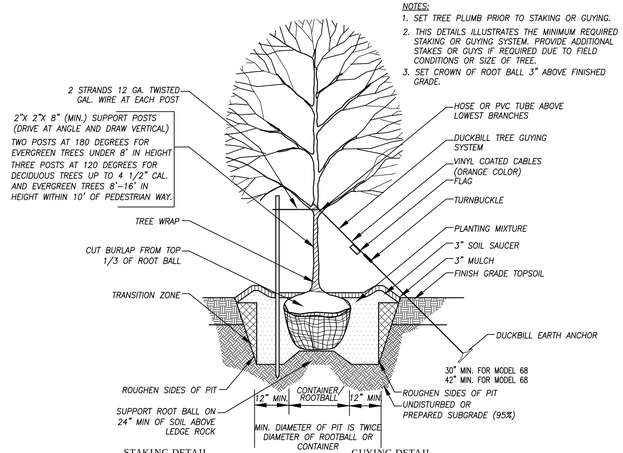
NOT TO SCALE



NOTES:
1. 5' DRILL DEPTH TO BE MAINTAINED EXCEPT WHERE ELEVATION CHANGES ARE REQUIRED TO AVOID OBSTACLES.
2. REFER TO ELECTRICAL PLANS AND WIRE SCHEDULE FOR ACTUAL NUMBER AND LOCATION OF CONDUITS.

TYPICAL HORIZONTAL DIRECTIONAL DRILLING DETAIL

NOT TO SCALE



NOTES:
1. SET TREE PLUMB PRIOR TO STAKING OR GUYING.
2. THIS DETAILS ILLUSTRATES THE MINIMUM REQUIRED STAKING OR GUYING SYSTEM. PROVIDE ADDITIONAL STAKES OR GUYS IF REQUIRED DUE TO FIELD CONDITIONS OR SIZE OF TREE.
3. SET CROWN OF ROOT BALL 3" ABOVE FINISHED GRADE.

STAKING DETAIL

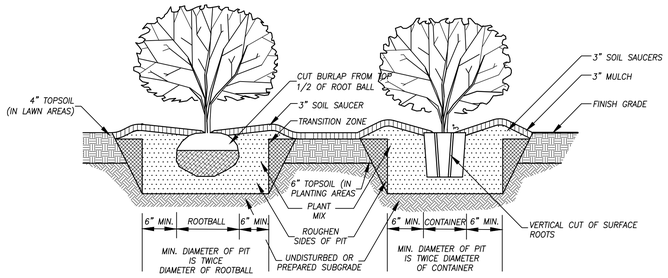
FOR USE WITH:
A. DECIDUOUS TREES UNDER 3" CALIPER.
B. DECIDUOUS TREES 3"–4 1/2" CALIPER WHEN PLANTED WITHIN 10' OF PEDESTRIAN WAYS.
C. EVERGREEN TREES UNDER 8' IN HEIGHT.
D. EVERGREEN TREES 8'–16' IN HEIGHT WHEN PLANTED WITHIN 10' OF PEDESTRIAN WAYS.

GUYING DETAIL

FOR USE WITH:
A. DECIDUOUS TREES 3"–4 1/2" CALIPER WHEN PLANTED GREATER THAN 10' OUTSIDE OF PEDESTRIAN WAYS.
B. DECIDUOUS TREE OVER 4 1/2" CALIPER.
C. EVERGREEN TREES 8'–16' IN HEIGHT WHEN PLANTED GREATER THAN 10' OUTSIDE OF PEDESTRIAN WAYS.
D. EVERGREEN TREES OVER 16' IN HEIGHT.

TREE PLANTING DETAIL

NOT TO SCALE



BALLED AND BURLAPPED MATERIAL — CONTAINER GROWN MATERIAL

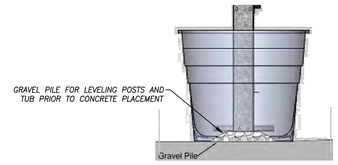
NOTES:
1. SET CROWN OF ROOTBALL 2" ABOVE FINISH GRADE.
2. FOR CONTAINER GROWN STOCK USE FINGERS OR A SHARP KNIFE TO LOOSEN ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS CIRCLING THE PERIMETER OF THE CONTAINER.
3. AT PLANTING THOROUGHLY SOAK THE ROOT MASS AND ADJACENT SOIL. REPEAT SEVERAL TIMES DURING THE FIRST MONTH AND THROUGHOUT THE FOLLOWING TWO SUMMERS.

SHRUB PLANTING DETAIL

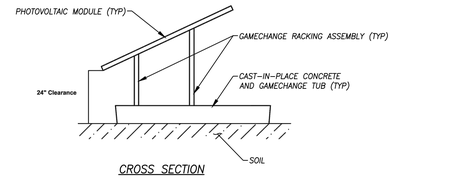
NOT TO SCALE

PLANTING SPECIFICATIONS:

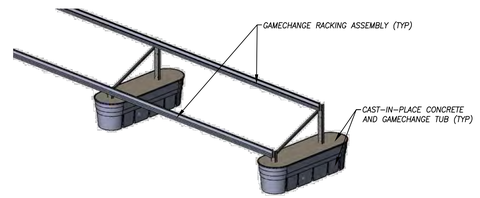
1. All materials and construction methods shall conform to the requirements of the Connecticut Association of Landscape Contractors Specification. All plants shall be nursery grown and conform to the latest edition of ANSI 260.1, AMERICAN STANDARD FOR NURSERY STOCK and also the minimum guidelines established for nursery stock published by the American Association of Nurserymen, Inc.
2. No substitution of plant materials will be allowed without the prior written consent of the Project Owner. Where a plant size range is provided at least 50% of the plants shall be of the larger size.
3. All lawn and planting area soil preparation shall be fertilized and amended according to recommendations of a soil analysis provided by an approved soil testing laboratory.
4. All exterior ground areas disturbed by construction and not covered by buildings, structures, paving, continuous planting beds or other site improvements shall be graded, topsoiled to a minimum depth of 4" and grass seeded. Provide lawn development in all areas of selective clearing as directed.
5. All plant pits must be free draining. Break up the bottom of the hole by fork if necessary to ensure plant has proper drainage.
6. Set all plants in center of plant pits, plumb and straight and as detailed on the drawing. All plant material shall bear the same relationship to finished grade as to original planting grade prior to digging. Trees shall be planted with the junction of roots and stem level with finished grade.
7. Handle balled and burlapped plants from the ball only. Once positioned in the hole, remove the top 1/3 of the burlap from the root ball without disturbing the roots.
8. Face each plant to give the best appearance. Final location of plant material should be approved by the Project Owner in the field.
9. Fill plant pits 2/3 their depth with prepared planting mixture, water thoroughly and allow to settle. Complete back-filling, water thoroughly to eliminate any voids and air pockets. Provide additional back-fill as necessary to conform to required elevation and as detailed.
10. Form saucer and install mulch over entire plant pit and saucer area as detailed.
11. All tree staking or guying shall be completed immediately after planting, but in no instance more than 24 hours after planting. See staking/guying detail. At the completion of the maintenance period remove all stakes, flags, guys, tree wrap, and anchors.
12. Mulch all new shrub beds and plant pits to achieve a 3" depth after settlement. Mulch all ground cover beds to achieve a 2" depth after settlement. Mulch for saucers and planting areas to be a double shredded bark mulch.
13. All plants shall be guaranteed for a period of one full year after inspection and acceptance by the Owner's representative, and shall have at least 80% healthy growth at the end of the guarantee period.
14. Landscape planting materials as proposed by this plan are Connecticut native and/or non-invasive species. This landscape plan has been designed to incorporate species which are prolific in USDA plant hardiness zone 6b and which require minimal energy input for upkeep and maintenance. References utilized for Connecticut native and non-invasive species selection include the Connecticut Botanical Society, the Connecticut agricultural experiment station, the U.S. Department of Transportation Federal Highway Administration, 2004 Connecticut Stormwater Quality Manual, New England Wetland Plants, Inc., and other sources.



GAMECHANGE TUB CROSS SECTION



CROSS SECTION



ISOMETRIC

NOTES:
1. GAMECHANGE RACKING SYSTEM TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.
2. SEE MANUFACTURER'S DETAIL SHEETS FOR ADDITIONAL INFORMATION AND INSTALLATION SEQUENCE.

ON-CAP SOLAR ARRAY AND RACKING SYSTEM

NOT TO SCALE

NOTES:
SEE MANUFACTURER'S DETAIL SHEETS FOR ADDITIONAL INFORMATION REGARDING RACKING SYSTEM REQUIREMENTS AND INSTALLATION PROCEDURES. RACKING SYSTEM TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

TYPICAL POST MOUNTED RACKING SYSTEM DETAIL (OFF-CAP)

NOT TO SCALE

29102

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SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Mounting Planes 1-3
Site Details

SCALE:

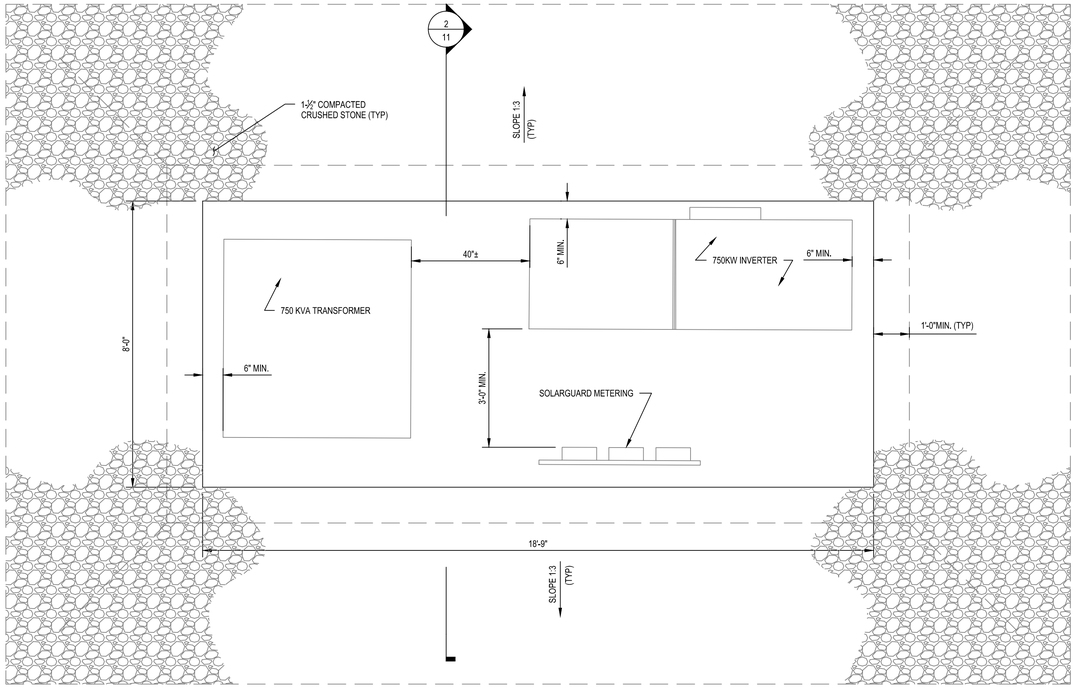
DATE: September 2015

JOB I.D. NO. 14-2302

Revisions

Rev. A - Equipment Pad Details - 9/29/15

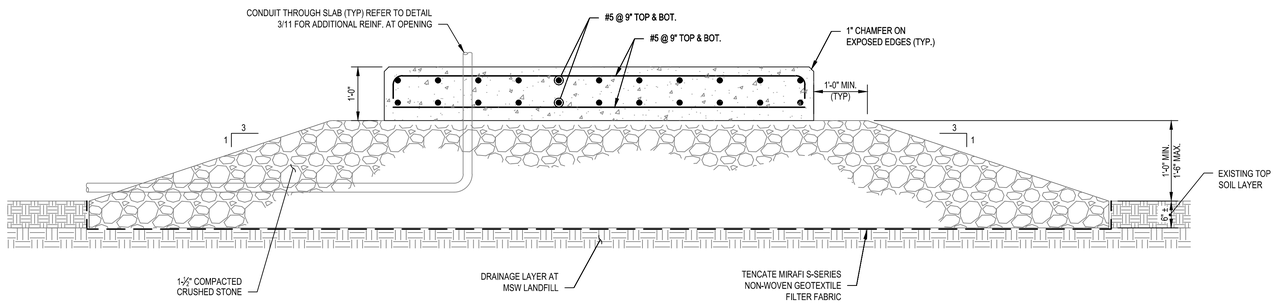
SHEET NO. 11 / 12



1 PLAN VIEW

SCALE: 1/2"=1'-0"

NOTES:
1. COORDINATE DIMENSIONS WITH EQUIPMENT REQUIREMENTS AND ELECTRICAL DRAWINGS.
2. ANCHOR EQUIPMENT TO SLAB PER MANUFACTURER'S REQUIREMENTS
3. TWO (2) PADS ARE REQUIRED: ONE (1) AT MSW LANDFILL AND ONE (1) AT BULKY WASTE LANDFILL.



2 PAD SECTION

SCALE: 3/4"=1'-0"

NOTE:
1. DO NOT DISTURB DRAINAGE LAYER AT MSW LANDFILL.
2. COORDINATE CONDUIT LOCATIONS WITH ELECTRICAL DRAWINGS.

PERMIT SET
9/29/2015

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THIS DRAWING IS THE PROPERTY OF BOUNDARIES LLC AND HAS BEEN SPECIFICALLY PREPARED FOR THE OWNER OF THIS PROJECT, AT THIS SITE, AND IS NOT TO BE DUPLICATED OR USED IN PART OR WHOLE FOR ANY OTHER PURPOSE, PROJECT, LOCATION OR OWNER WITHOUT THE EXPRESSED WRITTEN CONSENT OF BOUNDARIES LLC.

1.0 GENERAL NOTES:
1. ALL WORK SHALL CONFORM WITH THE CONNECTICUT STATE BUILDING CODE 2005 SUPPLEMENT AND AMENDMENTS, INTERNATIONAL BUILDING CODE (2003), ASCE 7-02, AND THE BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE (ACI 318-02).
2. THE CONTRACTOR IS RESPONSIBLE FOR CHECKING, COORDINATING AND VERIFYING ALL DIMENSIONS IN THE FIELD PRIOR TO COMMENCING WORK.
3. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF UNANTICIPATED CONDITIONS THAT MAY BE UNCOVERED DURING CONSTRUCTION.
4. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IN THE FIELD THE EXISTENCE OF ALL EMBEDDED UTILITIES AND DETERMINING THE EXISTENCE OF ALL MECHANICAL, ELECTRICAL AND PLUMBING SYSTEMS AFFECTED BY THE WORK OF THIS CONTRACT.

2.0 FOUNDATIONS:
1. THE CONTRACTOR SHALL DESIGN AND PROVIDE ALL TEMPORARY EARTH SUPPORT, SHORING AND BRACING NECESSARY TO PERFORM THE WORK IN ACCORDANCE WITH OSHA, STATE AND LOCAL REQUIREMENTS.
2. FOUNDATIONS SHALL BE INSTALLED IN THE GEOMETRY SHOWN IN THE PLANS.
3. REFER TO THE GEOTECHNICAL MEMOS BY WESTON & SAMPSON DATED 09/02/2015 AND 09/04/2015 FOR ADDITIONAL DATA AND REQUIREMENTS.
4. EXCAVATION FOR SUBGRADE SHALL BE PERFORMED USING A SMOOTH EDGED BUCKET.
5. THOROUGHLY COMPACT SUBGRADE BY MECHANICAL MEANS. THE CONTRACTOR SHALL USE CAUTION TO NOT OVERSTRESS THE FLEXIBLE MEMBRANE LINER WHEN SELECTING EQUIPMENT AND PERFORMING COMPACTION AT THE MSW LANDFILL. REFER TO THE GEOTECHNICAL MEMO BY WESTON & SAMPSON DATED 09/02/2015 FOR ADDITIONAL DATA AND RECOMMENDATIONS.

3.0 CAST IN PLACE CONCRETE
1. CONCRETE WORK SHALL CONFORM TO "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" (ACI 318-02).
2. CONCRETE SHALL BE CONTROLLED CONCRETE, PROPORTIONED, MIXED AND PLACED IN THE PRESENCE OF A REPRESENTATIVE TESTING AGENCY.
3. CONCRETE SHALL BE NORMAL WEIGHT AND HAVE THE FOLLOWING PROPERTIES:
   A. MINIMUM 28 DAY COMPRESSIVE STRENGTH 4000 PSI.
   B. MAXIMUM SLUMP 4"
4. SUBMIT CONCRETE MIX DESIGNS FOR APPROVAL.

4.0 CAST IN PLACE REINFORCEMENT
1. REINFORCEMENT DETAILING, FABRICATION, AND ERECTION SHALL CONFORM TO "ACI DETAILING MANUAL" - SP-66, "CRSI MANUAL OF STANDARD PRACTICE".
2. STEEL REINFORCEMENT, UNLESS NOTED OTHERWISE, SHALL CONFORM TO THE FOLLOWING:
   A. BARS, TIES, AND STIRRUPS ASTM A615 GRADE 60
3. REINFORCING STEEL SHALL BE UNCOATED AND DEFORMED.
4. MINIMUM CONCRETE PROTECTIVE COVERING FOR REINFORCEMENT, UNLESS REQUIRED FOR FIRE PROTECTION OR NOTED OTHERWISE, SHALL BE AS FOLLOWS:
   A. CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH: 3"
   B. CONCRETE EXPOSED TO EARTH OR WEATHER:
      (1) NO. 6 THRU NO. 18 BARS 2"
      (2) NO. 5 BAR, W31 OR D31 WIRE AND SMALLER 1½"
5. FOR REINFORCING STEEL SPLICE LAP LENGTHS REFER TO THE TABLE PROVIDED UNLESS NOTED OTHERWISE.
6. REINFORCEMENT SHALL NOT BE TACK WELDED.
7. DOWELS SHALL MATCH BAR SIZE, NUMBER AND SPACING, UNLESS NOTED OTHERWISE.
8. SUBMIT REINFORCING SHOP DRAWINGS FOR APPROVAL.

5.0 DESIGN LOADS

LOADS, LOADING CONDITIONS AND COMBINATIONS SHALL BE IN ACCORDANCE WITH THE CONNECTICUT STATE BUILDING CODE 2005 SUPPLEMENT AND AMENDMENTS, IBC 2003, AND ASCE 7-02 AS APPLICABLE. LOADS DESIGNATED BY "PSF" ARE UNIFORM LOADS, THOSE DESIGNATED BY "LB" ARE CONCENTRATED LOADINGS AND SHALL BE APPLIED AS REQUIRED BY THE CONNECTICUT STATE BUILDING CODE.

BUILDING OCCUPANCY CATEGORY II

1. DEAD LOADS
   1.1. SELFWEIGHT OF ALL ATTACHED ELEMENTS, CONSULT APPLICABLE DRAWINGS AND TRADES FOR FURTHER INFORMATION
   1.1.1. TRANSFORMER 5,920 LBS.
   1.1.2. INVERTER 3,570 LBS.

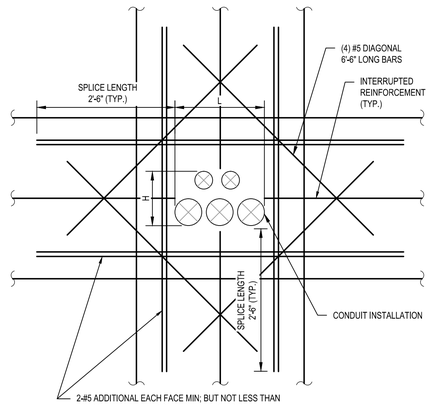
2. SNOW LOAD:
   2.1. GROUND SNOW LOAD, PG 30 PSF
   2.2. HEATED SPACE
   2.2.1. FLAT ROOF SNOW LOAD, PF 30 PSF MIN.
   2.2.2. SNOW EXPOSURE FACTOR, CE 1.0
   2.2.3. SNOW LOAD IMPORTANCE FACTOR, I 1.0 II
   2.2.4. THERMAL FACTOR, CT 1.2

3. WIND DESIGN DATA
   3.1. BASIC WIND SPEED, V 110 MPH
   3.2. WIND IMPORTANCE FACTOR, I 1.0, II
   3.3. WIND EXPOSURE C

4. EARTHQUAKE DESIGN DATA
   4.1. SEISMIC IMPORTANCE FACTOR, I 1.0, II
   4.2. MAPPED SPECTRAL RESPONSE ACCELERATIONS, SS, S1 0.270G, 0.068G
   4.3. SITE CLASS **

5. GEOTECHNICAL INFORMATION
   5.1. ALLOWABLE NET BEARING PRESSURE **

** REFER TO GEOTECHNICAL MEMOS BY WESTON & SAMPSON DATED 09/02/2015 AND 09/04/2015 FOR DATA AND REQUIREMENTS.



2-#5 ADDITIONAL EACH FACE MIN; BUT NOT LESS THAN 50% OF INTERRUPTED SLAB REINF EACH SIDE OF OPENING. SPACE BARS AT 3" OC, EACH FACE. LENGTH OF ADDL REINF = (L + 60") OR (H+60").

NOTES:

1. SLAB OPENINGS SHALL BE COORDINATED AND DETAILED ON THE REINFORCEMENT SHOP DRAWINGS.

3 ADDITIONAL SLAB REINFORCING AT CONDUIT PENETRATIONS

WESTON & SAMPSON ENGINEERS, INC. LICENSE NO. DATE

CIVIL ENGINEERING · LAND SURVEYING · LAND DEVELOPMENT PLANNING · GIS SERVICES
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SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Structural Details for On-Cap Equipment Pads

SCALE:
DATE: September 2015
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Revisions

SHEET NO.
12
12

APPENDIX E

Solar Array Equipment





Pour-in-Place™ Ballasted Ground System

- Patent pending protected system with self-leveling technology: 68% faster install than precast
- Substantial labor savings by eliminating moving and shimming heavy precast blocks
- Integrated grounding and wire management
- Gen4 Pour-in-Place™ Ballasted Ground System with round forms shipping in Q4 2015 - less concrete, faster install, steeper slopes
- Available in both 1 and 2 panels up in portrait
- 20 year warranty - Made in USA
- ETL / UL 2703 Tested
- Independent assessment by Black & Veatch
- Wind tunnel tested by industry leader CPP

System Information

Features:
Self-leveling technology: 68% faster install than precast
Up to 4ft. high ground clearance to allow for snow slide and vegetation growth
Substantial adjustability allows for slopes up to 15%
Gen4 Pour-in-Place™ Ballasted Ground System with Round Forms Shipping in Q4 2015 - Less Concrete, Faster Install, Steeper Slopes
Up to 25% less concrete due to optimized ballast distribution
Available in both 1 and 2 panels up in portrait
Slots enables additional vertical adjustability, up to total of 10"
No gravel beds or other expensive ground preparations required - save up to $.05/watt
Integrated grounding with star washers or teethed module clamps included - both approved under ETL/UL 2703
5 to 35° tilt with multiple inter-row spacing options
51% overall lower cost than competitors
Unique design innovations protected under patent pending
Made in the U.S.A.

Installation:
Fastest install of any ballasted ground system
Just place leave-behind Pour-in-Place™ forms, place rail supports, bolt on and level rails, pour concrete, mount panels
Panels mount rapidly from above using top mount clamps or from below using panel mounting holes
Five men install 1454 panels with racks and ballast per week: 15 men install 1.31 MW per week
Self-leveling technology enables 10" total vertical adjustability including use of slots
Rapid install using concrete truck to fill Pour-in-Place™ forms around supports, or for weight sensitive landfill caps or narrow row spacing using pump or tracked bobcats with gravity feed buckets
3 trucks per MW typical
Bundles typically 3100lbs. maximum for easy offloading
Full turnkey services provided by certified installers program

Testing & Certifications:
Wind tunnel tested by industry leader CPP & rated for 150mph wind speed
Independent assessment by Black & Veatch
Rated up to 90 psf snow load
ETL/UL 2703 tested
ETL/UL 467 GameChange teethed panel mounting clamps included for top mount installations
Meets IBC and ASME standards for structural loading
Warranty 20 years
Minimum order size 750 KW

Technical Data

Material:
Rail support structure components: G90+ galvanized steel
Panel mounting rails: 6005 aluminum, or G90+ galvanized steel
Recycled HMWPE forms
Stiffening Strips: 304 stainless steel
3/8" Magnacoat bolts and serrated flange nuts
Panel mounting hardware:
Top mount: panel mounting clips: stainless steel teethed clips
¼-20 x 1.5" to 2.5" T bolts, ¼-20 serrated flange nuts: stainless steel
Bottom mount: ¼-20 x 3/4" T bolts, ¼-20 serrated flange nuts, star washers: stainless steel
Use 4000 psi concrete, freeze thaw rated where applicable

Calculations:
100% code compliant designs for any locality
Structural PE, stamped drawings and calculations
Individual system structural calculations
Individual system design calculations based on regional load values
Design loads according to IBC 2006 or 2009

Grounding:
Integrated grounding with star washers or teethed module clamps included - both approved under ETL/UL 2703
Jumpers provided for aluminum rail thermal expansion breaks
Grounding must be done by electrician at row ends



Place supports, attach rails, then level rail supports quickly prior to pouring concrete



Available with galvanized purlins with large wire management tray



Slots combined with rail support self-leveling technology enable up to 10" vertical adjustability



Gen4 Pour-in-Place™ Ballasted System with round forms shipping Q4 2015: less concrete, faster install, steeper slope



Pouring bucket on bobcat for concrete pouring of Pour-in-Place™ forms on sensitive landfill caps



Standard concrete pump truck has long range and fills up to 2.5MW of Pour-in-Place™ forms per week

CanadianSolar



MAX POWER
CS6X-305|310|315P

High quality and reliability in all Canadian Solar modules is ensured by 14 years' experience in module manufacturing, well-engineered module design, stringent BOM quality testing, an automated manufacturing process and 100% EL testing.

KEY FEATURES

- Excellent module efficiency up to 16.42%
- Outstanding low irradiance performance > 96.0%
- +5Wp — Positive power tolerance up to 5 W
- No. 1 PTC — High PTC rating up to 91.97%
- IP67 — IP67 junction box for long-term weather endurance
- Heavy snow load up to 5400 Pa wind load up to 2400 Pa
- Salt mist and blown sand resistance, for seaside and desert environments

25 years — **insurance-backed warranty**
non-cancellable, immediate warranty insurance
linear power output warranty

10 years — **product warranty on materials and workmanship**

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001: 2008 / Quality management system
ISO/TS 16949: 2009 / The automotive industry quality management system
ISO 14001: 2004 / Standards for environmental management system
OHSAS 18001: 2007 / International standards for occupational health & safety

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730: VDE / MCS / CE / SII / CEC AU / CQC / INMETRO
UL 1703 / IEC 61215 performance: CEC listed (US)
UL 1703: CSA / IEC 61701 ED2: VDE / IEC 60068-2-68: SGS
PV CYCLE (EU) / UNI 9177 Reaction to Fire: Class 1

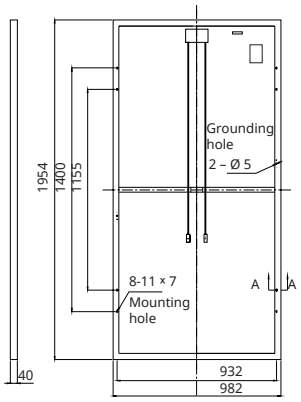
*As there are different certification requirements in different markets, please contact your local Canadian Solar sales representative for the specific certificates applicable to the products in the region in which the products are to be used.

CANADIAN SOLAR INC. is committed to providing high quality solar products, solar system solutions and services to customers around the world. As a leading manufacturer of solar modules and PV project developer with about 9 GW of premium quality modules deployed around the world since 2001, Canadian Solar Inc. (NASDAQ: CSIQ) is one of the most bankable solar companies worldwide.

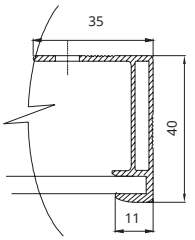
CANADIAN SOLAR INC.
545 Speedvale Avenue West, Guelph, Ontario N1K 1E6, Canada, www.canadiansolar.com, support@canadiansolar.com

MODULE / ENGINEERING DRAWING (mm)

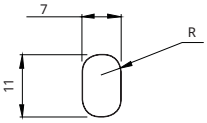
Rear View



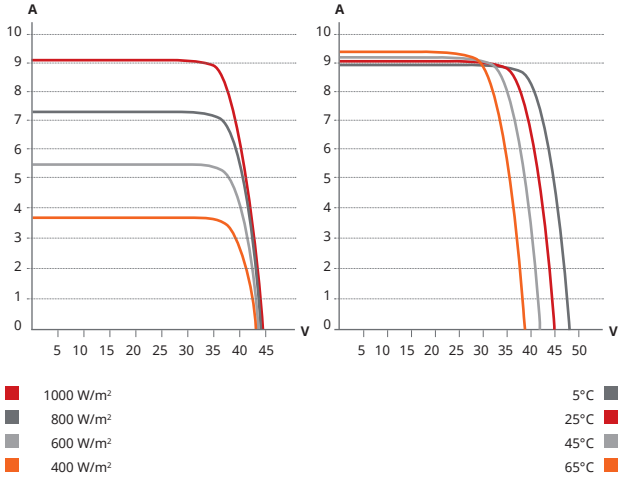
Frame Cross Section A-A



Mounting Hole



CS6X-310P / I-V CURVES



ELECTRICAL DATA / STC*

Electrical Data CS6X	305P	310P	315P
Nominal Max. Power (Pmax)	305 W	310 W	315 W
Opt. Operating Voltage (Vmp)	36.3 V	36.4 V	36.6 V
Opt. Operating Current (Imp)	8.41 A	8.52 A	8.61 A
Open Circuit Voltage (Voc)	44.8 V	44.9 V	45.1 V
Short Circuit Current (Isc)	8.97 A	9.08 A	9.18 A
Module Efficiency	15.90%	16.16%	16.42 %
Operating Temperature	-40°C ~ +85°C		
Max. System Voltage	1000 V (IEC) or 1000 V (UL)		
Module Fire Performance	TYPE 1 (UL 1703) or CLASS C (IEC61730)		
Max. Series Fuse Rating	15 A		
Application Classification	Class A		
Power Tolerance	0 ~ + 5 W		

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL DATA / NOCT*

Electrical Data CS6X	305P	310P	315P
Nominal Max. Power (Pmax)	221 W	225 W	228 W
Opt. Operating Voltage (Vmp)	33.1 V	33.2 V	33.4 V
Opt. Operating Current (Imp)	6.68 A	6.77 A	6.84 A
Open Circuit Voltage (Voc)	41.2 V	41.3 V	41.5 V
Short Circuit Current (Isc)	7.27 A	7.36 A	7.44 A

* Under Nominal Operating Cell Temperature (NOCT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

PERFORMANCE AT LOW IRRADIANCE

Industry leading performance at low irradiation, +96.0 % module efficiency from an irradiance of 1000 W/m² to 200 W/m² (AM 1.5, 25°C).

The specification and key features described in this Datasheet may deviate slightly and are not guaranteed. Due to on-going innovation, research and product enhancement, Canadian Solar Inc. reserves the right to make any adjustment to the information described herein at any time without notice. Please always obtain the most recent version of the datasheet which shall be duly incorporated into the binding contract made by the parties governing all transactions related to the purchase and sale of the products described herein.

Caution: For professional use only. The installation and handling of PV modules requires professional skills and should only be performed by qualified professionals. Please read the safety and installation instructions before using the modules.

MODULE / MECHANICAL DATA

Specification	Data
Cell Type	Poly-crystalline, 6 inch
Cell Arrangement	72 (6 × 12)
Dimensions	1954×982×40 mm (76.93×38.7×1.57 in)
Weight	22 kg (48.5 lbs)
Front Cover	3.2 mm tempered glass
Frame Material	Anodized aluminium alloy
J-BOX	IP67, 3 diodes
Cable	4 mm² (IEC) or 4 mm² & 12 AWG 1000V (UL), 1150 mm (45.3 in)
Connectors	MC4 or MC4 comparable
Stand. Packaging	24 pcs, 608 kg (quantity & weight per pallet)
Module Pieces per Container	528 pcs (40'HQ)

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.43% / °C
Temperature Coefficient (Voc)	-0.34% / °C
Temperature Coefficient (Isc)	0.065% / °C
Nominal Operating Cell Temperature	45±2°C

PARTNER SECTION

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SOLECTRIA
A YASKAWA COMPANY

UTILITY-SCALE INVERTERS

SGI **500XTM**
SGI **750XTM**



FEATURES

- Compliant with NEC 2014 690.11 & 690.12 arc fault and rapid shutdown requirements when coupled with ARCCOM combiner
- 98% CEC efficiency
- 1000 VDC
- Parallel power stages
- Fuse and breaker subcombiner options
- Modbus communications
- User-interactive LCD

OPTIONS

- Stainless steel enclosure
- Web-based monitoring
- Built-in cellular connectivity
- AC breaker with shunt trip
- Revenue grade metering
- Air filters
- Uptime guarantee

OPTIONS FOR UTILITIES

- Real power curtailment
- Reactive power control
- Voltage ride through
- Frequency ride through
- Controlled ramp rates
- DMS tie-in
- Plant master controller
- Rule 21 compatible

1000VDC UTILITY-SCALE INVERTERS

The only 1000VDC inverter available that is compliant with NEC 2014 690.11 & 690.12 arc fault and rapid shutdown requirements. Solectria Renewables' next generation of SMARTGRID series inverters are optimized for high efficiency, reliability, and economy. Available in two power classes, 500 kW and 750 kW, these inverters are designed for direct connection to an external transformer for large commercial or utility-scale applications. They are robust, outdoor rated inverters that can be configured as 1 or 1.5 MW Solar Stations. Available utility-scale options include a plant master controller and advanced grid management features such as voltage and frequency ride through, reactive power control, real power curtailment and power factor control. Listed to 1000 VDC, with 98% CEC weighted efficiency, the SGI 500/750XTM inverters set a new standard for large scale power conversion.

Built for the real world

SPECIFICATIONS	SGI 500XTM	SGI 750XTM
DC Input		
Absolute Maximum Input Voltage	1000 VDC	
Max Power Input Voltage Range (MPPT)*	545-820 VDC	
Operating Voltage Range	545-1000 VDC	
Maximum Operating Input Current	965 A	1445 A
Strike Voltage	700 V	
AC Output		
Native Output Voltage	380 VAC, 3-Ph	
AC Voltage Range	-12/+10%	
Continuous Output Power	500 kW	750 kW
Continuous Output Current	760 A	1140 A
Maximum Backfeed Current	0 A	
Nominal Output Frequency	60 Hz	
Output Frequency Range	57-60.5 Hz	
Power Factor	Adjustable - 0.8 to +0.8, factory set at 1	
Total Harmonic Distortion (THD) @ Rated Load	‹ 3%	
Efficiency		
Peak Efficiency	98.3%	
CEC Efficiency	98.0%	
Tare Loss	89 W	123 W
Subcombiner Options		
Fuses	4 to 16 positions, 100-400 A	
Breakers	4 to 15 positions, 125-350 A	
Temperature		
Ambient Temperature Range (full power)	-40°F to +122°F (-40°C to +50°C)	
Storage Temperature Range	-40°F to +122°F (-40°C to +50°C)	
Relative Humidity (non-condensing)	5-95%	
Data Monitoring		
Optional SolrenView Web-based Monitoring	Integrated	
Optional Revenue Grade Monitoring	800 A	1600 A
Optional SolZone™ Sub-Array Monitoring (DC Current)	1 zone per protected input (up to 16 zones)	
Optional Cellular Communication	SolrenView AIR	
External Communication Interface	RS-485 SunSpec Modbus RTU	
Testing & Certifications		
Safety Listings & Certifications	UL 1741/IEEE 1547, CSA C22.2#107.1	
Testing Agency	ETL	
Warranty		
Standard	5 year	
Optional	10, 15, 20 year; extended service agreement; uptime guarantee	
Dedicated External Transformer		
Dedicated External Transformer	Required, provided by customer to Solectria's specification	
Transformer Type	Self cooled, step up, pad mount	
Output Voltage	Typical: 2.4-36.0 kV, 3-Ph	
Enclosure		
DC Disconnect (integrated)	Standard	
AC Disconnect/Breaker (integrated)	Optional disconnect, breaker or breaker with shunt trip	
Dimensions (H x W x D)	82 in. x 109 in. x 41 in. (2080 mm x 2769 mm x 1041 mm)	
Shading Set Back	137" (3480 mm) at 30˚ solar elevation	
Shipping Weight	3080 lbs (1397 kg)	3570 lbs (1619 kg)
Enclosure Rating	Type 3R	
Enclosure Finish	Polyester powder coated steel; optional 316 stainless steel	

*At nominal AC voltage

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Cooper Power Systems
by EATON

Date: June 08, 2015
Proposal Valid Through: August 04, 2015

Item Details

Item Number: 00003

Customer RFQ Information: Specification: DOCR-070354; Dated: 11/25/2014

Quantity	Unit Price	Extended Price
1		

Lead-time (Per Lead-time definition in Proposal Details):
Product Lead-time (X): 8-10 weeks ex-factory
Optional Approval Drawing Lead-time (Y): 3-4 weeks plus time for customer review.

Description:

kVA	750 kVA 3 Phase Pad-Mounted Transformer
Temperature Rise	65 degree average winding rise
Cooling Class	KNAN
Frequency	60 Hz.
Duty Cycle	Designed for step-up operation
Insulating fluid	Envirotemp FR3
Elevation	Designed for operation at 1000 m (3300 ft) above sea level
Sound Level	NEMA TR1 Standard
Efficiency Standard	None
Electrostatic Shield	Electrostatic Shield Between Primary & Secondary Windings
Electrostatic Shield	Ground Shield Bushing
High Voltage	14400Y/8314, 13800Y/7970, 13200Y/7620, 12870Y/7430, 12470Y/7200, 12000Y/6928, 11700Y/6755, 95 kV BIL, 1500 kVA, 95 kV BIL
kV Class	15 kV
Primary Configuration	Dead Front, Loop Feed
Taps	7-Position Custom: 14400Y/8314, 13800Y/7970, 13200Y/7620, 12870Y/7430, 12470Y/7200, 12000Y/6928, 11700Y/6755
Tap Changer	150 Amp 7-position tap changer
High Voltage Bushings	200 amp Cooper bushing wells with removable studs (Qty: 6)
Inserts	15 kV, 95 kV BIL Cooper load-break inserts (Qty: 6)
Neutral Bushing	250 amp porcelain .63 eyebolt bushing(s)
Load-break Switching	15-38 kV, 300A 2 Position
Arresters	None
Overcurrent Protection	Bayonet fuse in series with Partial-Range Current-Limiting Fuses (Qty: 3)
Expulsion fuses	Bayonet fuses (Qty: 3)
Bayonet Holder	Copper Bayonet Fuse Holder (Qty: 3)
Low Voltage	380 Delta Volts, 30 kV BIL
Secondary kV Class	1.2 kV
Secondary Bushings	Integral aluminum 6-hole spade bushing(s) (Qty: 3)
Bushing Supports	Standard LV Bushing Support Assembly
Cabinet	24in deep cabinet
Cabinet hardware	Penta-head cabinet door bolts
IEEE K-Dimension	Loop feed per IEEE C57.12.34-2009 Figure 11 minimum dimensions (without bails)
Coatings	Munsell Green (Munsell 7GY 3.29/1.5) topcoat
Certifications	UL Listed
Gauges & Fittings	Liquid level gauge

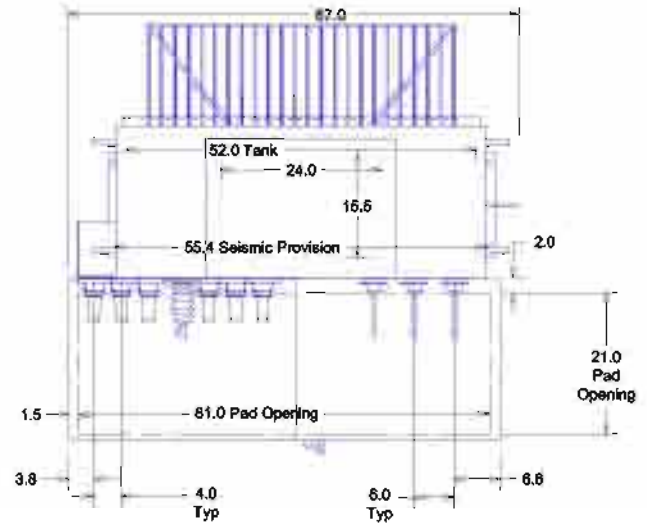
Date: June 08, 2015
Proposal Valid Through: August 04, 2015

Item Number: 00003

Gauges & Fittings	Thermometer, dial-type
Gauges & Fittings	Pressure/vacuum gauge
Gauges & Fittings	Drain valve with sampler in LV Compartment (1")
Gauges & Fittings	Schrader valve
Gauges & Fittings	Pressure relief device, 50 SCFM
Gauges & Fittings	Pressure relief device, 5000 SCFM, cover mounted
Tank accessories	Nitrogen Blanket
Tank accessories	Seismic anchoring provisions welded to tank
Tank accessories	IEEE standard two-hole ground pads (Qty: 3)
Packaging	Solar Full Deck Pallet
Cover	Welded cover with handhole

PERFORMANCE DATA:	**Losses are For Reference Only**
Minimum Impedance	1.80%, Absolute
No Load Losses @20 C	1588 Watts
Load Losses @85 C	8381 Watts
Fluid Weight	1750 lbs
Total Weight	5912 lbs
Fluid Volume	228 Gallons
Primary Conductor Material	AL
Secondary Conductor Material	AL

ITE	DESCRIPTION
1	Welded Cover w/ Handhole
2	Cooling Corrugate
3	Cooper Bayonet Fusing w/ Dripshield
4	Current Limiting Backup Fuses (Internal)
5	Drain Valve with Sampler
6	Ground Pad .50-13 Tap
7	Ground Strap and Nut
8	Ground Pad .50-13 Tap
9	Ground Shield Bushing
10	H0 Bushing
11	High Security Cabinet w/ Pentahead Door Bolts
12	35kV 200 Amp HV Bushing Well w/ 15kV Insert
13	LV Bushing Support
14	Lifting Lug
15	Liquid Temperature Gauge
16	1.2kV LV Bushing w/6 Hole Spade Supported
17	Magnetic Oil Level Gauge
18	Nameplate
19	One Inch Upper Press. Conn. and Fill Plug
20	Two Position Loadbreak Switch
21	Parking Stand
22	Pressure Relief Device
23	Pressure Relief Valve
24	Pressure Vacuum Gauge
25	Schrader Valve
26	Seismic Anchor Provisions
27	Tank Base w/ Jacking and Rolling Facilities
28	Tap Changer



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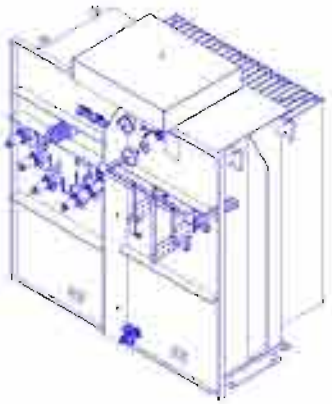
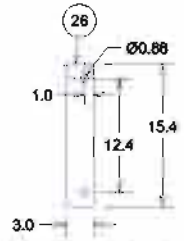
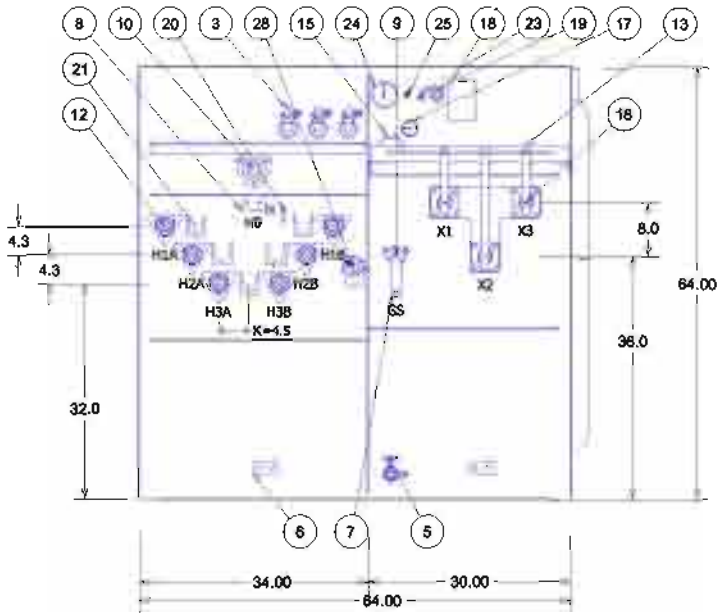
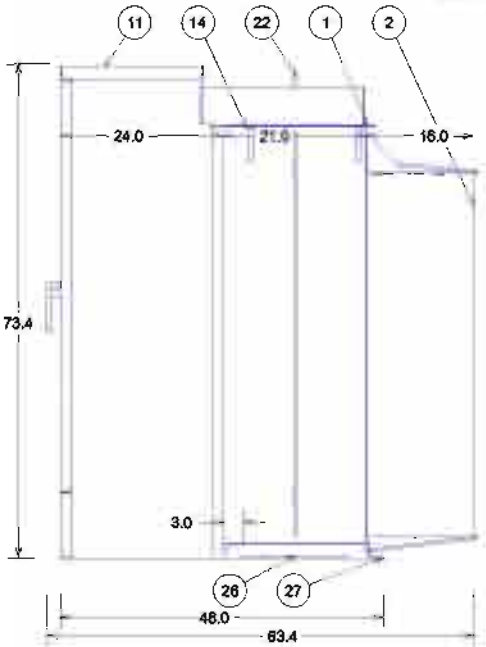




Seismic Provision Detail





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750.0 kVA KNAN 85 AWR FR3
HV 13200Y/7620 95 BIL
LV 360D 30 BIL
5.14 %IZ
Munsell Green Topcoat
Mild Steel Construction
UL Listed

SO	207790663
PO	6218-496215
Project Name	SOLAR CITY J-TAPS
Customer	WESCO 6218

MATERIAL

ALL DIMENSIONS ARE IN INCHES [MM]

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THIS DRAWING HAS BEEN GENERATED FROM A 3D MODEL.

EATON
Powering Business Worldwide

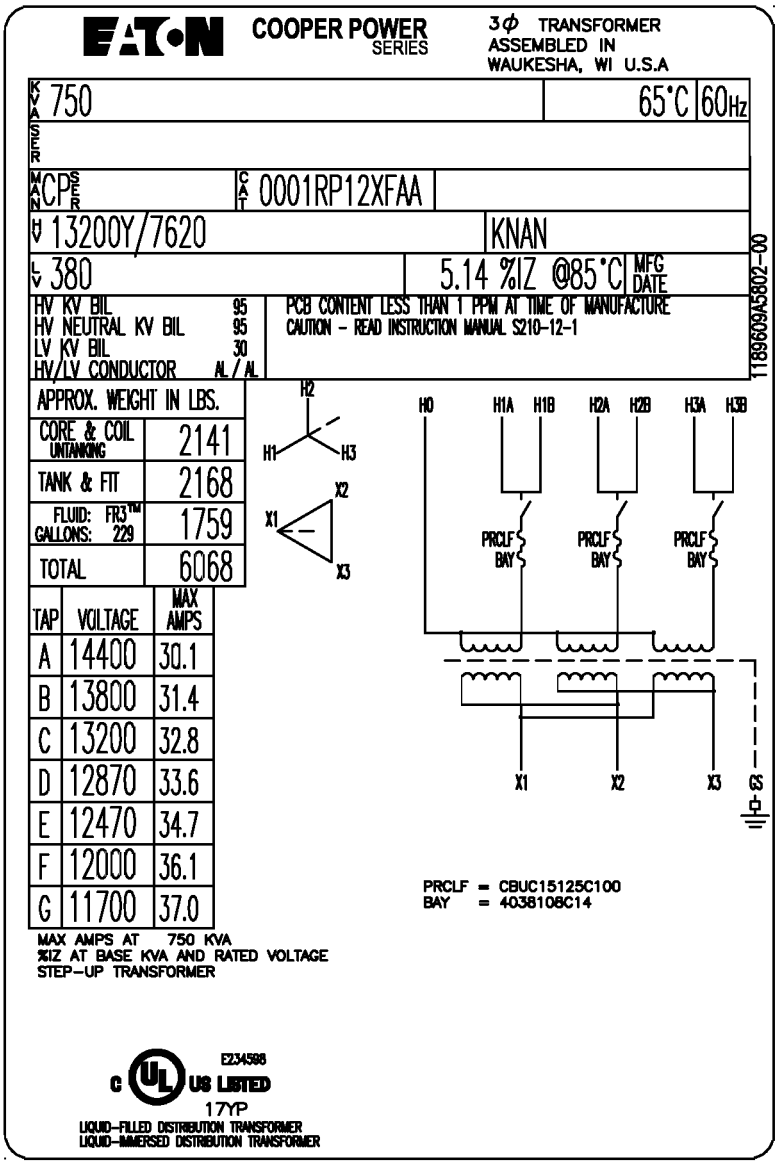
TITLE: Distribution Transformer Outline Drawing

DESC: **COOPER POWER SERIES** THREE-PHASE PAD-MOUNTED COMPARTMENTAL TYPE

DWG:	DATE	REF	SHEET #:	SCALE	REV
GER	7/21/2015	P3D V03R06M04	1 OF 1		00

0001RP12XFAA

0001RP12XFAA
REVISIONS



NOTES: **1) ACTUAL PLATE IS A NEGATIVE OF THE ABOVE DRAWING.**
2) ACTUAL %IZ TO BE STAMPED IN AFTER TESTING.

NAMEPLATE MATERIAL: ALUMINUM

207790663,30

1189609A5802 REVISIONS

MATERIAL:

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Powering Business Worldwide

TITLE: LASER NAMEPLATE

DESC: **COOPER POWER SERIES** 0001RP12XFAA

DWG:	DATE:	REF:	SHEET #:	SCALE:	REV:
PTP	7/22/2015		1 of 1	1=1	00

1189609A5802

APPENDIX F

Stormwater Management Plan

John U. Faulise Jr. L.S.
James McNally, Jr., L.S.

David C. McKay, P.E.
Demian A. Sorrentino AICP, C.S.S.

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STORMWATER MANAGEMENT REPORT

PREPARED FOR:

SOLARCITY CORPORATION
DEVELOPMENT AND MANAGEMENT PLAN
ROGERS ROAD SOLAR PROJECT
82 ROGERS ROAD
NORWICH, CONNECTICUT

AUGUST 2015

PREPARED BY:

BOUNDARIES LLC

PROJECT I.D. NO. 14-2302

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FIGURE 3 POST-DEVELOPMENT CONDITIONS WATERSHED MAP

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APPENDIX B HYDROCAD MODELING RESULTS
APPENDIX C SITE DEVELOPMENT PLANS

Introduction

On behalf of SolarCity Corporation, Boundaries LLC has prepared the following stormwater management report for the proposed solar photovoltaic development to be located at 82 Rogers Road and the Norwich Landfill in Norwich, CT. The proposed development consists of an approximately 2.8 MW DC solar photovoltaic development on two distinct lots (four locations/mounting planes). This stormwater management report has been prepared to determine the potential for the proposed development to impact stormwater runoff patterns and flow rates. The proposed development makes use of low impact development techniques in order to limit the impacts to stormwater flow patterns and utilize the existing stormwater management systems.

The new construction includes solar panels mounted on posts or concrete ballasts, electrical equipment installed on concrete pads, and improvements to the existing gravel access drives for maintenance access to the landfill sites. The proposed developments will be protected by a chain link fences and access gates as shown on the attached plans. The mounting posts for the solar arrays located at 82 Rogers Road will be pole driven approximately 8-feet into the ground, while the landfill solar panels will be anchored on plastic tubs filled with concrete set on top of the landfill cover. The proposed project areas are shown on the Location Map included as Figure 1.

The primary purpose of this stormwater management report is to demonstrate how the proposed solar arrays may affect the existing runoff flow patterns. The proposed solar panel system is raised above grade by approximately 2-feet at its leading edge (lowest end). There will be minimal regrading required on all sites and with the exception of the installation of the pole driven supports, the proposed project areas remain essentially unchanged. These low impact techniques will have minimal impact on runoff flow patterns and will ensure that the landfill caps continue to operate as designed.

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey the soils on the landfill sites are classified as “Dumps”, and have no Hydrologic Soil Group classification. Hydrologic Soil Group C was assigned for the purposes of this analysis as a typical value for landfills in this region due to the impervious liner below the vegetative support layer. The non-landfill sites located south of Rogers Road consist primarily of Agawam fine sandy loam, 3 to 8% slopes, with some areas designated as Charlon-Chatfield complex, 3 to 15% slopes, very rocky; Hollis-Chatfield-Rock outcrop complex, 3 to 15% slopes; Walpole sandy loam, 0 to 3% slopes; and Catden and Freetown soils. Agawam and Charlton-Chatfield soils are classified as Hydrologic Soil Group B. Hollis-Chatfield-Rock outcrop, Walpole, and Catden and Freetown soils are classified as Hydrologic Soil Group A/D or D, and have been modeled as Hydrologic Soils Group D. The Soils Report is provided in Appendix A.

Existing and post-development conditions hydrographs were estimated using the hydrologic modeling program HydroCAD. The methodology selected was NRCS TR-20. Times of concentration were estimated using multiple segment flow paths as described in the NRCS TR-55 manual. The Type III 24-hour storm was analyzed under antecedent moisture condition two. HydroCAD modeling results are presented in Appendix B.

There are several regulated inland wetlands resource areas in the vicinity of the project, as determined by Demian Sorrentino of Boundaries LLC, a certified soil scientist, and were confirmed by All-Points Technology. The wetland areas south of Rogers Road are located in the woods at the limits of the existing cleared areas. There are also wetlands and watercourses located at the base of both of the landfills. For additional information regarding the locations of the regulated wetland resources within the project areas, please see Sheets 2, 4, and 6 of the Proposed Site Development Plans included in Appendix C.

Existing Conditions

The proposed project area consists of approximately 5.1 acres of the 75.0-acre parcel that contains the Norwich landfills and approximately 4.2 acres of the 23.3 acre 82 Rogers Road parcel. The proposed array area includes 2.5 acres on the bulky waste landfill (MP-2), 2.6 acres on the Norwich landfill (MP-3), 3.8 acres on the western portion of 82 Rogers Road (MP-1), and 0.4 acres on the eastern portion of 82 Rogers Road (MP-4). The landfill property is zoned ROS and 82 Rogers Road is zoned R-80. The Norwich Landfill property contains the City of Norwich's former bulky waste and municipal waste landfills. The property currently contains the City of Norwich's Transfer Station. 82 Rogers Road is a City-owned property and consists of wooded areas with wetlands and open fields that were previously used for agricultural purposes. The landfill property is adjacent to properties owned by the Norwich Fish and Game Club, municipally owned properties, undeveloped properties, and a large residential lot. 82 Rogers Road is adjacent to several single family residential lots and two undeveloped properties. Existing conditions of the property are shown below.



Aerial Photograph of Project Area

During storm events, runoff flows overland from the 82 Rogers Road site (MP-1/MP-4) to the wetlands systems that surround the existing clearings. Runoff from the bulky waste landfill (MP-2) flows overland to the wooded areas and the adjacent wetlands and watercourses that surround the landfill. The majority of the runoff from the Norwich landfill (MP-3) is collected in riprap lined swales and discharged to a detention basin. The remainder of the runoff from MP-3 flows overland to the wooded areas and watercourse located at the northern base of the landfill. Existing conditions sub-watersheds are shown on Figure 2. Existing conditions sub-watersheds were delineated using topographic survey data supplemented with aerial topographic survey from the City of Norwich's GIS mapping for areas outside of the detailed survey limits. Land uses were estimated based on Site inspections, aerial photography and survey data.

Runoff Curve Numbers (CN) used for the existing conditions analysis are as follows: 61 (>75% grass cover) for the grassed areas in Hydrologic Soil Group B, 74 (>75% grass cover) for the grassed landfill cap and the grassed areas in Hydrologic Soil Group C, 80 (>75% grass cover) for the grassed areas in Hydrologic Soil Group D, 55 (woods) for wooded areas in Hydrologic Soil Group B, 77 (woods) for wooded areas in Hydrologic Soil Group D, and 89 (gravel roads) for existing unpaved access drives.

The existing conditions sub-watersheds are described further below:

Drainage Area #1S (DA #1S)

This 1.0± acre drainage area encompasses the southern portion of the top of the bulky waste landfill (MP-2). The drainage area is comprised of dense grass that makes up the vegetative cover of the landfill. The weighted CN of the drainage area is 74. This area drains generally southerly via overland flow along the existing gravel access drive and eventually flows to a depression area south of the landfill before entering the wooded area and intermittent water course east of the bulky waste landfill.

Drainage Area #2S (DA #2S)

This 0.7± acre drainage area encompasses the western portion of the top of the bulky waste landfill (MP-2). The drainage area is comprised of dense grass that makes up the vegetative cover of the landfill. The weighted CN of the drainage area is 74. This area drains generally westerly via overland flow over the landfill cover before entering the wooded wetland area west of the bulky waste landfill.

Drainage Area #3S (DA #3S)

This 1.1± acre drainage area encompasses the eastern portion of the top of the bulky waste landfill (MP-2). The drainage area is comprised of dense grass that makes up the vegetative cover of the landfill. The weighted CN of the drainage area is 74. This area drains generally easterly via overland flow over the landfill cover before entering the wooded area and intermittent water course east of the bulky waste landfill.

Drainage Area #4S (DA #4S)

This 0.6± acre drainage area encompasses the northern portion of the top of the Norwich landfill (MP-3). The drainage area is comprised of dense grass that makes up the vegetative cover of the landfill. The weighted CN of the drainage area is 74. This area drains generally northerly via overland flow over the landfill cover before entering the brushy area of the old landfill cover and the wooded area north of the landfill.

Drainage Area #5S (DA #5S)

This 2.0± acre drainage area encompasses the western portion of the top of the Norwich landfill (MP-3). The drainage area is comprised of dense grass that makes up the vegetative cover of the landfill. The weighted CN of the drainage area is 74. This area drains generally westerly via overland flow over the landfill cover before entering a riprap drainage swale that collects runoff from the landfill and eventually discharges to a detention basin at the base of the landfill.

Drainage Area #6S (DA #6S)

This 1.2± acre drainage area encompasses the eastern portion of the top of the Norwich landfill (MP-3). The drainage area is comprised of dense grass that makes up the vegetative cover of the landfill and a portion of the existing gravel access drive. The weighted CN of the drainage area is 75. This area drains generally easterly via overland flow over the landfill cover and gravel access drive before entering a riprap drainage swale that collects runoff from the landfill and eventually discharges to a detention basin at the base of the landfill.

Drainage Area #7S (DA #7S)

This 2.1± acre drainage area encompasses the western portion of the larger 82 Rogers Road clearing (MP-1). The drainage area is comprised of dense grass pasture. The weighted CN of the drainage area is 62. This area drains generally westerly via overland flow to the wooded wetland area adjacent to the clearing.

Drainage Area #8S (DA #8S)

This 2.9± acre drainage area encompasses the eastern portion of the larger 82 Rogers Road clearing (MP-1). The drainage area is comprised of dense grass pasture. The weighted CN of the drainage area is 62. This area drains generally easterly via overland flow to the wooded wetland area adjacent to the clearing.

Drainage Area #9S (DA #9S)

This 1.7± acre drainage area encompasses the smaller 82 Rogers Road clearing (MP-4). The drainage area is comprised of dense grass pasture and a small wooded area. The weighted CN of the drainage area is 63. This area drains generally southerly and westerly via overland flow to the wooded wetland area adjacent to the clearing.

Existing conditions peak runoff rates were analyzed at the limits of the proposed development areas. The existing conditions peak runoff rates will be compared to the post-development peak runoff rates to determine the effect of the proposed development on existing stormwater runoff patterns. Existing conditions peak flow rates are summarized below in Tables 1 through 3. Detailed modeling results are included in Appendix B.

Table 1
Peak Runoff Rates – Bulky Waste Landfill (MP-2) Existing Conditions

Storm Event	DA #1S (CFS)	DA #2S (CFS)	DA #3S (CFS)
2-Year	1.0	0.7	1.1
5-Year	1.6	1.1	1.7
10-Year	2.0	1.5	2.3
25-Year	2.5	1.9	2.9
50-Year	3.0	2.2	3.3
100-Year	3.6	2.6	4.0

Table 2
Peak Runoff Rates – Norwich Landfill (MP-3) Existing Conditions

Storm Event	DA #4S (CFS)	DA #5S (CFS)	DA #6S (CFS)
2-Year	0.6	1.9	1.5
5-Year	1.0	3.1	2.3
10-Year	1.3	4.0	3.0
25-Year	1.6	5.0	3.8
50-Year	1.9	5.9	4.4
100-Year	2.3	7.1	5.2

Table 3
Peak Runoff Rates – 82 Rogers Road (MP-1/4) Existing Conditions

Storm Event	DA #7S (CFS)	DA #8S (CFS)	DA #9S (CFS)
2-Year	0.7	0.9	0.6
5-Year	1.4	2.0	1.3
10-Year	2.0	3.0	1.9
25-Year	2.8	4.0	2.6
50-Year	3.4	5.0	3.2
100-Year	4.3	6.3	4.0

Proposed Conditions

The proposed improvements to the site include the installation of solar panels mounted on steel posts driven into the ground, or in the case of the landfills, at grade plastic tubs filled with concrete. Additional proposed conditions include minor improvements to the existing gravel landfill access drives as needed to support construction equipment, various concrete pads for electrical equipment, and installation of chain link security fence to limits access to each solar array.

Installation of the solar arrays will consist of mowing the dense grass in the proposed development areas, installing proposed metal racking posts or plastic tubs as applicable, installing and anchoring the solar array panels to the racking system, installing the proposed chain link fence, and installing the necessary electrical equipment for harvesting power.

The stormwater analysis was conducted to determine if the proposed development would result in significant changes to existing flow patterns, water quality, or peak runoff rates. The design

incorporates measures for limiting disturbed areas and minimizing increases in impervious area. Proposed impervious areas are limited to the steel posts for the proposed racking system, the proposed electrical equipment pads, the cast-in-place concrete racking ballasts for the solar arrays on the landfill sites, paved aprons for access to the 82 Rogers Road arrays, and gravel drive improvements to the to the landfill access roadways.

The W8X10 steel post each cover 2.96 square inches (0.02 square feet) and they are spaced approximately 16 feet along each row of solar arrays. The plastic tubs for the cast-in-place racking system cover approximately 22 square feet each, are spaced at 13 feet along each row of solar arrays for the edge of the layout and at approximately 20 feet along each row of solar arrays in the interior of the layout. The proposed concrete equipment pads are approximately 18 feet by 8 feet and cover approximately 144 square feet. The changes in impervious areas and CN values for each drainage area as a result of the proposed development are presented below in Table 4 – Impervious Area Summary.

Table 4
Impervious Area Summary

Drainage Area	Access Drive Improvements (SF)	Proposed Racking System (SF)	Proposed Concrete Pads (SF)	Total Proposed Impervious Area (SF)	Total Watershed Area (SF)	CN (Pre)	CN (Post)
DA #1S	3,485	1,742	144	5,371	41,469	74	76
DA #2S	610	1,394	0	2,004	30,710	74	75
DA #3S	0	2,526	0	2,526	47,567	74	75
MP-2 Total	**4,095**	**5,662**	**144**	**9,901**	**119,746**	**74**	**75**
DA #4S	0	1,220	0	1,220	26,921	74	75
DA #5S	0	2,778	0	2,778	85,378	74	75
DA #6S	440	2,004	144	2,588	53,318	75	76
MP-3 Total	**440**	**6,002**	**144**	**6,586**	**165,617**	**74**	**75**
DA #7S	340	4	230	574	93,438	62	62
DA #8S	0	5	0	5	125,941	62	62
DA #9S	218	<1	0	219	74,793	63	63
MP-1/4 Total	**558**	**10**	**230**	**798**	**294,172**	**62**	**62**

Proposed conditions sub-watersheds are shown on Figure 3. Proposed conditions sub-watersheds were delineated using topographic survey data supplemented with aerial topographic survey from the City of Norwich's GIS mapping for areas outside of the detailed survey limits. Land uses were estimated based on Site inspections and by using the proposed site development plan.

Runoff Curve Numbers (CN) used for the proposed conditions analysis are as follows: 61 (>75% grass cover) for the grassed areas in Hydrologic Soil Group B, 74 (>75% grass cover) for the grassed landfill cap and the grassed areas in Hydrologic Soil Group C, 80 (>75% grass cover) for the grassed areas in Hydrologic Soil Group D, 55 (woods) for wooded areas in Hydrologic Soil Group B, 77 (woods) for wooded areas in Hydrologic Soil Group D, and 89 (gravel roads) for proposed gravel access improvements, and 98 (impervious) for solar array ballasts and posts, concrete equipment pads and fence post ballasts, and paved aprons.

The proposed improvements to the existing conditions sub-watersheds are described further below:

Drainage Area #1S (DA #1S)

The area will be mowed prior to construction. The proposed improvements to this drainage area include the construction of 3,485 square feet of gravel access drive and the installation of 1,742 square feet of concrete ballasts for the proposed racking system, and the installation of 144 square feet of concrete equipment pads. The weighted CN of the drainage area is 76. This area drains generally southerly via overland flow along the existing gravel access drive and eventually flows to a depression area south of the landfill before entering the wooded area and intermittent water course east of the bulky waste landfill. The existing runoff flow paths will not be affected by the proposed development.

Drainage Area #2S (DA #2S)

The area will be mowed prior to construction. The proposed improvements to this drainage area include the construction of 610 square feet of gravel access drive and the installation of 1,394 square feet of concrete ballasts for the proposed racking system. The weighted CN of the drainage area is 75. This area drains generally westerly via overland flow over the landfill cover before entering the wooded wetland area west of the bulky waste landfill. The existing runoff flow paths will not be affected by the proposed development.

Drainage Area #3S (DA #3S)

The area will be mowed prior to construction. The proposed improvements to this drainage area include the installation of 2,526 square feet of concrete ballasts for the proposed racking system. The weighted CN of the drainage area is 75. This area drains generally easterly via overland flow over the landfill cover before entering the wooded area and intermittent water course east of the bulky waste landfill. The existing runoff flow paths will not be affected by the proposed development.

Drainage Area #4S (DA #4S)

The area will be mowed prior to construction. The proposed improvements to this drainage area include the installation of 1,220 square feet of concrete ballasts for the proposed racking system. The weighted CN of the drainage area is 75. This area drains generally northerly via overland flow over the landfill cover before entering the brushy area of the old landfill cover and the wooded area north of the landfill. The existing runoff flow paths will not be affected by the proposed development.

Drainage Area #5S (DA #5S)

The area will be mowed prior to construction. The proposed improvements to this drainage area include the installation of 2,778 square feet of concrete ballasts for the proposed racking system. The weighted CN of the drainage area is 75. This area drains generally westerly via overland flow over the landfill cover before entering a riprap drainage swale that collects runoff from the landfill and eventually discharges to a detention basin at the base of the landfill. The existing runoff flow paths will not be affected by the proposed development.

Drainage Area #6S (DA #6S)

The area will be mowed prior to construction. The proposed improvements to this drainage area include the construction of 440 square feet of gravel access drive and the installation of 2,004 square feet of concrete ballasts for the proposed racking system, and the installation 144 square feet of concrete equipment pads. The weighted CN of the drainage area is 76. This area drains generally easterly via overland flow over the landfill cover and gravel access drive before entering a riprap drainage swale that collects runoff from the landfill and eventually discharges to a detention basin at the base of the landfill. The existing runoff flow paths will not be affected by the proposed development.

Drainage Area #7S (DA #7S)

The area will be mowed prior to construction. The proposed improvements to this drainage area include the construction of 340 square feet of paved apron, the installation of 4 square feet of posts for the proposed racking system, and the installation of an estimated 230 square feet of concrete pads for the proposed electrical equipment. The weighted CN of the drainage area is 62. This area drains generally westerly via overland flow to the wooded wetland area adjacent to the clearing. The existing runoff flow paths will not be affected by the proposed development.

Drainage Area #8S (DA #8S)

The area will be mowed prior to construction. The proposed improvements to this drainage area include the installation of 5 square feet of posts for the proposed racking system. The weighted CN of the drainage area is 62. This area drains generally easterly via overland flow to the wooded wetland area adjacent to the clearing. The existing runoff flow paths will not be affected by the proposed development.

Drainage Area #9S (DA #9S)

The area will be mowed prior to construction. The proposed improvements to this drainage area include the construction of 218 square feet of paved apron, and the installation of 1 square foot of posts for the proposed racking system. The weighted CN of the drainage area is 63. This area drains generally southerly and westerly via overland flow to the wooded wetland area adjacent to the clearing. The existing runoff flow paths will not be affected by the proposed development.

Proposed conditions peak flow rates were analyzed at the down-gradient limit of the proposed development areas for 82 Rogers Road (MP-1/MP-4) and the bulky waste landfill (MP-2) as there are no stormwater management systems in place on these sites and runoff flows overland. Peak runoff rates for the Norwich landfill (MP-3) were analyzed at the existing riprap swales. The change in peak runoff rates as a result of the proposed improvements are summarized below in Tables 5, 6, and 7. Detailed modeling results are included in Appendix B.

Table 5
Peak Runoff Rates – Bulky Waste Landfill (MP-2) Post-Development vs. Pre-Development

Storm Event	DA #1S			DA #2S			DA #3S		
	Post (CFS)	Pre (CFS)	Change (CFS)	Post (CFS)	Pre (CFS)	Change (CFS)	Post (CFS)	Pre (CFS)	Change (CFS)
2-Year	1.1	1.0	+0.1	0.8	0.7	+0.1	1.2	1.1	+0.1
5-Year	1.7	1.6	+0.1	1.2	1.1	+0.1	1.8	1.7	+0.1
10-Year	2.2	2.0	+0.2	1.6	1.5	+0.1	2.4	2.3	+0.1
25-Year	2.7	2.5	+0.2	1.9	1.9	+0.0	2.9	2.9	+0.0
50-Year	3.2	3.0	+0.2	2.3	2.2	+0.1	3.4	3.3	+0.1
100-Year	3.8	3.6	+0.2	2.7	2.6	+0.1	4.1	4.0	+0.1

Table 6
Peak Runoff Rates – Norwich Landfill (MP-3) Post-Development vs. Pre-Development

Storm Event	DA #4S			DA #5S			DA #6S		
	Post (CFS)	Pre (CFS)	Change (CFS)	Post (CFS)	Pre (CFS)	Change (CFS)	Post (CFS)	Pre (CFS)	Change (CFS)
2-Year	0.7	0.6	+0.1	2.0	1.9	+0.1	1.6	1.5	+0.1
5-Year	1.0	1.0	+0.0	3.2	3.1	+0.1	2.4	2.3	+0.1
10-Year	1.4	1.3	+0.1	4.2	4.0	+0.2	3.1	3.0	+0.1
25-Year	1.7	1.6	+0.1	5.2	5.0	+0.2	3.9	3.8	+0.1
50-Year	2.0	1.9	+0.1	6.1	5.9	+0.2	4.5	4.4	+0.1
100-Year	2.4	2.3	+0.1	7.3	7.1	+0.2	5.4	5.2	+0.2

Table 7
Peak Runoff Rates – 82 Rogers Road (MP-1/4) Post-Development vs. Pre-Development

Storm Event	DA #7S			DA #8S			DA #9S		
	Post (CFS)	Pre (CFS)	Change (CFS)	Post (CFS)	Pre (CFS)	Change (CFS)	Post (CFS)	Pre (CFS)	Change (CFS)
2-Year	0.7	0.7	+0.0	0.9	0.9	+0.0	0.6	0.6	+0.0
5-Year	1.4	1.4	+0.0	2.0	2.0	+0.0	1.3	1.3	+0.0
10-Year	2.0	2.0	+0.0	3.0	3.0	+0.0	1.9	1.9	+0.0
25-Year	2.8	2.8	+0.0	4.0	4.0	+0.0	2.6	2.6	+0.0
50-Year	3.4	3.4	+0.0	5.0	5.0	+0.0	3.2	3.2	+0.0
100-Year	4.3	4.3	+0.0	6.3	6.3	+0.0	4.0	4.0	+0.0

As presented above, the proposed low impact development has limited effects on peak runoff rates. Due to the minimal impervious area increase associated with the post mounted solar arrays to be used at 82 Rogers Road (MP-1/MP-4) there is no modeled increase in peak runoff rates after development. The larger impervious areas of the concrete ballasts for the ballasted solar arrays results in minor increases in the peak runoff rates, but no change in the runoff flow paths.

As a result of the proposed development, runoff from the bulky waste landfill (MP-2) solar array increases slightly due to the proposed concrete ballasts, as presented above in Table 5. Runoff from the bulky waste landfill currently flows overland from the top of the cap (the location of the proposed development) to the wooded areas and wetlands/watercourses that surround the base of the landfill. Due to the heavily vegetated nature of the landfill cap, the distance of overland flow to the wetland

resources, and the lack of an existing stormwater management system point discharge, and current conditions being maintained and essentially unchanged, it is believed that the minimal increases in peak flow rates should not negatively impact down gradient areas.

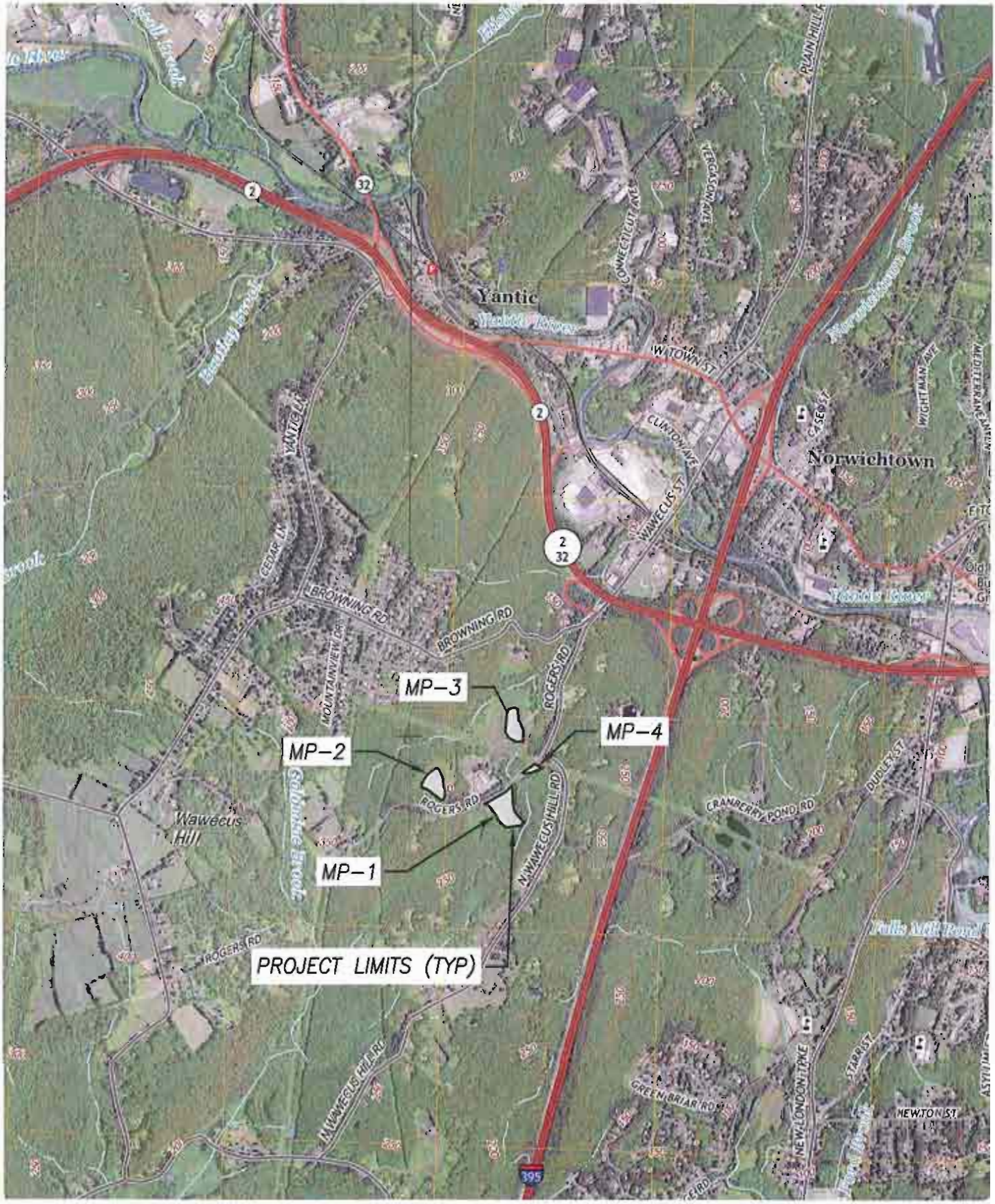
Runoff from the Norwich landfill (MP-3) solar array also increases slightly due to the proposed concrete ballasts, as presented above in Table 6. Runoff from two out of the three sub-watersheds on the Norwich landfill is collected by riprap swales and is discharged to an existing detention basin. The capacities of the swales were analyzed to determine if they had sufficient capacity to transport the post-development runoff to the existing detention basin. The existing riprap swales, based on the existing conditions and survey data, have capacity for greater than 8.6 CFS, depending on the running slope of the swale. The detailed modeling results of the swale capacities are included in Appendix B. The post-development peak runoff rate ranges from 5.4 CFS to 7.3 CFS during the 100-year storm event, therefore the existing stormwater management system should have sufficient excess capacity to manage the slight increase in peak runoff rates. Runoff from the top of the cap (the location of the proposed development) currently flows to the wooded areas and wetlands/watercourses that surround the base of the landfill on the northern and eastern sides. Due to the heavily vegetated nature of the landfill cap in this area, the distance of overland flow to the wetland resources, and the lack of an existing stormwater management system point discharge, and current conditions being maintained and essentially unchanged, it is believed that the minimal increases in peak flow rates should not negatively impact down gradient areas.

Summary

As discussed above the proposed development has been designed to limit the impacts to existing stormwater runoff flow rates and patterns. The existing runoff flow paths have been maintained and while there are minor increases in peak runoff rates from the existing landfill sites they should not have a negative impact on down gradient areas.

The proposed improvements are shown on plans titled “Rogers Road Solar Project, Prepared for SolarCity Corporation, 82 Rogers Road, Norwich, Connecticut, July 2015, Job I.D. No. 14-2302, Cover Sheet through Sheet 11 of 11” prepared by Boundaries LLC.

Figures

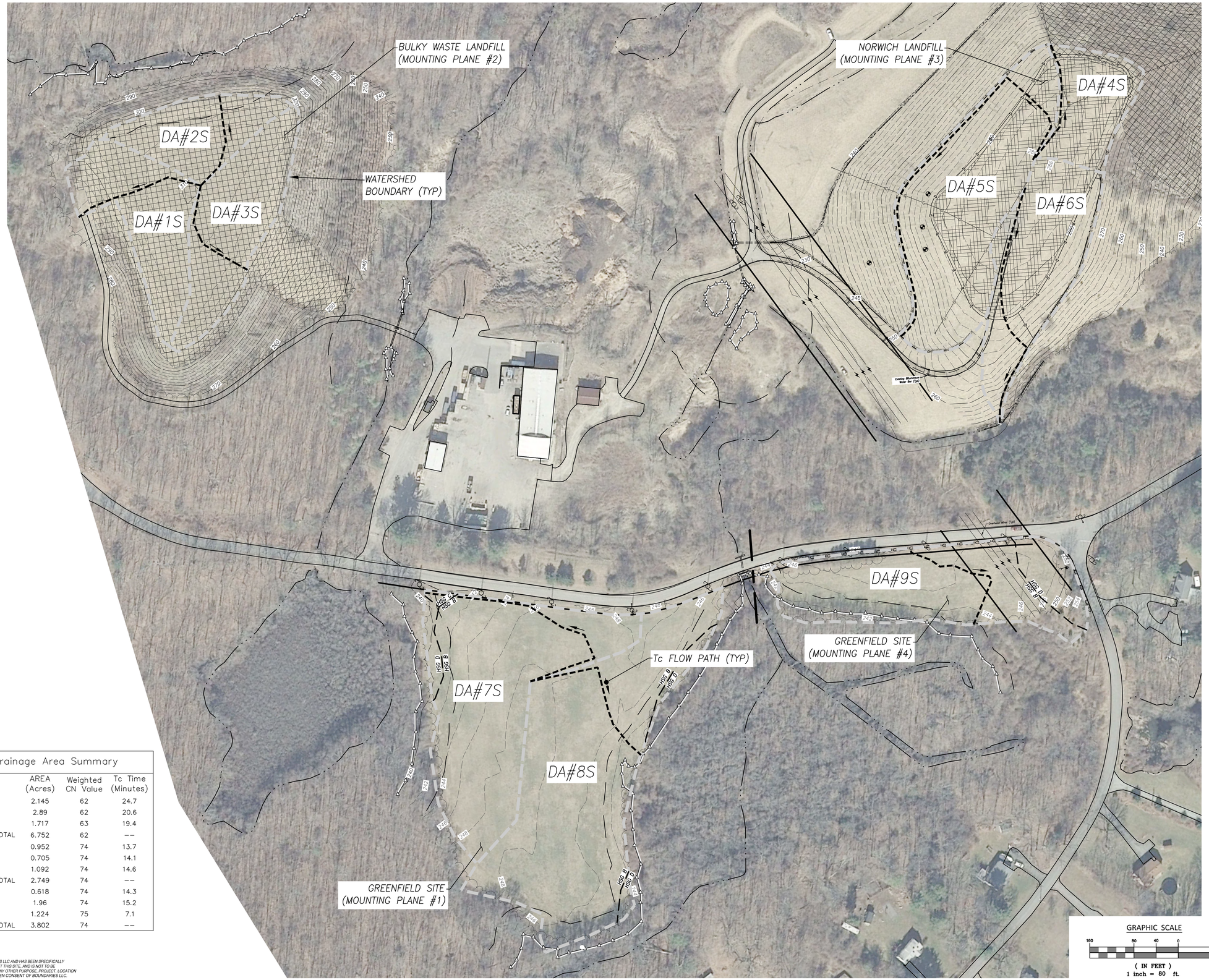


BOUNDARIES

Boundaries LLC
179 Padanaram River Drive, Glastonbury, CT 06033
T 860.376.7006 | www.boundariesllc.net

Location Map
(Norwich/Fitchville Quads)
Brightfields Development, LLC
82 Rogers Road, Norwich, CT

SCALE:	1"=2,000'
DATE:	August 2015
JOB NO.	14-2302
FIGURE	1



Drainage Area Summary			
NAME	AREA (Acres)	Weighted CN Value	Tc Time (Minutes)
DA #7S	2.145	62	24.7
DA #8S	2.89	62	20.6
DA #9S	1.717	63	19.4
MP–1/4 TOTAL	6.752	62	––
DA #1S	0.952	74	13.7
DA #2S	0.705	74	14.1
DA #3S	1.092	74	14.6
MP–2 TOTAL	2.749	74	––
DA #4S	0.618	74	14.3
DA #5S	1.96	74	15.2
DA #6S	1.224	75	7.1
MP–3 TOTAL	3.802	74	––

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P:\CIVIL 3D PROJECTS\2014\14-2302 - BRIGHTFIELDS-NORWICH\DWG\DESIGN\ROGERS ROAD WATERSHEDS.DWG

Figure 2
"Pre-Development Conditions Watershed Map"
Prepared for
SolarCity Corporation
Rogers Road, Norwich, Connecticut

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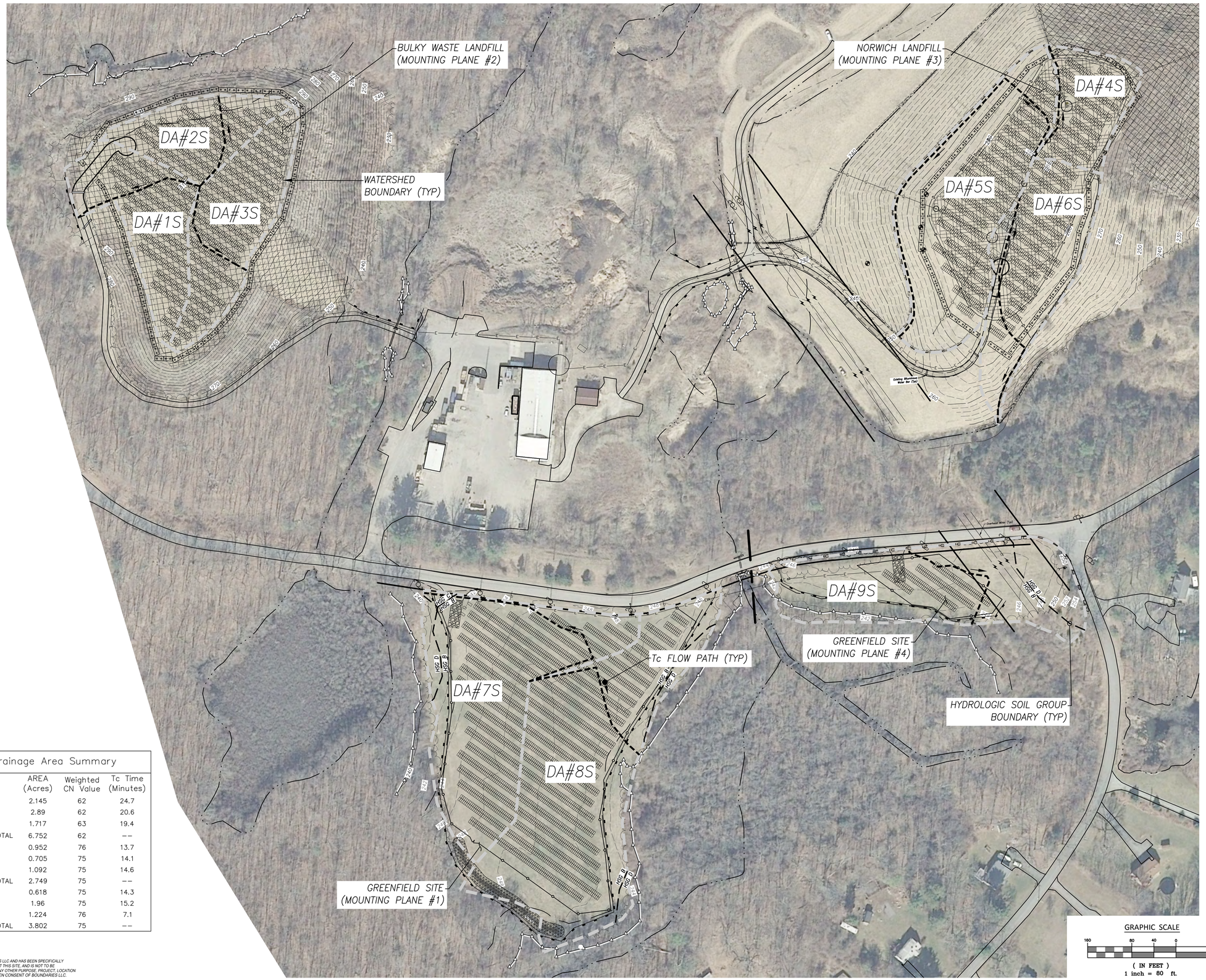
SCALE: 1" = 80'
DATE: August 2015
JOB I.D. NO. 14-2302
Revisions

SHEET NO.
1
2



Drainage Area Summary			
NAME	AREA (Acres)	Weighted CN Value	Tc Time (Minutes)
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DA #2S	0.705	75	14.1
DA #3S	1.092	75	14.6
MP-2 TOTAL	2.749	75	--
DA #4S	0.618	75	14.3
DA #5S	1.96	75	15.2
DA #6S	1.224	76	7.1
MP-3 TOTAL	3.802	75	--

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P:\CIVIL 3D PROJECTS\2014\14-2302 - BRIGHTFIELDS NORWICH\DWG\DESIGN\ROGERS ROAD WATERSHEDS.DWG

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Boundaries LLC
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Figure 3
"Post-Development Conditions Watershed Map"
Prepared for
SolarCity Corporation
Rogers Road, Norwich, Connecticut

SCALE: 1" = 80'
DATE: August 2015
JOB I.D. NO. 14-2302

Revisions

SHEET NO.
2
2

Appendix A
NRCS Web Soil Survey Soils Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for State of Connecticut

Rogers Road Solar Sites



June 5, 2015

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

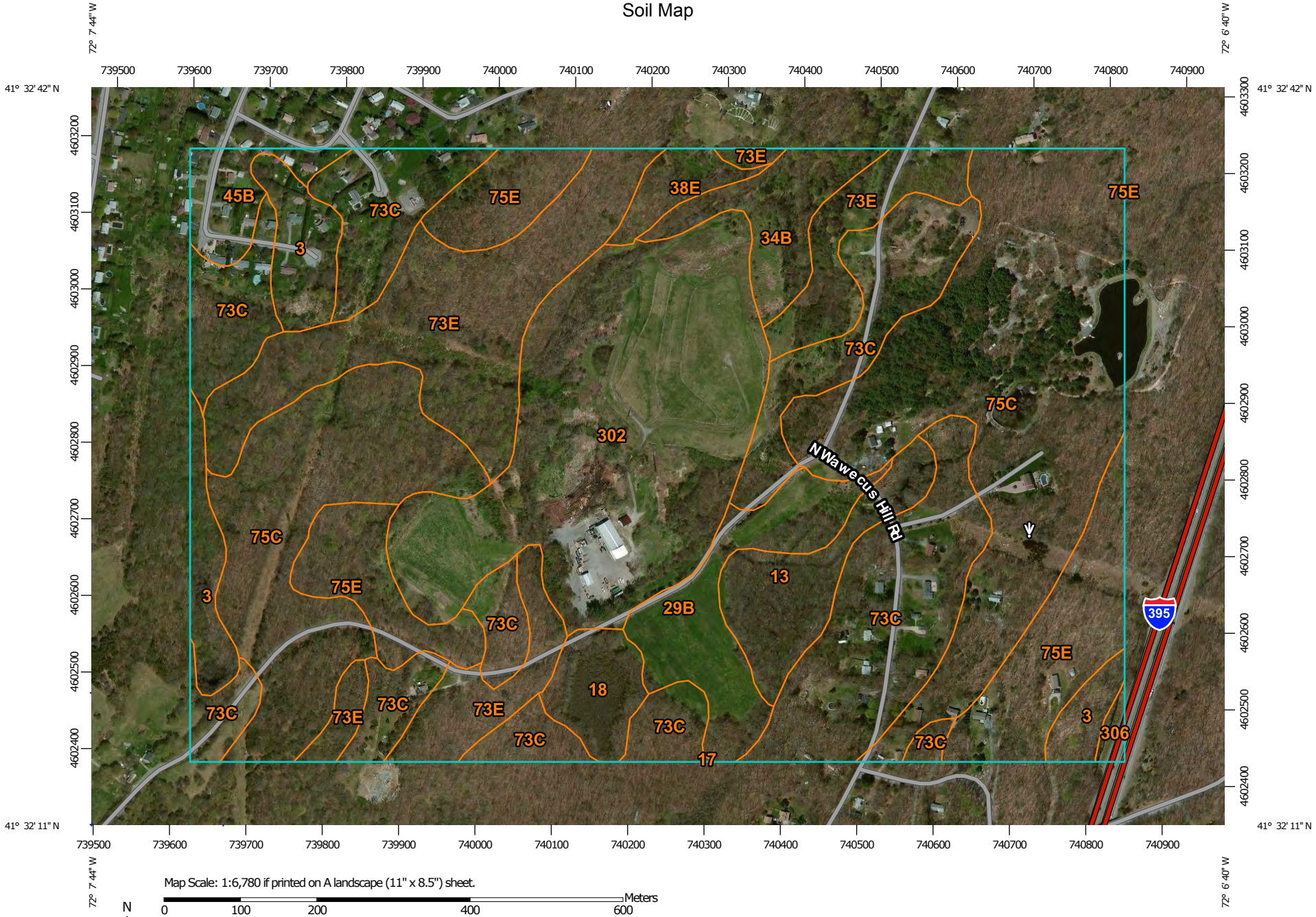
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:6,780 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 13, Oct 28, 2014

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

Date(s) aerial images were photographed: Mar 28, 2011—May 12, 2011

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

Map Unit Legend

State of Connecticut (CT600)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	9.4	3.9%
13	Walpole sandy loam, 0 to 3 percent slopes	7.3	3.0%
17	Timakwa and Natchaug soils	0.0	0.0%
18	Catden and Freetown soils	4.1	1.7%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	9.7	4.0%
34B	Merrimac sandy loam, 3 to 8 percent slopes	6.1	2.5%
38E	Hinckley gravelly sandy loam, 15 to 45 percent slopes	2.5	1.0%
45B	Woodbridge fine sandy loam, 3 to 8 percent slopes	3.7	1.5%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	47.4	19.5%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	33.0	13.6%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	60.5	24.9%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	19.7	8.1%
302	Dumps	39.0	16.1%
306	Udorthents-Urban land complex	0.6	0.3%
Totals for Area of Interest		**243.1**	**100.0%**

Map Unit Descriptions

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

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic

class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

State of Connecticut

3—Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2t2qt
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ridgebury, extremely stony, and similar soils: 40 percent
Leicester, extremely stony, and similar soils: 35 percent
Whitman, extremely stony, and similar soils: 20 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgebury, Extremely Stony

Setting

Landform: Drainageways, depressions, hills, ground moraines
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, base slope, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

A - 0 to 5 inches: fine sandy loam
Bw - 5 to 9 inches: sandy loam
Bg - 9 to 18 inches: gravelly sandy loam
Cd - 18 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 14 to 32 inches to densic material
Natural drainage class: Poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D

Description of Leicester, Extremely Stony

Setting

Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope, footslope, backslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 7 inches: fine sandy loam
Bg1 - 7 to 10 inches: fine sandy loam
Bg2 - 10 to 18 inches: fine sandy loam
BC - 18 to 24 inches: fine sandy loam
C1 - 24 to 43 inches: gravelly fine sandy loam
C2 - 43 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B/D

Description of Whitman, Extremely Stony

Setting

Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope, footslope, backslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 9 inches: fine sandy loam
Bg - 9 to 16 inches: fine sandy loam
Cdg1 - 16 to 22 inches: fine sandy loam
Cdg2 - 22 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 12 to 20 inches to densic material
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D

Minor Components

Woodbridge, extremely stony

Percent of map unit: 3 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear

Swansea

Percent of map unit: 2 percent
Landform: Swamps, bogs
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave

13—Walpole sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkl
Elevation: 0 to 1,020 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Walpole and similar soils: 80 percent

Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Walpole

Setting

Landform: Deltas, depressions, outwash terraces, outwash plains, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, talf, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits derived from igneous, metamorphic and sedimentary rock

Typical profile

Oe - 0 to 1 inches: mucky peat
A - 1 to 7 inches: sandy loam
Bg - 7 to 21 inches: sandy loam
BC - 21 to 25 inches: gravelly sandy loam
C - 25 to 65 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D

Minor Components

Sudbury

Percent of map unit: 10 percent
Landform: Terraces, deltas, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear

Scarboro

Percent of map unit: 10 percent
Landform: Outwash plains, outwash terraces, deltas
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave

17—Timakwa and Natchaug soils

Map Unit Setting

National map unit symbol: 9lk2
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Timakwa and similar soils: 45 percent
Natchaug and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Timakwa

Setting

Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Woody organic material over sandy and gravelly glaciofluvial deposits

Typical profile

Oa1 - 0 to 10 inches: muck
Oa2 - 10 to 21 inches: muck
Oa3 - 21 to 24 inches: muck
Oa4 - 24 to 37 inches: muck
2Cg1 - 37 to 47 inches: very gravelly loamy coarse sand
2Cg2 - 47 to 60 inches: gravelly loamy very fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.57 to 99.62 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 16.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D

Description of Natchaug

Setting

Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Woody organic material over loamy alluvium and/or loamy glaciofluvial deposits and/or loamy till

Typical profile

Oi1 - 0 to 2 inches: peat
Oi2 - 2 to 4 inches: peat
Oa1 - 4 to 6 inches: muck
Oa2 - 6 to 11 inches: muck
Oa3 - 11 to 18 inches: muck
Oa4 - 18 to 24 inches: muck
2Cg1 - 24 to 33 inches: fine sandy loam
2Cg2 - 33 to 36 inches: fine sandy loam
2Cg3 - 36 to 80 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 13.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D

Minor Components

Maybid

Percent of map unit: 3 percent
Landform: Depressions, drainageways, terraces
Down-slope shape: Concave
Across-slope shape: Concave

Catden

Percent of map unit: 3 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave

Saco

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave

Whitman

Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave

Menlo

Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave

Scarboro

Percent of map unit: 2 percent
Landform: Depressions, drainageways, terraces
Down-slope shape: Concave
Across-slope shape: Concave

18—Catden and Freetown soils

Map Unit Setting

National map unit symbol: 9lk3
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Freetown and similar soils: 40 percent
Catden and similar soils: 40 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Catden

Setting

Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Woody organic material

Typical profile

Oa1 - 0 to 2 inches: muck
Oa2 - 2 to 18 inches: muck
Oa3 - 18 to 47 inches: muck
Oa4 - 47 to 49 inches: muck
Oa5 - 49 to 61 inches: muck

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 23.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D

Description of Freetown

Setting

Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Woody organic material

Typical profile

Oi1 - 0 to 4 inches: peat
Oi2 - 4 to 10 inches: peat
Oa1 - 10 to 22 inches: muck
Oa2 - 22 to 35 inches: muck
Oa3 - 35 to 41 inches: muck
Oa4 - 41 to 55 inches: muck
Oa5 - 55 to 71 inches: muck
Oa6 - 71 to 91 inches: muck

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 23.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D

Minor Components

Timakwa

Percent of map unit: 5 percent
Landform: Depressions

Down-slope shape: Concave
Across-slope shape: Concave

Natchaug
Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave

Whitman
Percent of map unit: 3 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave

Scarboro
Percent of map unit: 2 percent
Landform: Depressions, drainageways, terraces
Down-slope shape: Concave
Across-slope shape: Concave

Saco
Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave

Maybid
Percent of map unit: 2 percent
Landform: Depressions, drainageways, terraces
Down-slope shape: Concave
Across-slope shape: Concave

Menlo
Percent of map unit: 1 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave

29B—Agawam fine sandy loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 9lm6
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Agawam and similar soils: 80 percent

Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Agawam

Setting

Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bw1 - 8 to 14 inches: fine sandy loam
Bw2 - 14 to 24 inches: fine sandy loam
2C - 24 to 60 inches: stratified very gravelly coarse sand to fine sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B

Minor Components

Hinckley

Percent of map unit: 5 percent
Landform: Eskers, kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex

Merrimac

Percent of map unit: 5 percent
Landform: Kames, outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Walpole

Percent of map unit: 3 percent
Landform: Depressions on terraces, drainageways on terraces
Down-slope shape: Concave
Across-slope shape: Concave

Ninigret

Percent of map unit: 3 percent
Landform: Outwash plains, terraces

Down-slope shape: Linear
Across-slope shape: Concave

Unnamed, red parent material
Percent of map unit: 2 percent

Scarboro
Percent of map unit: 2 percent
Landform: Depressions, drainageways, terraces
Down-slope shape: Concave
Across-slope shape: Concave

34B—Merrimac sandy loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 9lmy
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Merrimac and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting
Landform: Kames, outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile
Ap - 0 to 9 inches: sandy loam
Bw1 - 9 to 16 inches: sandy loam
Bw2 - 16 to 24 inches: gravelly sandy loam
2C - 24 to 60 inches: stratified very gravelly coarse sand to gravelly sand

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex

Agawam

Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Hinckley

Percent of map unit: 3 percent
Landform: Eskers, kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex

Walpole

Percent of map unit: 2 percent
Landform: Depressions on terraces, drainageways on terraces
Down-slope shape: Concave
Across-slope shape: Concave

Scarboro

Percent of map unit: 2 percent
Landform: Depressions, drainageways, terraces
Down-slope shape: Concave
Across-slope shape: Concave

Ninigret

Percent of map unit: 2 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, terraces
Down-slope shape: Concave
Across-slope shape: Linear

Unnamed, red parent material

Percent of map unit: 1 percent

38E—Hinckley gravelly sandy loam, 15 to 45 percent slopes

Map Unit Setting

National map unit symbol: 9lnb
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Hinckley and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Eskers, kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Ap - 0 to 8 inches: gravelly sandy loam
Bw1 - 8 to 20 inches: very gravelly loamy sand
Bw2 - 20 to 27 inches: very gravelly sand
C1 - 27 to 42 inches: stratified cobbly coarse sand to extremely gravelly sand
C2 - 42 to 60 inches: stratified cobbly coarse sand to extremely gravelly sand

Properties and qualities

Slope: 15 to 45 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A

Minor Components

Windsor
Percent of map unit: 5 percent
Landform: Kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex

Merrimac
Percent of map unit: 5 percent
Landform: Kames, outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Agawam
Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Sudbury
Percent of map unit: 2 percent
Landform: Outwash plains, terraces
Down-slope shape: Concave
Across-slope shape: Linear

Rock outcrop
Percent of map unit: 1 percent

Unnamed, red parent material
Percent of map unit: 1 percent

Walpole
Percent of map unit: 1 percent
Landform: Depressions on terraces, drainageways on terraces
Down-slope shape: Concave
Across-slope shape: Concave

Scarboro
Percent of map unit: 1 percent
Landform: Depressions, drainageways, terraces
Down-slope shape: Concave
Across-slope shape: Concave

Unnamed, gravelly silt loam solum
Percent of map unit: 1 percent

45B—Woodbridge fine sandy loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2t2ql
Elevation: 0 to 1,470 feet

Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Woodbridge, fine sandy loam, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Fine Sandy Loam

Setting

Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 18 inches: fine sandy loam
Bw2 - 18 to 30 inches: fine sandy loam
Cd - 30 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D

Minor Components

Paxton

Percent of map unit: 10 percent
Landform: Hills, ground moraines, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, crest, side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex

Ridgebury

Percent of map unit: 8 percent

Landform: Drainageways, hills, ground moraines, depressions
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, base slope, dip
Down-slope shape: Concave
Across-slope shape: Concave

73C—Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 9lqk
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 45 percent
Chatfield and similar soils: 30 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Ap - 0 to 4 inches: fine sandy loam
Bw1 - 4 to 7 inches: fine sandy loam
Bw2 - 7 to 19 inches: fine sandy loam
Bw3 - 19 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B

Description of Chatfield

Setting

Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 15 inches: gravelly fine sandy loam
Bw2 - 15 to 29 inches: gravelly fine sandy loam
2R - 29 to 80 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B

Minor Components

Rock outcrop

Percent of map unit: 6 percent

Sutton

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Linear

Leicester

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave

Hollis

Percent of map unit: 5 percent

Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Convex

Unnamed, sandy subsoil
Percent of map unit: 2 percent

Unnamed, red parent material
Percent of map unit: 2 percent

73E—Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky

Map Unit Setting
National map unit symbol: 9lql
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition
Charlton and similar soils: 45 percent
Chatfield and similar soils: 30 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile
Ap - 0 to 4 inches: fine sandy loam
Bw1 - 4 to 7 inches: fine sandy loam
Bw2 - 7 to 19 inches: fine sandy loam
Bw3 - 19 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities
Slope: 15 to 45 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B

Description of Chatfield

Setting

Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 15 inches: gravelly fine sandy loam
Bw2 - 15 to 29 inches: gravelly fine sandy loam
2R - 29 to 80 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B

Minor Components

Rock outcrop

Percent of map unit: 10 percent

Leicester

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave

Sutton

Percent of map unit: 5 percent
Landform: Depressions, drainageways

Down-slope shape: Concave
Across-slope shape: Linear

Hollis
Percent of map unit: 3 percent
Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Convex

Unnamed, sandy subsoil
Percent of map unit: 1 percent

Unnamed, red parent material
Percent of map unit: 1 percent

75C—Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes

Map Unit Setting
National map unit symbol: 9lqn
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition
Hollis and similar soils: 35 percent
Chatfield and similar soils: 30 percent
Rock outcrop: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis

Setting
Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile
Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 9 inches: channery fine sandy loam
Bw2 - 9 to 15 inches: gravelly fine sandy loam
2R - 15 to 80 inches: bedrock

Properties and qualities
Slope: 3 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock

Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D

Description of Chatfield

Setting
Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile
Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 15 inches: gravelly fine sandy loam
Bw2 - 15 to 29 inches: gravelly fine sandy loam
2R - 29 to 80 inches: unweathered bedrock

Properties and qualities
Slope: 3 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B

Description of Rock Outcrop

Properties and qualities
Slope: 3 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

Hydrologic Soil Group: D

Minor Components

Charlton
Percent of map unit: 7 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Sutton
Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Linear

Leicester
Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave

Brimfield
Percent of map unit: 1 percent
Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Convex

Unnamed, sandy subsoil
Percent of map unit: 1 percent

Unnamed, red parent material
Percent of map unit: 1 percent

75E—Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes

Map Unit Setting
National map unit symbol: 9lqp
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition
Hollis and similar soils: 35 percent
Chatfield and similar soils: 30 percent
Rock outcrop: 15 percent
Minor components: 20 percent

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

Description of Hollis

Setting

Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 9 inches: channery fine sandy loam
Bw2 - 9 to 15 inches: gravelly fine sandy loam
2R - 15 to 80 inches: bedrock

Properties and qualities

Slope: 15 to 45 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D

Description of Chatfield

Setting

Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 15 inches: gravelly fine sandy loam
Bw2 - 15 to 29 inches: gravelly fine sandy loam
2R - 29 to 80 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B

Description of Rock Outcrop

Properties and qualities

Slope: 15 to 45 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D

Minor Components

Charlton

Percent of map unit: 7 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Sutton

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Linear

Leicester

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave

Unnamed, sandy subsoil

Percent of map unit: 1 percent

Unnamed, red parent material

Percent of map unit: 1 percent

Brimfield

Percent of map unit: 1 percent
Landform: Hills, ridges
Down-slope shape: Convex
Across-slope shape: Convex

302—Dumps

Map Unit Setting

National map unit symbol: 9lmb
Elevation: 0 to 1,200 feet
Mean annual precipitation: 37 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Dumps: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dumps

Typical profile

C - 0 to 65 inches: variable

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

Minor Components

Udorthents

Percent of map unit: 2 percent

Westbrook

Percent of map unit: 1 percent
Landform: Salt marshes, tidal marshes
Down-slope shape: Concave
Across-slope shape: Concave

Rock outcrop

Percent of map unit: 1 percent

Unnamed, frequently flooded

Percent of map unit: 1 percent
Landform: Drainageways

306—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 9lmg
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 50 percent
Urban land: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Drift

Typical profile

A - 0 to 5 inches: loam
C1 - 5 to 21 inches: gravelly loam
C2 - 21 to 80 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: About 54 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B

Description of Urban Land

Typical profile

H - 0 to 6 inches: material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D

Minor Components

Unnamed, undisturbed soils

Percent of map unit: 8 percent

Udorthents, wet substratum

Percent of map unit: 5 percent
Down-slope shape: Convex
Across-slope shape: Linear

Rock outcrop

Percent of map unit: 2 percent

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

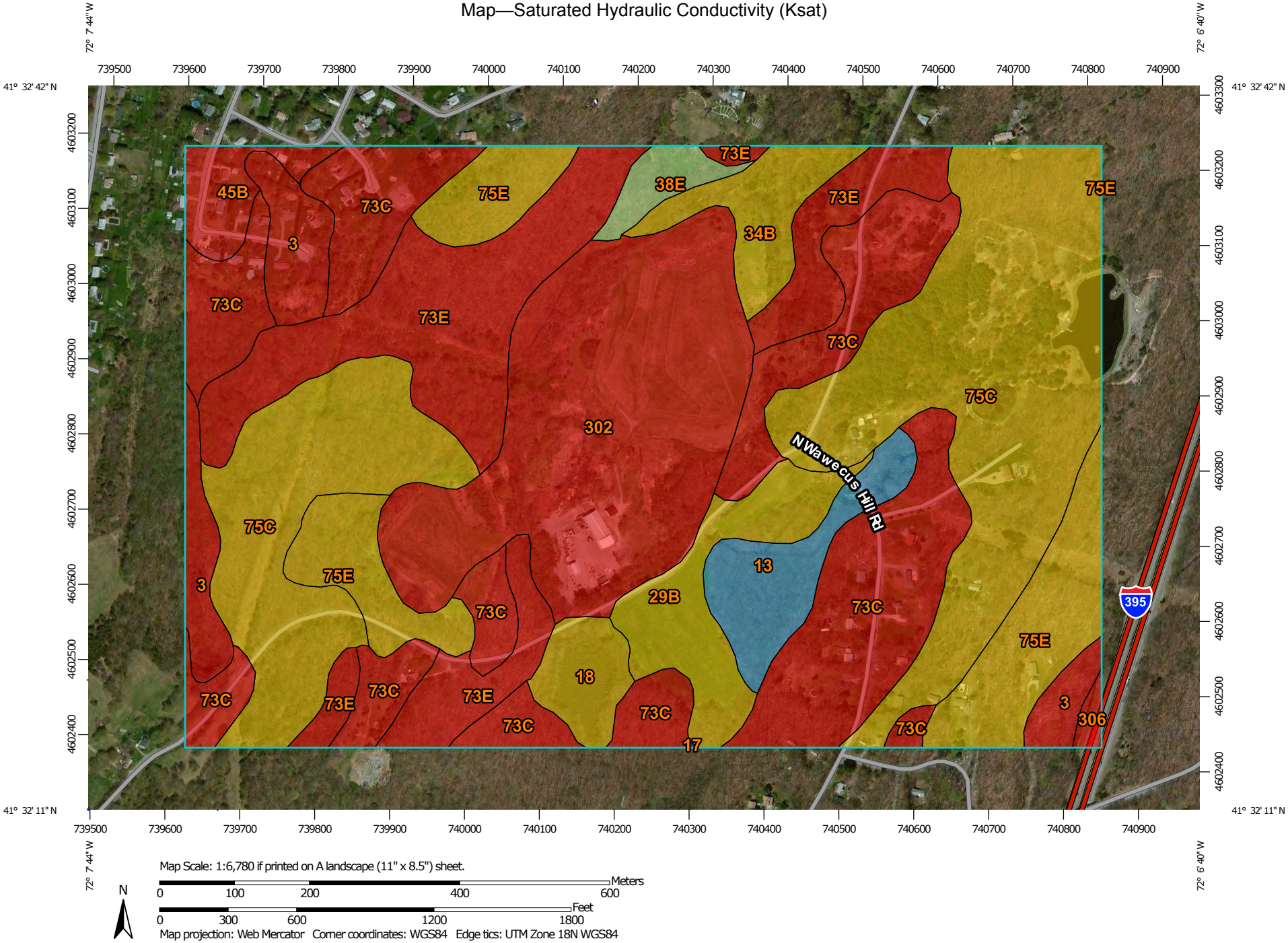
Saturated Hydraulic Conductivity (Ksat)

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Custom Soil Resource Report
Map—Saturated Hydraulic Conductivity (Ksat)



Map Scale: 1:6,780 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- <= 10.0000
- > 10.0000 and <= 28.0000
- > 28.0000 and <= 92.0000
- > 92.0000 and <= 100.0000
- > 100.0000 and <= 354.0000
- Not rated or not available

Soil Rating Lines

- <= 10.0000
- > 10.0000 and <= 28.0000
- > 28.0000 and <= 92.0000
- > 92.0000 and <= 100.0000
- > 100.0000 and <= 354.0000
- Not rated or not available

Soil Rating Points

- <= 10.0000
- > 10.0000 and <= 28.0000
- > 28.0000 and <= 92.0000
- > 92.0000 and <= 100.0000
- > 100.0000 and <= 354.0000
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 13, Oct 28, 2014

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

Date(s) aerial images were photographed: Mar 28, 2011—May 12, 2011

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

Table—Saturated Hydraulic Conductivity (Ksat)

Saturated Hydraulic Conductivity (Ksat)— Summary by Map Unit — State of Connecticut (CT600)				
Map unit symbol	**Map unit name**	**Rating (micrometers per second)**	**Acres in AOI**	**Percent of AOI**
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	5.5000	9.4	3.9%
13	Walpole sandy loam, 0 to 3 percent slopes	100.0000	7.3	3.0%
17	Timakwa and Natchaug soils	354.0000	0.0	0.0%
18	Catden and Freetown soils	23.0000	4.1	1.7%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	28.0000	9.7	4.0%
34B	Merrimac sandy loam, 3 to 8 percent slopes	28.0000	6.1	2.5%
38E	Hinckley gravelly sandy loam, 15 to 45 percent slopes	92.0000	2.5	1.0%
45B	Woodbridge fine sandy loam, 3 to 8 percent slopes	5.5000	3.7	1.5%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	10.0000	47.4	19.5%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	10.0000	33.0	13.6%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	28.0000	60.5	24.9%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	28.0000	19.7	8.1%
302	Dumps	10.0000	39.0	16.1%
306	Udorthents-Urban land complex	10.0000	0.6	0.3%
Totals for Area of Interest			**243.1**	**100.0%**

Rating Options—Saturated Hydraulic Conductivity (Ksat)

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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

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

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

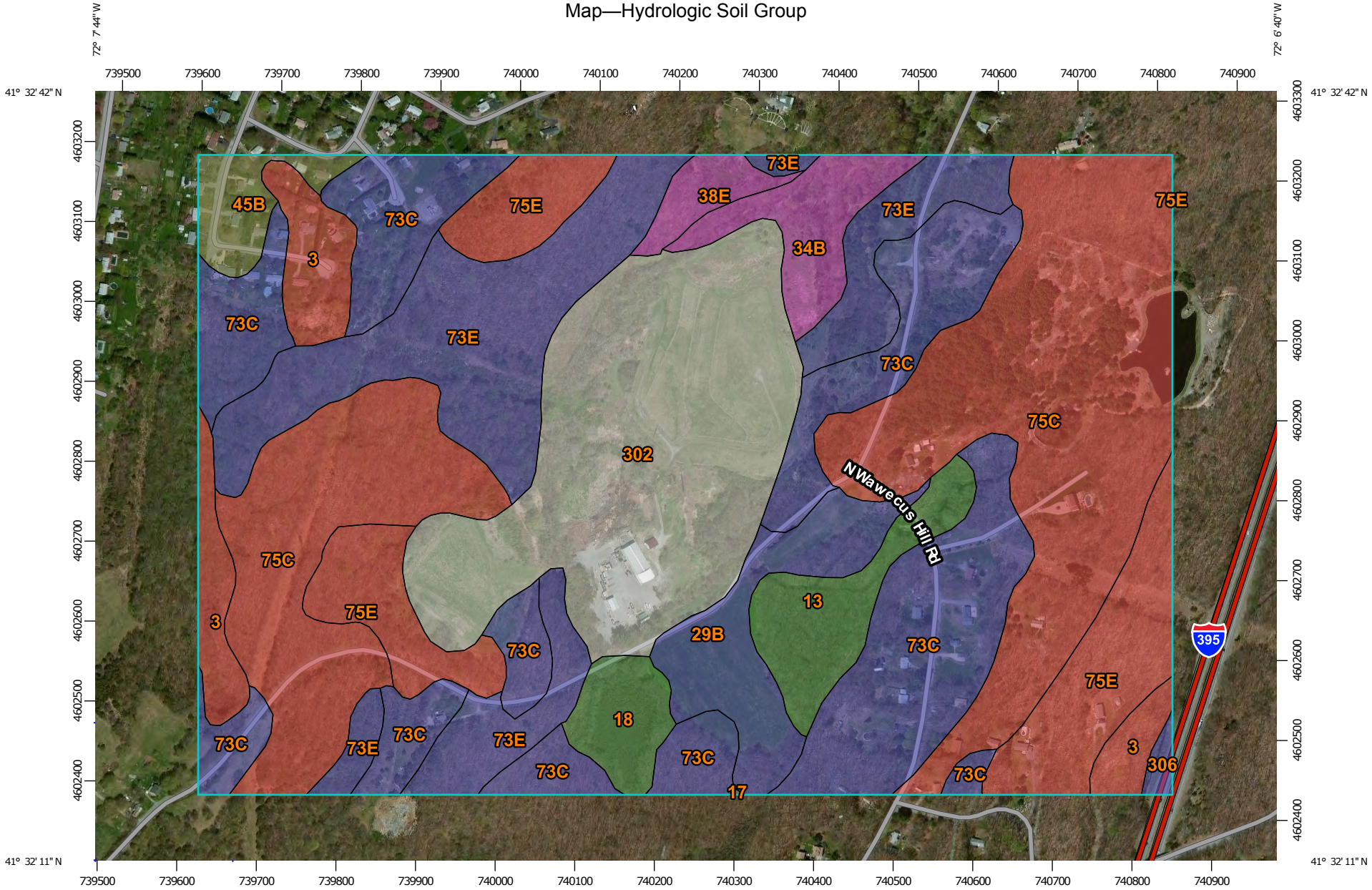
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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

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

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

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:6,780 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 13, Oct 28, 2014

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

Date(s) aerial images were photographed: Mar 28, 2011—May 12, 2011

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

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — State of Connecticut (CT600)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	D	9.4	3.9%
13	Walpole sandy loam, 0 to 3 percent slopes	A/D	7.3	3.0%
17	Timakwa and Natchaug soils	A/D	0.0	0.0%
18	Catden and Freetown soils	A/D	4.1	1.7%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	B	9.7	4.0%
34B	Merrimac sandy loam, 3 to 8 percent slopes	A	6.1	2.5%
38E	Hinckley gravelly sandy loam, 15 to 45 percent slopes	A	2.5	1.0%
45B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	3.7	1.5%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	B	47.4	19.5%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	B	33.0	13.6%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	D	60.5	24.9%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	D	19.7	8.1%
302	Dumps		39.0	16.1%
306	Udorthents-Urban land complex	B	0.6	0.3%
Totals for Area of Interest			**243.1**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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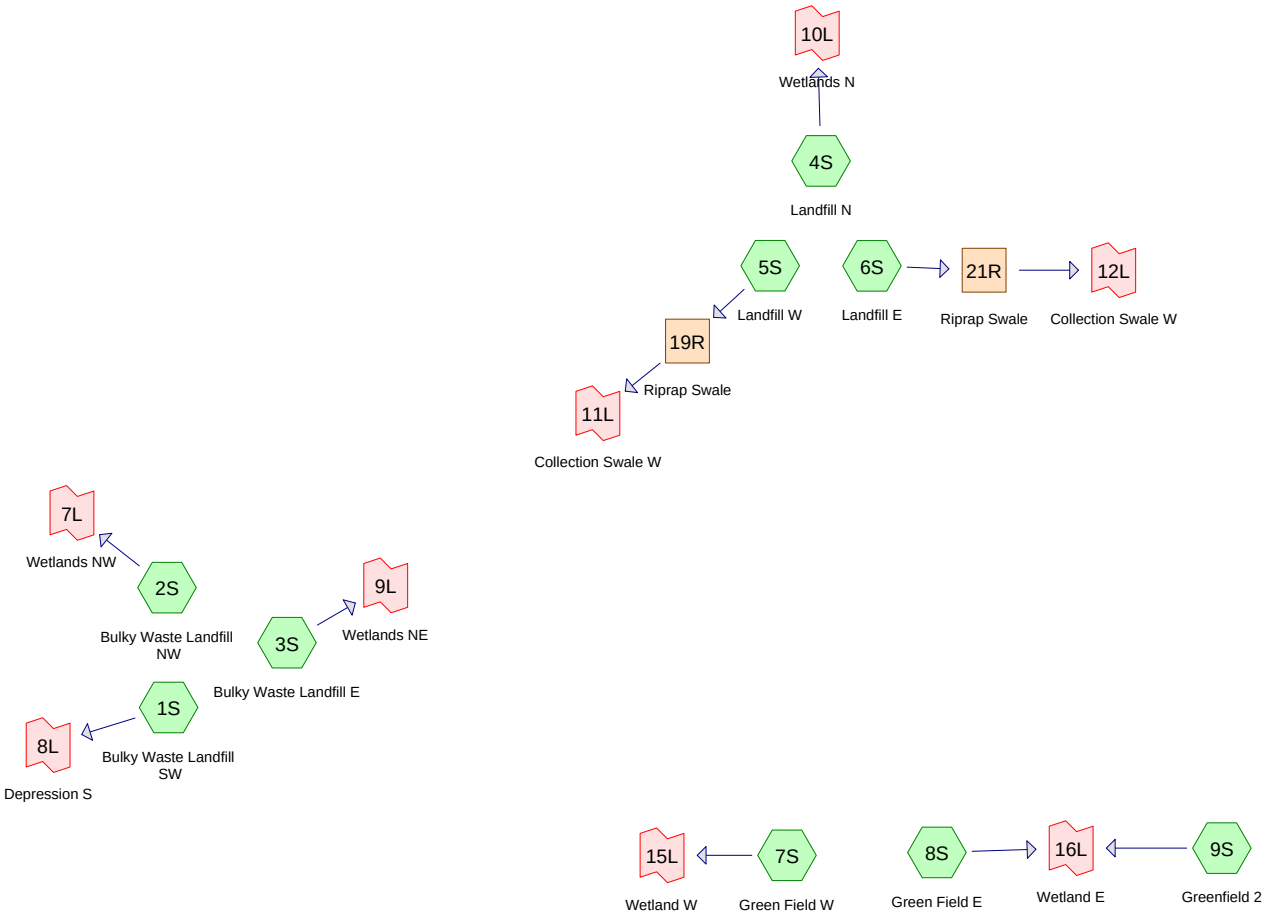
Appendix B
HydroCAD Modeling Results

Existing Conditions Results



Subcat Reach Pond Link

Routing Diagram for Rogers Road Existing Conditions
Prepared by Boundaries LLC - DCM, Printed 8/12/2015
HydroCAD® 10.00-13 s/n 04031 © 2014 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
266,021	61	>75% Grass cover, Good, HSG B (7S, 8S, 9S)
282,399	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S, 4S, 5S, 6S, 7S)
16,596	80	>75% Grass cover, Good, HSG D (7S, 8S, 9S)
3,920	89	Gravel roads, HSG C (6S)
6,578	55	Woods, Good, HSG B (9S)
3,964	77	Woods, Good, HSG D (9S)
579,479	**68**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
272,598	HSG B	7S, 8S, 9S
286,320	HSG C	1S, 2S, 3S, 4S, 5S, 6S, 7S
20,560	HSG D	7S, 8S, 9S
0	Other	
579,479		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	266,021	282,399	16,596	0	565,017	>75% Grass cover, Good	
0	0	3,920	0	0	3,920	Gravel roads	
0	6,578	0	3,964	0	10,542	Woods, Good	
0	**272,598**	**286,320**	**20,560**	**0**	**579,479**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.050 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Bulky Waste Landfill SW Runoff Area=0.952 ac 0.00% Impervious Runoff Depth>1.17"
Flow Length=239' Tc=13.7 min CN=74 Runoff=1.0 cfs 4,035 cf

Subcatchment 2S: Bulky Waste Landfill NW Runoff Area=0.705 ac 0.00% Impervious Runoff Depth>1.17"
Flow Length=179' Tc=14.1 min CN=74 Runoff=0.7 cfs 2,988 cf

Subcatchment 3S: Bulky Waste Landfill E Runoff Area=1.092 ac 0.00% Impervious Runoff Depth>1.17"
Flow Length=204' Tc=14.6 min CN=74 Runoff=1.1 cfs 4,628 cf

Subcatchment 4S: Landfill N Runoff Area=0.618 ac 0.00% Impervious Runoff Depth>1.17"
Flow Length=222' Tc=14.3 min CN=74 Runoff=0.6 cfs 2,619 cf

Subcatchment 5S: Landfill W Runoff Area=1.960 ac 0.00% Impervious Runoff Depth>1.17"
Flow Length=752' Tc=15.2 min CN=74 Runoff=1.9 cfs 8,304 cf

Subcatchment 6S: Landfill E Runoff Area=1.224 ac 0.00% Impervious Runoff Depth>1.23"
Flow Length=459' Tc=10.0 min CN=75 Runoff=1.5 cfs 5,460 cf

Subcatchment 7S: Green Field W Runoff Area=2.145 ac 0.00% Impervious Runoff Depth>0.56"
Flow Length=472' Tc=24.7 min CN=62 Runoff=0.7 cfs 4,395 cf

Subcatchment 8S: Green Field E Runoff Area=2.890 ac 0.00% Impervious Runoff Depth>0.57"
Flow Length=305' Tc=20.6 min CN=62 Runoff=0.9 cfs 5,931 cf

Subcatchment 9S: Greenfield 2 Runoff Area=1.717 ac 0.00% Impervious Runoff Depth>0.61"
Flow Length=247' Tc=19.4 min CN=63 Runoff=0.6 cfs 3,787 cf

Reach 19R: Riprap Swale Avg. Flow Depth=0.18' Max Vel=2.61 fps Inflow=1.9 cfs 8,304 cf
n=0.030 L=657.0' S=0.0383 '/' Capacity=8.6 cfs Outflow=1.8 cfs 8,265 cf

Reach 21R: Riprap Swale Avg. Flow Depth=0.16' Max Vel=2.54 fps Inflow=1.5 cfs 5,460 cf
n=0.030 L=527.0' S=0.0372 '/' Capacity=34.5 cfs Outflow=1.4 cfs 5,437 cf

Link 7L: Wetlands NW Inflow=0.7 cfs 2,988 cf
Primary=0.7 cfs 2,988 cf

Link 8L: Depression S Inflow=1.0 cfs 4,035 cf
Primary=1.0 cfs 4,035 cf

Link 9L: Wetlands NE Inflow=1.1 cfs 4,628 cf
Primary=1.1 cfs 4,628 cf

Link 10L: Wetlands N Inflow=0.6 cfs 2,619 cf
Primary=0.6 cfs 2,619 cf

Link 11L: Collection Swale W Inflow=1.8 cfs 8,265 cf
Primary=1.8 cfs 8,265 cf

Link 12L: Collection Swale W Inflow=1.4 cfs 5,437 cf
Primary=1.4 cfs 5,437 cf

Link 15L: Wetland W Inflow=0.7 cfs 4,395 cf
Primary=0.7 cfs 4,395 cf

Link 16L: Wetland E Inflow=1.6 cfs 9,719 cf
Primary=1.6 cfs 9,719 cf

Total Runoff Area = 579,479 sf Runoff Volume = 42,148 cf Average Runoff Depth = 0.87"
100.00% Pervious = 579,479 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1S: Bulky Waste Landfill SW

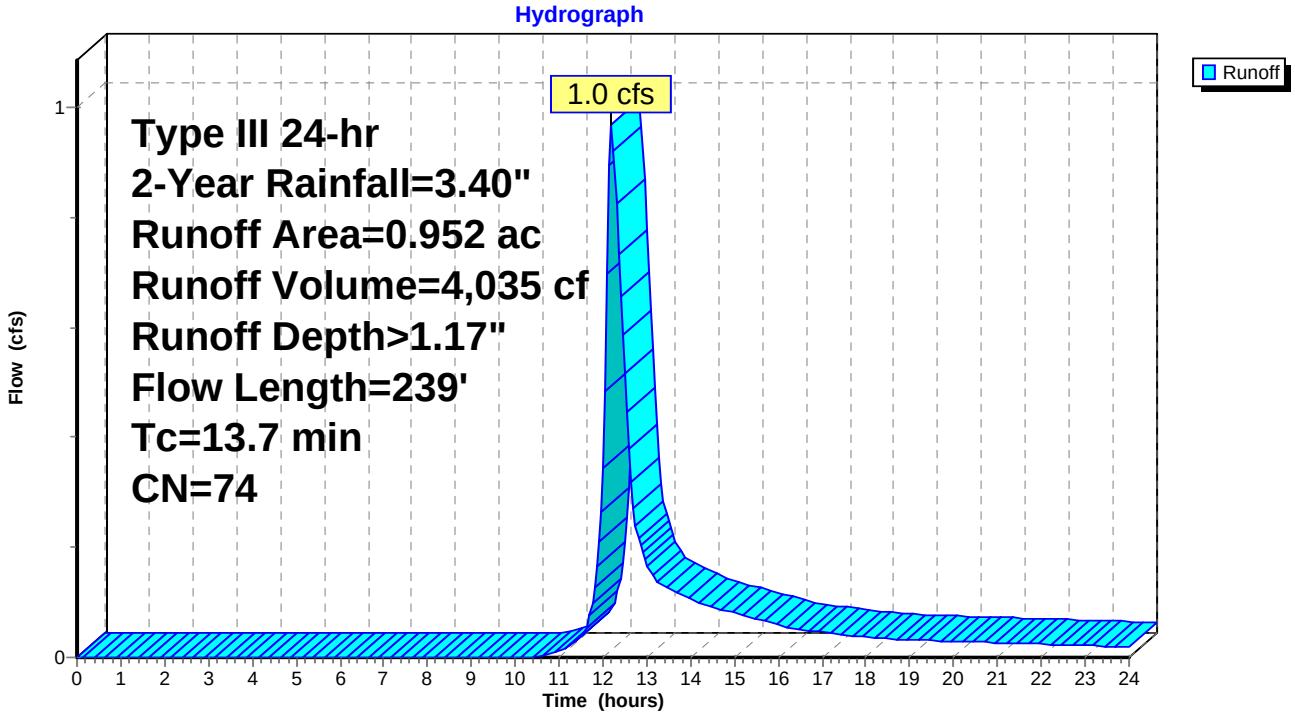
Runoff = 1.0 cfs @ 12.21 hrs, Volume= 4,035 cf, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.952	74	>75% Grass cover, Good, HSG C
0.952		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0251	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.5	66	0.1137	2.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	46	0.1957	3.10		**Shallow Concentrated Flow, Lanfill Cap** Short Grass Pasture Kv= 7.0 fps
0.4	27	0.0050	1.14		**Shallow Concentrated Flow, Access Drive** Unpaved Kv= 16.1 fps
13.7	239	Total			

Subcatchment 1S: Bulky Waste Landfill SW



Summary for Subcatchment 2S: Bulky Waste Landfill NW

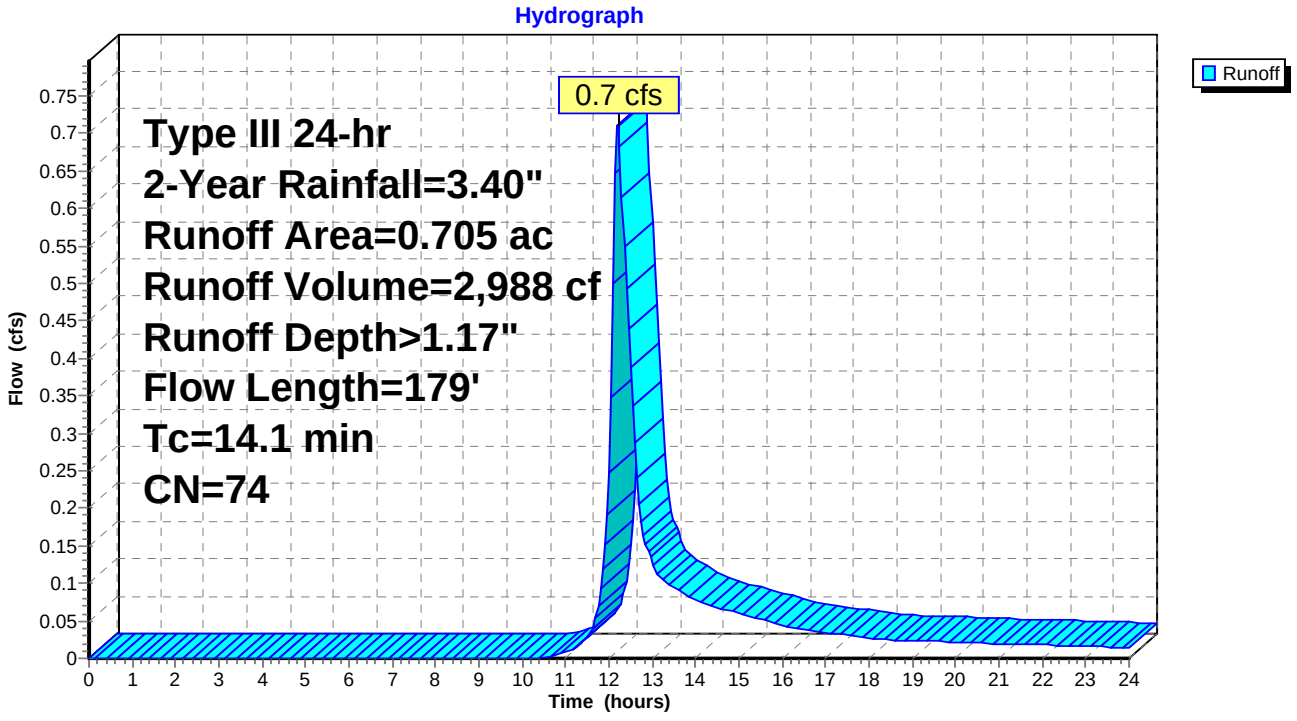
Runoff = 0.7 cfs @ 12.21 hrs, Volume= 2,988 cf, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.705	74	>75% Grass cover, Good, HSG C
0.705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.6	79	0.0886	2.08		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.1	179	Total			

Subcatchment 2S: Bulky Waste Landfill NW



Summary for Subcatchment 3S: Bulky Waste Landfill E

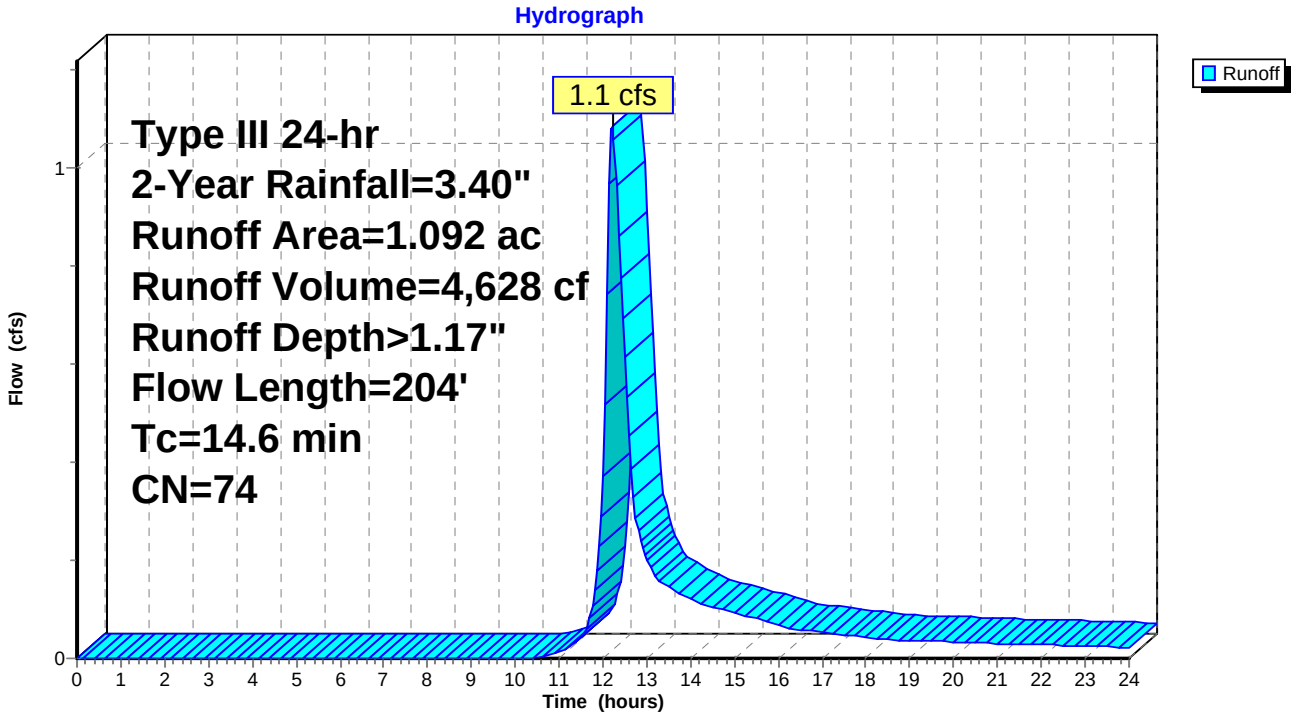
Runoff = 1.1 cfs @ 12.22 hrs, Volume= 4,628 cf, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
1.092	74	>75% Grass cover, Good, HSG C
1.092		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.1	24	0.1667	2.86		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.6	204	Total			

Subcatchment 3S: Bulky Waste Landfill E



Summary for Subcatchment 4S: Landfill N

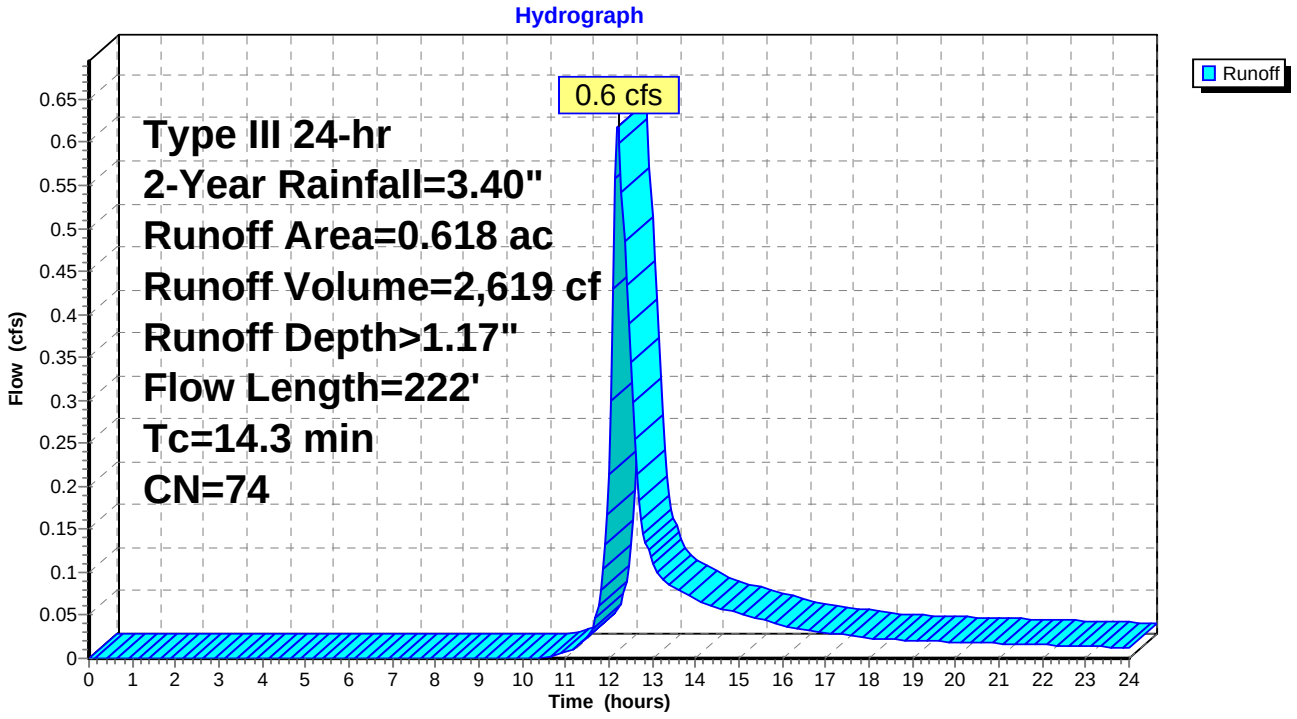
Runoff = 0.6 cfs @ 12.21 hrs, Volume= 2,619 cf, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.618	74	>75% Grass cover, Good, HSG C
0.618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0230	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	81	0.0371	1.35		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	41	0.1707	2.89		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.3	222	Total			

Subcatchment 4S: Landfill N



Summary for Subcatchment 5S: Landfill W

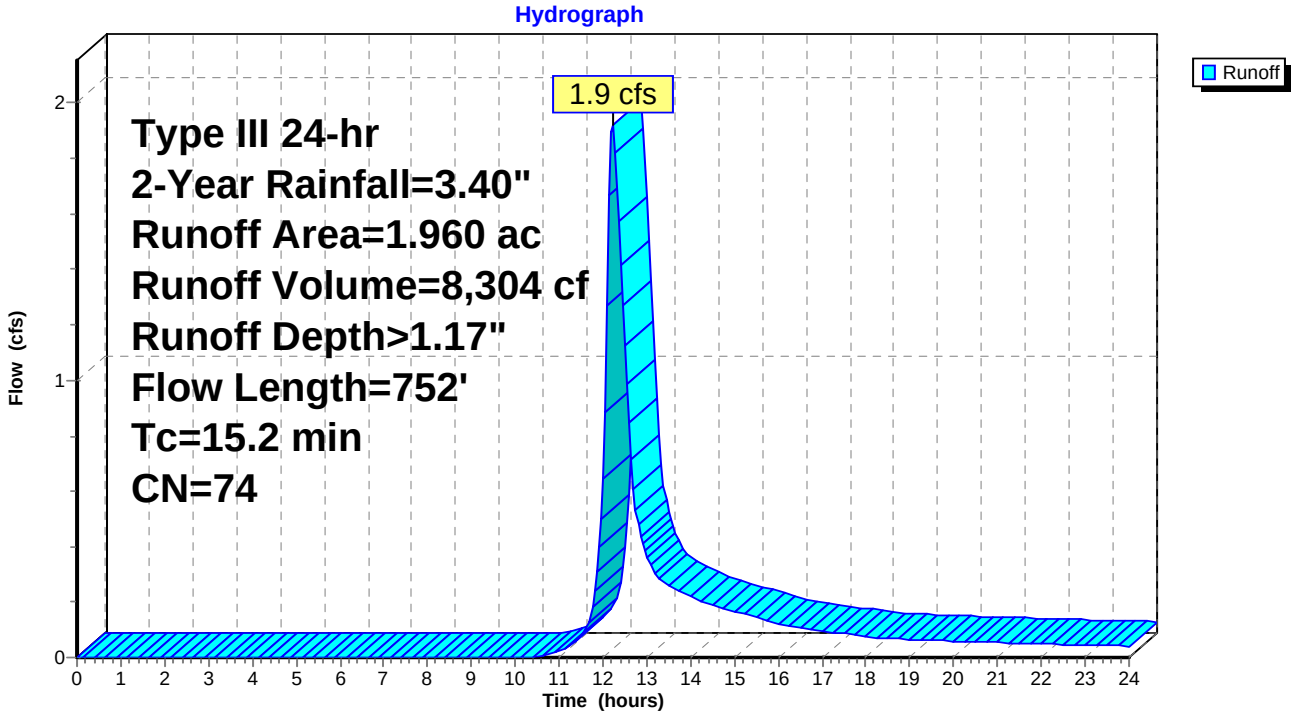
Runoff = 1.9 cfs @ 12.22 hrs, Volume= 8,304 cf, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
1.960	74	>75% Grass cover, Good, HSG C
1.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0220	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.3	37	0.0811	1.99		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.3	58	0.1897	3.05		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
1.3	520	0.0200	6.71	50.33	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
0.0	37	0.2160	22.05	165.39	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
15.2	752	Total			

Subcatchment 5S: Landfill W



Summary for Subcatchment 6S: Landfill E

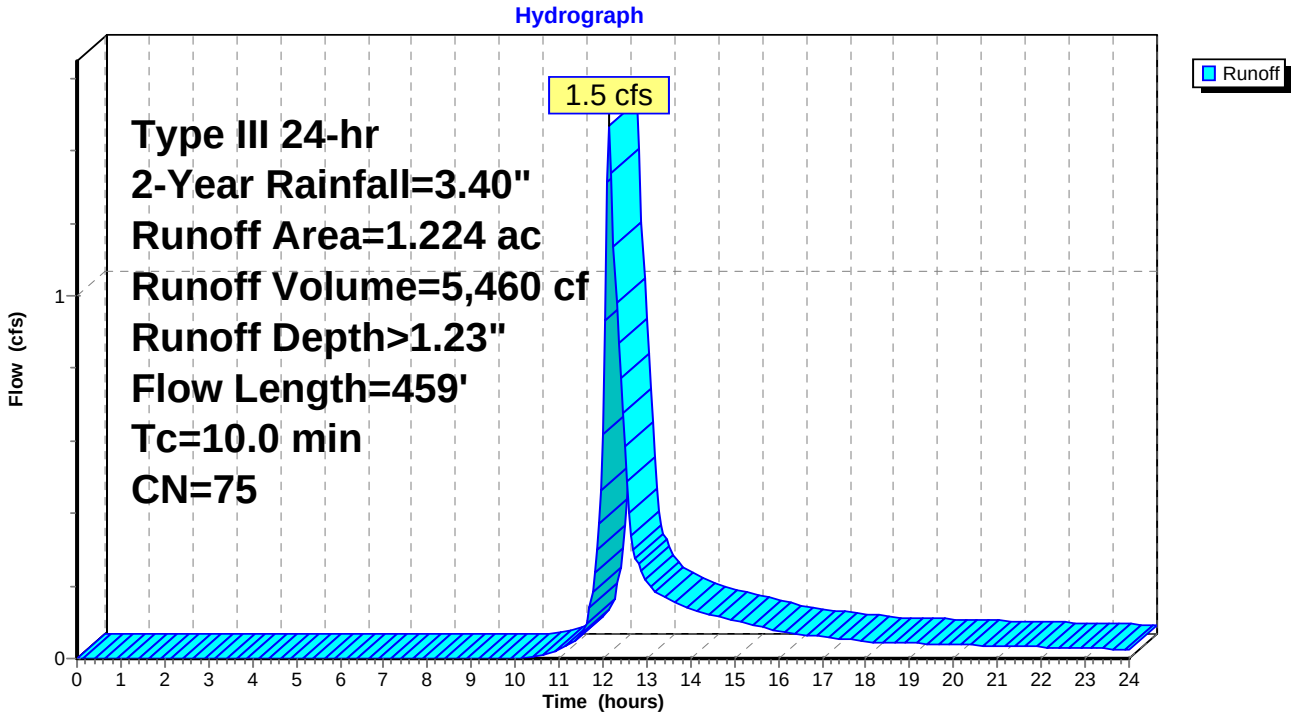
Runoff = 1.5 cfs @ 12.15 hrs, Volume= 5,460 cf, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
1.134	74	>75% Grass cover, Good, HSG C
0.090	89	Gravel roads, HSG C
1.224	75	Weighted Average
1.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	40	0.0543	0.15		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	60	0.0117	1.03		**Sheet Flow, Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.5	86	0.0384	3.15		**Shallow Concentrated Flow, Gravel** Unpaved Kv= 16.1 fps
0.7	76	0.0658	1.80		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	49	0.2245	3.32		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	148	0.1081	15.60	117.00	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
7.1	459	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: Landfill E



Summary for Subcatchment 7S: Green Field W

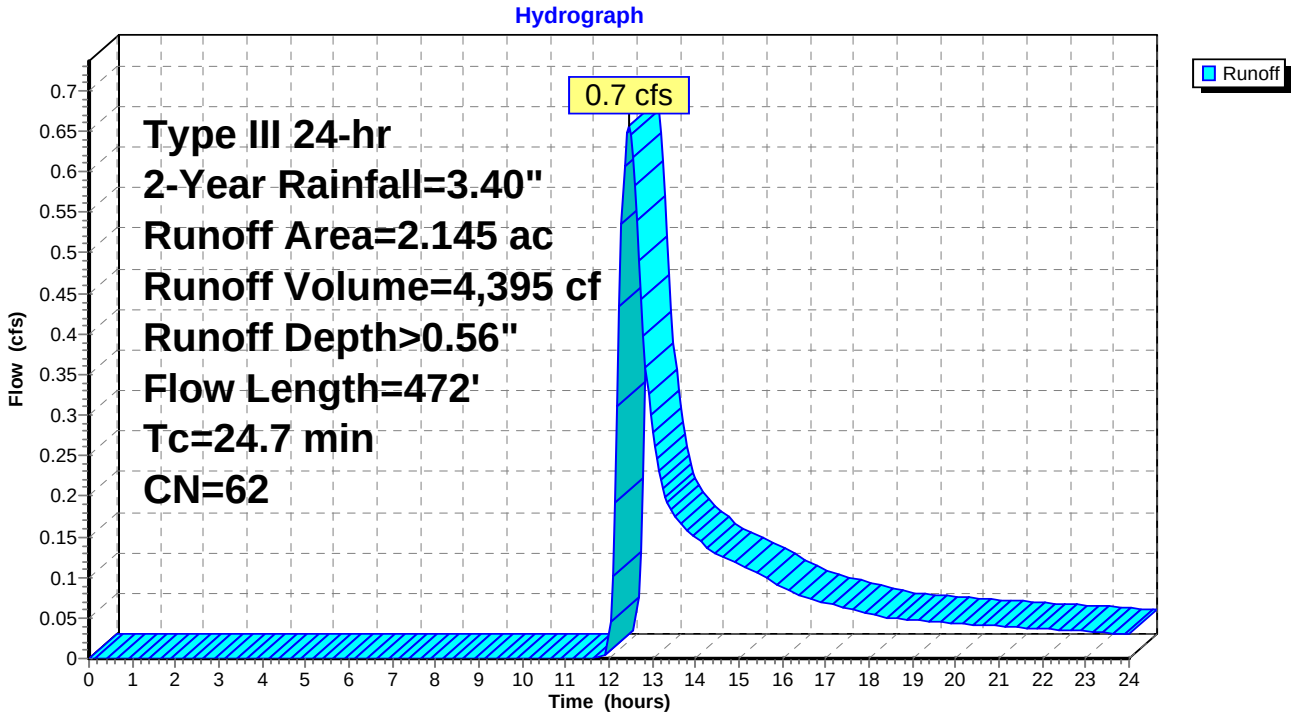
Runoff = 0.7 cfs @ 12.45 hrs, Volume= 4,395 cf, Depth> 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.022	74	>75% Grass cover, Good, HSG C
0.089	80	>75% Grass cover, Good, HSG D
0.282	61	>75% Grass cover, Good, HSG B
1.752	61	>75% Grass cover, Good, HSG B
2.145	62	Weighted Average
2.145		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	23	0.0217	1.03		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
4.8	160	0.0063	0.56		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.6	51	0.0392	1.39		**Shallow Concentrated Flow, field** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.7	50	0.0300	1.21		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
24.7	472	Total			

Subcatchment 7S: Green Field W



Summary for Subcatchment 8S: Green Field E

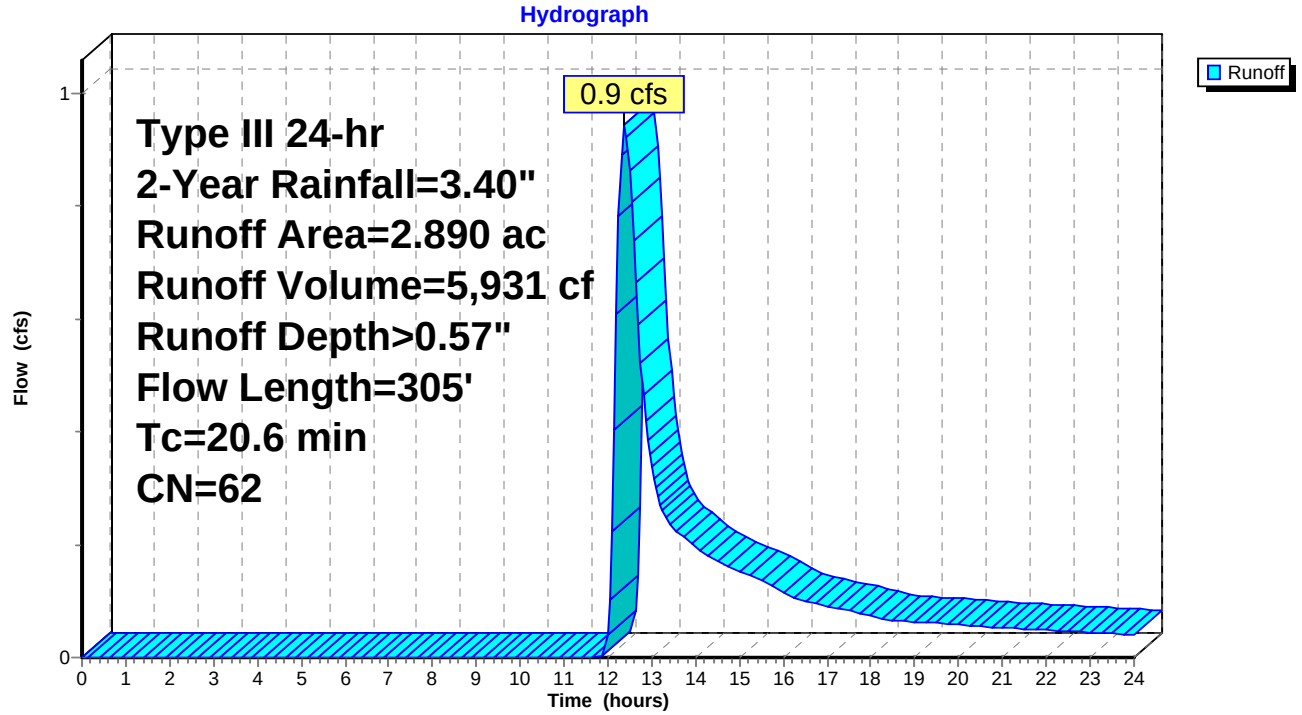
Runoff = 0.9 cfs @ 12.37 hrs, Volume= 5,931 cf, Depth> 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
2.685	61	>75% Grass cover, Good, HSG B
0.072	80	>75% Grass cover, Good, HSG D
0.033	80	>75% Grass cover, Good, HSG D
0.100	61	>75% Grass cover, Good, HSG B
2.890	62	Weighted Average
2.890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	24	0.0208	1.01		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
2.6	106	0.0094	0.68		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.8	75	0.0467	1.51		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
20.6	305	Total			

Subcatchment 8S: Green Field E



Summary for Subcatchment 9S: Greenfield 2

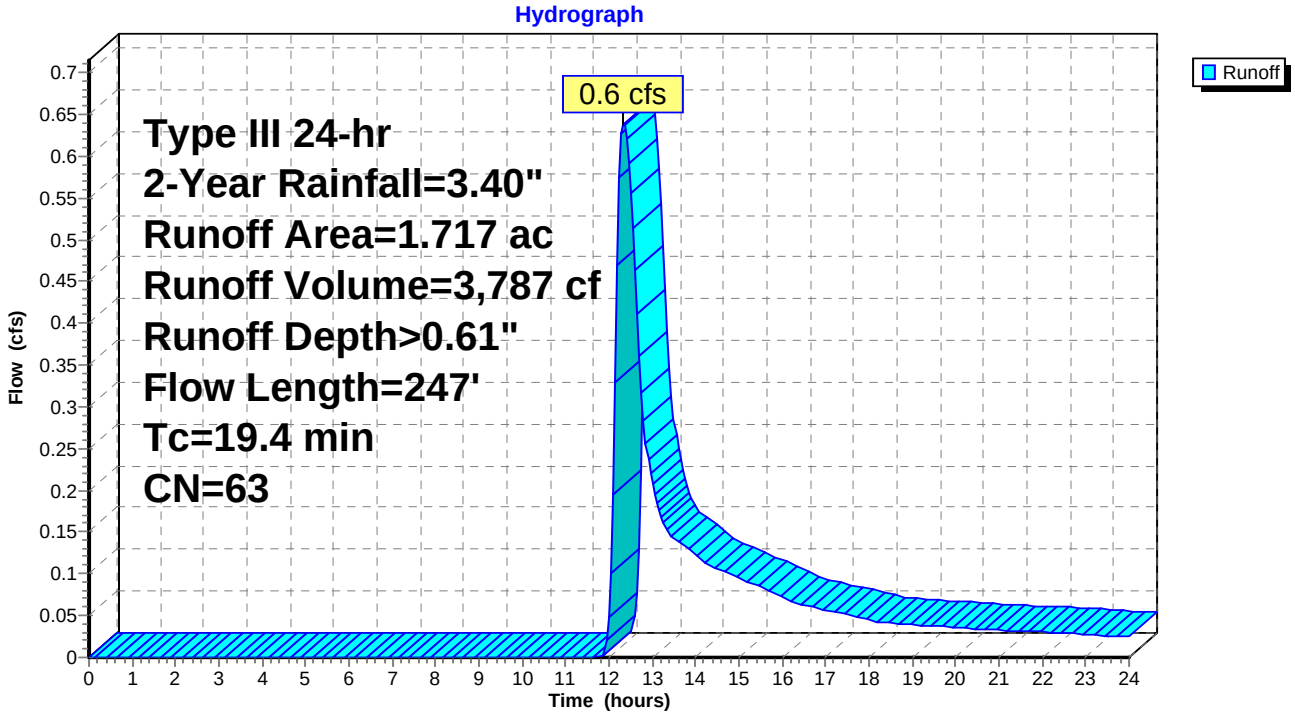
Runoff = 0.6 cfs @ 12.34 hrs, Volume= 3,787 cf, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.091	77	Woods, Good, HSG D
0.151	55	Woods, Good, HSG B
1.288	61	>75% Grass cover, Good, HSG B
0.187	80	>75% Grass cover, Good, HSG D
1.717	63	Weighted Average
1.717		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0128	0.10		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.40"
2.9	147	0.0148	0.85		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
19.4	247	Total			

Subcatchment 9S: Greenfield 2



Summary for Reach 19R: Riprap Swale

Inflow Area = 85,378 sf, 0.00% Impervious, Inflow Depth > 1.17" for 2-Year event
Inflow = 1.9 cfs @ 12.22 hrs, Volume= 8,304 cf
Outflow = 1.8 cfs @ 12.28 hrs, Volume= 8,265 cf, Atten= 5%, Lag= 3.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 2.61 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.99 fps, Avg. Travel Time= 11.1 min

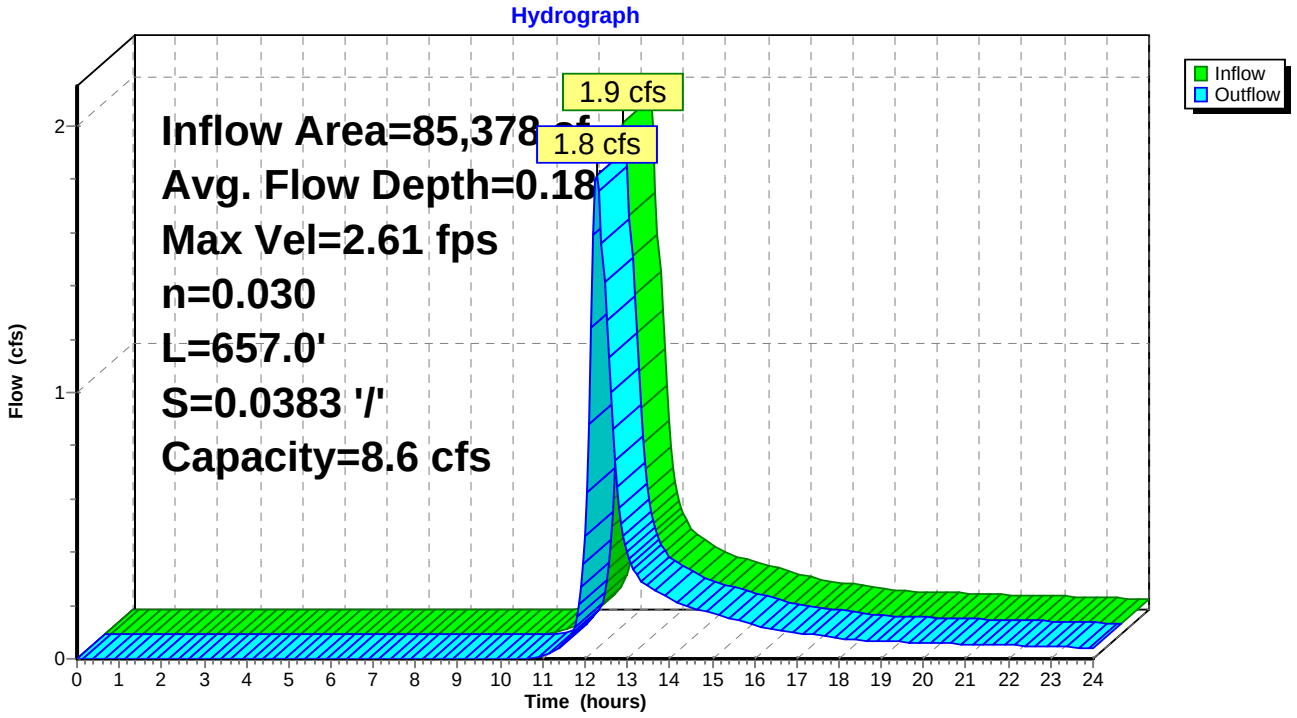
Peak Storage= 457 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 0.40' Flow Area= 2.1 sf, Capacity= 8.6 cfs

3.00' x 0.40' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 5.5 '/' Top Width= 7.40'
Length= 657.0' Slope= 0.0383 '/'
Inlet Invert= 274.52', Outlet Invert= 249.36'



‡

Reach 19R: Riprap Swale



Summary for Reach 21R: Riprap Swale

Inflow Area = 53,317 sf, 0.00% Impervious, Inflow Depth > 1.23" for 2-Year event
Inflow = 1.5 cfs @ 12.15 hrs, Volume= 5,460 cf
Outflow = 1.4 cfs @ 12.20 hrs, Volume= 5,437 cf, Atten= 6%, Lag= 2.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 2.54 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 10.2 min

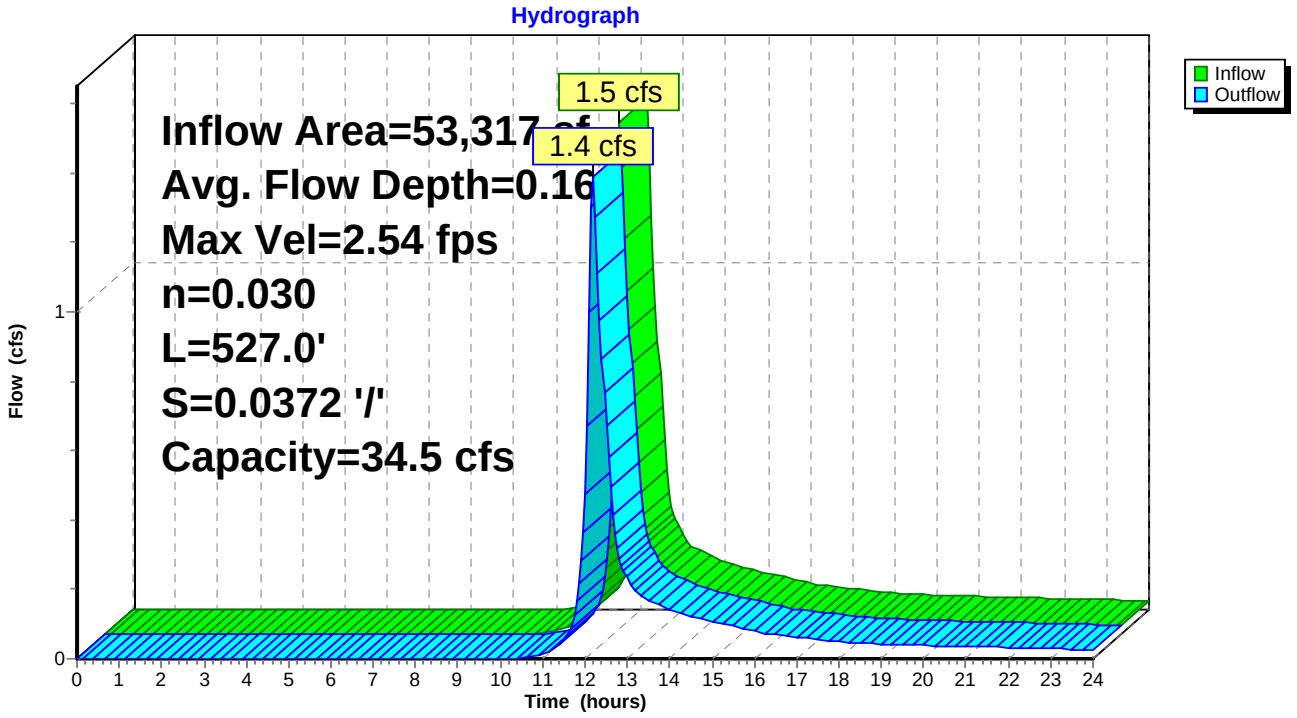
Peak Storage= 288 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 0.90' Flow Area= 5.1 sf, Capacity= 34.5 cfs

3.00' x 0.90' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 3.0 '/' Top Width= 8.40'
Length= 527.0' Slope= 0.0372 '/'
Inlet Invert= 276.70', Outlet Invert= 257.10'



‡

Reach 21R: Riprap Swale

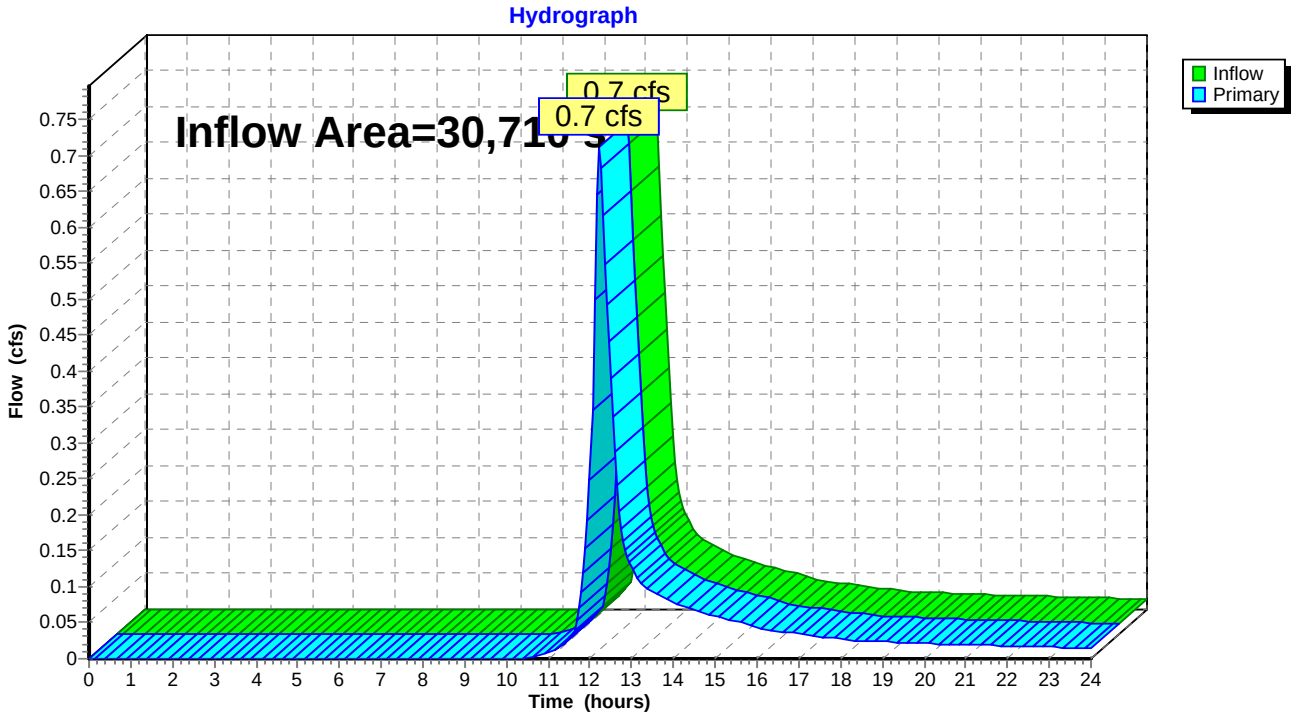


Summary for Link 7L: Wetlands NW

Inflow Area = 30,710 sf, 0.00% Impervious, Inflow Depth > 1.17" for 2-Year event
Inflow = 0.7 cfs @ 12.21 hrs, Volume= 2,988 cf
Primary = 0.7 cfs @ 12.21 hrs, Volume= 2,988 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 7L: Wetlands NW

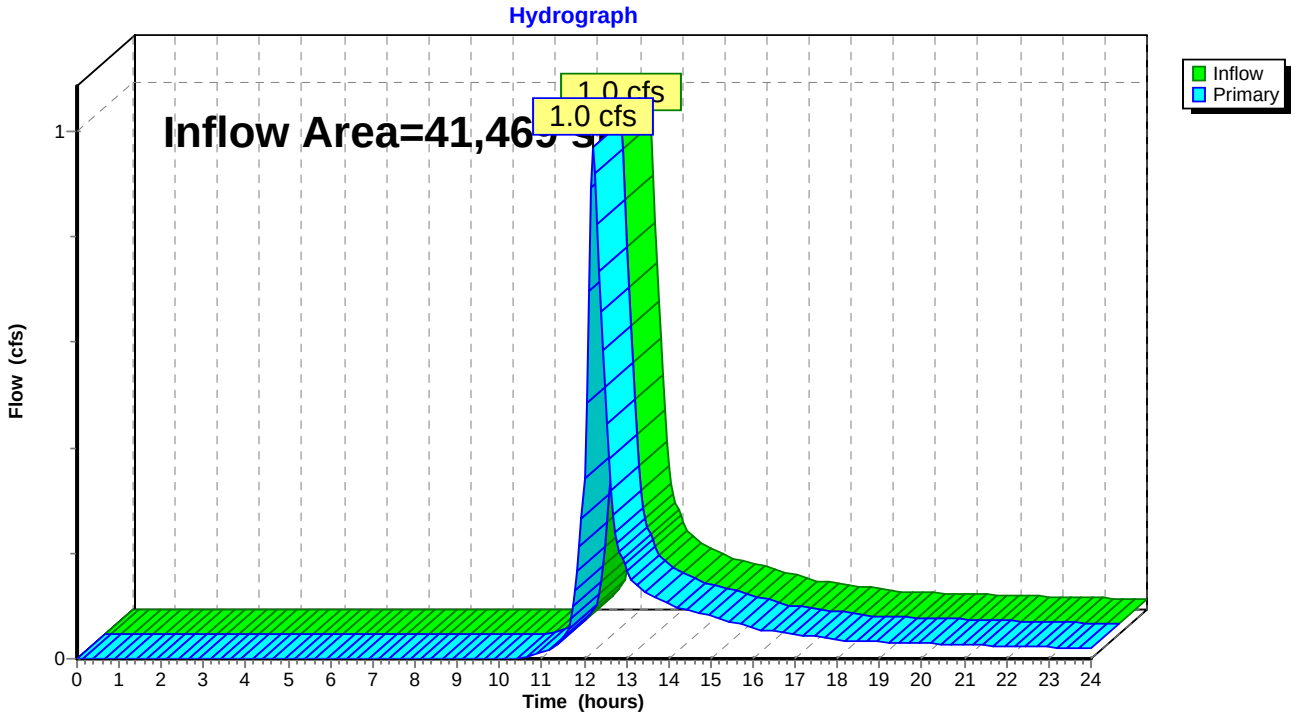


Summary for Link 8L: Depression S

Inflow Area = 41,469 sf, 0.00% Impervious, Inflow Depth > 1.17" for 2-Year event
Inflow = 1.0 cfs @ 12.21 hrs, Volume= 4,035 cf
Primary = 1.0 cfs @ 12.21 hrs, Volume= 4,035 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 8L: Depression S

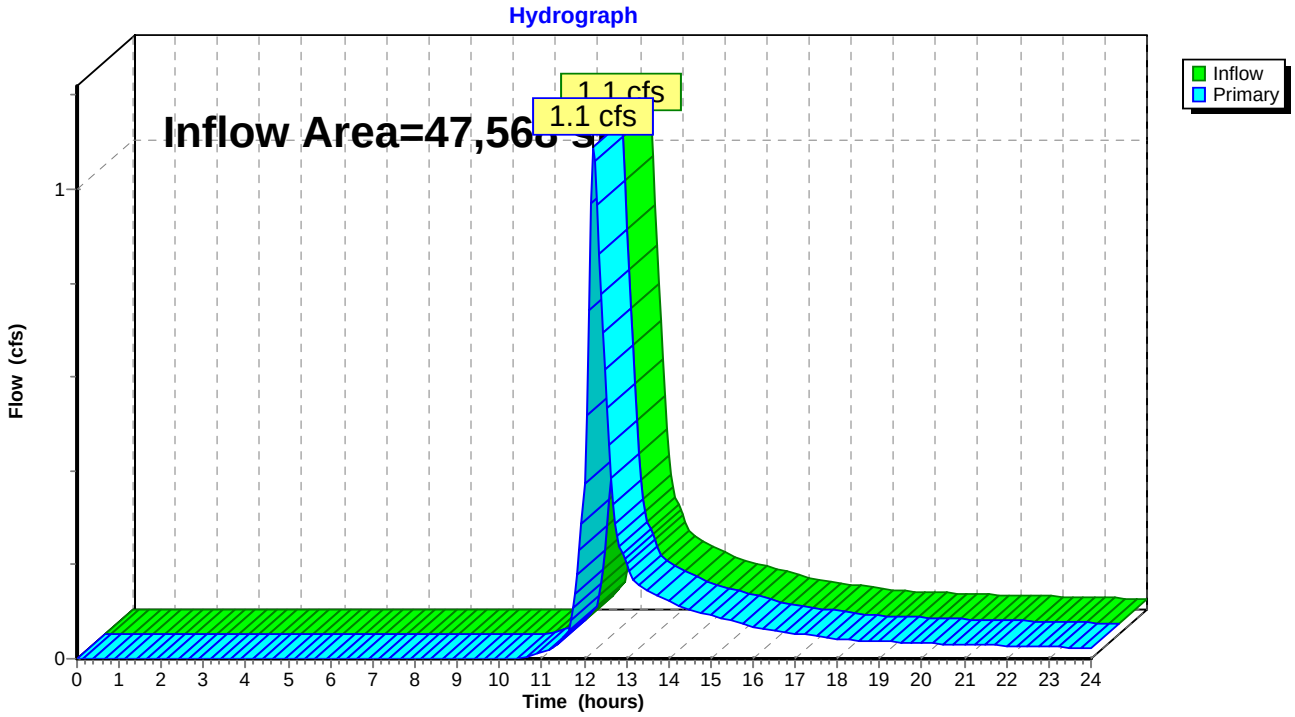


Summary for Link 9L: Wetlands NE

Inflow Area = 47,568 sf, 0.00% Impervious, Inflow Depth > 1.17" for 2-Year event
Inflow = 1.1 cfs @ 12.22 hrs, Volume= 4,628 cf
Primary = 1.1 cfs @ 12.22 hrs, Volume= 4,628 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 9L: Wetlands NE

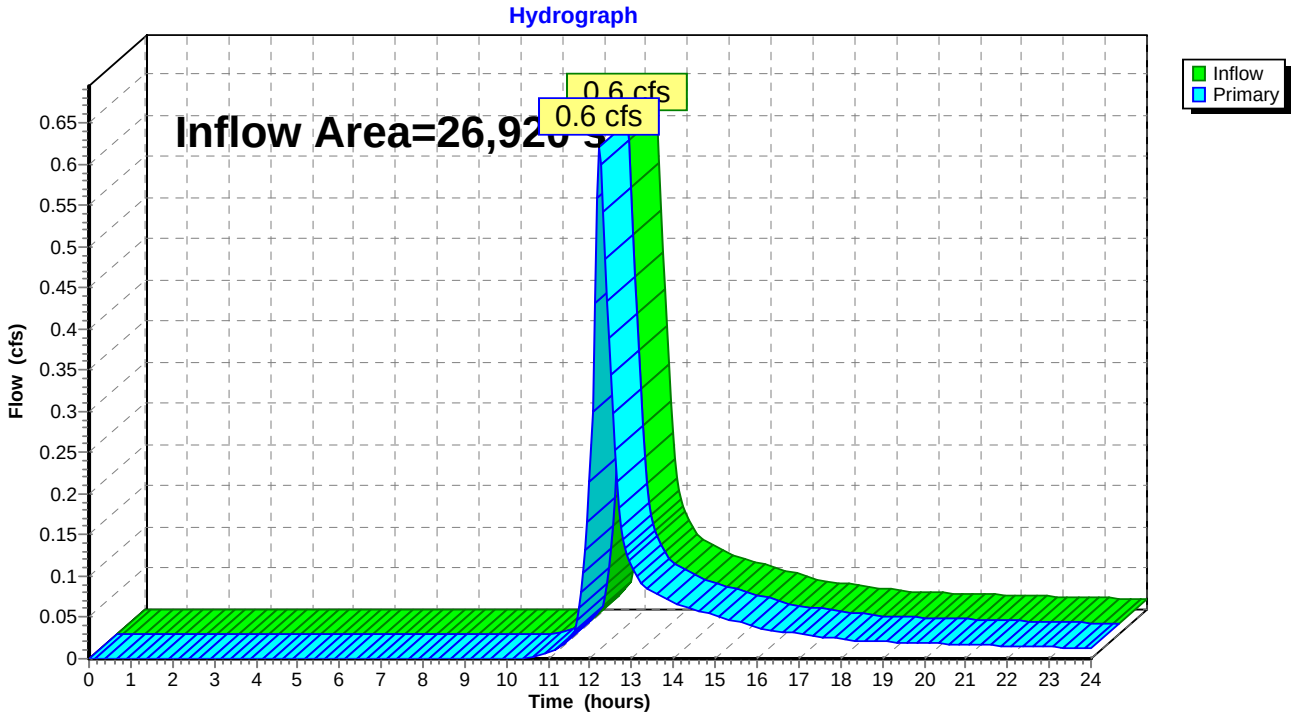


Summary for Link 10L: Wetlands N

Inflow Area = 26,920 sf, 0.00% Impervious, Inflow Depth > 1.17" for 2-Year event
Inflow = 0.6 cfs @ 12.21 hrs, Volume= 2,619 cf
Primary = 0.6 cfs @ 12.21 hrs, Volume= 2,619 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 10L: Wetlands N

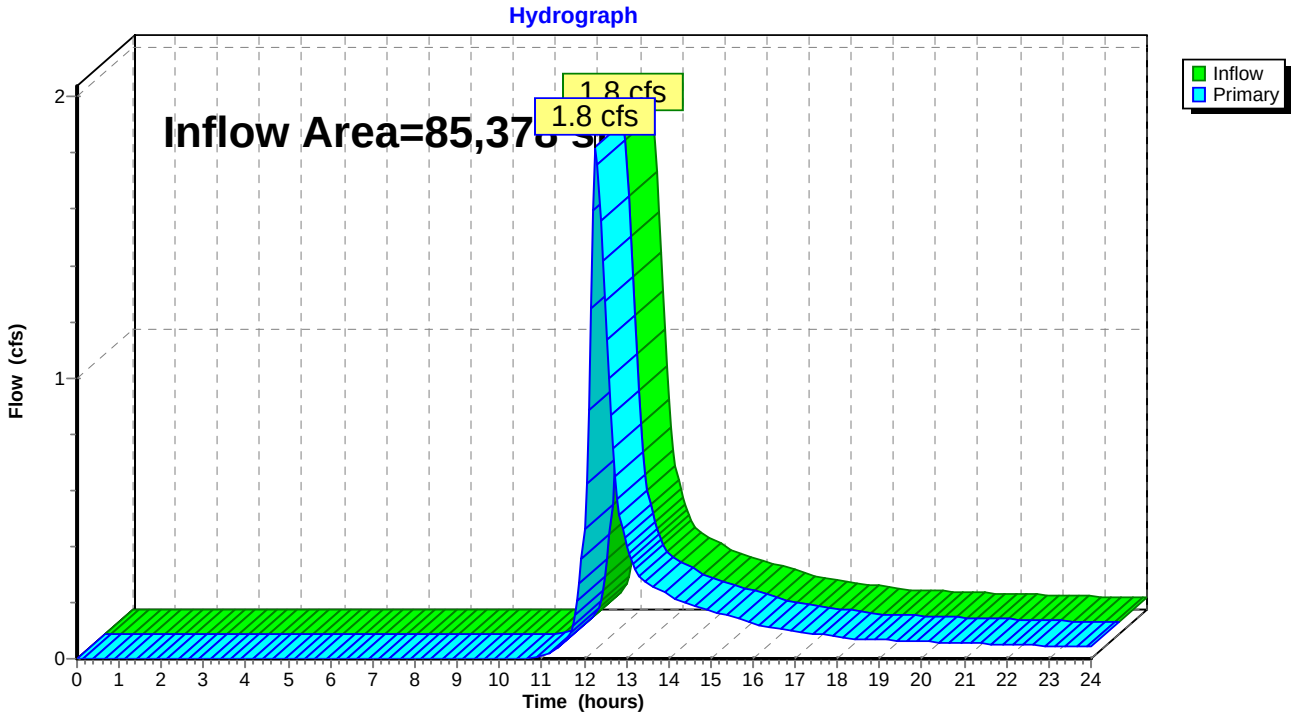


Summary for Link 11L: Collection Swale W

Inflow Area = 85,378 sf, 0.00% Impervious, Inflow Depth > 1.16" for 2-Year event
Inflow = 1.8 cfs @ 12.28 hrs, Volume= 8,265 cf
Primary = 1.8 cfs @ 12.28 hrs, Volume= 8,265 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 11L: Collection Swale W

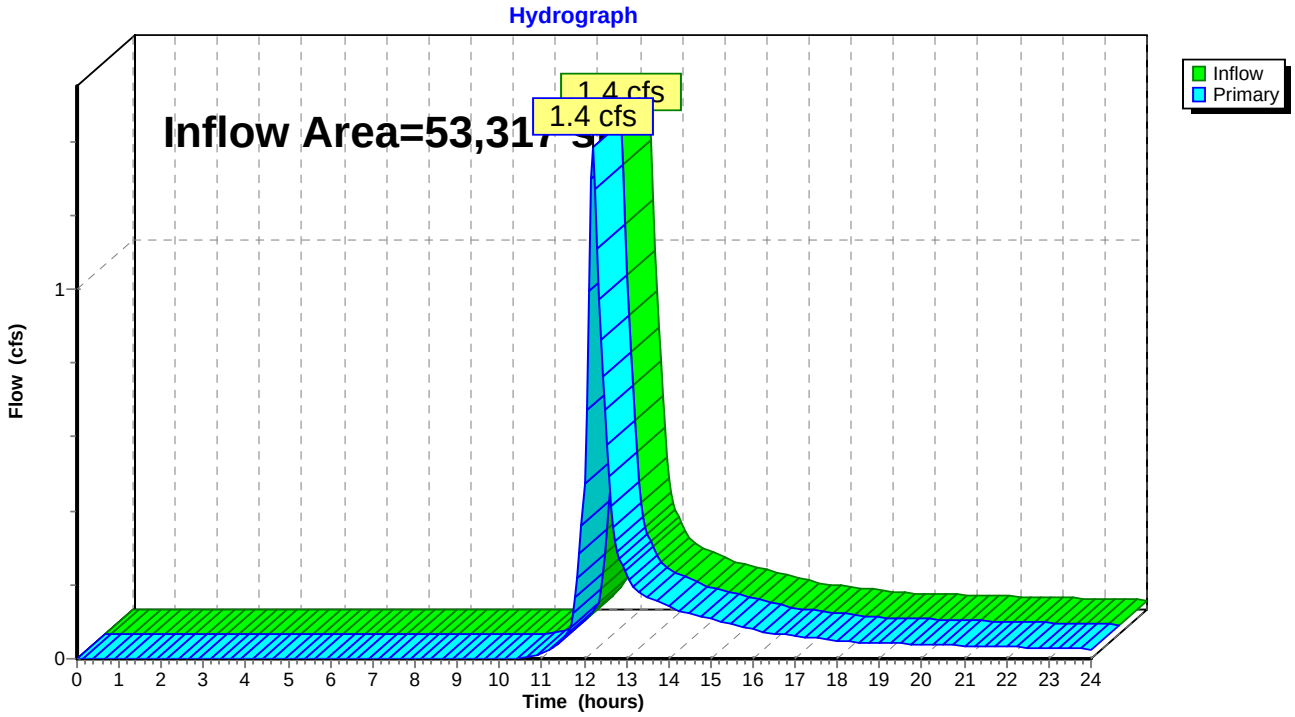


Summary for Link 12L: Collection Swale W

Inflow Area = 53,317 sf, 0.00% Impervious, Inflow Depth > 1.22" for 2-Year event
Inflow = 1.4 cfs @ 12.20 hrs, Volume= 5,437 cf
Primary = 1.4 cfs @ 12.20 hrs, Volume= 5,437 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 12L: Collection Swale W

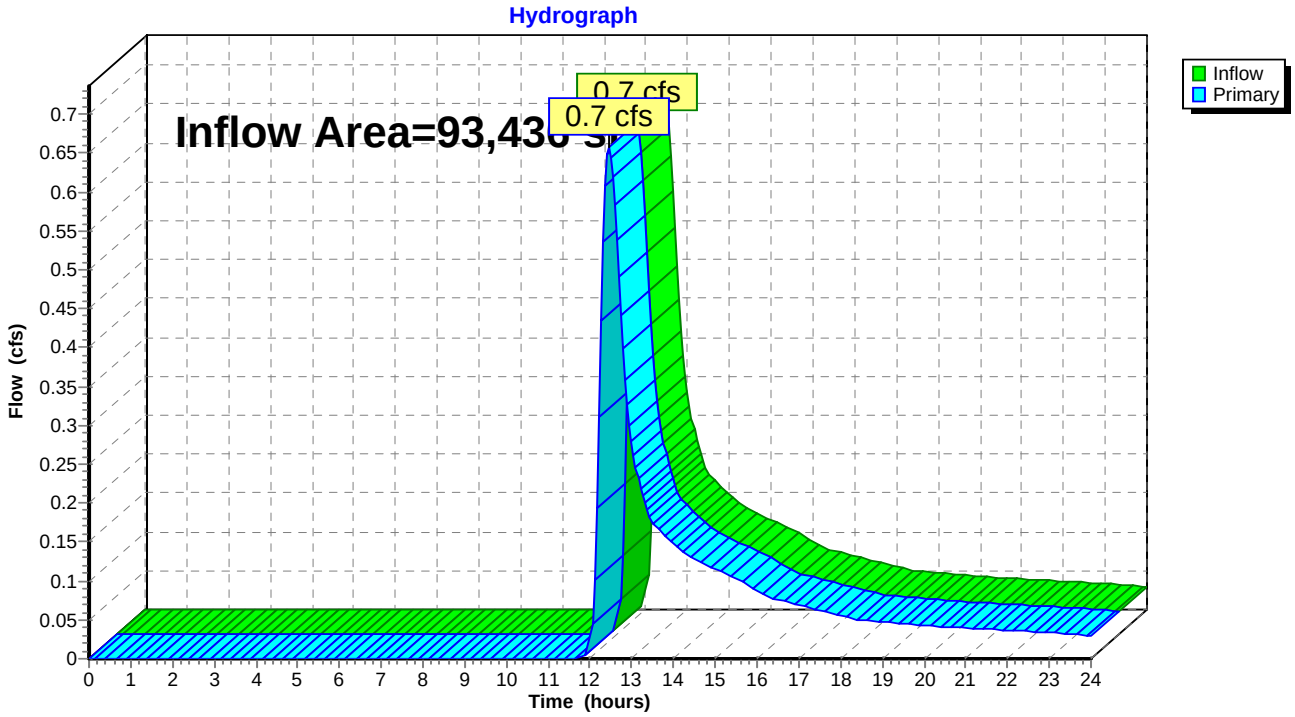


Summary for Link 15L: Wetland W

Inflow Area = 93,436 sf, 0.00% Impervious, Inflow Depth > 0.56" for 2-Year event
Inflow = 0.7 cfs @ 12.45 hrs, Volume= 4,395 cf
Primary = 0.7 cfs @ 12.45 hrs, Volume= 4,395 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 15L: Wetland W

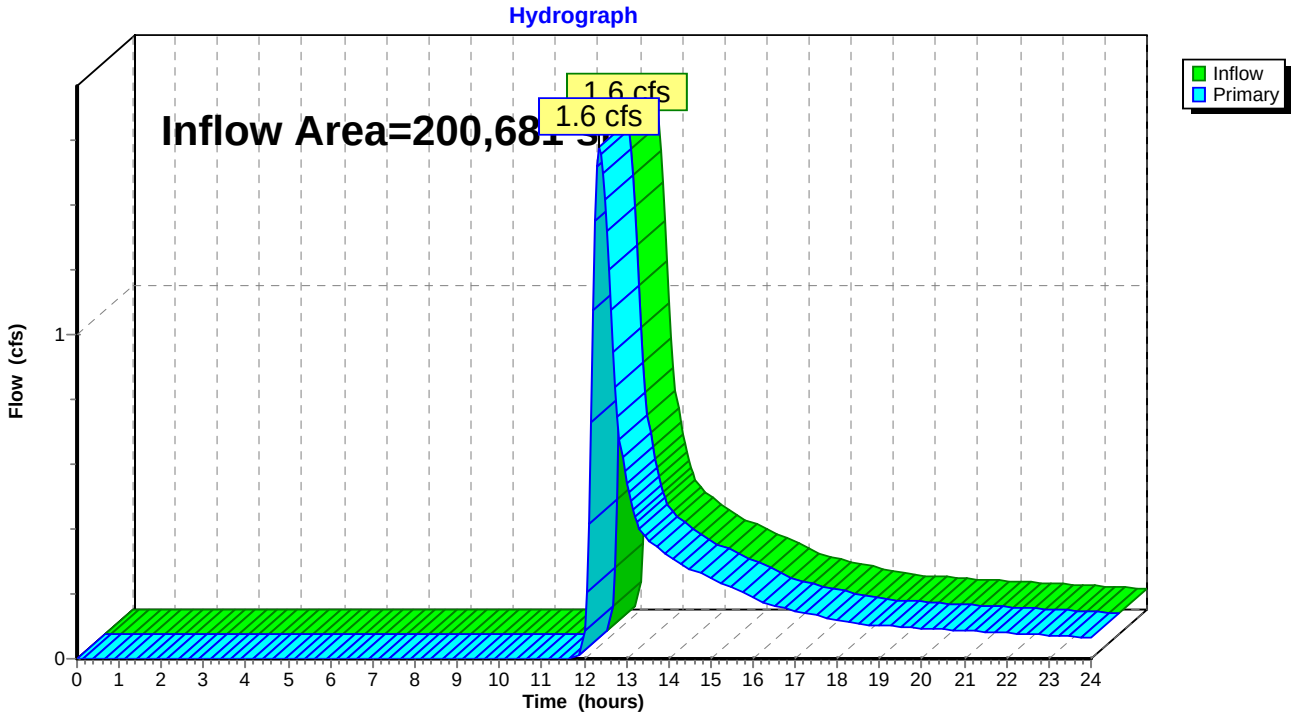


Summary for Link 16L: Wetland E

Inflow Area = 200,681 sf, 0.00% Impervious, Inflow Depth > 0.58" for 2-Year event
Inflow = 1.6 cfs @ 12.36 hrs, Volume= 9,719 cf
Primary = 1.6 cfs @ 12.36 hrs, Volume= 9,719 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 16L: Wetland E



Time span=0.00-24.00 hrs, dt=0.050 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Bulky Waste Landfill SW Runoff Area=0.952 ac 0.00% Impervious Runoff Depth>1.81"
Flow Length=239' Tc=13.7 min CN=74 Runoff=1.6 cfs 6,271 cf

Subcatchment 2S: Bulky Waste Landfill NW Runoff Area=0.705 ac 0.00% Impervious Runoff Depth>1.81"
Flow Length=179' Tc=14.1 min CN=74 Runoff=1.1 cfs 4,643 cf

Subcatchment 3S: Bulky Waste Landfill E Runoff Area=1.092 ac 0.00% Impervious Runoff Depth>1.81"
Flow Length=204' Tc=14.6 min CN=74 Runoff=1.7 cfs 7,191 cf

Subcatchment 4S: Landfill N Runoff Area=0.618 ac 0.00% Impervious Runoff Depth>1.81"
Flow Length=222' Tc=14.3 min CN=74 Runoff=1.0 cfs 4,070 cf

Subcatchment 5S: Landfill W Runoff Area=1.960 ac 0.00% Impervious Runoff Depth>1.81"
Flow Length=752' Tc=15.2 min CN=74 Runoff=3.1 cfs 12,906 cf

Subcatchment 6S: Landfill E Runoff Area=1.224 ac 0.00% Impervious Runoff Depth>1.89"
Flow Length=459' Tc=10.0 min CN=75 Runoff=2.3 cfs 8,403 cf

Subcatchment 7S: Green Field W Runoff Area=2.145 ac 0.00% Impervious Runoff Depth>1.02"
Flow Length=472' Tc=24.7 min CN=62 Runoff=1.4 cfs 7,938 cf

Subcatchment 8S: Green Field E Runoff Area=2.890 ac 0.00% Impervious Runoff Depth>1.02"
Flow Length=305' Tc=20.6 min CN=62 Runoff=2.0 cfs 10,709 cf

Subcatchment 9S: Greenfield 2 Runoff Area=1.717 ac 0.00% Impervious Runoff Depth>1.08"
Flow Length=247' Tc=19.4 min CN=63 Runoff=1.3 cfs 6,729 cf

Reach 19R: Riprap Swale Avg. Flow Depth=0.23' Max Vel=3.03 fps Inflow=3.1 cfs 12,906 cf
n=0.030 L=657.0' S=0.0383 '/' Capacity=8.6 cfs Outflow=3.0 cfs 12,857 cf

Reach 21R: Riprap Swale Avg. Flow Depth=0.21' Max Vel=2.96 fps Inflow=2.3 cfs 8,403 cf
n=0.030 L=527.0' S=0.0372 '/' Capacity=34.5 cfs Outflow=2.2 cfs 8,374 cf

Link 7L: Wetlands NW Inflow=1.1 cfs 4,643 cf
Primary=1.1 cfs 4,643 cf

Link 8L: Depression S Inflow=1.6 cfs 6,271 cf
Primary=1.6 cfs 6,271 cf

Link 9L: Wetlands NE Inflow=1.7 cfs 7,191 cf
Primary=1.7 cfs 7,191 cf

Link 10L: Wetlands N Inflow=1.0 cfs 4,070 cf
Primary=1.0 cfs 4,070 cf

Link 11L: Collection Swale W Inflow=3.0 cfs 12,857 cf
Primary=3.0 cfs 12,857 cf

Link 12L: Collection Swale W Inflow=2.2 cfs 8,374 cf
Primary=2.2 cfs 8,374 cf

Link 15L: Wetland W Inflow=1.4 cfs 7,938 cf
Primary=1.4 cfs 7,938 cf

Link 16L: Wetland E Inflow=3.3 cfs 17,438 cf
Primary=3.3 cfs 17,438 cf

Total Runoff Area = 579,479 sf Runoff Volume = 68,860 cf Average Runoff Depth = 1.43"
100.00% Pervious = 579,479 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1S: Bulky Waste Landfill SW

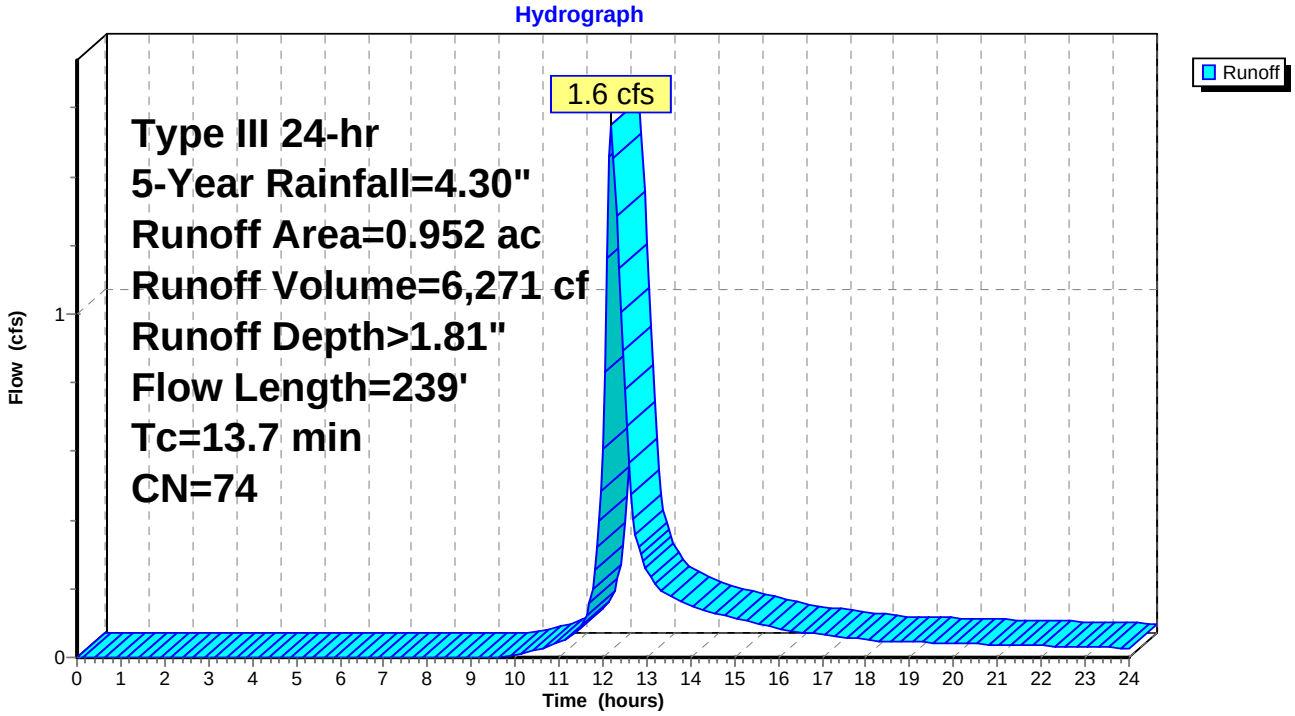
Runoff = 1.6 cfs @ 12.20 hrs, Volume= 6,271 cf, Depth> 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

Area (ac)	CN	Description
0.952	74	>75% Grass cover, Good, HSG C
0.952		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0251	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.5	66	0.1137	2.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	46	0.1957	3.10		**Shallow Concentrated Flow, Lanfill Cap** Short Grass Pasture Kv= 7.0 fps
0.4	27	0.0050	1.14		**Shallow Concentrated Flow, Access Drive** Unpaved Kv= 16.1 fps
13.7	239	Total			

Subcatchment 1S: Bulky Waste Landfill SW



Summary for Subcatchment 2S: Bulky Waste Landfill NW

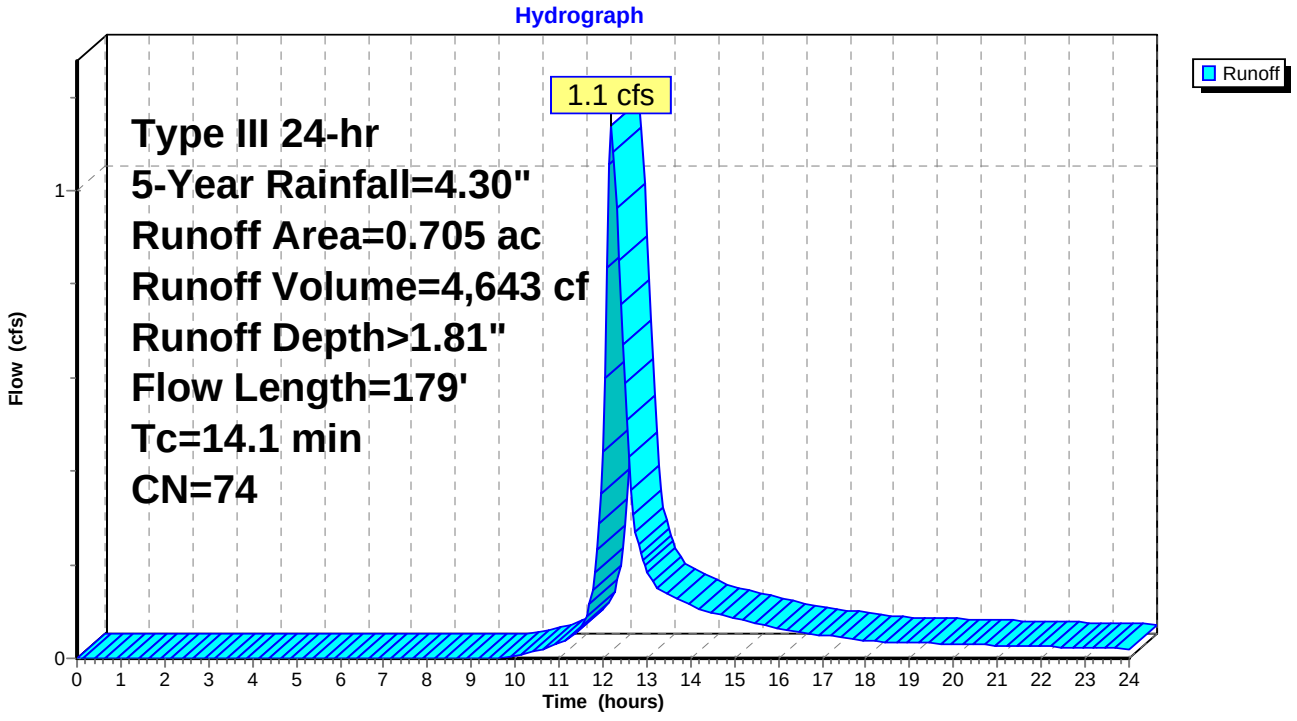
Runoff = 1.1 cfs @ 12.20 hrs, Volume= 4,643 cf, Depth> 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

Area (ac)	CN	Description
0.705	74	>75% Grass cover, Good, HSG C
0.705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.6	79	0.0886	2.08		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.1	179	Total			

Subcatchment 2S: Bulky Waste Landfill NW



Summary for Subcatchment 3S: Bulky Waste Landfill E

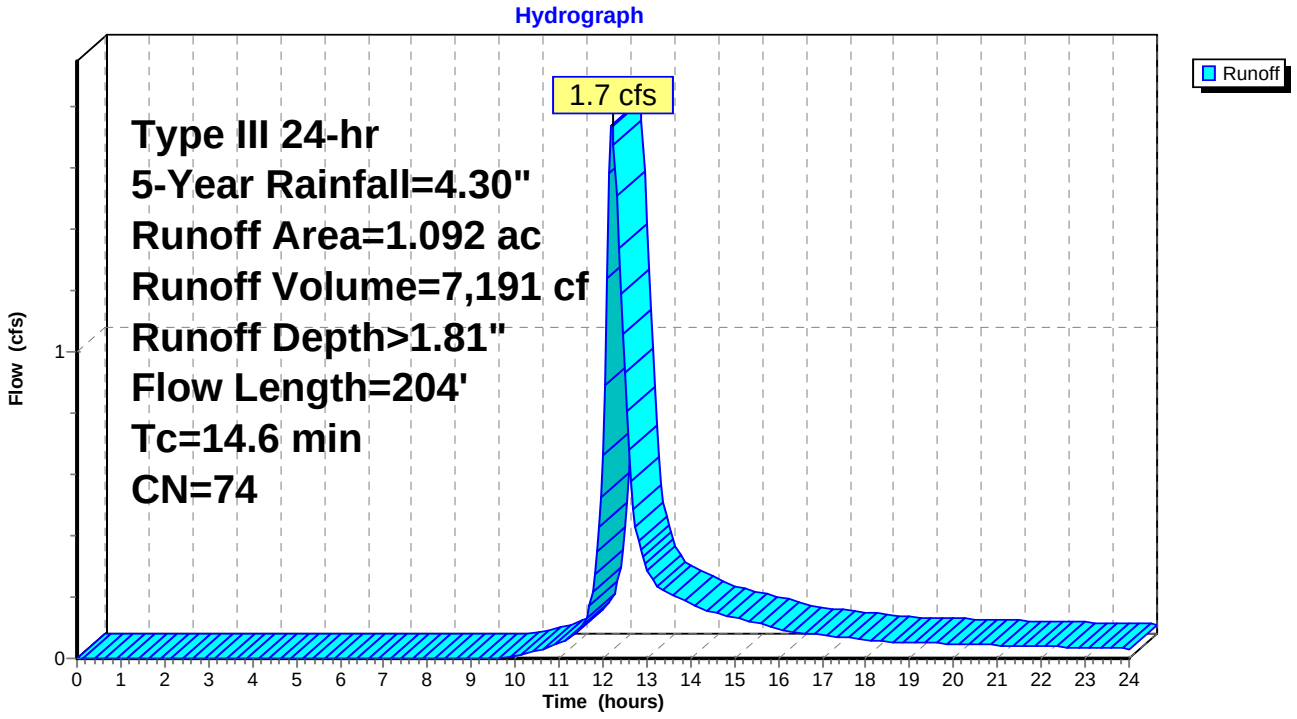
Runoff = 1.7 cfs @ 12.21 hrs, Volume= 7,191 cf, Depth> 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

Area (ac)	CN	Description
1.092	74	>75% Grass cover, Good, HSG C
1.092		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.1	24	0.1667	2.86		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.6	204	Total			

Subcatchment 3S: Bulky Waste Landfill E



Summary for Subcatchment 4S: Landfill N

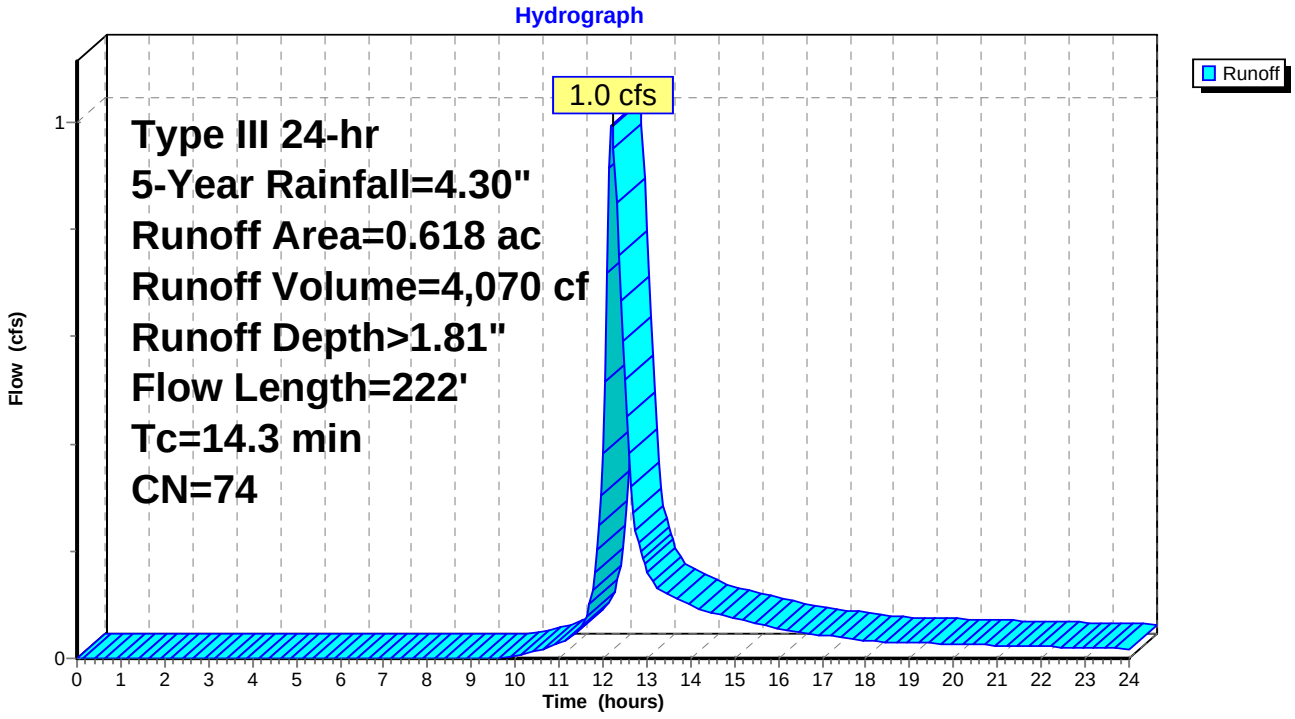
Runoff = 1.0 cfs @ 12.21 hrs, Volume= 4,070 cf, Depth> 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

Area (ac)	CN	Description
0.618	74	>75% Grass cover, Good, HSG C
0.618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0230	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	81	0.0371	1.35		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	41	0.1707	2.89		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.3	222	Total			

Subcatchment 4S: Landfill N



Summary for Subcatchment 5S: Landfill W

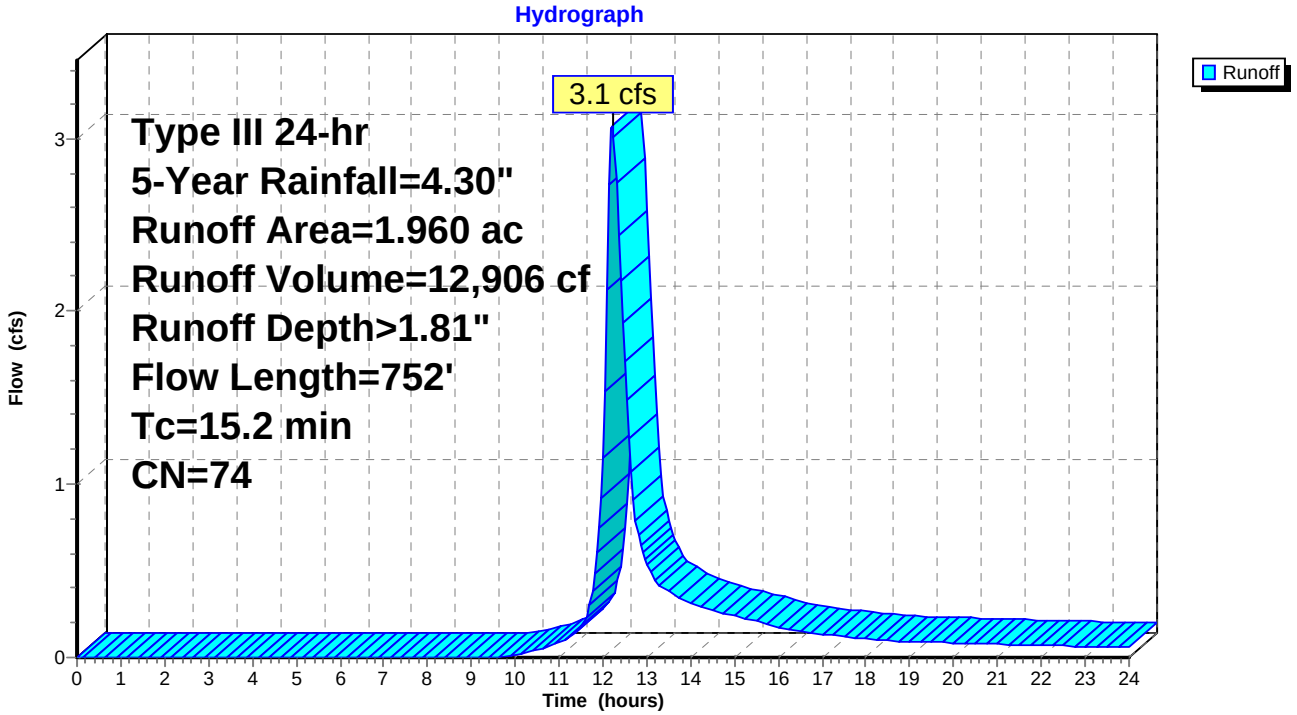
Runoff = 3.1 cfs @ 12.22 hrs, Volume= 12,906 cf, Depth> 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

Area (ac)	CN	Description
1.960	74	>75% Grass cover, Good, HSG C
1.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0220	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.3	37	0.0811	1.99		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.3	58	0.1897	3.05		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
1.3	520	0.0200	6.71	50.33	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
0.0	37	0.2160	22.05	165.39	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
15.2	752	Total			

Subcatchment 5S: Landfill W



Summary for Subcatchment 6S: Landfill E

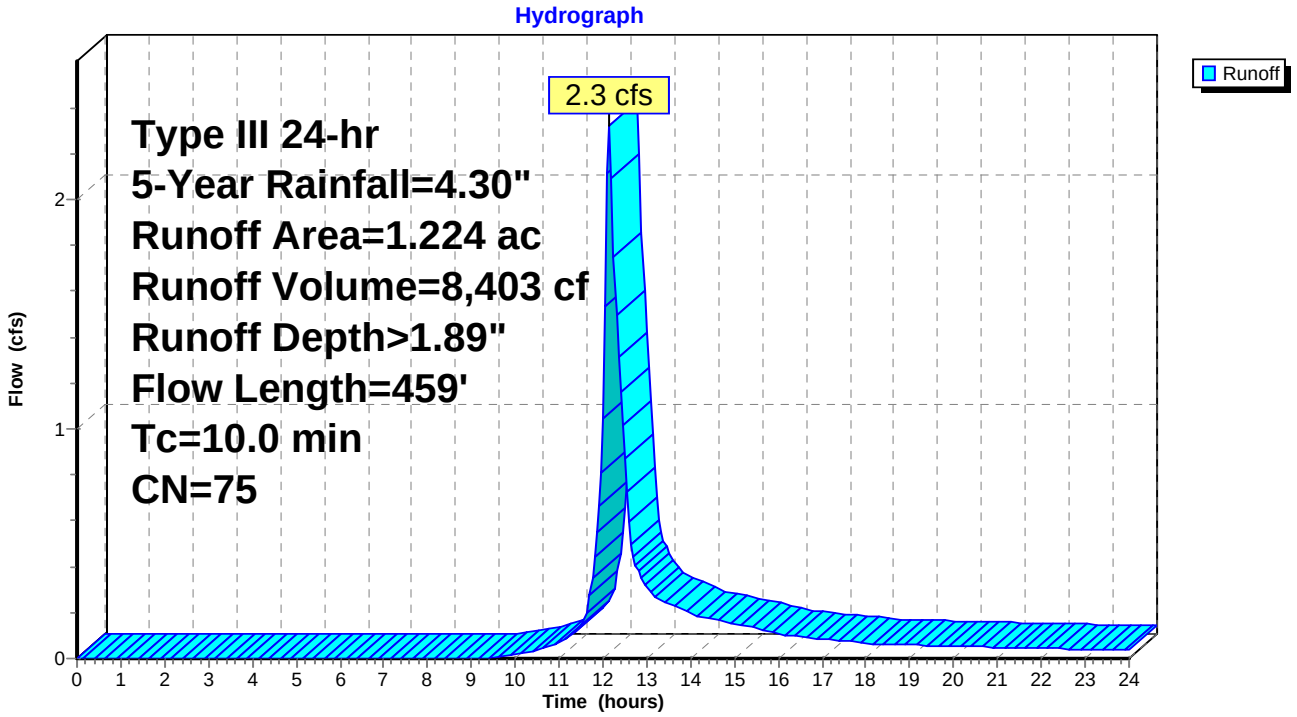
Runoff = 2.3 cfs @ 12.15 hrs, Volume= 8,403 cf, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

Area (ac)	CN	Description
1.134	74	>75% Grass cover, Good, HSG C
0.090	89	Gravel roads, HSG C
1.224	75	Weighted Average
1.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	40	0.0543	0.15		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	60	0.0117	1.03		**Sheet Flow, Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.5	86	0.0384	3.15		**Shallow Concentrated Flow, Gravel** Unpaved Kv= 16.1 fps
0.7	76	0.0658	1.80		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	49	0.2245	3.32		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	148	0.1081	15.60	117.00	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
7.1	459	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: Landfill E



Summary for Subcatchment 7S: Green Field W

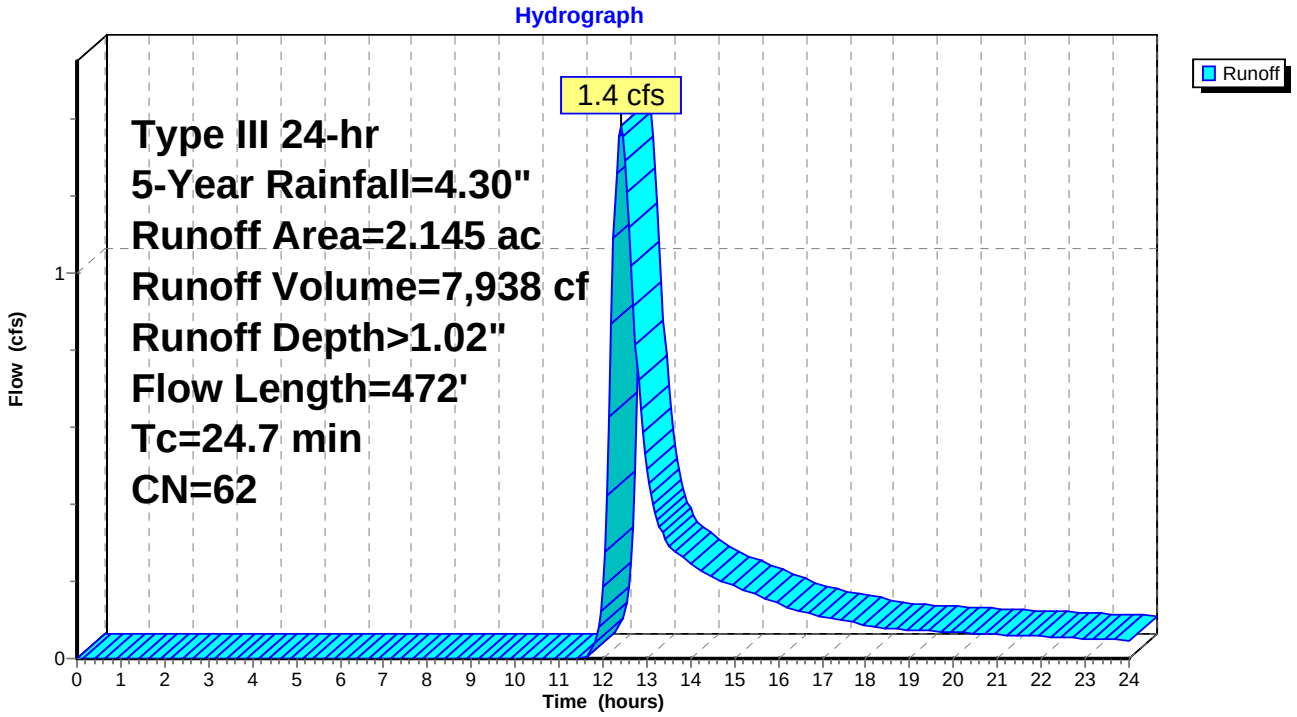
Runoff = 1.4 cfs @ 12.40 hrs, Volume= 7,938 cf, Depth> 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

Area (ac)	CN	Description
0.022	74	>75% Grass cover, Good, HSG C
0.089	80	>75% Grass cover, Good, HSG D
0.282	61	>75% Grass cover, Good, HSG B
1.752	61	>75% Grass cover, Good, HSG B
2.145	62	Weighted Average
2.145		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	23	0.0217	1.03		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
4.8	160	0.0063	0.56		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.6	51	0.0392	1.39		**Shallow Concentrated Flow, field** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.7	50	0.0300	1.21		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
24.7	472	Total			

Subcatchment 7S: Green Field W



Summary for Subcatchment 8S: Green Field E

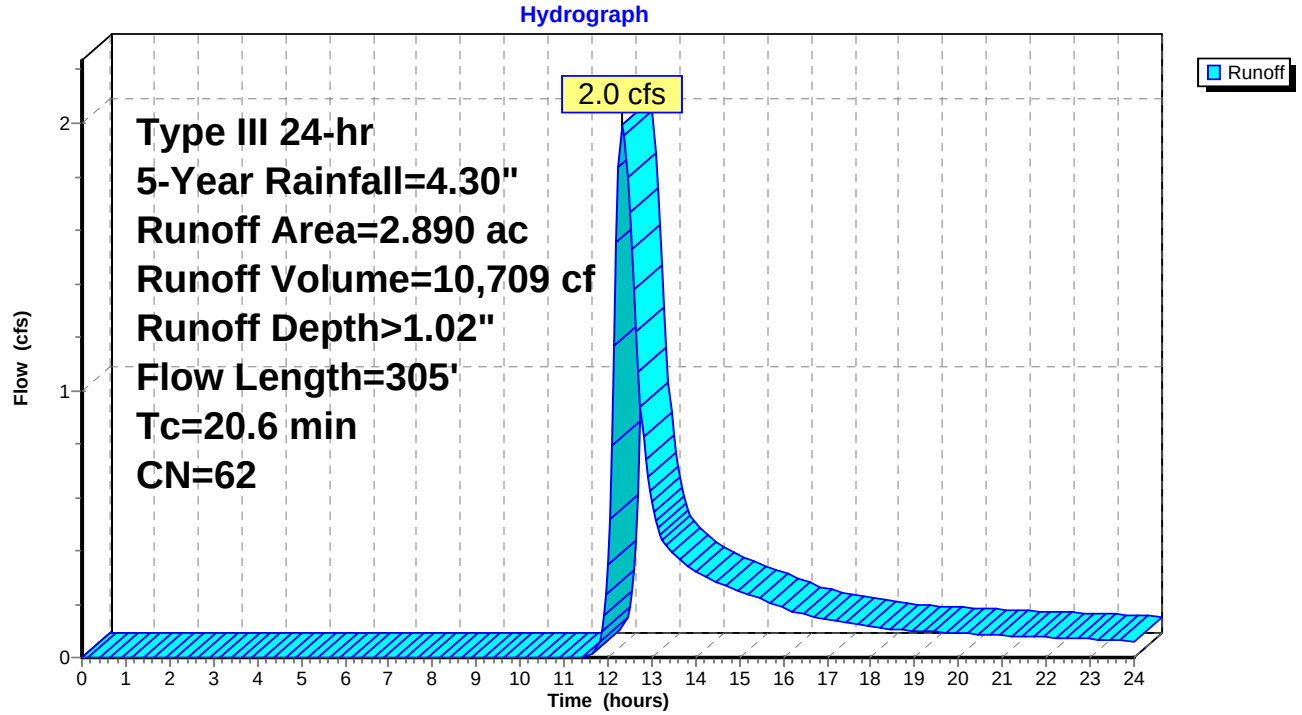
Runoff = 2.0 cfs @ 12.33 hrs, Volume= 10,709 cf, Depth> 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

Area (ac)	CN	Description
2.685	61	>75% Grass cover, Good, HSG B
0.072	80	>75% Grass cover, Good, HSG D
0.033	80	>75% Grass cover, Good, HSG D
0.100	61	>75% Grass cover, Good, HSG B
2.890	62	Weighted Average
2.890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	24	0.0208	1.01		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
2.6	106	0.0094	0.68		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.8	75	0.0467	1.51		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
20.6	305	Total			

Subcatchment 8S: Green Field E



Summary for Subcatchment 9S: Greenfield 2

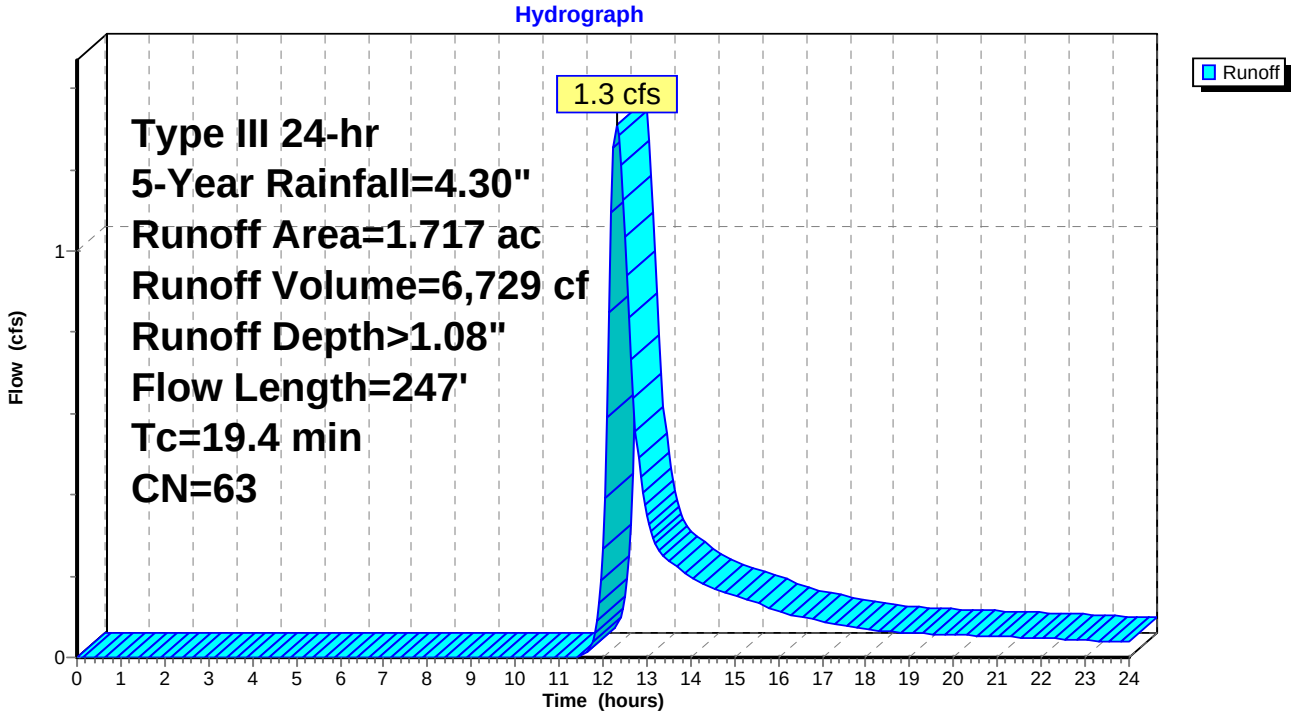
Runoff = 1.3 cfs @ 12.31 hrs, Volume= 6,729 cf, Depth> 1.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

Area (ac)	CN	Description
0.091	77	Woods, Good, HSG D
0.151	55	Woods, Good, HSG B
1.288	61	>75% Grass cover, Good, HSG B
0.187	80	>75% Grass cover, Good, HSG D
1.717	63	Weighted Average
1.717		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0128	0.10		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.40"
2.9	147	0.0148	0.85		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
19.4	247	Total			

Subcatchment 9S: Greenfield 2



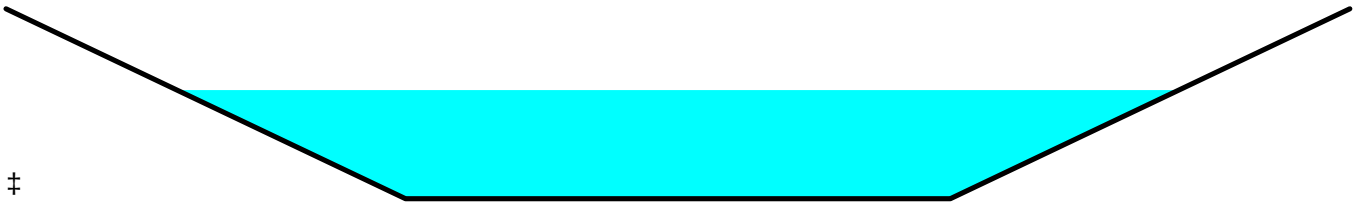
Summary for Reach 19R: Riprap Swale

Inflow Area = 85,378 sf, 0.00% Impervious, Inflow Depth > 1.81" for 5-Year event
Inflow = 3.1 cfs @ 12.22 hrs, Volume= 12,906 cf
Outflow = 3.0 cfs @ 12.27 hrs, Volume= 12,857 cf, Atten= 4%, Lag= 2.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.03 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 1.11 fps, Avg. Travel Time= 9.8 min

Peak Storage= 641 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 0.40' Flow Area= 2.1 sf, Capacity= 8.6 cfs

3.00' x 0.40' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 5.5 '/' Top Width= 7.40'
Length= 657.0' Slope= 0.0383 '/'
Inlet Invert= 274.52', Outlet Invert= 249.36'



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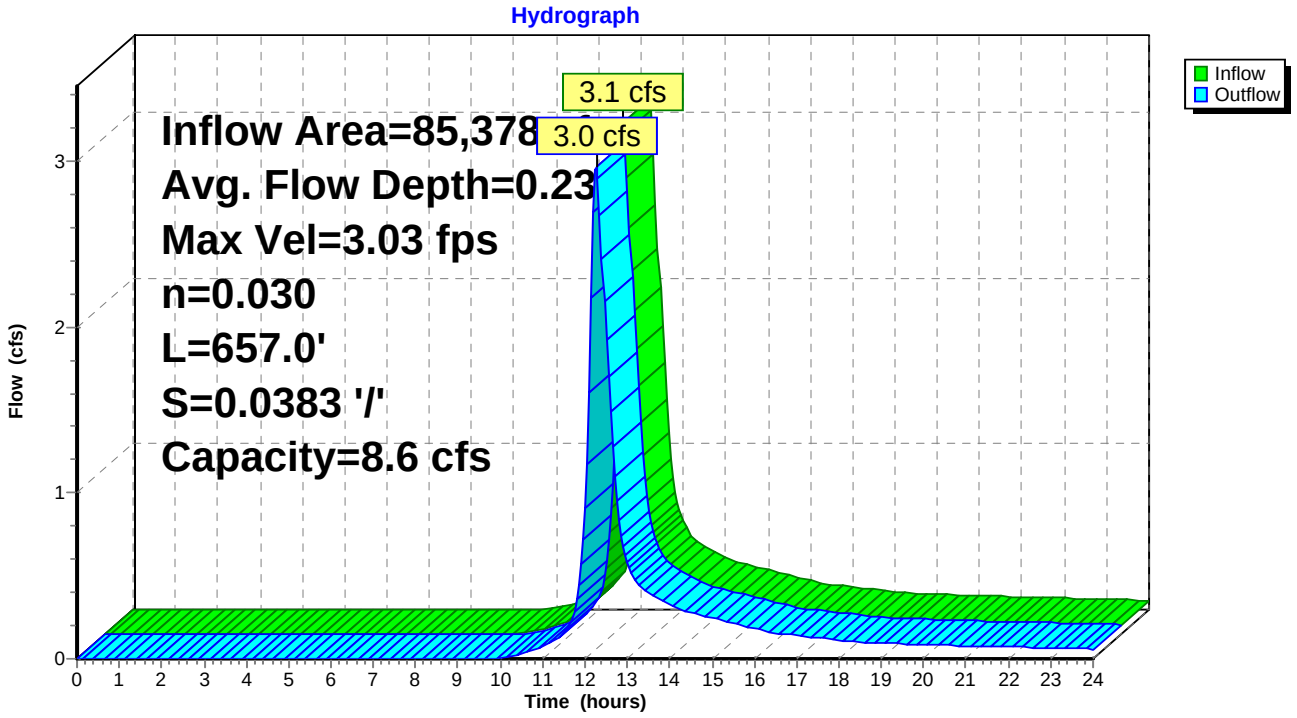
Reach 19R: Riprap Swale



Summary for Reach 21R: Riprap Swale

Inflow Area = 53,317 sf, 0.00% Impervious, Inflow Depth > 1.89" for 5-Year event
Inflow = 2.3 cfs @ 12.15 hrs, Volume= 8,403 cf
Outflow = 2.2 cfs @ 12.19 hrs, Volume= 8,374 cf, Atten= 5%, Lag= 2.2 min

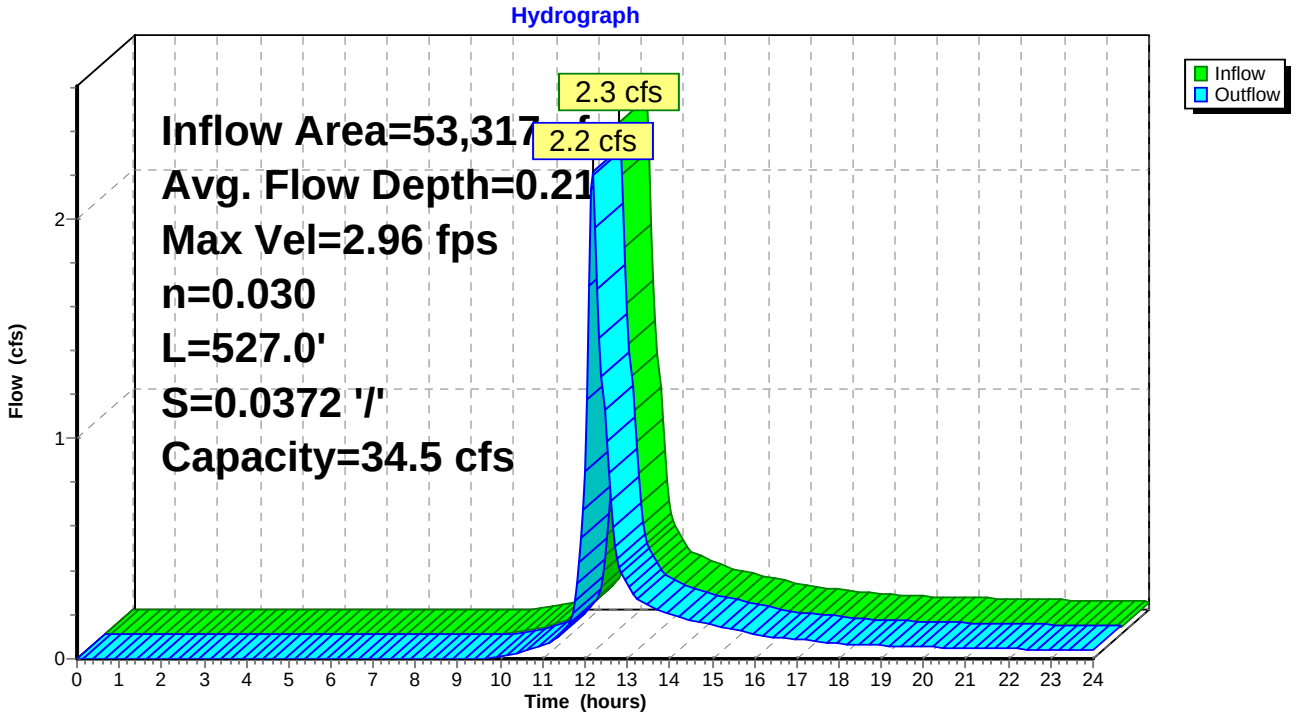
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 2.96 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 9.0 min

Peak Storage= 392 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 0.90' Flow Area= 5.1 sf, Capacity= 34.5 cfs

3.00' x 0.90' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 3.0 '/' Top Width= 8.40'
Length= 527.0' Slope= 0.0372 '/'
Inlet Invert= 276.70', Outlet Invert= 257.10'



‡

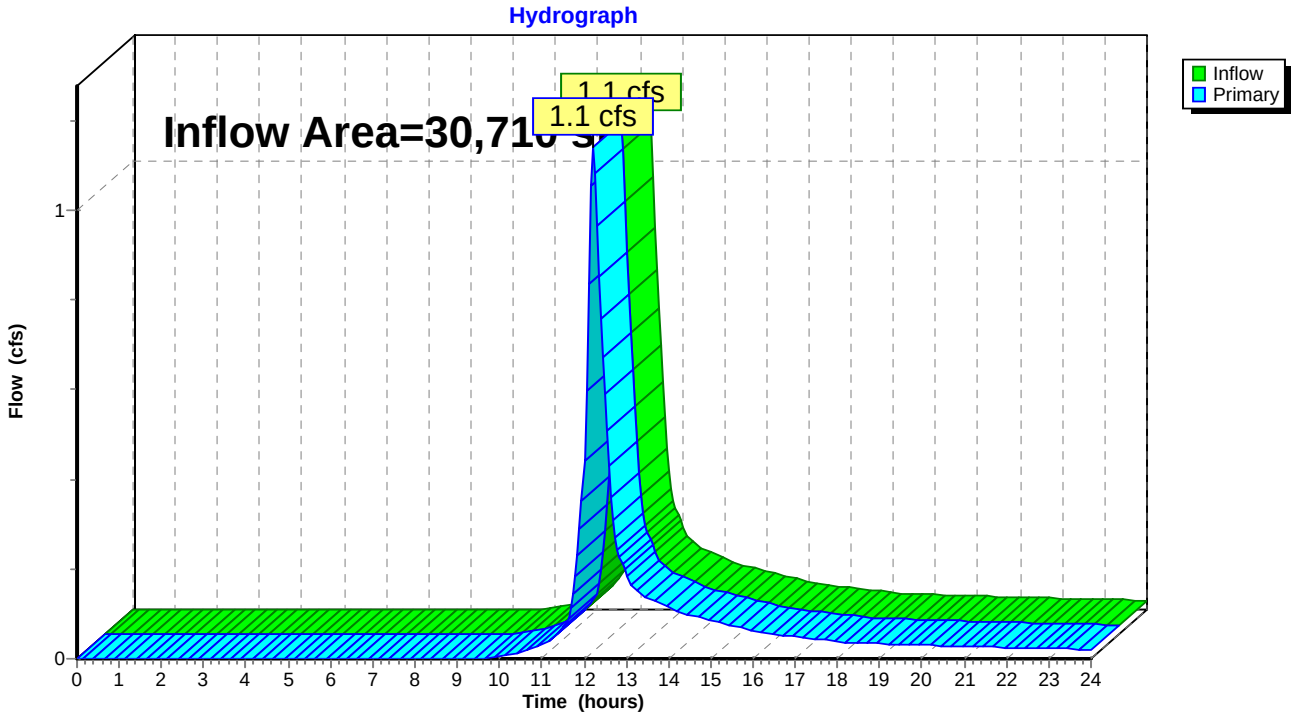


Summary for Link 7L: Wetlands NW

Inflow Area = 30,710 sf, 0.00% Impervious, Inflow Depth > 1.81" for 5-Year event
Inflow = 1.1 cfs @ 12.20 hrs, Volume= 4,643 cf
Primary = 1.1 cfs @ 12.20 hrs, Volume= 4,643 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 7L: Wetlands NW

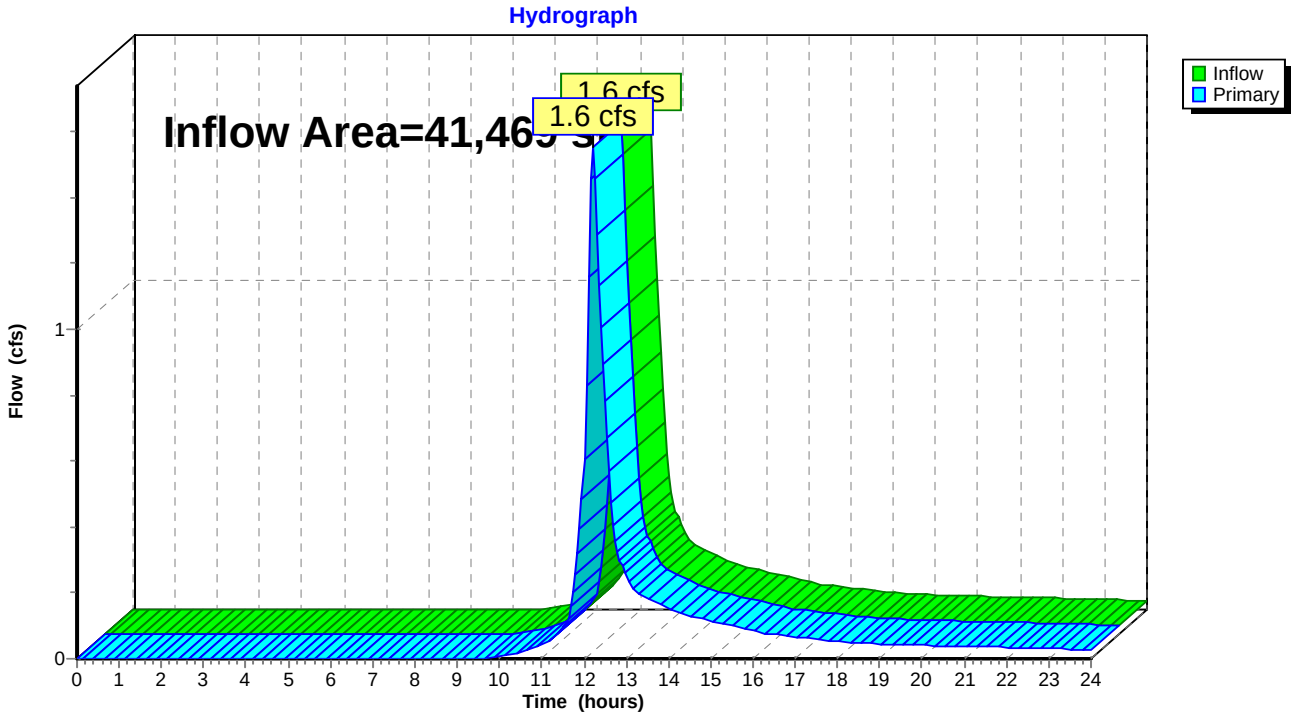


Summary for Link 8L: Depression S

Inflow Area = 41,469 sf, 0.00% Impervious, Inflow Depth > 1.81" for 5-Year event
Inflow = 1.6 cfs @ 12.20 hrs, Volume= 6,271 cf
Primary = 1.6 cfs @ 12.20 hrs, Volume= 6,271 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 8L: Depression S

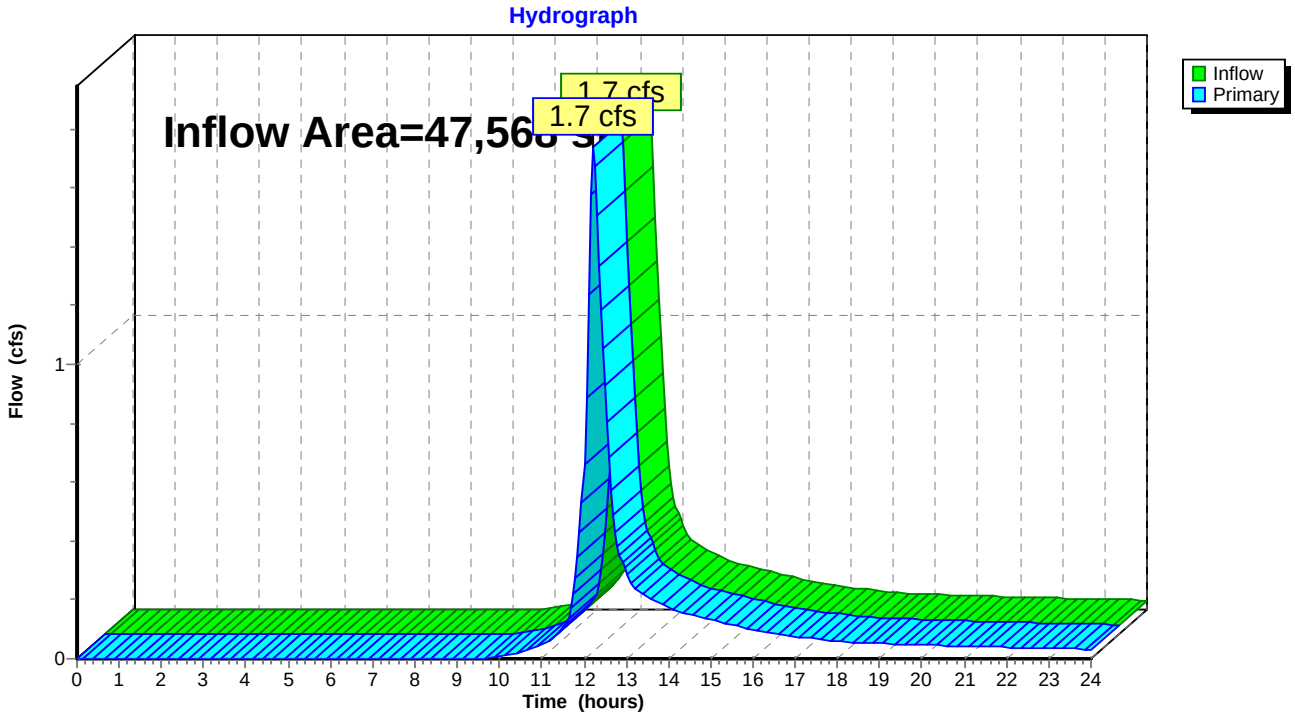


Summary for Link 9L: Wetlands NE

Inflow Area = 47,568 sf, 0.00% Impervious, Inflow Depth > 1.81" for 5-Year event
Inflow = 1.7 cfs @ 12.21 hrs, Volume= 7,191 cf
Primary = 1.7 cfs @ 12.21 hrs, Volume= 7,191 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 9L: Wetlands NE

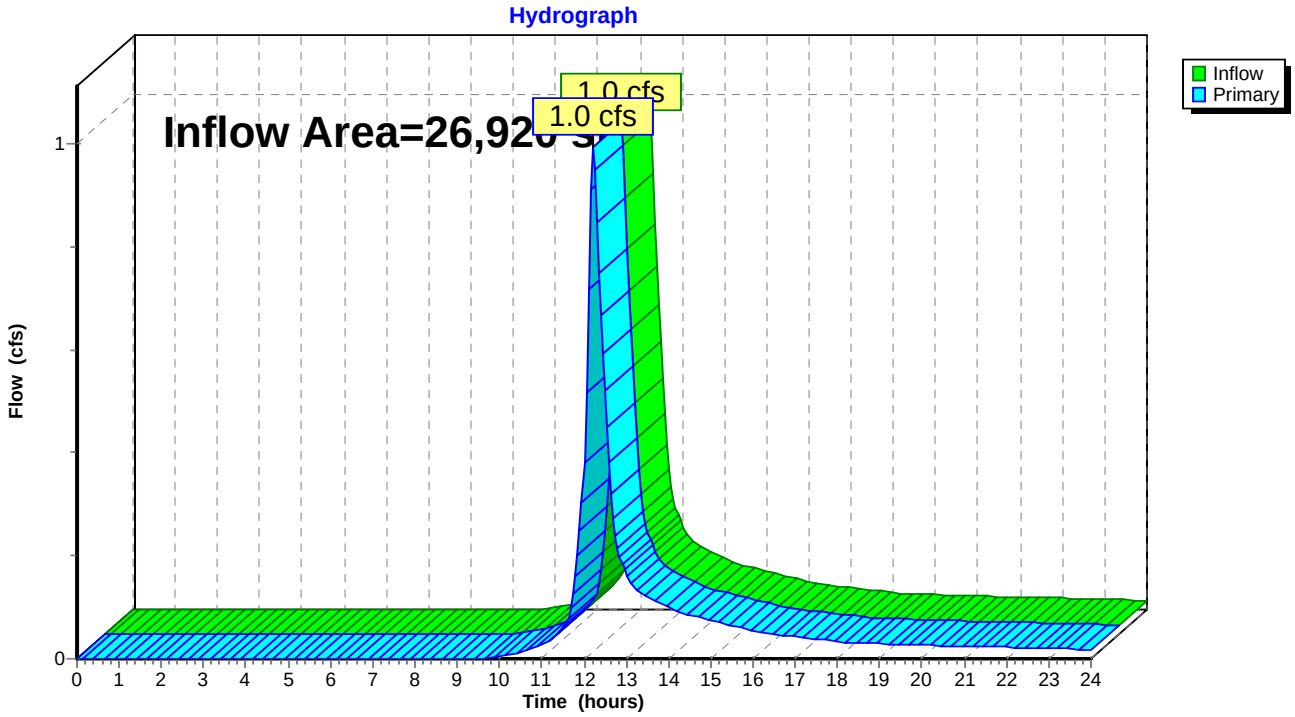


Summary for Link 10L: Wetlands N

Inflow Area = 26,920 sf, 0.00% Impervious, Inflow Depth > 1.81" for 5-Year event
Inflow = 1.0 cfs @ 12.21 hrs, Volume= 4,070 cf
Primary = 1.0 cfs @ 12.21 hrs, Volume= 4,070 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 10L: Wetlands N

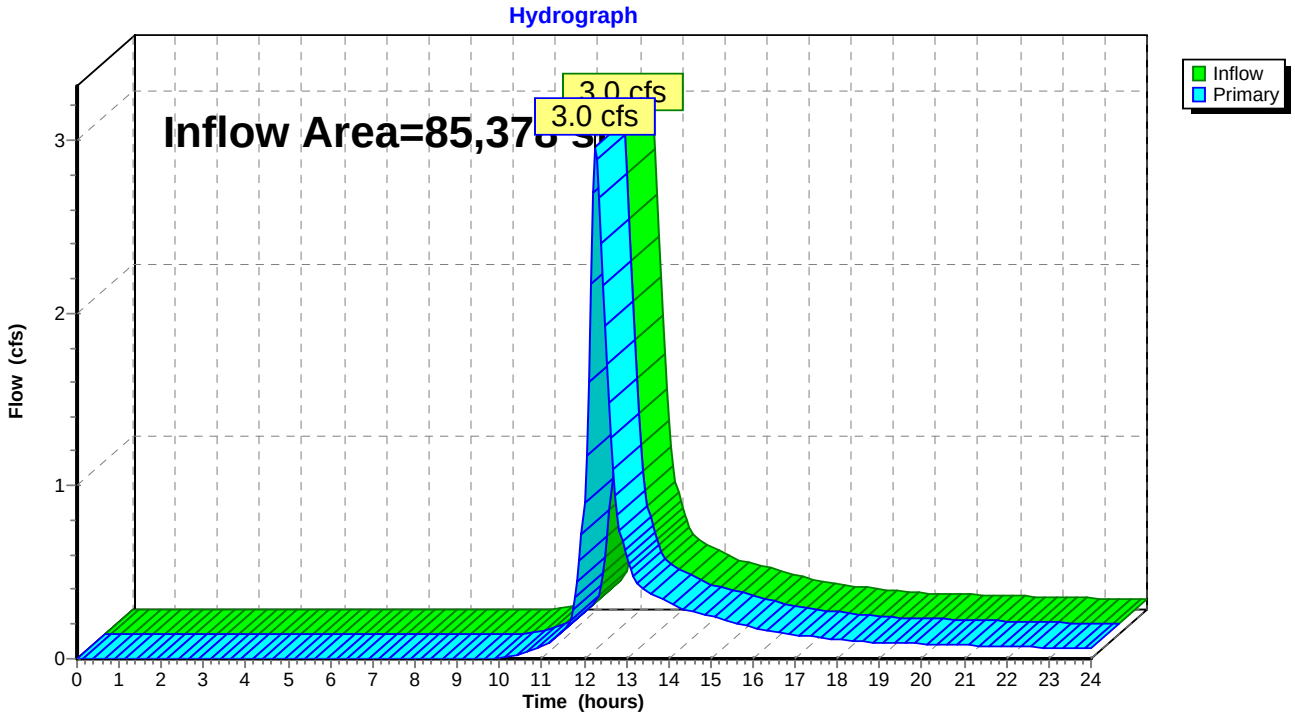


Summary for Link 11L: Collection Swale W

Inflow Area = 85,378 sf, 0.00% Impervious, Inflow Depth > 1.81" for 5-Year event
Inflow = 3.0 cfs @ 12.27 hrs, Volume= 12,857 cf
Primary = 3.0 cfs @ 12.27 hrs, Volume= 12,857 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 11L: Collection Swale W

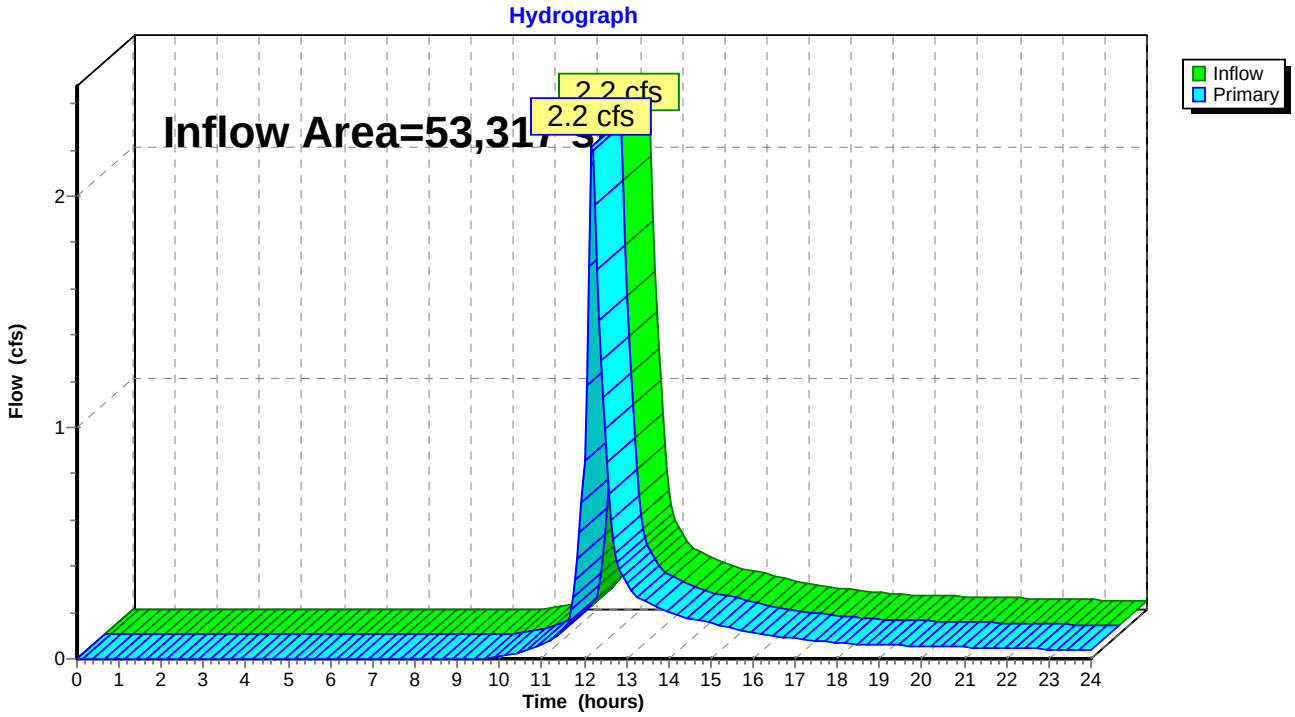


Summary for Link 12L: Collection Swale W

Inflow Area = 53,317 sf, 0.00% Impervious, Inflow Depth > 1.88" for 5-Year event
Inflow = 2.2 cfs @ 12.19 hrs, Volume= 8,374 cf
Primary = 2.2 cfs @ 12.19 hrs, Volume= 8,374 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 12L: Collection Swale W

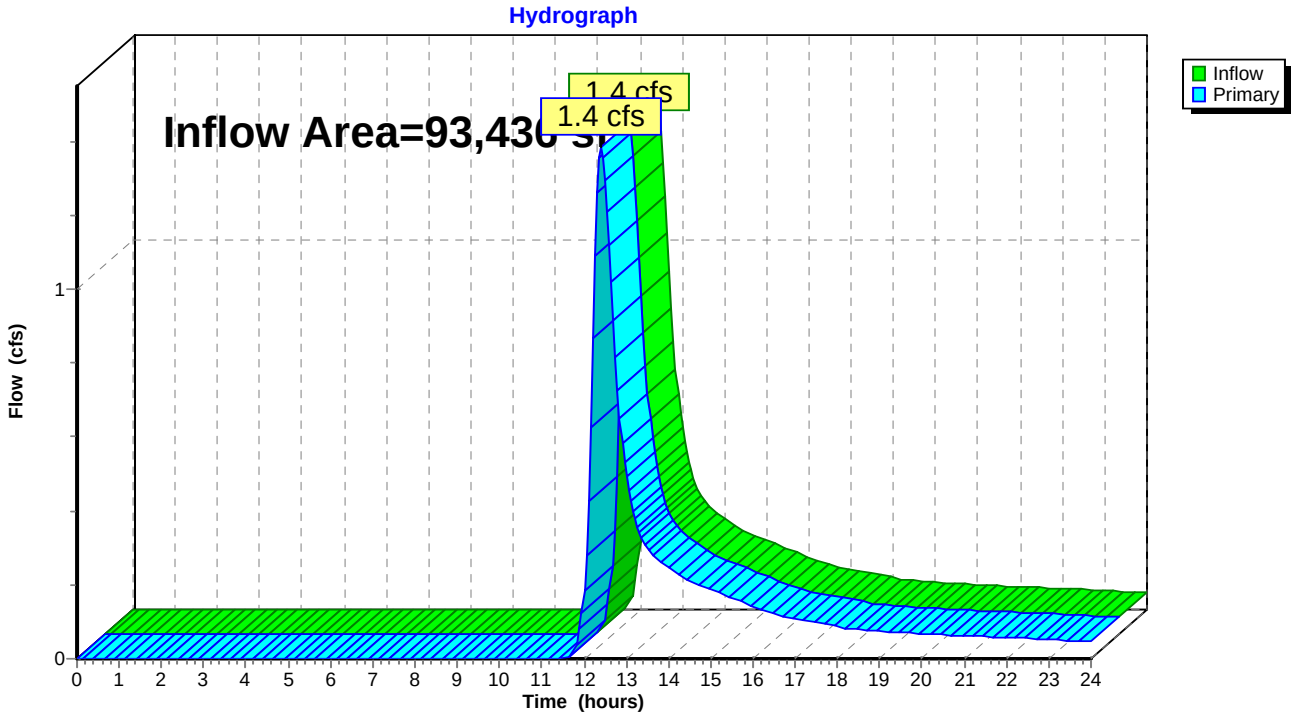


Summary for Link 15L: Wetland W

Inflow Area = 93,436 sf, 0.00% Impervious, Inflow Depth > 1.02" for 5-Year event
Inflow = 1.4 cfs @ 12.40 hrs, Volume= 7,938 cf
Primary = 1.4 cfs @ 12.40 hrs, Volume= 7,938 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 15L: Wetland W

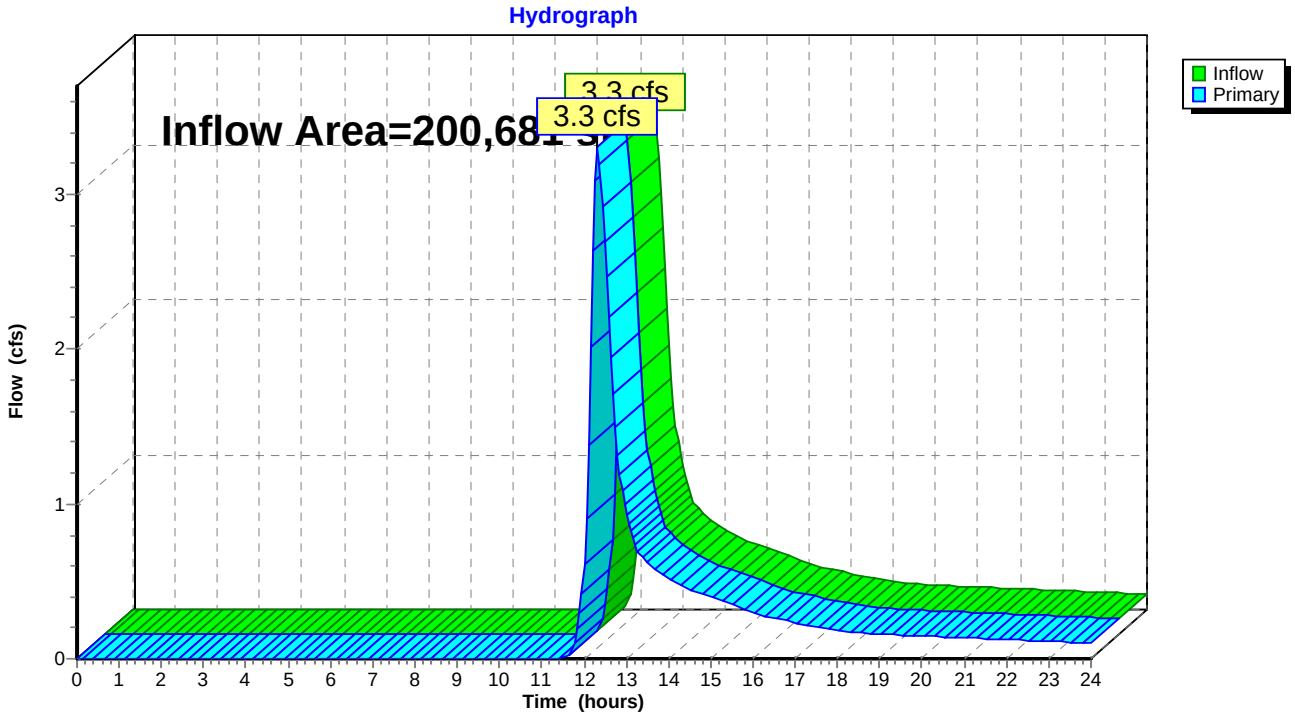


Summary for Link 16L: Wetland E

Inflow Area = 200,681 sf, 0.00% Impervious, Inflow Depth > 1.04" for 5-Year event
Inflow = 3.3 cfs @ 12.32 hrs, Volume= 17,438 cf
Primary = 3.3 cfs @ 12.32 hrs, Volume= 17,438 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 16L: Wetland E



Time span=0.00-24.00 hrs, dt=0.050 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Bulky Waste Landfill SW Runoff Area=0.952 ac 0.00% Impervious Runoff Depth>2.36"
Flow Length=239' Tc=13.7 min CN=74 Runoff=2.0 cfs 8,148 cf

Subcatchment 2S: Bulky Waste Landfill NW Runoff Area=0.705 ac 0.00% Impervious Runoff Depth>2.36"
Flow Length=179' Tc=14.1 min CN=74 Runoff=1.5 cfs 6,033 cf

Subcatchment 3S: Bulky Waste Landfill E Runoff Area=1.092 ac 0.00% Impervious Runoff Depth>2.36"
Flow Length=204' Tc=14.6 min CN=74 Runoff=2.3 cfs 9,344 cf

Subcatchment 4S: Landfill N Runoff Area=0.618 ac 0.00% Impervious Runoff Depth>2.36"
Flow Length=222' Tc=14.3 min CN=74 Runoff=1.3 cfs 5,289 cf

Subcatchment 5S: Landfill W Runoff Area=1.960 ac 0.00% Impervious Runoff Depth>2.36"
Flow Length=752' Tc=15.2 min CN=74 Runoff=4.0 cfs 16,770 cf

Subcatchment 6S: Landfill E Runoff Area=1.224 ac 0.00% Impervious Runoff Depth>2.44"
Flow Length=459' Tc=10.0 min CN=75 Runoff=3.0 cfs 10,862 cf

Subcatchment 7S: Green Field W Runoff Area=2.145 ac 0.00% Impervious Runoff Depth>1.43"
Flow Length=472' Tc=24.7 min CN=62 Runoff=2.0 cfs 11,125 cf

Subcatchment 8S: Green Field E Runoff Area=2.890 ac 0.00% Impervious Runoff Depth>1.43"
Flow Length=305' Tc=20.6 min CN=62 Runoff=3.0 cfs 15,007 cf

Subcatchment 9S: Greenfield 2 Runoff Area=1.717 ac 0.00% Impervious Runoff Depth>1.50"
Flow Length=247' Tc=19.4 min CN=63 Runoff=1.9 cfs 9,357 cf

Reach 19R: Riprap Swale Avg. Flow Depth=0.27' Max Vel=3.30 fps Inflow=4.0 cfs 16,770 cf
n=0.030 L=657.0' S=0.0383 '/' Capacity=8.6 cfs Outflow=3.9 cfs 16,715 cf

Reach 21R: Riprap Swale Avg. Flow Depth=0.24' Max Vel=3.23 fps Inflow=3.0 cfs 10,862 cf
n=0.030 L=527.0' S=0.0372 '/' Capacity=34.5 cfs Outflow=2.9 cfs 10,830 cf

Link 7L: Wetlands NW Inflow=1.5 cfs 6,033 cf
Primary=1.5 cfs 6,033 cf

Link 8L: Depression S Inflow=2.0 cfs 8,148 cf
Primary=2.0 cfs 8,148 cf

Link 9L: Wetlands NE Inflow=2.3 cfs 9,344 cf
Primary=2.3 cfs 9,344 cf

Link 10L: Wetlands N Inflow=1.3 cfs 5,289 cf
Primary=1.3 cfs 5,289 cf

Link 11L: Collection Swale W Inflow=3.9 cfs 16,715 cf
Primary=3.9 cfs 16,715 cf

Link 12L: Collection Swale W Inflow=2.9 cfs 10,830 cf
Primary=2.9 cfs 10,830 cf

Link 15L: Wetland W Inflow=2.0 cfs 11,125 cf
Primary=2.0 cfs 11,125 cf

Link 16L: Wetland E Inflow=4.9 cfs 24,364 cf
Primary=4.9 cfs 24,364 cf

Total Runoff Area = 579,479 sf Runoff Volume = 91,936 cf Average Runoff Depth = 1.90"
100.00% Pervious = 579,479 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1S: Bulky Waste Landfill SW

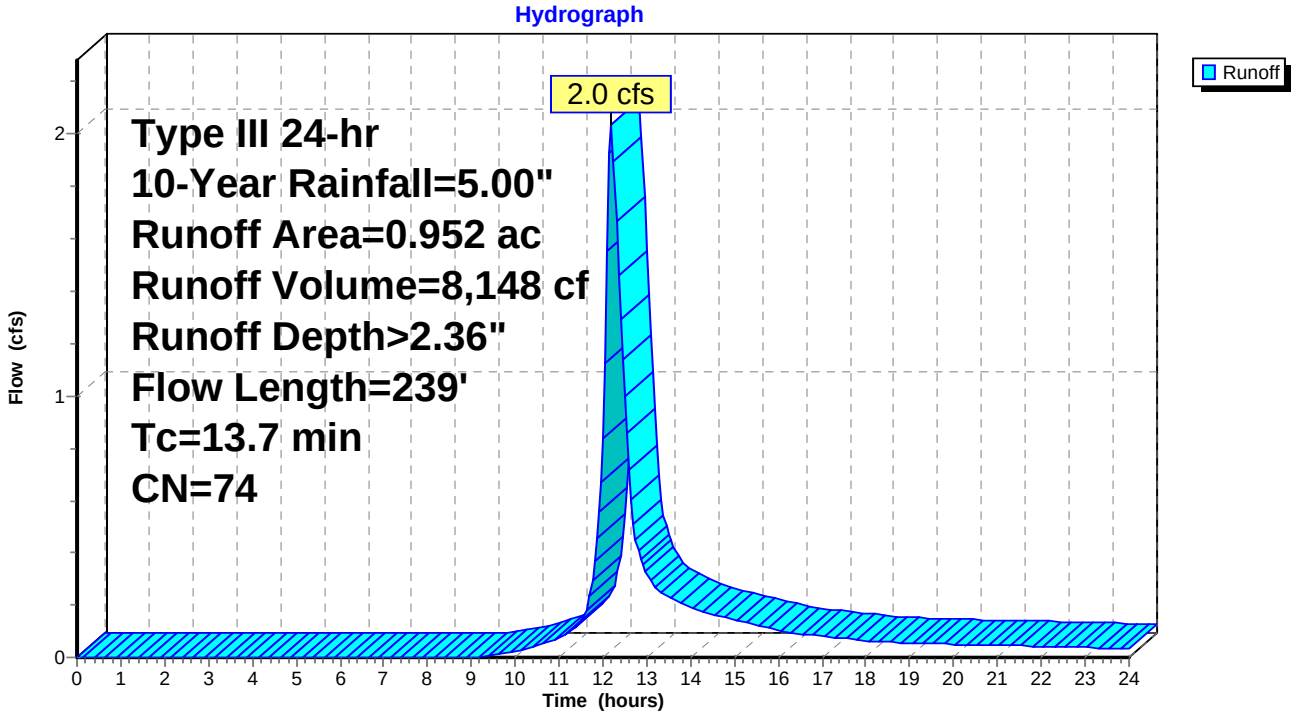
Runoff = 2.0 cfs @ 12.20 hrs, Volume= 8,148 cf, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

Area (ac)	CN	Description
0.952	74	>75% Grass cover, Good, HSG C
0.952		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0251	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.5	66	0.1137	2.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	46	0.1957	3.10		**Shallow Concentrated Flow, Lanfill Cap** Short Grass Pasture Kv= 7.0 fps
0.4	27	0.0050	1.14		**Shallow Concentrated Flow, Access Drive** Unpaved Kv= 16.1 fps
13.7	239	Total			

Subcatchment 1S: Bulky Waste Landfill SW



Summary for Subcatchment 2S: Bulky Waste Landfill NW

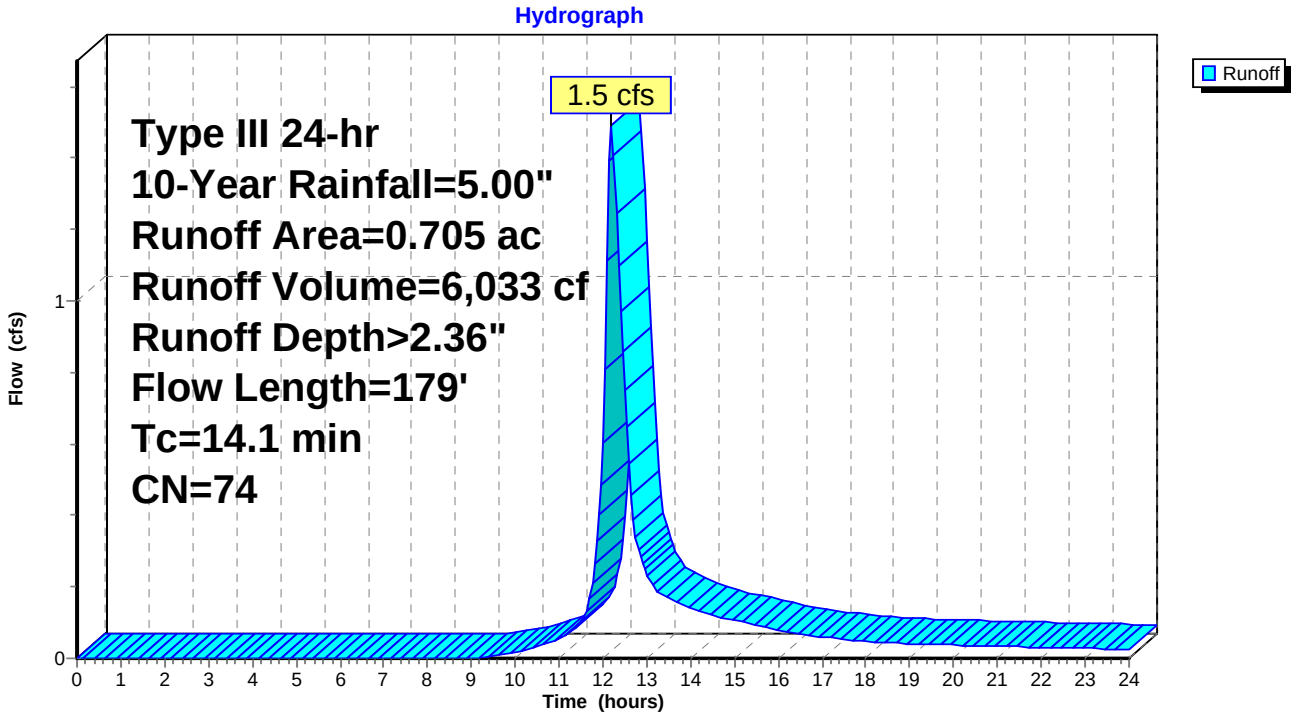
Runoff = 1.5 cfs @ 12.20 hrs, Volume= 6,033 cf, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

Area (ac)	CN	Description
0.705	74	>75% Grass cover, Good, HSG C
0.705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.6	79	0.0886	2.08		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.1	179	Total			

Subcatchment 2S: Bulky Waste Landfill NW



Summary for Subcatchment 3S: Bulky Waste Landfill E

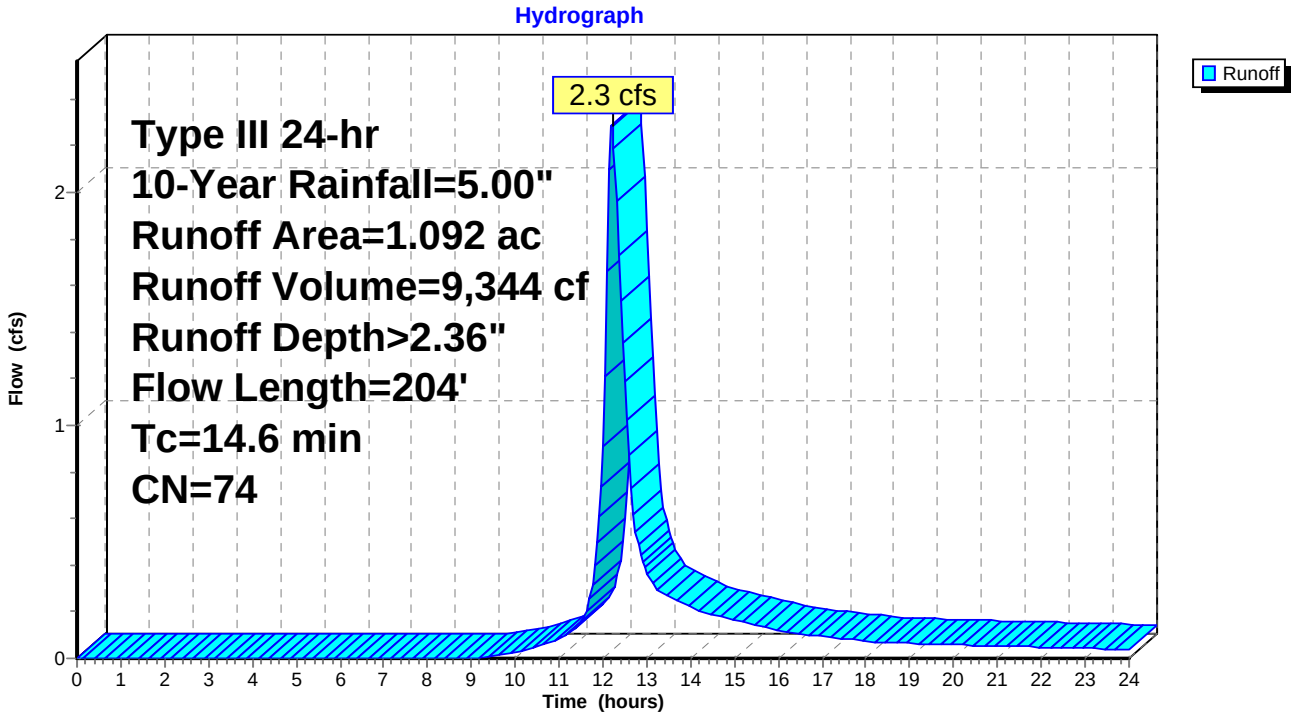
Runoff = 2.3 cfs @ 12.21 hrs, Volume= 9,344 cf, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

Area (ac)	CN	Description
1.092	74	>75% Grass cover, Good, HSG C
1.092		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.1	24	0.1667	2.86		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.6	204	Total			

Subcatchment 3S: Bulky Waste Landfill E



Summary for Subcatchment 4S: Landfill N

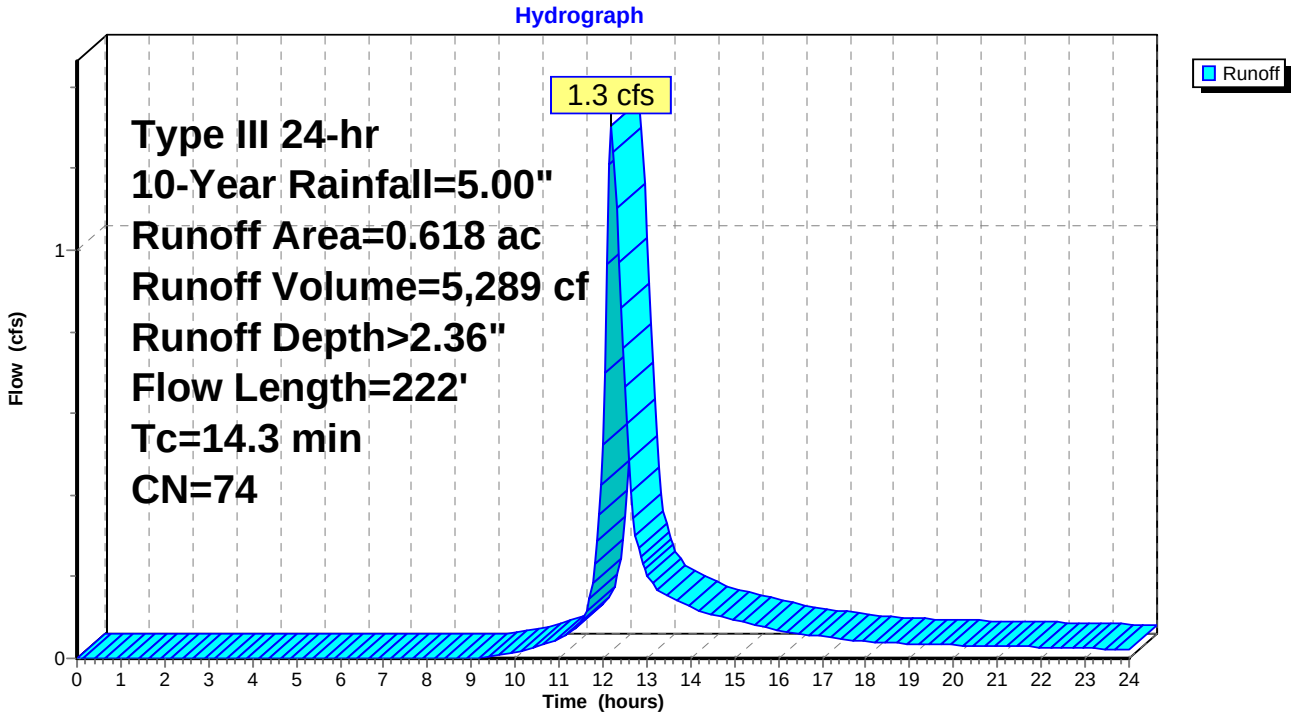
Runoff = 1.3 cfs @ 12.20 hrs, Volume= 5,289 cf, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

Area (ac)	CN	Description
0.618	74	>75% Grass cover, Good, HSG C
0.618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0230	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	81	0.0371	1.35		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	41	0.1707	2.89		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.3	222	Total			

Subcatchment 4S: Landfill N



Summary for Subcatchment 5S: Landfill W

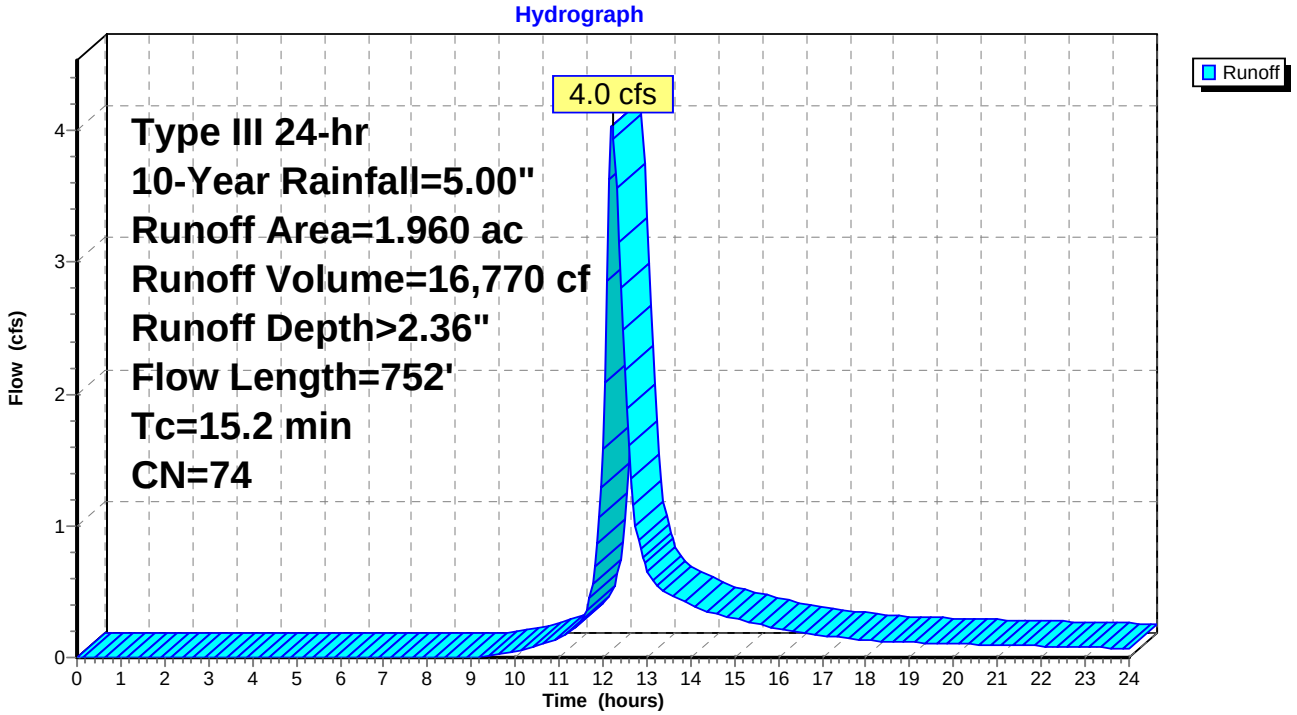
Runoff = 4.0 cfs @ 12.22 hrs, Volume= 16,770 cf, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

Area (ac)	CN	Description
1.960	74	>75% Grass cover, Good, HSG C
1.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0220	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.3	37	0.0811	1.99		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.3	58	0.1897	3.05		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
1.3	520	0.0200	6.71	50.33	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
0.0	37	0.2160	22.05	165.39	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
15.2	752	Total			

Subcatchment 5S: Landfill W



Summary for Subcatchment 6S: Landfill E

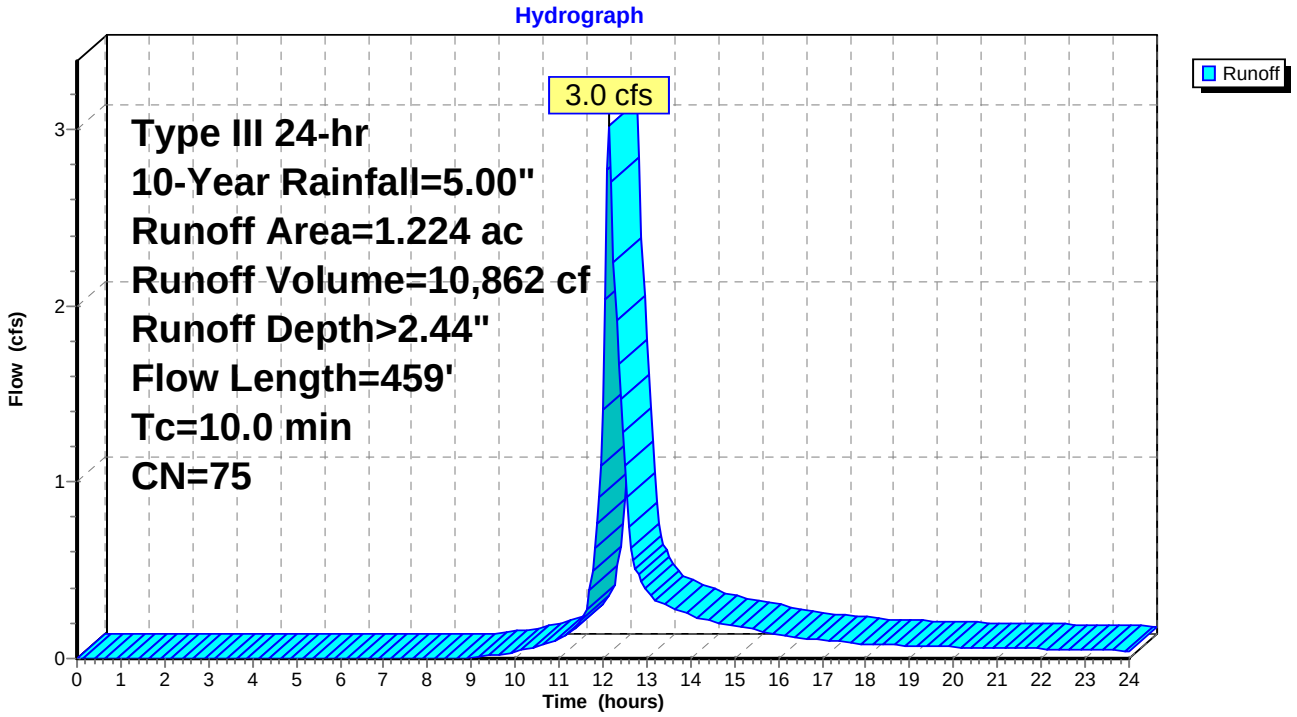
Runoff = 3.0 cfs @ 12.15 hrs, Volume= 10,862 cf, Depth> 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

Area (ac)	CN	Description
1.134	74	>75% Grass cover, Good, HSG C
0.090	89	Gravel roads, HSG C
1.224	75	Weighted Average
1.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	40	0.0543	0.15		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	60	0.0117	1.03		**Sheet Flow, Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.5	86	0.0384	3.15		**Shallow Concentrated Flow, Gravel** Unpaved Kv= 16.1 fps
0.7	76	0.0658	1.80		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	49	0.2245	3.32		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	148	0.1081	15.60	117.00	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
7.1	459	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: Landfill E



Summary for Subcatchment 7S: Green Field W

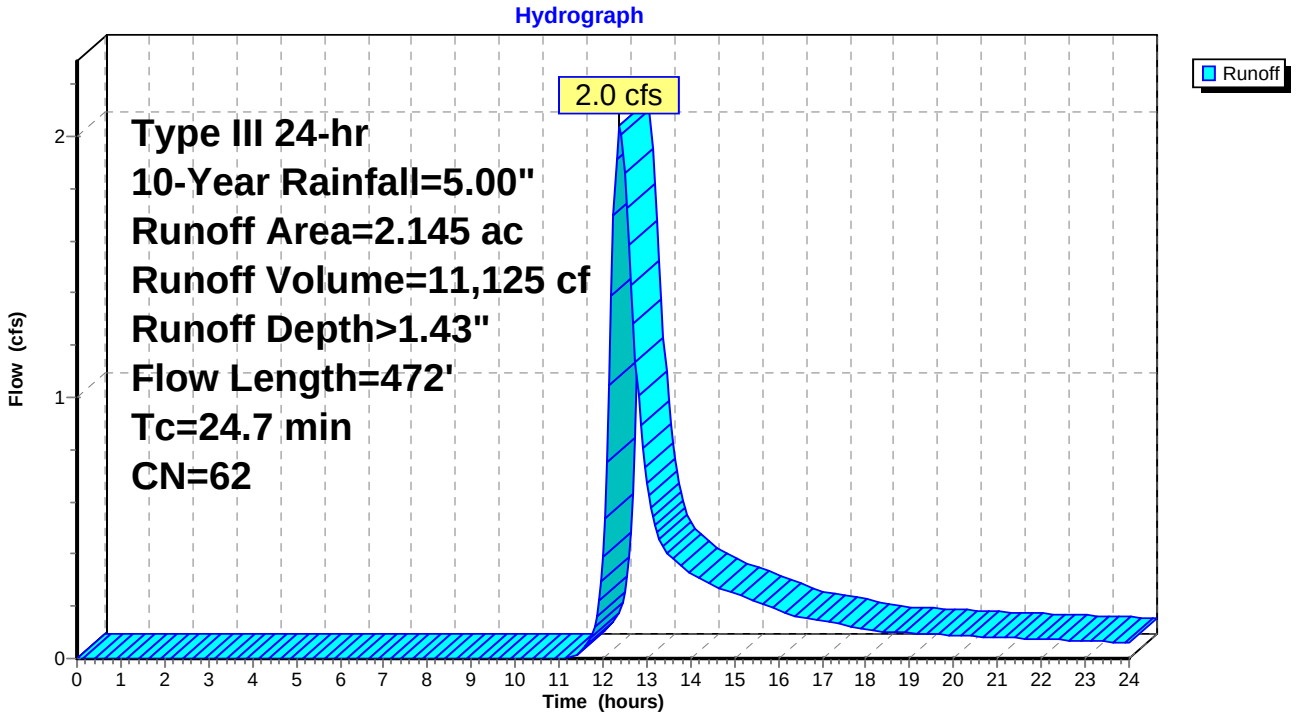
Runoff = 2.0 cfs @ 12.38 hrs, Volume= 11,125 cf, Depth> 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

Area (ac)	CN	Description
0.022	74	>75% Grass cover, Good, HSG C
0.089	80	>75% Grass cover, Good, HSG D
0.282	61	>75% Grass cover, Good, HSG B
1.752	61	>75% Grass cover, Good, HSG B
2.145	62	Weighted Average
2.145		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	23	0.0217	1.03		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
4.8	160	0.0063	0.56		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.6	51	0.0392	1.39		**Shallow Concentrated Flow, field** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.7	50	0.0300	1.21		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
24.7	472	Total			

Subcatchment 7S: Green Field W



Summary for Subcatchment 8S: Green Field E

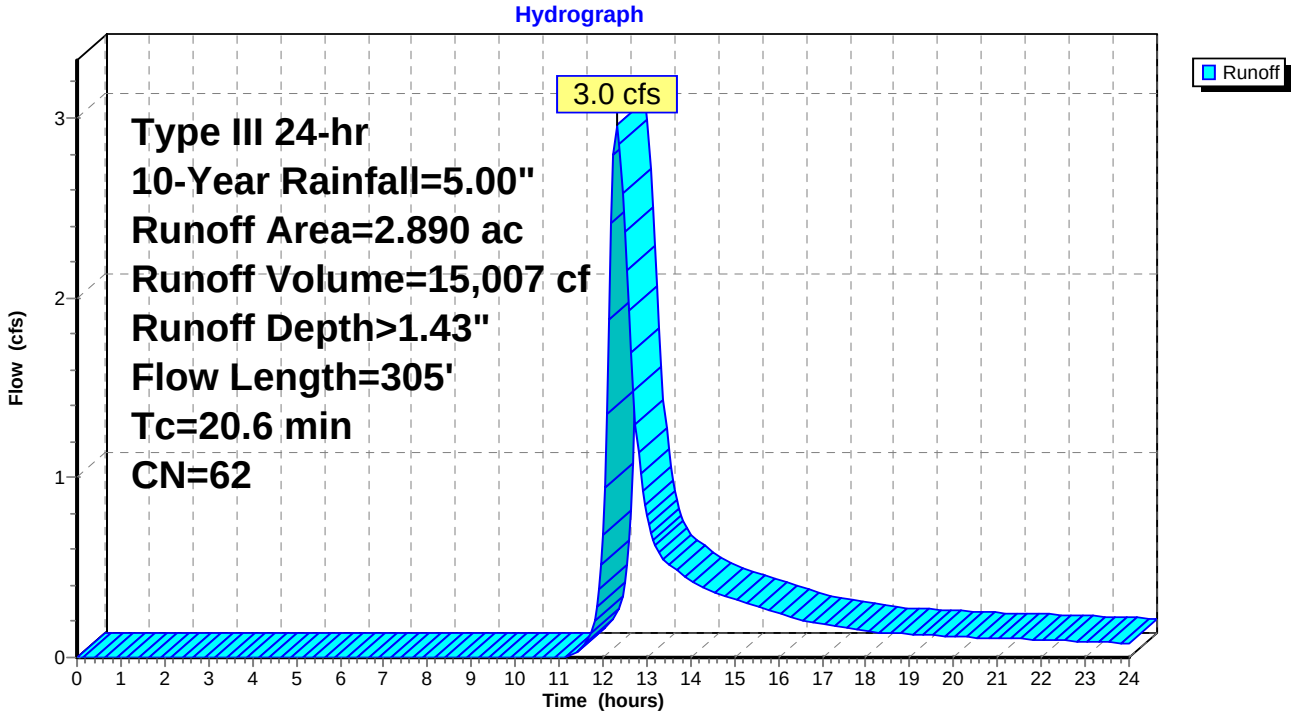
Runoff = 3.0 cfs @ 12.32 hrs, Volume= 15,007 cf, Depth> 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

Area (ac)	CN	Description
2.685	61	>75% Grass cover, Good, HSG B
0.072	80	>75% Grass cover, Good, HSG D
0.033	80	>75% Grass cover, Good, HSG D
0.100	61	>75% Grass cover, Good, HSG B
2.890	62	Weighted Average
2.890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	24	0.0208	1.01		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
2.6	106	0.0094	0.68		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.8	75	0.0467	1.51		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
20.6	305	Total			

Subcatchment 8S: Green Field E



Summary for Subcatchment 9S: Greenfield 2

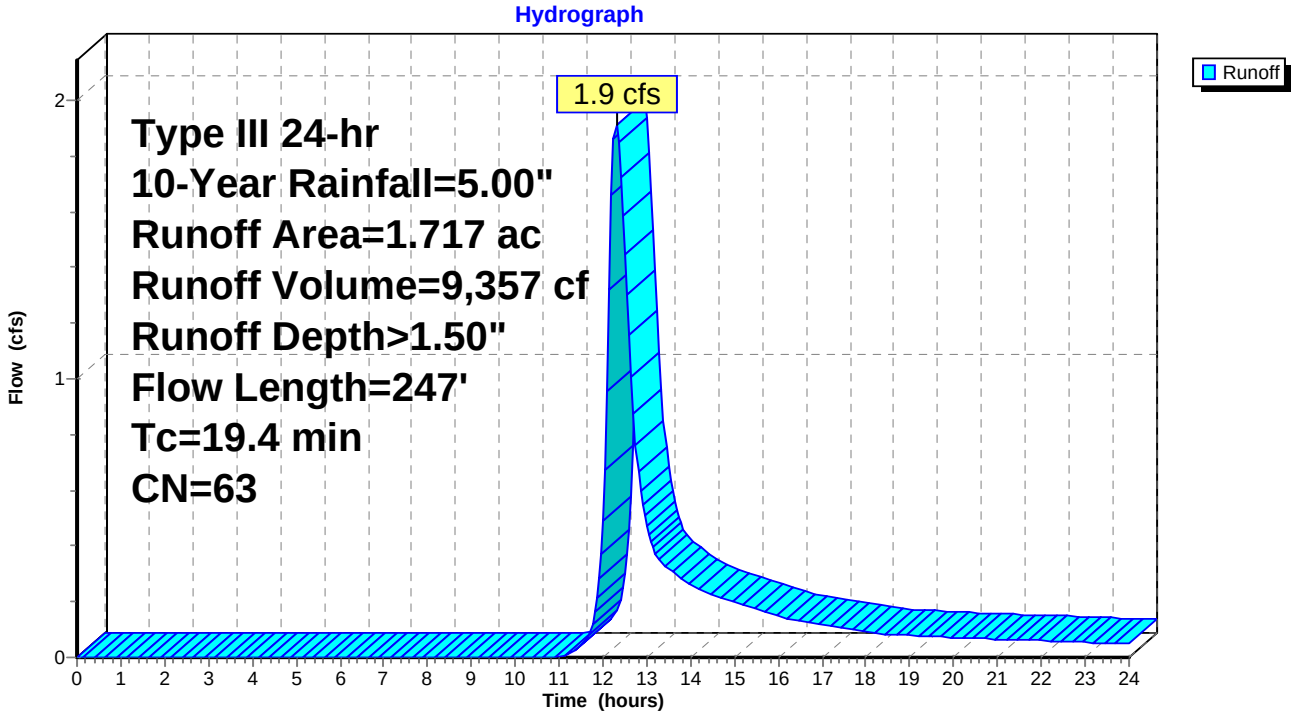
Runoff = 1.9 cfs @ 12.30 hrs, Volume= 9,357 cf, Depth> 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

Area (ac)	CN	Description
0.091	77	Woods, Good, HSG D
0.151	55	Woods, Good, HSG B
1.288	61	>75% Grass cover, Good, HSG B
0.187	80	>75% Grass cover, Good, HSG D
1.717	63	Weighted Average
1.717		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0128	0.10		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.40"
2.9	147	0.0148	0.85		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
19.4	247	Total			

Subcatchment 9S: Greenfield 2



Summary for Reach 19R: Riprap Swale

Inflow Area = 85,378 sf, 0.00% Impervious, Inflow Depth > 2.36" for 10-Year event
Inflow = 4.0 cfs @ 12.22 hrs, Volume= 16,770 cf
Outflow = 3.9 cfs @ 12.26 hrs, Volume= 16,715 cf, Atten= 3%, Lag= 2.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.30 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 1.20 fps, Avg. Travel Time= 9.2 min

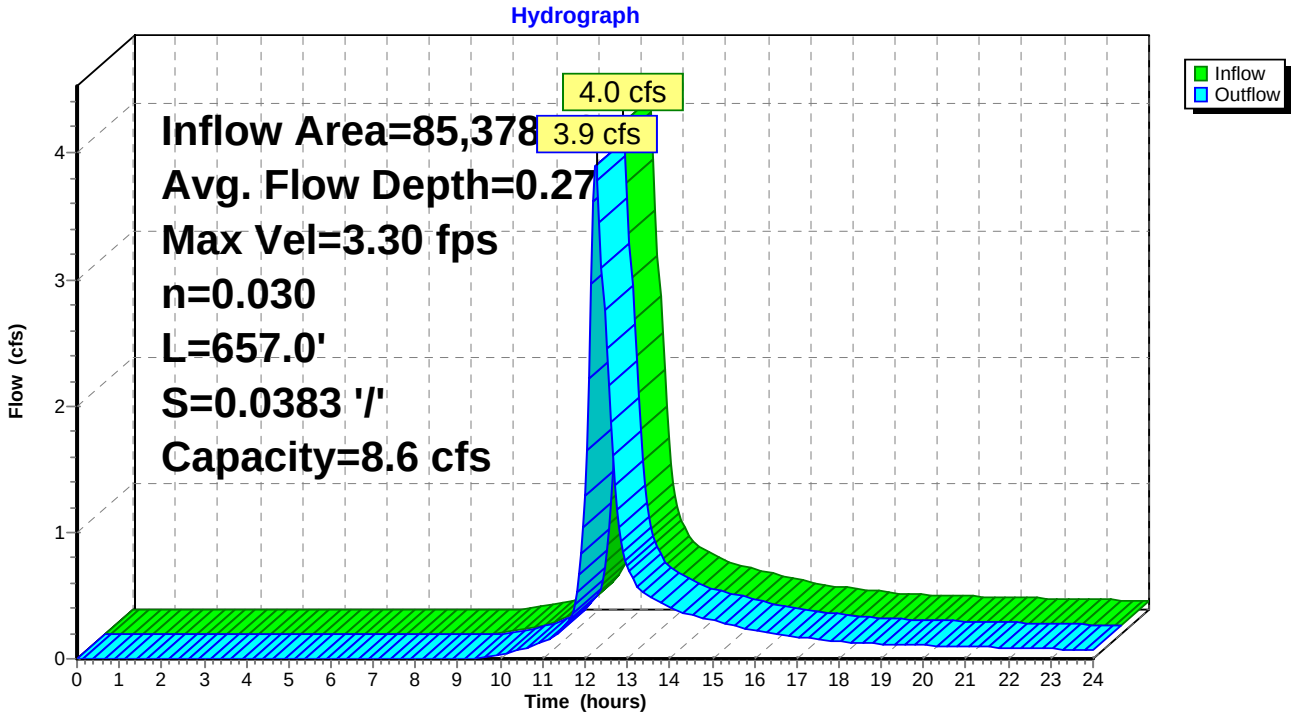
Peak Storage= 778 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 0.40' Flow Area= 2.1 sf, Capacity= 8.6 cfs

3.00' x 0.40' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 5.5 '/' Top Width= 7.40'
Length= 657.0' Slope= 0.0383 '/'
Inlet Invert= 274.52', Outlet Invert= 249.36'



‡

Reach 19R: Riprap Swale



Summary for Reach 21R: Riprap Swale

Inflow Area = 53,317 sf, 0.00% Impervious, Inflow Depth > 2.44" for 10-Year event
Inflow = 3.0 cfs @ 12.15 hrs, Volume= 10,862 cf
Outflow = 2.9 cfs @ 12.18 hrs, Volume= 10,830 cf, Atten= 4%, Lag= 1.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.23 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 8.4 min

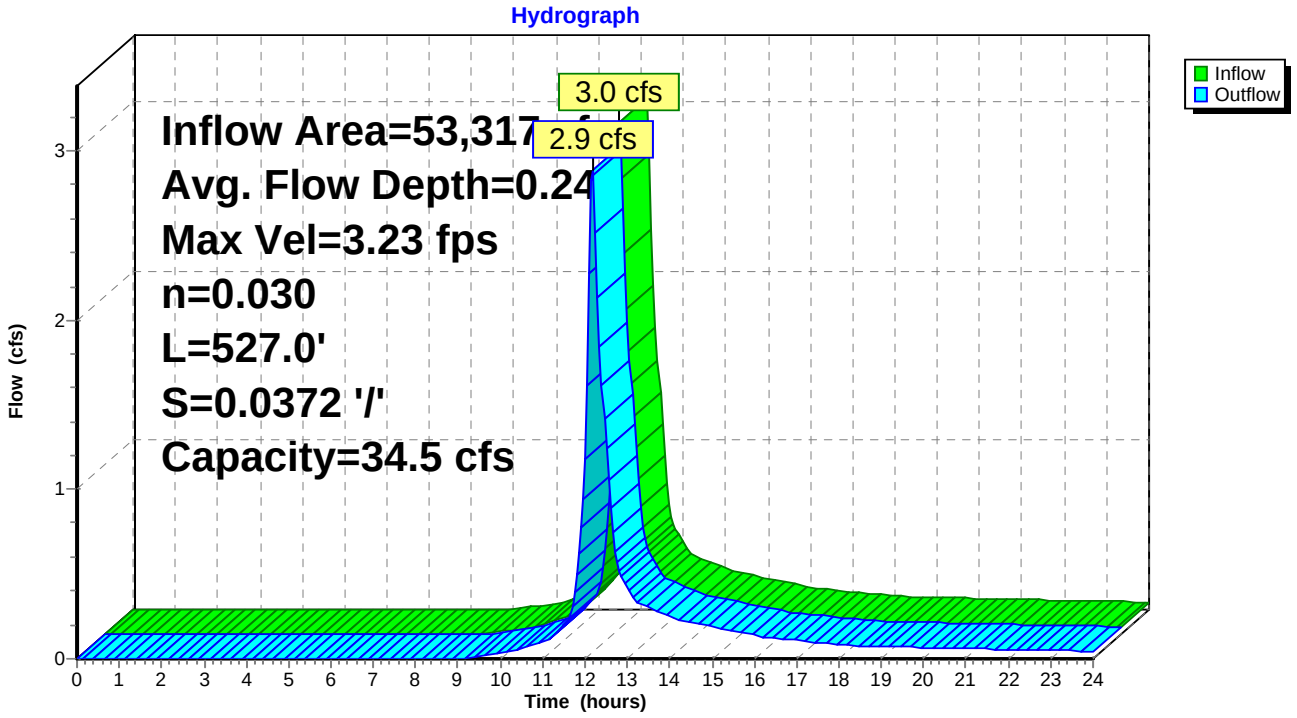
Peak Storage= 470 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 0.90' Flow Area= 5.1 sf, Capacity= 34.5 cfs

3.00' x 0.90' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 3.0 '/' Top Width= 8.40'
Length= 527.0' Slope= 0.0372 '/'
Inlet Invert= 276.70', Outlet Invert= 257.10'



‡

Reach 21R: Riprap Swale

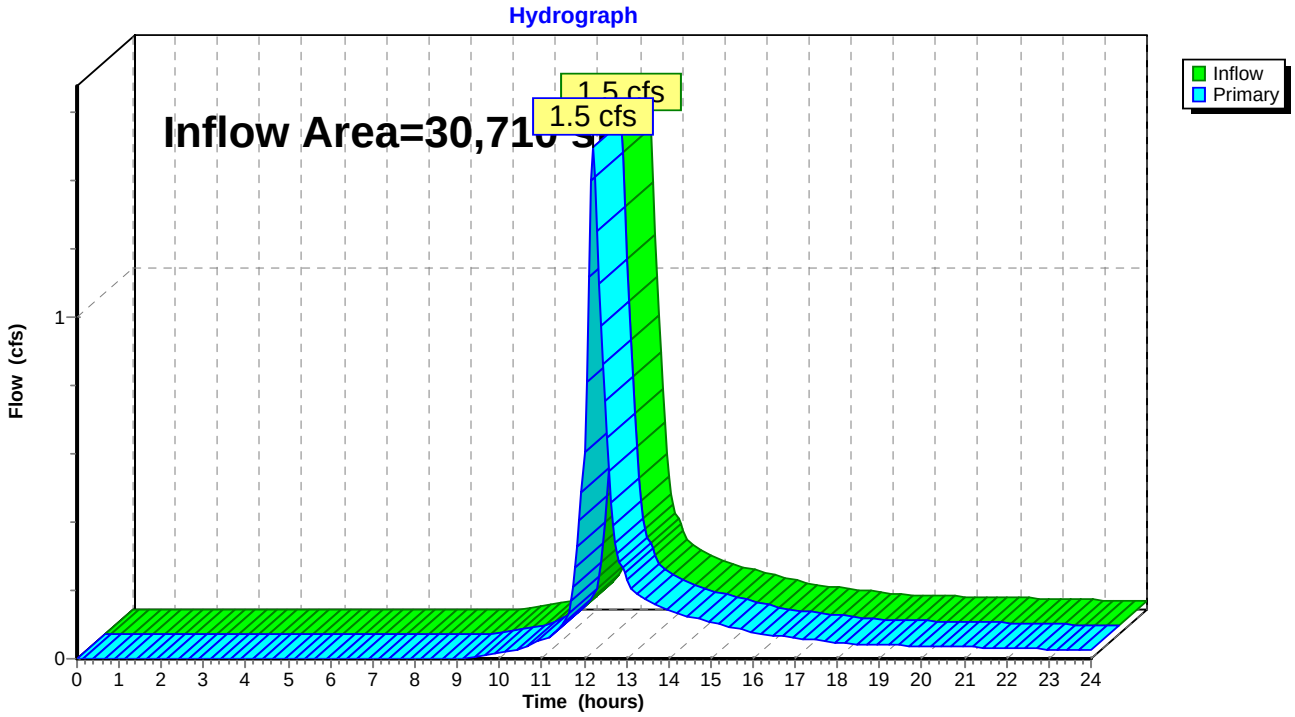


Summary for Link 7L: Wetlands NW

Inflow Area = 30,710 sf, 0.00% Impervious, Inflow Depth > 2.36" for 10-Year event
Inflow = 1.5 cfs @ 12.20 hrs, Volume= 6,033 cf
Primary = 1.5 cfs @ 12.20 hrs, Volume= 6,033 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 7L: Wetlands NW

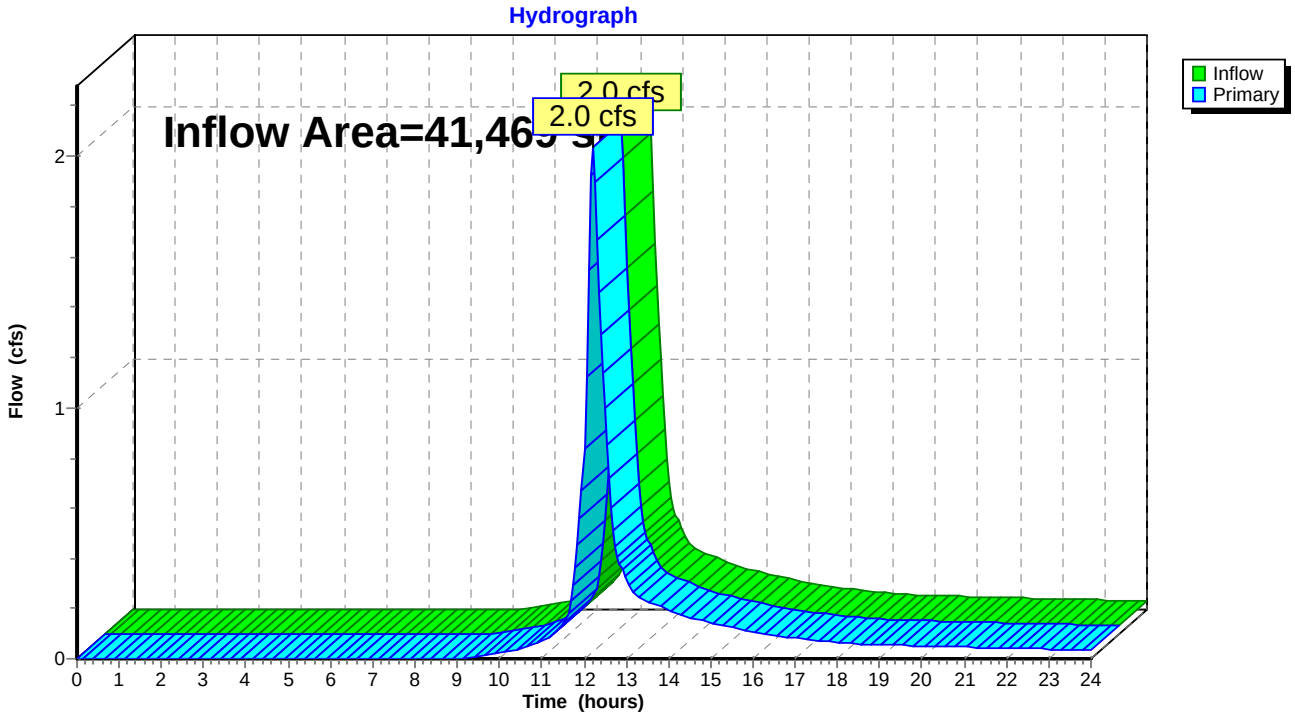


Summary for Link 8L: Depression S

Inflow Area = 41,469 sf, 0.00% Impervious, Inflow Depth > 2.36" for 10-Year event
Inflow = 2.0 cfs @ 12.20 hrs, Volume= 8,148 cf
Primary = 2.0 cfs @ 12.20 hrs, Volume= 8,148 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 8L: Depression S

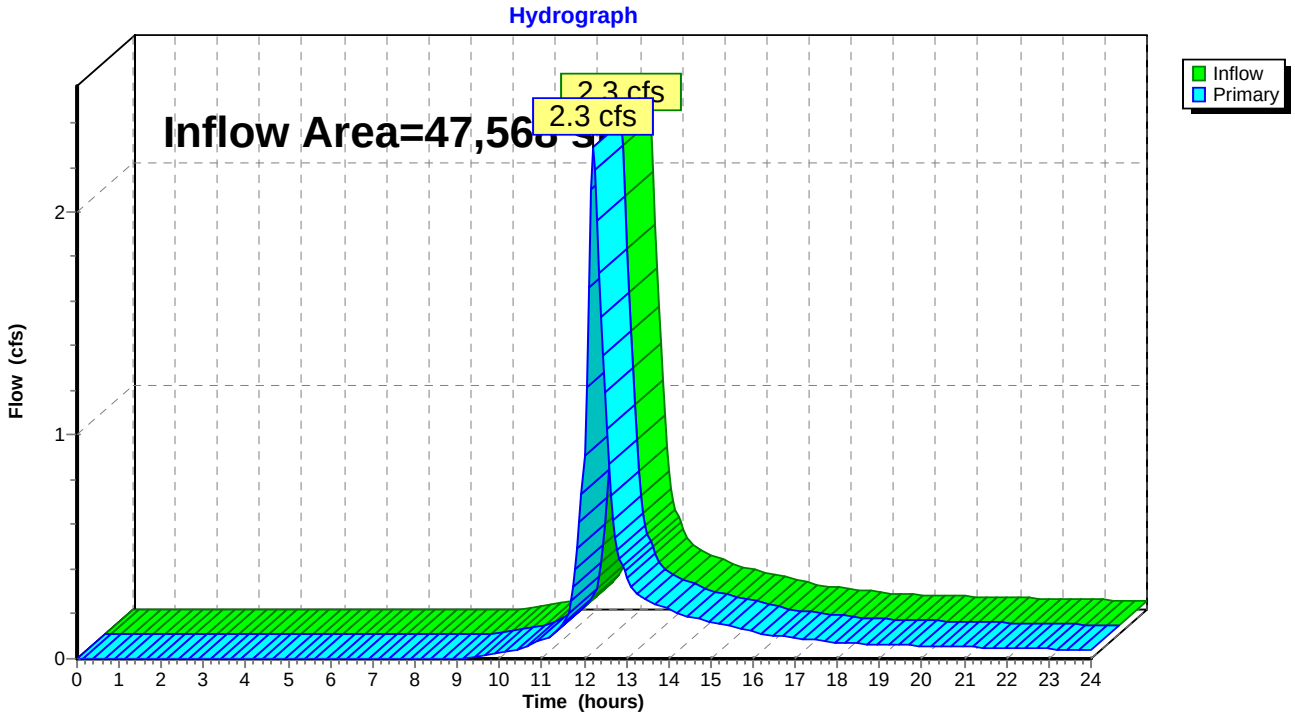


Summary for Link 9L: Wetlands NE

Inflow Area = 47,568 sf, 0.00% Impervious, Inflow Depth > 2.36" for 10-Year event
Inflow = 2.3 cfs @ 12.21 hrs, Volume= 9,344 cf
Primary = 2.3 cfs @ 12.21 hrs, Volume= 9,344 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 9L: Wetlands NE

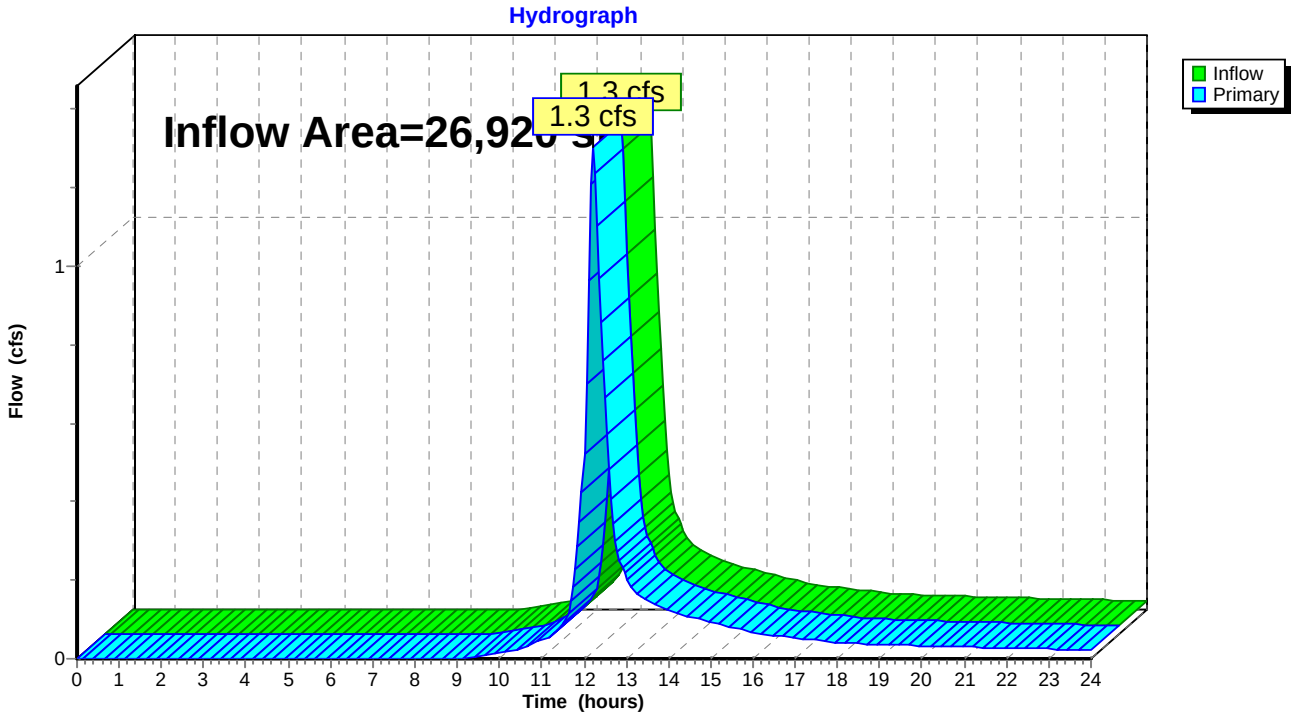


Summary for Link 10L: Wetlands N

Inflow Area = 26,920 sf, 0.00% Impervious, Inflow Depth > 2.36" for 10-Year event
Inflow = 1.3 cfs @ 12.20 hrs, Volume= 5,289 cf
Primary = 1.3 cfs @ 12.20 hrs, Volume= 5,289 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 10L: Wetlands N

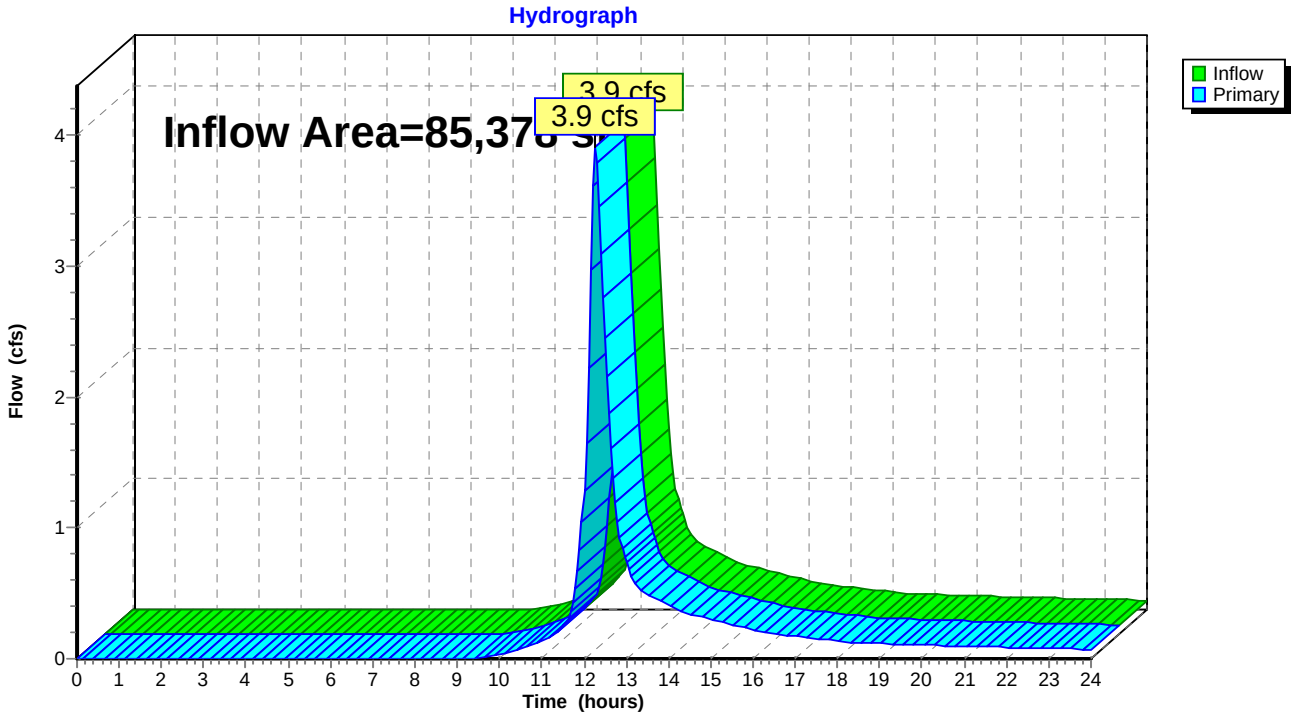


Summary for Link 11L: Collection Swale W

Inflow Area = 85,378 sf, 0.00% Impervious, Inflow Depth > 2.35" for 10-Year event
Inflow = 3.9 cfs @ 12.26 hrs, Volume= 16,715 cf
Primary = 3.9 cfs @ 12.26 hrs, Volume= 16,715 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 11L: Collection Swale W

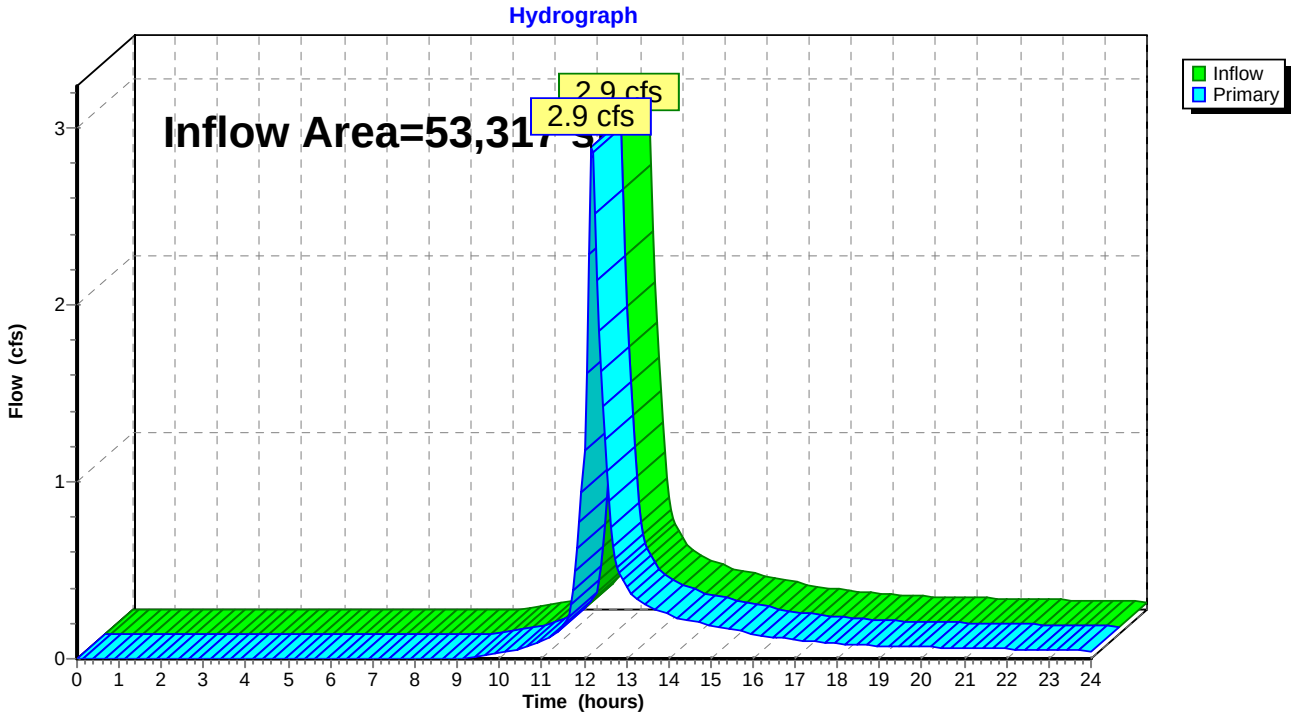


Summary for Link 12L: Collection Swale W

Inflow Area = 53,317 sf, 0.00% Impervious, Inflow Depth > 2.44" for 10-Year event
Inflow = 2.9 cfs @ 12.18 hrs, Volume= 10,830 cf
Primary = 2.9 cfs @ 12.18 hrs, Volume= 10,830 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 12L: Collection Swale W

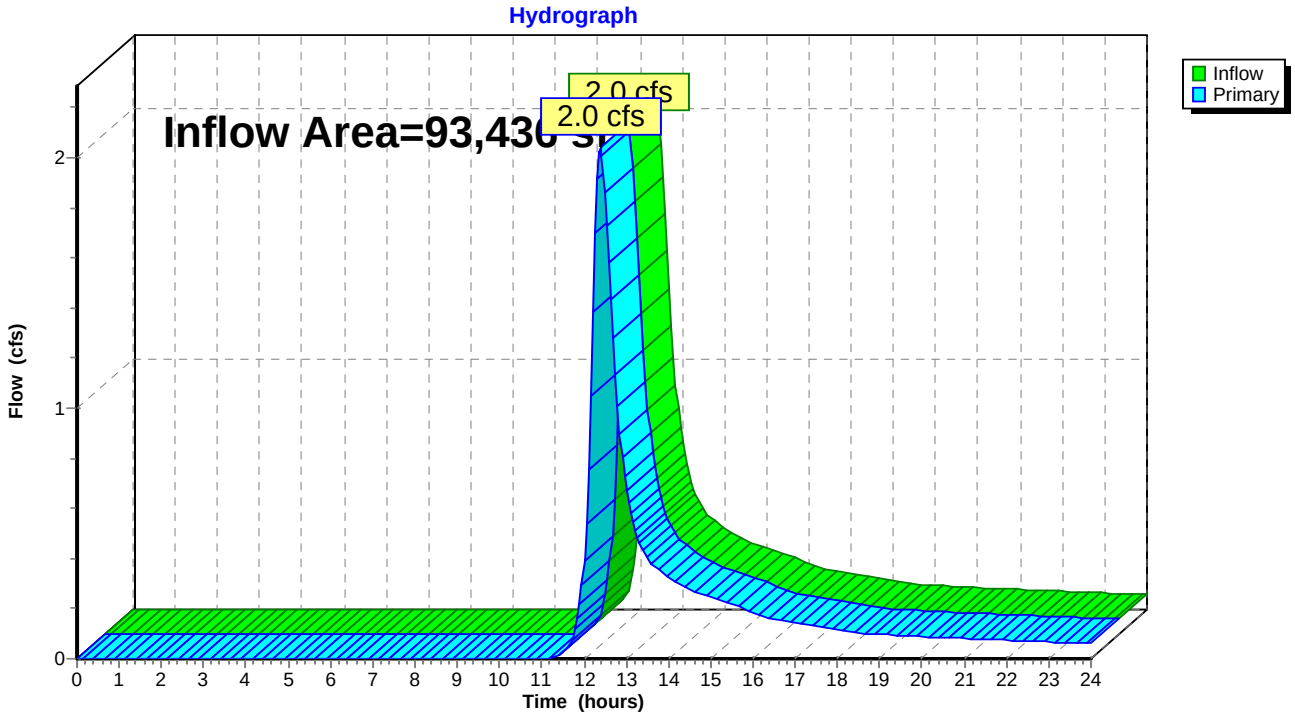


Summary for Link 15L: Wetland W

Inflow Area = 93,436 sf, 0.00% Impervious, Inflow Depth > 1.43" for 10-Year event
Inflow = 2.0 cfs @ 12.38 hrs, Volume= 11,125 cf
Primary = 2.0 cfs @ 12.38 hrs, Volume= 11,125 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 15L: Wetland W

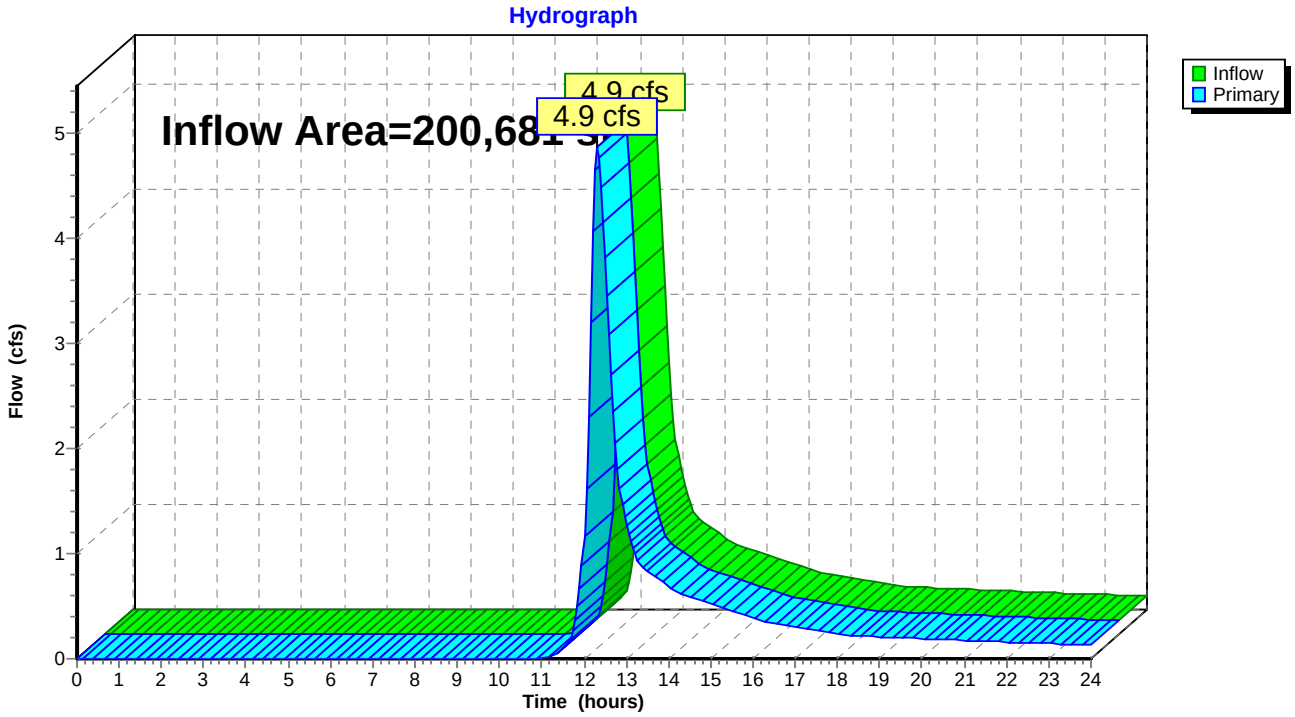


Summary for Link 16L: Wetland E

Inflow Area = 200,681 sf, 0.00% Impervious, Inflow Depth > 1.46" for 10-Year event
Inflow = 4.9 cfs @ 12.31 hrs, Volume= 24,364 cf
Primary = 4.9 cfs @ 12.31 hrs, Volume= 24,364 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 16L: Wetland E



Time span=0.00-24.00 hrs, dt=0.050 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Bulky Waste Landfill SW Runoff Area=0.952 ac 0.00% Impervious Runoff Depth>2.93"
Flow Length=239' Tc=13.7 min CN=74 Runoff=2.5 cfs 10,114 cf

Subcatchment 2S: Bulky Waste Landfill NW Runoff Area=0.705 ac 0.00% Impervious Runoff Depth>2.93"
Flow Length=179' Tc=14.1 min CN=74 Runoff=1.9 cfs 7,489 cf

Subcatchment 3S: Bulky Waste Landfill E Runoff Area=1.092 ac 0.00% Impervious Runoff Depth>2.93"
Flow Length=204' Tc=14.6 min CN=74 Runoff=2.9 cfs 11,599 cf

Subcatchment 4S: Landfill N Runoff Area=0.618 ac 0.00% Impervious Runoff Depth>2.93"
Flow Length=222' Tc=14.3 min CN=74 Runoff=1.6 cfs 6,565 cf

Subcatchment 5S: Landfill W Runoff Area=1.960 ac 0.00% Impervious Runoff Depth>2.93"
Flow Length=752' Tc=15.2 min CN=74 Runoff=5.0 cfs 20,816 cf

Subcatchment 6S: Landfill E Runoff Area=1.224 ac 0.00% Impervious Runoff Depth>3.02"
Flow Length=459' Tc=10.0 min CN=75 Runoff=3.8 cfs 13,430 cf

Subcatchment 7S: Green Field W Runoff Area=2.145 ac 0.00% Impervious Runoff Depth>1.88"
Flow Length=472' Tc=24.7 min CN=62 Runoff=2.8 cfs 14,608 cf

Subcatchment 8S: Green Field E Runoff Area=2.890 ac 0.00% Impervious Runoff Depth>1.88"
Flow Length=305' Tc=20.6 min CN=62 Runoff=4.0 cfs 19,704 cf

Subcatchment 9S: Greenfield 2 Runoff Area=1.717 ac 0.00% Impervious Runoff Depth>1.96"
Flow Length=247' Tc=19.4 min CN=63 Runoff=2.6 cfs 12,217 cf

Reach 19R: Riprap Swale Avg. Flow Depth=0.30' Max Vel=3.52 fps Inflow=5.0 cfs 20,816 cf
n=0.030 L=657.0' S=0.0383 '/' Capacity=8.6 cfs Outflow=4.9 cfs 20,755 cf

Reach 21R: Riprap Swale Avg. Flow Depth=0.27' Max Vel=3.46 fps Inflow=3.8 cfs 13,430 cf
n=0.030 L=527.0' S=0.0372 '/' Capacity=34.5 cfs Outflow=3.6 cfs 13,394 cf

Link 7L: Wetlands NW Inflow=1.9 cfs 7,489 cf
Primary=1.9 cfs 7,489 cf

Link 8L: Depression S Inflow=2.5 cfs 10,114 cf
Primary=2.5 cfs 10,114 cf

Link 9L: Wetlands NE Inflow=2.9 cfs 11,599 cf
Primary=2.9 cfs 11,599 cf

Link 10L: Wetlands N Inflow=1.6 cfs 6,565 cf
Primary=1.6 cfs 6,565 cf

Link 11L: Collection Swale W Inflow=4.9 cfs 20,755 cf
Primary=4.9 cfs 20,755 cf

Link 12L: Collection Swale W Inflow=3.6 cfs 13,394 cf
Primary=3.6 cfs 13,394 cf

Link 15L: Wetland W Inflow=2.8 cfs 14,608 cf
Primary=2.8 cfs 14,608 cf

Link 16L: Wetland E Inflow=6.6 cfs 31,922 cf
Primary=6.6 cfs 31,922 cf

Total Runoff Area = 579,479 sf Runoff Volume = 116,542 cf Average Runoff Depth = 2.41"
100.00% Pervious = 579,479 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1S: Bulky Waste Landfill SW

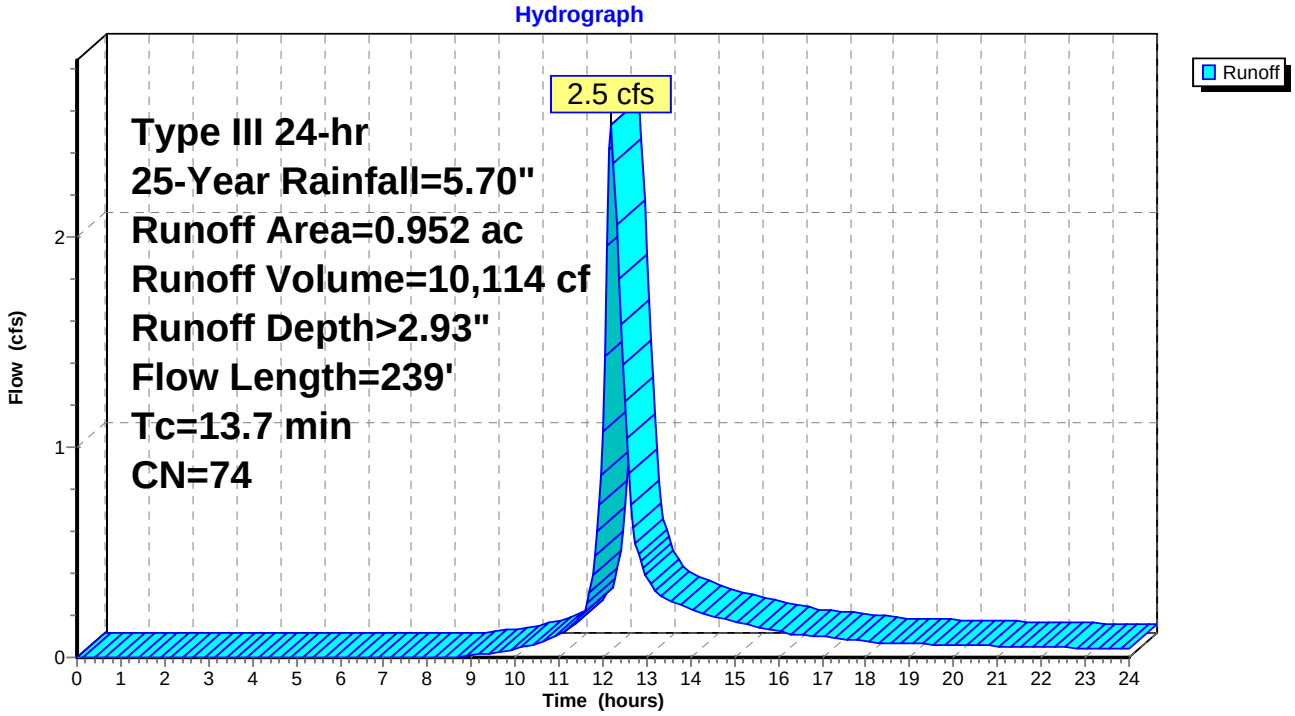
Runoff = 2.5 cfs @ 12.19 hrs, Volume= 10,114 cf, Depth> 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (ac)	CN	Description
0.952	74	>75% Grass cover, Good, HSG C
0.952		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0251	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.5	66	0.1137	2.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	46	0.1957	3.10		**Shallow Concentrated Flow, Lanfill Cap** Short Grass Pasture Kv= 7.0 fps
0.4	27	0.0050	1.14		**Shallow Concentrated Flow, Access Drive** Unpaved Kv= 16.1 fps
13.7	239	Total			

Subcatchment 1S: Bulky Waste Landfill SW



Summary for Subcatchment 2S: Bulky Waste Landfill NW

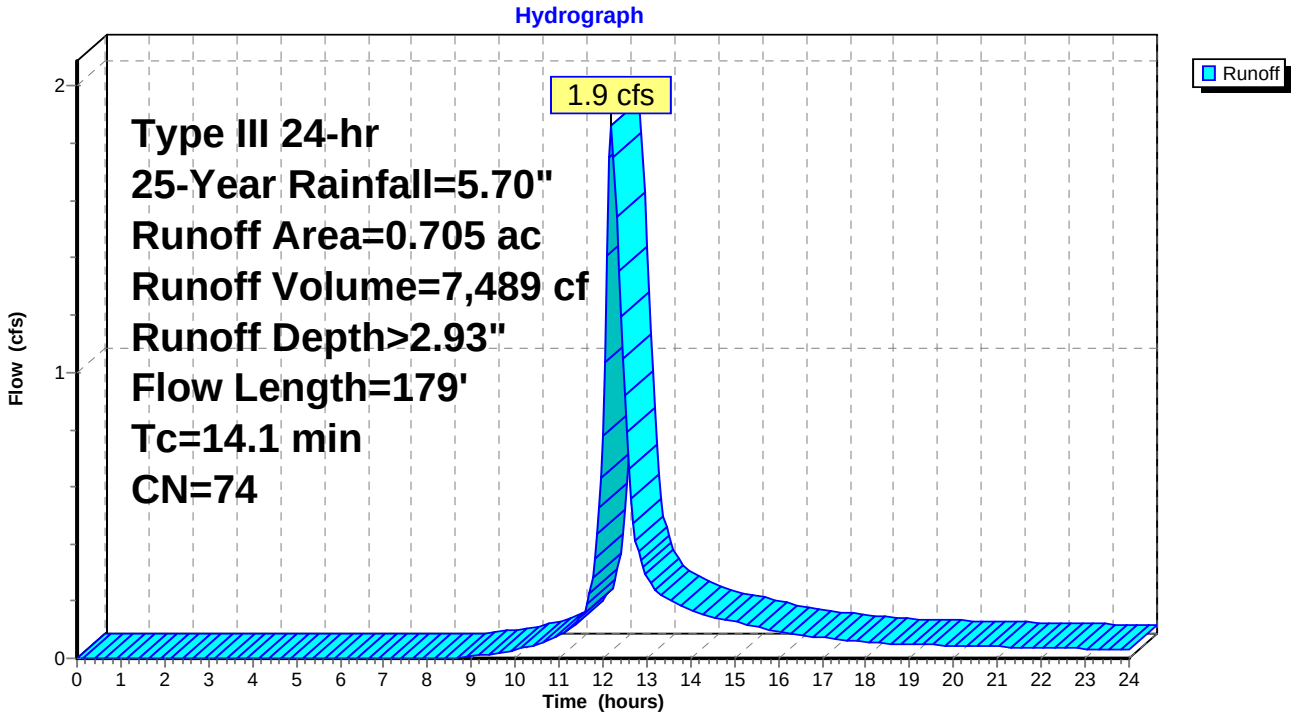
Runoff = 1.9 cfs @ 12.20 hrs, Volume= 7,489 cf, Depth> 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (ac)	CN	Description
0.705	74	>75% Grass cover, Good, HSG C
0.705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.6	79	0.0886	2.08		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.1	179	Total			

Subcatchment 2S: Bulky Waste Landfill NW



Summary for Subcatchment 3S: Bulky Waste Landfill E

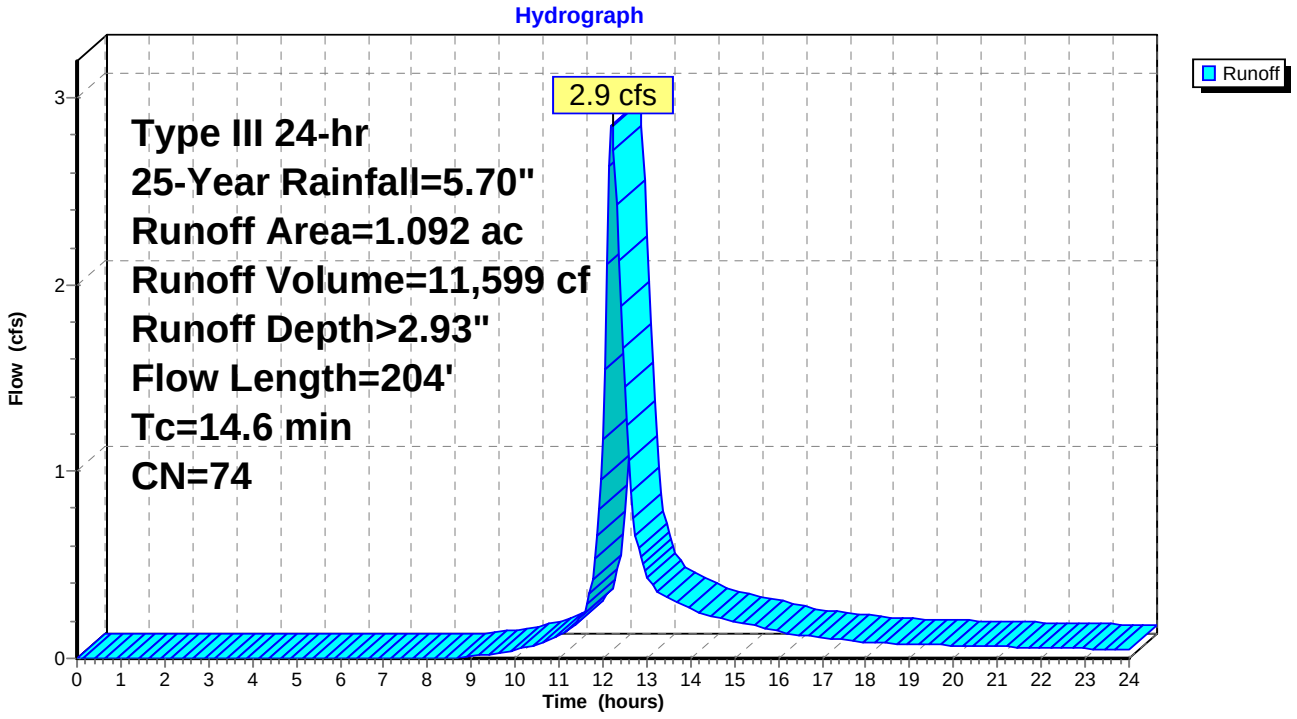
Runoff = 2.9 cfs @ 12.21 hrs, Volume= 11,599 cf, Depth> 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (ac)	CN	Description
1.092	74	>75% Grass cover, Good, HSG C
1.092		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.1	24	0.1667	2.86		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.6	204	Total			

Subcatchment 3S: Bulky Waste Landfill E



Summary for Subcatchment 4S: Landfill N

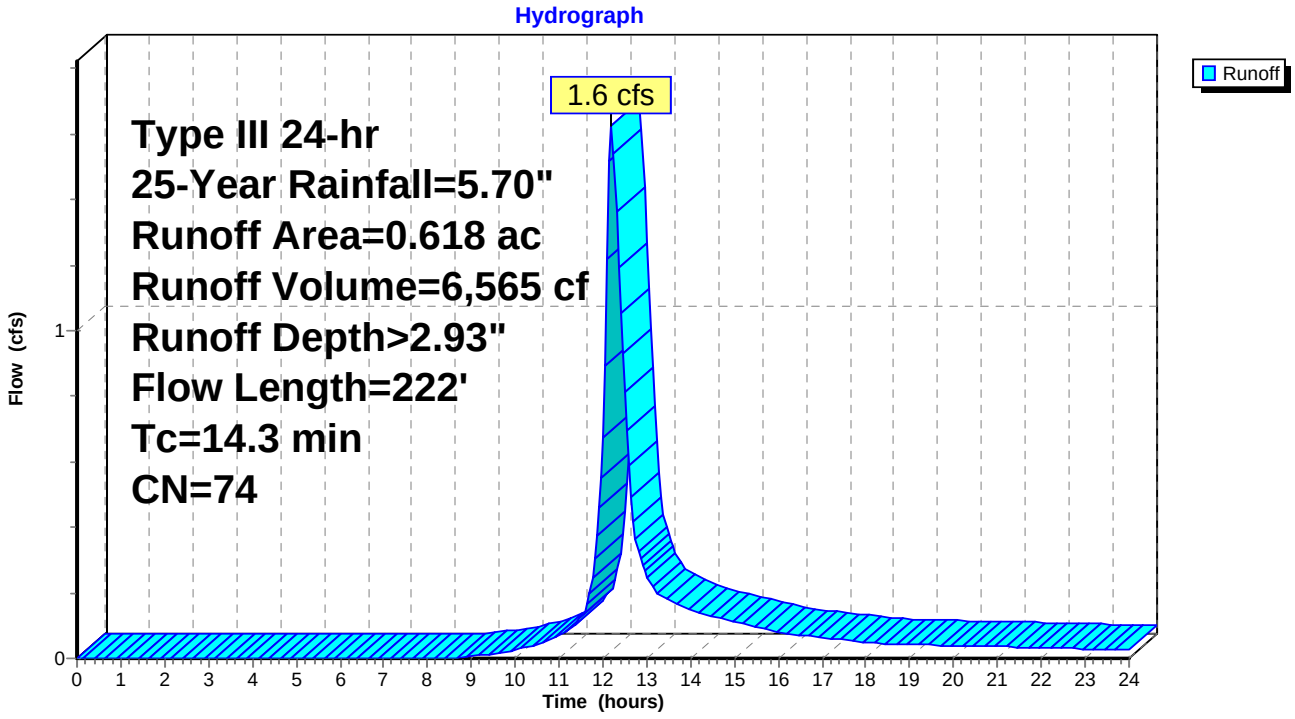
Runoff = 1.6 cfs @ 12.20 hrs, Volume= 6,565 cf, Depth> 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (ac)	CN	Description
0.618	74	>75% Grass cover, Good, HSG C
0.618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0230	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	81	0.0371	1.35		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	41	0.1707	2.89		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.3	222	Total			

Subcatchment 4S: Landfill N



Summary for Subcatchment 5S: Landfill W

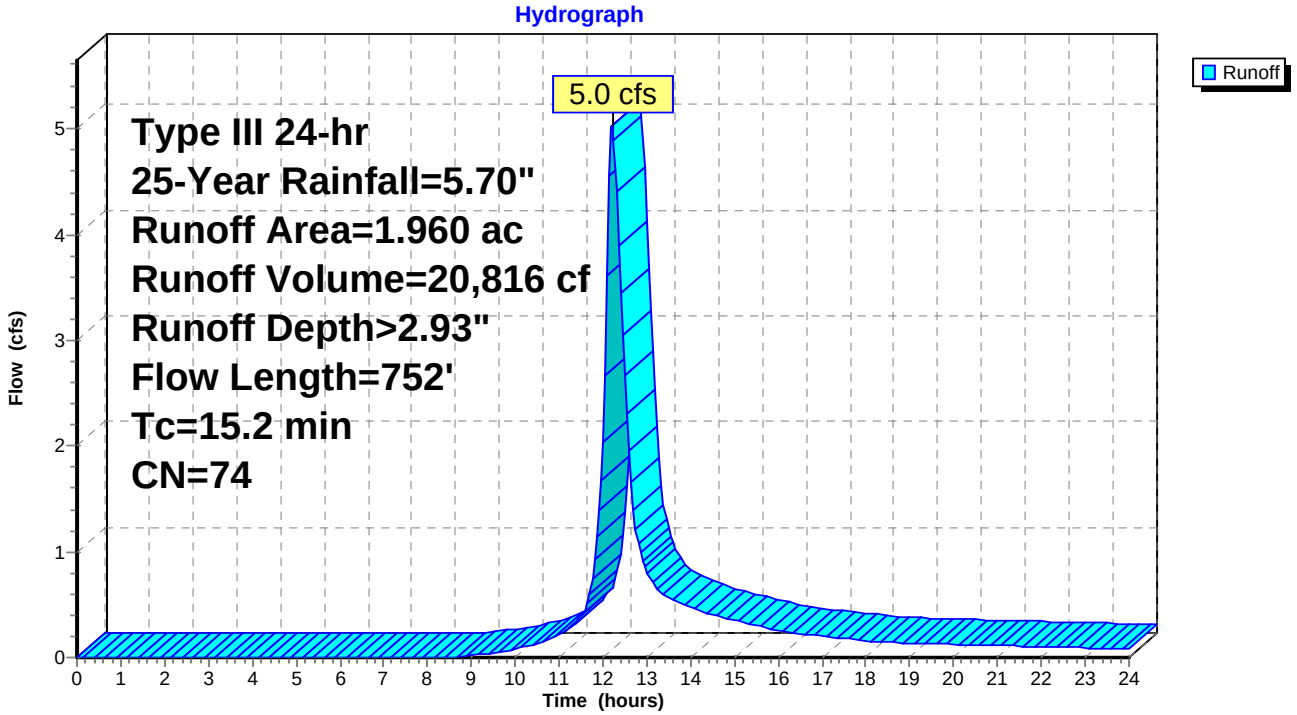
Runoff = 5.0 cfs @ 12.21 hrs, Volume= 20,816 cf, Depth> 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (ac)	CN	Description
1.960	74	>75% Grass cover, Good, HSG C
1.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0220	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.3	37	0.0811	1.99		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.3	58	0.1897	3.05		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
1.3	520	0.0200	6.71	50.33	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
0.0	37	0.2160	22.05	165.39	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
15.2	752	Total			

Subcatchment 5S: Landfill W



Summary for Subcatchment 6S: Landfill E

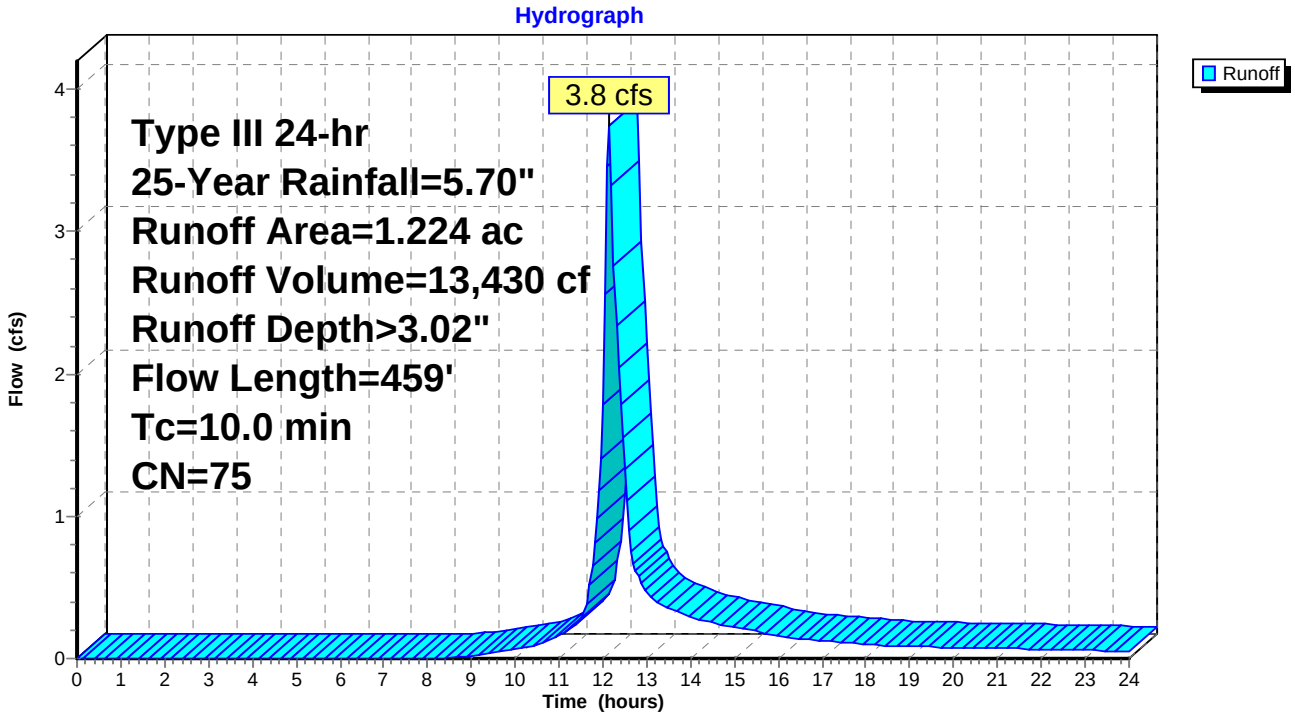
Runoff = 3.8 cfs @ 12.15 hrs, Volume= 13,430 cf, Depth> 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (ac)	CN	Description
1.134	74	>75% Grass cover, Good, HSG C
0.090	89	Gravel roads, HSG C
1.224	75	Weighted Average
1.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	40	0.0543	0.15		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	60	0.0117	1.03		**Sheet Flow, Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.5	86	0.0384	3.15		**Shallow Concentrated Flow, Gravel** Unpaved Kv= 16.1 fps
0.7	76	0.0658	1.80		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	49	0.2245	3.32		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	148	0.1081	15.60	117.00	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
7.1	459	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: Landfill E



Summary for Subcatchment 7S: Green Field W

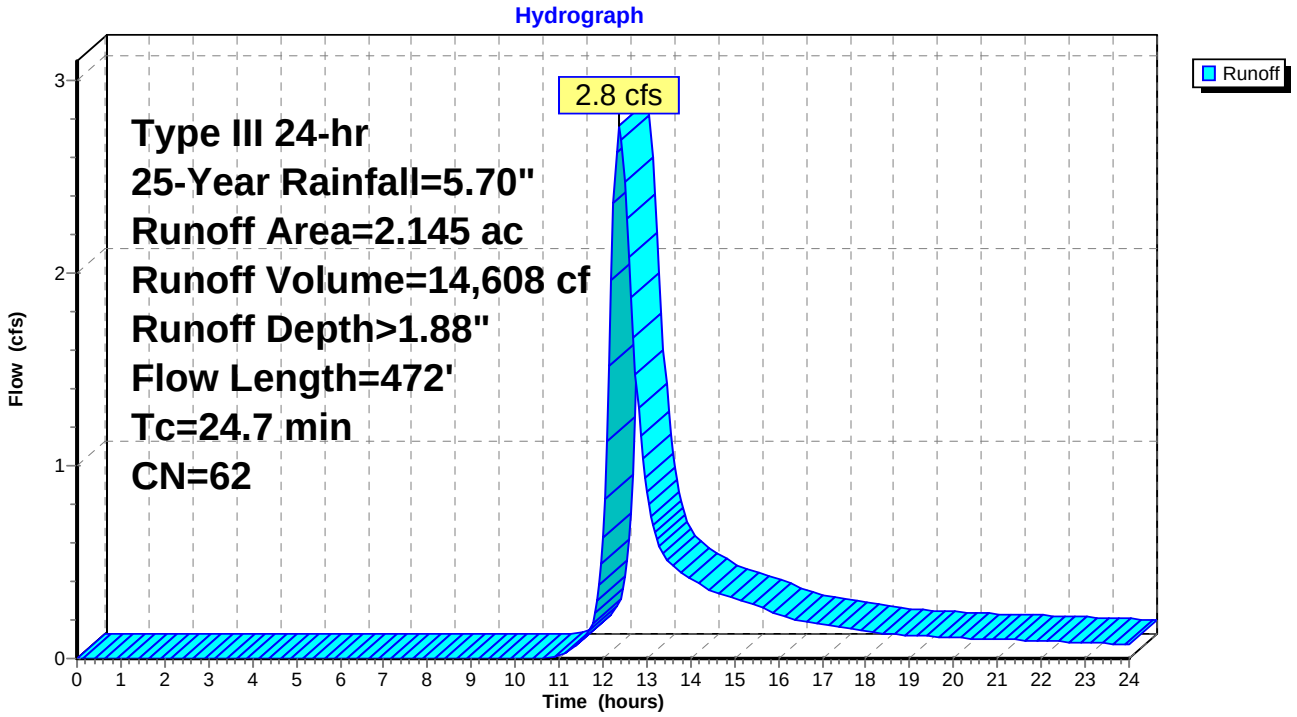
Runoff = 2.8 cfs @ 12.37 hrs, Volume= 14,608 cf, Depth> 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (ac)	CN	Description
0.022	74	>75% Grass cover, Good, HSG C
0.089	80	>75% Grass cover, Good, HSG D
0.282	61	>75% Grass cover, Good, HSG B
1.752	61	>75% Grass cover, Good, HSG B
2.145	62	Weighted Average
2.145		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	23	0.0217	1.03		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
4.8	160	0.0063	0.56		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.6	51	0.0392	1.39		**Shallow Concentrated Flow, field** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.7	50	0.0300	1.21		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
24.7	472	Total			

Subcatchment 7S: Green Field W



Summary for Subcatchment 8S: Green Field E

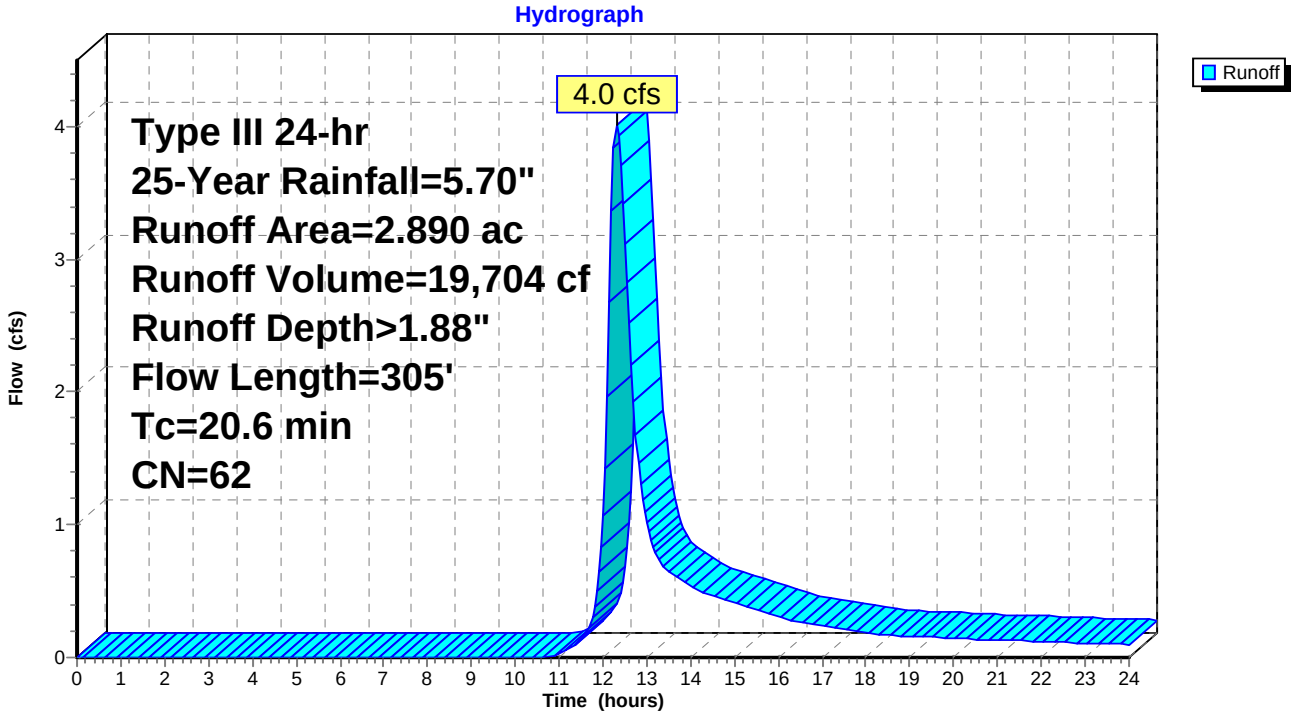
Runoff = 4.0 cfs @ 12.31 hrs, Volume= 19,704 cf, Depth> 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (ac)	CN	Description
2.685	61	>75% Grass cover, Good, HSG B
0.072	80	>75% Grass cover, Good, HSG D
0.033	80	>75% Grass cover, Good, HSG D
0.100	61	>75% Grass cover, Good, HSG B
2.890	62	Weighted Average
2.890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	24	0.0208	1.01		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
2.6	106	0.0094	0.68		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.8	75	0.0467	1.51		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
20.6	305	Total			

Subcatchment 8S: Green Field E



Summary for Subcatchment 9S: Greenfield 2

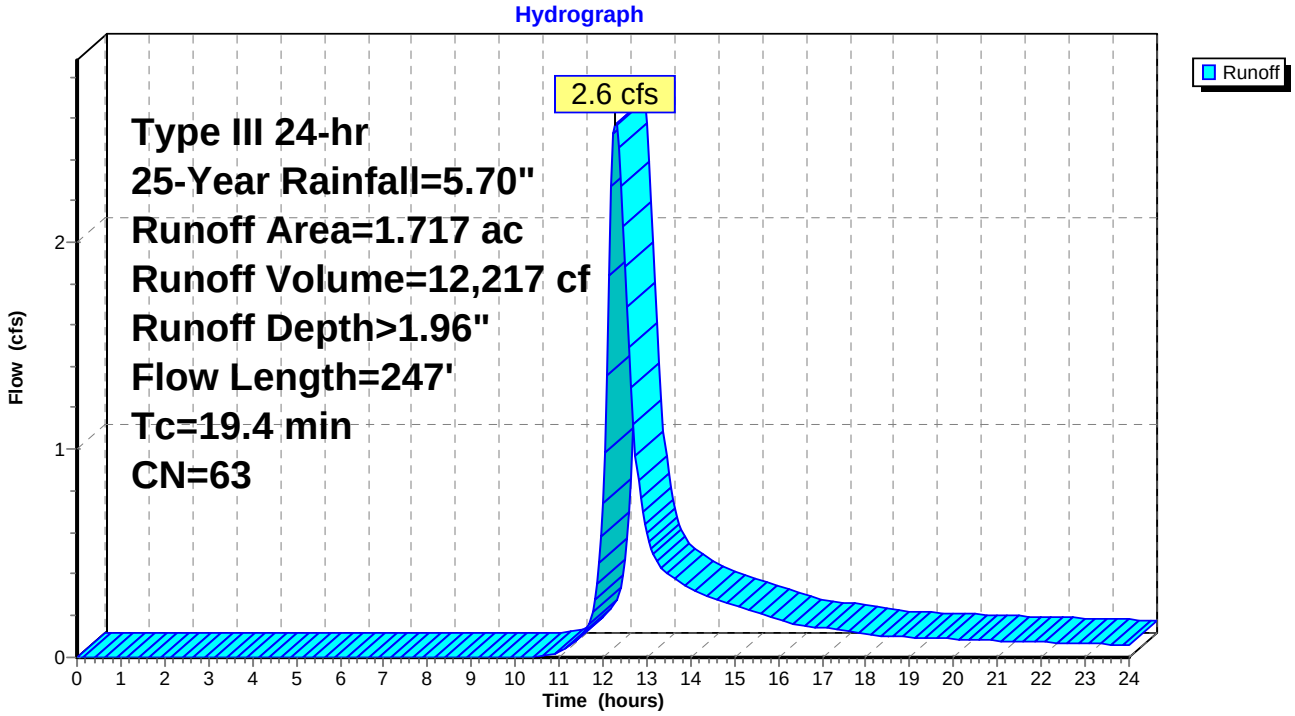
Runoff = 2.6 cfs @ 12.29 hrs, Volume= 12,217 cf, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (ac)	CN	Description
0.091	77	Woods, Good, HSG D
0.151	55	Woods, Good, HSG B
1.288	61	>75% Grass cover, Good, HSG B
0.187	80	>75% Grass cover, Good, HSG D
1.717	63	Weighted Average
1.717		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0128	0.10		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.40"
2.9	147	0.0148	0.85		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
19.4	247	Total			

Subcatchment 9S: Greenfield 2



Summary for Reach 19R: Riprap Swale

Inflow Area = 85,378 sf, 0.00% Impervious, Inflow Depth > 2.93" for 25-Year event
Inflow = 5.0 cfs @ 12.21 hrs, Volume= 20,816 cf
Outflow = 4.9 cfs @ 12.26 hrs, Volume= 20,755 cf, Atten= 3%, Lag= 2.5 min

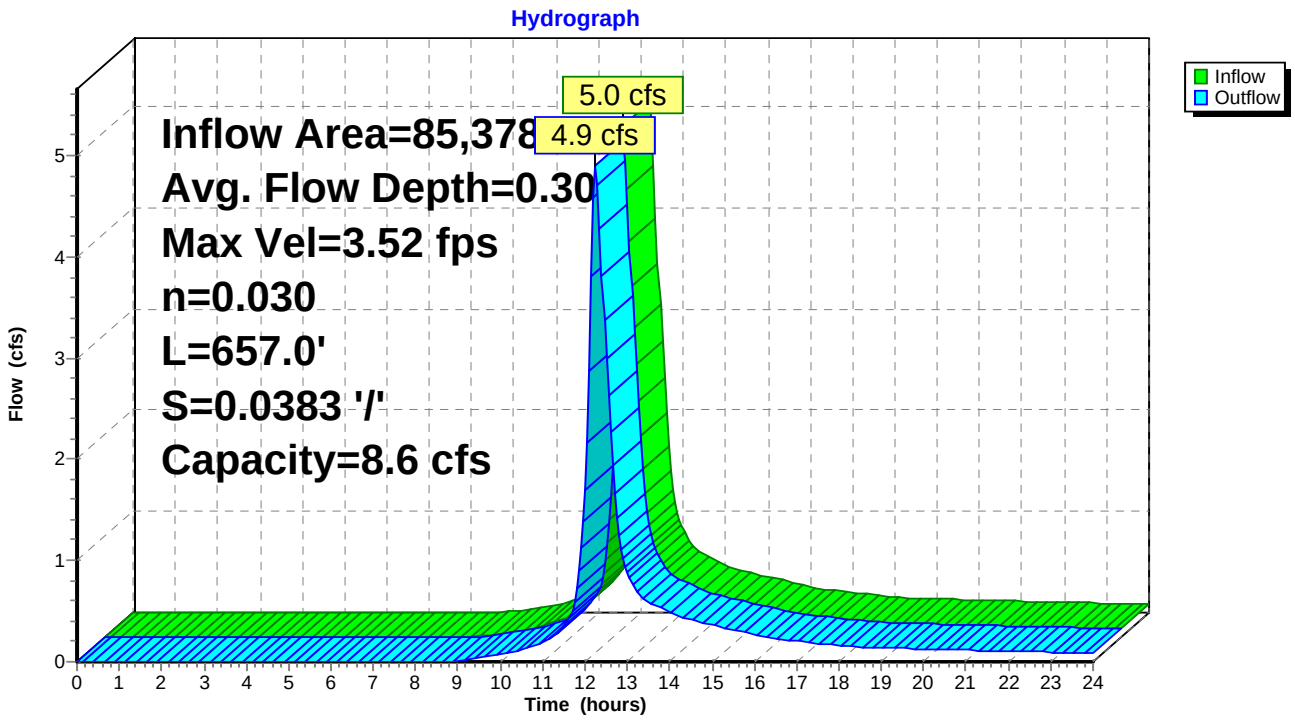
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.52 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 1.27 fps, Avg. Travel Time= 8.6 min

Peak Storage= 912 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 0.40' Flow Area= 2.1 sf, Capacity= 8.6 cfs

3.00' x 0.40' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 5.5 '/' Top Width= 7.40'
Length= 657.0' Slope= 0.0383 '/'
Inlet Invert= 274.52', Outlet Invert= 249.36'



‡



Summary for Reach 21R: Riprap Swale

Inflow Area = 53,317 sf, 0.00% Impervious, Inflow Depth > 3.02" for 25-Year event
Inflow = 3.8 cfs @ 12.15 hrs, Volume= 13,430 cf
Outflow = 3.6 cfs @ 12.17 hrs, Volume= 13,394 cf, Atten= 3%, Lag= 1.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.46 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 1.11 fps, Avg. Travel Time= 7.9 min

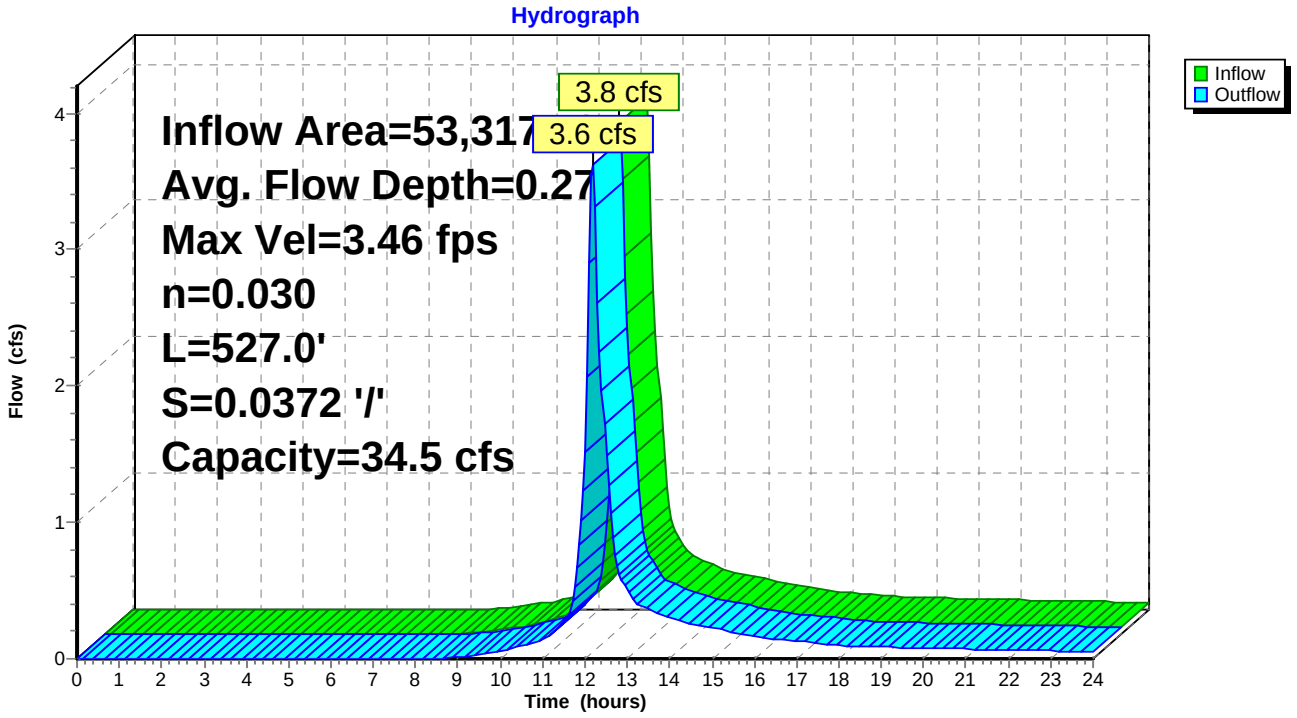
Peak Storage= 548 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 0.90' Flow Area= 5.1 sf, Capacity= 34.5 cfs

3.00' x 0.90' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 3.0 '/' Top Width= 8.40'
Length= 527.0' Slope= 0.0372 '/'
Inlet Invert= 276.70', Outlet Invert= 257.10'



‡

Reach 21R: Riprap Swale

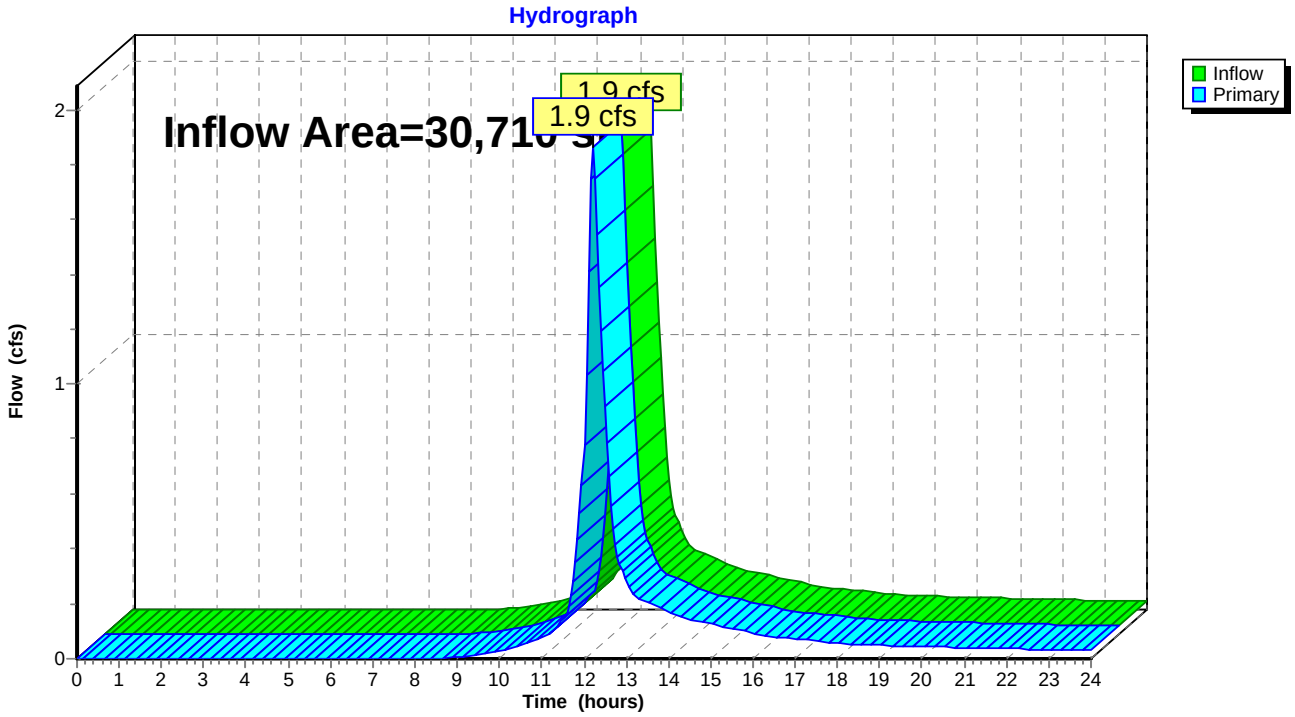


Summary for Link 7L: Wetlands NW

Inflow Area = 30,710 sf, 0.00% Impervious, Inflow Depth > 2.93" for 25-Year event
Inflow = 1.9 cfs @ 12.20 hrs, Volume= 7,489 cf
Primary = 1.9 cfs @ 12.20 hrs, Volume= 7,489 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 7L: Wetlands NW

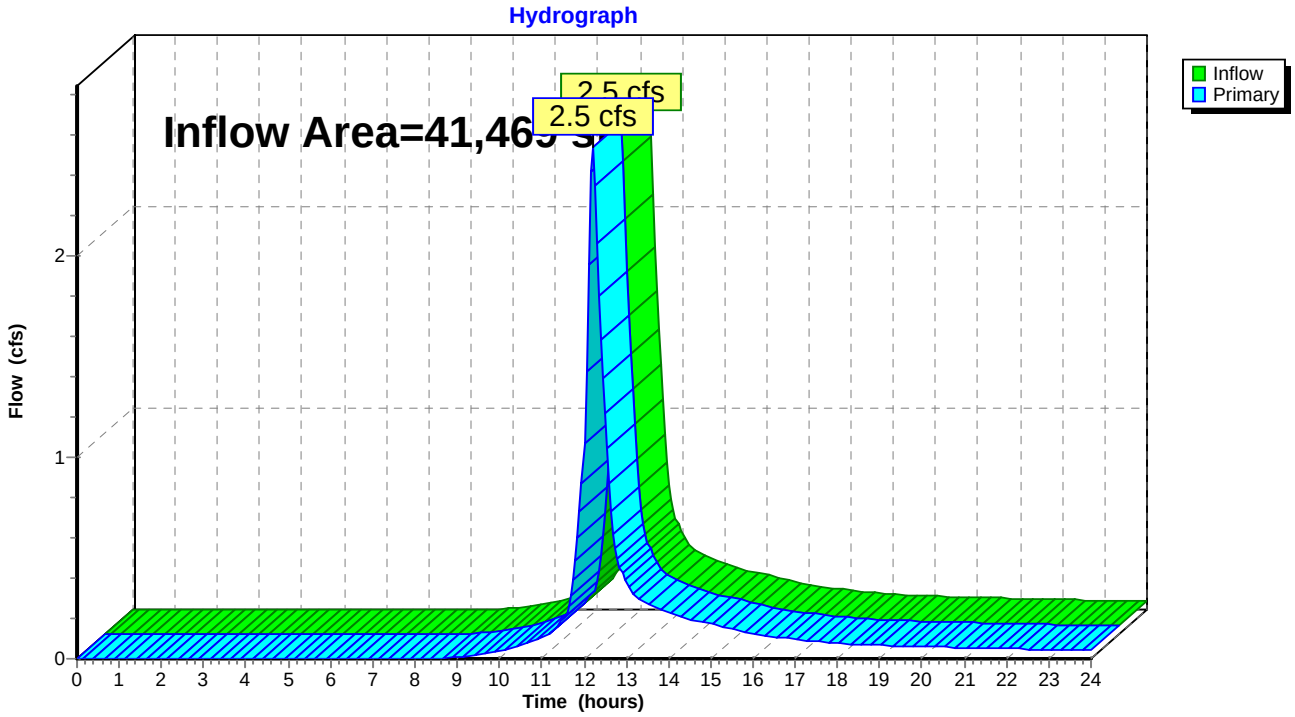


Summary for Link 8L: Depression S

Inflow Area = 41,469 sf, 0.00% Impervious, Inflow Depth > 2.93" for 25-Year event
Inflow = 2.5 cfs @ 12.19 hrs, Volume= 10,114 cf
Primary = 2.5 cfs @ 12.19 hrs, Volume= 10,114 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 8L: Depression S

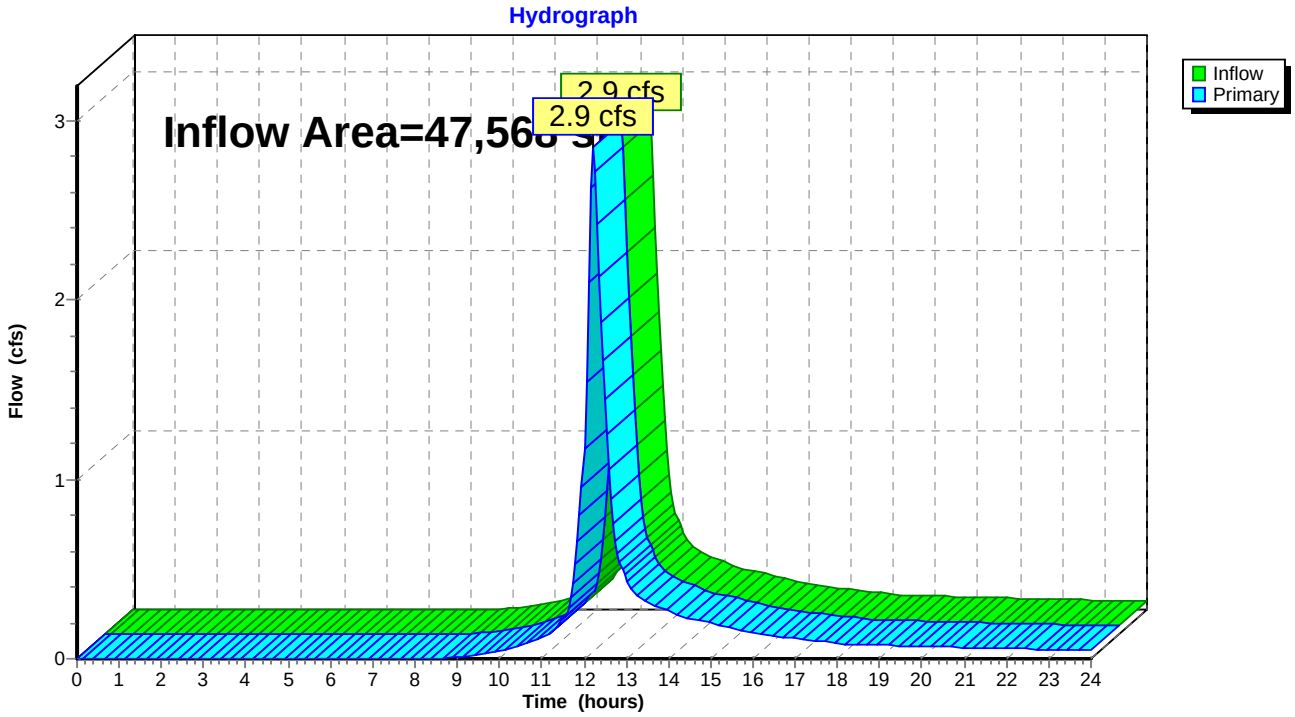


Summary for Link 9L: Wetlands NE

Inflow Area = 47,568 sf, 0.00% Impervious, Inflow Depth > 2.93" for 25-Year event
Inflow = 2.9 cfs @ 12.21 hrs, Volume= 11,599 cf
Primary = 2.9 cfs @ 12.21 hrs, Volume= 11,599 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 9L: Wetlands NE

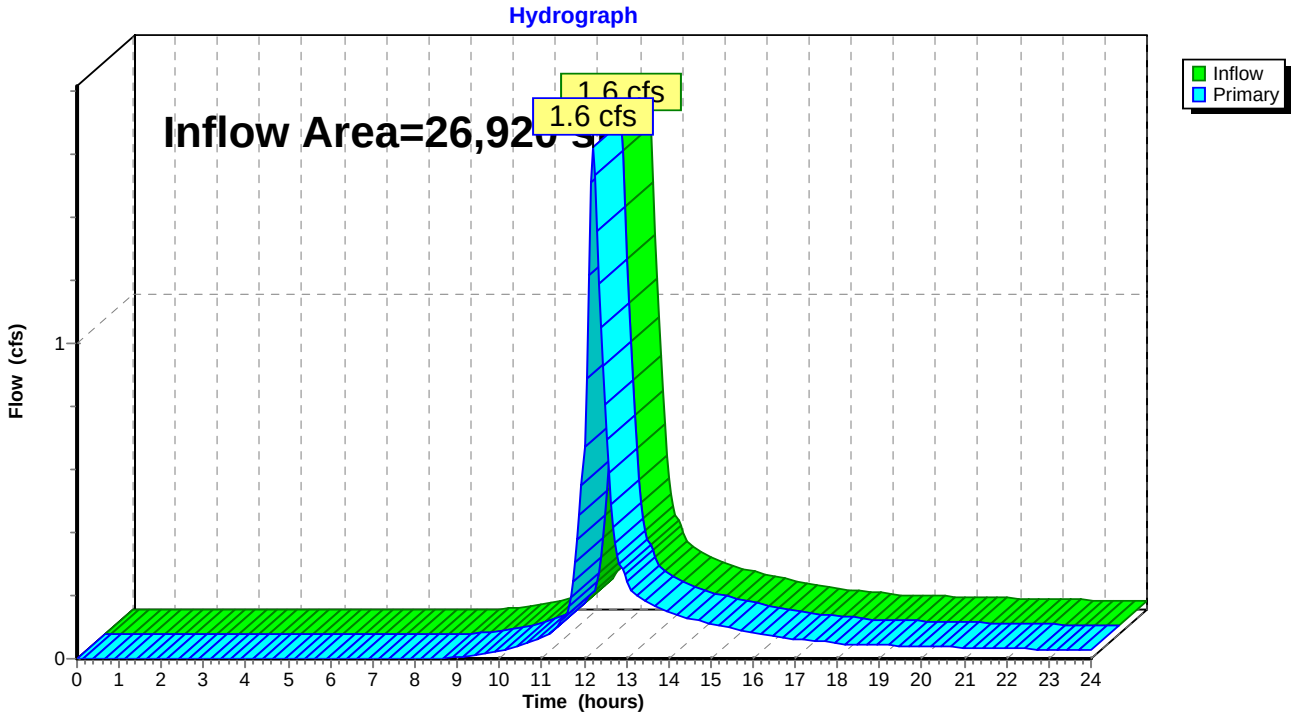


Summary for Link 10L: Wetlands N

Inflow Area = 26,920 sf, 0.00% Impervious, Inflow Depth > 2.93" for 25-Year event
Inflow = 1.6 cfs @ 12.20 hrs, Volume= 6,565 cf
Primary = 1.6 cfs @ 12.20 hrs, Volume= 6,565 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 10L: Wetlands N

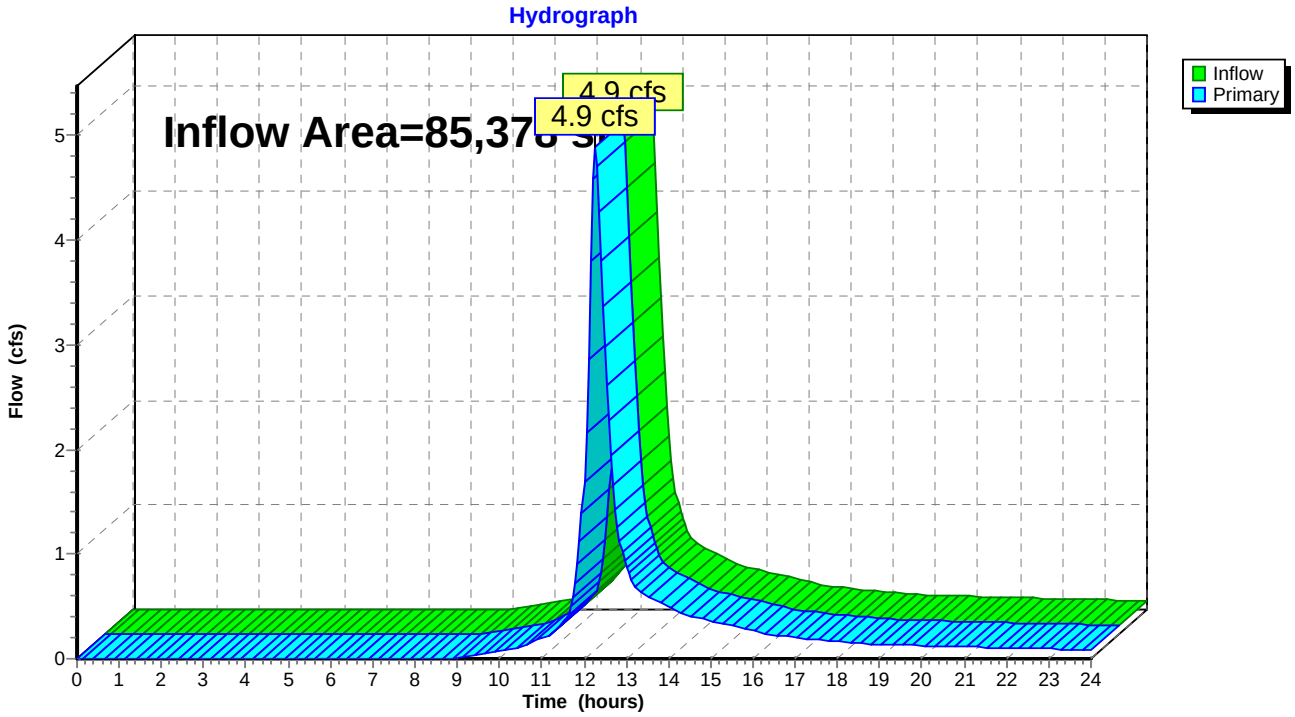


Summary for Link 11L: Collection Swale W

Inflow Area = 85,378 sf, 0.00% Impervious, Inflow Depth > 2.92" for 25-Year event
Inflow = 4.9 cfs @ 12.26 hrs, Volume= 20,755 cf
Primary = 4.9 cfs @ 12.26 hrs, Volume= 20,755 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 11L: Collection Swale W

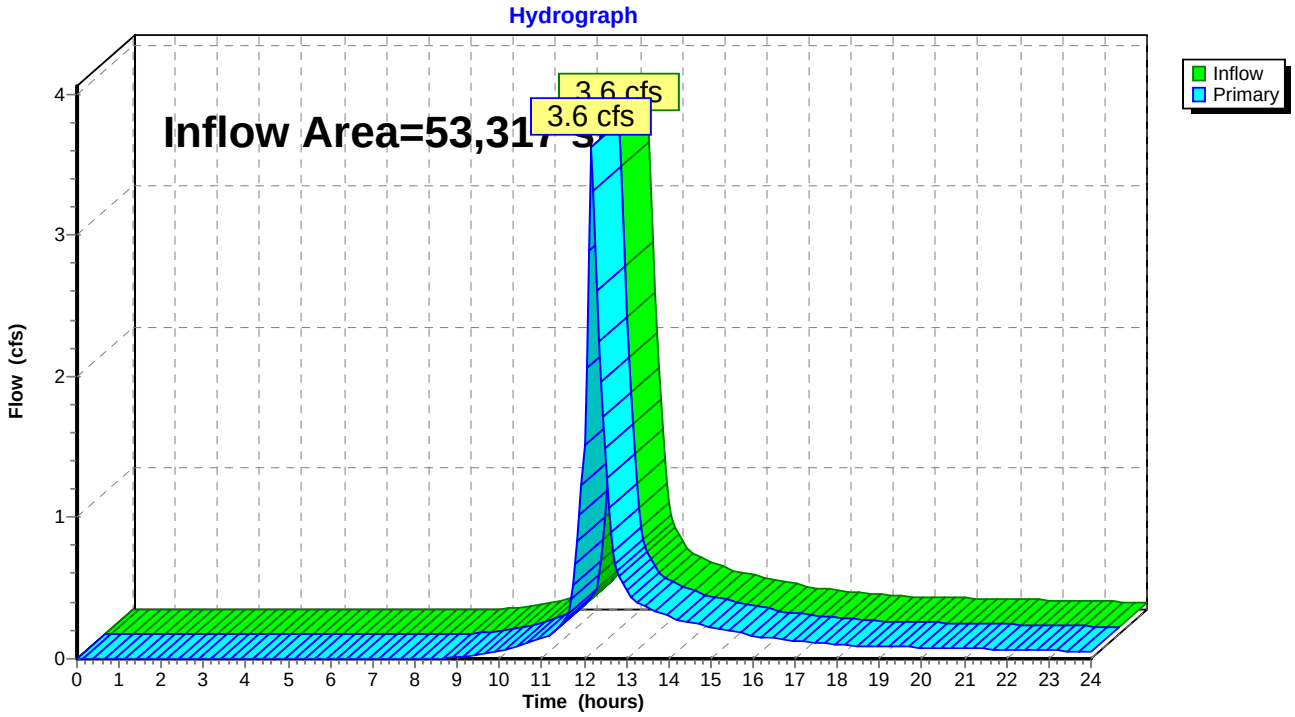


Summary for Link 12L: Collection Swale W

Inflow Area = 53,317 sf, 0.00% Impervious, Inflow Depth > 3.01" for 25-Year event
Inflow = 3.6 cfs @ 12.17 hrs, Volume= 13,394 cf
Primary = 3.6 cfs @ 12.17 hrs, Volume= 13,394 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 12L: Collection Swale W

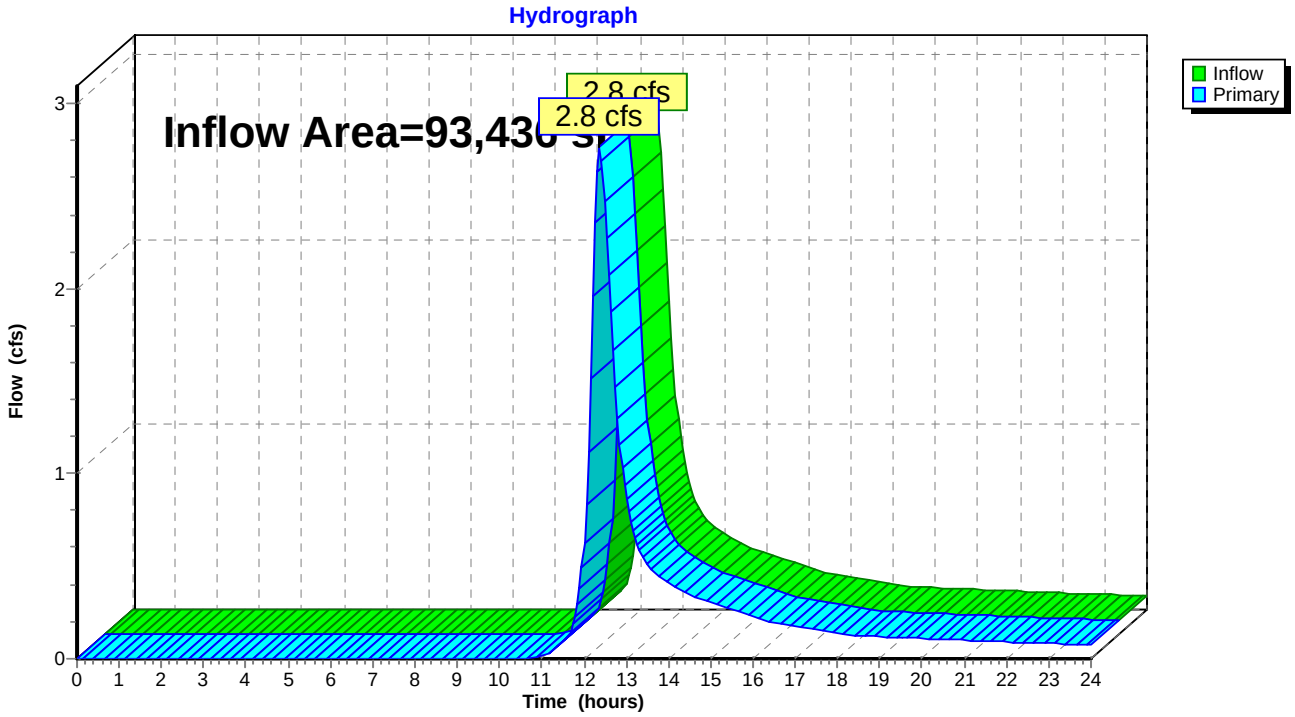


Summary for Link 15L: Wetland W

Inflow Area = 93,436 sf, 0.00% Impervious, Inflow Depth > 1.88" for 25-Year event
Inflow = 2.8 cfs @ 12.37 hrs, Volume= 14,608 cf
Primary = 2.8 cfs @ 12.37 hrs, Volume= 14,608 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 15L: Wetland W

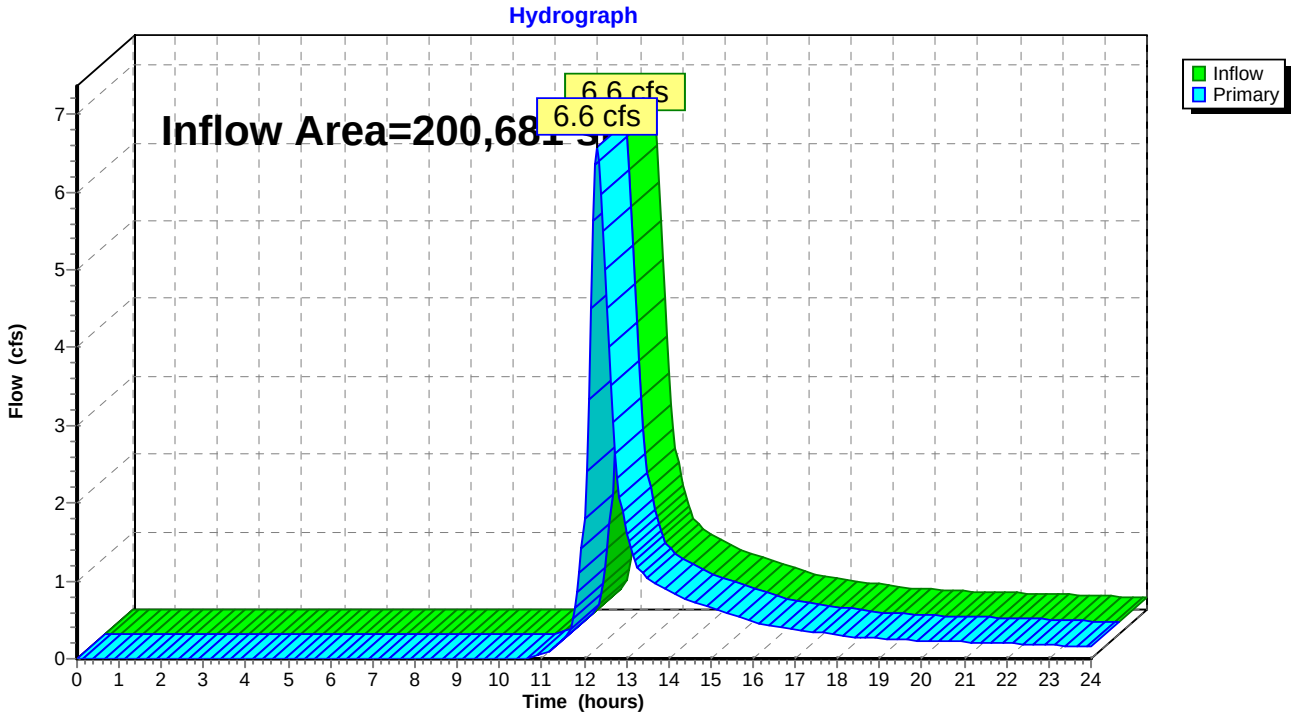


Summary for Link 16L: Wetland E

Inflow Area = 200,681 sf, 0.00% Impervious, Inflow Depth > 1.91" for 25-Year event
Inflow = 6.6 cfs @ 12.30 hrs, Volume= 31,922 cf
Primary = 6.6 cfs @ 12.30 hrs, Volume= 31,922 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 16L: Wetland E



Time span=0.00-24.00 hrs, dt=0.050 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Bulky Waste Landfill SW Runoff Area=0.952 ac 0.00% Impervious Runoff Depth>3.43"
Flow Length=239' Tc=13.7 min CN=74 Runoff=3.0 cfs 11,854 cf

Subcatchment 2S: Bulky Waste Landfill NW Runoff Area=0.705 ac 0.00% Impervious Runoff Depth>3.43"
Flow Length=179' Tc=14.1 min CN=74 Runoff=2.2 cfs 8,777 cf

Subcatchment 3S: Bulky Waste Landfill E Runoff Area=1.092 ac 0.00% Impervious Runoff Depth>3.43"
Flow Length=204' Tc=14.6 min CN=74 Runoff=3.3 cfs 13,594 cf

Subcatchment 4S: Landfill N Runoff Area=0.618 ac 0.00% Impervious Runoff Depth>3.43"
Flow Length=222' Tc=14.3 min CN=74 Runoff=1.9 cfs 7,694 cf

Subcatchment 5S: Landfill W Runoff Area=1.960 ac 0.00% Impervious Runoff Depth>3.43"
Flow Length=752' Tc=15.2 min CN=74 Runoff=5.9 cfs 24,397 cf

Subcatchment 6S: Landfill E Runoff Area=1.224 ac 0.00% Impervious Runoff Depth>3.53"
Flow Length=459' Tc=10.0 min CN=75 Runoff=4.4 cfs 15,698 cf

Subcatchment 7S: Green Field W Runoff Area=2.145 ac 0.00% Impervious Runoff Depth>2.28"
Flow Length=472' Tc=24.7 min CN=62 Runoff=3.4 cfs 17,787 cf

Subcatchment 8S: Green Field E Runoff Area=2.890 ac 0.00% Impervious Runoff Depth>2.29"
Flow Length=305' Tc=20.6 min CN=62 Runoff=5.0 cfs 23,992 cf

Subcatchment 9S: Greenfield 2 Runoff Area=1.717 ac 0.00% Impervious Runoff Depth>2.38"
Flow Length=247' Tc=19.4 min CN=63 Runoff=3.2 cfs 14,820 cf

Reach 19R: Riprap Swale Avg. Flow Depth=0.33' Max Vel=3.69 fps Inflow=5.9 cfs 24,397 cf
n=0.030 L=657.0' S=0.0383 '/' Capacity=8.6 cfs Outflow=5.8 cfs 24,331 cf

Reach 21R: Riprap Swale Avg. Flow Depth=0.30' Max Vel=3.64 fps Inflow=4.4 cfs 15,698 cf
n=0.030 L=527.0' S=0.0372 '/' Capacity=34.5 cfs Outflow=4.3 cfs 15,659 cf

Link 7L: Wetlands NW Inflow=2.2 cfs 8,777 cf
Primary=2.2 cfs 8,777 cf

Link 8L: Depression S Inflow=3.0 cfs 11,854 cf
Primary=3.0 cfs 11,854 cf

Link 9L: Wetlands NE Inflow=3.3 cfs 13,594 cf
Primary=3.3 cfs 13,594 cf

Link 10L: Wetlands N Inflow=1.9 cfs 7,694 cf
Primary=1.9 cfs 7,694 cf

Link 11L: Collection Swale W Inflow=5.8 cfs 24,331 cf
Primary=5.8 cfs 24,331 cf

Link 12L: Collection Swale W Inflow=4.3 cfs 15,659 cf
Primary=4.3 cfs 15,659 cf

Link 15L: Wetland W Inflow=3.4 cfs 17,787 cf
Primary=3.4 cfs 17,787 cf

Link 16L: Wetland E Inflow=8.1 cfs 38,811 cf
Primary=8.1 cfs 38,811 cf

Total Runoff Area = 579,479 sf Runoff Volume = 138,613 cf Average Runoff Depth = 2.87"
100.00% Pervious = 579,479 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1S: Bulky Waste Landfill SW

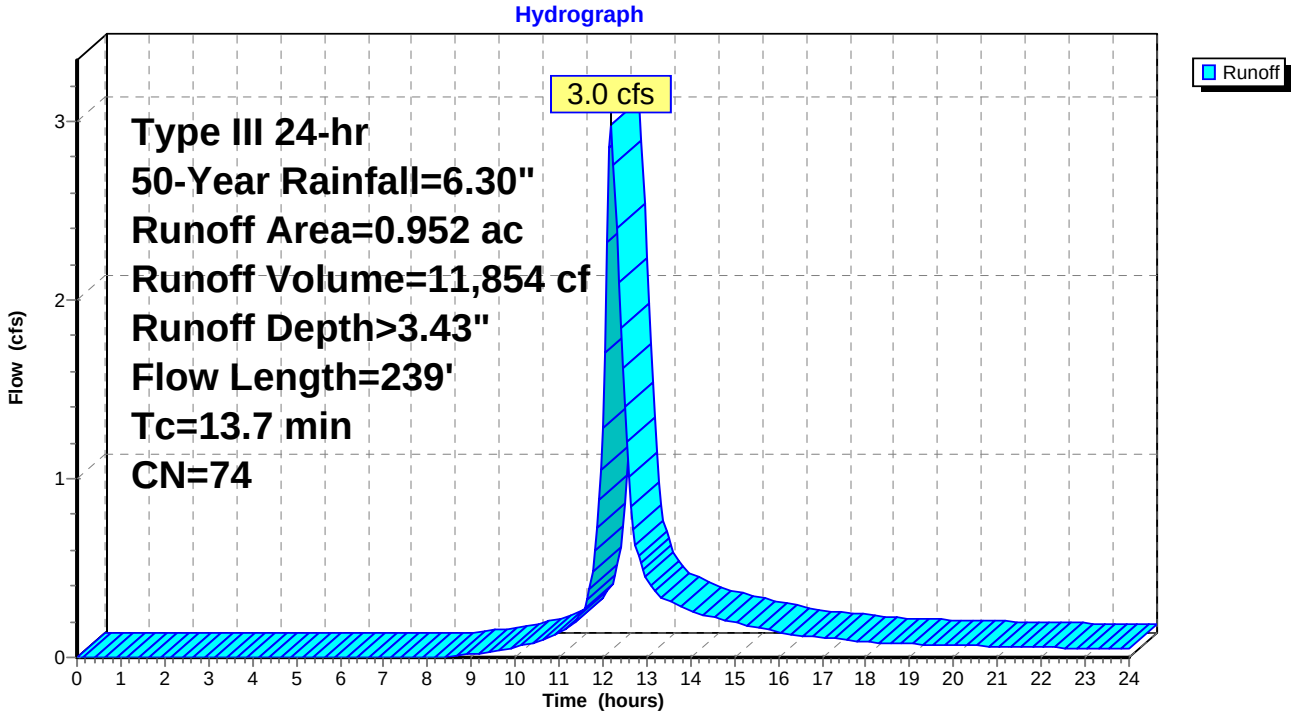
Runoff = 3.0 cfs @ 12.19 hrs, Volume= 11,854 cf, Depth> 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

Area (ac)	CN	Description
0.952	74	>75% Grass cover, Good, HSG C
0.952		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0251	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.5	66	0.1137	2.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	46	0.1957	3.10		**Shallow Concentrated Flow, Lanfill Cap** Short Grass Pasture Kv= 7.0 fps
0.4	27	0.0050	1.14		**Shallow Concentrated Flow, Access Drive** Unpaved Kv= 16.1 fps
13.7	239	Total			

Subcatchment 1S: Bulky Waste Landfill SW



Summary for Subcatchment 2S: Bulky Waste Landfill NW

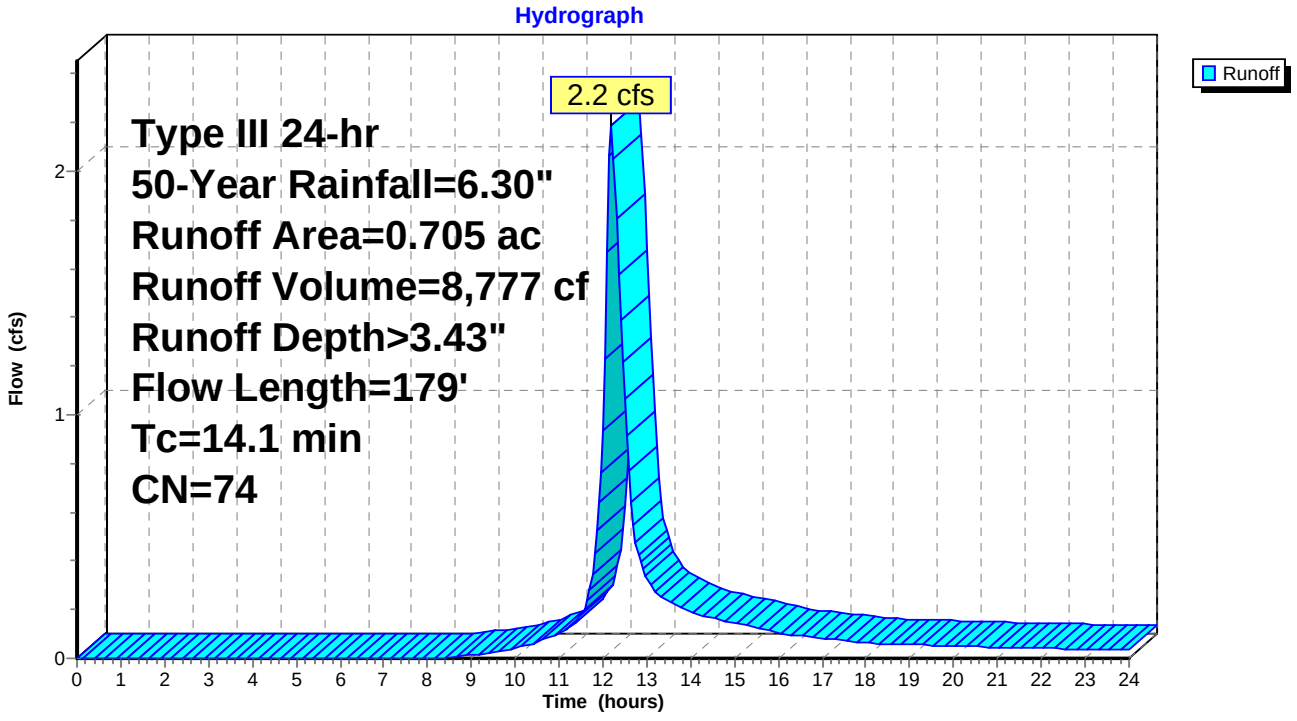
Runoff = 2.2 cfs @ 12.20 hrs, Volume= 8,777 cf, Depth> 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

Area (ac)	CN	Description
0.705	74	>75% Grass cover, Good, HSG C
0.705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.6	79	0.0886	2.08		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.1	179	Total			

Subcatchment 2S: Bulky Waste Landfill NW



Summary for Subcatchment 3S: Bulky Waste Landfill E

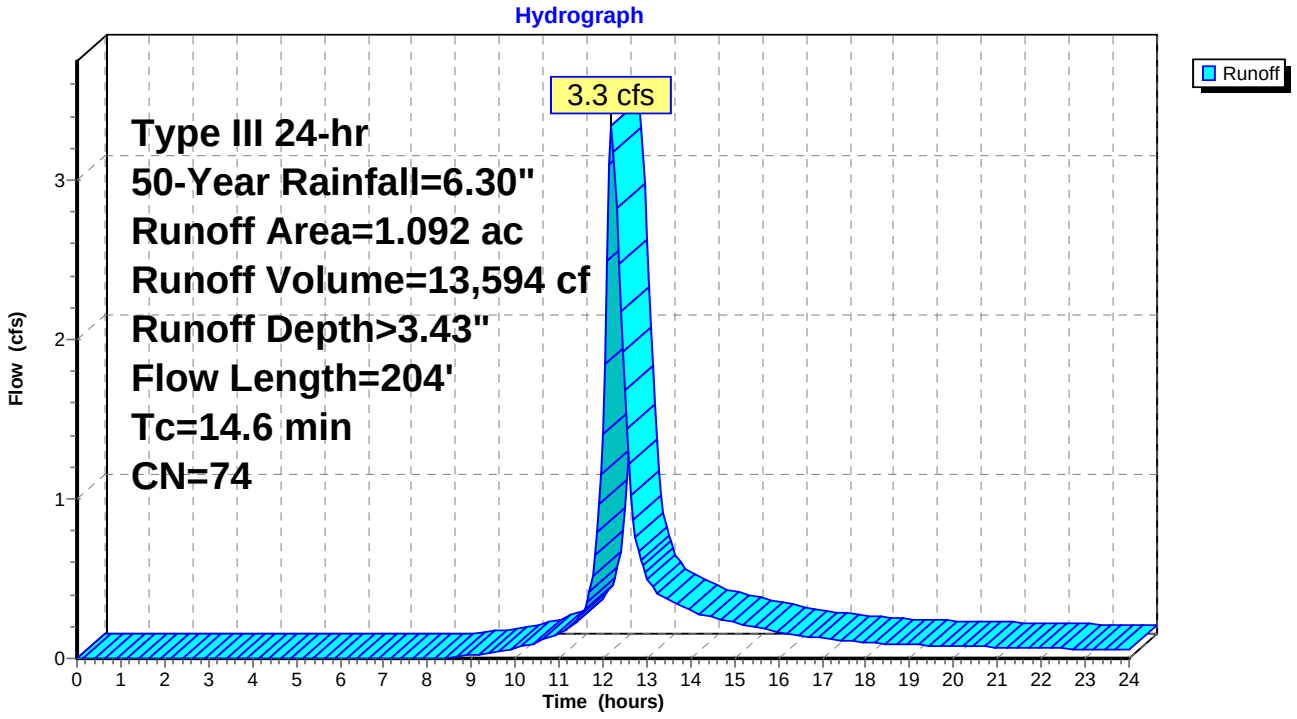
Runoff = 3.3 cfs @ 12.20 hrs, Volume= 13,594 cf, Depth> 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

Area (ac)	CN	Description
1.092	74	>75% Grass cover, Good, HSG C
1.092		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.1	24	0.1667	2.86		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.6	204	Total			

Subcatchment 3S: Bulky Waste Landfill E



Summary for Subcatchment 4S: Landfill N

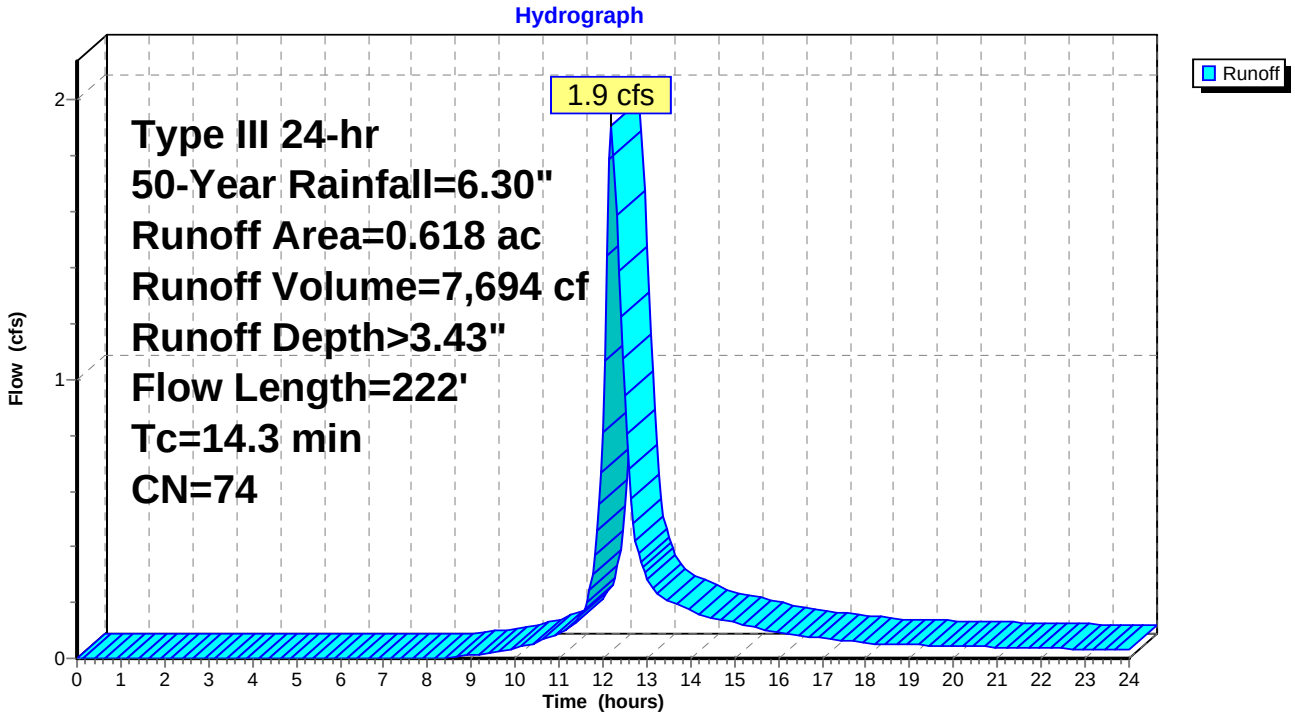
Runoff = 1.9 cfs @ 12.20 hrs, Volume= 7,694 cf, Depth> 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

Area (ac)	CN	Description
0.618	74	>75% Grass cover, Good, HSG C
0.618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0230	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	81	0.0371	1.35		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	41	0.1707	2.89		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.3	222	Total			

Subcatchment 4S: Landfill N



Summary for Subcatchment 5S: Landfill W

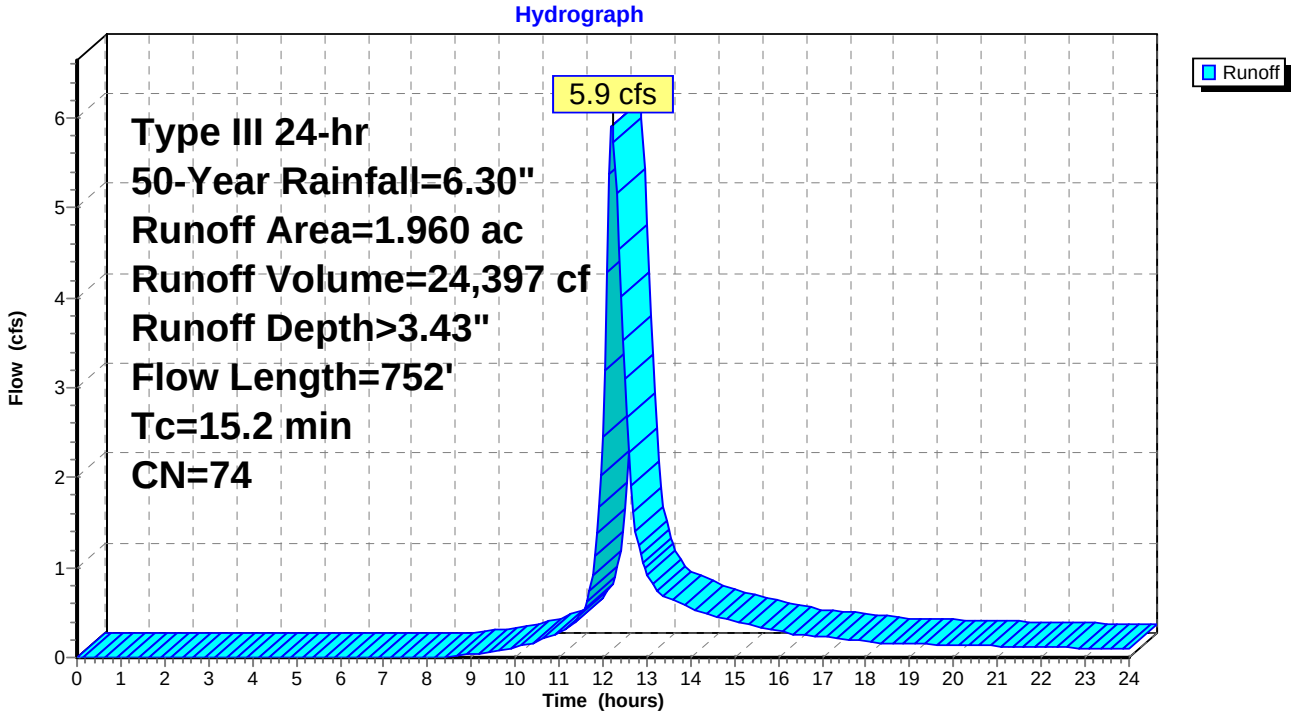
Runoff = 5.9 cfs @ 12.21 hrs, Volume= 24,397 cf, Depth> 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

Area (ac)	CN	Description
1.960	74	>75% Grass cover, Good, HSG C
1.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0220	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.3	37	0.0811	1.99		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.3	58	0.1897	3.05		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
1.3	520	0.0200	6.71	50.33	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
0.0	37	0.2160	22.05	165.39	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
15.2	752	Total			

Subcatchment 5S: Landfill W



Summary for Subcatchment 6S: Landfill E

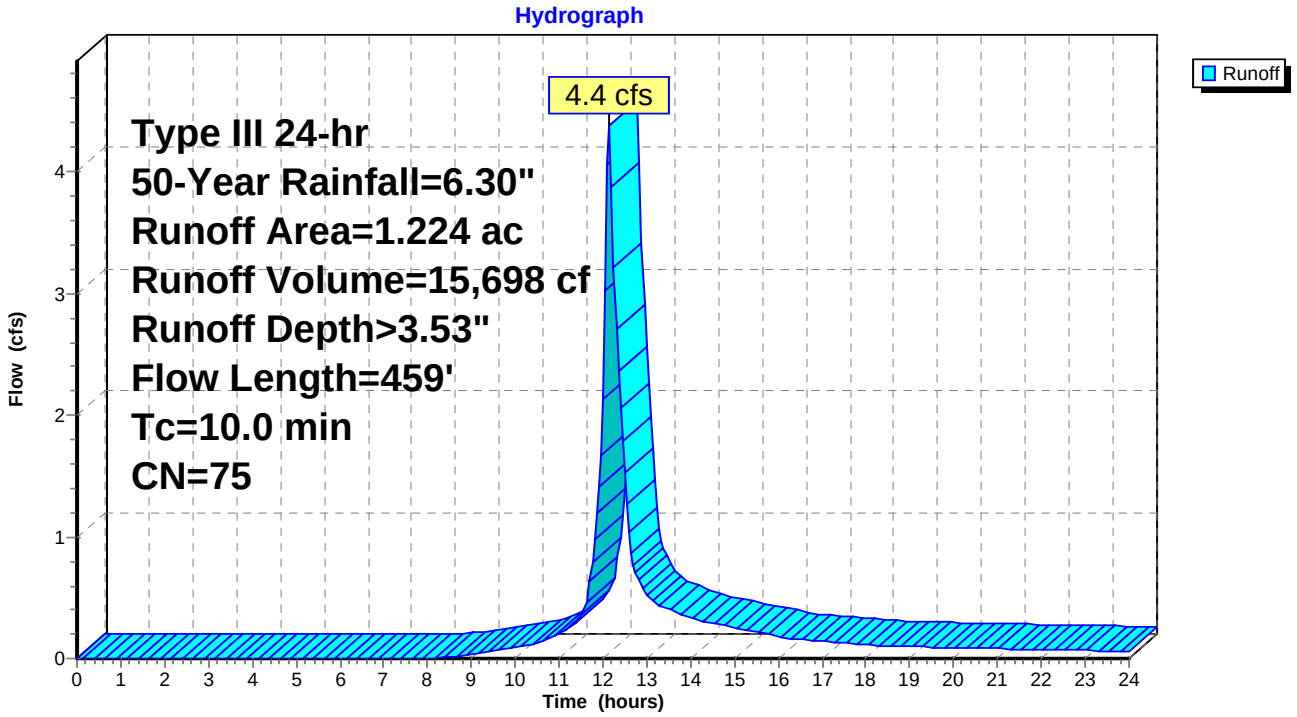
Runoff = 4.4 cfs @ 12.14 hrs, Volume= 15,698 cf, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

Area (ac)	CN	Description
1.134	74	>75% Grass cover, Good, HSG C
0.090	89	Gravel roads, HSG C
1.224	75	Weighted Average
1.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	40	0.0543	0.15		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	60	0.0117	1.03		**Sheet Flow, Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.5	86	0.0384	3.15		**Shallow Concentrated Flow, Gravel** Unpaved Kv= 16.1 fps
0.7	76	0.0658	1.80		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	49	0.2245	3.32		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	148	0.1081	15.60	117.00	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
7.1	459	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: Landfill E



Summary for Subcatchment 7S: Green Field W

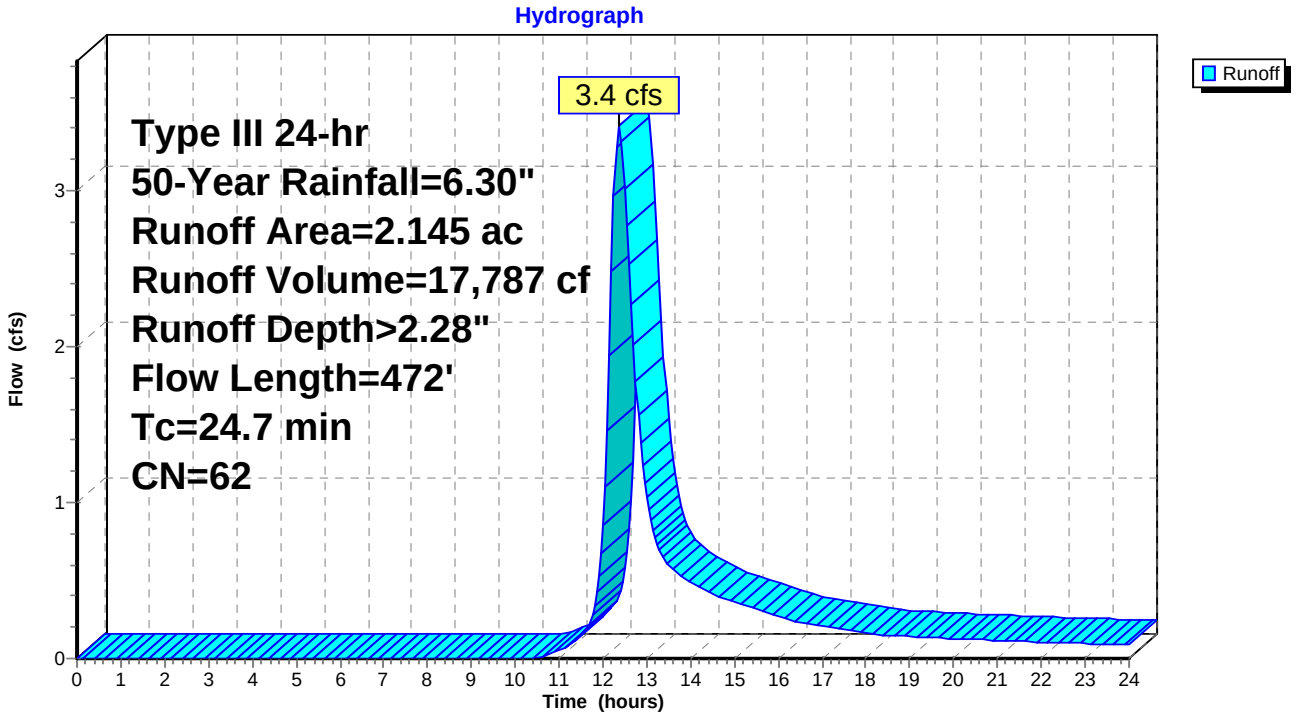
Runoff = 3.4 cfs @ 12.37 hrs, Volume= 17,787 cf, Depth> 2.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

Area (ac)	CN	Description
0.022	74	>75% Grass cover, Good, HSG C
0.089	80	>75% Grass cover, Good, HSG D
0.282	61	>75% Grass cover, Good, HSG B
1.752	61	>75% Grass cover, Good, HSG B
2.145	62	Weighted Average
2.145		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	23	0.0217	1.03		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
4.8	160	0.0063	0.56		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.6	51	0.0392	1.39		**Shallow Concentrated Flow, field** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.7	50	0.0300	1.21		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
24.7	472	Total			

Subcatchment 7S: Green Field W



Summary for Subcatchment 8S: Green Field E

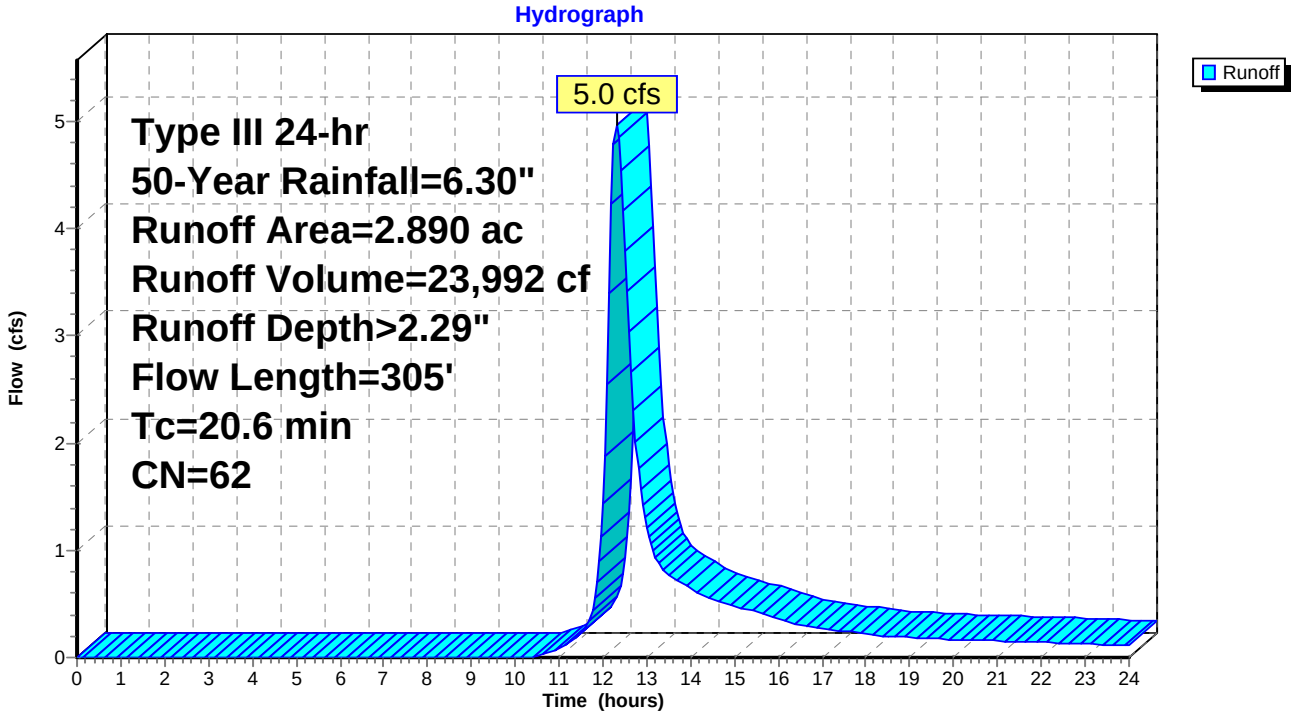
Runoff = 5.0 cfs @ 12.31 hrs, Volume= 23,992 cf, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

Area (ac)	CN	Description
2.685	61	>75% Grass cover, Good, HSG B
0.072	80	>75% Grass cover, Good, HSG D
0.033	80	>75% Grass cover, Good, HSG D
0.100	61	>75% Grass cover, Good, HSG B
2.890	62	Weighted Average
2.890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	24	0.0208	1.01		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
2.6	106	0.0094	0.68		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.8	75	0.0467	1.51		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
20.6	305	Total			

Subcatchment 8S: Green Field E



Summary for Subcatchment 9S: Greenfield 2

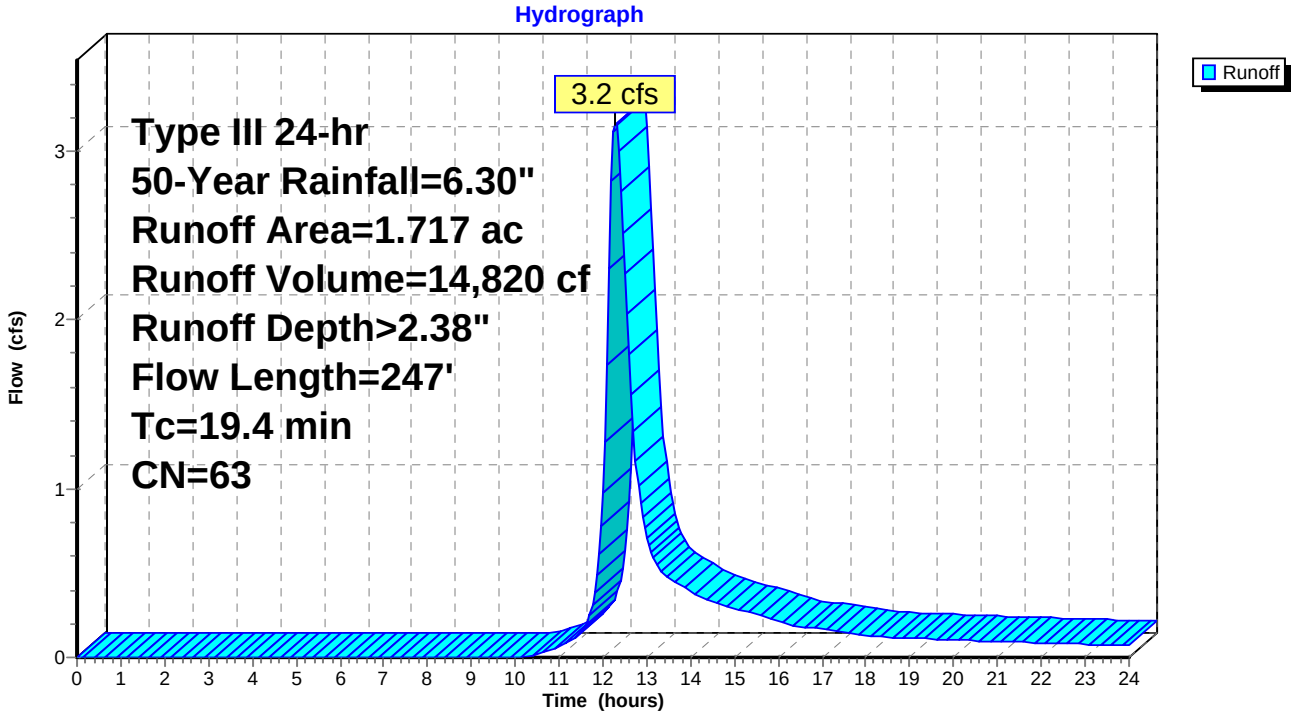
Runoff = 3.2 cfs @ 12.28 hrs, Volume= 14,820 cf, Depth> 2.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

Area (ac)	CN	Description
0.091	77	Woods, Good, HSG D
0.151	55	Woods, Good, HSG B
1.288	61	>75% Grass cover, Good, HSG B
0.187	80	>75% Grass cover, Good, HSG D
1.717	63	Weighted Average
1.717		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0128	0.10		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.40"
2.9	147	0.0148	0.85		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
19.4	247	Total			

Subcatchment 9S: Greenfield 2



Summary for Reach 19R: Riprap Swale

Inflow Area = 85,378 sf, 0.00% Impervious, Inflow Depth > 3.43" for 50-Year event
Inflow = 5.9 cfs @ 12.21 hrs, Volume= 24,397 cf
Outflow = 5.8 cfs @ 12.25 hrs, Volume= 24,331 cf, Atten= 3%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.69 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 1.32 fps, Avg. Travel Time= 8.3 min

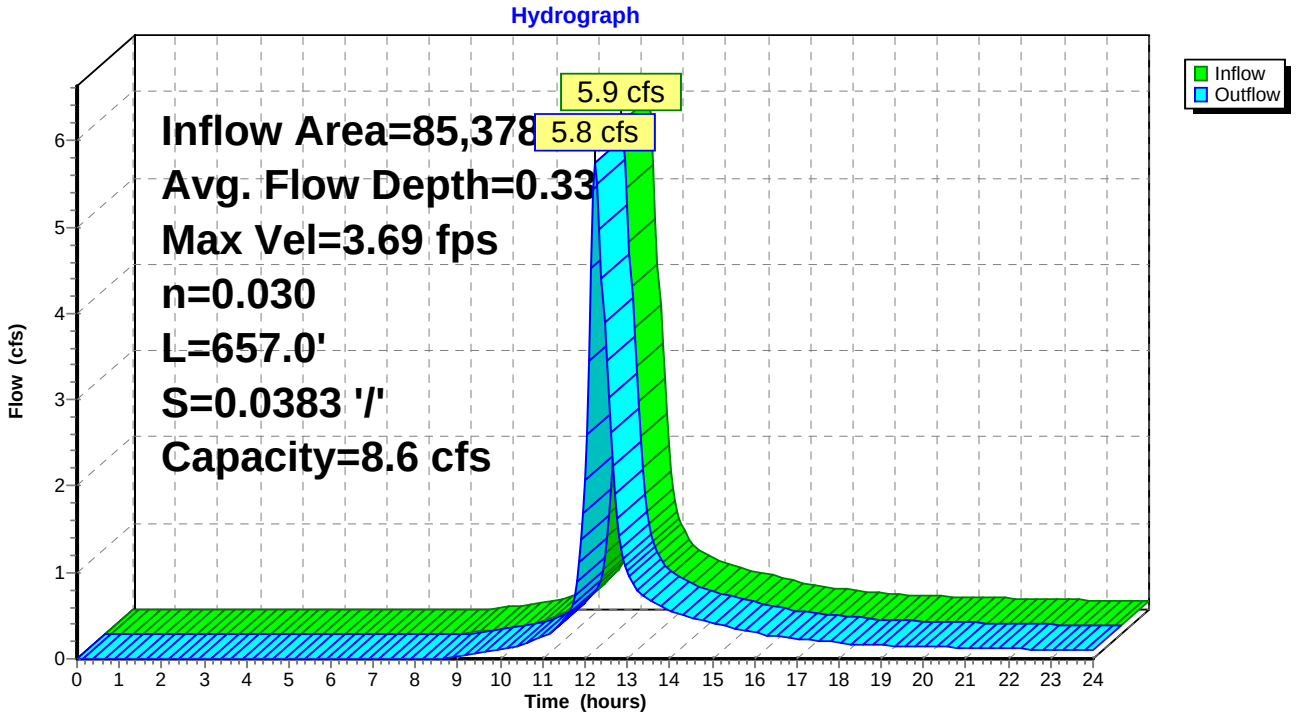
Peak Storage= 1,024 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 0.40' Flow Area= 2.1 sf, Capacity= 8.6 cfs

3.00' x 0.40' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 5.5 '/' Top Width= 7.40'
Length= 657.0' Slope= 0.0383 '/'
Inlet Invert= 274.52', Outlet Invert= 249.36'



‡

Reach 19R: Riprap Swale



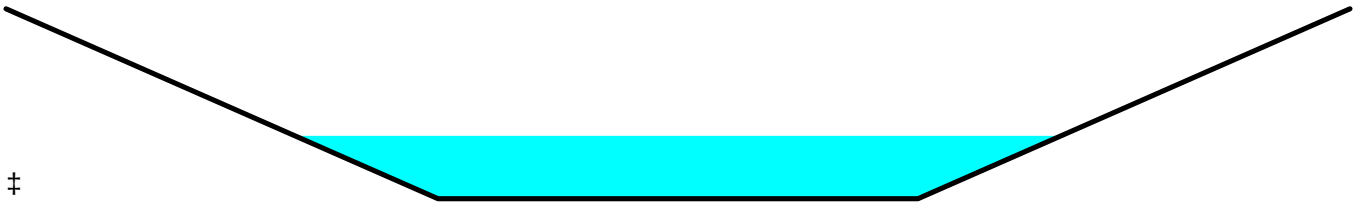
Summary for Reach 21R: Riprap Swale

Inflow Area = 53,317 sf, 0.00% Impervious, Inflow Depth > 3.53" for 50-Year event
Inflow = 4.4 cfs @ 12.14 hrs, Volume= 15,698 cf
Outflow = 4.3 cfs @ 12.17 hrs, Volume= 15,659 cf, Atten= 3%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.64 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 7.6 min

Peak Storage= 612 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 0.90' Flow Area= 5.1 sf, Capacity= 34.5 cfs

3.00' x 0.90' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 3.0 '/' Top Width= 8.40'
Length= 527.0' Slope= 0.0372 '/'
Inlet Invert= 276.70', Outlet Invert= 257.10'



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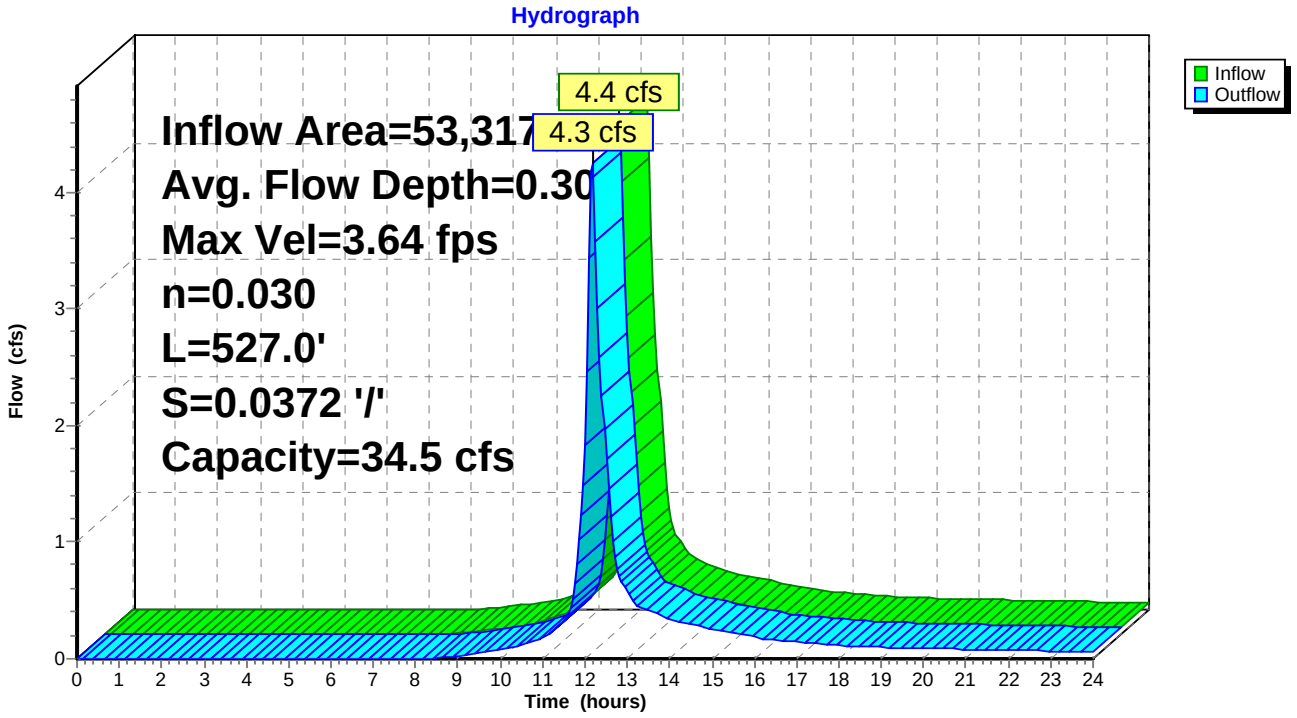
Reach 21R: Riprap Swale

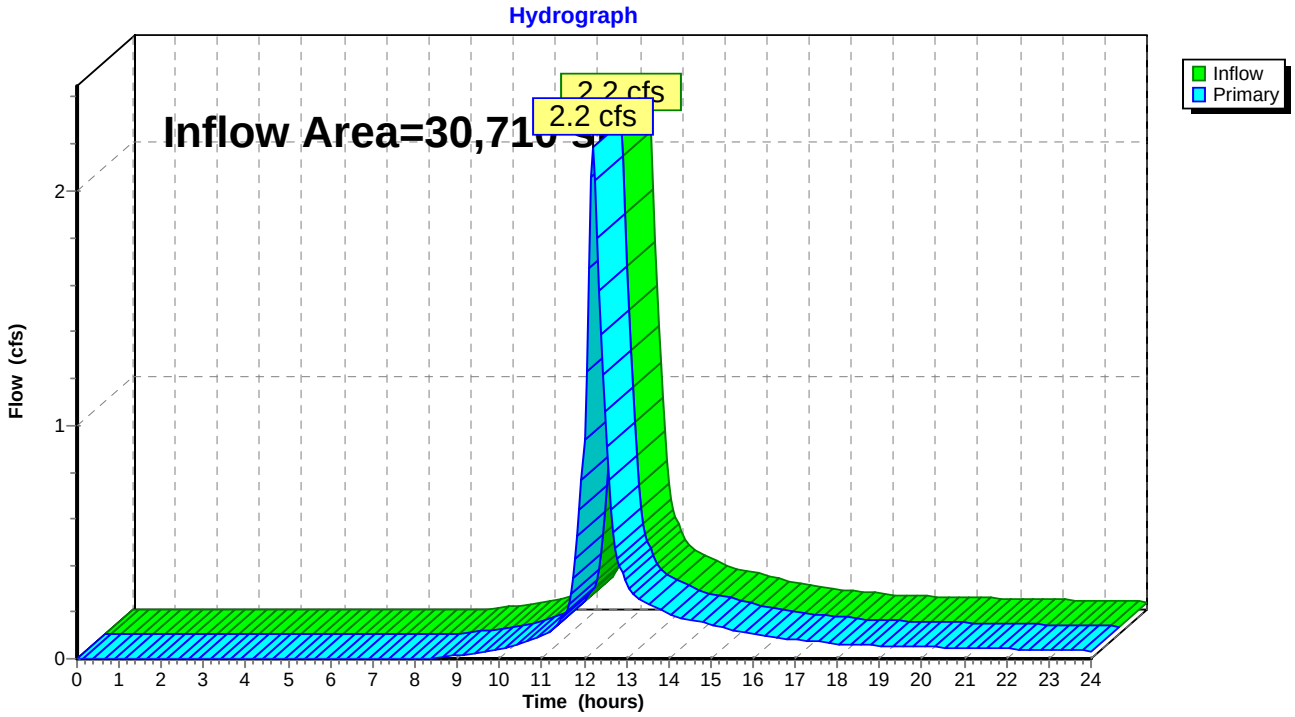


Summary for Link 7L: Wetlands NW

Inflow Area = 30,710 sf, 0.00% Impervious, Inflow Depth > 3.43" for 50-Year event
Inflow = 2.2 cfs @ 12.20 hrs, Volume= 8,777 cf
Primary = 2.2 cfs @ 12.20 hrs, Volume= 8,777 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 7L: Wetlands NW

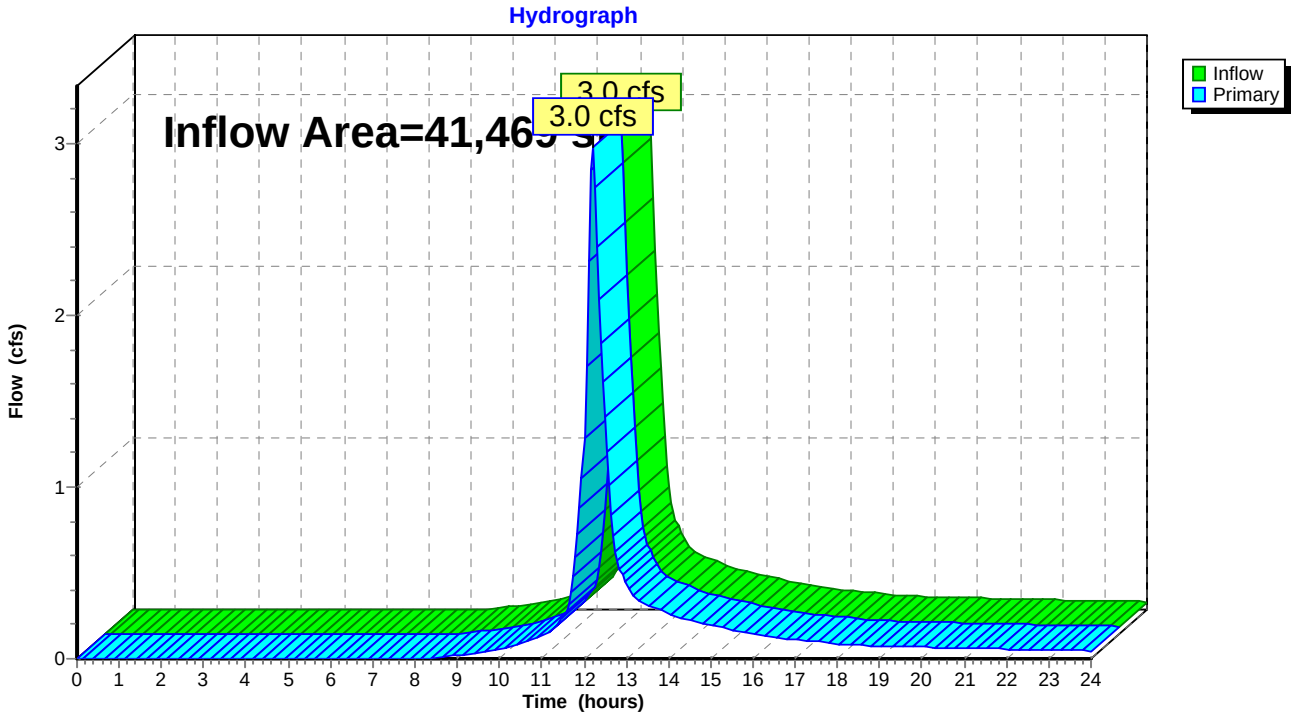


Summary for Link 8L: Depression S

Inflow Area = 41,469 sf, 0.00% Impervious, Inflow Depth > 3.43" for 50-Year event
Inflow = 3.0 cfs @ 12.19 hrs, Volume= 11,854 cf
Primary = 3.0 cfs @ 12.19 hrs, Volume= 11,854 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 8L: Depression S

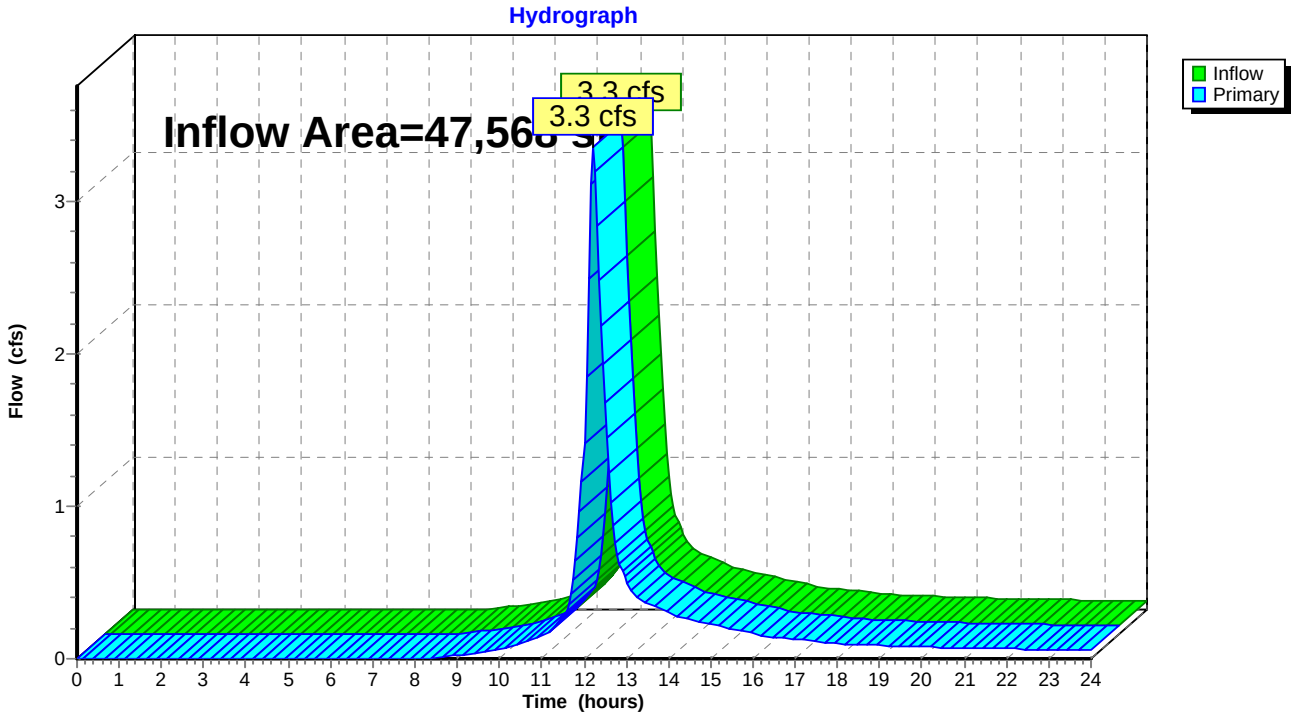


Summary for Link 9L: Wetlands NE

Inflow Area = 47,568 sf, 0.00% Impervious, Inflow Depth > 3.43" for 50-Year event
Inflow = 3.3 cfs @ 12.20 hrs, Volume= 13,594 cf
Primary = 3.3 cfs @ 12.20 hrs, Volume= 13,594 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 9L: Wetlands NE

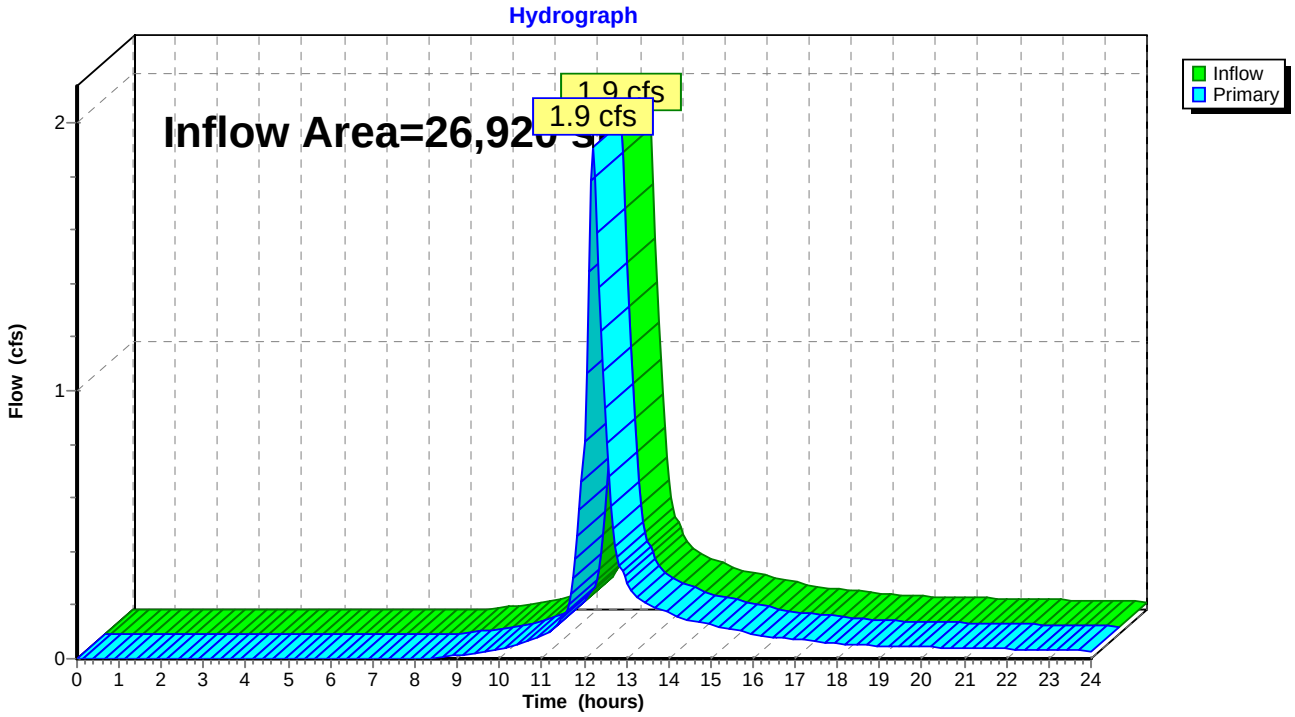


Summary for Link 10L: Wetlands N

Inflow Area = 26,920 sf, 0.00% Impervious, Inflow Depth > 3.43" for 50-Year event
Inflow = 1.9 cfs @ 12.20 hrs, Volume= 7,694 cf
Primary = 1.9 cfs @ 12.20 hrs, Volume= 7,694 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 10L: Wetlands N

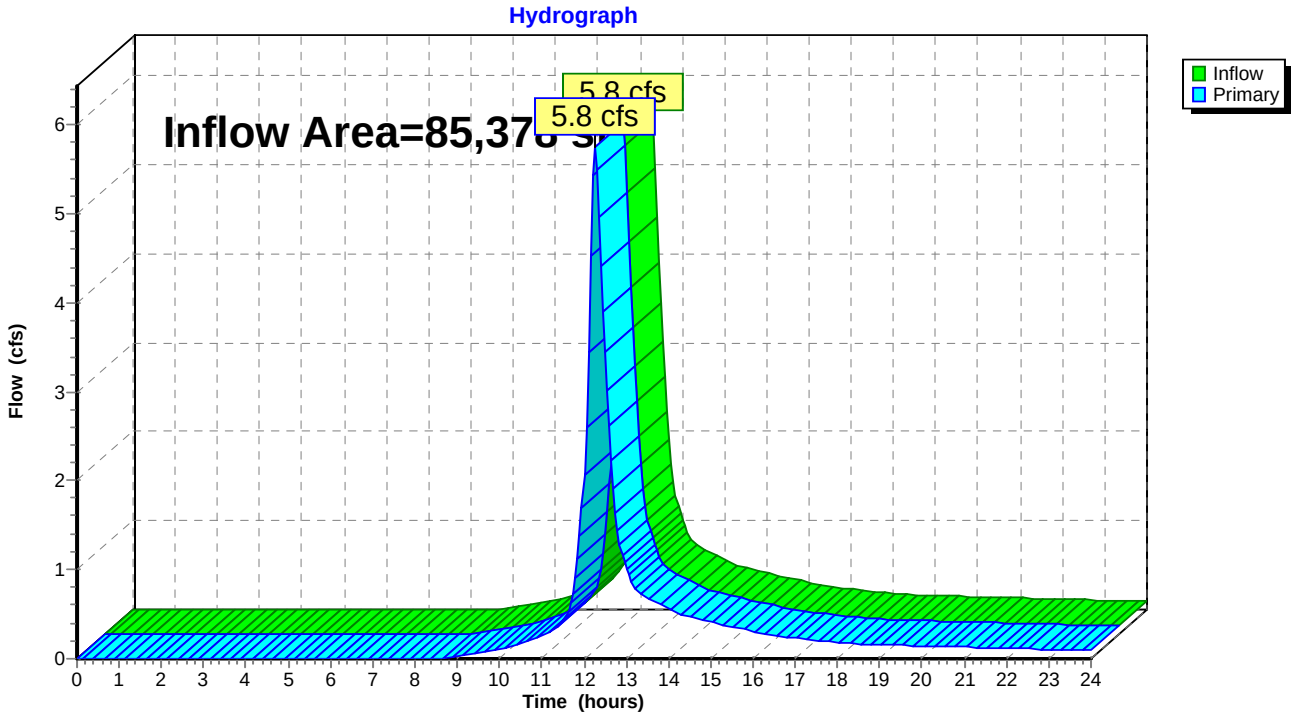


Summary for Link 11L: Collection Swale W

Inflow Area = 85,378 sf, 0.00% Impervious, Inflow Depth > 3.42" for 50-Year event
Inflow = 5.8 cfs @ 12.25 hrs, Volume= 24,331 cf
Primary = 5.8 cfs @ 12.25 hrs, Volume= 24,331 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 11L: Collection Swale W

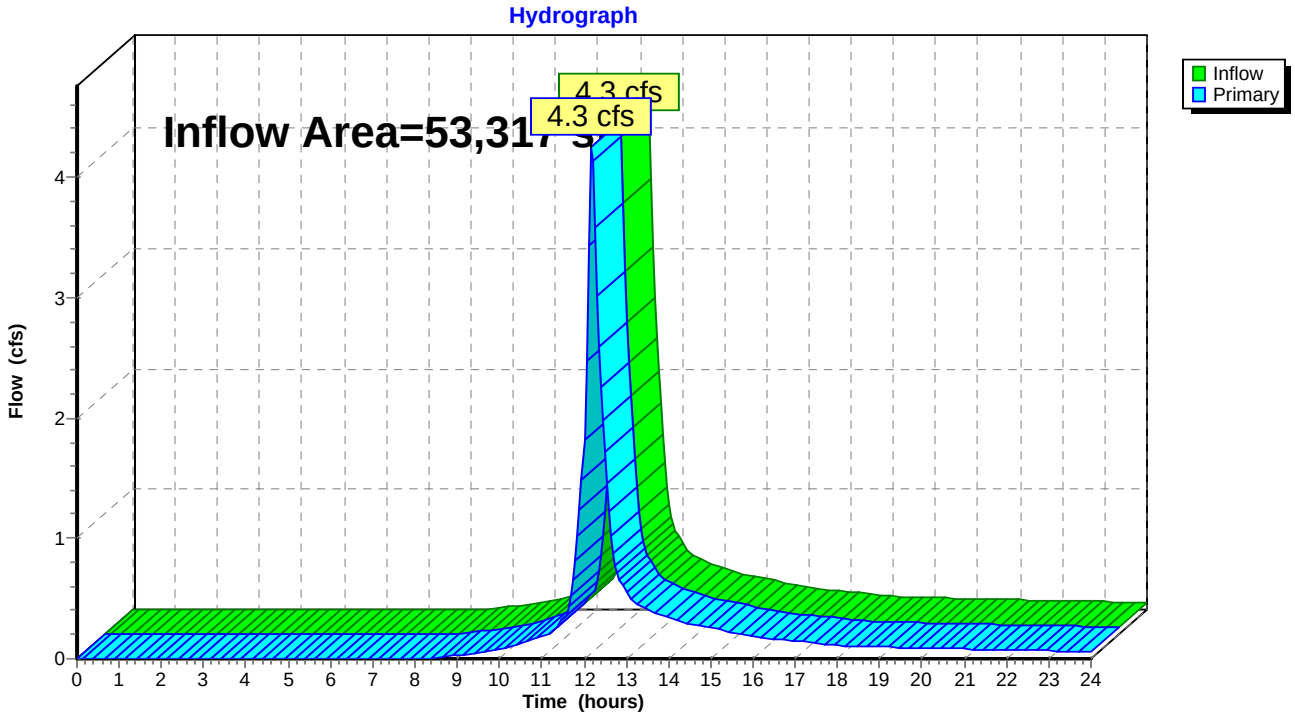


Summary for Link 12L: Collection Swale W

Inflow Area = 53,317 sf, 0.00% Impervious, Inflow Depth > 3.52" for 50-Year event
Inflow = 4.3 cfs @ 12.17 hrs, Volume= 15,659 cf
Primary = 4.3 cfs @ 12.17 hrs, Volume= 15,659 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 12L: Collection Swale W

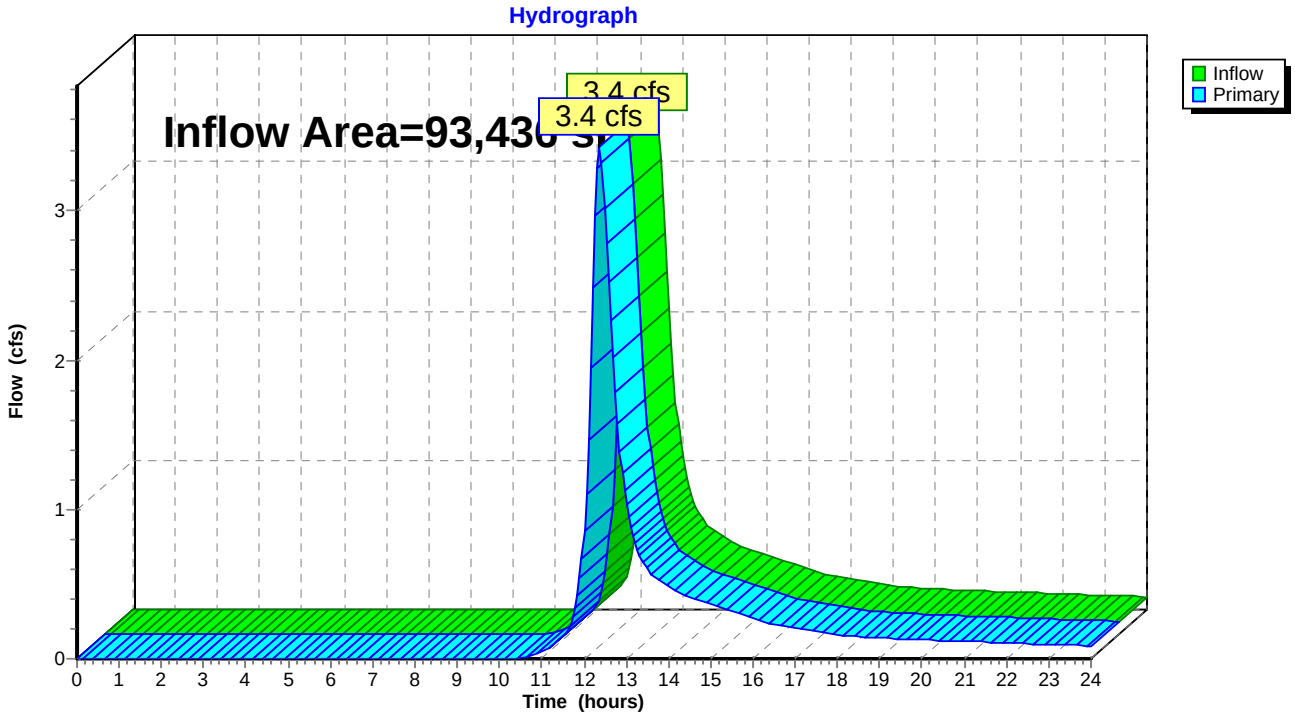


Summary for Link 15L: Wetland W

Inflow Area = 93,436 sf, 0.00% Impervious, Inflow Depth > 2.28" for 50-Year event
Inflow = 3.4 cfs @ 12.37 hrs, Volume= 17,787 cf
Primary = 3.4 cfs @ 12.37 hrs, Volume= 17,787 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 15L: Wetland W

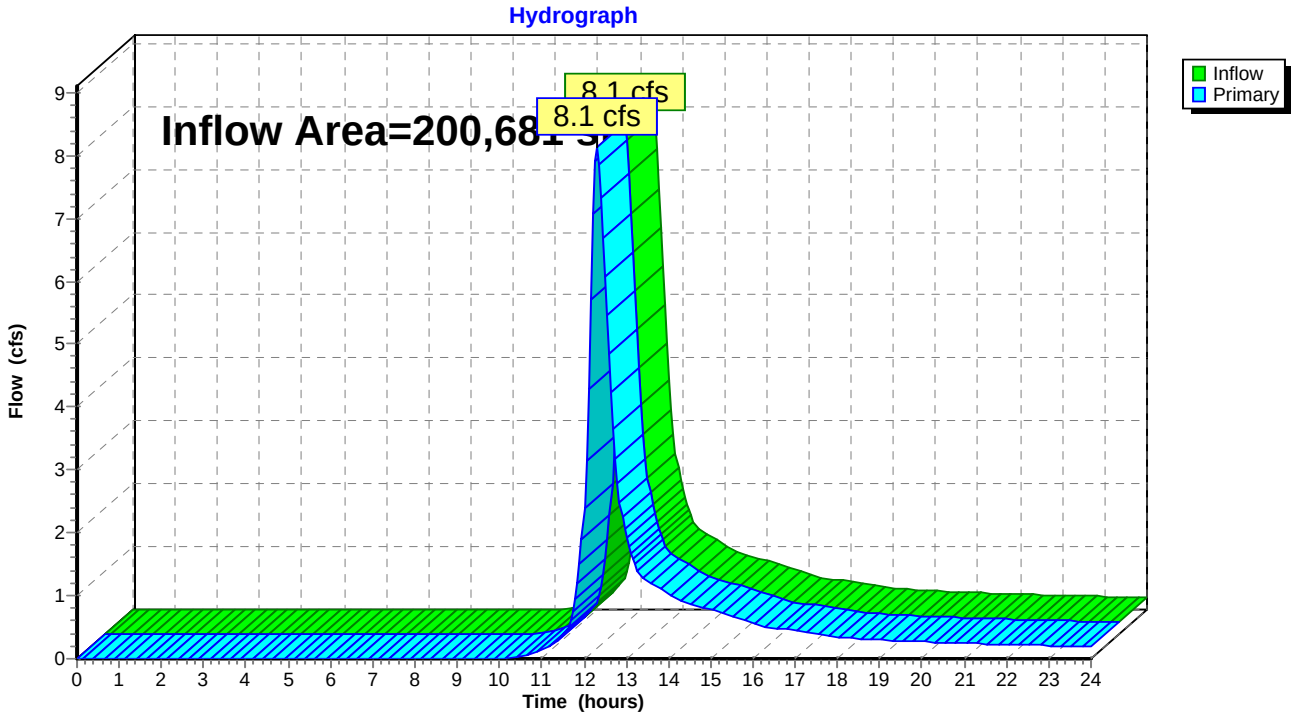


Summary for Link 16L: Wetland E

Inflow Area = 200,681 sf, 0.00% Impervious, Inflow Depth > 2.32" for 50-Year event
Inflow = 8.1 cfs @ 12.30 hrs, Volume= 38,811 cf
Primary = 8.1 cfs @ 12.30 hrs, Volume= 38,811 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 16L: Wetland E



Time span=0.00-24.00 hrs, dt=0.050 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Bulky Waste Landfill SW Runoff Area=0.952 ac 0.00% Impervious Runoff Depth>4.12"
Flow Length=239' Tc=13.7 min CN=74 Runoff=3.6 cfs 14,236 cf

Subcatchment 2S: Bulky Waste Landfill NW Runoff Area=0.705 ac 0.00% Impervious Runoff Depth>4.12"
Flow Length=179' Tc=14.1 min CN=74 Runoff=2.6 cfs 10,541 cf

Subcatchment 3S: Bulky Waste Landfill E Runoff Area=1.092 ac 0.00% Impervious Runoff Depth>4.12"
Flow Length=204' Tc=14.6 min CN=74 Runoff=4.0 cfs 16,326 cf

Subcatchment 4S: Landfill N Runoff Area=0.618 ac 0.00% Impervious Runoff Depth>4.12"
Flow Length=222' Tc=14.3 min CN=74 Runoff=2.3 cfs 9,240 cf

Subcatchment 5S: Landfill W Runoff Area=1.960 ac 0.00% Impervious Runoff Depth>4.12"
Flow Length=752' Tc=15.2 min CN=74 Runoff=7.1 cfs 29,299 cf

Subcatchment 6S: Landfill E Runoff Area=1.224 ac 0.00% Impervious Runoff Depth>4.23"
Flow Length=459' Tc=10.0 min CN=75 Runoff=5.2 cfs 18,797 cf

Subcatchment 7S: Green Field W Runoff Area=2.145 ac 0.00% Impervious Runoff Depth>2.86"
Flow Length=472' Tc=24.7 min CN=62 Runoff=4.3 cfs 22,256 cf

Subcatchment 8S: Green Field E Runoff Area=2.890 ac 0.00% Impervious Runoff Depth>2.86"
Flow Length=305' Tc=20.6 min CN=62 Runoff=6.3 cfs 30,017 cf

Subcatchment 9S: Greenfield 2 Runoff Area=1.717 ac 0.00% Impervious Runoff Depth>2.96"
Flow Length=247' Tc=19.4 min CN=63 Runoff=4.0 cfs 18,468 cf

Reach 19R: Riprap Swale Avg. Flow Depth=0.36' Max Vel=3.89 fps Inflow=7.1 cfs 29,299 cf
n=0.030 L=657.0' S=0.0383 '/' Capacity=8.6 cfs Outflow=6.9 cfs 29,227 cf

Reach 21R: Riprap Swale Avg. Flow Depth=0.33' Max Vel=3.86 fps Inflow=5.2 cfs 18,797 cf
n=0.030 L=527.0' S=0.0372 '/' Capacity=34.5 cfs Outflow=5.1 cfs 18,754 cf

Link 7L: Wetlands NW Inflow=2.6 cfs 10,541 cf
Primary=2.6 cfs 10,541 cf

Link 8L: Depression S Inflow=3.6 cfs 14,236 cf
Primary=3.6 cfs 14,236 cf

Link 9L: Wetlands NE Inflow=4.0 cfs 16,326 cf
Primary=4.0 cfs 16,326 cf

Link 10L: Wetlands N Inflow=2.3 cfs 9,240 cf
Primary=2.3 cfs 9,240 cf

Link 11L: Collection Swale W Inflow=6.9 cfs 29,227 cf
Primary=6.9 cfs 29,227 cf

Link 12L: Collection Swale W Inflow=5.1 cfs 18,754 cf
Primary=5.1 cfs 18,754 cf

Link 15L: Wetland W Inflow=4.3 cfs 22,256 cf
Primary=4.3 cfs 22,256 cf

Link 16L: Wetland E Inflow=10.3 cfs 48,486 cf
Primary=10.3 cfs 48,486 cf

Total Runoff Area = 579,479 sf Runoff Volume = 169,181 cf Average Runoff Depth = 3.50"
100.00% Pervious = 579,479 sf 0.00% Impervious = 0 sf

Summary for Subcatchment 1S: Bulky Waste Landfill SW

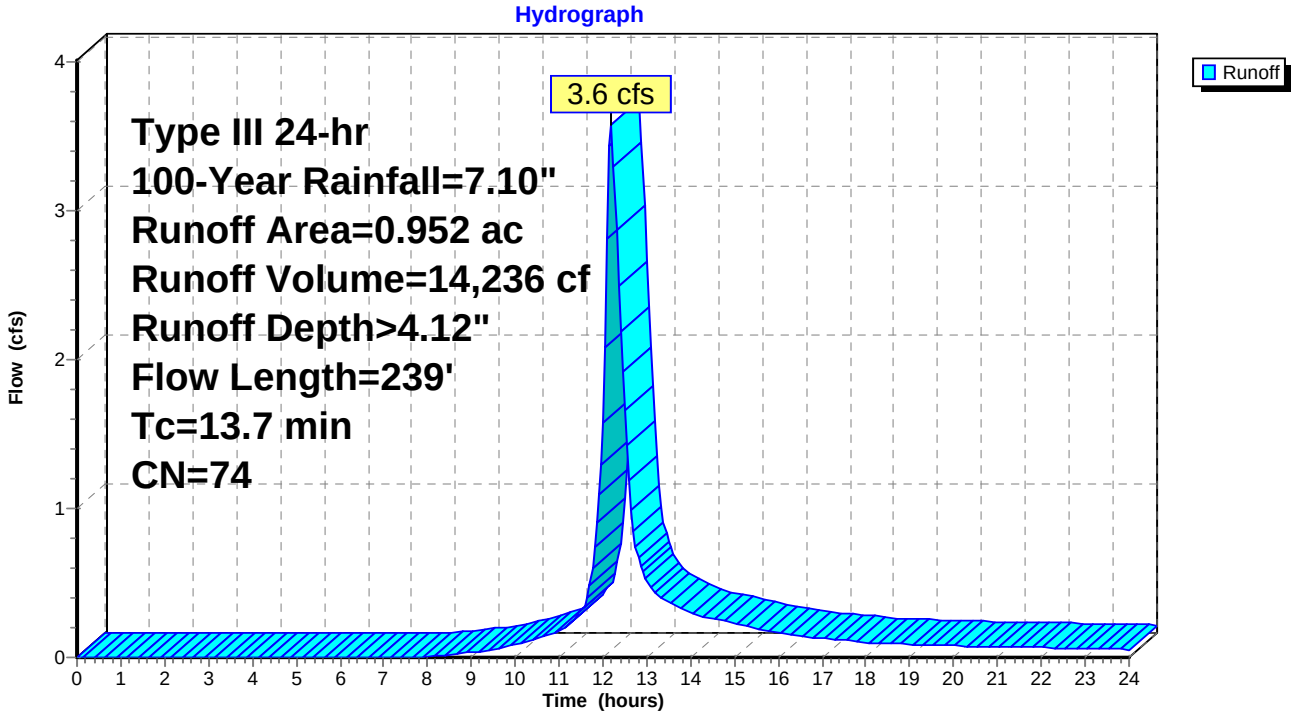
Runoff = 3.6 cfs @ 12.19 hrs, Volume= 14,236 cf, Depth> 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (ac)	CN	Description
0.952	74	>75% Grass cover, Good, HSG C
0.952		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0251	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.5	66	0.1137	2.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	46	0.1957	3.10		**Shallow Concentrated Flow, Lanfill Cap** Short Grass Pasture Kv= 7.0 fps
0.4	27	0.0050	1.14		**Shallow Concentrated Flow, Access Drive** Unpaved Kv= 16.1 fps
13.7	239	Total			

Subcatchment 1S: Bulky Waste Landfill SW



Summary for Subcatchment 2S: Bulky Waste Landfill NW

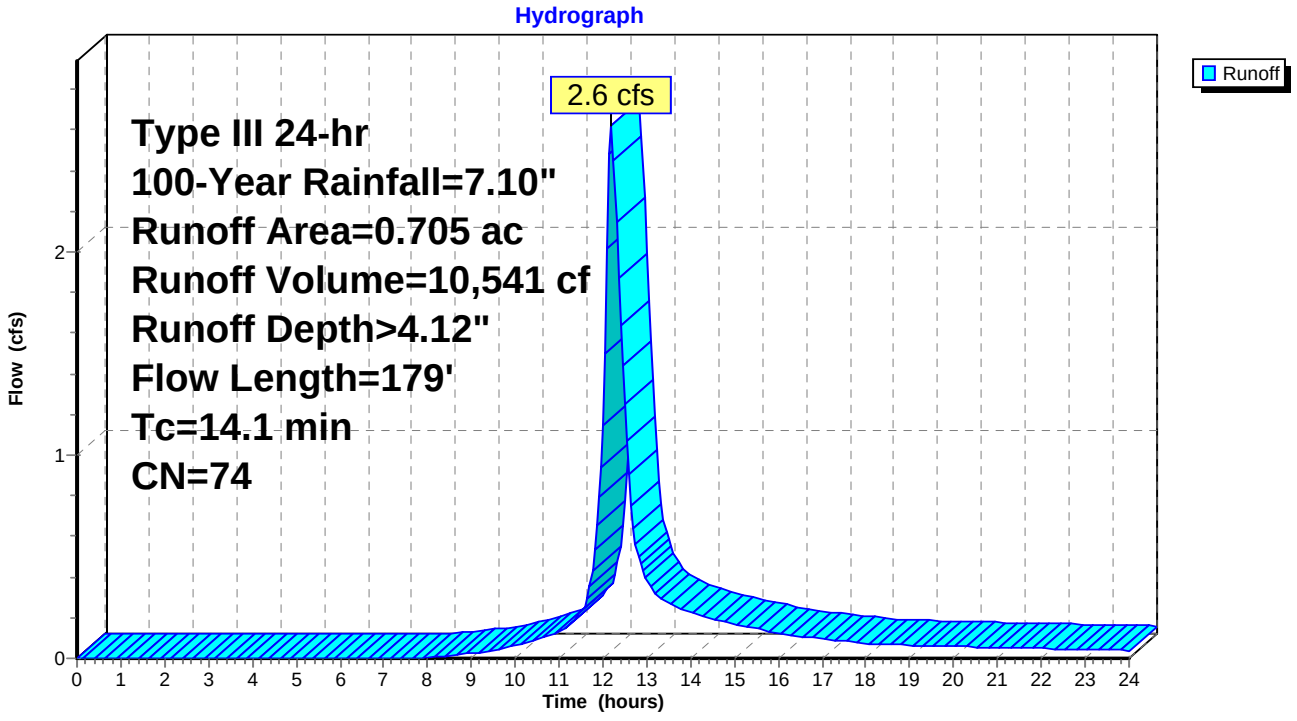
Runoff = 2.6 cfs @ 12.20 hrs, Volume= 10,541 cf, Depth> 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (ac)	CN	Description
0.705	74	>75% Grass cover, Good, HSG C
0.705		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.6	79	0.0886	2.08		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.1	179	Total			

Subcatchment 2S: Bulky Waste Landfill NW



Summary for Subcatchment 3S: Bulky Waste Landfill E

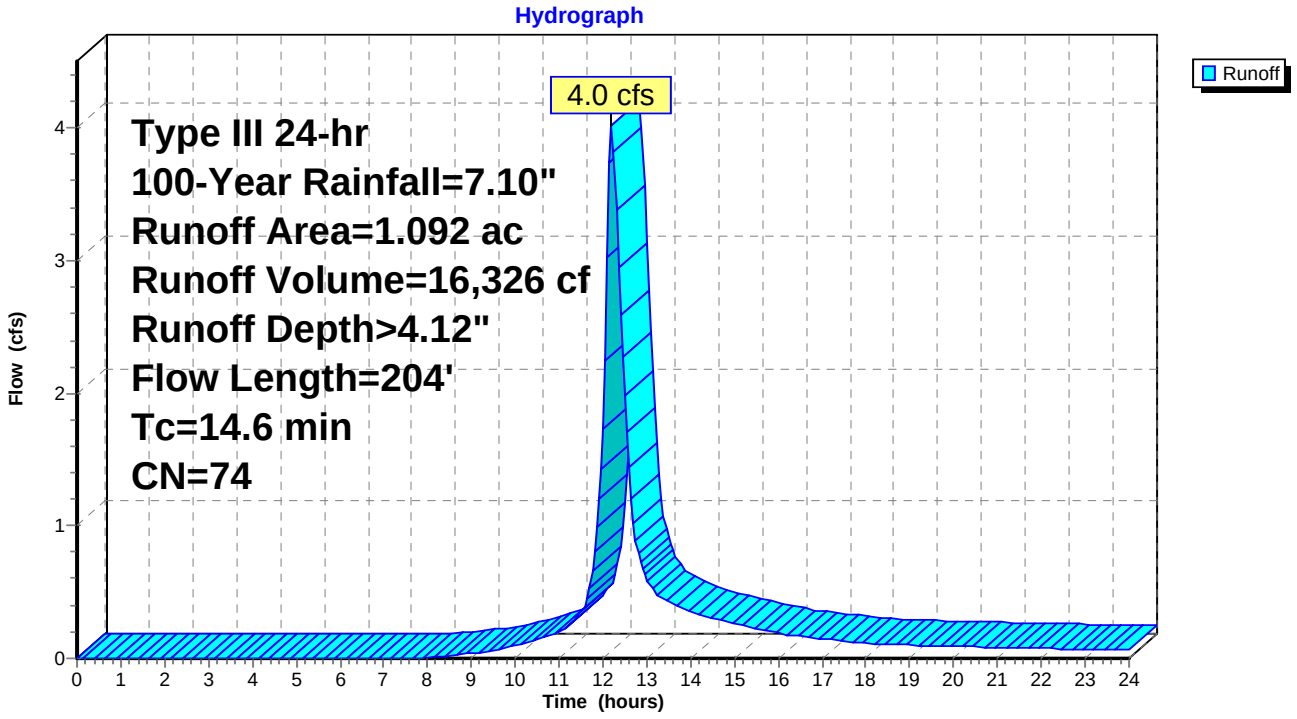
Runoff = 4.0 cfs @ 12.20 hrs, Volume= 16,326 cf, Depth> 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (ac)	CN	Description
1.092	74	>75% Grass cover, Good, HSG C
1.092		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.1	24	0.1667	2.86		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.6	204	Total			

Subcatchment 3S: Bulky Waste Landfill E



Summary for Subcatchment 4S: Landfill N

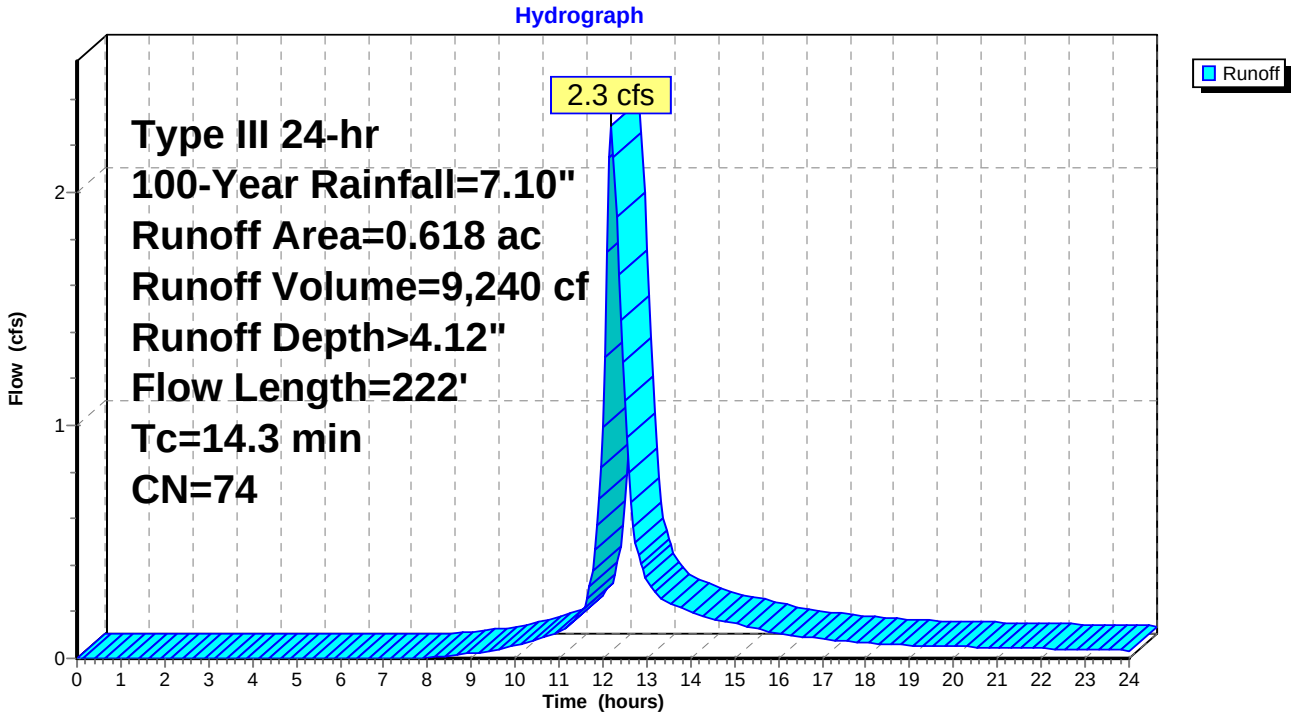
Runoff = 2.3 cfs @ 12.20 hrs, Volume= 9,240 cf, Depth> 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (ac)	CN	Description
0.618	74	>75% Grass cover, Good, HSG C
0.618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0230	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	81	0.0371	1.35		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	41	0.1707	2.89		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.3	222	Total			

Subcatchment 4S: Landfill N



Summary for Subcatchment 5S: Landfill W

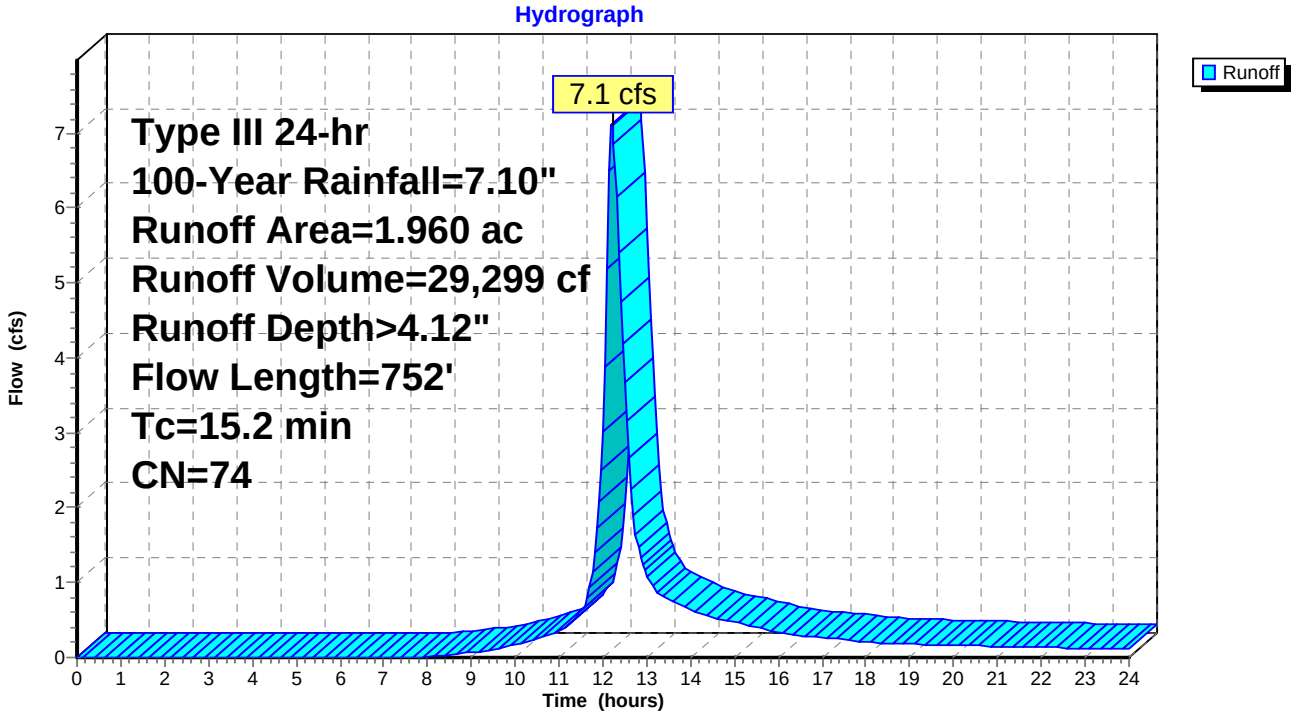
Runoff = 7.1 cfs @ 12.21 hrs, Volume= 29,299 cf, Depth> 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (ac)	CN	Description
1.960	74	>75% Grass cover, Good, HSG C
1.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0220	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.3	37	0.0811	1.99		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.3	58	0.1897	3.05		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
1.3	520	0.0200	6.71	50.33	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
0.0	37	0.2160	22.05	165.39	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
15.2	752	Total			

Subcatchment 5S: Landfill W



Summary for Subcatchment 6S: Landfill E

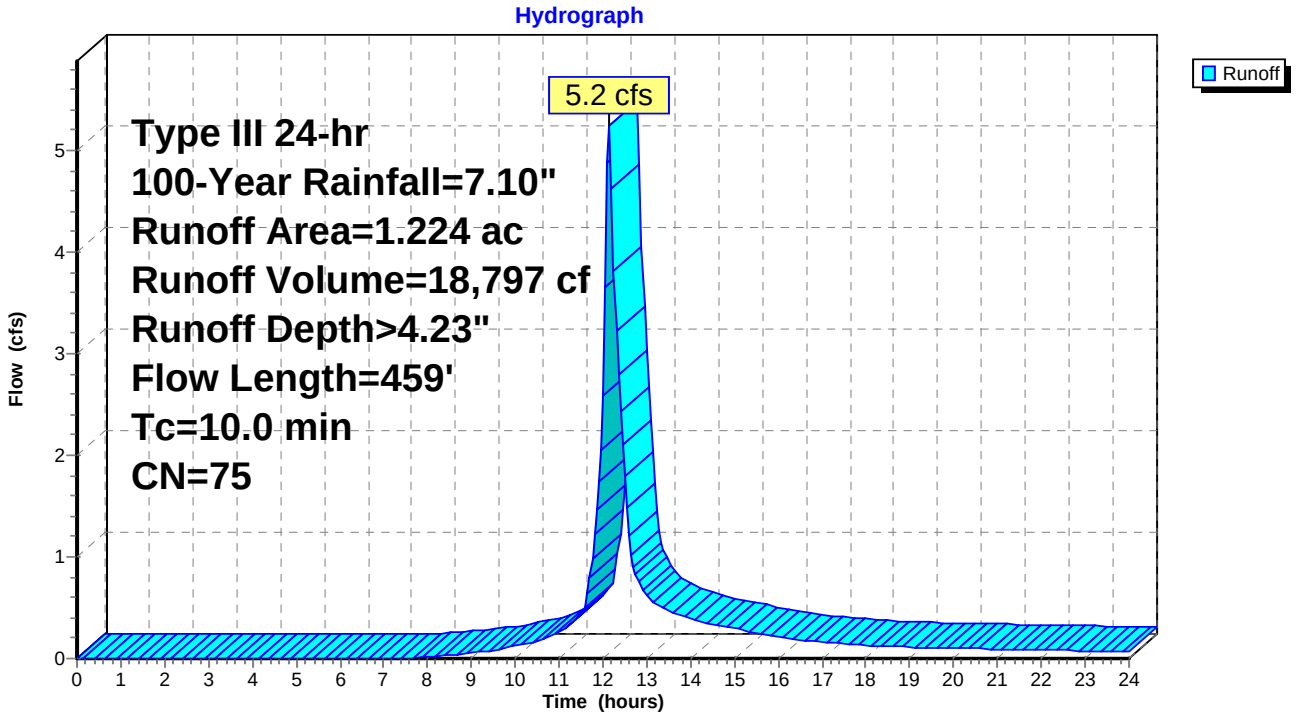
Runoff = 5.2 cfs @ 12.14 hrs, Volume= 18,797 cf, Depth> 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (ac)	CN	Description
1.134	74	>75% Grass cover, Good, HSG C
0.090	89	Gravel roads, HSG C
1.224	75	Weighted Average
1.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	40	0.0543	0.15		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	60	0.0117	1.03		**Sheet Flow, Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.5	86	0.0384	3.15		**Shallow Concentrated Flow, Gravel** Unpaved Kv= 16.1 fps
0.7	76	0.0658	1.80		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	49	0.2245	3.32		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	148	0.1081	15.60	117.00	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
7.1	459	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: Landfill E



Summary for Subcatchment 7S: Green Field W

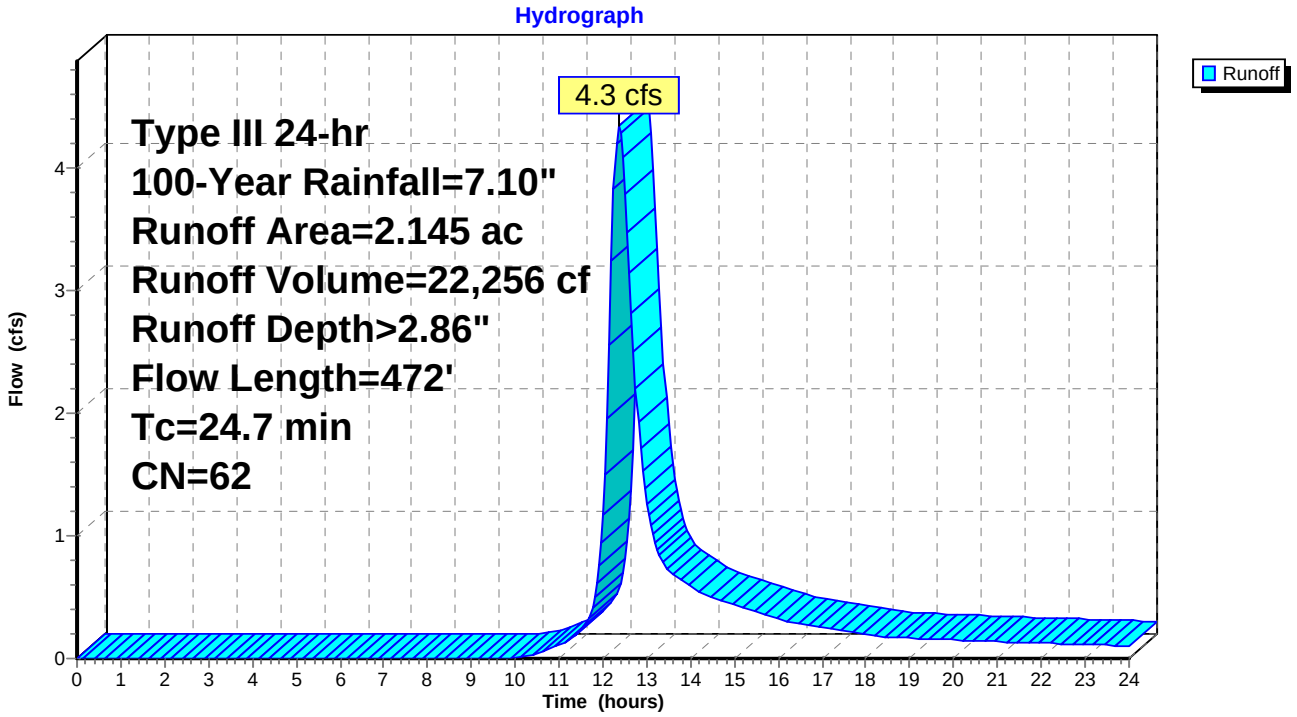
Runoff = 4.3 cfs @ 12.36 hrs, Volume= 22,256 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (ac)	CN	Description
0.022	74	>75% Grass cover, Good, HSG C
0.089	80	>75% Grass cover, Good, HSG D
0.282	61	>75% Grass cover, Good, HSG B
1.752	61	>75% Grass cover, Good, HSG B
2.145	62	Weighted Average
2.145		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	23	0.0217	1.03		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
4.8	160	0.0063	0.56		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.6	51	0.0392	1.39		**Shallow Concentrated Flow, field** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.7	50	0.0300	1.21		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
24.7	472	Total			

Subcatchment 7S: Green Field W



Summary for Subcatchment 8S: Green Field E

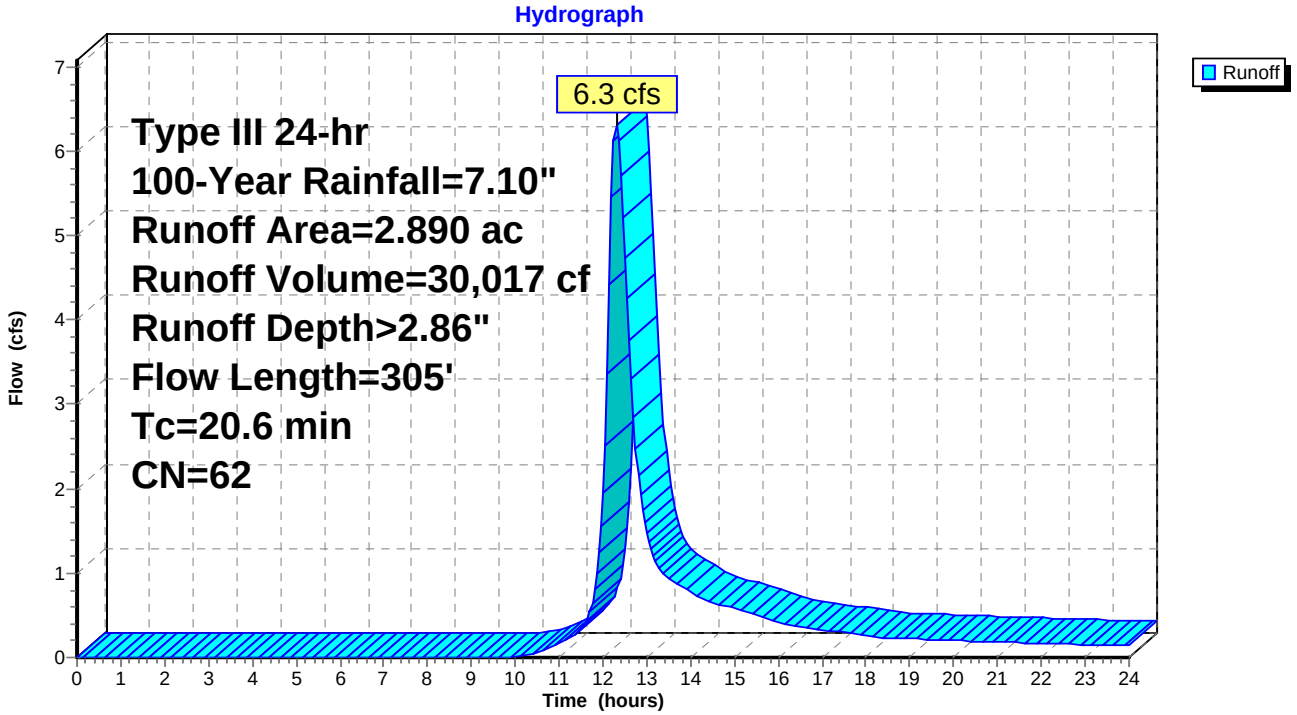
Runoff = 6.3 cfs @ 12.30 hrs, Volume= 30,017 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (ac)	CN	Description
2.685	61	>75% Grass cover, Good, HSG B
0.072	80	>75% Grass cover, Good, HSG D
0.033	80	>75% Grass cover, Good, HSG D
0.100	61	>75% Grass cover, Good, HSG B
2.890	62	Weighted Average
2.890		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	24	0.0208	1.01		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
2.6	106	0.0094	0.68		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.8	75	0.0467	1.51		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
20.6	305	Total			

Subcatchment 8S: Green Field E



Summary for Subcatchment 9S: Greenfield 2

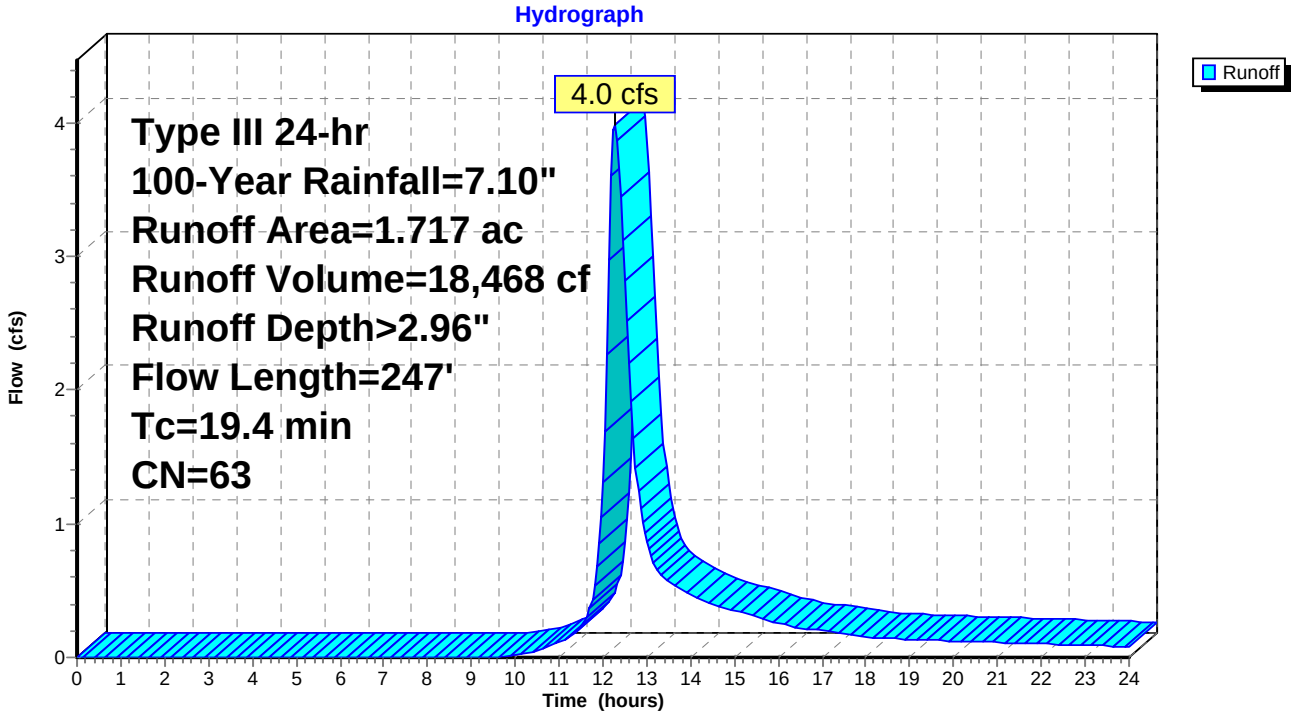
Runoff = 4.0 cfs @ 12.28 hrs, Volume= 18,468 cf, Depth> 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (ac)	CN	Description
0.091	77	Woods, Good, HSG D
0.151	55	Woods, Good, HSG B
1.288	61	>75% Grass cover, Good, HSG B
0.187	80	>75% Grass cover, Good, HSG D
1.717	63	Weighted Average
1.717		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0128	0.10		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.40"
2.9	147	0.0148	0.85		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
19.4	247	Total			

Subcatchment 9S: Greenfield 2



Summary for Reach 19R: Riprap Swale

Inflow Area = 85,378 sf, 0.00% Impervious, Inflow Depth > 4.12" for 100-Year event
Inflow = 7.1 cfs @ 12.21 hrs, Volume= 29,299 cf
Outflow = 6.9 cfs @ 12.25 hrs, Volume= 29,227 cf, Atten= 3%, Lag= 2.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.89 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.39 fps, Avg. Travel Time= 7.9 min

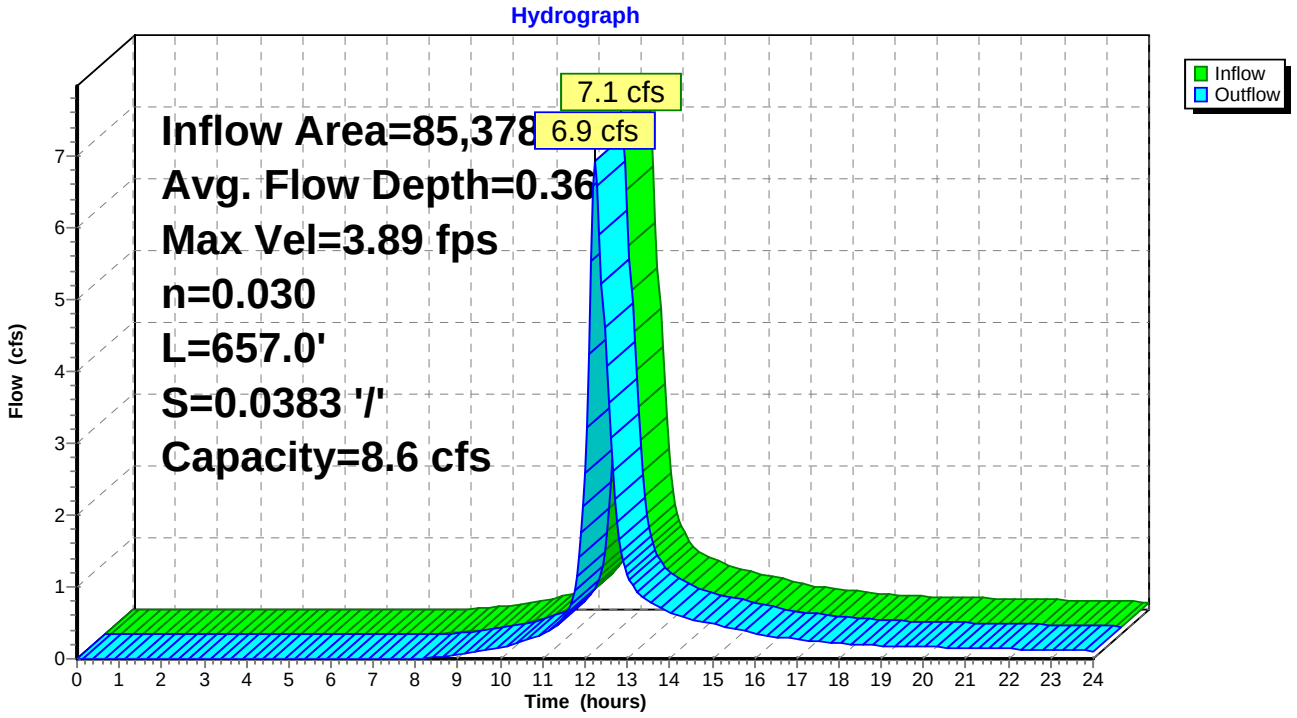
Peak Storage= 1,169 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 0.40' Flow Area= 2.1 sf, Capacity= 8.6 cfs

3.00' x 0.40' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 5.5 '/' Top Width= 7.40'
Length= 657.0' Slope= 0.0383 '/'
Inlet Invert= 274.52', Outlet Invert= 249.36'

‡



Reach 19R: Riprap Swale



Summary for Reach 21R: Riprap Swale

Inflow Area = 53,317 sf, 0.00% Impervious, Inflow Depth > 4.23" for 100-Year event
Inflow = 5.2 cfs @ 12.14 hrs, Volume= 18,797 cf
Outflow = 5.1 cfs @ 12.17 hrs, Volume= 18,754 cf, Atten= 3%, Lag= 1.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.86 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 1.22 fps, Avg. Travel Time= 7.2 min

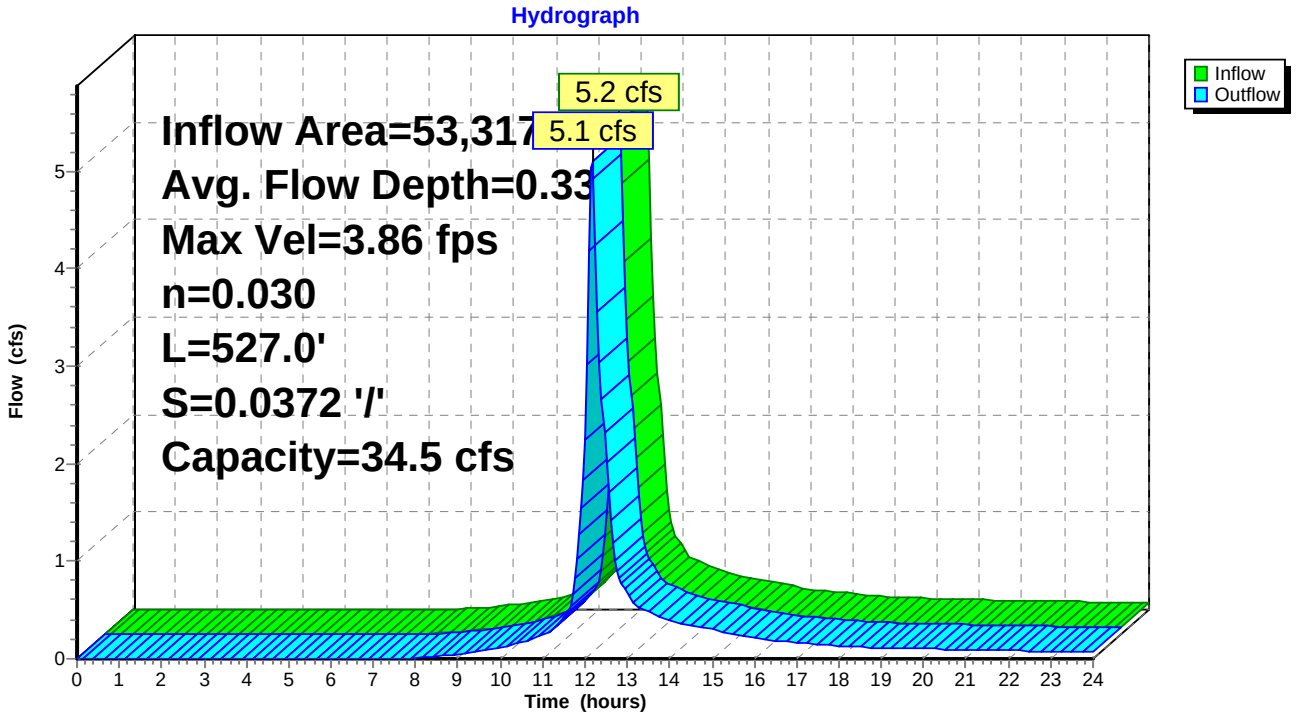
Peak Storage= 693 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 0.90' Flow Area= 5.1 sf, Capacity= 34.5 cfs

3.00' x 0.90' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 3.0 '/' Top Width= 8.40'
Length= 527.0' Slope= 0.0372 '/'
Inlet Invert= 276.70', Outlet Invert= 257.10'



‡

Reach 21R: Riprap Swale

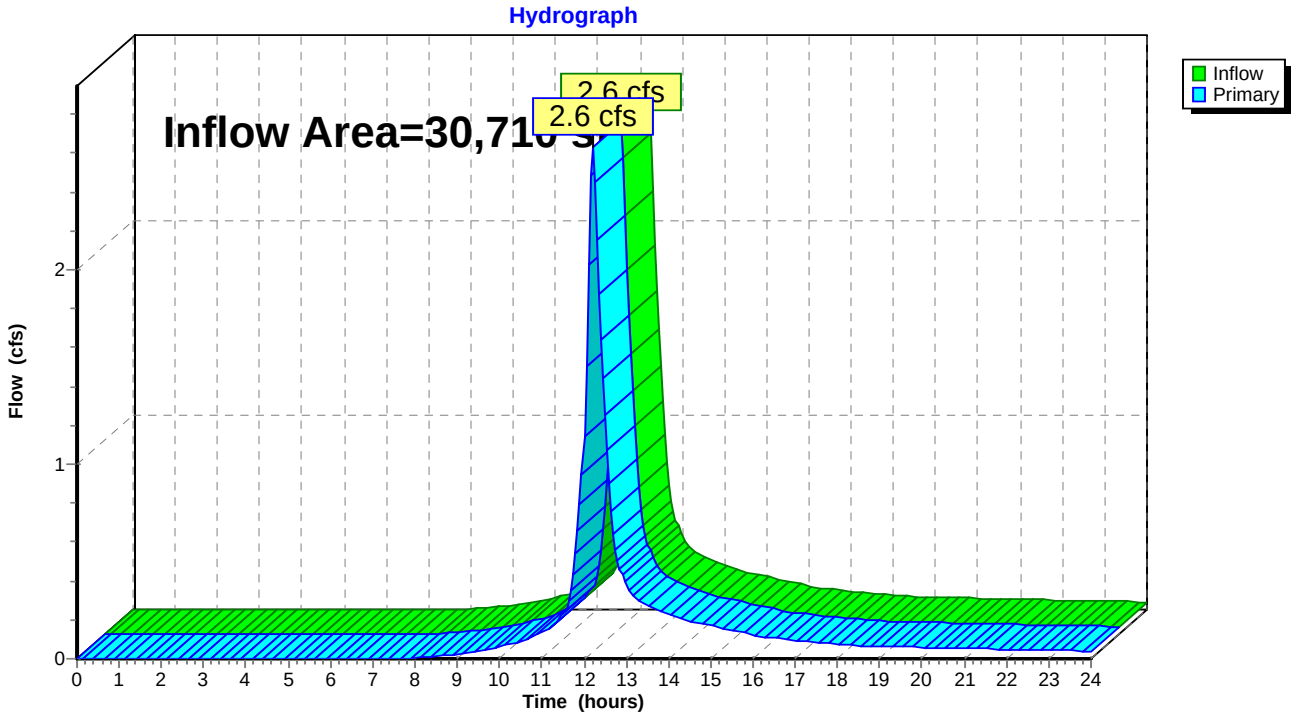


Summary for Link 7L: Wetlands NW

Inflow Area = 30,710 sf, 0.00% Impervious, Inflow Depth > 4.12" for 100-Year event
Inflow = 2.6 cfs @ 12.20 hrs, Volume= 10,541 cf
Primary = 2.6 cfs @ 12.20 hrs, Volume= 10,541 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 7L: Wetlands NW

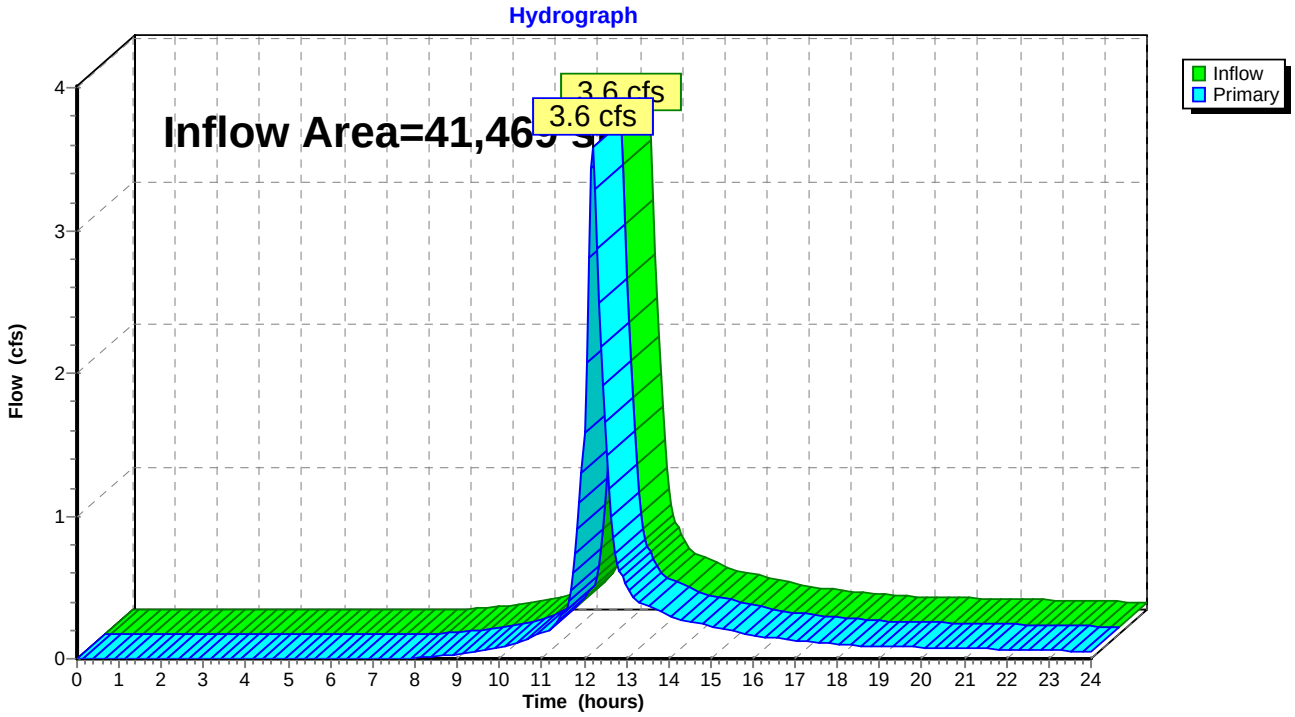


Summary for Link 8L: Depression S

Inflow Area = 41,469 sf, 0.00% Impervious, Inflow Depth > 4.12" for 100-Year event
Inflow = 3.6 cfs @ 12.19 hrs, Volume= 14,236 cf
Primary = 3.6 cfs @ 12.19 hrs, Volume= 14,236 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 8L: Depression S

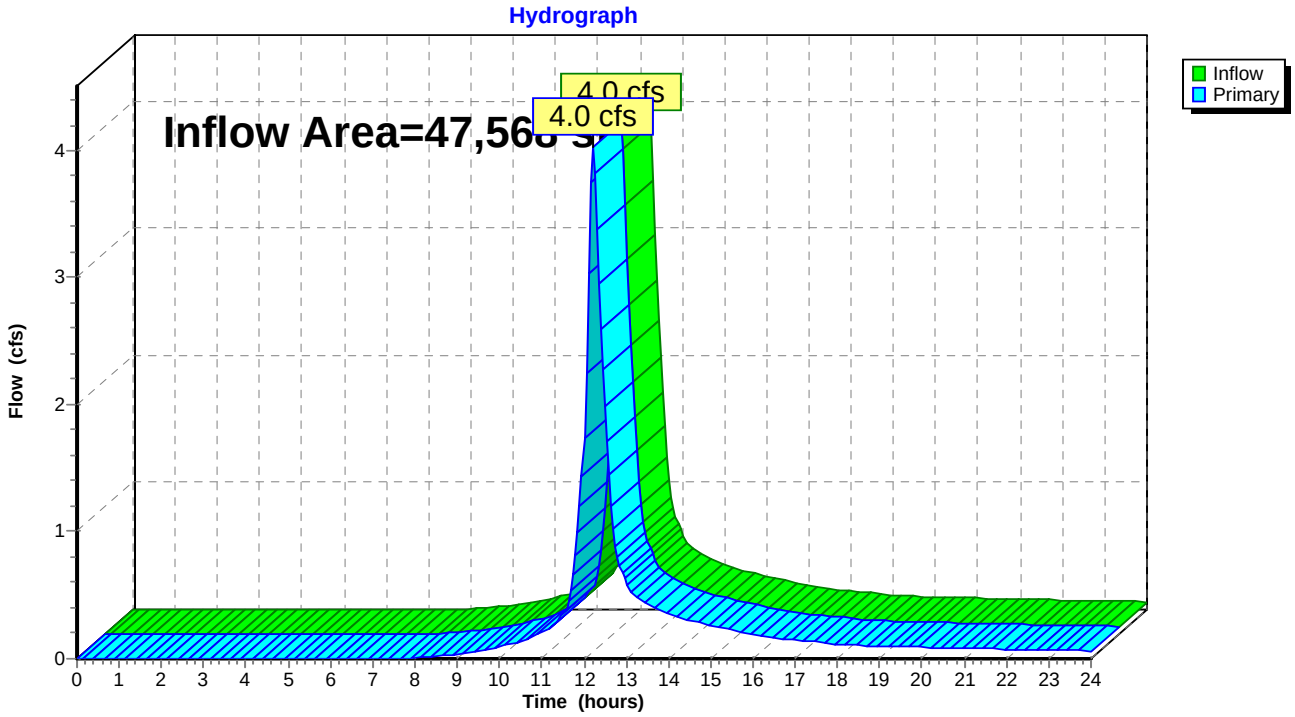


Summary for Link 9L: Wetlands NE

Inflow Area = 47,568 sf, 0.00% Impervious, Inflow Depth > 4.12" for 100-Year event
Inflow = 4.0 cfs @ 12.20 hrs, Volume= 16,326 cf
Primary = 4.0 cfs @ 12.20 hrs, Volume= 16,326 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 9L: Wetlands NE

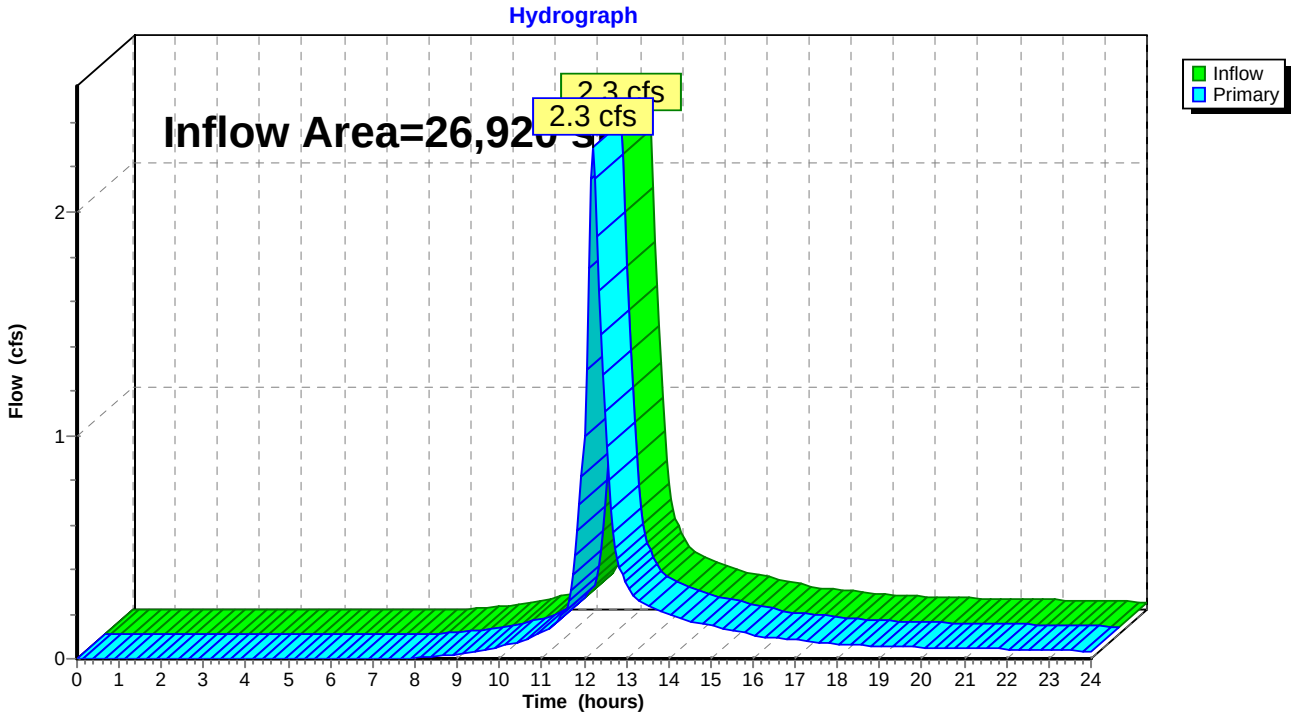


Summary for Link 10L: Wetlands N

Inflow Area = 26,920 sf, 0.00% Impervious, Inflow Depth > 4.12" for 100-Year event
Inflow = 2.3 cfs @ 12.20 hrs, Volume= 9,240 cf
Primary = 2.3 cfs @ 12.20 hrs, Volume= 9,240 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 10L: Wetlands N

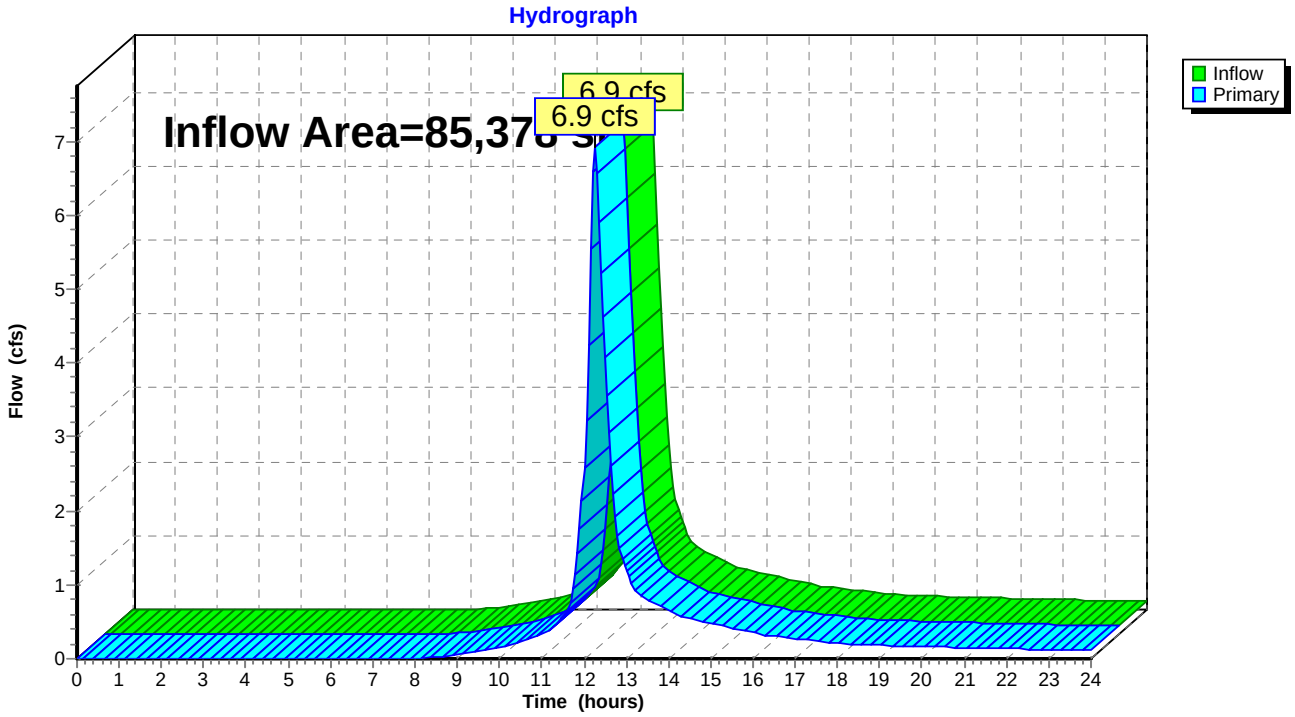


Summary for Link 11L: Collection Swale W

Inflow Area = 85,378 sf, 0.00% Impervious, Inflow Depth > 4.11" for 100-Year event
Inflow = 6.9 cfs @ 12.25 hrs, Volume= 29,227 cf
Primary = 6.9 cfs @ 12.25 hrs, Volume= 29,227 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 11L: Collection Swale W

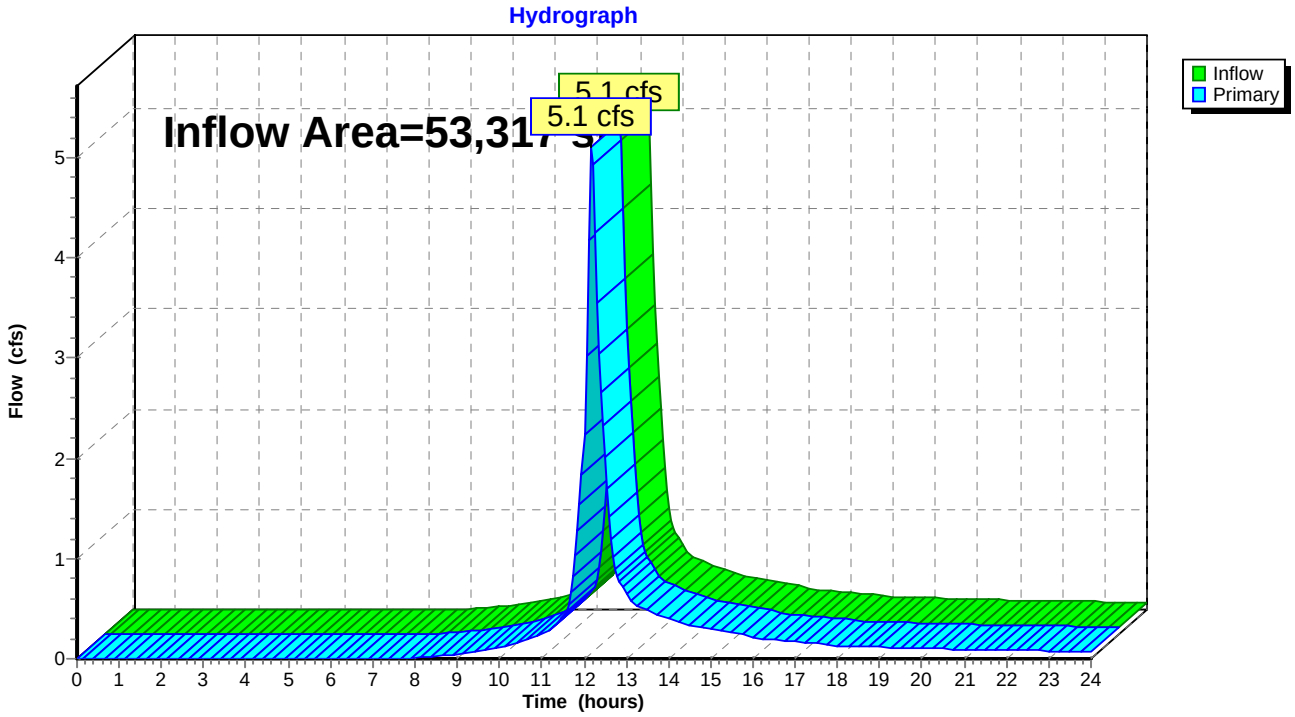


Summary for Link 12L: Collection Swale W

Inflow Area = 53,317 sf, 0.00% Impervious, Inflow Depth > 4.22" for 100-Year event
Inflow = 5.1 cfs @ 12.17 hrs, Volume= 18,754 cf
Primary = 5.1 cfs @ 12.17 hrs, Volume= 18,754 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 12L: Collection Swale W

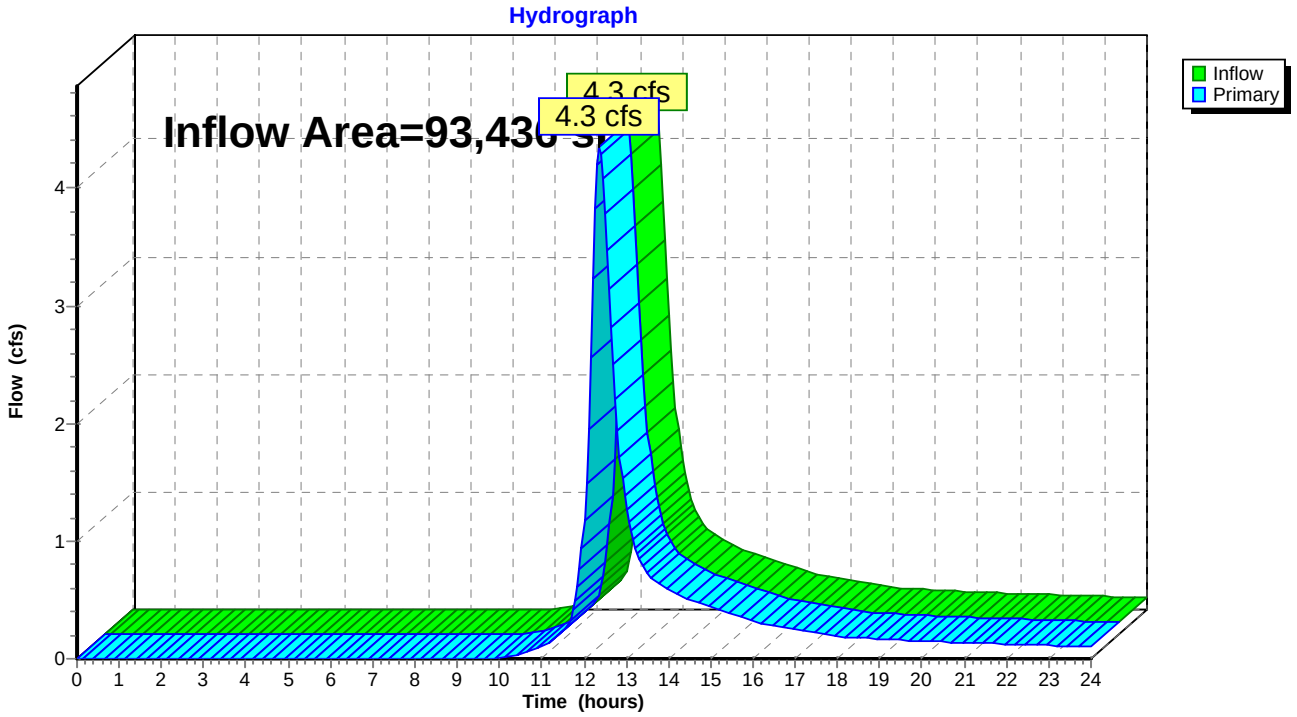


Summary for Link 15L: Wetland W

Inflow Area = 93,436 sf, 0.00% Impervious, Inflow Depth > 2.86" for 100-Year event
Inflow = 4.3 cfs @ 12.36 hrs, Volume= 22,256 cf
Primary = 4.3 cfs @ 12.36 hrs, Volume= 22,256 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 15L: Wetland W

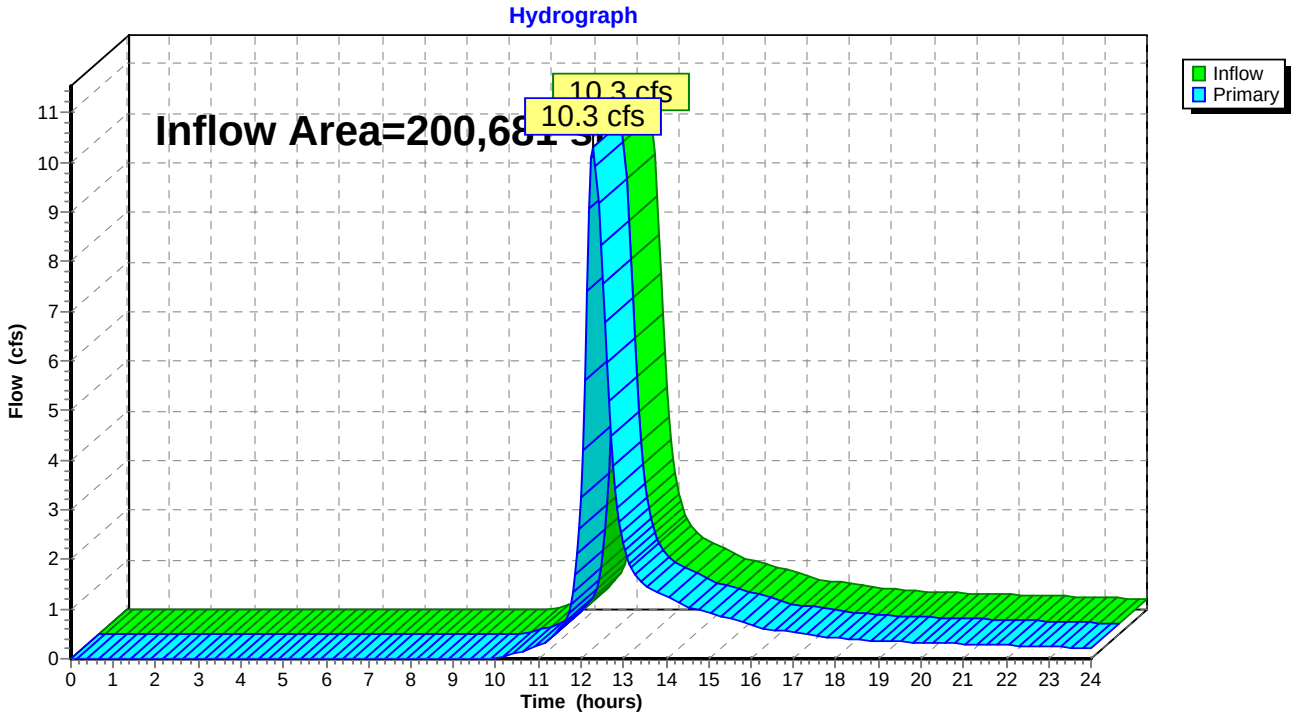


Summary for Link 16L: Wetland E

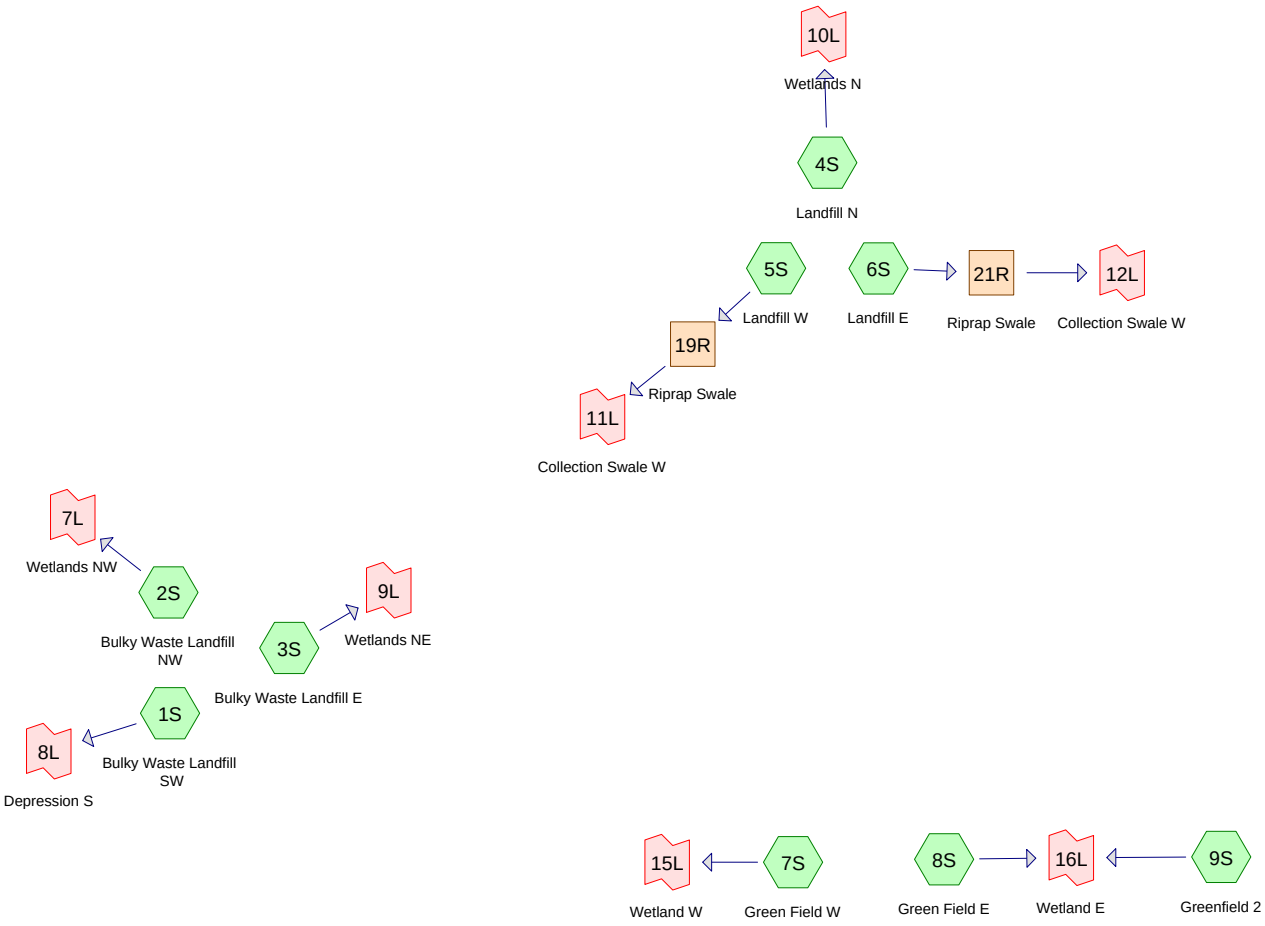
Inflow Area = 200,681 sf, 0.00% Impervious, Inflow Depth > 2.90" for 100-Year event
Inflow = 10.3 cfs @ 12.29 hrs, Volume= 48,486 cf
Primary = 10.3 cfs @ 12.29 hrs, Volume= 48,486 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 16L: Wetland E



Proposed Conditions Results



Subcat Reach Pond Link

Routing Diagram for Rogers Road Proposed Conditions
Prepared by Boundaries LLC - DCM, Printed 8/27/2015
HydroCAD® 10.00-13 s/n 04031 © 2014 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
265,413	61	>75% Grass cover, Good, HSG B (7S, 8S, 9S)
266,243	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S, 4S, 5S, 6S, 7S)
16,588	80	>75% Grass cover, Good, HSG D (7S, 8S, 9S)
131	98	Concrete Equipment Pad, HSG C (6S)
230	98	Equipment Pad, HSG B (7S)
131	98	Equipment Pad, HSG C (1S)
8,015	89	Gravel roads, HSG C (1S, 2S, 6S)
218	98	Paved parking, HSG B (9S)
340	98	Paved parking, HSG C (7S)
9	98	Solar Array Posts, HSG B (7S, 8S)
1,742	98	Solar array Ballasts, HSG C (1S)
9,932	98	Solar array ballasts, HSG C (2S, 3S, 4S, 5S, 6S)
6,578	55	Woods, Good, HSG B (9S)
3,964	77	Woods, Good, HSG D (9S)
579,533	**69**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
272,448	HSG B	7S, 8S, 9S
286,534	HSG C	1S, 2S, 3S, 4S, 5S, 6S, 7S
20,552	HSG D	7S, 8S, 9S
0	Other	
579,533		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	265,413	266,243	16,588	0	548,244	>75% Grass cover, Good	
0	0	131	0	0	131	Concrete Equipment Pad	
0	230	131	0	0	361	Equipment Pad	
0	0	8,015	0	0	8,015	Gravel roads	
0	218	340	0	0	558	Paved parking	
0	9	0	0	0	9	Solar Array Posts	
0	0	1,742	0	0	1,742	Solar array Ballasts	
0	0	9,932	0	0	9,932	Solar array ballasts	
0	6,578	0	3,964	0	10,542	Woods, Good	
0	**272,448**	**286,534**	**20,552**	**0**	**579,533**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.050 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Bulky Waste Landfill SW Runoff Area=0.952 ac 4.52% Impervious Runoff Depth>1.29"
Flow Length=239' Tc=13.7 min CN=76 Runoff=1.1 cfs 4,456 cf

Subcatchment 2S: Bulky Waste Landfill NW Runoff Area=0.705 ac 4.54% Impervious Runoff Depth>1.23"
Flow Length=179' Tc=14.1 min CN=75 Runoff=0.8 cfs 3,141 cf

Subcatchment 3S: Bulky Waste Landfill E Runoff Area=1.092 ac 5.31% Impervious Runoff Depth>1.23"
Flow Length=204' Tc=14.6 min CN=75 Runoff=1.2 cfs 4,865 cf

Subcatchment 4S: Landfill N Runoff Area=0.618 ac 4.53% Impervious Runoff Depth>1.23"
Flow Length=222' Tc=14.3 min CN=75 Runoff=0.7 cfs 2,754 cf

Subcatchment 5S: Landfill W Runoff Area=1.960 ac 3.27% Impervious Runoff Depth>1.23"
Flow Length=752' Tc=15.2 min CN=75 Runoff=2.0 cfs 8,731 cf

Subcatchment 6S: Landfill E Runoff Area=1.224 ac 4.00% Impervious Runoff Depth>1.29"
Flow Length=459' Tc=10.0 min CN=76 Runoff=1.6 cfs 5,734 cf

Subcatchment 7S: Green Field W Runoff Area=93,438 sf 0.61% Impervious Runoff Depth>0.56"
Flow Length=472' Tc=24.7 min CN=62 Runoff=0.7 cfs 4,395 cf

Subcatchment 8S: Green Field E Runoff Area=125,941 sf 0.00% Impervious Runoff Depth>0.57"
Flow Length=305' Tc=20.6 min CN=62 Runoff=0.9 cfs 5,934 cf

Subcatchment 9S: Greenfield 2 Runoff Area=1.717 ac 0.29% Impervious Runoff Depth>0.61"
Flow Length=247' Tc=19.4 min CN=63 Runoff=0.6 cfs 3,787 cf

Reach 19R: Riprap Swale Avg. Flow Depth=0.18' Max Vel=2.66 fps Inflow=2.0 cfs 8,731 cf
n=0.030 L=657.0' S=0.0383 '/' Capacity=8.6 cfs Outflow=1.9 cfs 8,691 cf

Reach 21R: Riprap Swale Avg. Flow Depth=0.16' Max Vel=2.59 fps Inflow=1.6 cfs 5,734 cf
n=0.030 L=527.0' S=0.0372 '/' Capacity=34.5 cfs Outflow=1.5 cfs 5,710 cf

Link 7L: Wetlands NW Inflow=0.8 cfs 3,141 cf
Primary=0.8 cfs 3,141 cf

Link 8L: Depression S Inflow=1.1 cfs 4,456 cf
Primary=1.1 cfs 4,456 cf

Link 9L: Wetlands NE Inflow=1.2 cfs 4,865 cf
Primary=1.2 cfs 4,865 cf

Link 10L: Wetlands N Inflow=0.7 cfs 2,754 cf
Primary=0.7 cfs 2,754 cf

Link 11L: Collection Swale W Inflow=1.9 cfs 8,691 cf
Primary=1.9 cfs 8,691 cf

Link 12L: Collection Swale W Inflow=1.5 cfs 5,710 cf
Primary=1.5 cfs 5,710 cf

Link 15L: Wetland W Inflow=0.7 cfs 4,395 cf
Primary=0.7 cfs 4,395 cf

Link 16L: Wetland E Inflow=1.6 cfs 9,721 cf
Primary=1.6 cfs 9,721 cf

Total Runoff Area = 579,533 sf Runoff Volume = 43,798 cf Average Runoff Depth = 0.91"
97.80% Pervious = 566,801 sf 2.20% Impervious = 12,732 sf

Summary for Subcatchment 1S: Bulky Waste Landfill SW

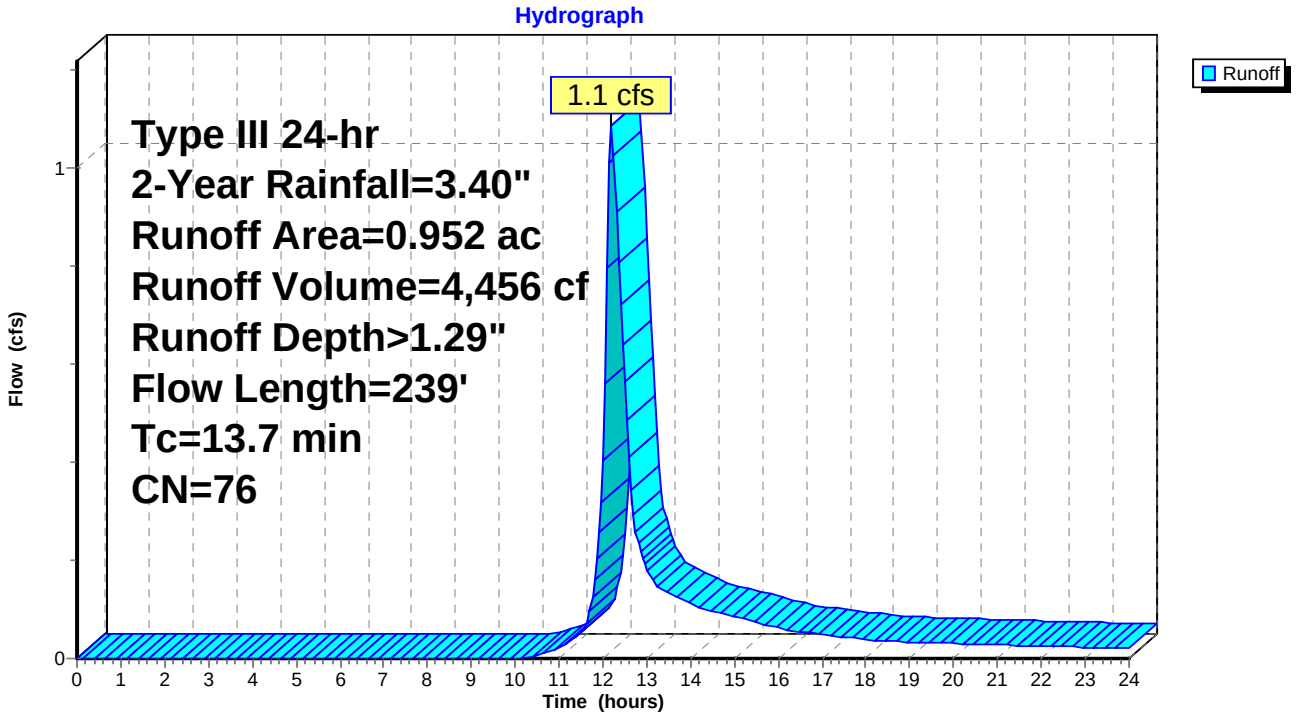
Runoff = 1.1 cfs @ 12.20 hrs, Volume= 4,456 cf, Depth> 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
	0.829	74	>75% Grass cover, Good, HSG C
	0.080	89	Gravel roads, HSG C
*	0.003	98	Equipment Pad, HSG C
*	0.040	98	Solar array Ballasts, HSG C
	0.952	76	Weighted Average
	0.909		95.48% Pervious Area
	0.043		4.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0251	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.5	66	0.1137	2.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	46	0.1957	3.10		**Shallow Concentrated Flow, Lanfill Cap** Short Grass Pasture Kv= 7.0 fps
0.4	27	0.0050	1.14		**Shallow Concentrated Flow, Access Drive** Unpaved Kv= 16.1 fps
13.7	239	Total			

Subcatchment 1S: Bulky Waste Landfill SW



Summary for Subcatchment 2S: Bulky Waste Landfill NW

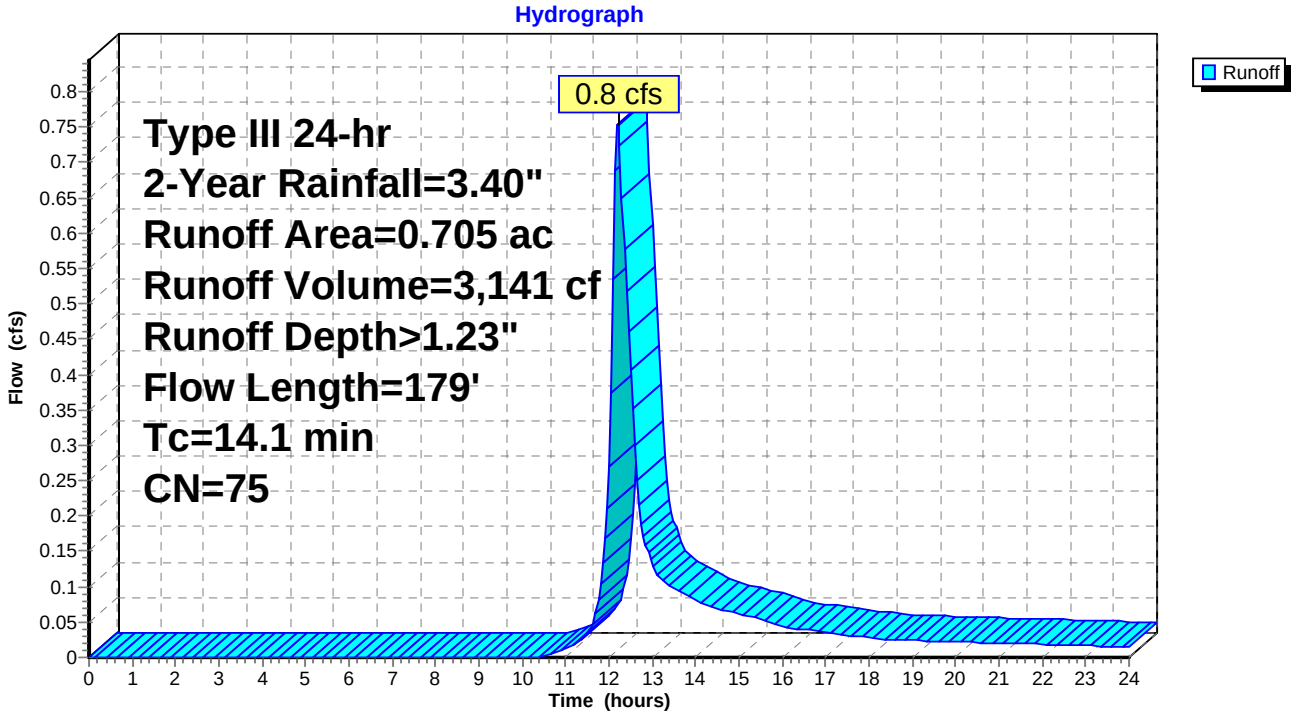
Runoff = 0.8 cfs @ 12.21 hrs, Volume= 3,141 cf, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
	0.659	74	>75% Grass cover, Good, HSG C
*	0.032	98	Solar array ballasts, HSG C
	0.014	89	Gravel roads, HSG C
	0.705	75	Weighted Average
	0.673		95.46% Pervious Area
	0.032		4.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.6	79	0.0886	2.08		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.1	179	Total			

Subcatchment 2S: Bulky Waste Landfill NW



Summary for Subcatchment 3S: Bulky Waste Landfill E

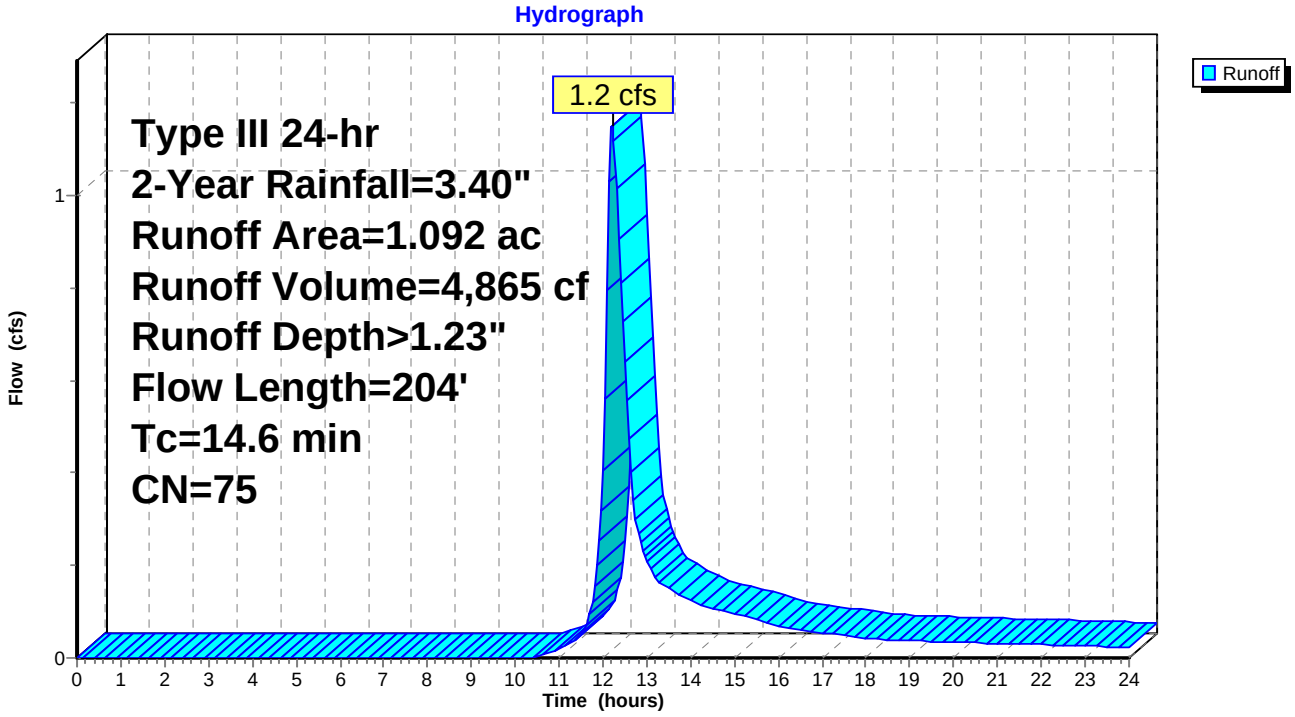
Runoff = 1.2 cfs @ 12.22 hrs, Volume= 4,865 cf, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
	1.034	74	>75% Grass cover, Good, HSG C
*	0.058	98	Solar array ballasts, HSG C
	1.092	75	Weighted Average
	1.034		94.69% Pervious Area
	0.058		5.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.1	24	0.1667	2.86		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.6	204	Total			

Subcatchment 3S: Bulky Waste Landfill E



Summary for Subcatchment 4S: Landfill N

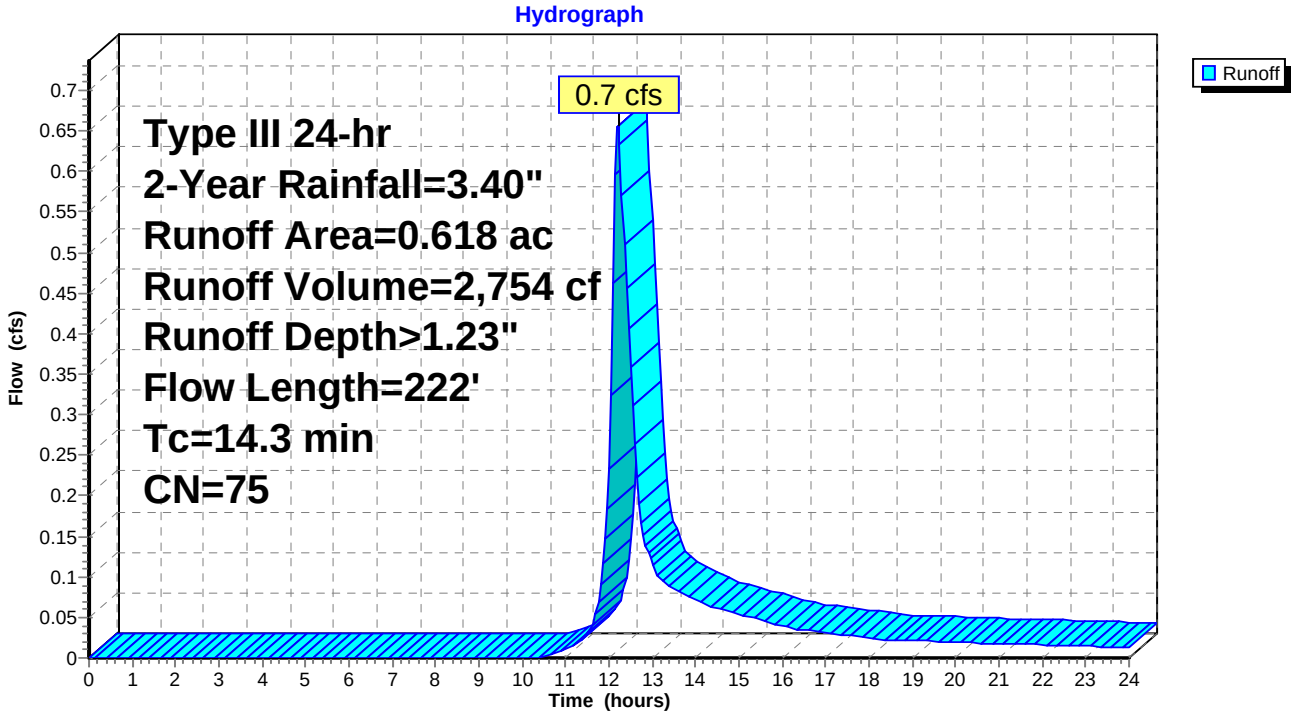
Runoff = 0.7 cfs @ 12.21 hrs, Volume= 2,754 cf, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
	0.590	74	>75% Grass cover, Good, HSG C
*	0.028	98	Solar array ballasts, HSG C
	0.618	75	Weighted Average
	0.590		95.47% Pervious Area
	0.028		4.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0230	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	81	0.0371	1.35		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	41	0.1707	2.89		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.3	222	Total			

Subcatchment 4S: Landfill N



Summary for Subcatchment 5S: Landfill W

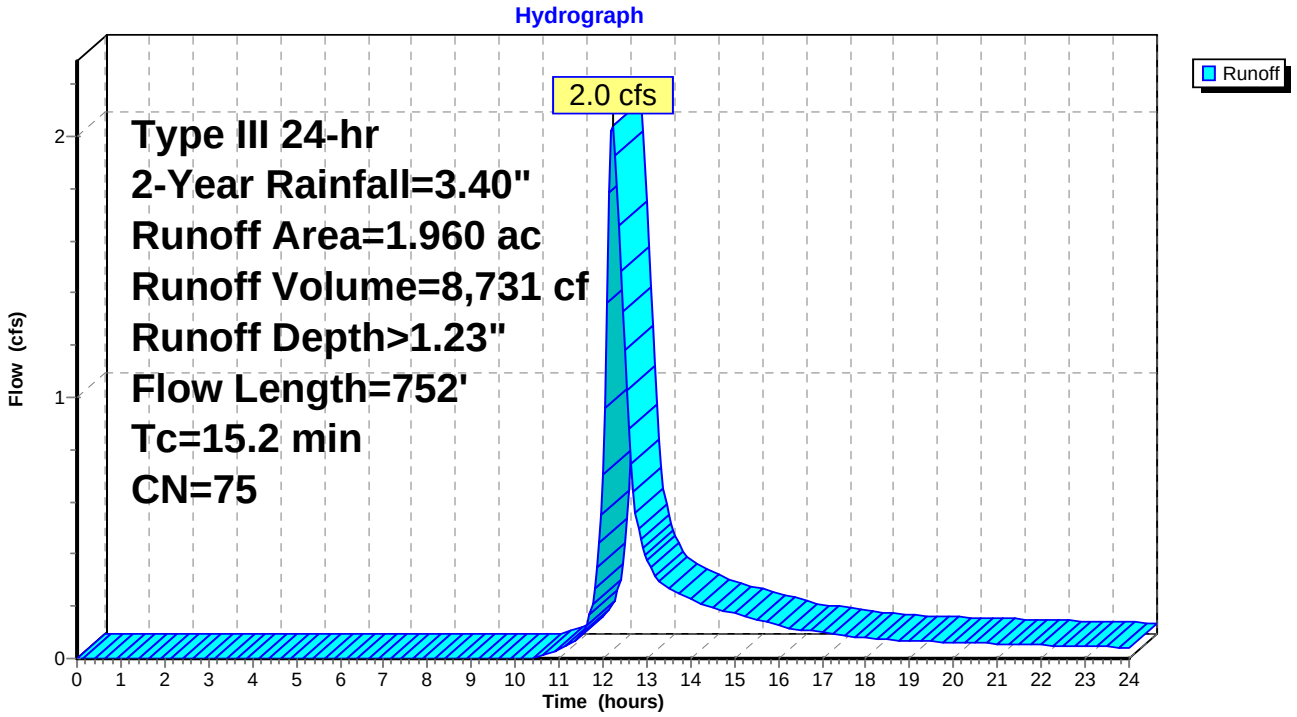
Runoff = 2.0 cfs @ 12.22 hrs, Volume= 8,731 cf, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
	1.896	74	>75% Grass cover, Good, HSG C
*	0.064	98	Solar array ballasts, HSG C
	1.960	75	Weighted Average
	1.896		96.73% Pervious Area
	0.064		3.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0220	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.3	37	0.0811	1.99		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.3	58	0.1897	3.05		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
1.3	520	0.0200	6.71	50.33	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
0.0	37	0.2160	22.05	165.39	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
15.2	752	Total			

Subcatchment 5S: Landfill W



Summary for Subcatchment 6S: Landfill E

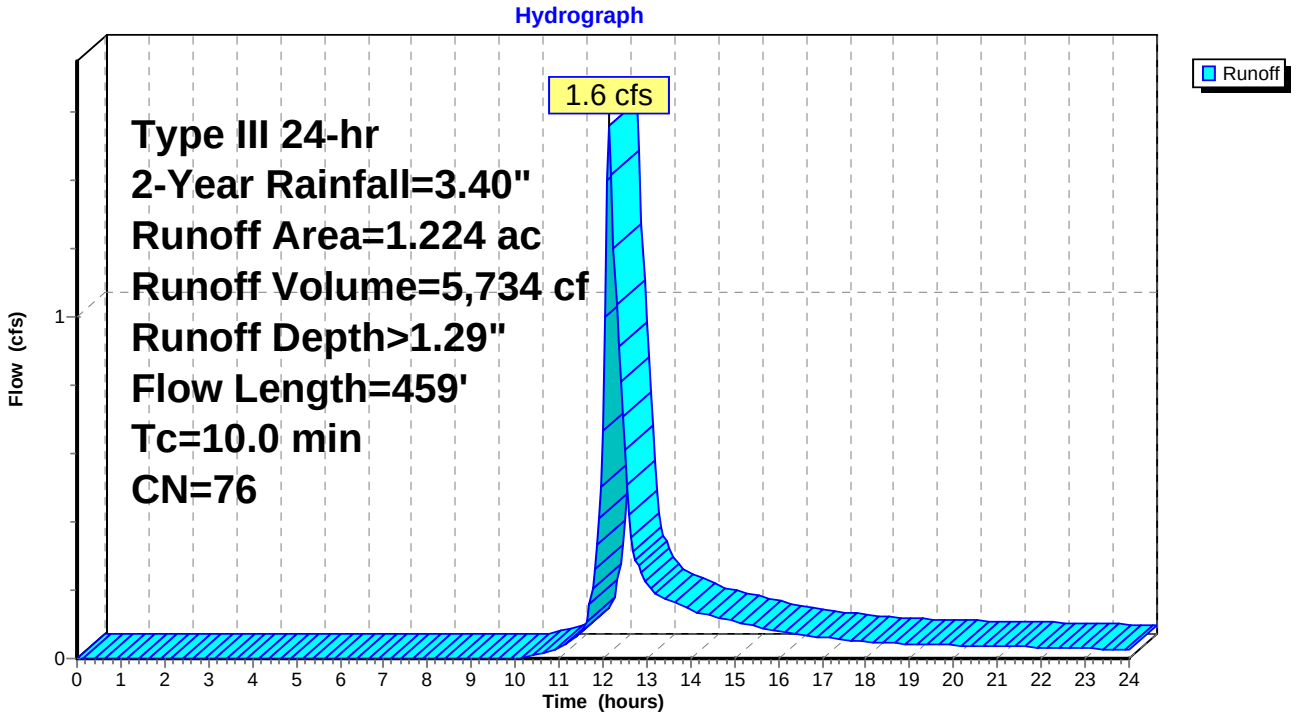
Runoff = 1.6 cfs @ 12.15 hrs, Volume= 5,734 cf, Depth> 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
	1.085	74	>75% Grass cover, Good, HSG C
	0.090	89	Gravel roads, HSG C
*	0.046	98	Solar array ballasts, HSG C
*	0.003	98	Concrete Equipment Pad, HSG C
	1.224	76	Weighted Average
	1.175		96.00% Pervious Area
	0.049		4.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	40	0.0543	0.15		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	60	0.0117	1.03		**Sheet Flow, Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.5	86	0.0384	3.15		**Shallow Concentrated Flow, Gravel** Unpaved Kv= 16.1 fps
0.7	76	0.0658	1.80		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	49	0.2245	3.32		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	148	0.1081	15.60	117.00	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
7.1	459	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: Landfill E



Summary for Subcatchment 7S: Green Field W

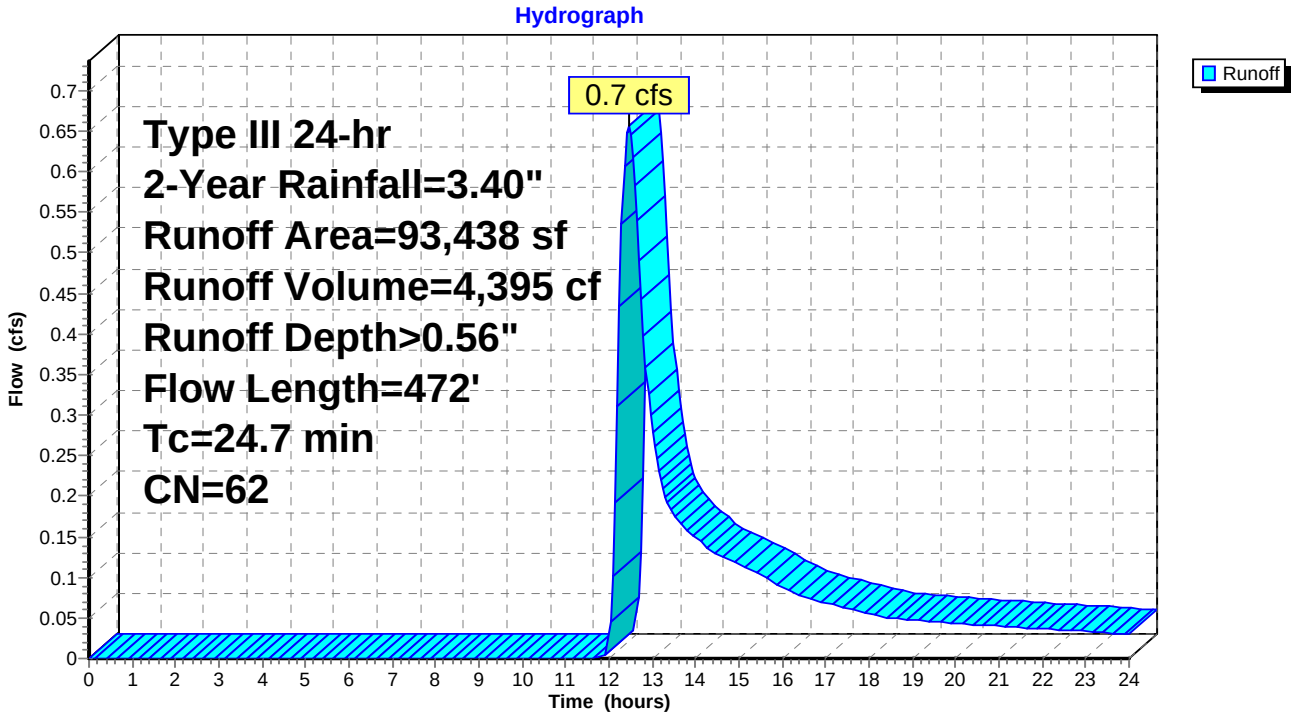
Runoff = 0.7 cfs @ 12.45 hrs, Volume= 4,395 cf, Depth> 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (sf)	CN	Description
	832	74	>75% Grass cover, Good, HSG C
	3,861	80	>75% Grass cover, Good, HSG D
	21,955	61	>75% Grass cover, Good, HSG B
	66,216	61	>75% Grass cover, Good, HSG B
	340	98	Paved parking, HSG C
*	4	98	Solar Array Posts, HSG B
*	230	98	Equipment Pad, HSG B
	93,438	62	Weighted Average
	92,864		99.39% Pervious Area
	574		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	23	0.0217	1.03		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
4.8	160	0.0063	0.56		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.6	51	0.0392	1.39		**Shallow Concentrated Flow, field** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.7	50	0.0300	1.21		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
24.7	472	Total			

Subcatchment 7S: Green Field W



Summary for Subcatchment 8S: Green Field E

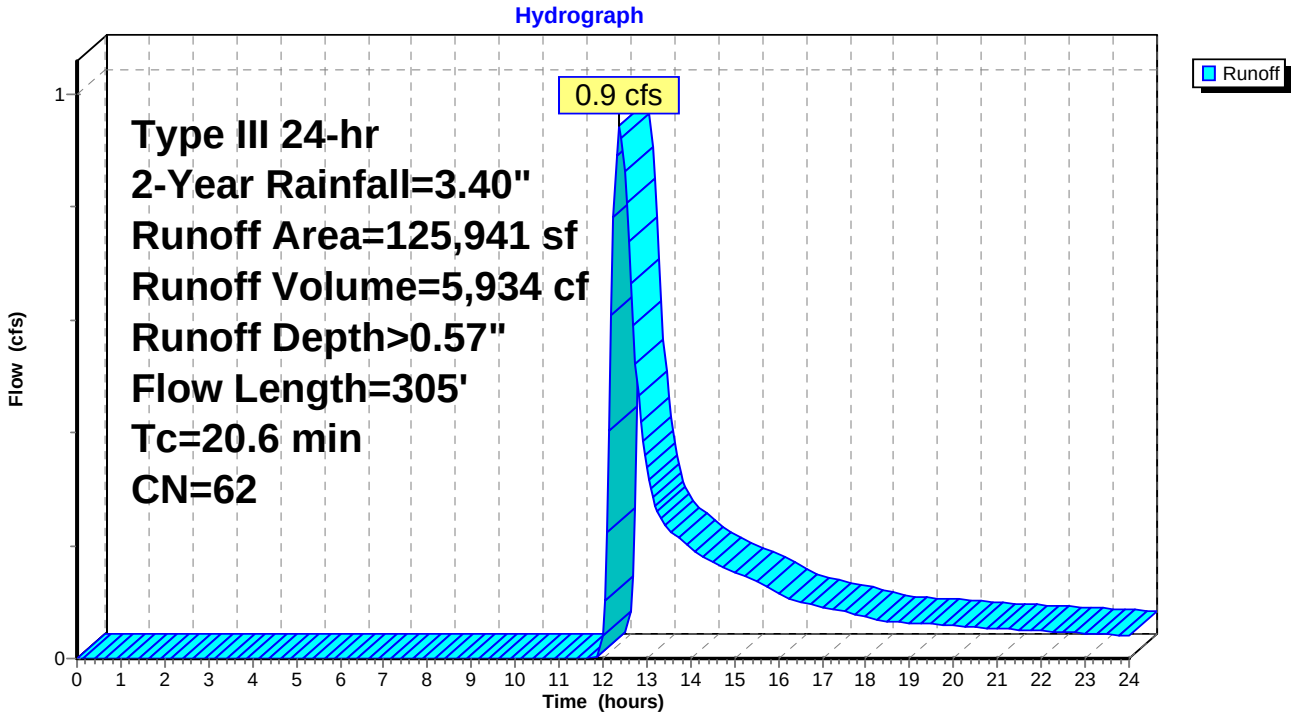
Runoff = 0.9 cfs @ 12.37 hrs, Volume= 5,934 cf, Depth> 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (sf)	CN	Description
	116,936	61	>75% Grass cover, Good, HSG B
	3,129	80	>75% Grass cover, Good, HSG D
	1,452	80	>75% Grass cover, Good, HSG D
	4,419	61	>75% Grass cover, Good, HSG B
*	5	98	Solar Array Posts, HSG B
	125,941	62	Weighted Average
	125,936		100.00% Pervious Area
	5		0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	24	0.0208	1.01		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
2.6	106	0.0094	0.68		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.8	75	0.0467	1.51		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
20.6	305	Total			

Subcatchment 8S: Green Field E



Summary for Subcatchment 9S: Greenfield 2

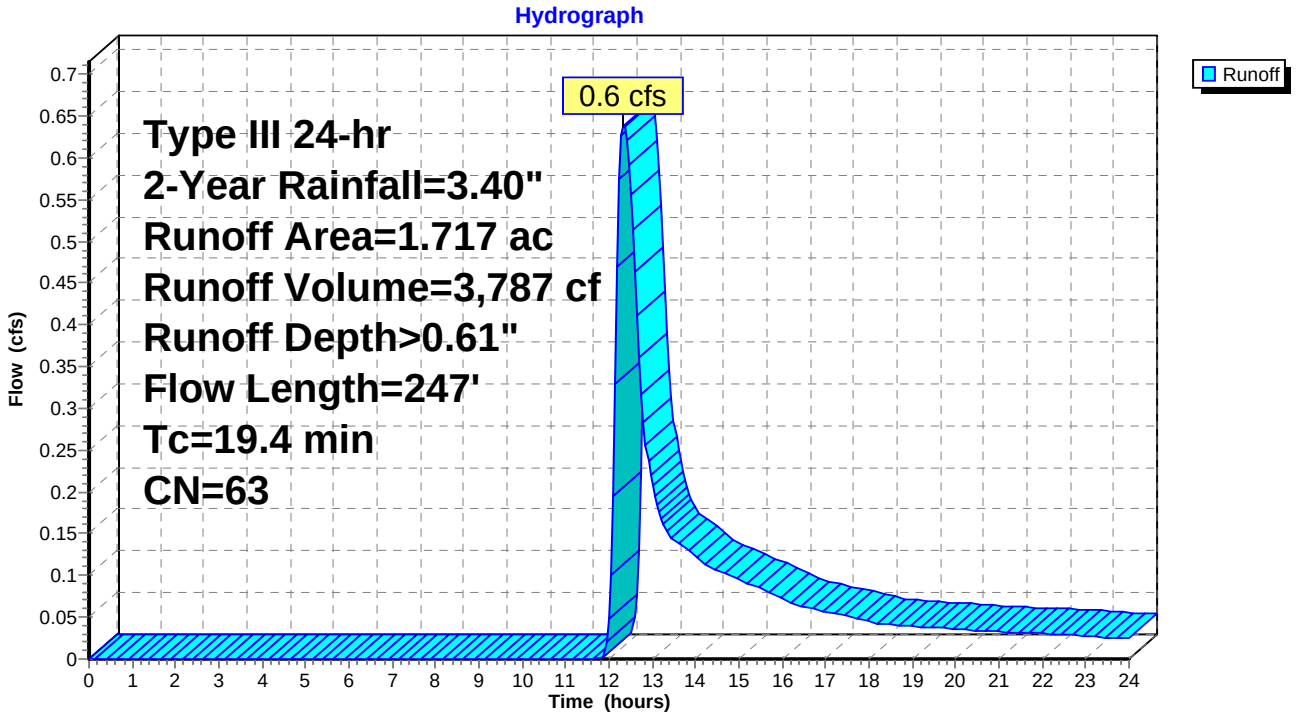
Runoff = 0.6 cfs @ 12.34 hrs, Volume= 3,787 cf, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (ac)	CN	Description
	0.091	77	Woods, Good, HSG D
	0.151	55	Woods, Good, HSG B
	1.283	61	>75% Grass cover, Good, HSG B
	0.187	80	>75% Grass cover, Good, HSG D
*	0.000	98	Solar Array Posts, HSG B
	0.005	98	Paved parking, HSG B
	1.717	63	Weighted Average
	1.712		99.71% Pervious Area
	0.005		0.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0128	0.10		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.40"
2.9	147	0.0148	0.85		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
19.4	247	Total			

Subcatchment 9S: Greenfield 2



Summary for Reach 19R: Riprap Swale

Inflow Area = 85,378 sf, 3.27% Impervious, Inflow Depth > 1.23" for 2-Year event
Inflow = 2.0 cfs @ 12.22 hrs, Volume= 8,731 cf
Outflow = 1.9 cfs @ 12.28 hrs, Volume= 8,691 cf, Atten= 5%, Lag= 3.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 2.66 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 11.0 min

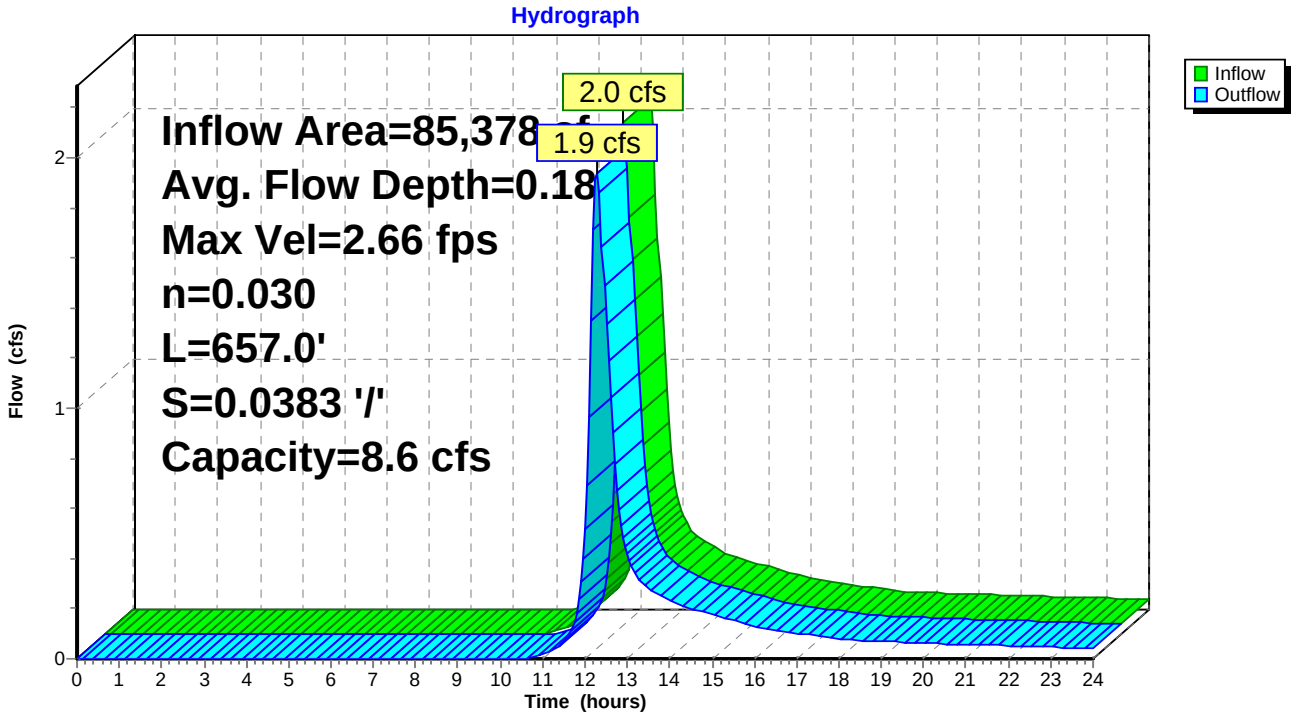
Peak Storage= 477 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 0.40' Flow Area= 2.1 sf, Capacity= 8.6 cfs

3.00' x 0.40' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 5.5 '/' Top Width= 7.40'
Length= 657.0' Slope= 0.0383 '/'
Inlet Invert= 274.52', Outlet Invert= 249.36'



‡

Reach 19R: Riprap Swale



Summary for Reach 21R: Riprap Swale

Inflow Area = 53,317 sf, 4.00% Impervious, Inflow Depth > 1.29" for 2-Year event
Inflow = 1.6 cfs @ 12.15 hrs, Volume= 5,734 cf
Outflow = 1.5 cfs @ 12.19 hrs, Volume= 5,710 cf, Atten= 6%, Lag= 2.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 2.59 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 10.1 min

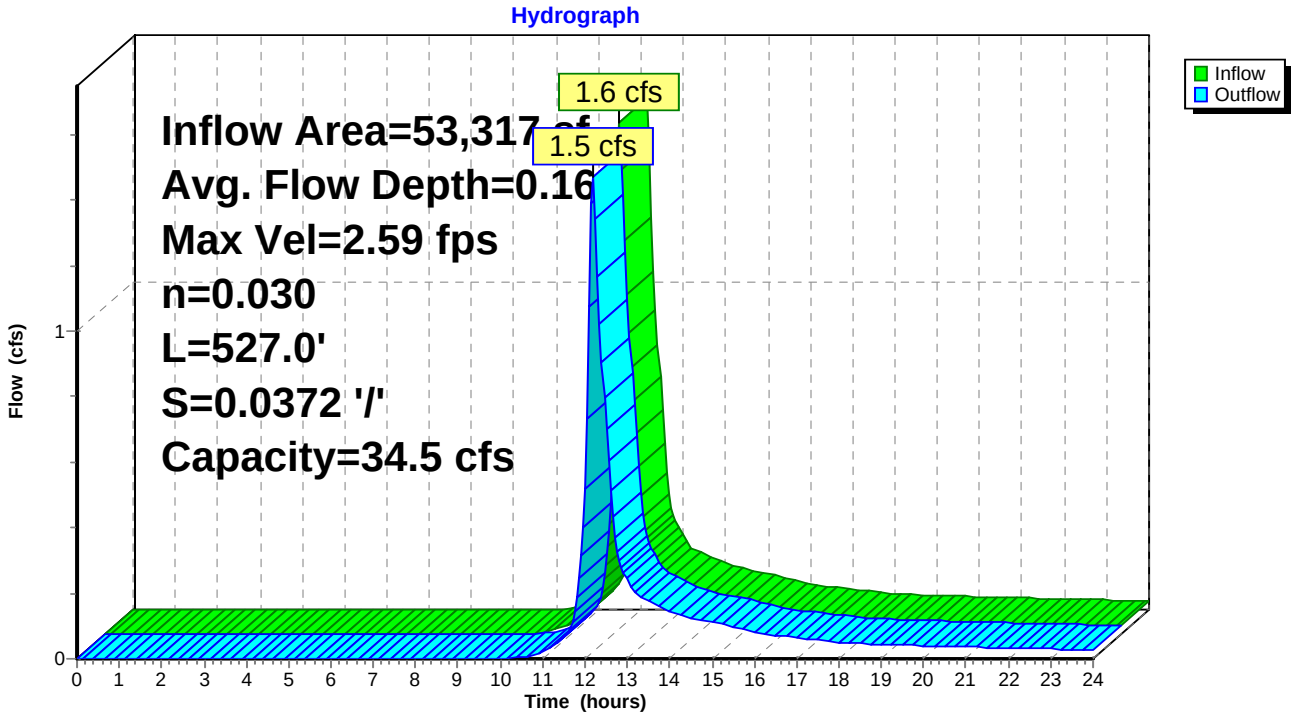
Peak Storage= 299 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 0.90' Flow Area= 5.1 sf, Capacity= 34.5 cfs

3.00' x 0.90' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 3.0 '/' Top Width= 8.40'
Length= 527.0' Slope= 0.0372 '/'
Inlet Invert= 276.70', Outlet Invert= 257.10'



‡

Reach 21R: Riprap Swale

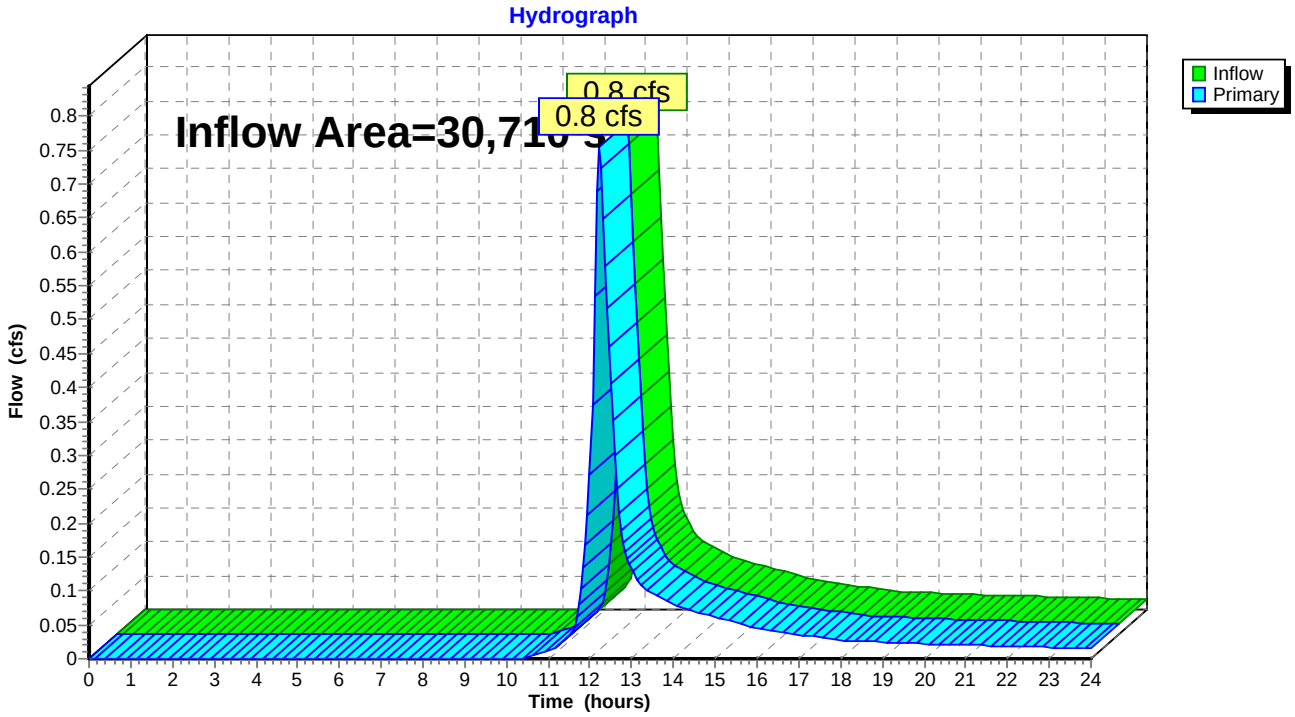


Summary for Link 7L: Wetlands NW

Inflow Area = 30,710 sf, 4.54% Impervious, Inflow Depth > 1.23" for 2-Year event
Inflow = 0.8 cfs @ 12.21 hrs, Volume= 3,141 cf
Primary = 0.8 cfs @ 12.21 hrs, Volume= 3,141 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 7L: Wetlands NW

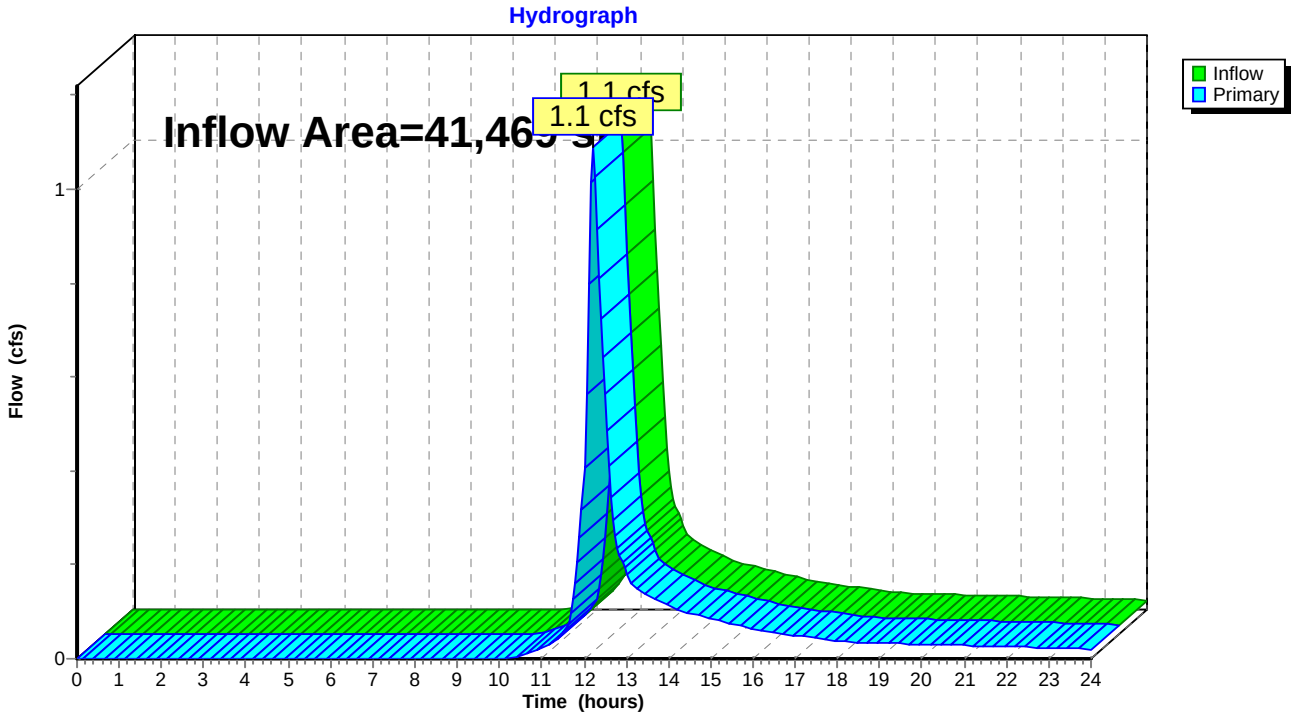


Summary for Link 8L: Depression S

Inflow Area = 41,469 sf, 4.52% Impervious, Inflow Depth > 1.29" for 2-Year event
Inflow = 1.1 cfs @ 12.20 hrs, Volume= 4,456 cf
Primary = 1.1 cfs @ 12.20 hrs, Volume= 4,456 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 8L: Depression S

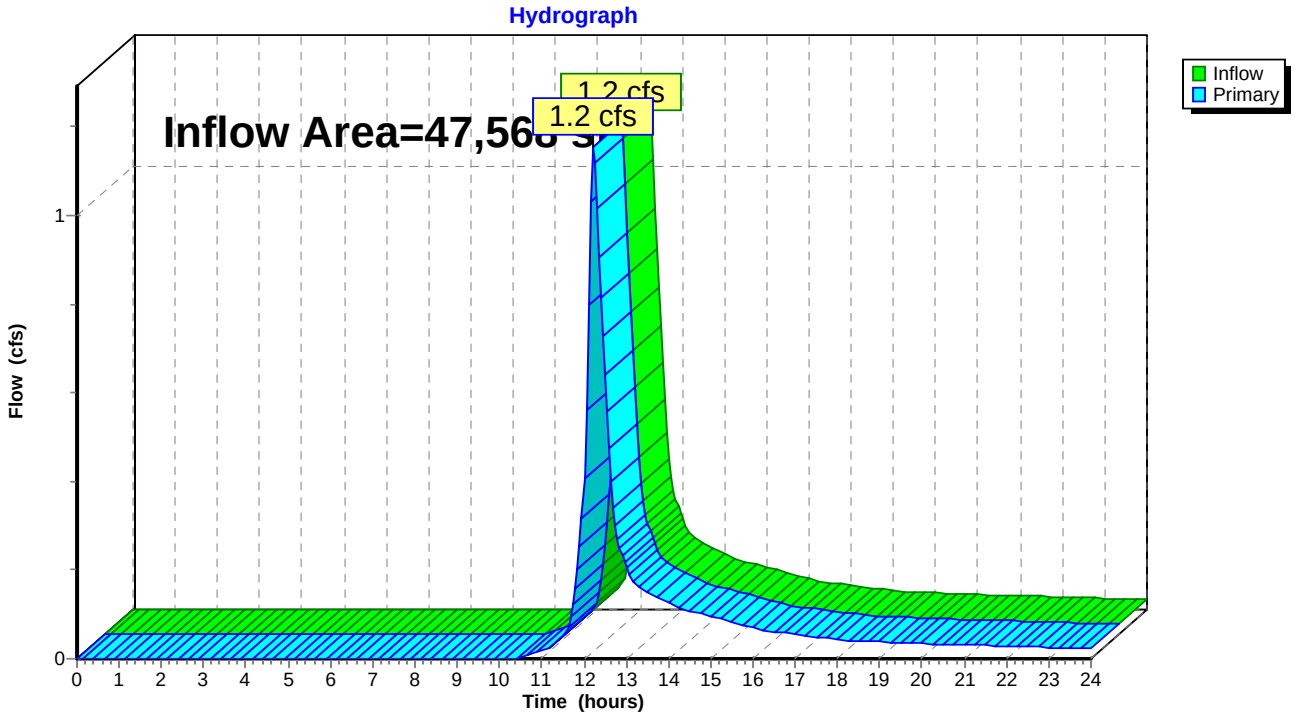


Summary for Link 9L: Wetlands NE

Inflow Area = 47,568 sf, 5.31% Impervious, Inflow Depth > 1.23" for 2-Year event
Inflow = 1.2 cfs @ 12.22 hrs, Volume= 4,865 cf
Primary = 1.2 cfs @ 12.22 hrs, Volume= 4,865 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 9L: Wetlands NE

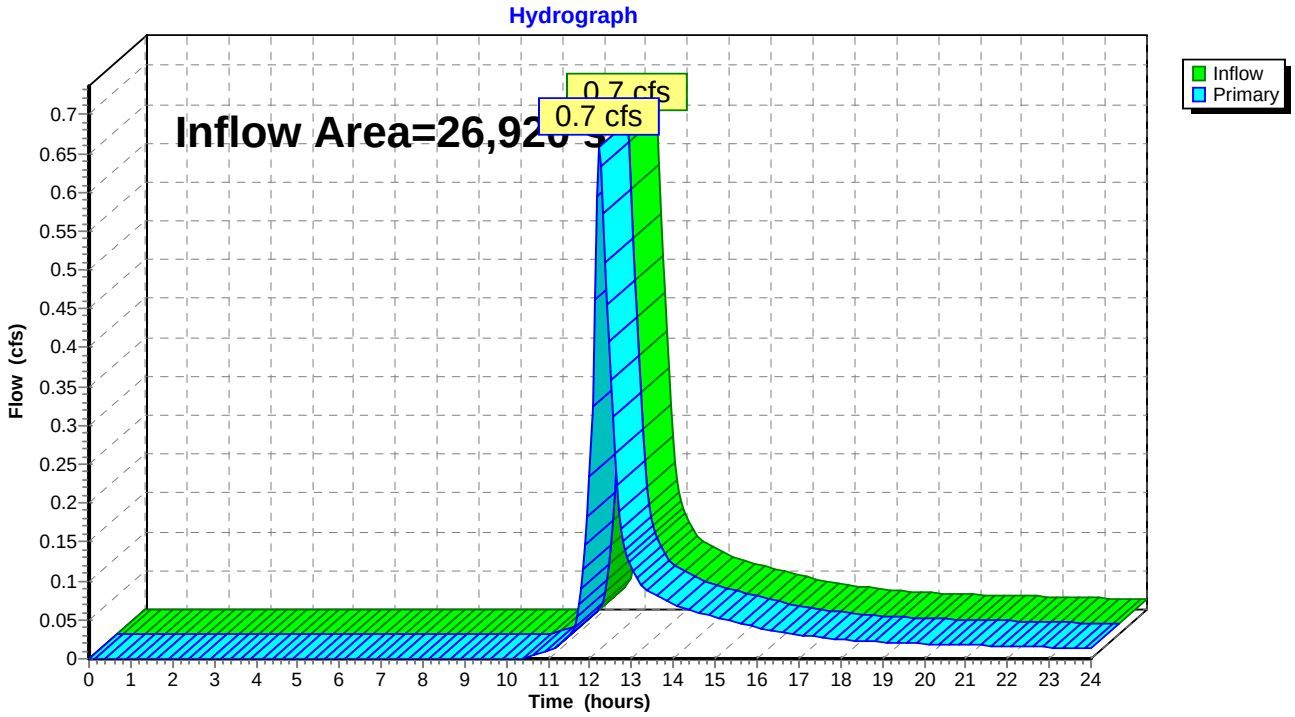


Summary for Link 10L: Wetlands N

Inflow Area = 26,920 sf, 4.53% Impervious, Inflow Depth > 1.23" for 2-Year event
Inflow = 0.7 cfs @ 12.21 hrs, Volume= 2,754 cf
Primary = 0.7 cfs @ 12.21 hrs, Volume= 2,754 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 10L: Wetlands N

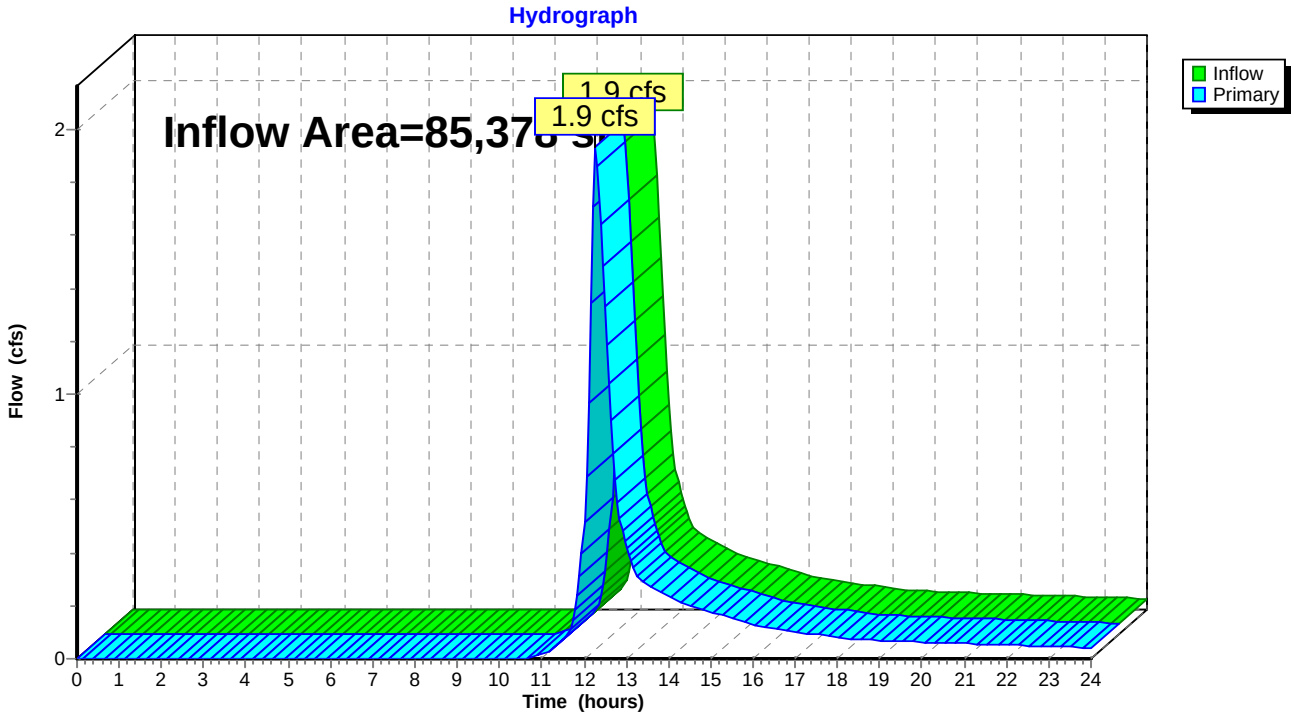


Summary for Link 11L: Collection Swale W

Inflow Area = 85,378 sf, 3.27% Impervious, Inflow Depth > 1.22" for 2-Year event
Inflow = 1.9 cfs @ 12.28 hrs, Volume= 8,691 cf
Primary = 1.9 cfs @ 12.28 hrs, Volume= 8,691 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 11L: Collection Swale W

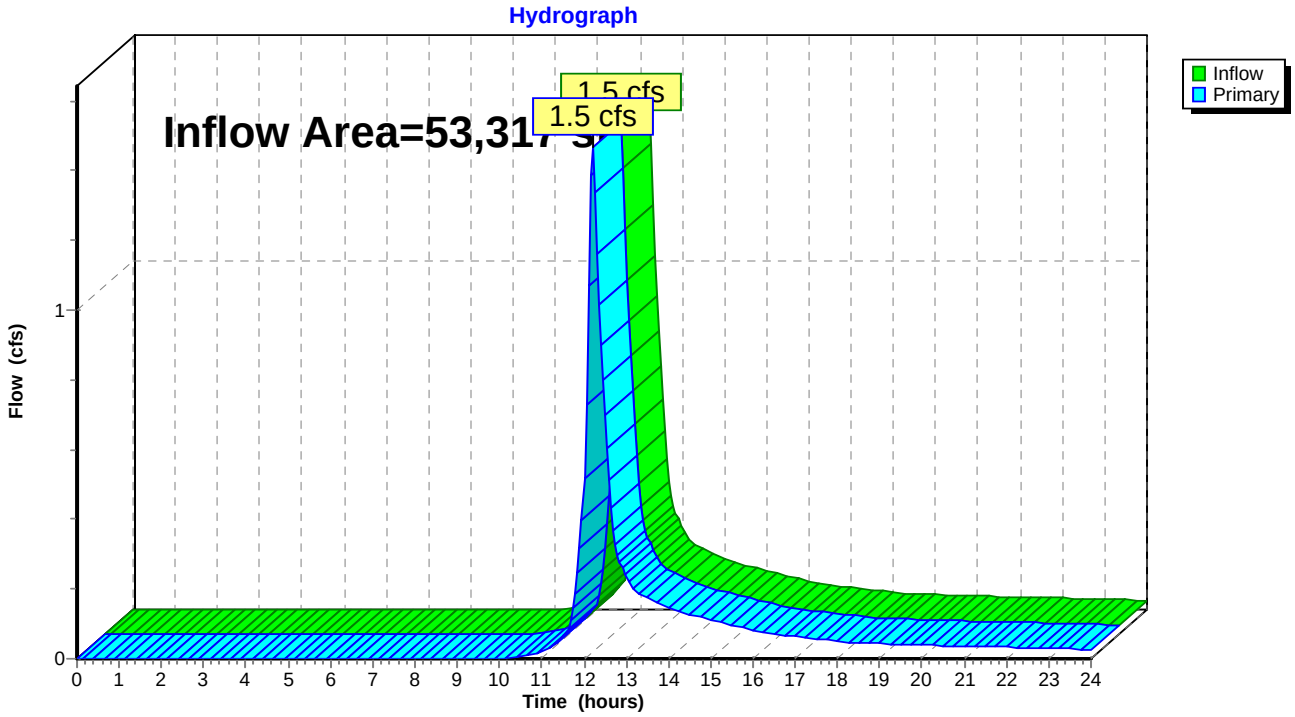


Summary for Link 12L: Collection Swale W

Inflow Area = 53,317 sf, 4.00% Impervious, Inflow Depth > 1.29" for 2-Year event
Inflow = 1.5 cfs @ 12.19 hrs, Volume= 5,710 cf
Primary = 1.5 cfs @ 12.19 hrs, Volume= 5,710 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 12L: Collection Swale W

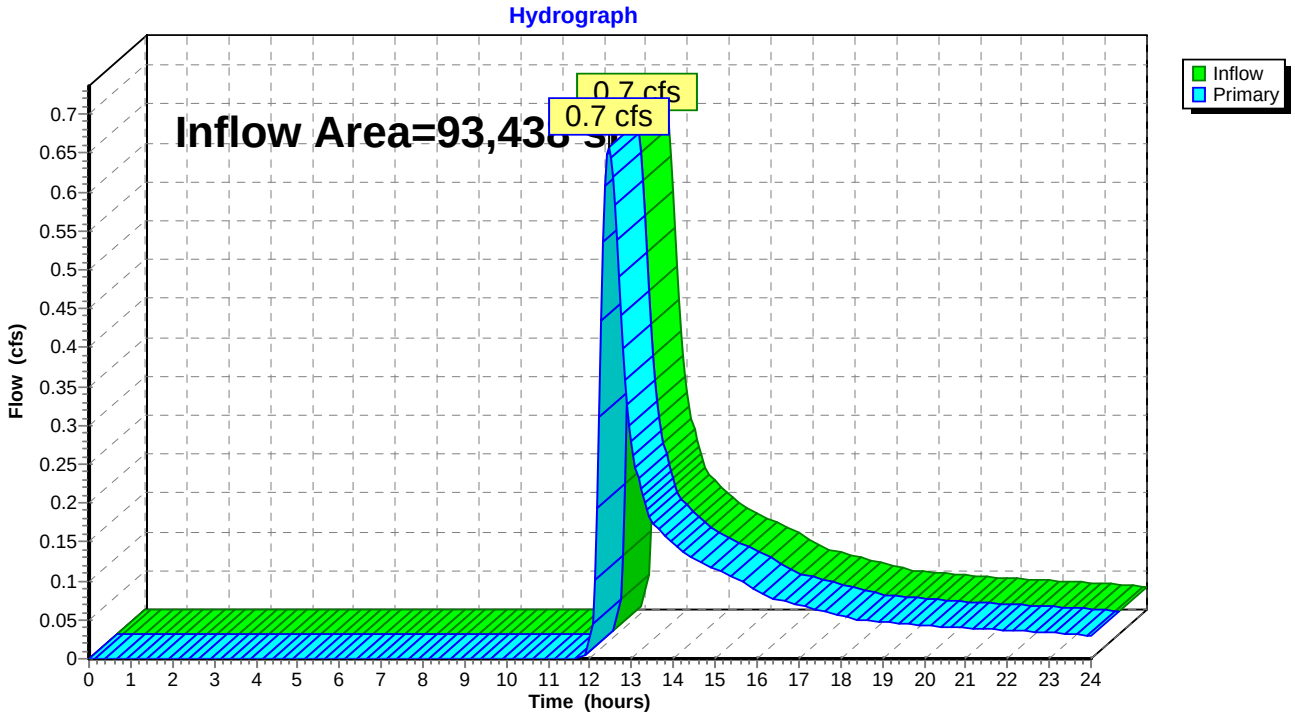


Summary for Link 15L: Wetland W

Inflow Area = 93,438 sf, 0.61% Impervious, Inflow Depth > 0.56" for 2-Year event
Inflow = 0.7 cfs @ 12.45 hrs, Volume= 4,395 cf
Primary = 0.7 cfs @ 12.45 hrs, Volume= 4,395 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 15L: Wetland W

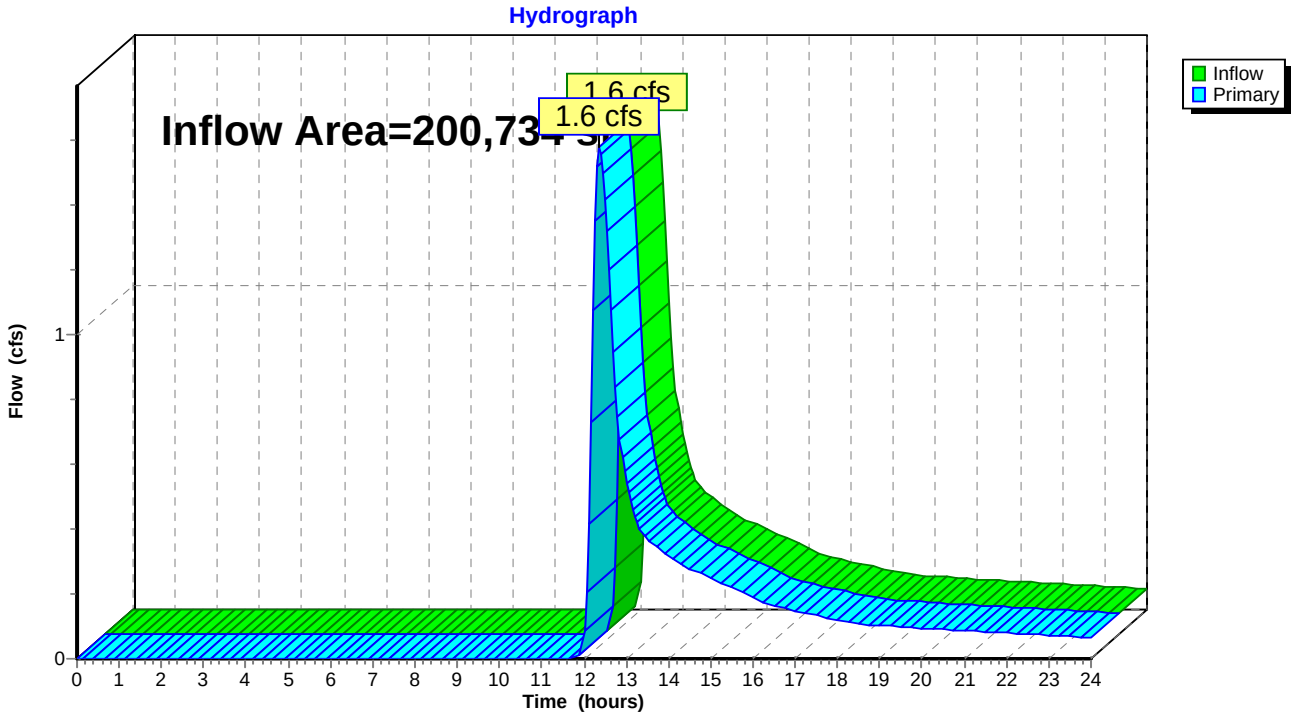


Summary for Link 16L: Wetland E

Inflow Area = 200,734 sf, 0.11% Impervious, Inflow Depth > 0.58" for 2-Year event
Inflow = 1.6 cfs @ 12.36 hrs, Volume= 9,721 cf
Primary = 1.6 cfs @ 12.36 hrs, Volume= 9,721 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 16L: Wetland E



Time span=0.00-24.00 hrs, dt=0.050 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Bulky Waste Landfill SW Runoff Area=0.952 ac 4.52% Impervious Runoff Depth>1.97"
Flow Length=239' Tc=13.7 min CN=76 Runoff=1.7 cfs 6,794 cf

Subcatchment 2S: Bulky Waste Landfill NW Runoff Area=0.705 ac 4.54% Impervious Runoff Depth>1.89"
Flow Length=179' Tc=14.1 min CN=75 Runoff=1.2 cfs 4,835 cf

Subcatchment 3S: Bulky Waste Landfill E Runoff Area=1.092 ac 5.31% Impervious Runoff Depth>1.89"
Flow Length=204' Tc=14.6 min CN=75 Runoff=1.8 cfs 7,489 cf

Subcatchment 4S: Landfill N Runoff Area=0.618 ac 4.53% Impervious Runoff Depth>1.89"
Flow Length=222' Tc=14.3 min CN=75 Runoff=1.0 cfs 4,238 cf

Subcatchment 5S: Landfill W Runoff Area=1.960 ac 3.27% Impervious Runoff Depth>1.89"
Flow Length=752' Tc=15.2 min CN=75 Runoff=3.2 cfs 13,439 cf

Subcatchment 6S: Landfill E Runoff Area=1.224 ac 4.00% Impervious Runoff Depth>1.97"
Flow Length=459' Tc=10.0 min CN=76 Runoff=2.4 cfs 8,742 cf

Subcatchment 7S: Green Field W Runoff Area=93,438 sf 0.61% Impervious Runoff Depth>1.02"
Flow Length=472' Tc=24.7 min CN=62 Runoff=1.4 cfs 7,938 cf

Subcatchment 8S: Green Field E Runoff Area=125,941 sf 0.00% Impervious Runoff Depth>1.02"
Flow Length=305' Tc=20.6 min CN=62 Runoff=2.0 cfs 10,713 cf

Subcatchment 9S: Greenfield 2 Runoff Area=1.717 ac 0.29% Impervious Runoff Depth>1.08"
Flow Length=247' Tc=19.4 min CN=63 Runoff=1.3 cfs 6,729 cf

Reach 19R: Riprap Swale Avg. Flow Depth=0.23' Max Vel=3.07 fps Inflow=3.2 cfs 13,439 cf
n=0.030 L=657.0' S=0.0383 '/' Capacity=8.6 cfs Outflow=3.1 cfs 13,390 cf

Reach 21R: Riprap Swale Avg. Flow Depth=0.21' Max Vel=3.00 fps Inflow=2.4 cfs 8,742 cf
n=0.030 L=527.0' S=0.0372 '/' Capacity=34.5 cfs Outflow=2.3 cfs 8,713 cf

Link 7L: Wetlands NW Inflow=1.2 cfs 4,835 cf
Primary=1.2 cfs 4,835 cf

Link 8L: Depression S Inflow=1.7 cfs 6,794 cf
Primary=1.7 cfs 6,794 cf

Link 9L: Wetlands NE Inflow=1.8 cfs 7,489 cf
Primary=1.8 cfs 7,489 cf

Link 10L: Wetlands N Inflow=1.0 cfs 4,238 cf
Primary=1.0 cfs 4,238 cf

Link 11L: Collection Swale W Inflow=3.1 cfs 13,390 cf
Primary=3.1 cfs 13,390 cf

Link 12L: Collection Swale W Inflow=2.3 cfs 8,713 cf
Primary=2.3 cfs 8,713 cf

Link 15L: Wetland W Inflow=1.4 cfs 7,938 cf
Primary=1.4 cfs 7,938 cf

Link 16L: Wetland E Inflow=3.3 cfs 17,442 cf
Primary=3.3 cfs 17,442 cf

Total Runoff Area = 579,533 sf Runoff Volume = 70,917 cf Average Runoff Depth = 1.47"
97.80% Pervious = 566,801 sf 2.20% Impervious = 12,732 sf

Summary for Subcatchment 1S: Bulky Waste Landfill SW

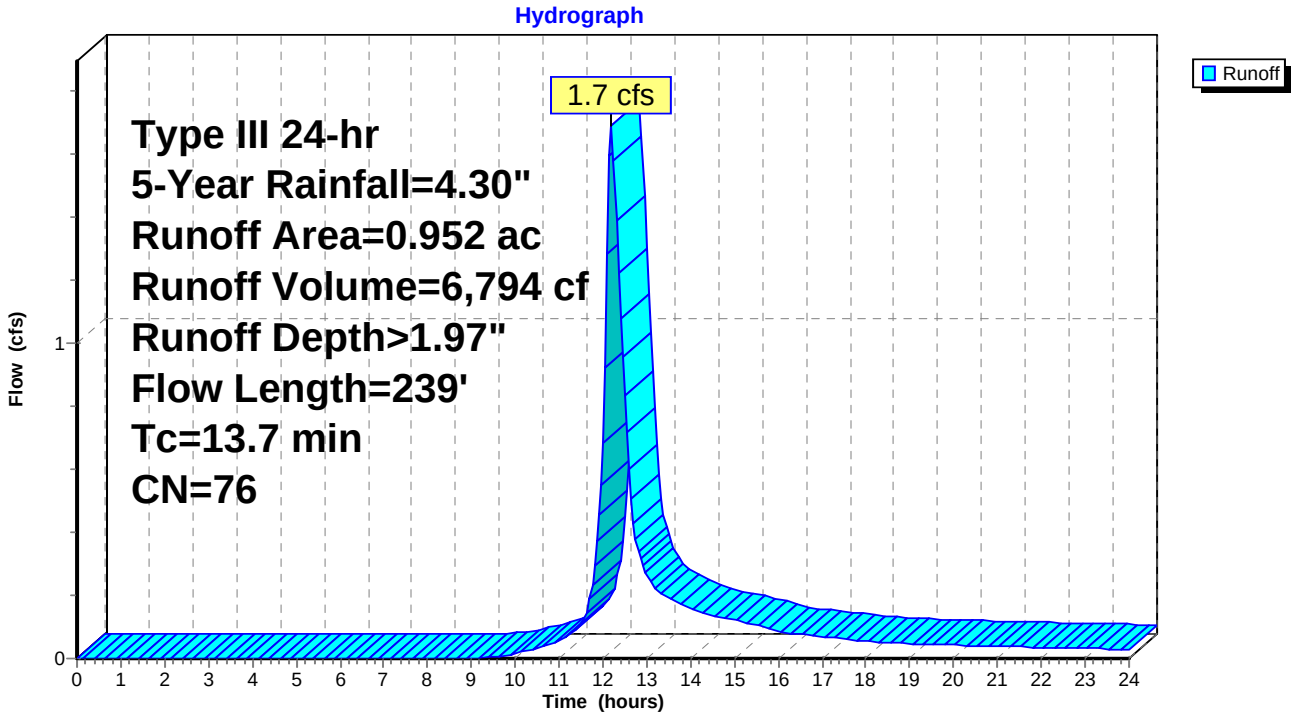
Runoff = 1.7 cfs @ 12.20 hrs, Volume= 6,794 cf, Depth> 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

	Area (ac)	CN	Description
	0.829	74	>75% Grass cover, Good, HSG C
	0.080	89	Gravel roads, HSG C
*	0.003	98	Equipment Pad, HSG C
*	0.040	98	Solar array Ballasts, HSG C
	0.952	76	Weighted Average
	0.909		95.48% Pervious Area
	0.043		4.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0251	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.5	66	0.1137	2.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	46	0.1957	3.10		**Shallow Concentrated Flow, Lanfill Cap** Short Grass Pasture Kv= 7.0 fps
0.4	27	0.0050	1.14		**Shallow Concentrated Flow, Access Drive** Unpaved Kv= 16.1 fps
13.7	239	Total			

Subcatchment 1S: Bulky Waste Landfill SW



Summary for Subcatchment 2S: Bulky Waste Landfill NW

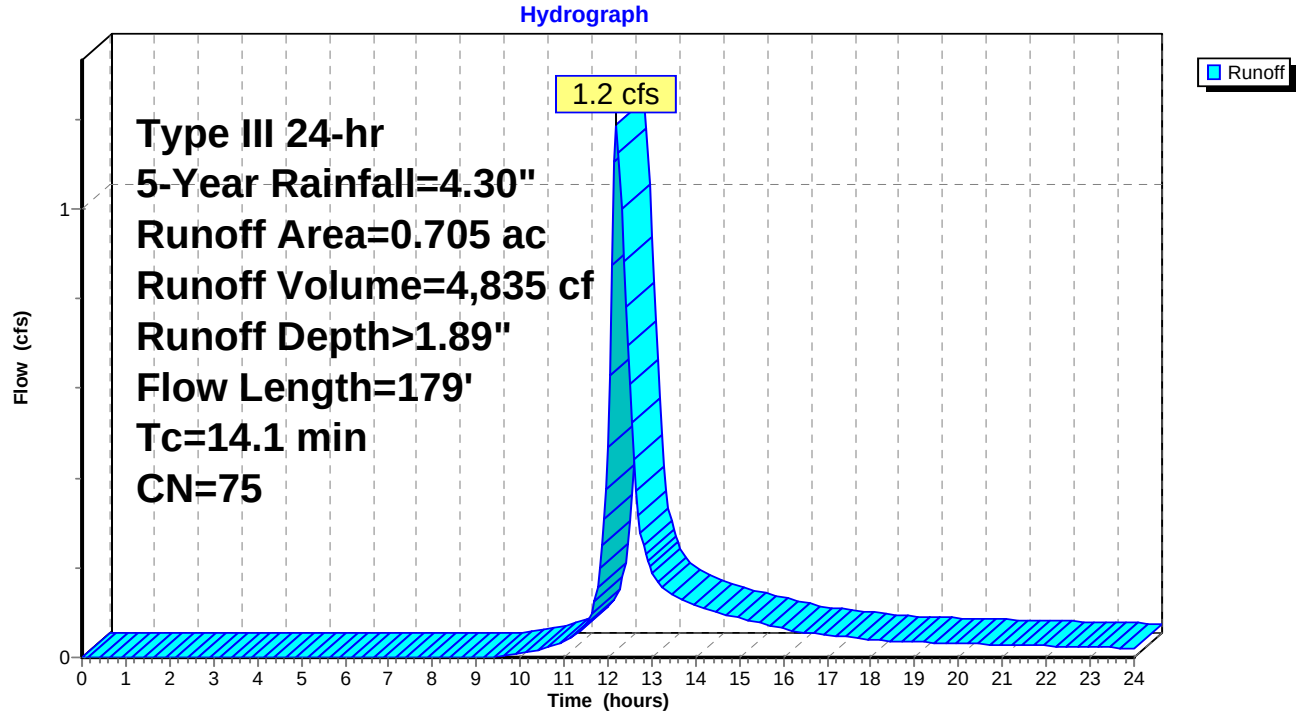
Runoff = 1.2 cfs @ 12.20 hrs, Volume= 4,835 cf, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

	Area (ac)	CN	Description
	0.659	74	>75% Grass cover, Good, HSG C
*	0.032	98	Solar array ballasts, HSG C
	0.014	89	Gravel roads, HSG C
	0.705	75	Weighted Average
	0.673		95.46% Pervious Area
	0.032		4.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.6	79	0.0886	2.08		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.1	179	Total			

Subcatchment 2S: Bulky Waste Landfill NW



Summary for Subcatchment 3S: Bulky Waste Landfill E

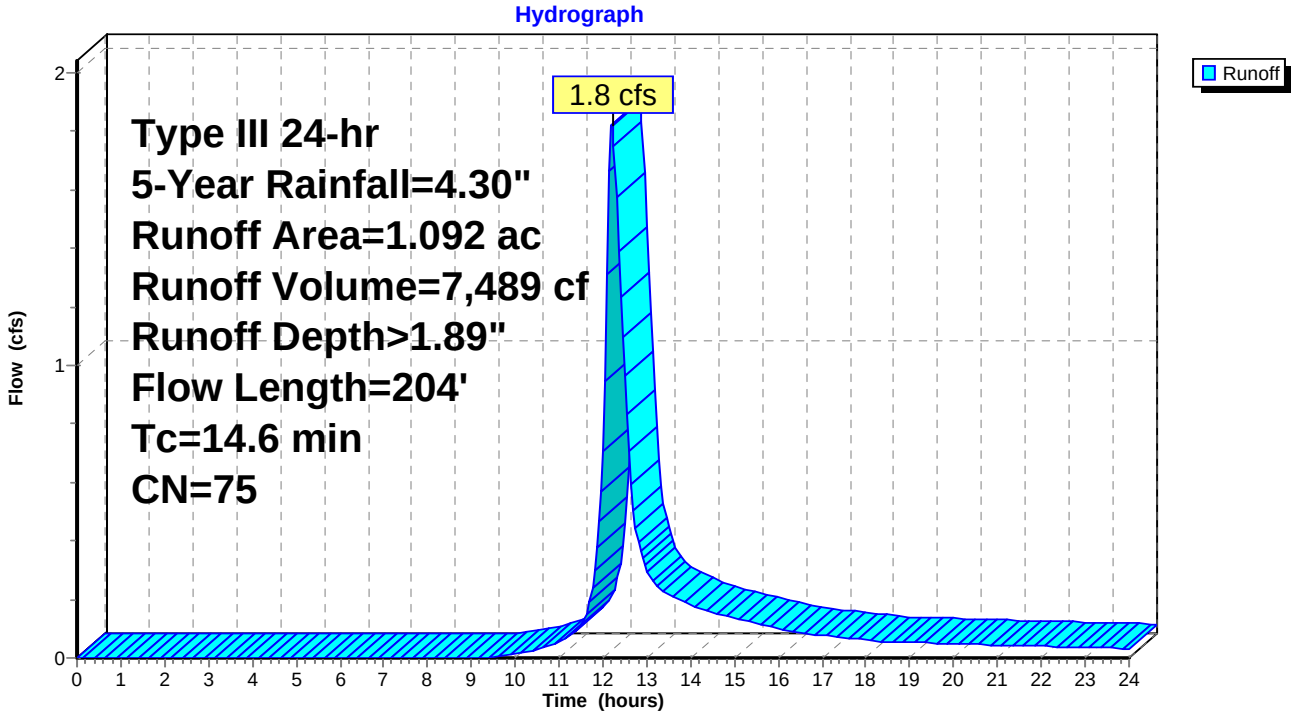
Runoff = 1.8 cfs @ 12.21 hrs, Volume= 7,489 cf, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

	Area (ac)	CN	Description
	1.034	74	>75% Grass cover, Good, HSG C
*	0.058	98	Solar array ballasts, HSG C
	1.092	75	Weighted Average
	1.034		94.69% Pervious Area
	0.058		5.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.1	24	0.1667	2.86		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.6	204	Total			

Subcatchment 3S: Bulky Waste Landfill E



Summary for Subcatchment 4S: Landfill N

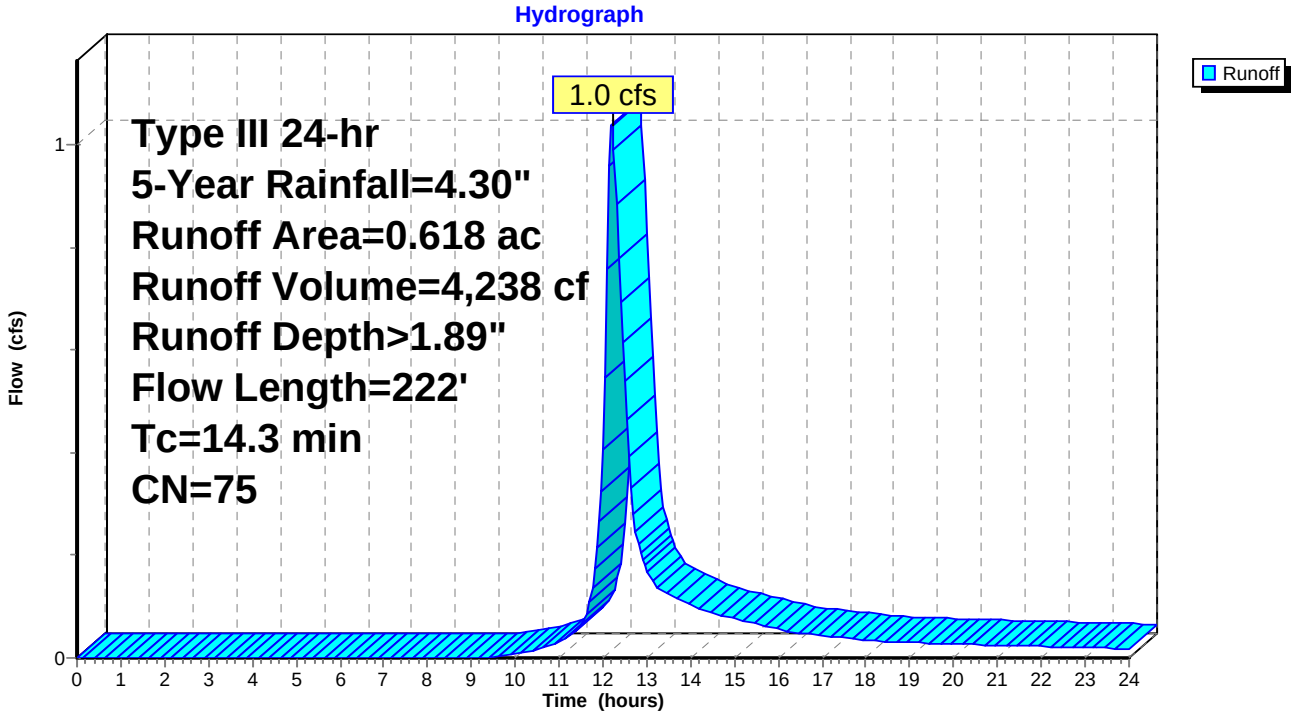
Runoff = 1.0 cfs @ 12.21 hrs, Volume= 4,238 cf, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

	Area (ac)	CN	Description
	0.590	74	>75% Grass cover, Good, HSG C
*	0.028	98	Solar array ballasts, HSG C
	0.618	75	Weighted Average
	0.590		95.47% Pervious Area
	0.028		4.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0230	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	81	0.0371	1.35		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	41	0.1707	2.89		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.3	222	Total			

Subcatchment 4S: Landfill N



Summary for Subcatchment 5S: Landfill W

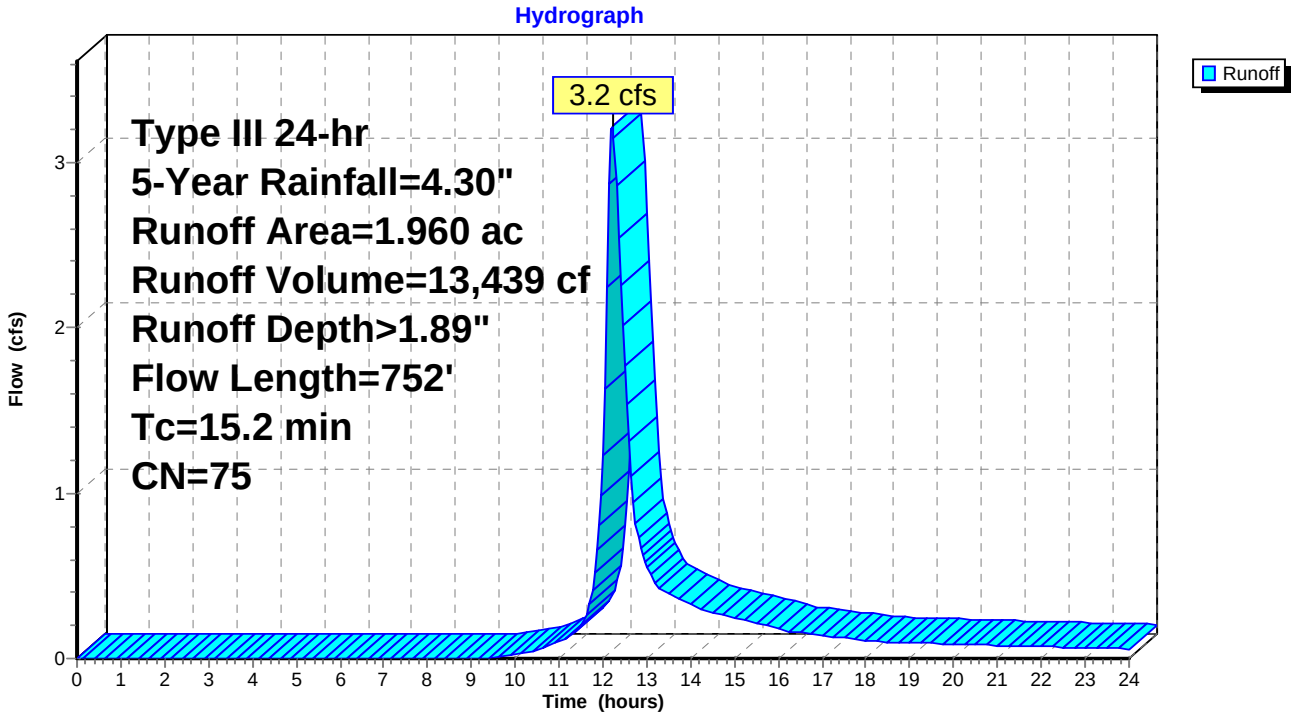
Runoff = 3.2 cfs @ 12.22 hrs, Volume= 13,439 cf, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

	Area (ac)	CN	Description
	1.896	74	>75% Grass cover, Good, HSG C
*	0.064	98	Solar array ballasts, HSG C
	1.960	75	Weighted Average
	1.896		96.73% Pervious Area
	0.064		3.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0220	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.3	37	0.0811	1.99		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.3	58	0.1897	3.05		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
1.3	520	0.0200	6.71	50.33	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
0.0	37	0.2160	22.05	165.39	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
15.2	752	Total			

Subcatchment 5S: Landfill W



Summary for Subcatchment 6S: Landfill E

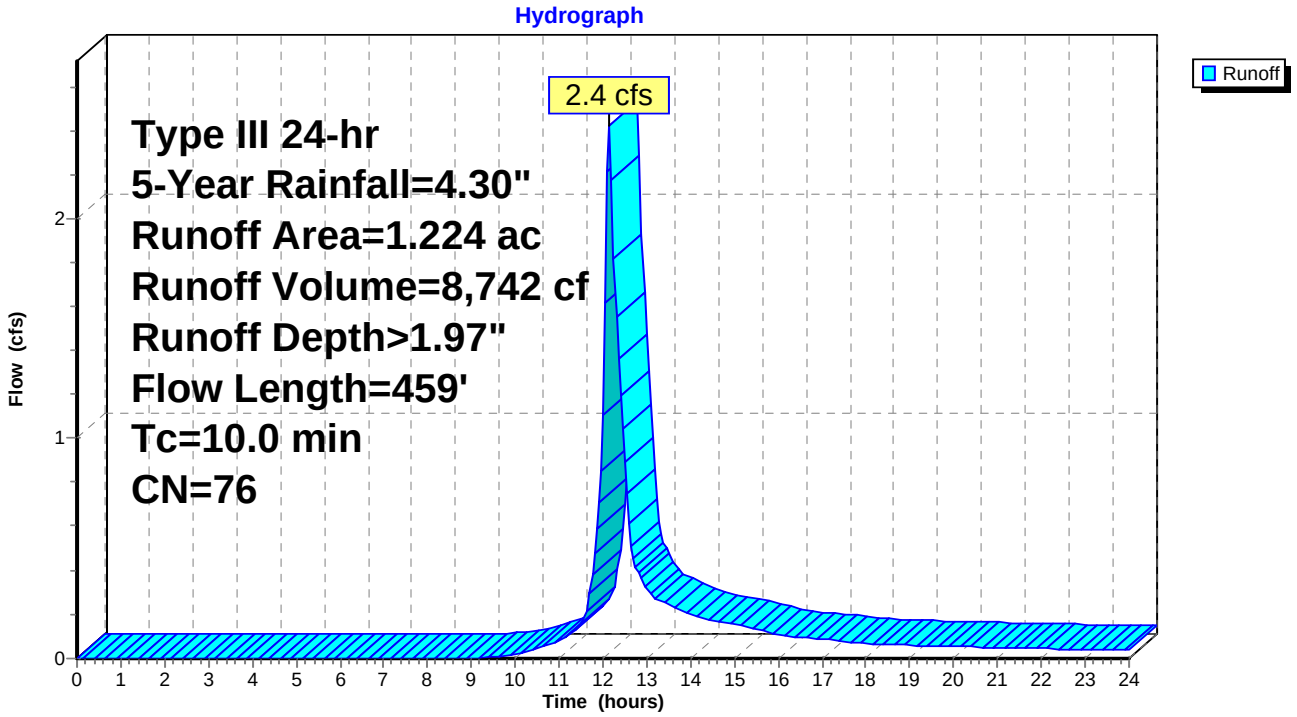
Runoff = 2.4 cfs @ 12.15 hrs, Volume= 8,742 cf, Depth> 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

	Area (ac)	CN	Description
	1.085	74	>75% Grass cover, Good, HSG C
	0.090	89	Gravel roads, HSG C
*	0.046	98	Solar array ballasts, HSG C
*	0.003	98	Concrete Equipment Pad, HSG C
	1.224	76	Weighted Average
	1.175		96.00% Pervious Area
	0.049		4.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	40	0.0543	0.15		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	60	0.0117	1.03		**Sheet Flow, Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.5	86	0.0384	3.15		**Shallow Concentrated Flow, Gravel** Unpaved Kv= 16.1 fps
0.7	76	0.0658	1.80		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	49	0.2245	3.32		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	148	0.1081	15.60	117.00	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
7.1	459	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: Landfill E



Summary for Subcatchment 7S: Green Field W

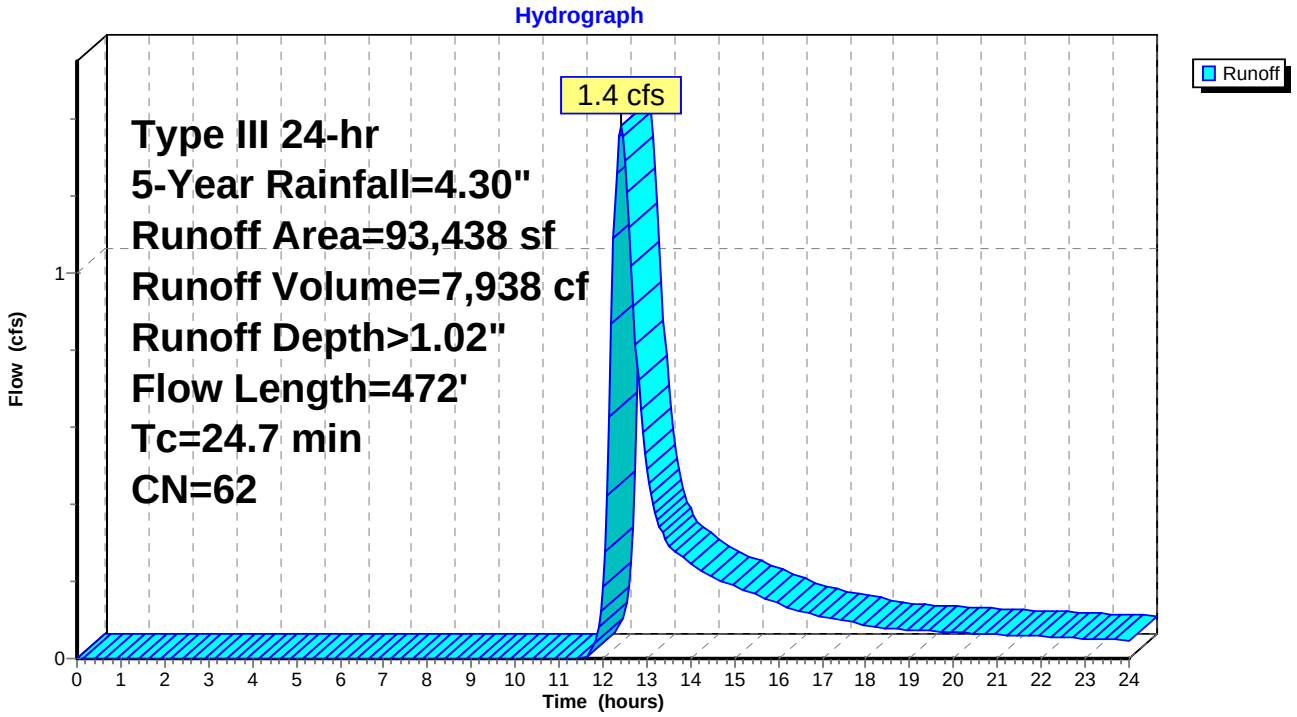
Runoff = 1.4 cfs @ 12.40 hrs, Volume= 7,938 cf, Depth> 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

	Area (sf)	CN	Description
	832	74	>75% Grass cover, Good, HSG C
	3,861	80	>75% Grass cover, Good, HSG D
	21,955	61	>75% Grass cover, Good, HSG B
	66,216	61	>75% Grass cover, Good, HSG B
	340	98	Paved parking, HSG C
*	4	98	Solar Array Posts, HSG B
*	230	98	Equipment Pad, HSG B
	93,438	62	Weighted Average
	92,864		99.39% Pervious Area
	574		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	23	0.0217	1.03		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
4.8	160	0.0063	0.56		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.6	51	0.0392	1.39		**Shallow Concentrated Flow, field** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.7	50	0.0300	1.21		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
24.7	472	Total			

Subcatchment 7S: Green Field W



Summary for Subcatchment 8S: Green Field E

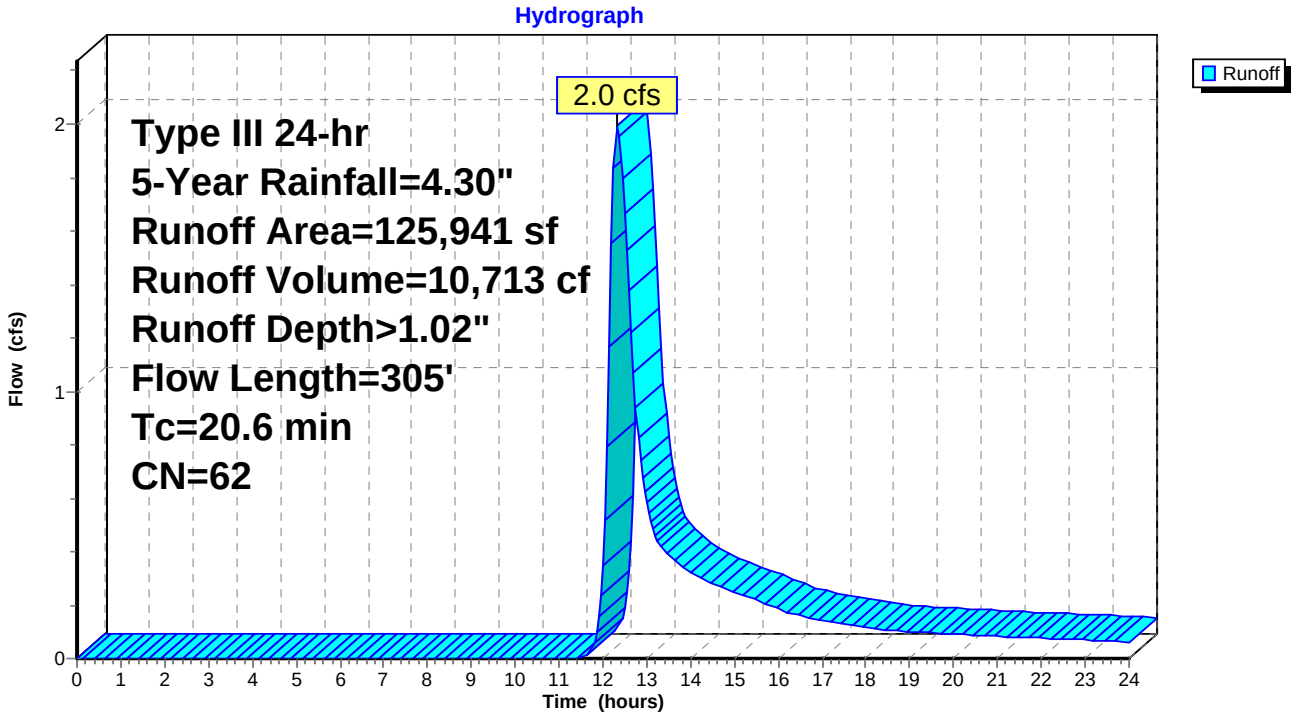
Runoff = 2.0 cfs @ 12.33 hrs, Volume= 10,713 cf, Depth> 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

	Area (sf)	CN	Description
	116,936	61	>75% Grass cover, Good, HSG B
	3,129	80	>75% Grass cover, Good, HSG D
	1,452	80	>75% Grass cover, Good, HSG D
	4,419	61	>75% Grass cover, Good, HSG B
*	5	98	Solar Array Posts, HSG B
	125,941	62	Weighted Average
	125,936		100.00% Pervious Area
	5		0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	24	0.0208	1.01		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
2.6	106	0.0094	0.68		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.8	75	0.0467	1.51		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
20.6	305	Total			

Subcatchment 8S: Green Field E



Summary for Subcatchment 9S: Greenfield 2

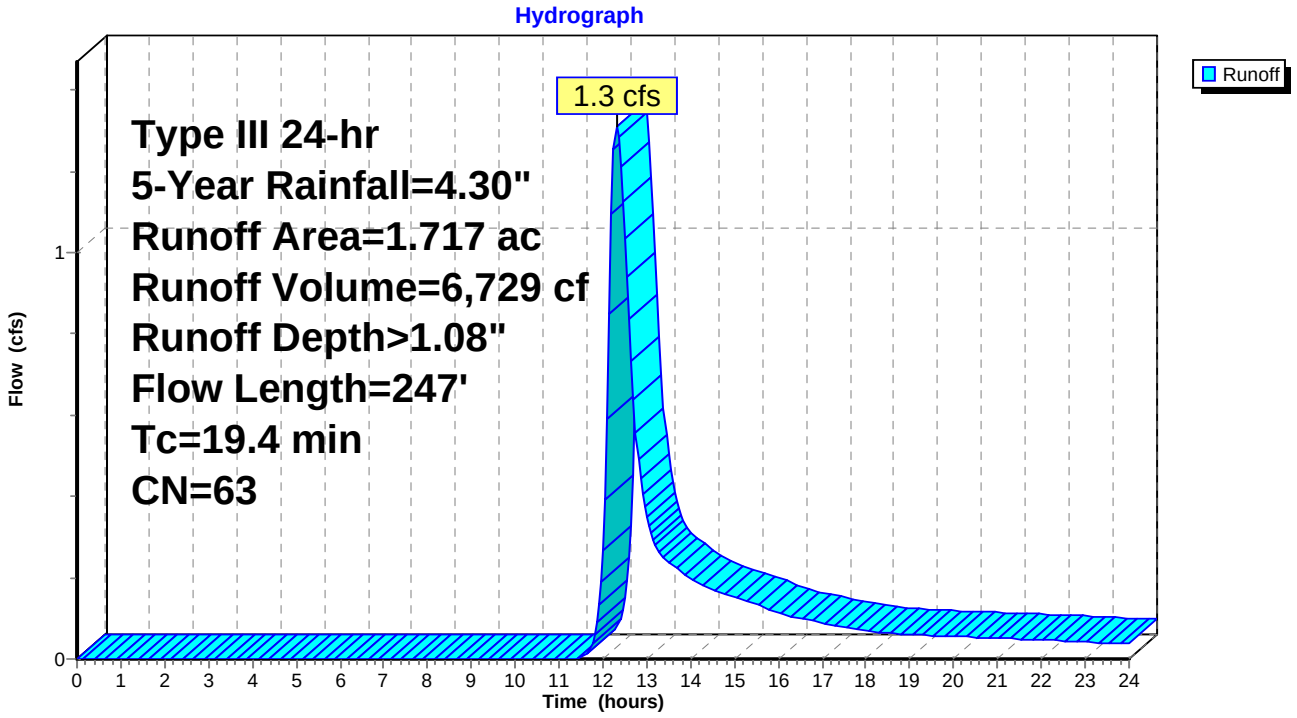
Runoff = 1.3 cfs @ 12.31 hrs, Volume= 6,729 cf, Depth> 1.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 5-Year Rainfall=4.30"

	Area (ac)	CN	Description
	0.091	77	Woods, Good, HSG D
	0.151	55	Woods, Good, HSG B
	1.283	61	>75% Grass cover, Good, HSG B
	0.187	80	>75% Grass cover, Good, HSG D
*	0.000	98	Solar Array Posts, HSG B
	0.005	98	Paved parking, HSG B
	1.717	63	Weighted Average
	1.712		99.71% Pervious Area
	0.005		0.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0128	0.10		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.40"
2.9	147	0.0148	0.85		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
19.4	247	Total			

Subcatchment 9S: Greenfield 2



Summary for Reach 19R: Riprap Swale

Inflow Area = 85,378 sf, 3.27% Impervious, Inflow Depth > 1.89" for 5-Year event
Inflow = 3.2 cfs @ 12.22 hrs, Volume= 13,439 cf
Outflow = 3.1 cfs @ 12.26 hrs, Volume= 13,390 cf, Atten= 4%, Lag= 2.8 min

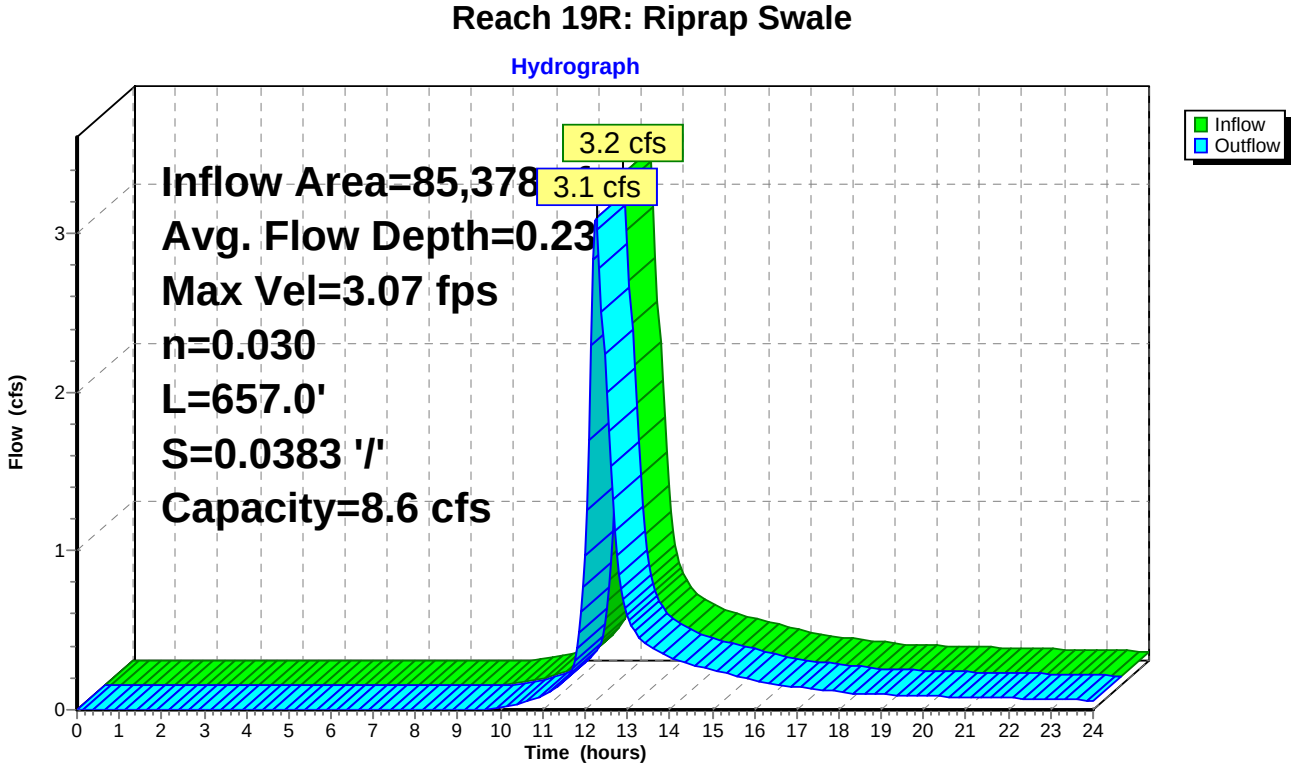
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.07 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 1.12 fps, Avg. Travel Time= 9.8 min

Peak Storage= 661 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 0.40' Flow Area= 2.1 sf, Capacity= 8.6 cfs

3.00' x 0.40' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 5.5 '/' Top Width= 7.40'
Length= 657.0' Slope= 0.0383 '/'
Inlet Invert= 274.52', Outlet Invert= 249.36'



‡



Summary for Reach 21R: Riprap Swale

Inflow Area = 53,317 sf, 4.00% Impervious, Inflow Depth > 1.97" for 5-Year event
Inflow = 2.4 cfs @ 12.15 hrs, Volume= 8,742 cf
Outflow = 2.3 cfs @ 12.18 hrs, Volume= 8,713 cf, Atten= 5%, Lag= 2.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.00 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 9.0 min

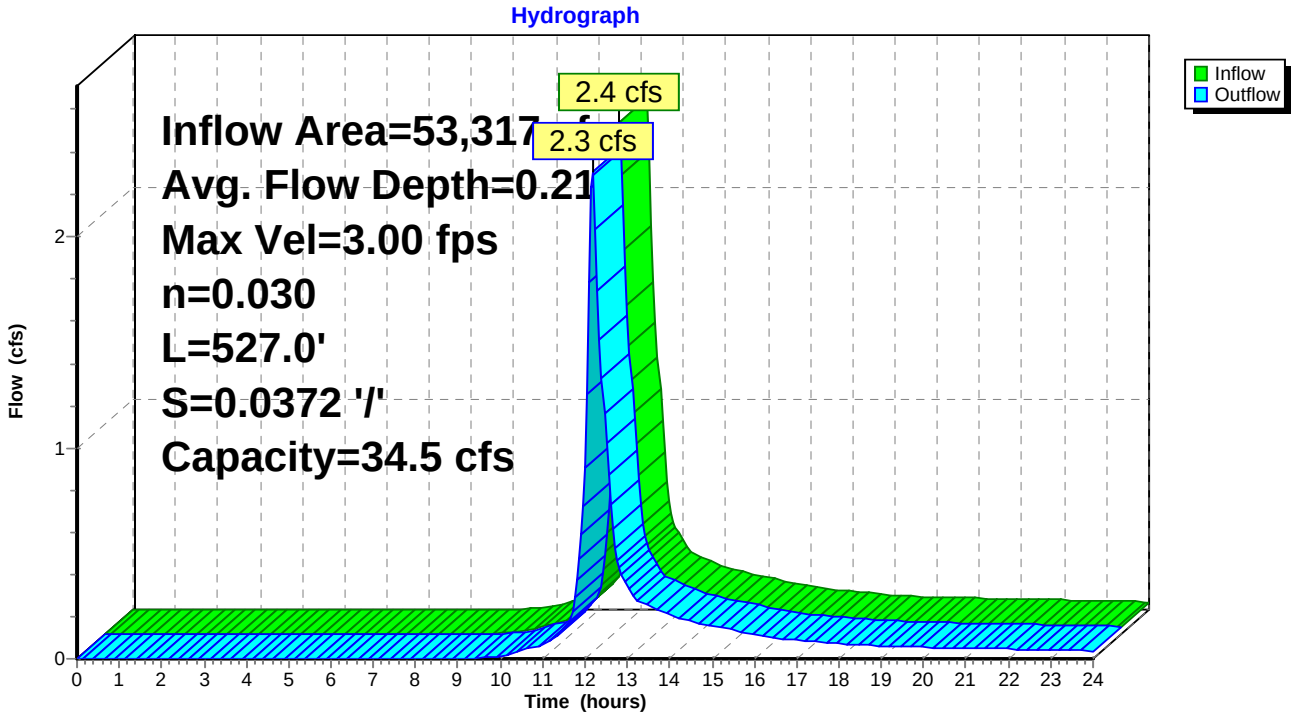
Peak Storage= 404 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 0.90' Flow Area= 5.1 sf, Capacity= 34.5 cfs

3.00' x 0.90' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 3.0 '/' Top Width= 8.40'
Length= 527.0' Slope= 0.0372 '/'
Inlet Invert= 276.70', Outlet Invert= 257.10'



‡

Reach 21R: Riprap Swale

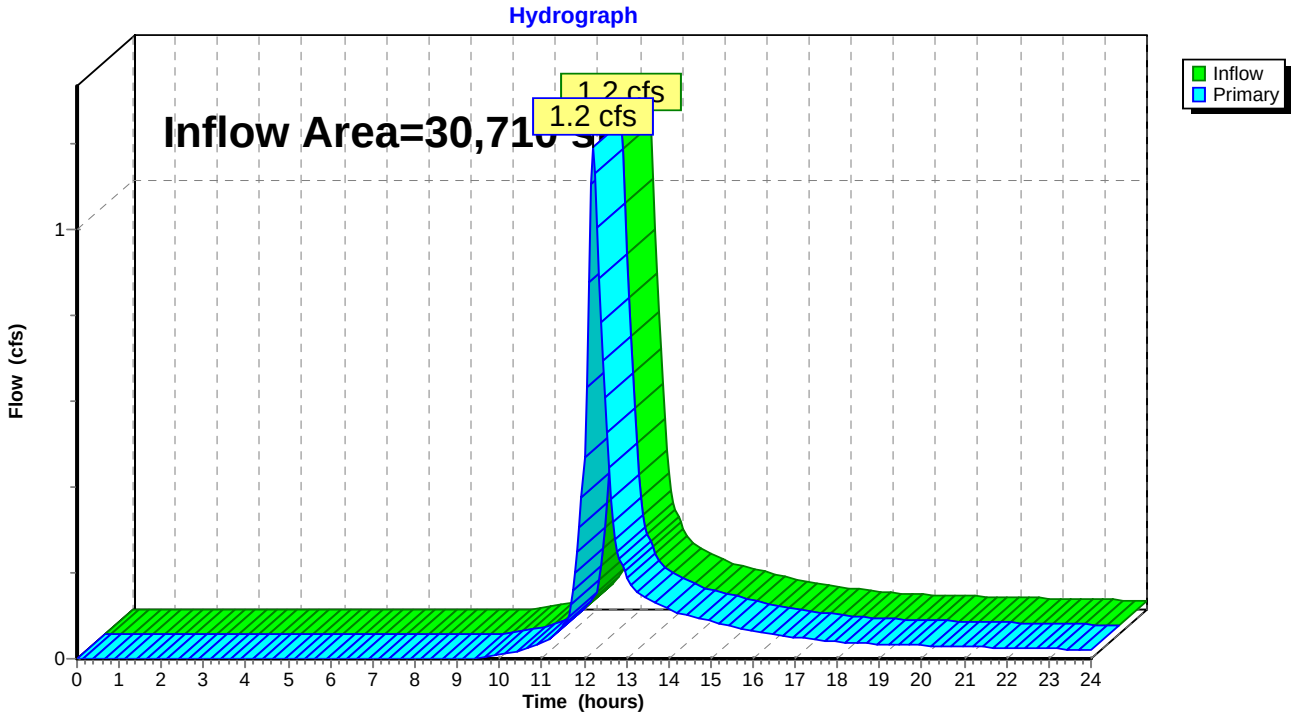


Summary for Link 7L: Wetlands NW

Inflow Area = 30,710 sf, 4.54% Impervious, Inflow Depth > 1.89" for 5-Year event
Inflow = 1.2 cfs @ 12.20 hrs, Volume= 4,835 cf
Primary = 1.2 cfs @ 12.20 hrs, Volume= 4,835 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 7L: Wetlands NW

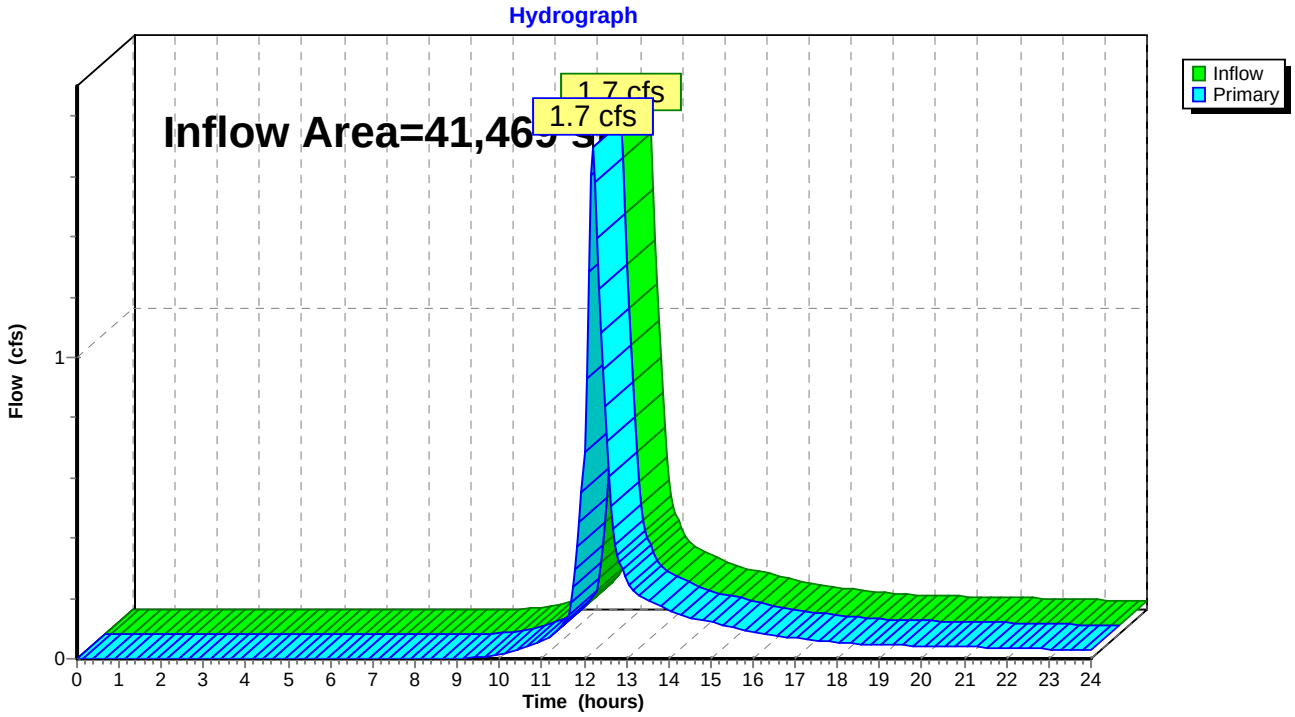


Summary for Link 8L: Depression S

Inflow Area = 41,469 sf, 4.52% Impervious, Inflow Depth > 1.97" for 5-Year event
Inflow = 1.7 cfs @ 12.20 hrs, Volume= 6,794 cf
Primary = 1.7 cfs @ 12.20 hrs, Volume= 6,794 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 8L: Depression S

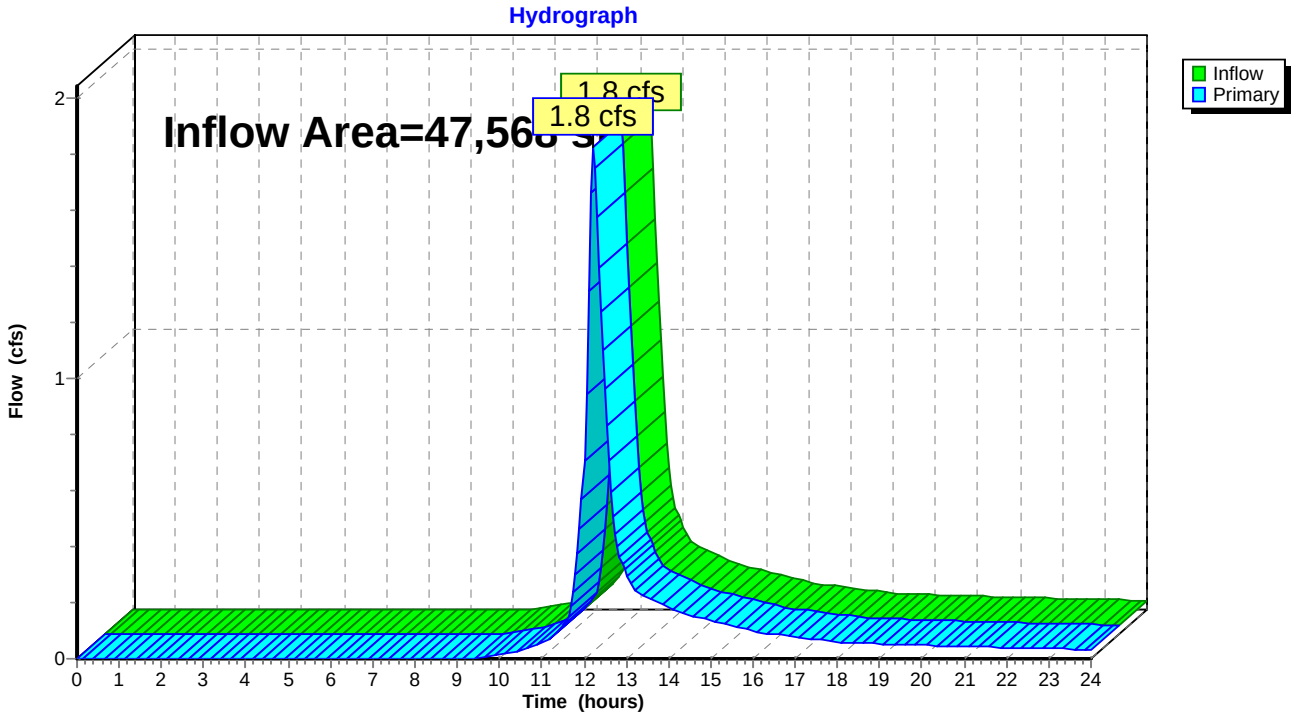


Summary for Link 9L: Wetlands NE

Inflow Area = 47,568 sf, 5.31% Impervious, Inflow Depth > 1.89" for 5-Year event
Inflow = 1.8 cfs @ 12.21 hrs, Volume= 7,489 cf
Primary = 1.8 cfs @ 12.21 hrs, Volume= 7,489 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 9L: Wetlands NE

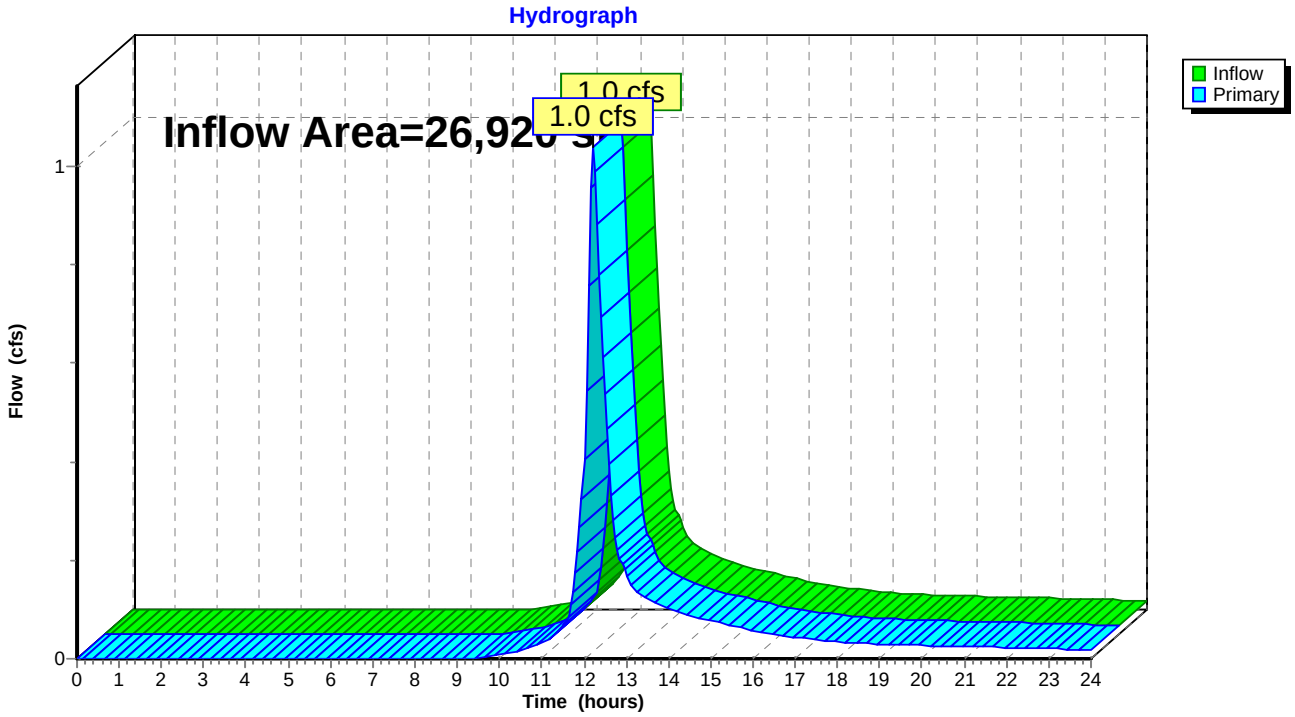


Summary for Link 10L: Wetlands N

Inflow Area = 26,920 sf, 4.53% Impervious, Inflow Depth > 1.89" for 5-Year event
Inflow = 1.0 cfs @ 12.21 hrs, Volume= 4,238 cf
Primary = 1.0 cfs @ 12.21 hrs, Volume= 4,238 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 10L: Wetlands N

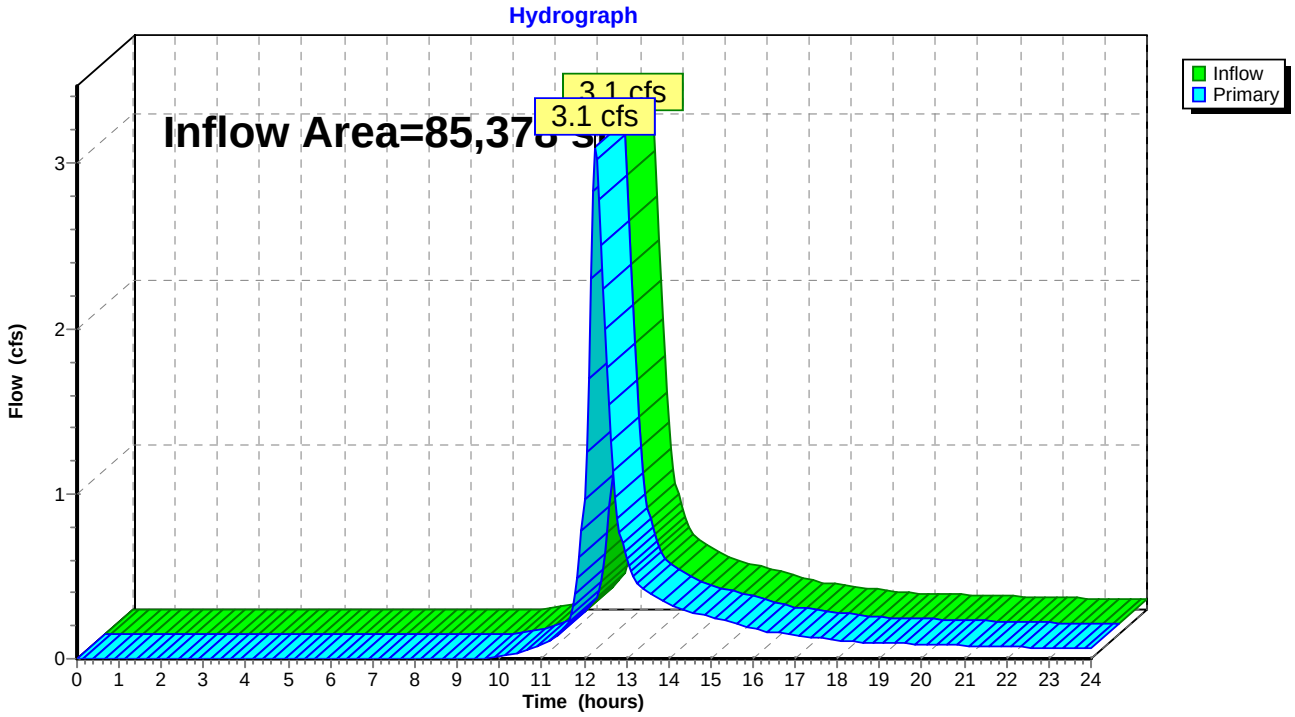


Summary for Link 11L: Collection Swale W

Inflow Area = 85,378 sf, 3.27% Impervious, Inflow Depth > 1.88" for 5-Year event
Inflow = 3.1 cfs @ 12.26 hrs, Volume= 13,390 cf
Primary = 3.1 cfs @ 12.26 hrs, Volume= 13,390 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 11L: Collection Swale W

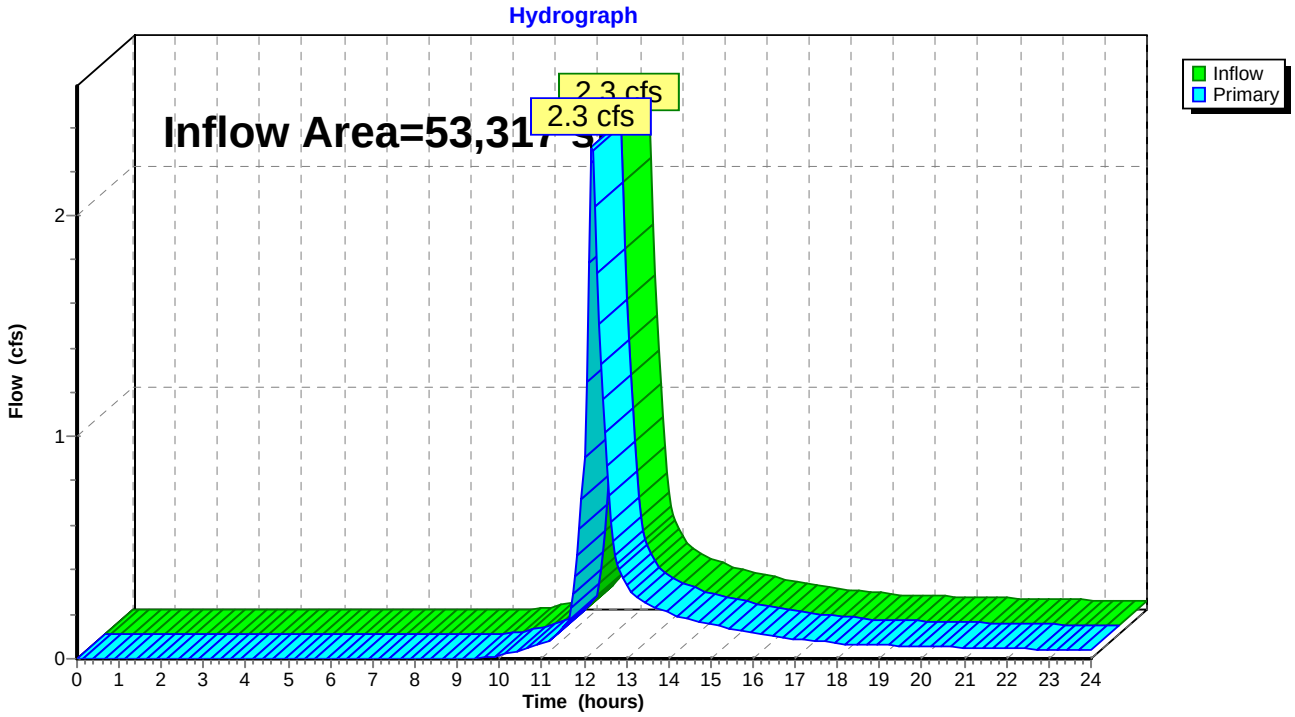


Summary for Link 12L: Collection Swale W

Inflow Area = 53,317 sf, 4.00% Impervious, Inflow Depth > 1.96" for 5-Year event
Inflow = 2.3 cfs @ 12.18 hrs, Volume= 8,713 cf
Primary = 2.3 cfs @ 12.18 hrs, Volume= 8,713 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 12L: Collection Swale W

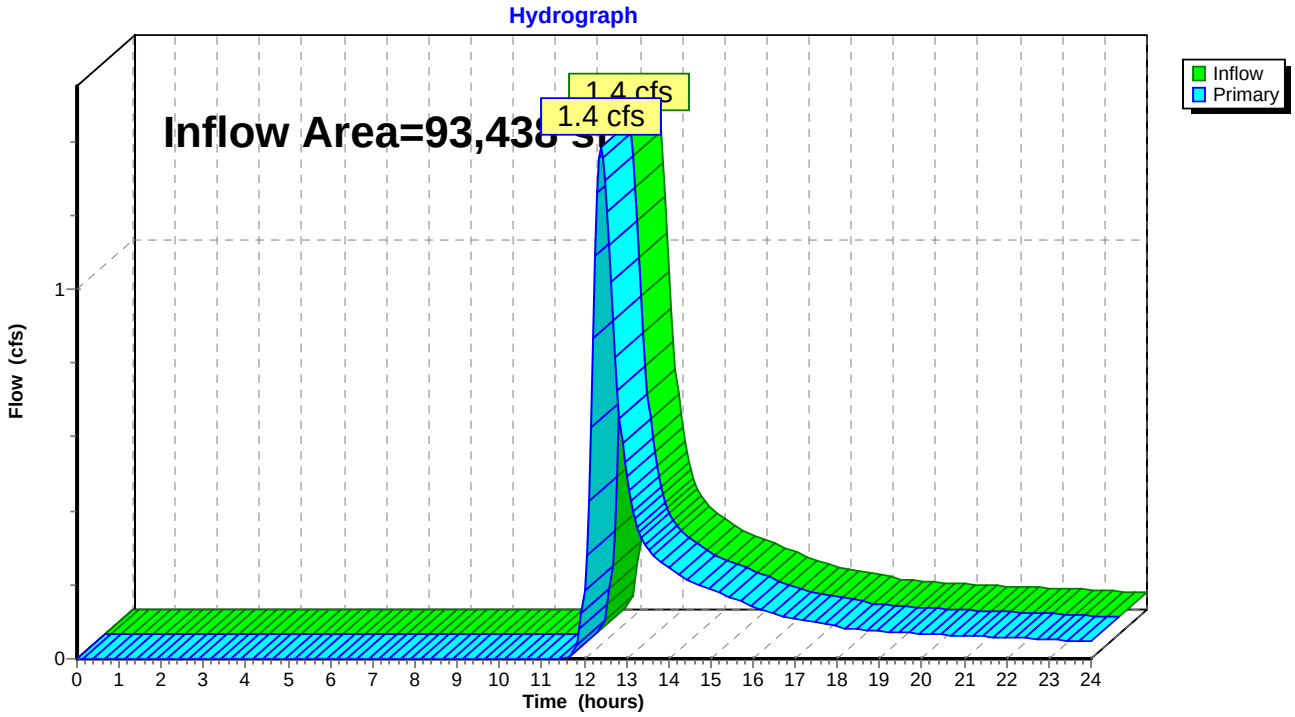


Summary for Link 15L: Wetland W

Inflow Area = 93,438 sf, 0.61% Impervious, Inflow Depth > 1.02" for 5-Year event
Inflow = 1.4 cfs @ 12.40 hrs, Volume= 7,938 cf
Primary = 1.4 cfs @ 12.40 hrs, Volume= 7,938 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 15L: Wetland W

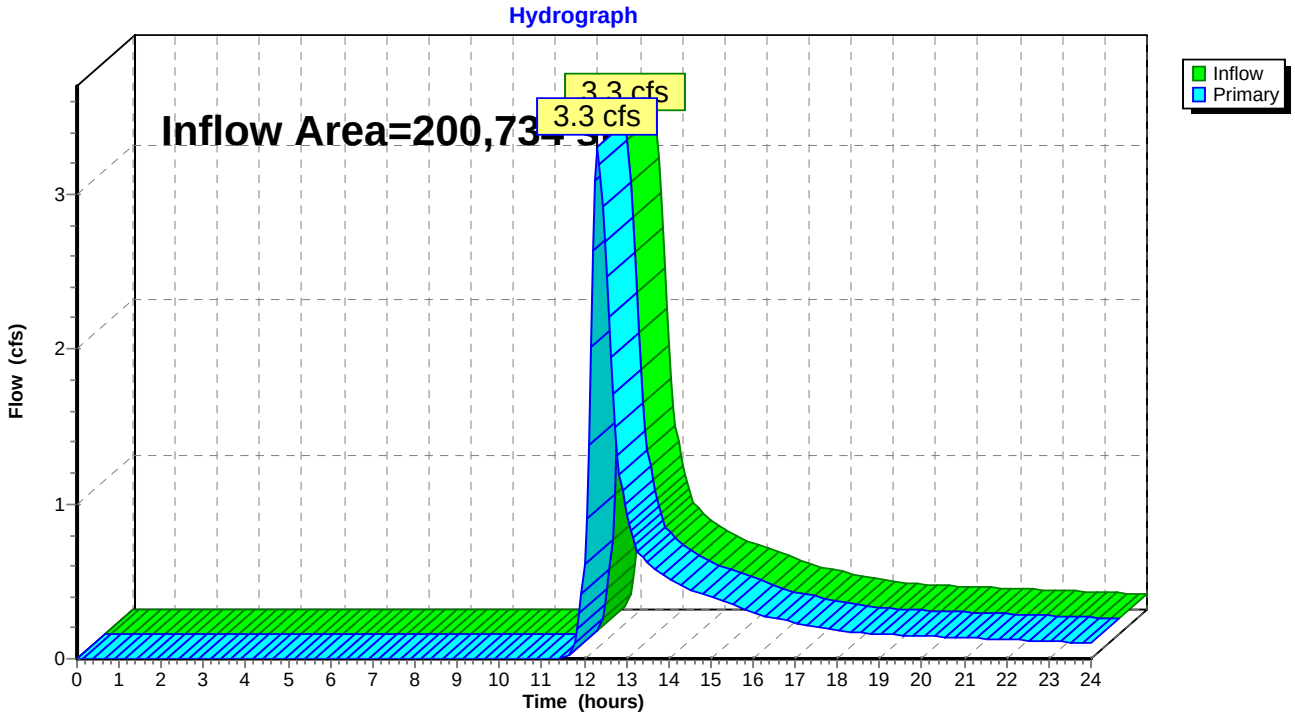


Summary for Link 16L: Wetland E

Inflow Area = 200,734 sf, 0.11% Impervious, Inflow Depth > 1.04" for 5-Year event
Inflow = 3.3 cfs @ 12.32 hrs, Volume= 17,442 cf
Primary = 3.3 cfs @ 12.32 hrs, Volume= 17,442 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 16L: Wetland E



Time span=0.00-24.00 hrs, dt=0.050 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Bulky Waste Landfill SW Runoff Area=0.952 ac 4.52% Impervious Runoff Depth>2.53"
Flow Length=239' Tc=13.7 min CN=76 Runoff=2.2 cfs 8,739 cf

Subcatchment 2S: Bulky Waste Landfill NW Runoff Area=0.705 ac 4.54% Impervious Runoff Depth>2.44"
Flow Length=179' Tc=14.1 min CN=75 Runoff=1.6 cfs 6,251 cf

Subcatchment 3S: Bulky Waste Landfill E Runoff Area=1.092 ac 5.31% Impervious Runoff Depth>2.44"
Flow Length=204' Tc=14.6 min CN=75 Runoff=2.4 cfs 9,681 cf

Subcatchment 4S: Landfill N Runoff Area=0.618 ac 4.53% Impervious Runoff Depth>2.44"
Flow Length=222' Tc=14.3 min CN=75 Runoff=1.4 cfs 5,479 cf

Subcatchment 5S: Landfill W Runoff Area=1.960 ac 3.27% Impervious Runoff Depth>2.44"
Flow Length=752' Tc=15.2 min CN=75 Runoff=4.2 cfs 17,374 cf

Subcatchment 6S: Landfill E Runoff Area=1.224 ac 4.00% Impervious Runoff Depth>2.53"
Flow Length=459' Tc=10.0 min CN=76 Runoff=3.1 cfs 11,245 cf

Subcatchment 7S: Green Field W Runoff Area=93,438 sf 0.61% Impervious Runoff Depth>1.43"
Flow Length=472' Tc=24.7 min CN=62 Runoff=2.0 cfs 11,125 cf

Subcatchment 8S: Green Field E Runoff Area=125,941 sf 0.00% Impervious Runoff Depth>1.43"
Flow Length=305' Tc=20.6 min CN=62 Runoff=3.0 cfs 15,013 cf

Subcatchment 9S: Greenfield 2 Runoff Area=1.717 ac 0.29% Impervious Runoff Depth>1.50"
Flow Length=247' Tc=19.4 min CN=63 Runoff=1.9 cfs 9,357 cf

Reach 19R: Riprap Swale Avg. Flow Depth=0.27' Max Vel=3.33 fps Inflow=4.2 cfs 17,374 cf
n=0.030 L=657.0' S=0.0383 '/' Capacity=8.6 cfs Outflow=4.1 cfs 17,318 cf

Reach 21R: Riprap Swale Avg. Flow Depth=0.24' Max Vel=3.27 fps Inflow=3.1 cfs 11,245 cf
n=0.030 L=527.0' S=0.0372 '/' Capacity=34.5 cfs Outflow=3.0 cfs 11,212 cf

Link 7L: Wetlands NW Inflow=1.6 cfs 6,251 cf
Primary=1.6 cfs 6,251 cf

Link 8L: Depression S Inflow=2.2 cfs 8,739 cf
Primary=2.2 cfs 8,739 cf

Link 9L: Wetlands NE Inflow=2.4 cfs 9,681 cf
Primary=2.4 cfs 9,681 cf

Link 10L: Wetlands N Inflow=1.4 cfs 5,479 cf
Primary=1.4 cfs 5,479 cf

Link 11L: Collection Swale W Inflow=4.1 cfs 17,318 cf
Primary=4.1 cfs 17,318 cf

Link 12L: Collection Swale W Inflow=3.0 cfs 11,212 cf
Primary=3.0 cfs 11,212 cf

Link 15L: Wetland W Inflow=2.0 cfs 11,125 cf
Primary=2.0 cfs 11,125 cf

Link 16L: Wetland E Inflow=4.9 cfs 24,370 cf
Primary=4.9 cfs 24,370 cf

Total Runoff Area = 579,533 sf Runoff Volume = 94,264 cf Average Runoff Depth = 1.95"
97.80% Pervious = 566,801 sf 2.20% Impervious = 12,732 sf

Summary for Subcatchment 1S: Bulky Waste Landfill SW

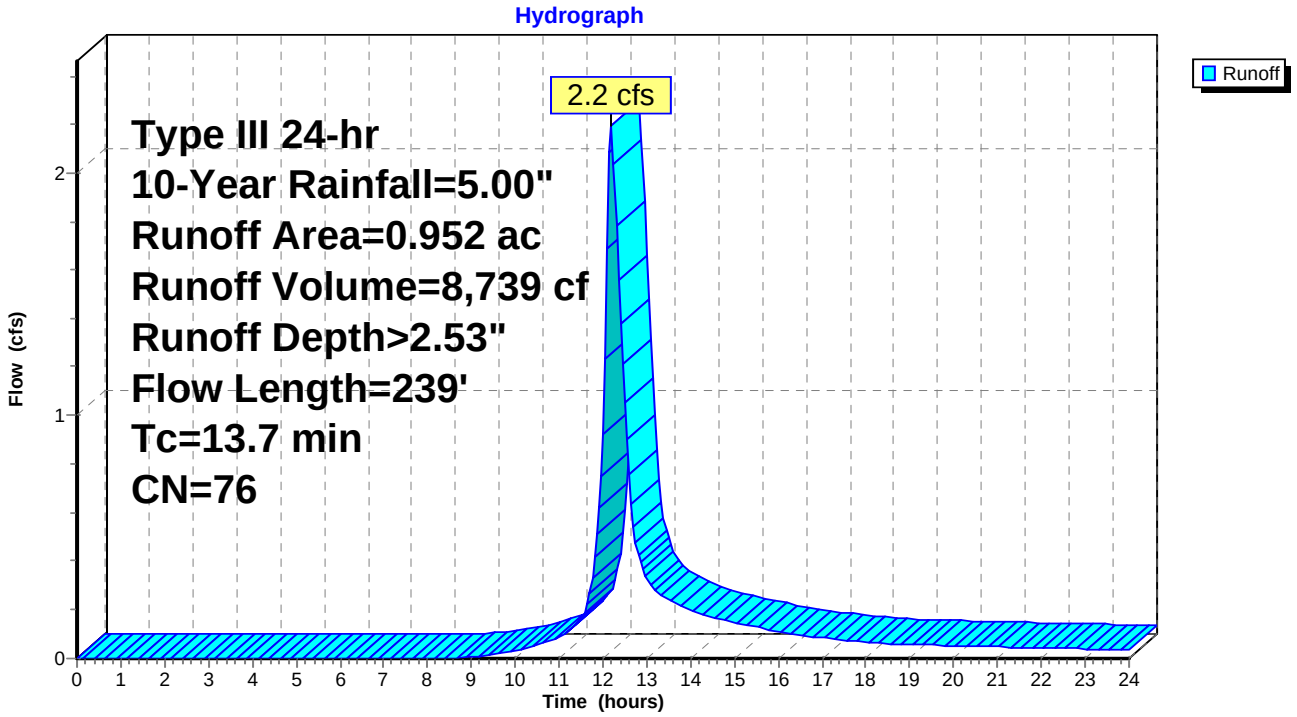
Runoff = 2.2 cfs @ 12.20 hrs, Volume= 8,739 cf, Depth> 2.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (ac)	CN	Description
	0.829	74	>75% Grass cover, Good, HSG C
	0.080	89	Gravel roads, HSG C
*	0.003	98	Equipment Pad, HSG C
*	0.040	98	Solar array Ballasts, HSG C
	0.952	76	Weighted Average
	0.909		95.48% Pervious Area
	0.043		4.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0251	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.5	66	0.1137	2.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	46	0.1957	3.10		**Shallow Concentrated Flow, Lanfill Cap** Short Grass Pasture Kv= 7.0 fps
0.4	27	0.0050	1.14		**Shallow Concentrated Flow, Access Drive** Unpaved Kv= 16.1 fps
13.7	239	Total			

Subcatchment 1S: Bulky Waste Landfill SW



Summary for Subcatchment 2S: Bulky Waste Landfill NW

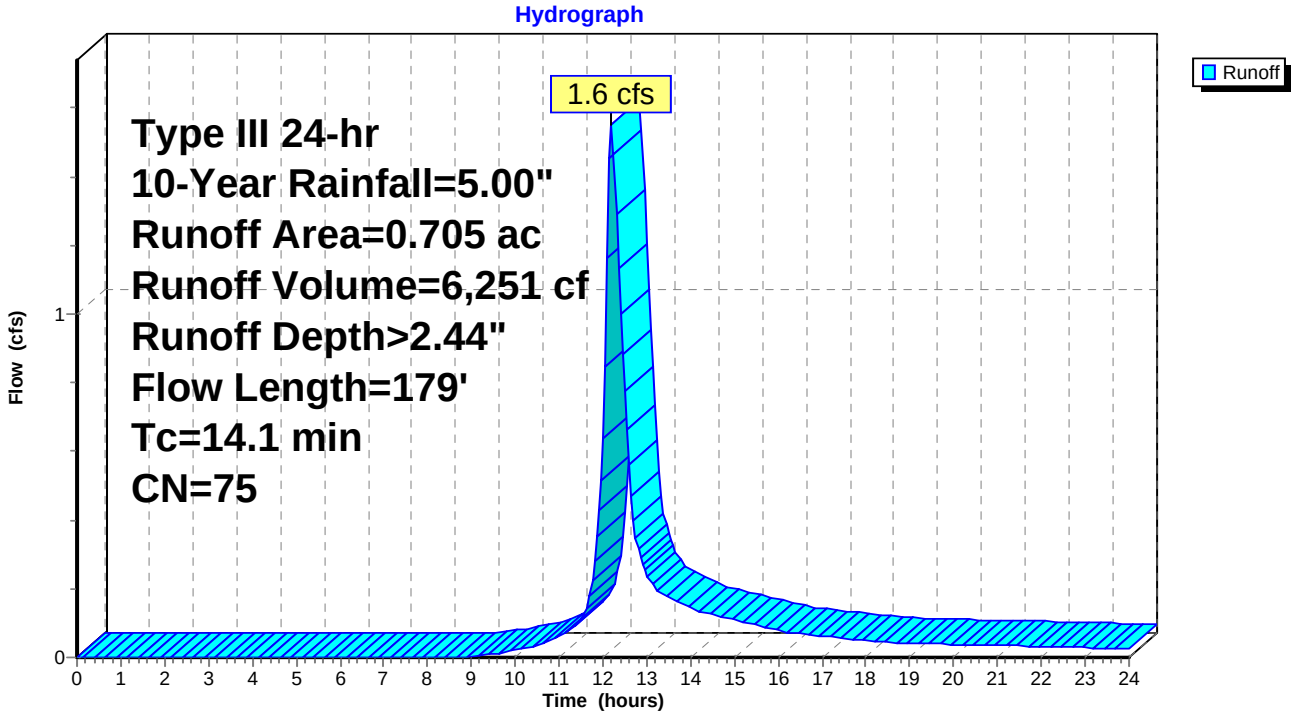
Runoff = 1.6 cfs @ 12.20 hrs, Volume= 6,251 cf, Depth> 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (ac)	CN	Description
	0.659	74	>75% Grass cover, Good, HSG C
*	0.032	98	Solar array ballasts, HSG C
	0.014	89	Gravel roads, HSG C
	0.705	75	Weighted Average
	0.673		95.46% Pervious Area
	0.032		4.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.6	79	0.0886	2.08		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.1	179	Total			

Subcatchment 2S: Bulky Waste Landfill NW



Summary for Subcatchment 3S: Bulky Waste Landfill E

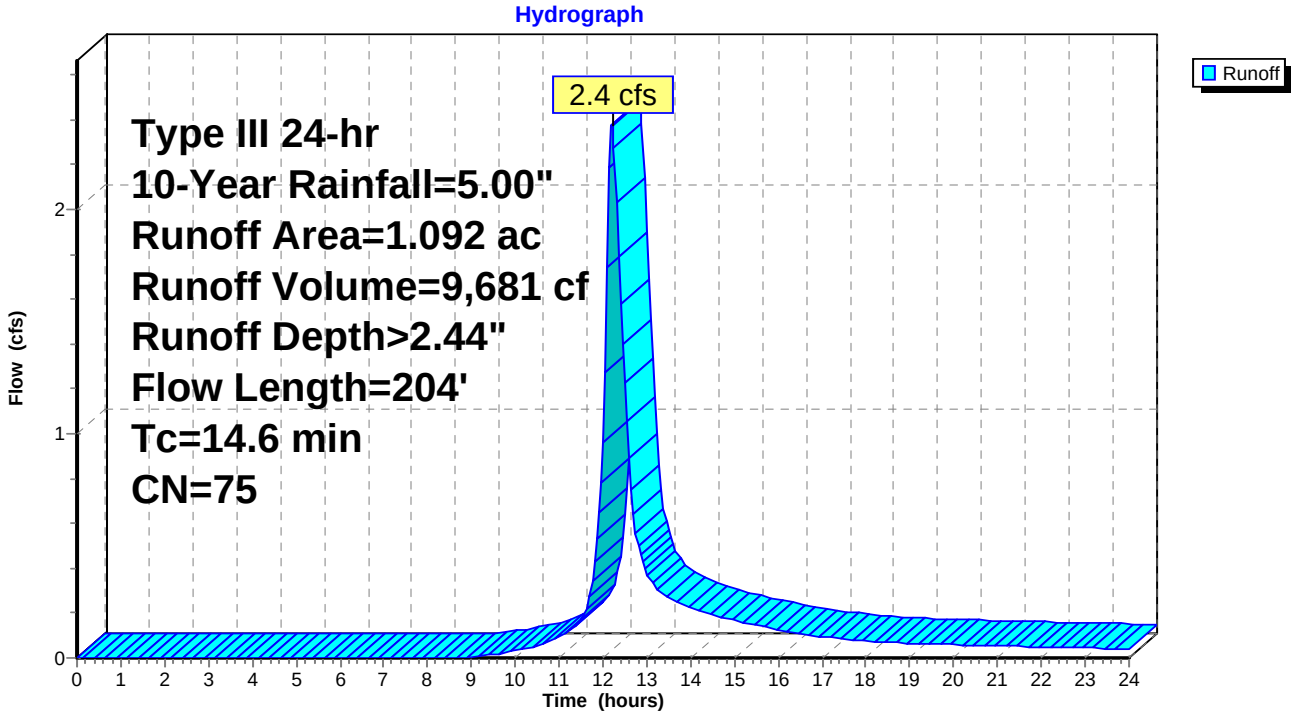
Runoff = 2.4 cfs @ 12.21 hrs, Volume= 9,681 cf, Depth> 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (ac)	CN	Description
	1.034	74	>75% Grass cover, Good, HSG C
*	0.058	98	Solar array ballasts, HSG C
	1.092	75	Weighted Average
	1.034		94.69% Pervious Area
	0.058		5.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.1	24	0.1667	2.86		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.6	204	Total			

Subcatchment 3S: Bulky Waste Landfill E



Summary for Subcatchment 4S: Landfill N

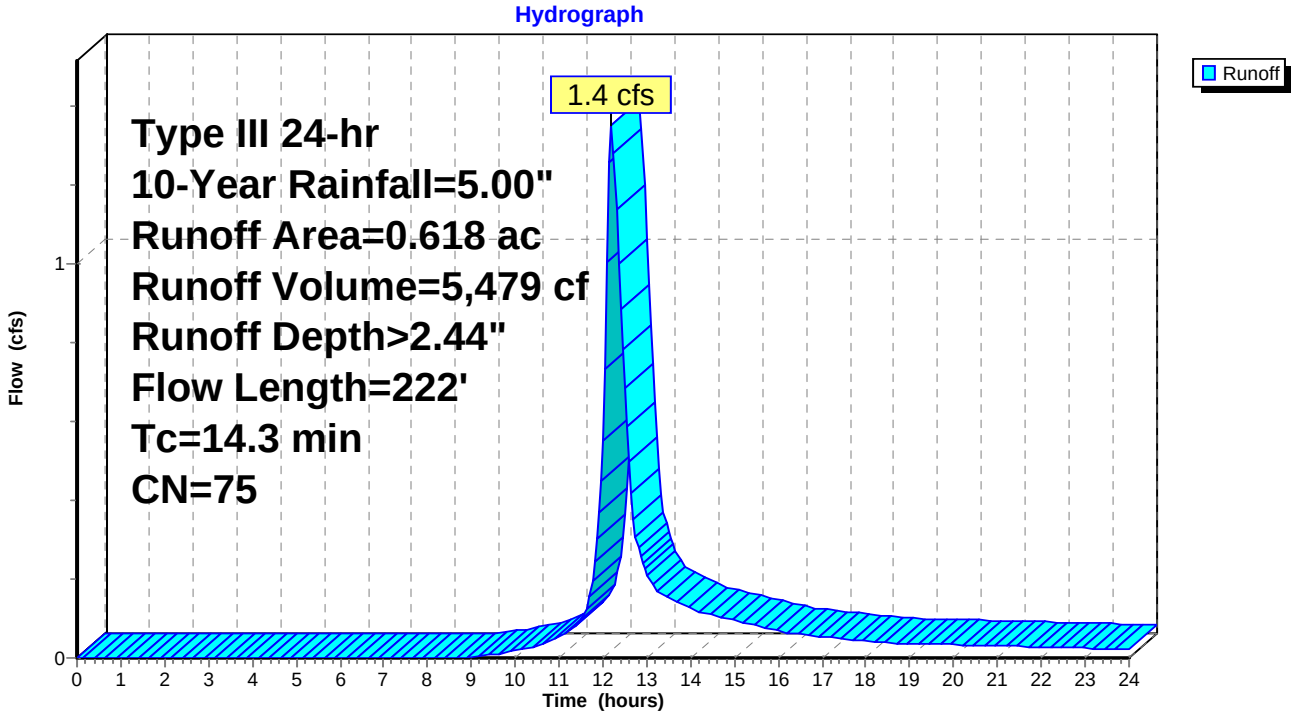
Runoff = 1.4 cfs @ 12.20 hrs, Volume= 5,479 cf, Depth> 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (ac)	CN	Description
	0.590	74	>75% Grass cover, Good, HSG C
*	0.028	98	Solar array ballasts, HSG C
	0.618	75	Weighted Average
	0.590		95.47% Pervious Area
	0.028		4.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0230	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	81	0.0371	1.35		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	41	0.1707	2.89		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.3	222	Total			

Subcatchment 4S: Landfill N



Summary for Subcatchment 5S: Landfill W

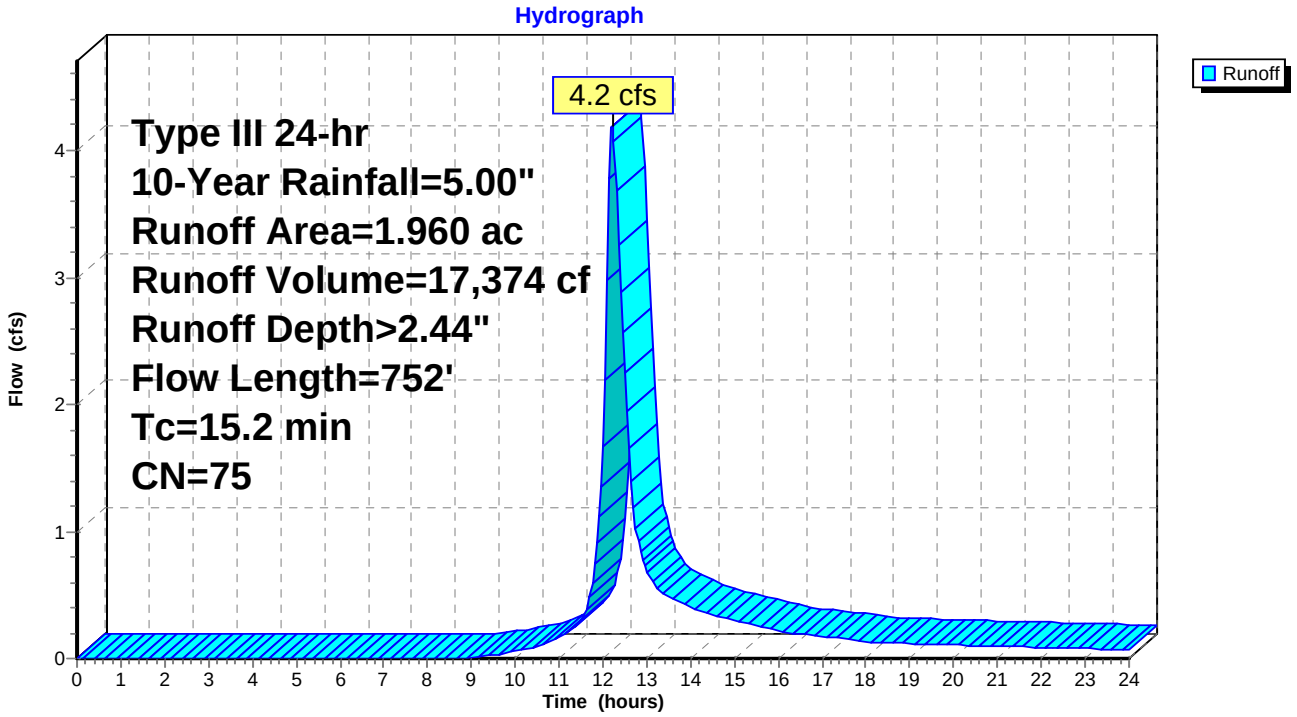
Runoff = 4.2 cfs @ 12.21 hrs, Volume= 17,374 cf, Depth> 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (ac)	CN	Description
	1.896	74	>75% Grass cover, Good, HSG C
*	0.064	98	Solar array ballasts, HSG C
	1.960	75	Weighted Average
	1.896		96.73% Pervious Area
	0.064		3.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0220	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.3	37	0.0811	1.99		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.3	58	0.1897	3.05		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
1.3	520	0.0200	6.71	50.33	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
0.0	37	0.2160	22.05	165.39	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
15.2	752	Total			

Subcatchment 5S: Landfill W



Summary for Subcatchment 6S: Landfill E

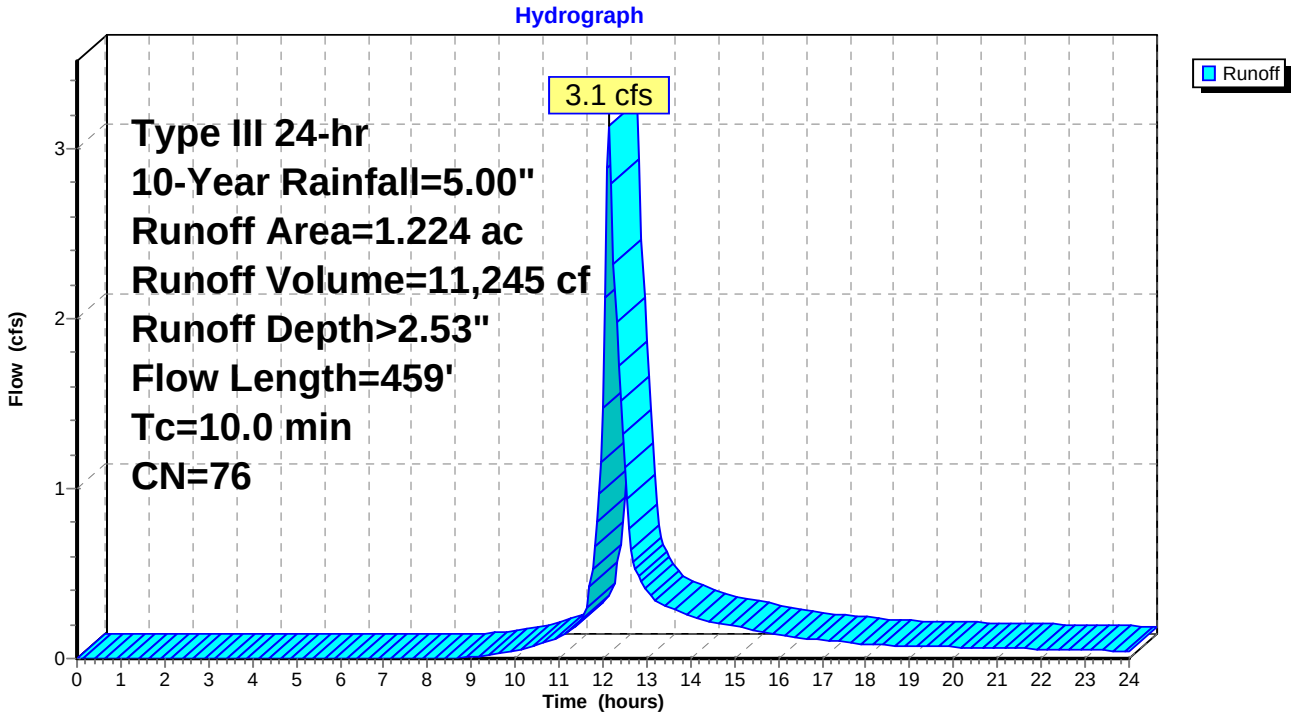
Runoff = 3.1 cfs @ 12.15 hrs, Volume= 11,245 cf, Depth> 2.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (ac)	CN	Description
	1.085	74	>75% Grass cover, Good, HSG C
	0.090	89	Gravel roads, HSG C
*	0.046	98	Solar array ballasts, HSG C
*	0.003	98	Concrete Equipment Pad, HSG C
	1.224	76	Weighted Average
	1.175		96.00% Pervious Area
	0.049		4.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	40	0.0543	0.15		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	60	0.0117	1.03		**Sheet Flow, Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.5	86	0.0384	3.15		**Shallow Concentrated Flow, Gravel** Unpaved Kv= 16.1 fps
0.7	76	0.0658	1.80		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	49	0.2245	3.32		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	148	0.1081	15.60	117.00	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
7.1	459	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: Landfill E



Summary for Subcatchment 7S: Green Field W

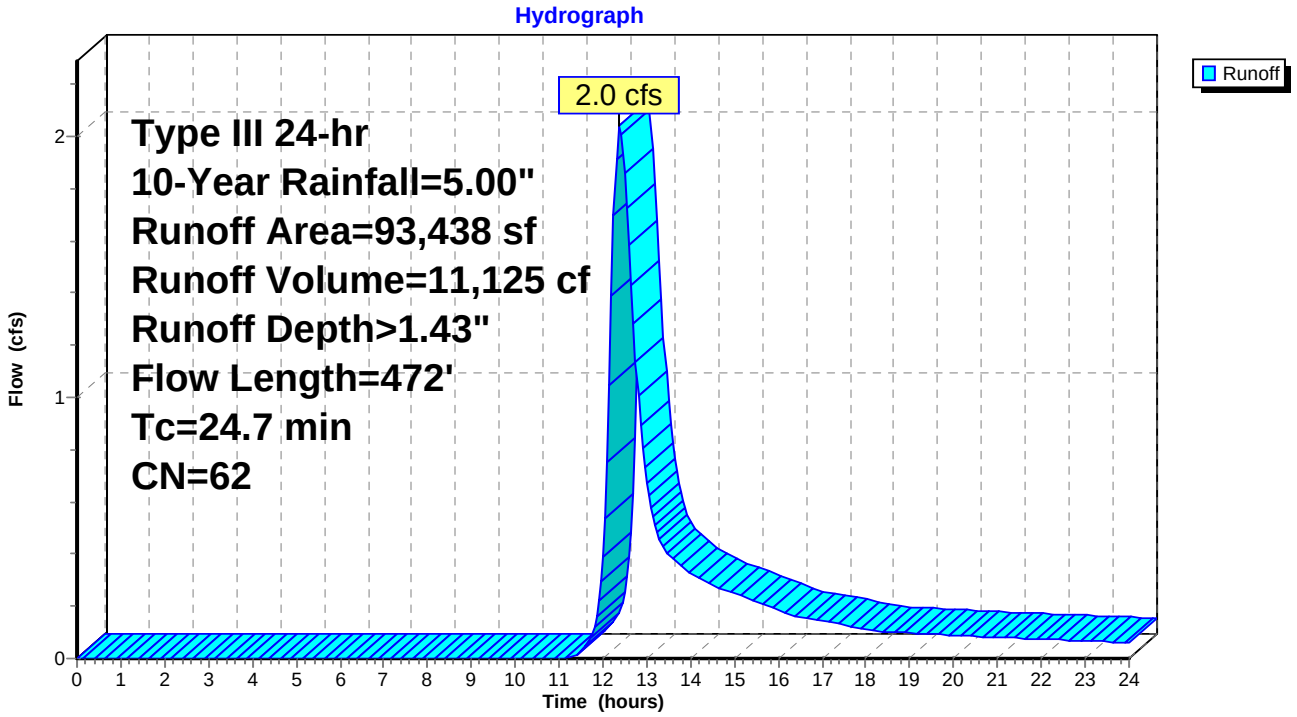
Runoff = 2.0 cfs @ 12.38 hrs, Volume= 11,125 cf, Depth> 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (sf)	CN	Description
	832	74	>75% Grass cover, Good, HSG C
	3,861	80	>75% Grass cover, Good, HSG D
	21,955	61	>75% Grass cover, Good, HSG B
	66,216	61	>75% Grass cover, Good, HSG B
	340	98	Paved parking, HSG C
*	4	98	Solar Array Posts, HSG B
*	230	98	Equipment Pad, HSG B
	93,438	62	Weighted Average
	92,864		99.39% Pervious Area
	574		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	23	0.0217	1.03		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
4.8	160	0.0063	0.56		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.6	51	0.0392	1.39		**Shallow Concentrated Flow, field** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.7	50	0.0300	1.21		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
24.7	472	Total			

Subcatchment 7S: Green Field W



Summary for Subcatchment 8S: Green Field E

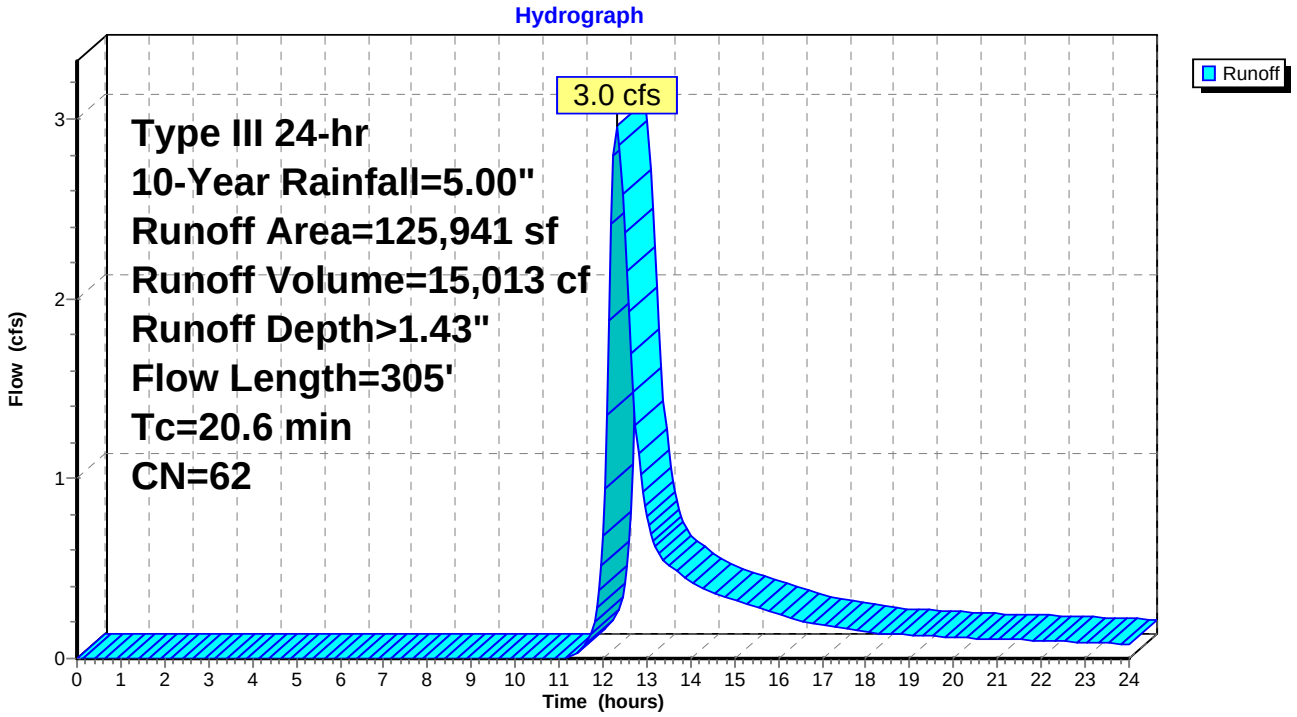
Runoff = 3.0 cfs @ 12.32 hrs, Volume= 15,013 cf, Depth> 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (sf)	CN	Description
	116,936	61	>75% Grass cover, Good, HSG B
	3,129	80	>75% Grass cover, Good, HSG D
	1,452	80	>75% Grass cover, Good, HSG D
	4,419	61	>75% Grass cover, Good, HSG B
*	5	98	Solar Array Posts, HSG B
	125,941	62	Weighted Average
	125,936		100.00% Pervious Area
	5		0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	24	0.0208	1.01		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
2.6	106	0.0094	0.68		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.8	75	0.0467	1.51		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
20.6	305	Total			

Subcatchment 8S: Green Field E



Summary for Subcatchment 9S: Greenfield 2

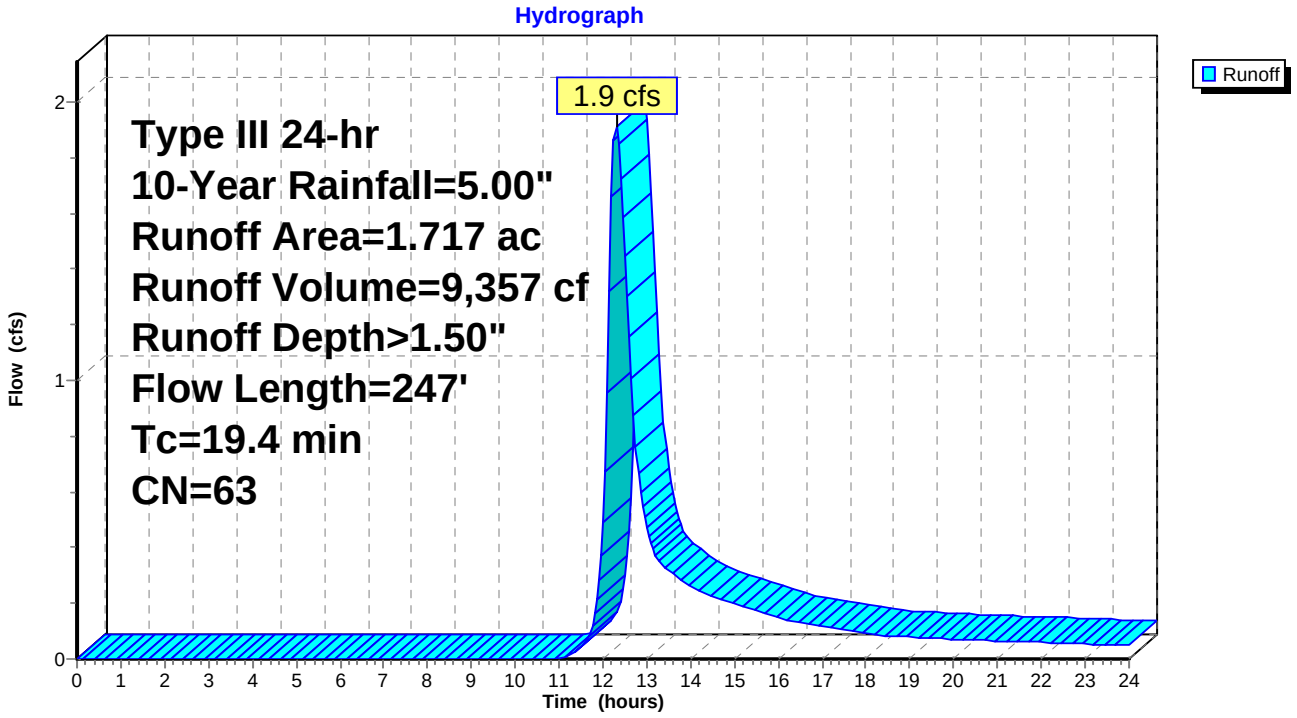
Runoff = 1.9 cfs @ 12.30 hrs, Volume= 9,357 cf, Depth> 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (ac)	CN	Description
	0.091	77	Woods, Good, HSG D
	0.151	55	Woods, Good, HSG B
	1.283	61	>75% Grass cover, Good, HSG B
	0.187	80	>75% Grass cover, Good, HSG D
*	0.000	98	Solar Array Posts, HSG B
	0.005	98	Paved parking, HSG B
	1.717	63	Weighted Average
	1.712		99.71% Pervious Area
	0.005		0.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0128	0.10		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.40"
2.9	147	0.0148	0.85		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
19.4	247	Total			

Subcatchment 9S: Greenfield 2



Summary for Reach 19R: Riprap Swale

Inflow Area = 85,378 sf, 3.27% Impervious, Inflow Depth > 2.44" for 10-Year event
Inflow = 4.2 cfs @ 12.21 hrs, Volume= 17,374 cf
Outflow = 4.1 cfs @ 12.26 hrs, Volume= 17,318 cf, Atten= 3%, Lag= 2.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.33 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 1.20 fps, Avg. Travel Time= 9.1 min

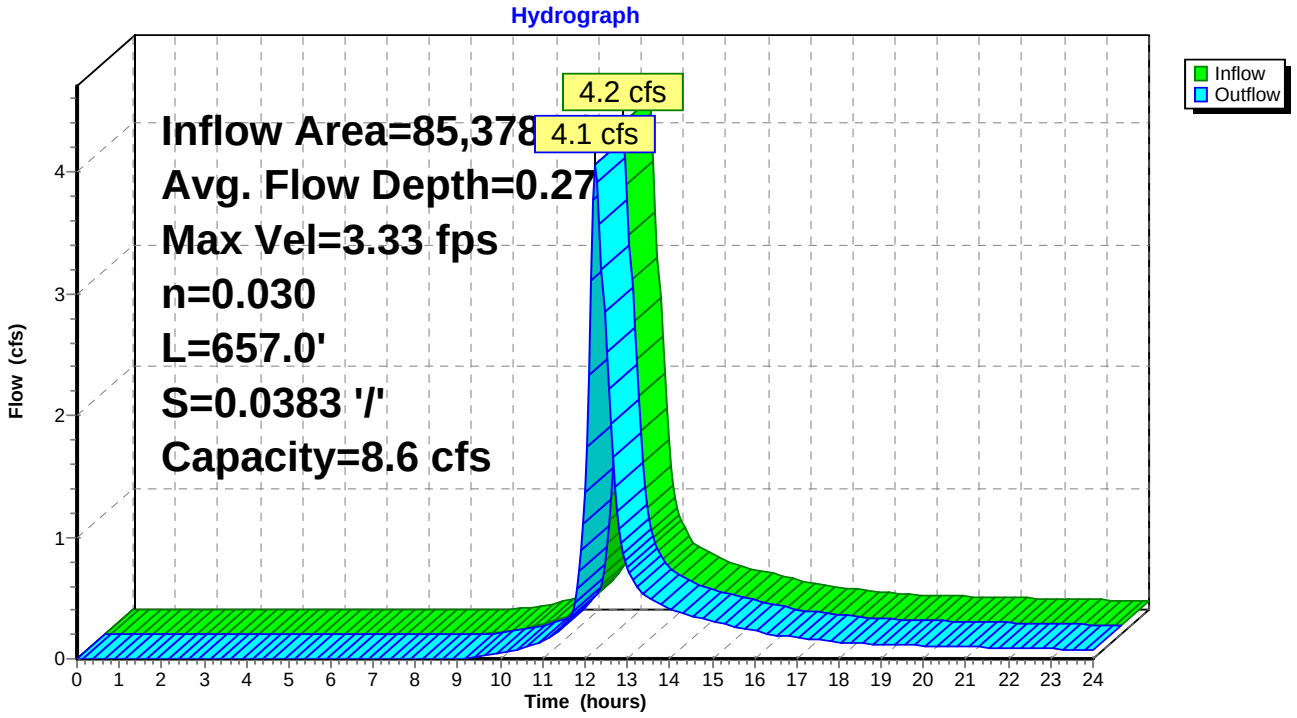
Peak Storage= 800 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 0.40' Flow Area= 2.1 sf, Capacity= 8.6 cfs

3.00' x 0.40' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 5.5 '/' Top Width= 7.40'
Length= 657.0' Slope= 0.0383 '/'
Inlet Invert= 274.52', Outlet Invert= 249.36'



‡

Reach 19R: Riprap Swale



Summary for Reach 21R: Riprap Swale

Inflow Area = 53,317 sf, 4.00% Impervious, Inflow Depth > 2.53" for 10-Year event
Inflow = 3.1 cfs @ 12.15 hrs, Volume= 11,245 cf
Outflow = 3.0 cfs @ 12.18 hrs, Volume= 11,212 cf, Atten= 4%, Lag= 1.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.27 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 1.05 fps, Avg. Travel Time= 8.4 min

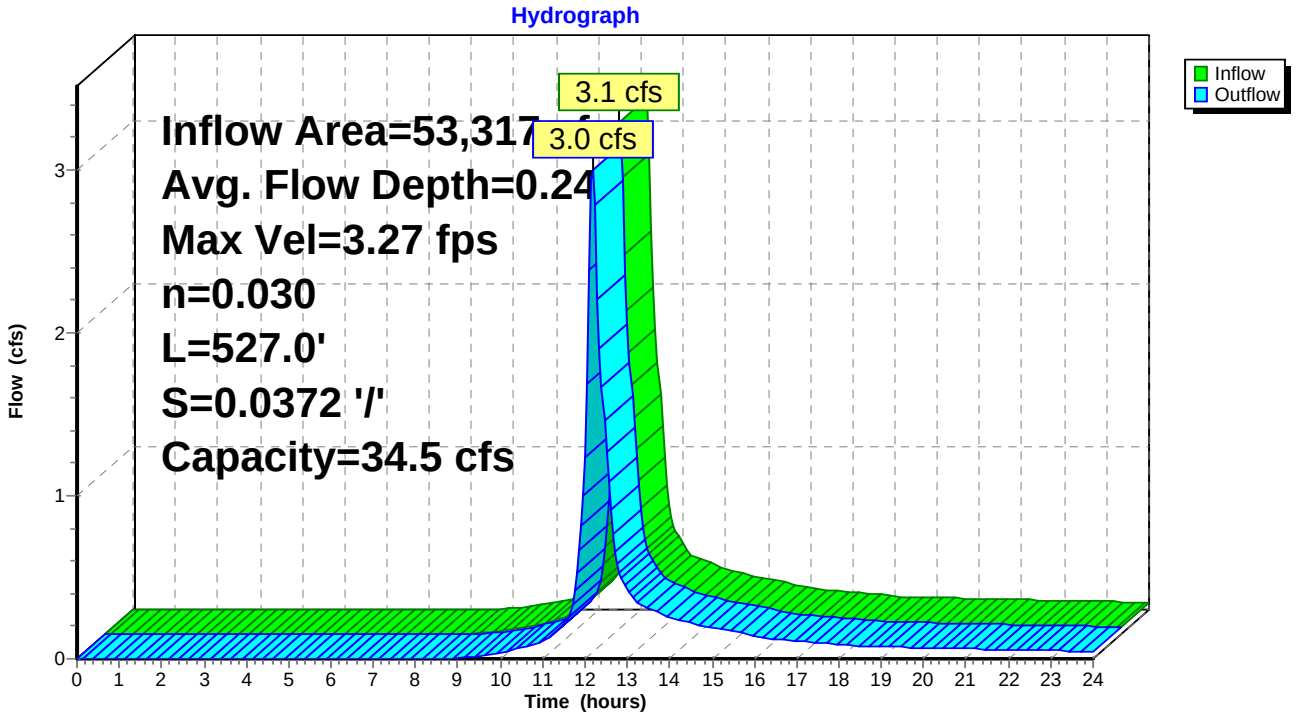
Peak Storage= 482 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 0.90' Flow Area= 5.1 sf, Capacity= 34.5 cfs

3.00' x 0.90' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 3.0 '/' Top Width= 8.40'
Length= 527.0' Slope= 0.0372 '/'
Inlet Invert= 276.70', Outlet Invert= 257.10'



‡

Reach 21R: Riprap Swale

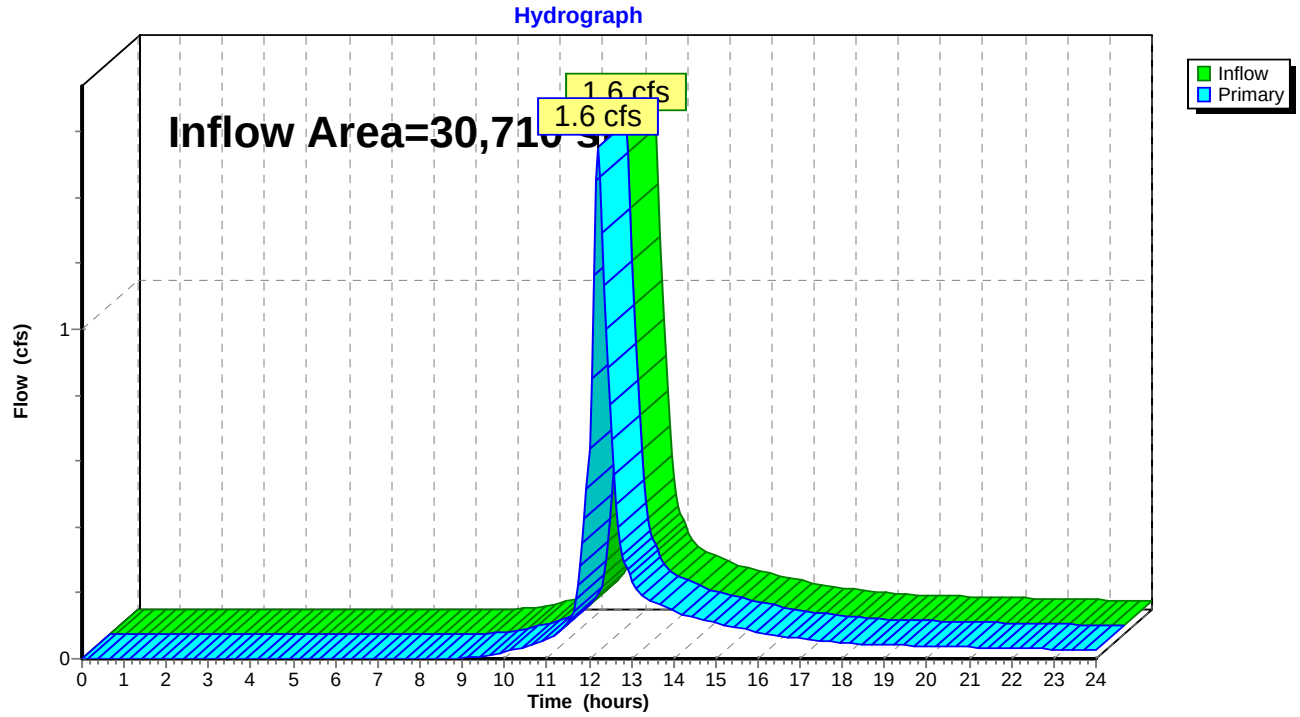


Summary for Link 7L: Wetlands NW

Inflow Area = 30,710 sf, 4.54% Impervious, Inflow Depth > 2.44" for 10-Year event
Inflow = 1.6 cfs @ 12.20 hrs, Volume= 6,251 cf
Primary = 1.6 cfs @ 12.20 hrs, Volume= 6,251 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 7L: Wetlands NW

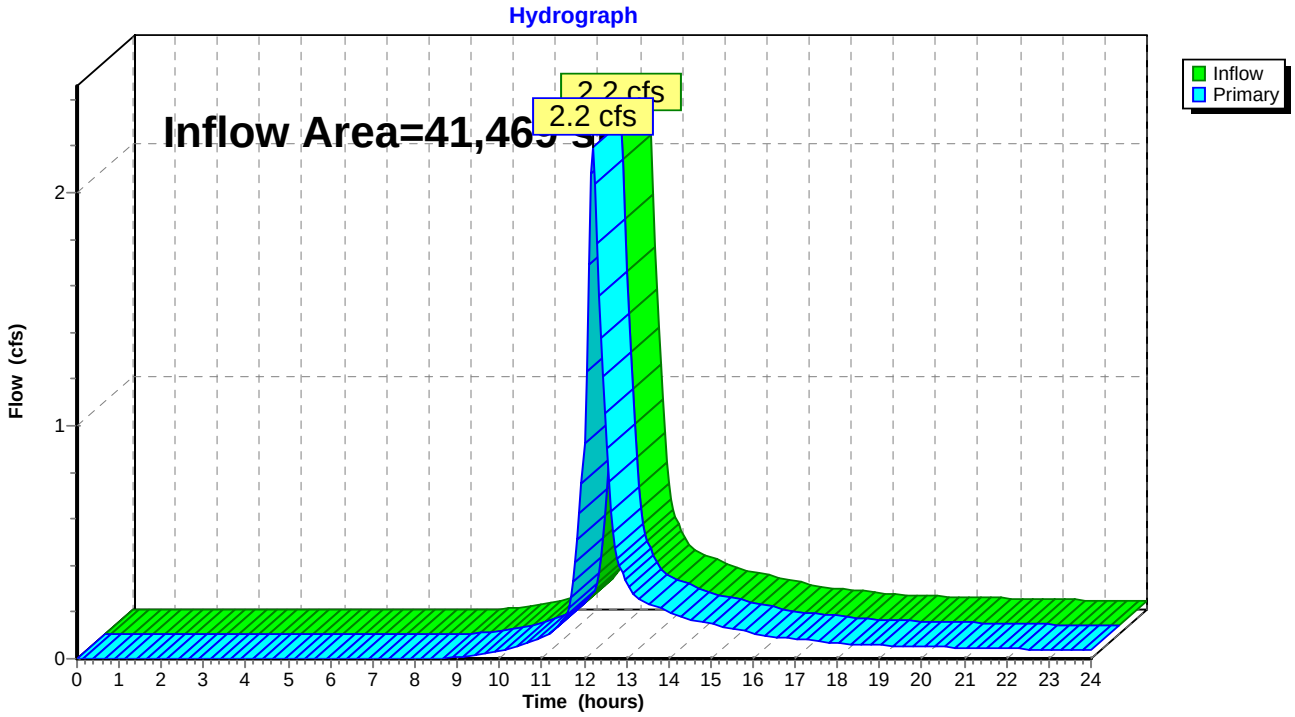


Summary for Link 8L: Depression S

Inflow Area = 41,469 sf, 4.52% Impervious, Inflow Depth > 2.53" for 10-Year event
Inflow = 2.2 cfs @ 12.20 hrs, Volume= 8,739 cf
Primary = 2.2 cfs @ 12.20 hrs, Volume= 8,739 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 8L: Depression S

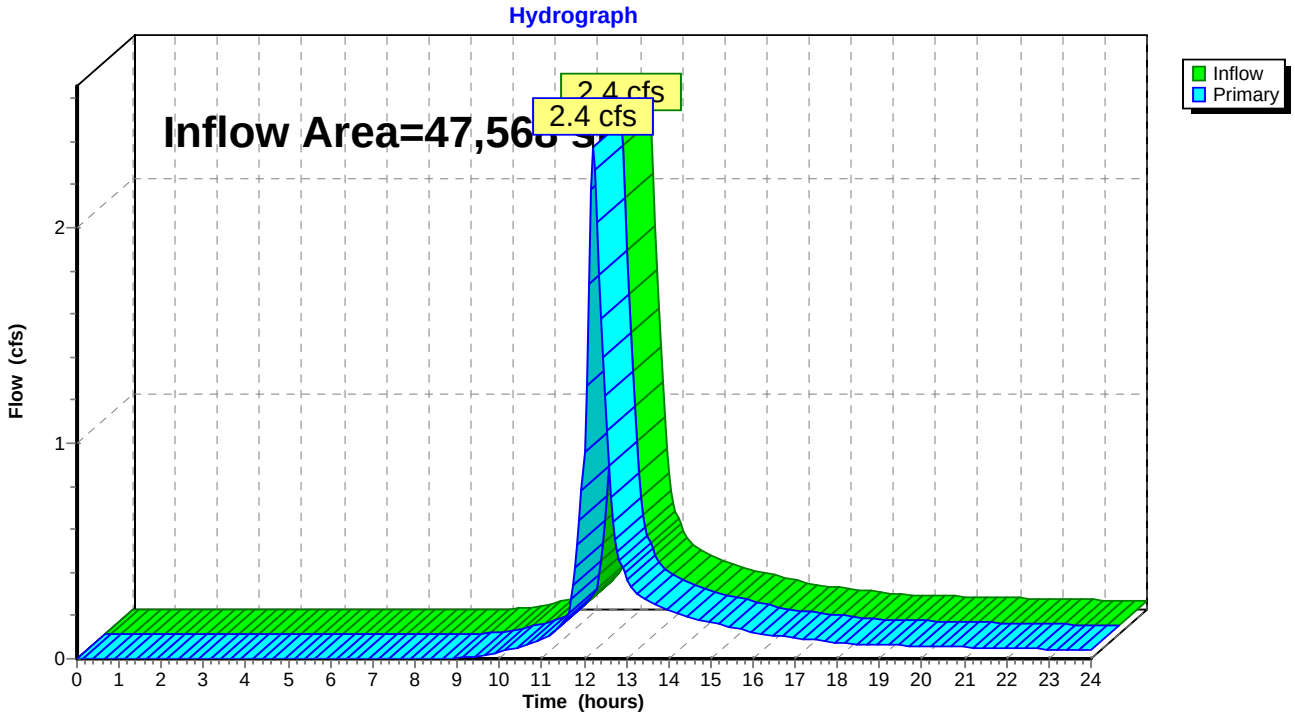


Summary for Link 9L: Wetlands NE

Inflow Area = 47,568 sf, 5.31% Impervious, Inflow Depth > 2.44" for 10-Year event
Inflow = 2.4 cfs @ 12.21 hrs, Volume= 9,681 cf
Primary = 2.4 cfs @ 12.21 hrs, Volume= 9,681 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 9L: Wetlands NE

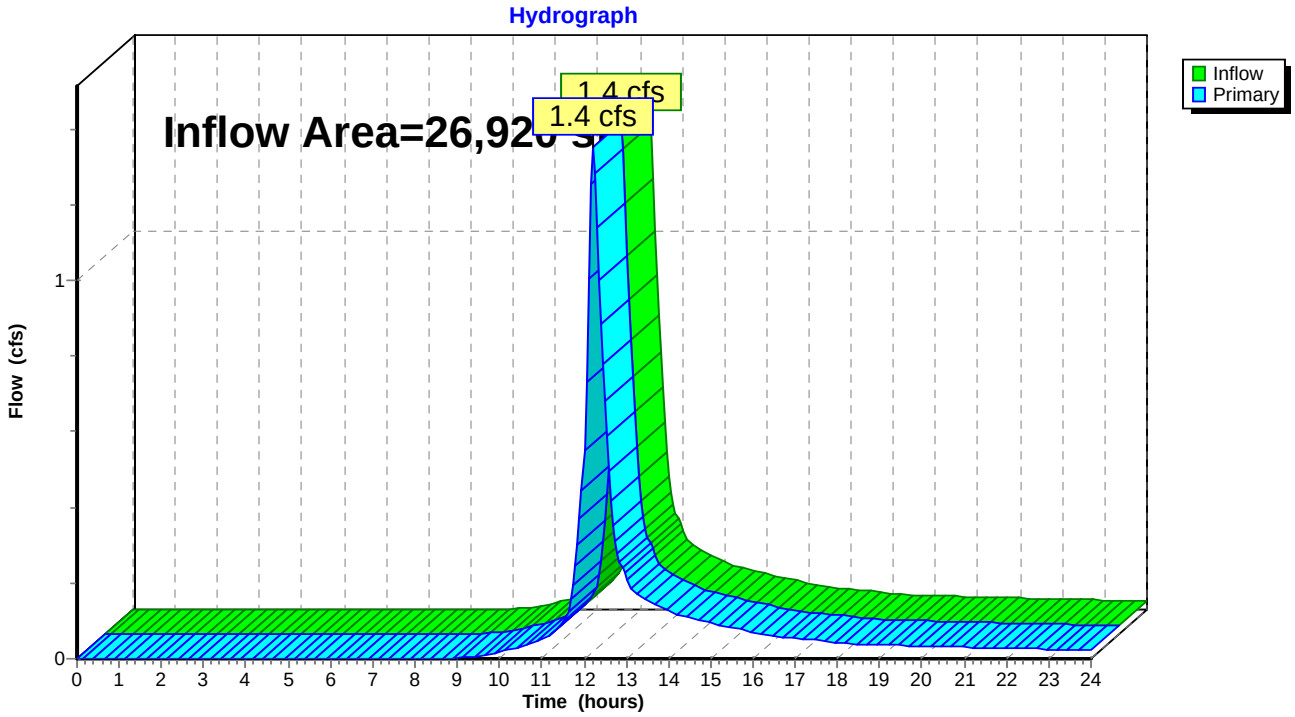


Summary for Link 10L: Wetlands N

Inflow Area = 26,920 sf, 4.53% Impervious, Inflow Depth > 2.44" for 10-Year event
Inflow = 1.4 cfs @ 12.20 hrs, Volume= 5,479 cf
Primary = 1.4 cfs @ 12.20 hrs, Volume= 5,479 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 10L: Wetlands N

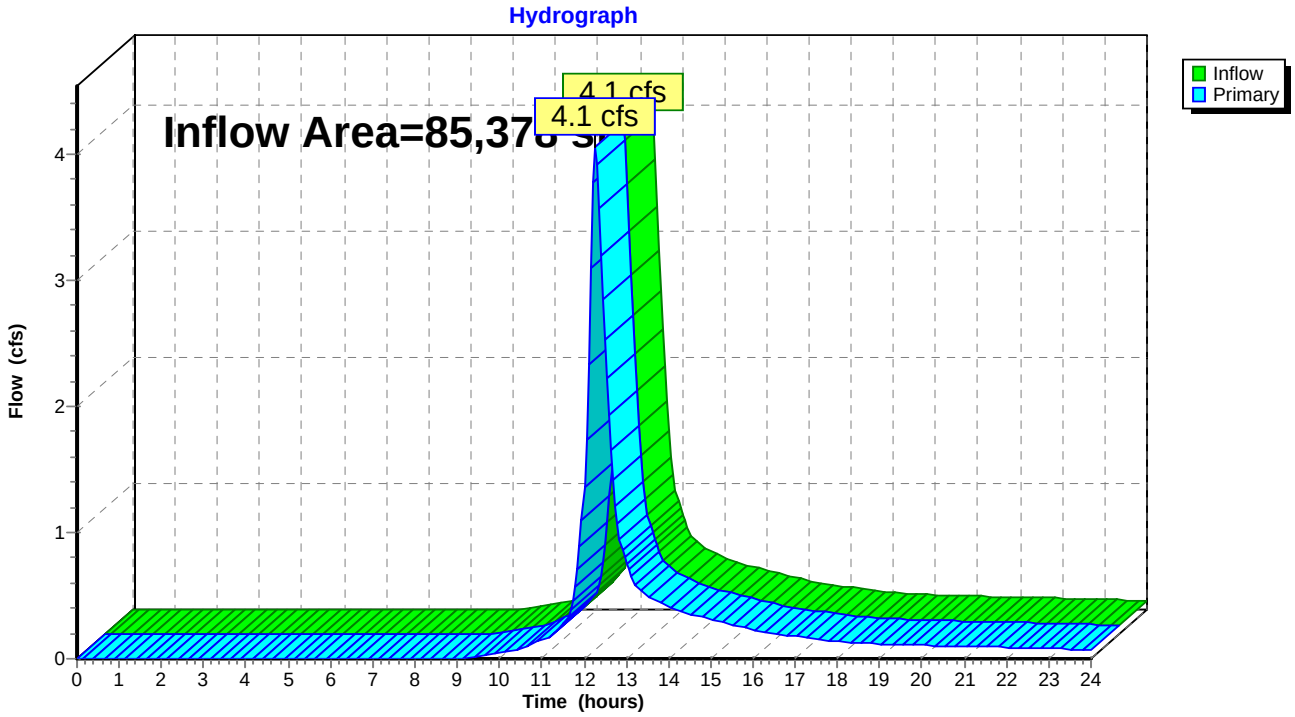


Summary for Link 11L: Collection Swale W

Inflow Area = 85,378 sf, 3.27% Impervious, Inflow Depth > 2.43" for 10-Year event
Inflow = 4.1 cfs @ 12.26 hrs, Volume= 17,318 cf
Primary = 4.1 cfs @ 12.26 hrs, Volume= 17,318 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 11L: Collection Swale W

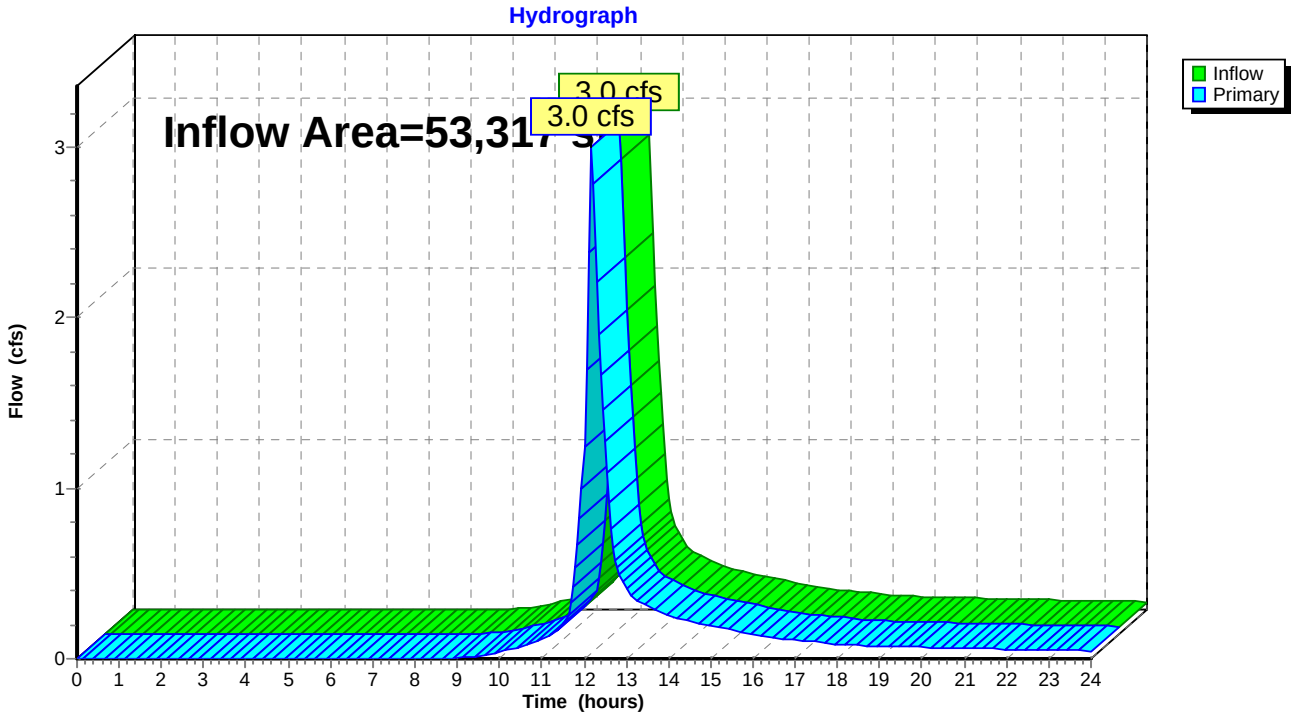


Summary for Link 12L: Collection Swale W

Inflow Area = 53,317 sf, 4.00% Impervious, Inflow Depth > 2.52" for 10-Year event
Inflow = 3.0 cfs @ 12.18 hrs, Volume= 11,212 cf
Primary = 3.0 cfs @ 12.18 hrs, Volume= 11,212 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 12L: Collection Swale W

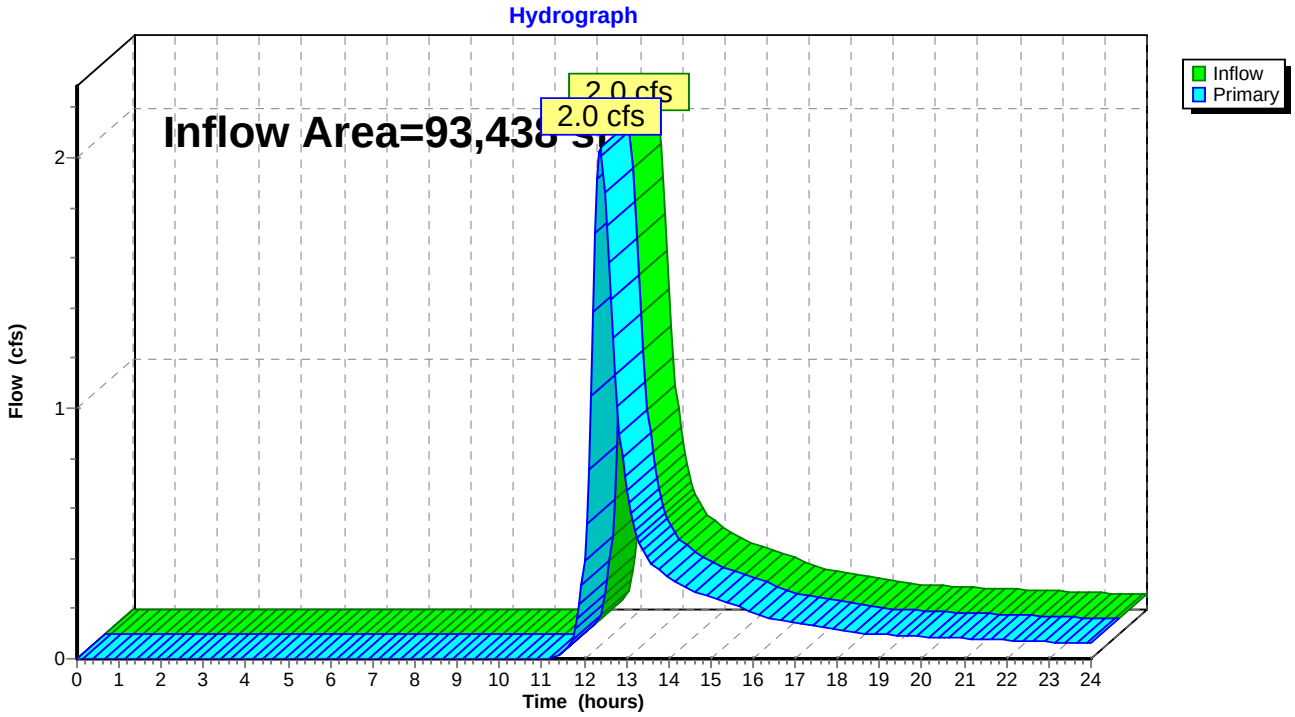


Summary for Link 15L: Wetland W

Inflow Area = 93,438 sf, 0.61% Impervious, Inflow Depth > 1.43" for 10-Year event
Inflow = 2.0 cfs @ 12.38 hrs, Volume= 11,125 cf
Primary = 2.0 cfs @ 12.38 hrs, Volume= 11,125 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 15L: Wetland W

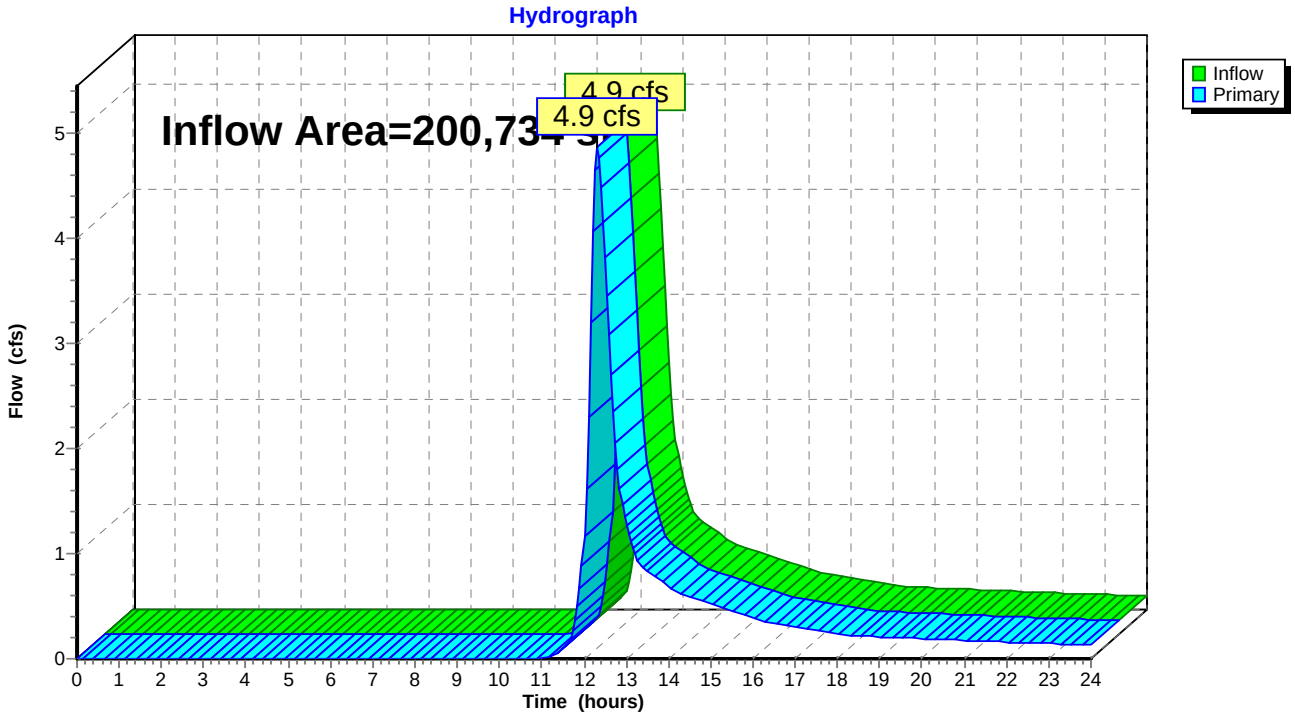


Summary for Link 16L: Wetland E

Inflow Area = 200,734 sf, 0.11% Impervious, Inflow Depth > 1.46" for 10-Year event
Inflow = 4.9 cfs @ 12.31 hrs, Volume= 24,370 cf
Primary = 4.9 cfs @ 12.31 hrs, Volume= 24,370 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 16L: Wetland E



Time span=0.00-24.00 hrs, dt=0.050 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Bulky Waste Landfill SW Runoff Area=0.952 ac 4.52% Impervious Runoff Depth>3.11"
Flow Length=239' Tc=13.7 min CN=76 Runoff=2.7 cfs 10,764 cf

Subcatchment 2S: Bulky Waste Landfill NW Runoff Area=0.705 ac 4.54% Impervious Runoff Depth>3.02"
Flow Length=179' Tc=14.1 min CN=75 Runoff=1.9 cfs 7,729 cf

Subcatchment 3S: Bulky Waste Landfill E Runoff Area=1.092 ac 5.31% Impervious Runoff Depth>3.02"
Flow Length=204' Tc=14.6 min CN=75 Runoff=2.9 cfs 11,970 cf

Subcatchment 4S: Landfill N Runoff Area=0.618 ac 4.53% Impervious Runoff Depth>3.02"
Flow Length=222' Tc=14.3 min CN=75 Runoff=1.7 cfs 6,775 cf

Subcatchment 5S: Landfill W Runoff Area=1.960 ac 3.27% Impervious Runoff Depth>3.02"
Flow Length=752' Tc=15.2 min CN=75 Runoff=5.2 cfs 21,482 cf

Subcatchment 6S: Landfill E Runoff Area=1.224 ac 4.00% Impervious Runoff Depth>3.12"
Flow Length=459' Tc=10.0 min CN=76 Runoff=3.9 cfs 13,851 cf

Subcatchment 7S: Green Field W Runoff Area=93,438 sf 0.61% Impervious Runoff Depth>1.88"
Flow Length=472' Tc=24.7 min CN=62 Runoff=2.8 cfs 14,608 cf

Subcatchment 8S: Green Field E Runoff Area=125,941 sf 0.00% Impervious Runoff Depth>1.88"
Flow Length=305' Tc=20.6 min CN=62 Runoff=4.0 cfs 19,713 cf

Subcatchment 9S: Greenfield 2 Runoff Area=1.717 ac 0.29% Impervious Runoff Depth>1.96"
Flow Length=247' Tc=19.4 min CN=63 Runoff=2.6 cfs 12,217 cf

Reach 19R: Riprap Swale Avg. Flow Depth=0.30' Max Vel=3.55 fps Inflow=5.2 cfs 21,482 cf
n=0.030 L=657.0' S=0.0383 '/' Capacity=8.6 cfs Outflow=5.1 cfs 21,420 cf

Reach 21R: Riprap Swale Avg. Flow Depth=0.28' Max Vel=3.50 fps Inflow=3.9 cfs 13,851 cf
n=0.030 L=527.0' S=0.0372 '/' Capacity=34.5 cfs Outflow=3.7 cfs 13,814 cf

Link 7L: Wetlands NW Inflow=1.9 cfs 7,729 cf
Primary=1.9 cfs 7,729 cf

Link 8L: Depression S Inflow=2.7 cfs 10,764 cf
Primary=2.7 cfs 10,764 cf

Link 9L: Wetlands NE Inflow=2.9 cfs 11,970 cf
Primary=2.9 cfs 11,970 cf

Link 10L: Wetlands N Inflow=1.7 cfs 6,775 cf
Primary=1.7 cfs 6,775 cf

Link 11L: Collection Swale W Inflow=5.1 cfs 21,420 cf
Primary=5.1 cfs 21,420 cf

Link 12L: Collection Swale W Inflow=3.7 cfs 13,814 cf
Primary=3.7 cfs 13,814 cf

Link 15L: Wetland W Inflow=2.8 cfs 14,608 cf
Primary=2.8 cfs 14,608 cf

Link 16L: Wetland E Inflow=6.6 cfs 31,930 cf
Primary=6.6 cfs 31,930 cf

Total Runoff Area = 579,533 sf Runoff Volume = 119,109 cf Average Runoff Depth = 2.47"
97.80% Pervious = 566,801 sf 2.20% Impervious = 12,732 sf

Summary for Subcatchment 1S: Bulky Waste Landfill SW

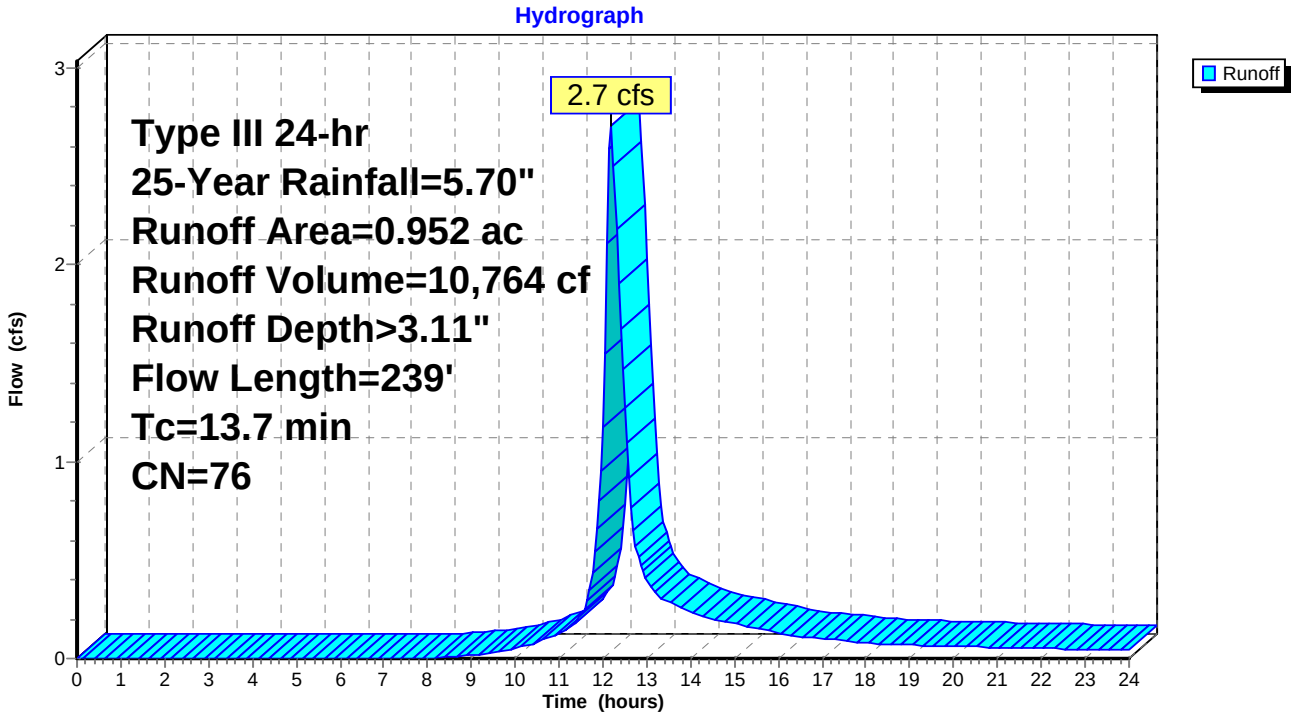
Runoff = 2.7 cfs @ 12.19 hrs, Volume= 10,764 cf, Depth> 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (ac)	CN	Description
	0.829	74	>75% Grass cover, Good, HSG C
	0.080	89	Gravel roads, HSG C
*	0.003	98	Equipment Pad, HSG C
*	0.040	98	Solar array Ballasts, HSG C
	0.952	76	Weighted Average
	0.909		95.48% Pervious Area
	0.043		4.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0251	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.5	66	0.1137	2.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	46	0.1957	3.10		**Shallow Concentrated Flow, Lanfill Cap** Short Grass Pasture Kv= 7.0 fps
0.4	27	0.0050	1.14		**Shallow Concentrated Flow, Access Drive** Unpaved Kv= 16.1 fps
13.7	239	Total			

Subcatchment 1S: Bulky Waste Landfill SW



Summary for Subcatchment 2S: Bulky Waste Landfill NW

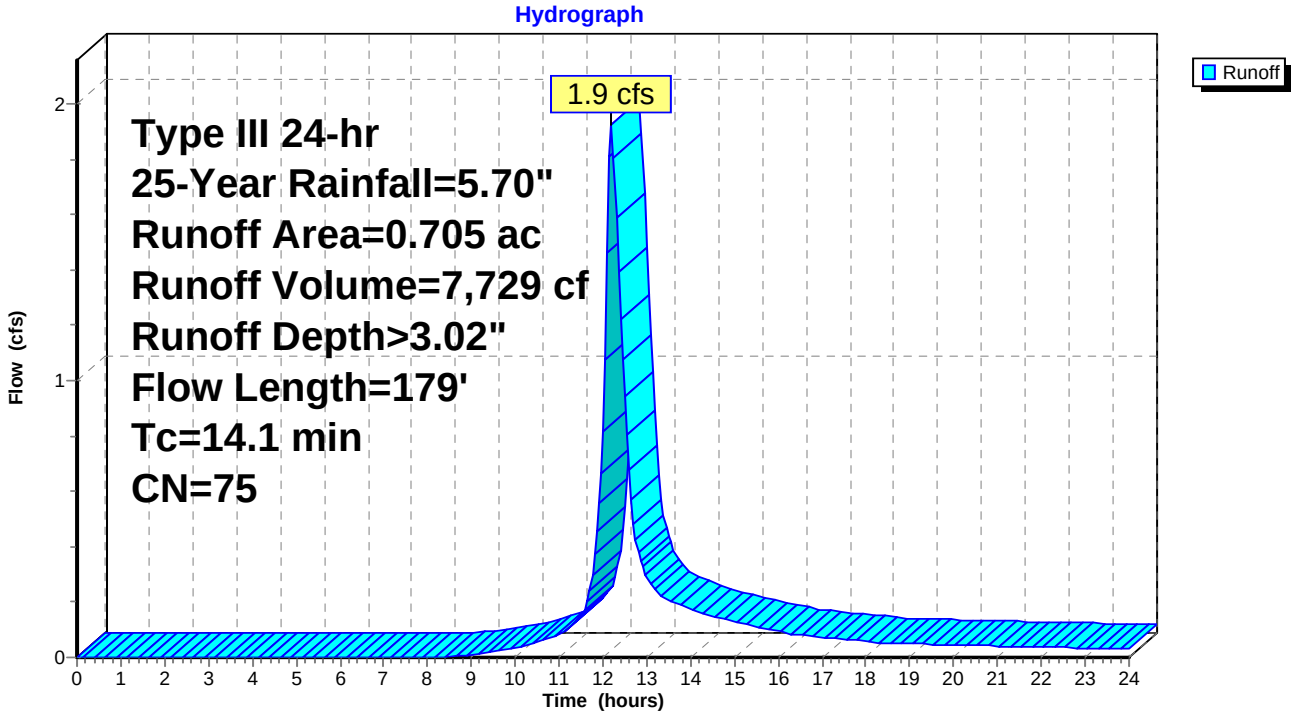
Runoff = 1.9 cfs @ 12.20 hrs, Volume= 7,729 cf, Depth> 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (ac)	CN	Description
	0.659	74	>75% Grass cover, Good, HSG C
*	0.032	98	Solar array ballasts, HSG C
	0.014	89	Gravel roads, HSG C
	0.705	75	Weighted Average
	0.673		95.46% Pervious Area
	0.032		4.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.6	79	0.0886	2.08		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.1	179	Total			

Subcatchment 2S: Bulky Waste Landfill NW



Summary for Subcatchment 3S: Bulky Waste Landfill E

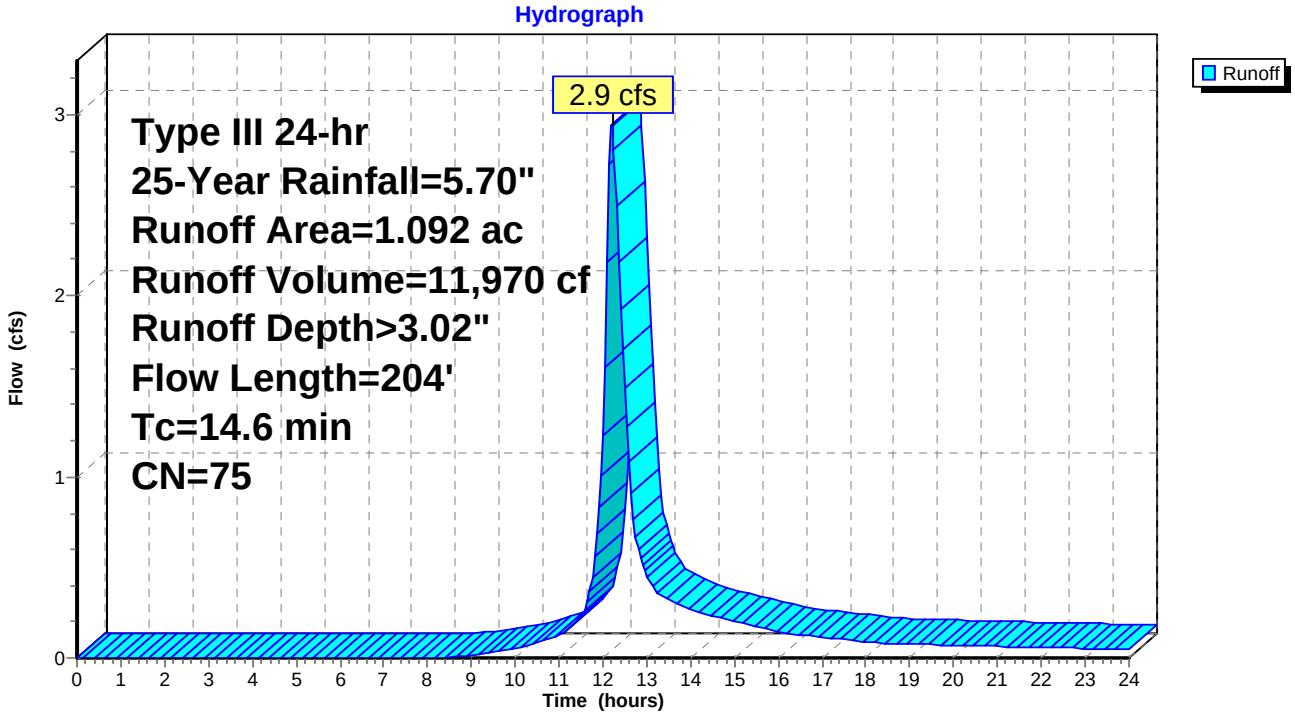
Runoff = 2.9 cfs @ 12.21 hrs, Volume= 11,970 cf, Depth> 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (ac)	CN	Description
	1.034	74	>75% Grass cover, Good, HSG C
*	0.058	98	Solar array ballasts, HSG C
	1.092	75	Weighted Average
	1.034		94.69% Pervious Area
	0.058		5.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.1	24	0.1667	2.86		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.6	204	Total			

Subcatchment 3S: Bulky Waste Landfill E



Summary for Subcatchment 4S: Landfill N

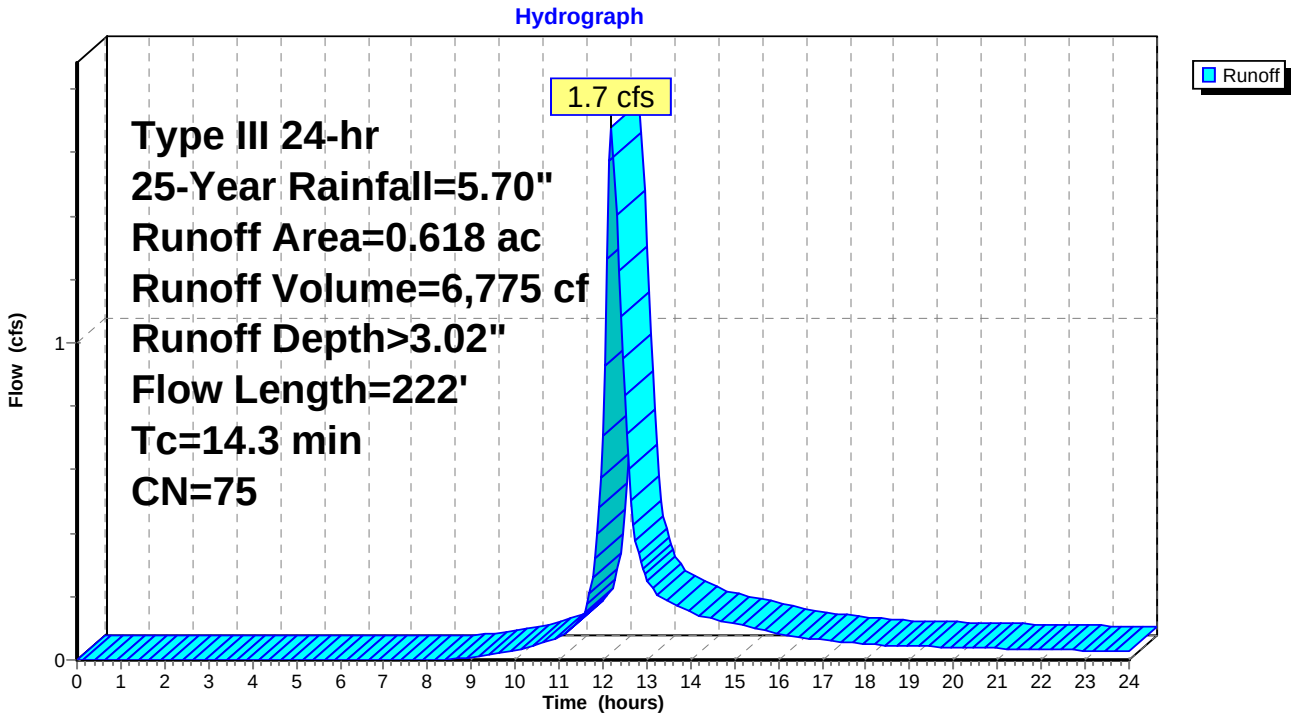
Runoff = 1.7 cfs @ 12.20 hrs, Volume= 6,775 cf, Depth> 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (ac)	CN	Description
	0.590	74	>75% Grass cover, Good, HSG C
*	0.028	98	Solar array ballasts, HSG C
	0.618	75	Weighted Average
	0.590		95.47% Pervious Area
	0.028		4.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0230	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	81	0.0371	1.35		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	41	0.1707	2.89		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.3	222	Total			

Subcatchment 4S: Landfill N



Summary for Subcatchment 5S: Landfill W

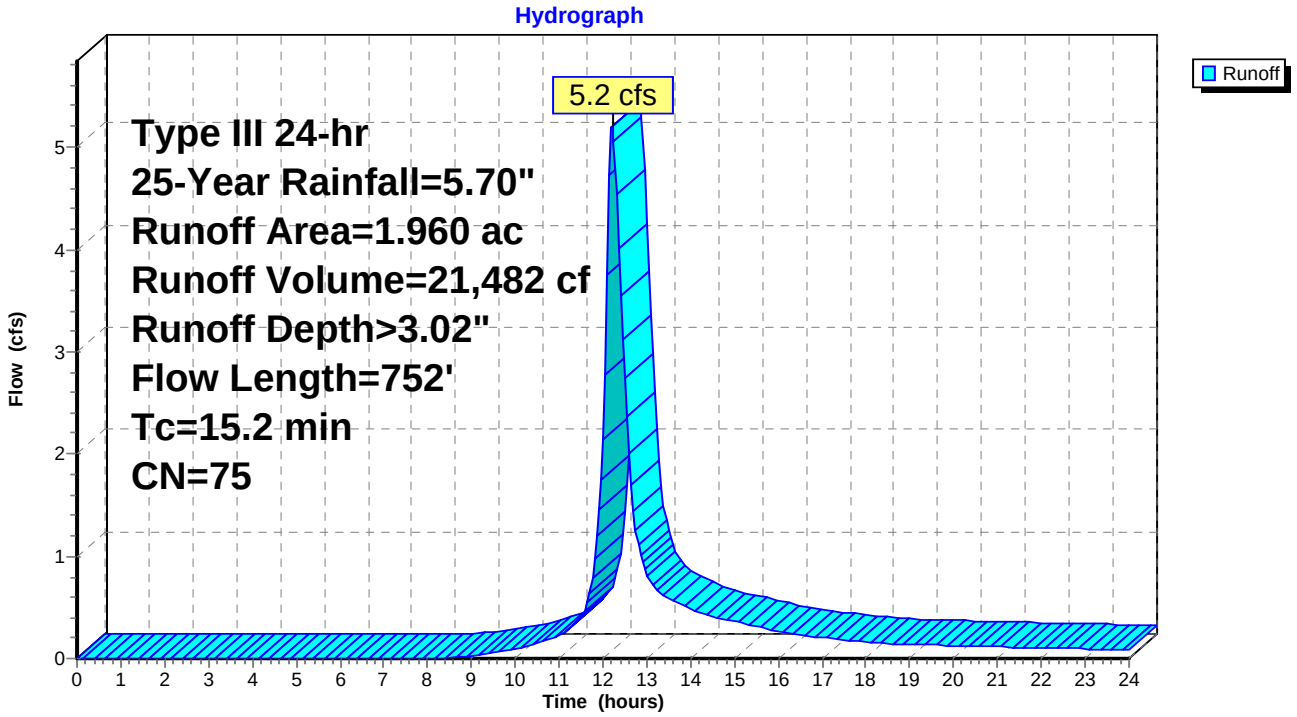
Runoff = 5.2 cfs @ 12.21 hrs, Volume= 21,482 cf, Depth> 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (ac)	CN	Description
	1.896	74	>75% Grass cover, Good, HSG C
*	0.064	98	Solar array ballasts, HSG C
	1.960	75	Weighted Average
	1.896		96.73% Pervious Area
	0.064		3.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0220	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.3	37	0.0811	1.99		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.3	58	0.1897	3.05		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
1.3	520	0.0200	6.71	50.33	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
0.0	37	0.2160	22.05	165.39	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
15.2	752	Total			

Subcatchment 5S: Landfill W



Summary for Subcatchment 6S: Landfill E

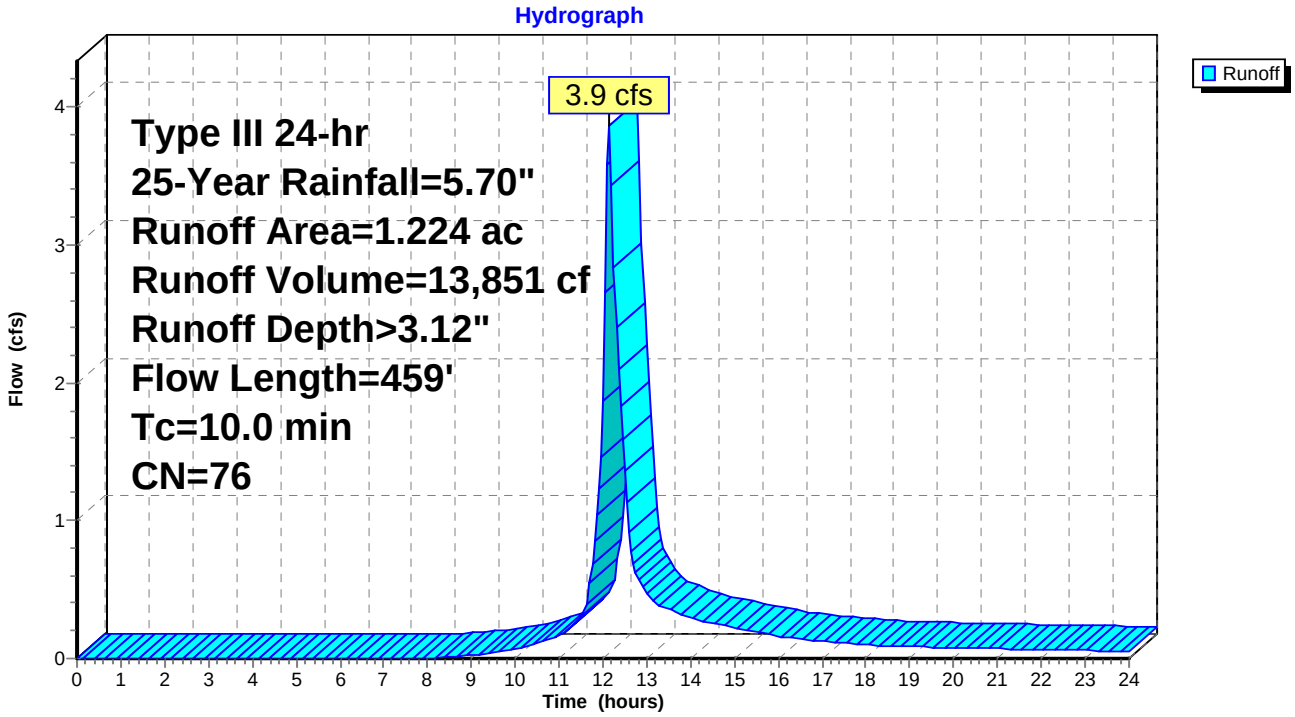
Runoff = 3.9 cfs @ 12.14 hrs, Volume= 13,851 cf, Depth> 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (ac)	CN	Description
	1.085	74	>75% Grass cover, Good, HSG C
	0.090	89	Gravel roads, HSG C
*	0.046	98	Solar array ballasts, HSG C
*	0.003	98	Concrete Equipment Pad, HSG C
	1.224	76	Weighted Average
	1.175		96.00% Pervious Area
	0.049		4.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	40	0.0543	0.15		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	60	0.0117	1.03		**Sheet Flow, Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.5	86	0.0384	3.15		**Shallow Concentrated Flow, Gravel** Unpaved Kv= 16.1 fps
0.7	76	0.0658	1.80		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	49	0.2245	3.32		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	148	0.1081	15.60	117.00	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
7.1	459	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: Landfill E



Summary for Subcatchment 7S: Green Field W

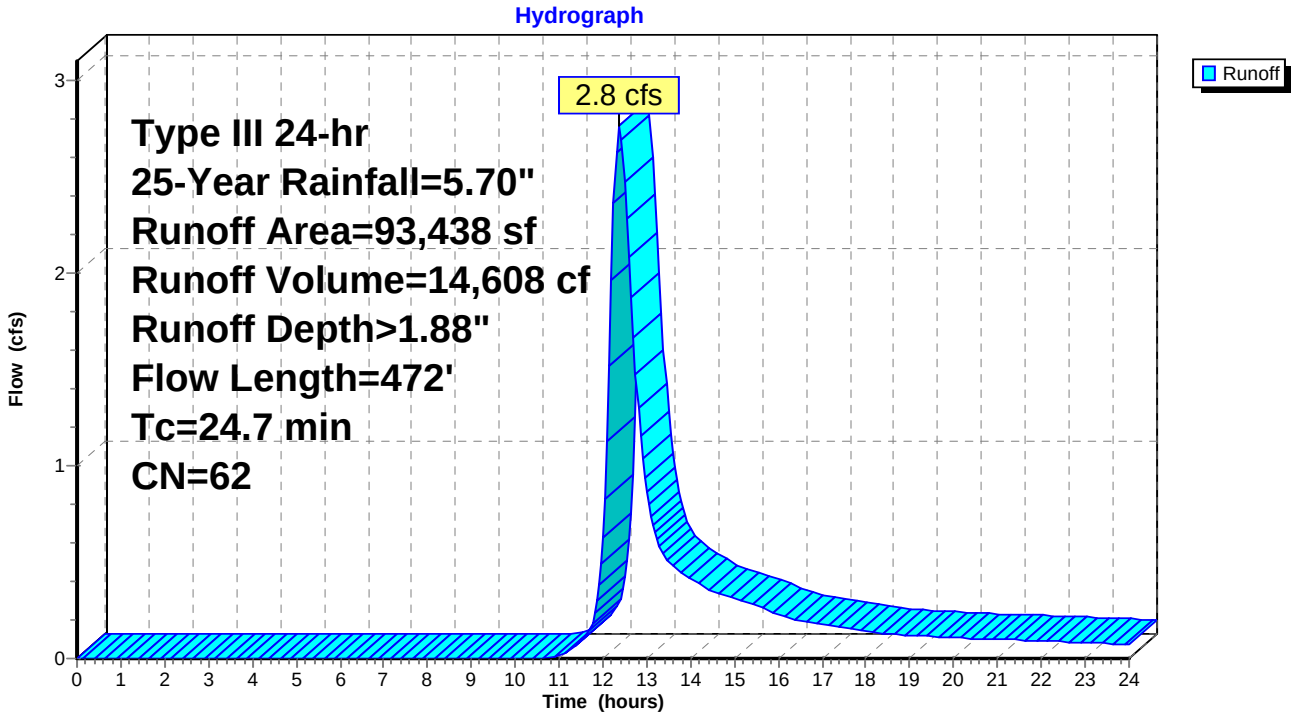
Runoff = 2.8 cfs @ 12.37 hrs, Volume= 14,608 cf, Depth> 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
	832	74	>75% Grass cover, Good, HSG C
	3,861	80	>75% Grass cover, Good, HSG D
	21,955	61	>75% Grass cover, Good, HSG B
	66,216	61	>75% Grass cover, Good, HSG B
	340	98	Paved parking, HSG C
*	4	98	Solar Array Posts, HSG B
*	230	98	Equipment Pad, HSG B
	93,438	62	Weighted Average
	92,864		99.39% Pervious Area
	574		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	23	0.0217	1.03		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
4.8	160	0.0063	0.56		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.6	51	0.0392	1.39		**Shallow Concentrated Flow, field** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.7	50	0.0300	1.21		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
24.7	472	Total			

Subcatchment 7S: Green Field W



Summary for Subcatchment 8S: Green Field E

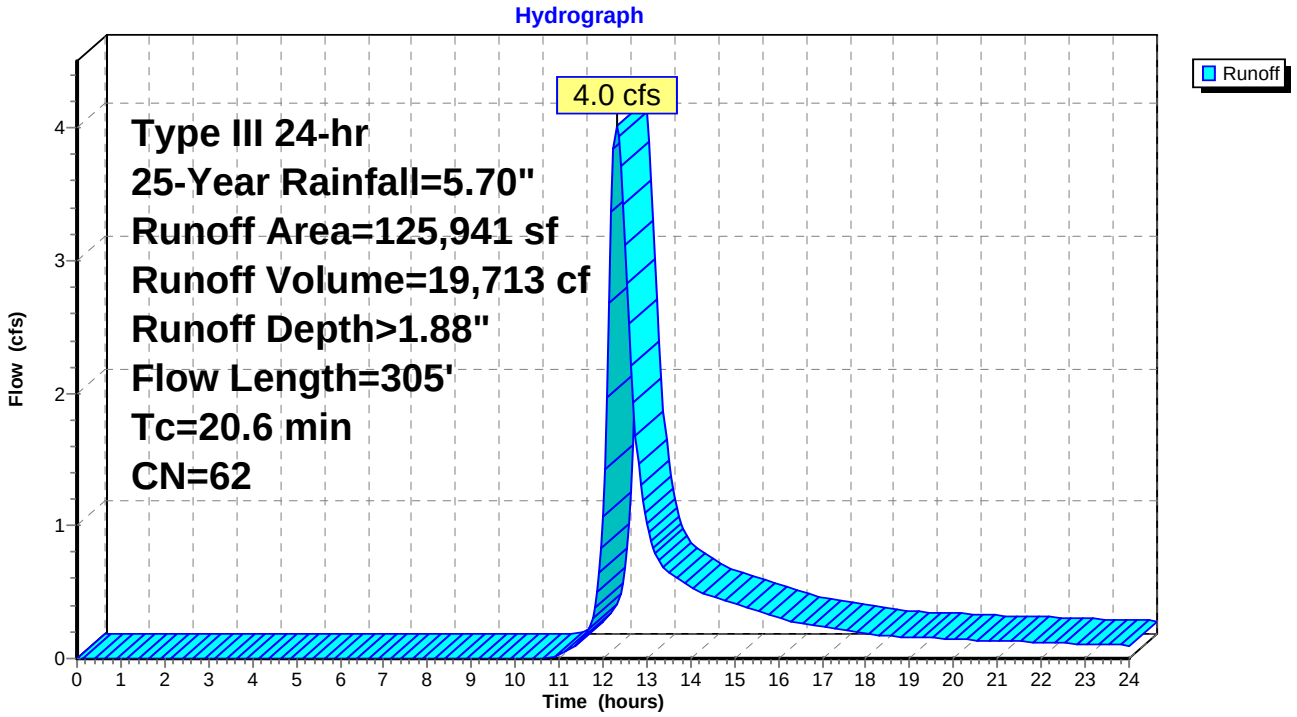
Runoff = 4.0 cfs @ 12.31 hrs, Volume= 19,713 cf, Depth> 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
	116,936	61	>75% Grass cover, Good, HSG B
	3,129	80	>75% Grass cover, Good, HSG D
	1,452	80	>75% Grass cover, Good, HSG D
	4,419	61	>75% Grass cover, Good, HSG B
*	5	98	Solar Array Posts, HSG B
	125,941	62	Weighted Average
	125,936		100.00% Pervious Area
	5		0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	24	0.0208	1.01		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
2.6	106	0.0094	0.68		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.8	75	0.0467	1.51		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
20.6	305	Total			

Subcatchment 8S: Green Field E



Summary for Subcatchment 9S: Greenfield 2

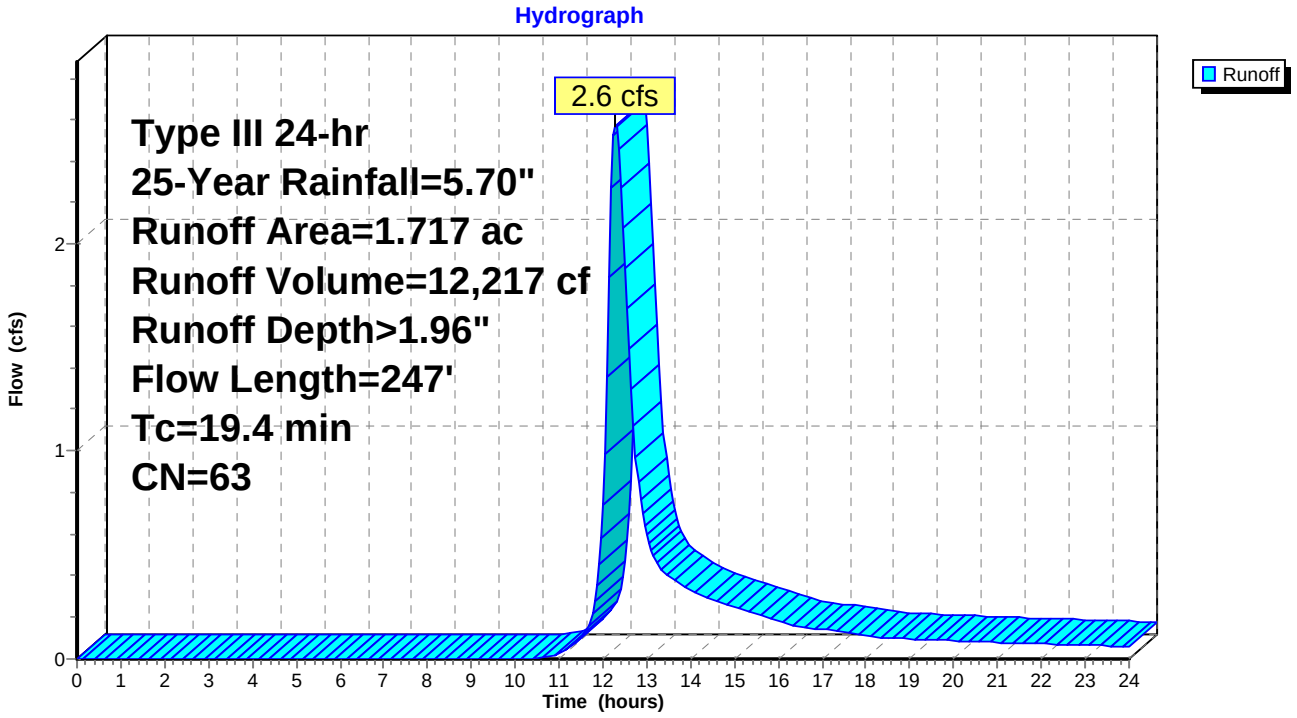
Runoff = 2.6 cfs @ 12.29 hrs, Volume= 12,217 cf, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (ac)	CN	Description
	0.091	77	Woods, Good, HSG D
	0.151	55	Woods, Good, HSG B
	1.283	61	>75% Grass cover, Good, HSG B
	0.187	80	>75% Grass cover, Good, HSG D
*	0.000	98	Solar Array Posts, HSG B
	0.005	98	Paved parking, HSG B
	1.717	63	Weighted Average
	1.712		99.71% Pervious Area
	0.005		0.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0128	0.10		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.40"
2.9	147	0.0148	0.85		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
19.4	247	Total			

Subcatchment 9S: Greenfield 2



Summary for Reach 19R: Riprap Swale

Inflow Area = 85,378 sf, 3.27% Impervious, Inflow Depth > 3.02" for 25-Year event
Inflow = 5.2 cfs @ 12.21 hrs, Volume= 21,482 cf
Outflow = 5.1 cfs @ 12.25 hrs, Volume= 21,420 cf, Atten= 3%, Lag= 2.5 min

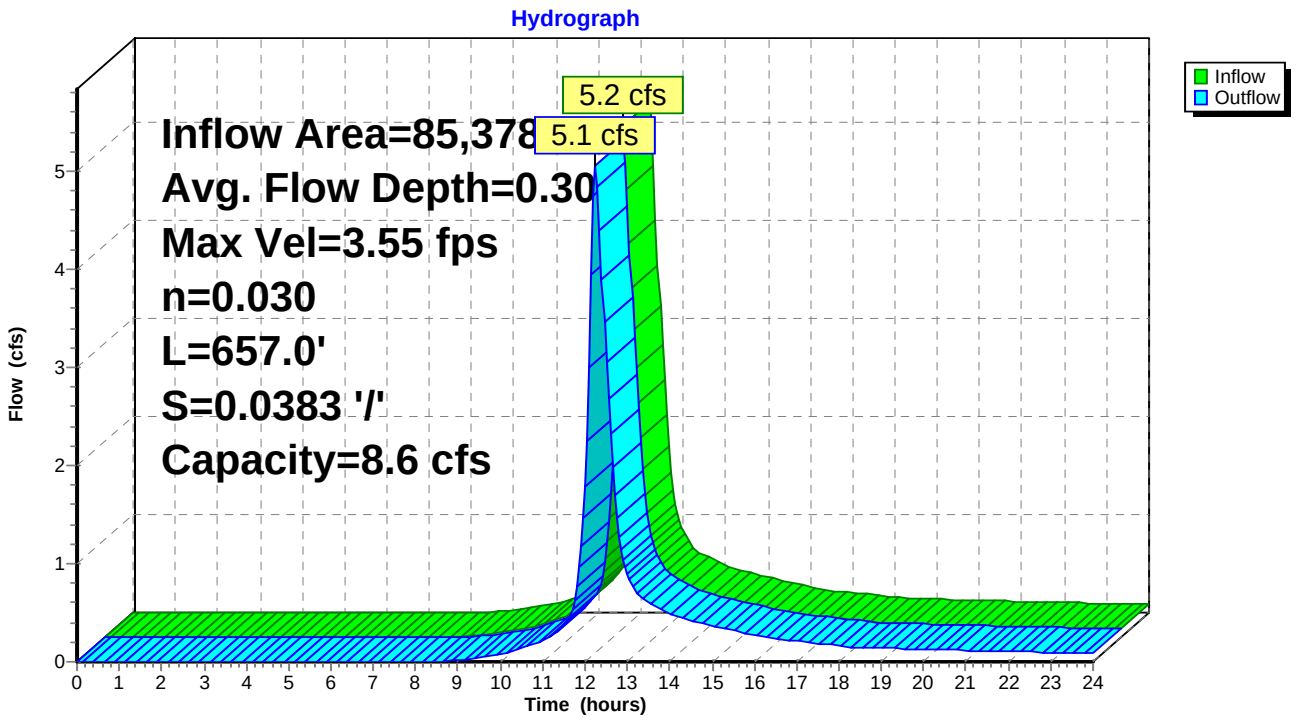
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.55 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 1.27 fps, Avg. Travel Time= 8.6 min

Peak Storage= 934 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 0.40' Flow Area= 2.1 sf, Capacity= 8.6 cfs

3.00' x 0.40' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 5.5 '/' Top Width= 7.40'
Length= 657.0' Slope= 0.0383 '/'
Inlet Invert= 274.52', Outlet Invert= 249.36'



‡



Summary for Reach 21R: Riprap Swale

Inflow Area = 53,317 sf, 4.00% Impervious, Inflow Depth > 3.12" for 25-Year event
Inflow = 3.9 cfs @ 12.14 hrs, Volume= 13,851 cf
Outflow = 3.7 cfs @ 12.17 hrs, Volume= 13,814 cf, Atten= 3%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 1.11 fps, Avg. Travel Time= 7.9 min

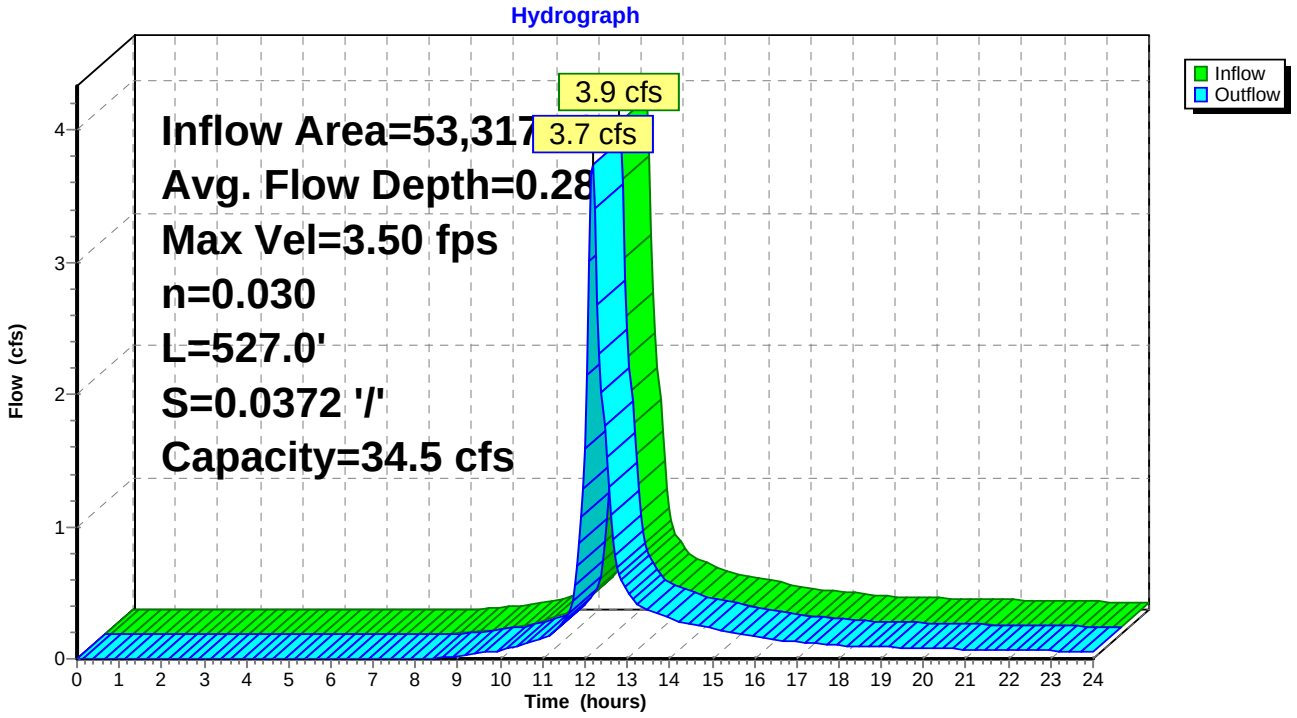
Peak Storage= 560 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 0.90' Flow Area= 5.1 sf, Capacity= 34.5 cfs

3.00' x 0.90' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 3.0 '/' Top Width= 8.40'
Length= 527.0' Slope= 0.0372 '/'
Inlet Invert= 276.70', Outlet Invert= 257.10'



‡

Reach 21R: Riprap Swale

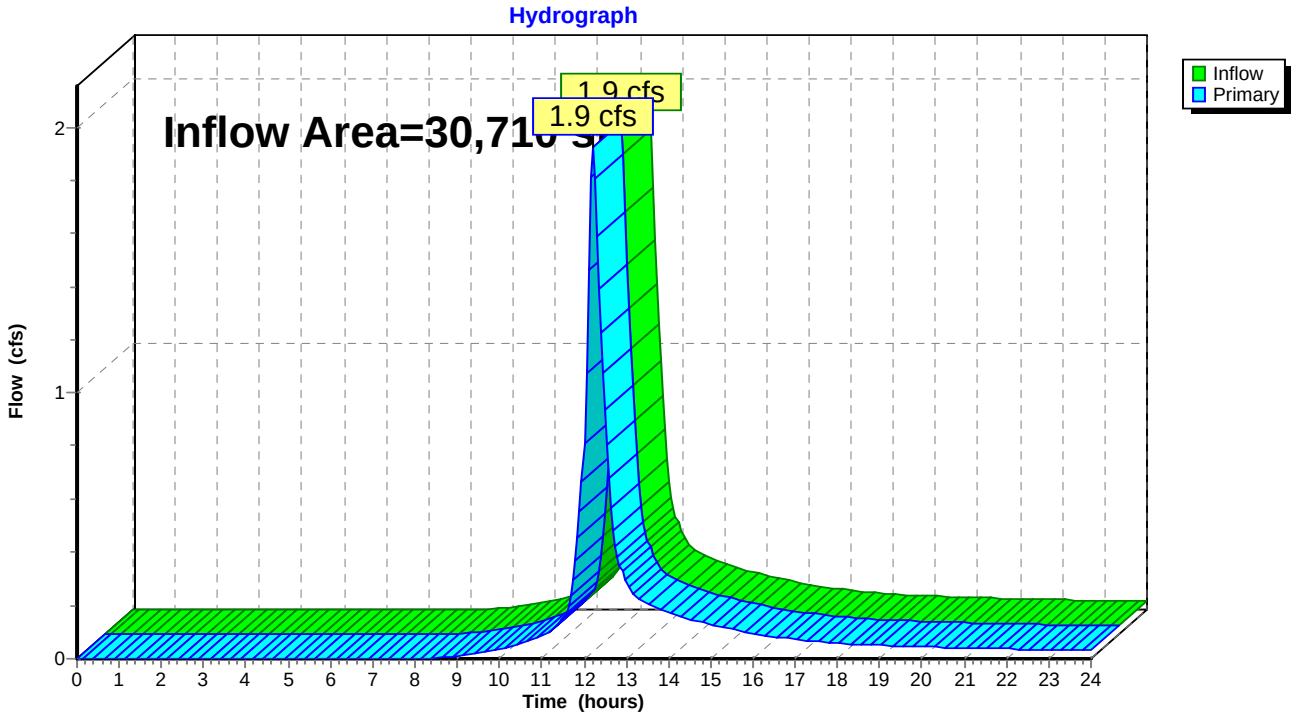


Summary for Link 7L: Wetlands NW

Inflow Area = 30,710 sf, 4.54% Impervious, Inflow Depth > 3.02" for 25-Year event
Inflow = 1.9 cfs @ 12.20 hrs, Volume= 7,729 cf
Primary = 1.9 cfs @ 12.20 hrs, Volume= 7,729 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 7L: Wetlands NW

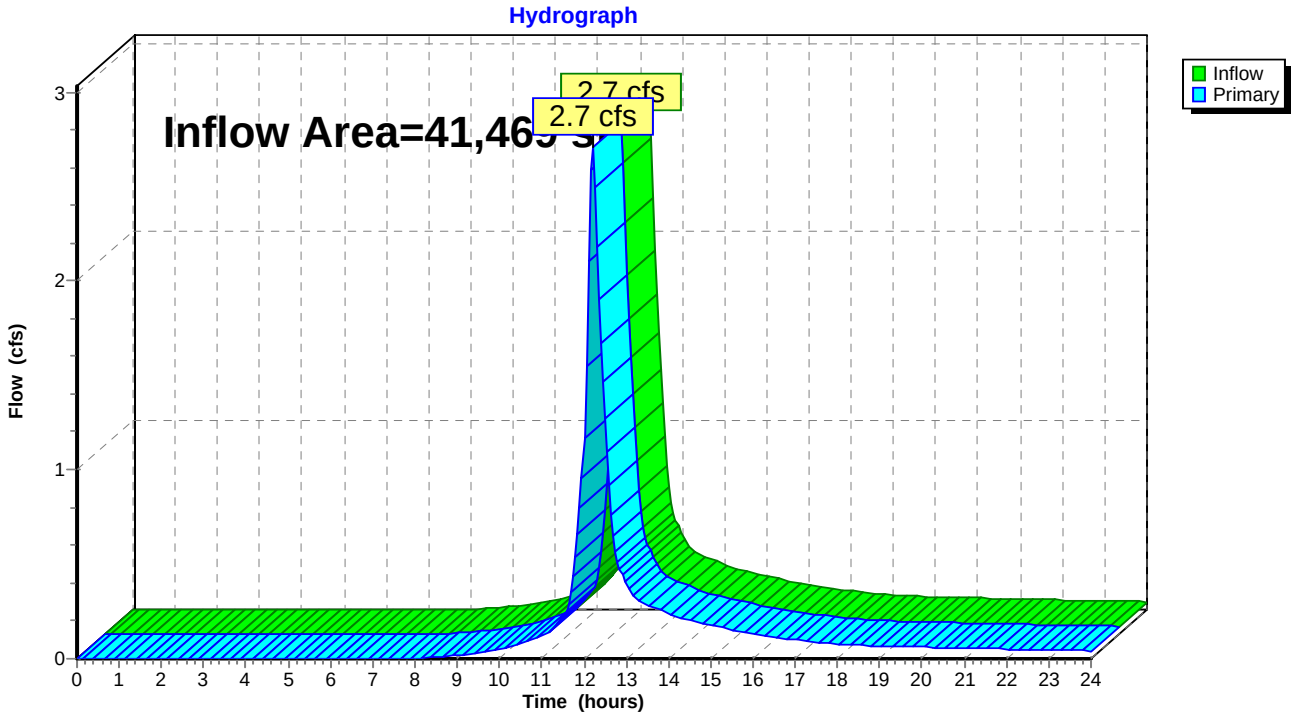


Summary for Link 8L: Depression S

Inflow Area = 41,469 sf, 4.52% Impervious, Inflow Depth > 3.11" for 25-Year event
Inflow = 2.7 cfs @ 12.19 hrs, Volume= 10,764 cf
Primary = 2.7 cfs @ 12.19 hrs, Volume= 10,764 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 8L: Depression S

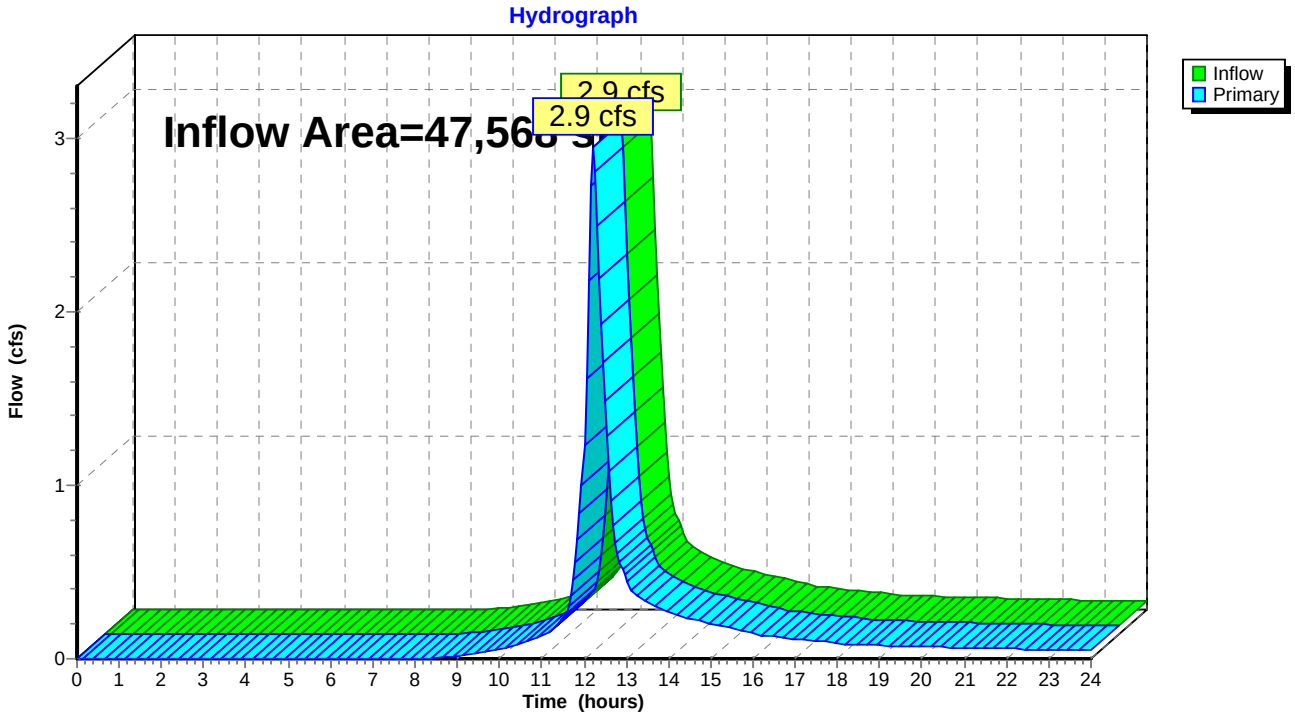


Summary for Link 9L: Wetlands NE

Inflow Area = 47,568 sf, 5.31% Impervious, Inflow Depth > 3.02" for 25-Year event
Inflow = 2.9 cfs @ 12.21 hrs, Volume= 11,970 cf
Primary = 2.9 cfs @ 12.21 hrs, Volume= 11,970 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 9L: Wetlands NE

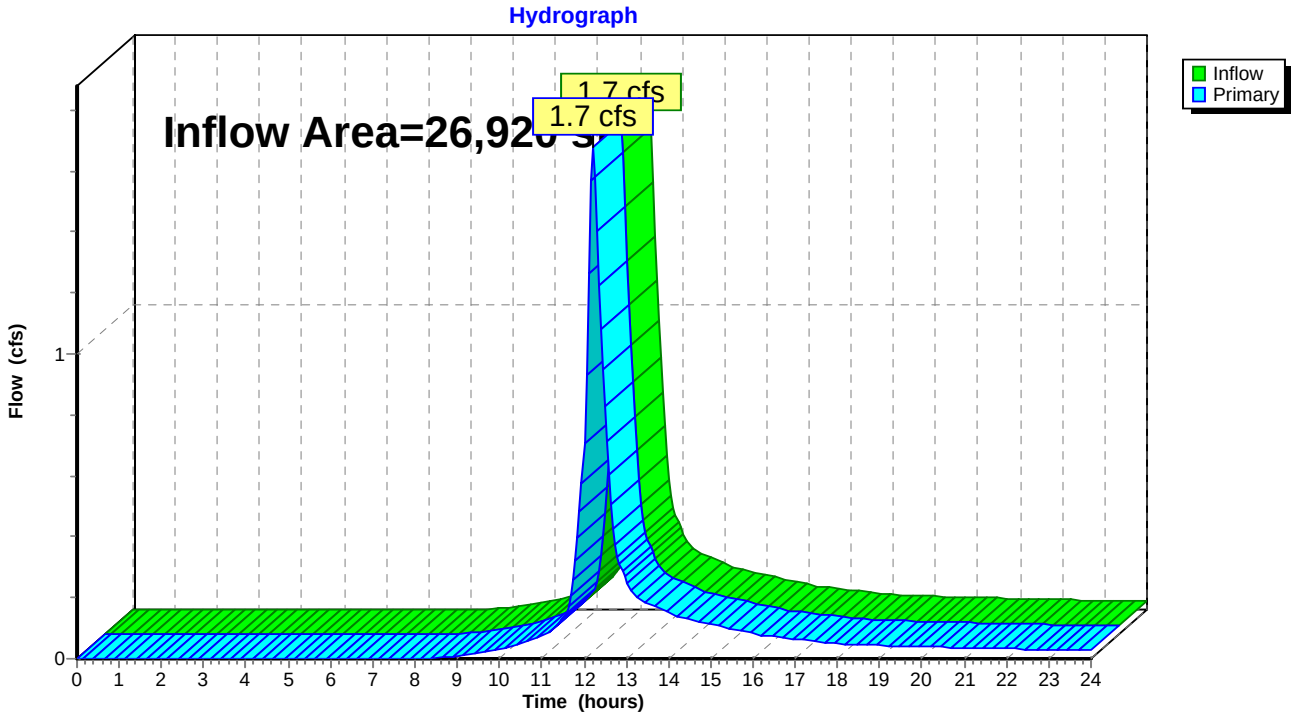


Summary for Link 10L: Wetlands N

Inflow Area = 26,920 sf, 4.53% Impervious, Inflow Depth > 3.02" for 25-Year event
Inflow = 1.7 cfs @ 12.20 hrs, Volume= 6,775 cf
Primary = 1.7 cfs @ 12.20 hrs, Volume= 6,775 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 10L: Wetlands N

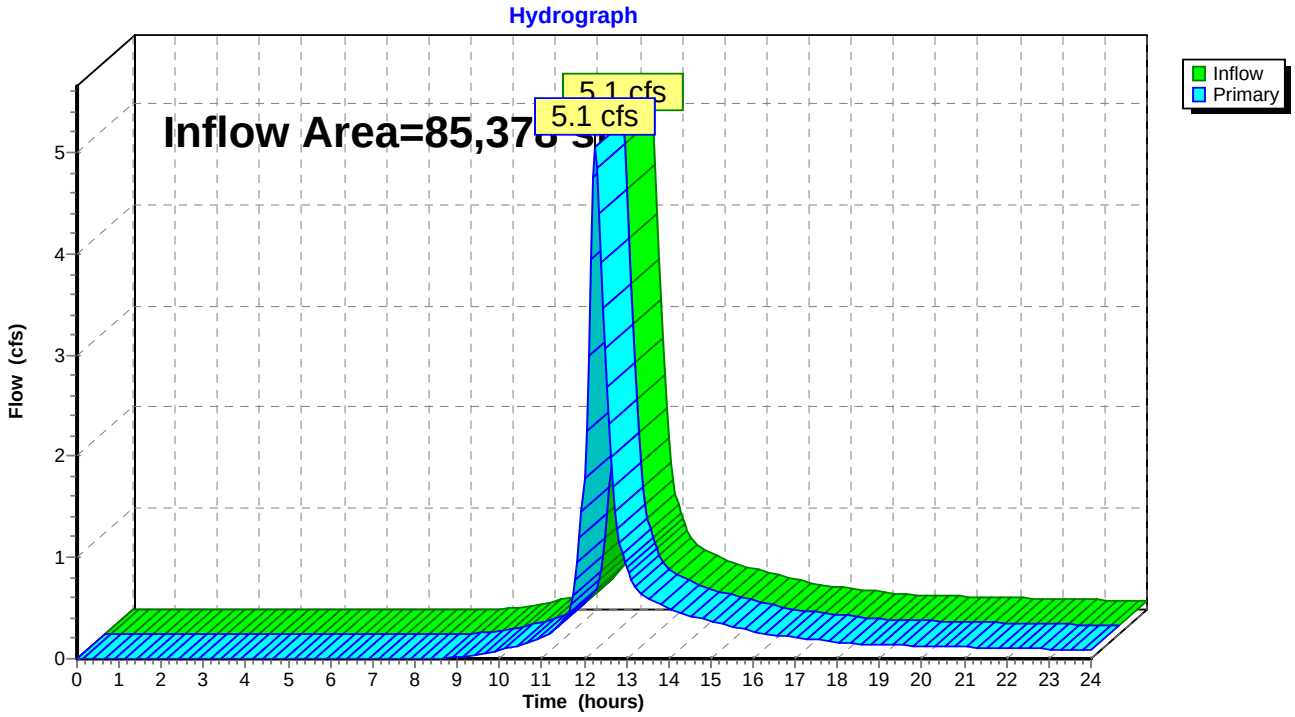


Summary for Link 11L: Collection Swale W

Inflow Area = 85,378 sf, 3.27% Impervious, Inflow Depth > 3.01" for 25-Year event
Inflow = 5.1 cfs @ 12.25 hrs, Volume= 21,420 cf
Primary = 5.1 cfs @ 12.25 hrs, Volume= 21,420 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 11L: Collection Swale W

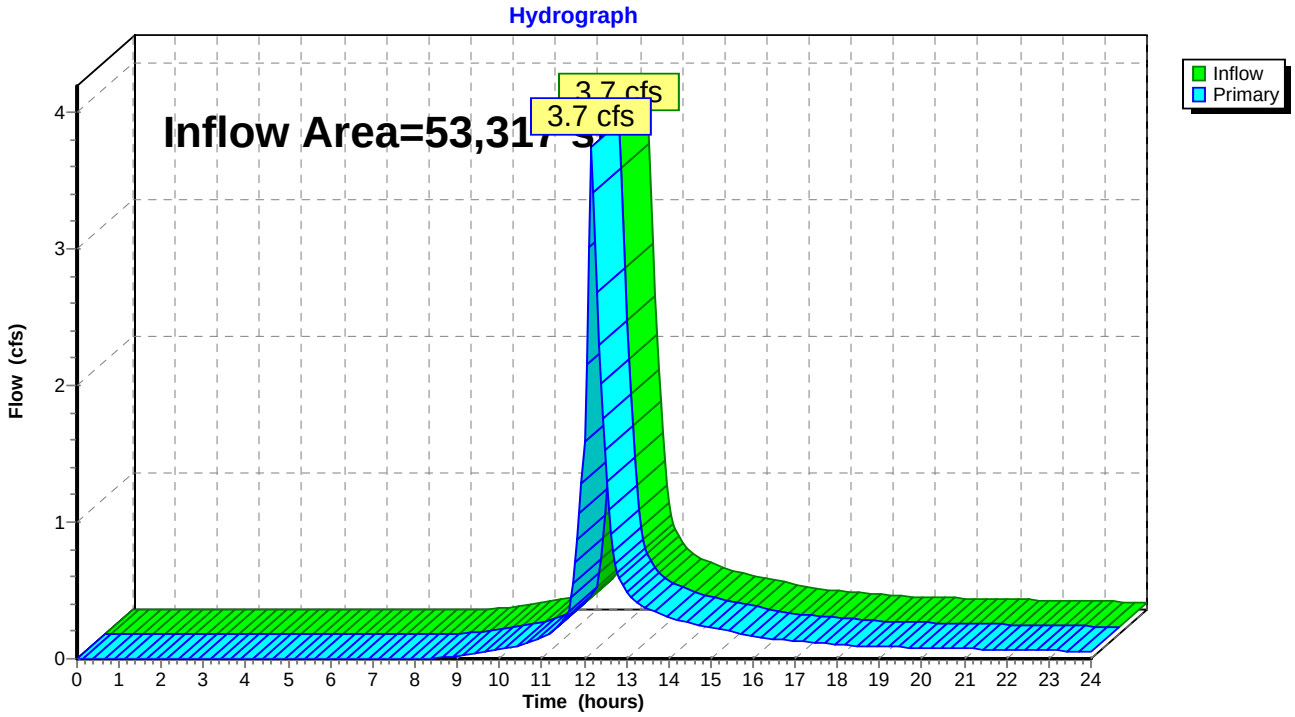


Summary for Link 12L: Collection Swale W

Inflow Area = 53,317 sf, 4.00% Impervious, Inflow Depth > 3.11" for 25-Year event
Inflow = 3.7 cfs @ 12.17 hrs, Volume= 13,814 cf
Primary = 3.7 cfs @ 12.17 hrs, Volume= 13,814 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 12L: Collection Swale W

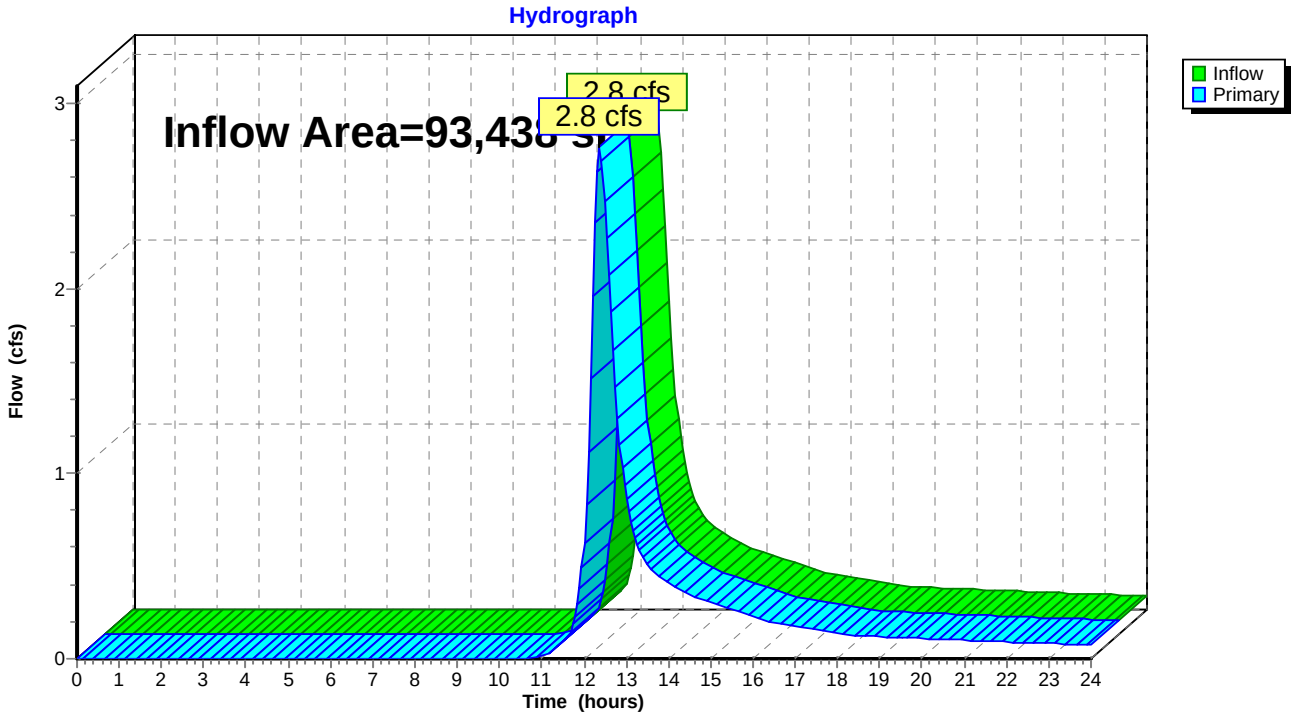


Summary for Link 15L: Wetland W

Inflow Area = 93,438 sf, 0.61% Impervious, Inflow Depth > 1.88" for 25-Year event
Inflow = 2.8 cfs @ 12.37 hrs, Volume= 14,608 cf
Primary = 2.8 cfs @ 12.37 hrs, Volume= 14,608 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 15L: Wetland W

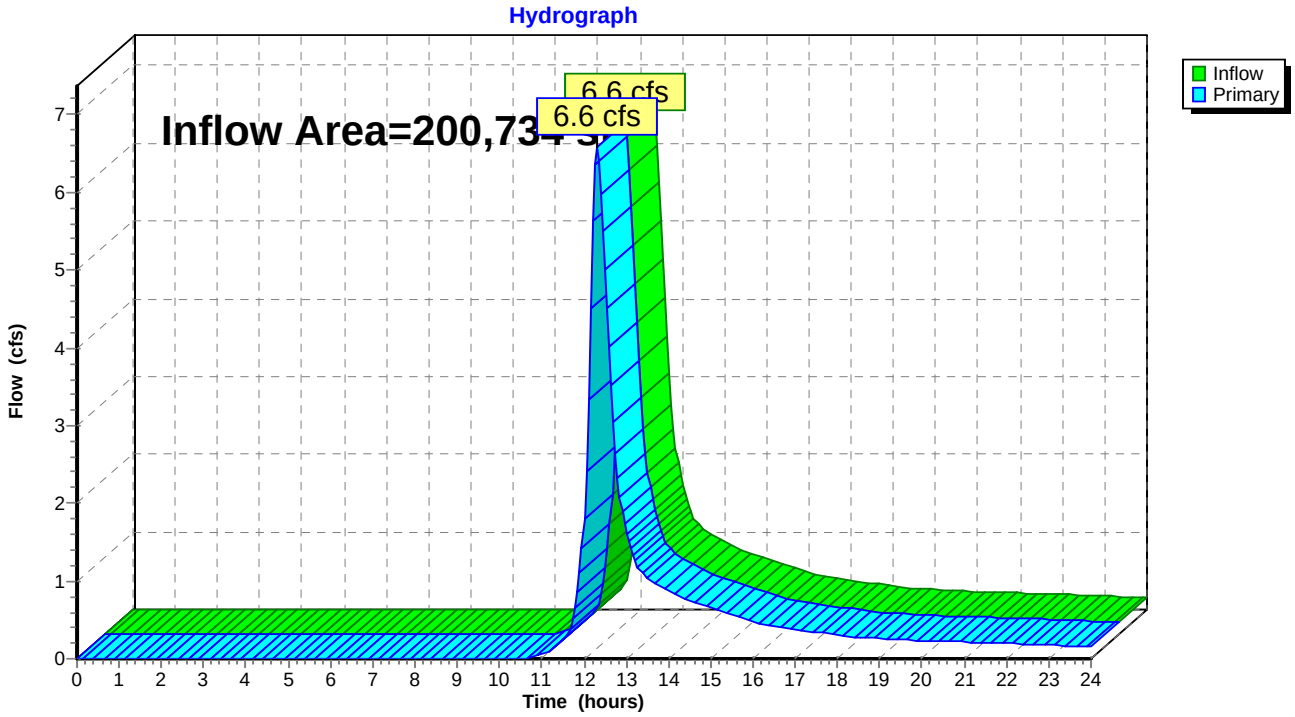


Summary for Link 16L: Wetland E

Inflow Area = 200,734 sf, 0.11% Impervious, Inflow Depth > 1.91" for 25-Year event
Inflow = 6.6 cfs @ 12.30 hrs, Volume= 31,930 cf
Primary = 6.6 cfs @ 12.30 hrs, Volume= 31,930 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 16L: Wetland E



Time span=0.00-24.00 hrs, dt=0.050 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Bulky Waste Landfill SW Runoff Area=0.952 ac 4.52% Impervious Runoff Depth>3.63"
Flow Length=239' Tc=13.7 min CN=76 Runoff=3.2 cfs 12,550 cf

Subcatchment 2S: Bulky Waste Landfill NW Runoff Area=0.705 ac 4.54% Impervious Runoff Depth>3.53"
Flow Length=179' Tc=14.1 min CN=75 Runoff=2.3 cfs 9,034 cf

Subcatchment 3S: Bulky Waste Landfill E Runoff Area=1.092 ac 5.31% Impervious Runoff Depth>3.53"
Flow Length=204' Tc=14.6 min CN=75 Runoff=3.4 cfs 13,992 cf

Subcatchment 4S: Landfill N Runoff Area=0.618 ac 4.53% Impervious Runoff Depth>3.53"
Flow Length=222' Tc=14.3 min CN=75 Runoff=2.0 cfs 7,919 cf

Subcatchment 5S: Landfill W Runoff Area=1.960 ac 3.27% Impervious Runoff Depth>3.53"
Flow Length=752' Tc=15.2 min CN=75 Runoff=6.1 cfs 25,110 cf

Subcatchment 6S: Landfill E Runoff Area=1.224 ac 4.00% Impervious Runoff Depth>3.63"
Flow Length=459' Tc=10.0 min CN=76 Runoff=4.5 cfs 16,147 cf

Subcatchment 7S: Green Field W Runoff Area=93,438 sf 0.61% Impervious Runoff Depth>2.28"
Flow Length=472' Tc=24.7 min CN=62 Runoff=3.4 cfs 17,788 cf

Subcatchment 8S: Green Field E Runoff Area=125,941 sf 0.00% Impervious Runoff Depth>2.29"
Flow Length=305' Tc=20.6 min CN=62 Runoff=5.0 cfs 24,002 cf

Subcatchment 9S: Greenfield 2 Runoff Area=1.717 ac 0.29% Impervious Runoff Depth>2.38"
Flow Length=247' Tc=19.4 min CN=63 Runoff=3.2 cfs 14,820 cf

Reach 19R: Riprap Swale Avg. Flow Depth=0.33' Max Vel=3.72 fps Inflow=6.1 cfs 25,110 cf
n=0.030 L=657.0' S=0.0383 '/' Capacity=8.6 cfs Outflow=5.9 cfs 25,044 cf

Reach 21R: Riprap Swale Avg. Flow Depth=0.30' Max Vel=3.68 fps Inflow=4.5 cfs 16,147 cf
n=0.030 L=527.0' S=0.0372 '/' Capacity=34.5 cfs Outflow=4.4 cfs 16,108 cf

Link 7L: Wetlands NW Inflow=2.3 cfs 9,034 cf
Primary=2.3 cfs 9,034 cf

Link 8L: Depression S Inflow=3.2 cfs 12,550 cf
Primary=3.2 cfs 12,550 cf

Link 9L: Wetlands NE Inflow=3.4 cfs 13,992 cf
Primary=3.4 cfs 13,992 cf

Link 10L: Wetlands N Inflow=2.0 cfs 7,919 cf
Primary=2.0 cfs 7,919 cf

Link 11L: Collection Swale W Inflow=5.9 cfs 25,044 cf
Primary=5.9 cfs 25,044 cf

Link 12L: Collection Swale W Inflow=4.4 cfs 16,108 cf
Primary=4.4 cfs 16,108 cf

Link 15L: Wetland W Inflow=3.4 cfs 17,788 cf
Primary=3.4 cfs 17,788 cf

Link 16L: Wetland E Inflow=8.1 cfs 38,821 cf
Primary=8.1 cfs 38,821 cf

Total Runoff Area = 579,533 sf Runoff Volume = 141,361 cf Average Runoff Depth = 2.93"
97.80% Pervious = 566,801 sf 2.20% Impervious = 12,732 sf

Summary for Subcatchment 1S: Bulky Waste Landfill SW

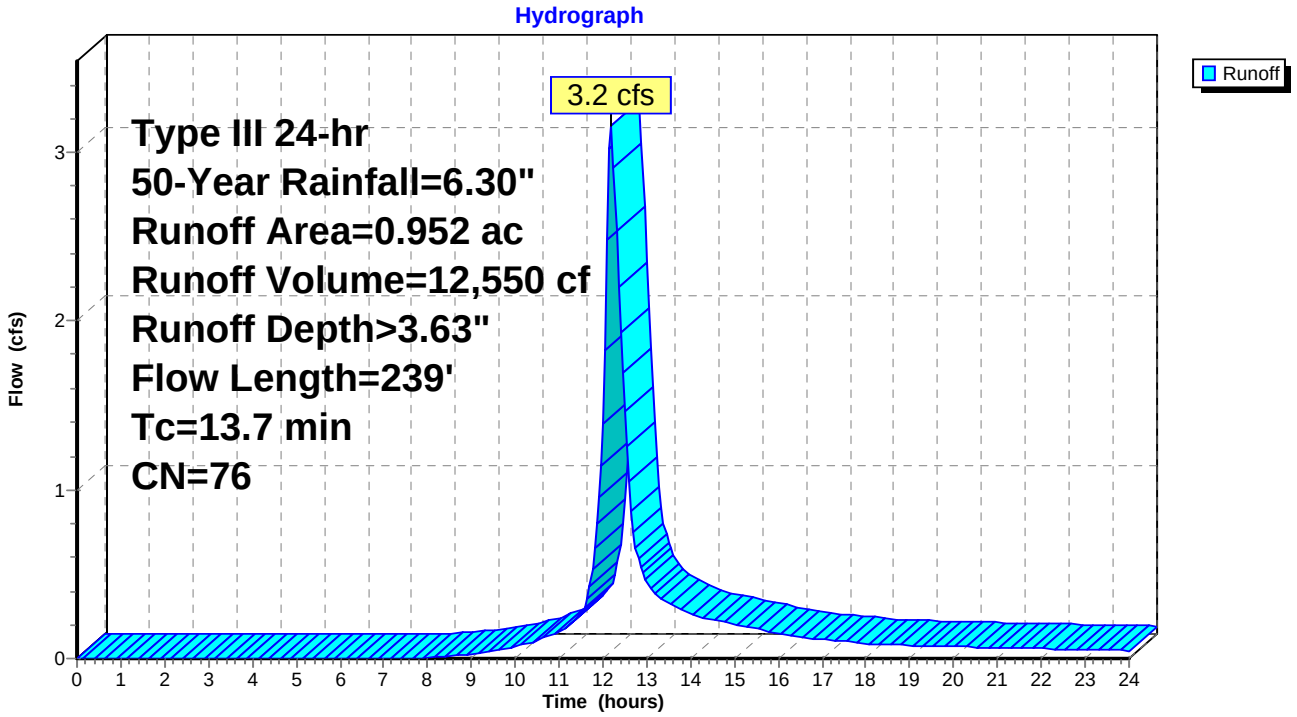
Runoff = 3.2 cfs @ 12.19 hrs, Volume= 12,550 cf, Depth> 3.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

	Area (ac)	CN	Description
	0.829	74	>75% Grass cover, Good, HSG C
	0.080	89	Gravel roads, HSG C
*	0.003	98	Equipment Pad, HSG C
*	0.040	98	Solar array Ballasts, HSG C
	0.952	76	Weighted Average
	0.909		95.48% Pervious Area
	0.043		4.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0251	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.5	66	0.1137	2.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	46	0.1957	3.10		**Shallow Concentrated Flow, Lanfill Cap** Short Grass Pasture Kv= 7.0 fps
0.4	27	0.0050	1.14		**Shallow Concentrated Flow, Access Drive** Unpaved Kv= 16.1 fps
13.7	239	Total			

Subcatchment 1S: Bulky Waste Landfill SW



Summary for Subcatchment 2S: Bulky Waste Landfill NW

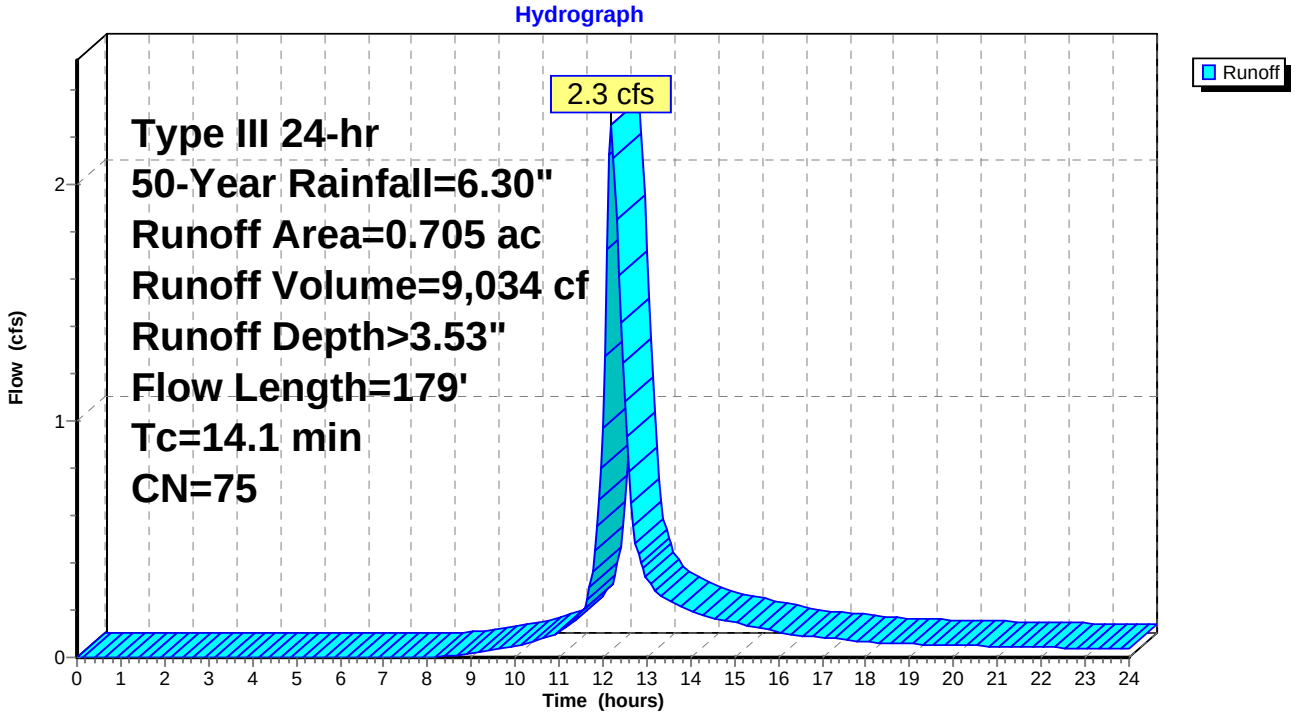
Runoff = 2.3 cfs @ 12.20 hrs, Volume= 9,034 cf, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

	Area (ac)	CN	Description
	0.659	74	>75% Grass cover, Good, HSG C
*	0.032	98	Solar array ballasts, HSG C
	0.014	89	Gravel roads, HSG C
	0.705	75	Weighted Average
	0.673		95.46% Pervious Area
	0.032		4.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.6	79	0.0886	2.08		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.1	179	Total			

Subcatchment 2S: Bulky Waste Landfill NW



Summary for Subcatchment 3S: Bulky Waste Landfill E

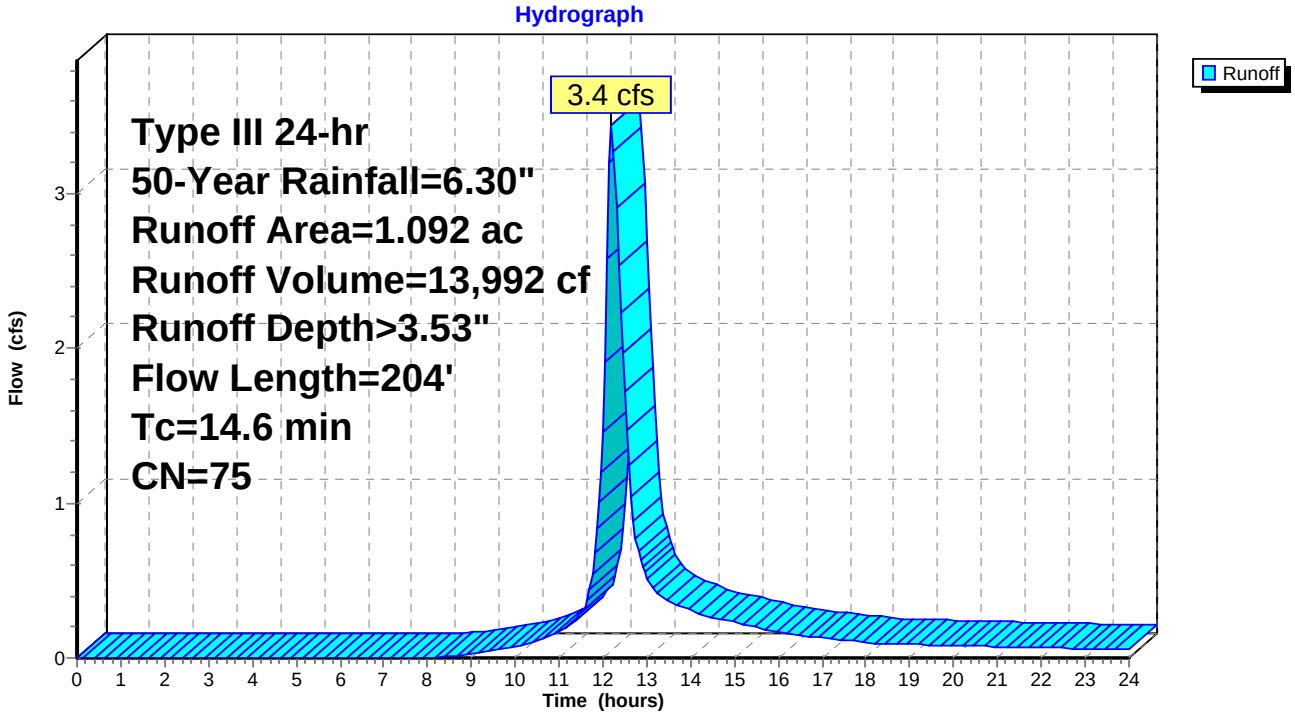
Runoff = 3.4 cfs @ 12.20 hrs, Volume= 13,992 cf, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

	Area (ac)	CN	Description
	1.034	74	>75% Grass cover, Good, HSG C
*	0.058	98	Solar array ballasts, HSG C
	1.092	75	Weighted Average
	1.034		94.69% Pervious Area
	0.058		5.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.1	24	0.1667	2.86		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.6	204	Total			

Subcatchment 3S: Bulky Waste Landfill E



Summary for Subcatchment 4S: Landfill N

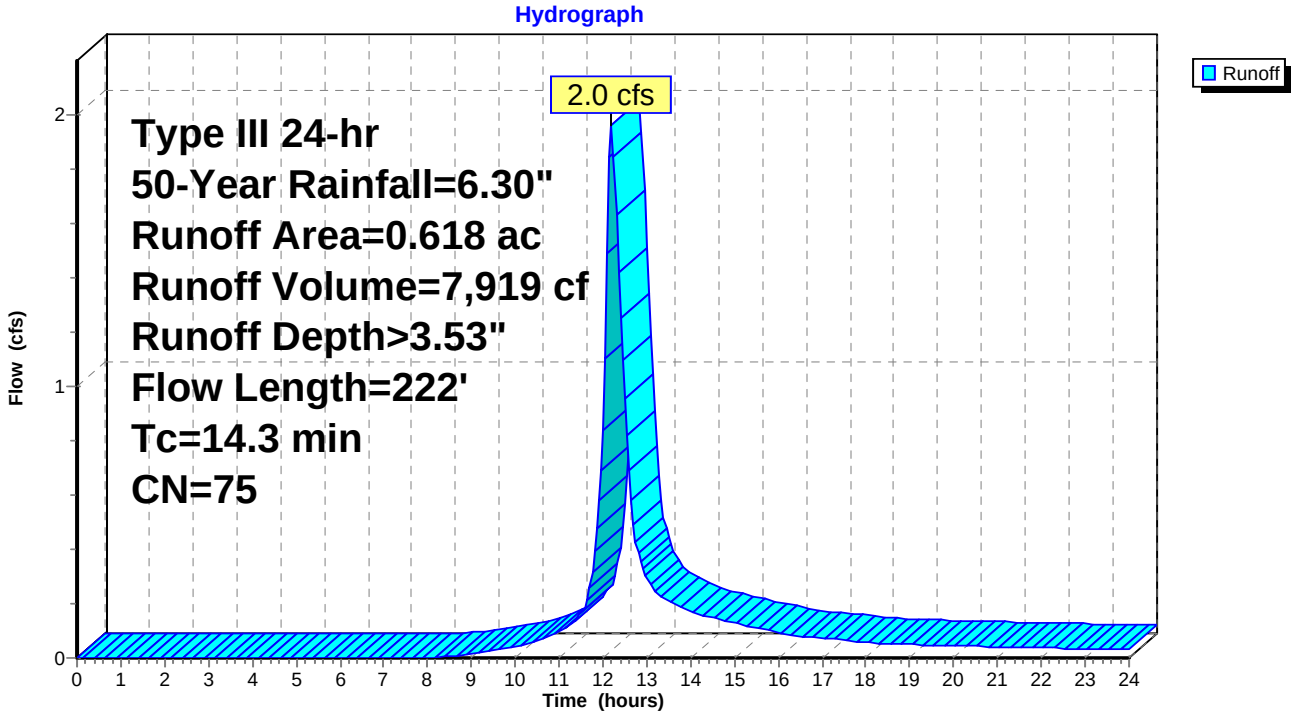
Runoff = 2.0 cfs @ 12.20 hrs, Volume= 7,919 cf, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

	Area (ac)	CN	Description
	0.590	74	>75% Grass cover, Good, HSG C
*	0.028	98	Solar array ballasts, HSG C
	0.618	75	Weighted Average
	0.590		95.47% Pervious Area
	0.028		4.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0230	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	81	0.0371	1.35		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	41	0.1707	2.89		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.3	222	Total			

Subcatchment 4S: Landfill N



Summary for Subcatchment 5S: Landfill W

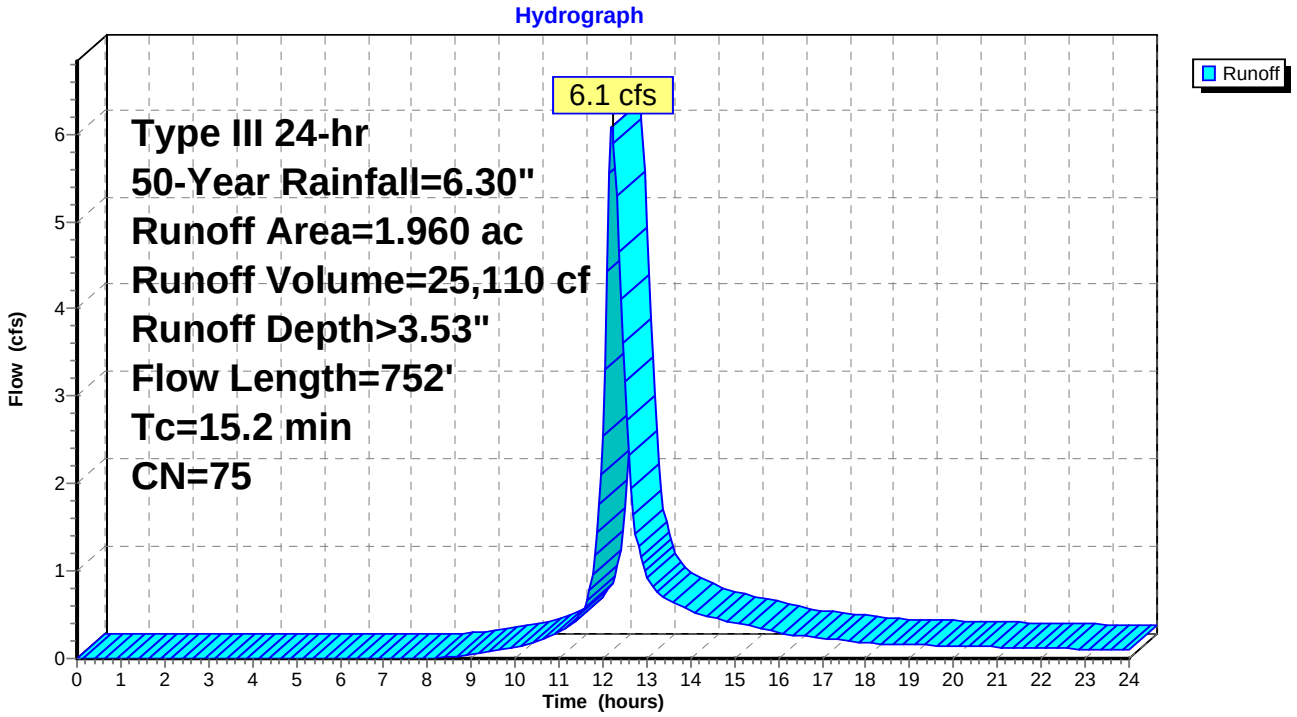
Runoff = 6.1 cfs @ 12.21 hrs, Volume= 25,110 cf, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

	Area (ac)	CN	Description
	1.896	74	>75% Grass cover, Good, HSG C
*	0.064	98	Solar array ballasts, HSG C
	1.960	75	Weighted Average
	1.896		96.73% Pervious Area
	0.064		3.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0220	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.3	37	0.0811	1.99		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.3	58	0.1897	3.05		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
1.3	520	0.0200	6.71	50.33	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
0.0	37	0.2160	22.05	165.39	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
15.2	752	Total			

Subcatchment 5S: Landfill W



Summary for Subcatchment 6S: Landfill E

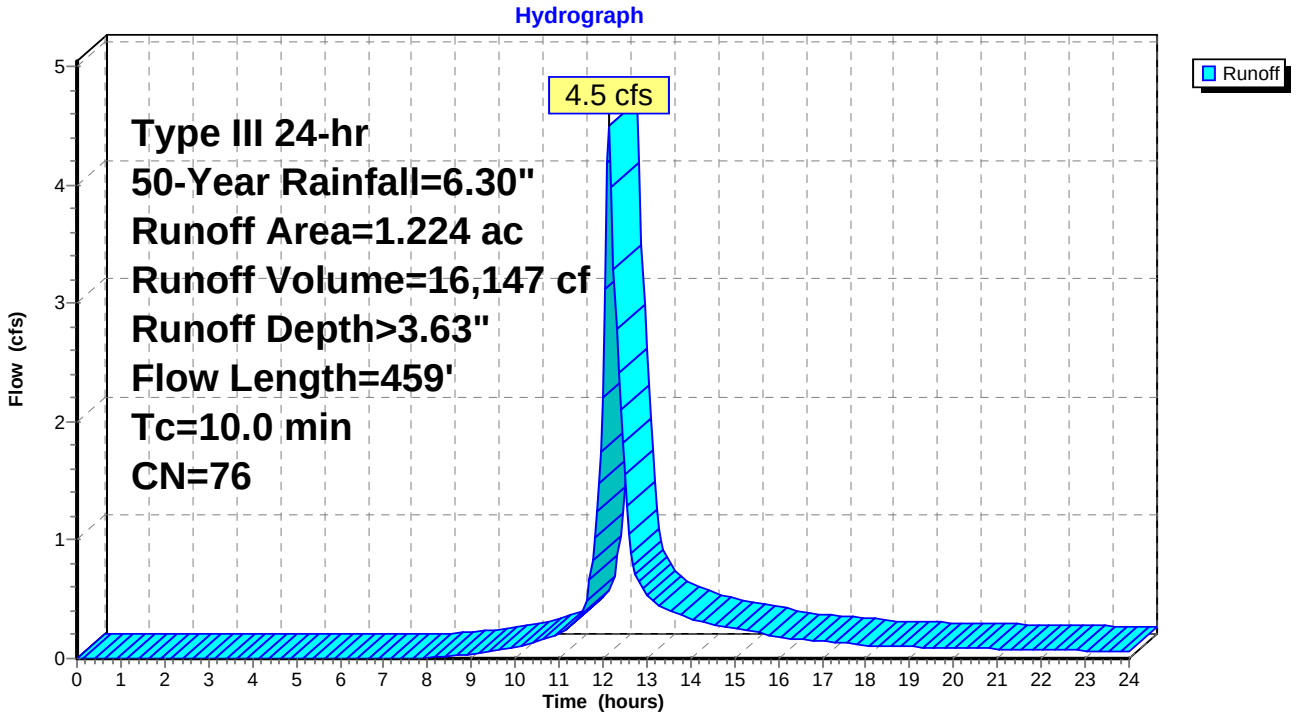
Runoff = 4.5 cfs @ 12.14 hrs, Volume= 16,147 cf, Depth> 3.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

	Area (ac)	CN	Description
	1.085	74	>75% Grass cover, Good, HSG C
	0.090	89	Gravel roads, HSG C
*	0.046	98	Solar array ballasts, HSG C
*	0.003	98	Concrete Equipment Pad, HSG C
	1.224	76	Weighted Average
	1.175		96.00% Pervious Area
	0.049		4.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	40	0.0543	0.15		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	60	0.0117	1.03		**Sheet Flow, Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.5	86	0.0384	3.15		**Shallow Concentrated Flow, Gravel** Unpaved Kv= 16.1 fps
0.7	76	0.0658	1.80		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	49	0.2245	3.32		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	148	0.1081	15.60	117.00	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
7.1	459	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: Landfill E



Summary for Subcatchment 7S: Green Field W

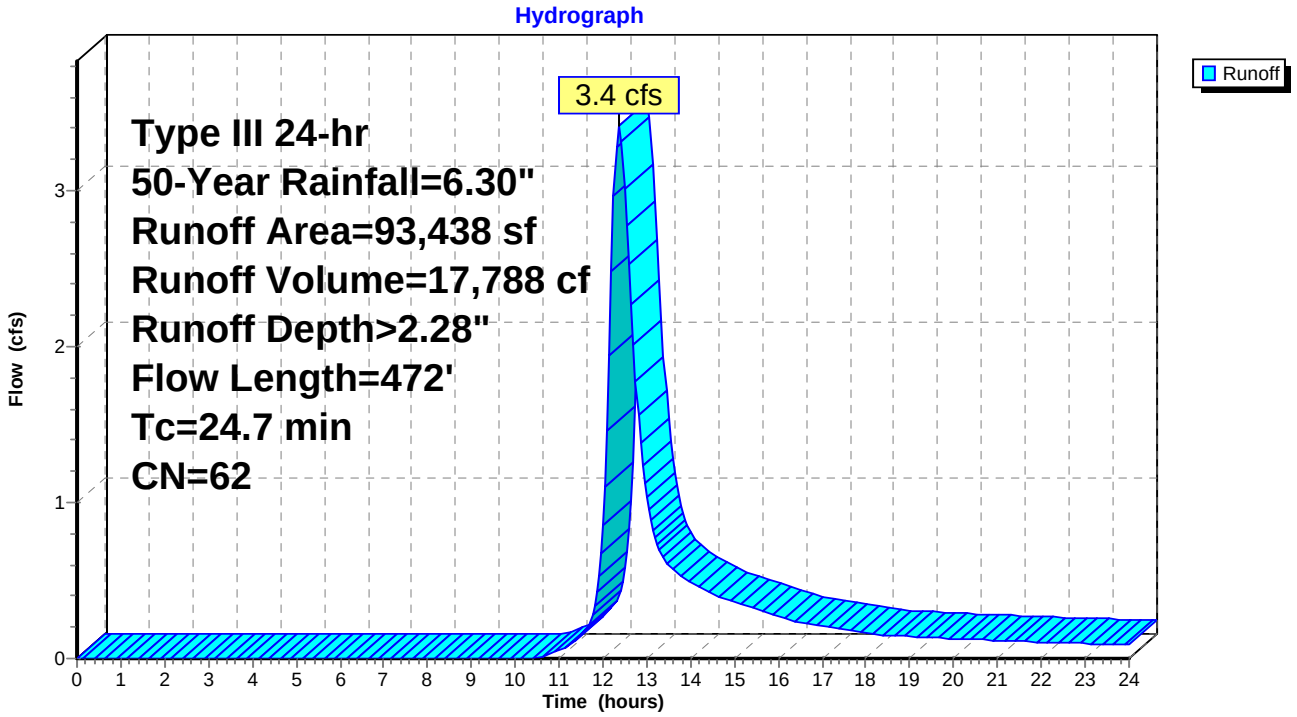
Runoff = 3.4 cfs @ 12.37 hrs, Volume= 17,788 cf, Depth> 2.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

	Area (sf)	CN	Description
	832	74	>75% Grass cover, Good, HSG C
	3,861	80	>75% Grass cover, Good, HSG D
	21,955	61	>75% Grass cover, Good, HSG B
	66,216	61	>75% Grass cover, Good, HSG B
	340	98	Paved parking, HSG C
*	4	98	Solar Array Posts, HSG B
*	230	98	Equipment Pad, HSG B
	93,438	62	Weighted Average
	92,864		99.39% Pervious Area
	574		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	23	0.0217	1.03		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
4.8	160	0.0063	0.56		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.6	51	0.0392	1.39		**Shallow Concentrated Flow, field** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.7	50	0.0300	1.21		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
24.7	472	Total			

Subcatchment 7S: Green Field W



Summary for Subcatchment 8S: Green Field E

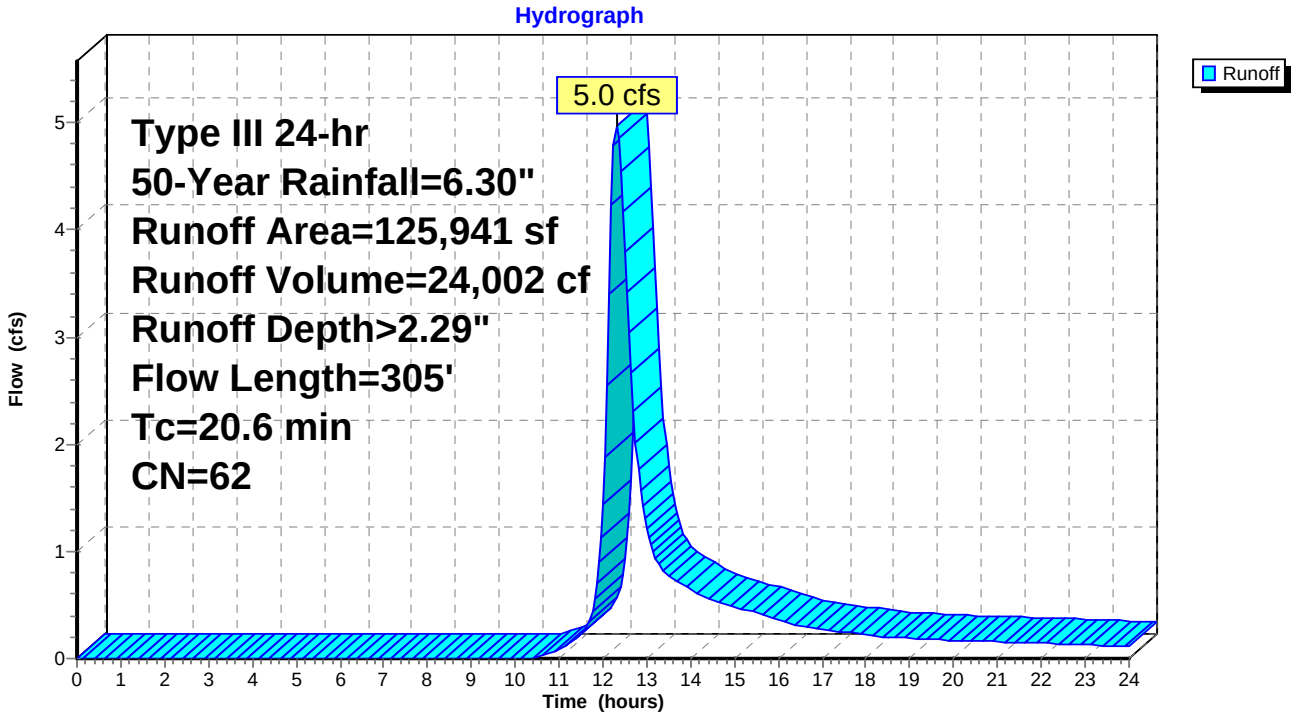
Runoff = 5.0 cfs @ 12.31 hrs, Volume= 24,002 cf, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

	Area (sf)	CN	Description
	116,936	61	>75% Grass cover, Good, HSG B
	3,129	80	>75% Grass cover, Good, HSG D
	1,452	80	>75% Grass cover, Good, HSG D
	4,419	61	>75% Grass cover, Good, HSG B
*	5	98	Solar Array Posts, HSG B
	125,941	62	Weighted Average
	125,936		100.00% Pervious Area
	5		0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	24	0.0208	1.01		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
2.6	106	0.0094	0.68		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.8	75	0.0467	1.51		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
20.6	305	Total			

Subcatchment 8S: Green Field E



Summary for Subcatchment 9S: Greenfield 2

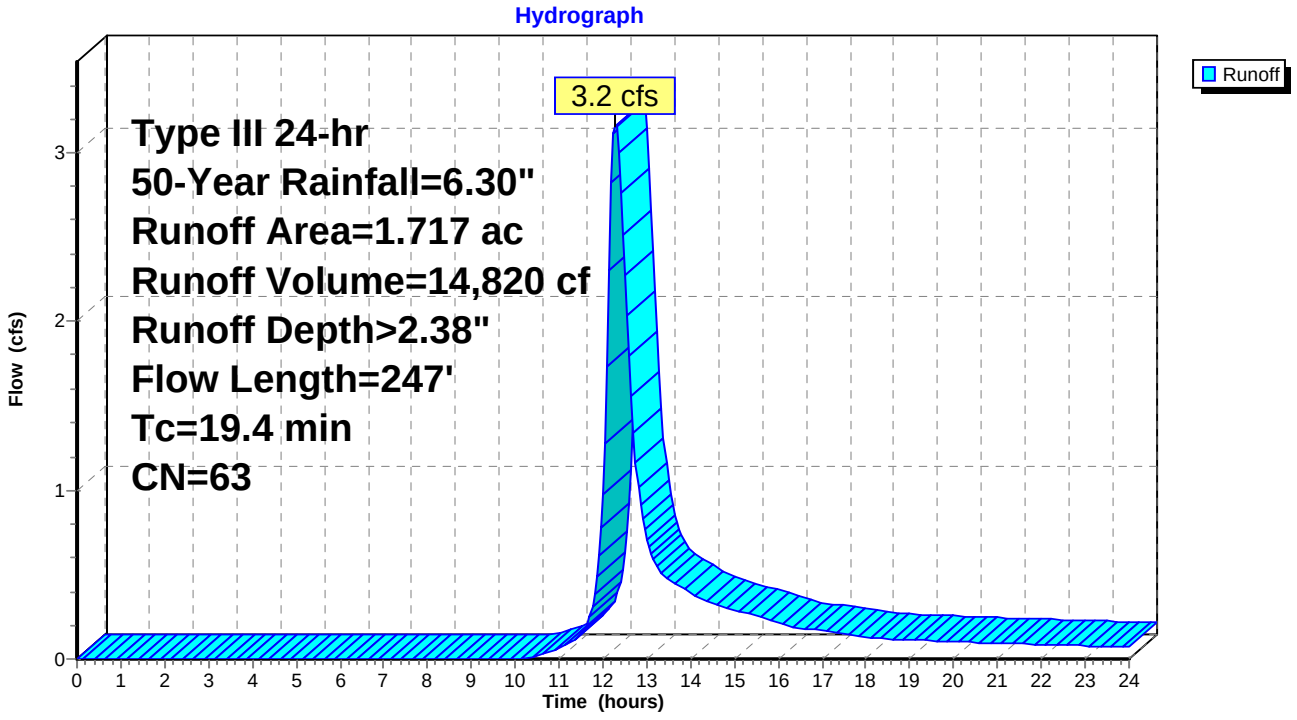
Runoff = 3.2 cfs @ 12.28 hrs, Volume= 14,820 cf, Depth> 2.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 50-Year Rainfall=6.30"

	Area (ac)	CN	Description
	0.091	77	Woods, Good, HSG D
	0.151	55	Woods, Good, HSG B
	1.283	61	>75% Grass cover, Good, HSG B
	0.187	80	>75% Grass cover, Good, HSG D
*	0.000	98	Solar Array Posts, HSG B
	0.005	98	Paved parking, HSG B
	1.717	63	Weighted Average
	1.712		99.71% Pervious Area
	0.005		0.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0128	0.10		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.40"
2.9	147	0.0148	0.85		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
19.4	247	Total			

Subcatchment 9S: Greenfield 2



Summary for Reach 19R: Riprap Swale

Inflow Area = 85,378 sf, 3.27% Impervious, Inflow Depth > 3.53" for 50-Year event
Inflow = 6.1 cfs @ 12.21 hrs, Volume= 25,110 cf
Outflow = 5.9 cfs @ 12.25 hrs, Volume= 25,044 cf, Atten= 3%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.72 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 8.3 min

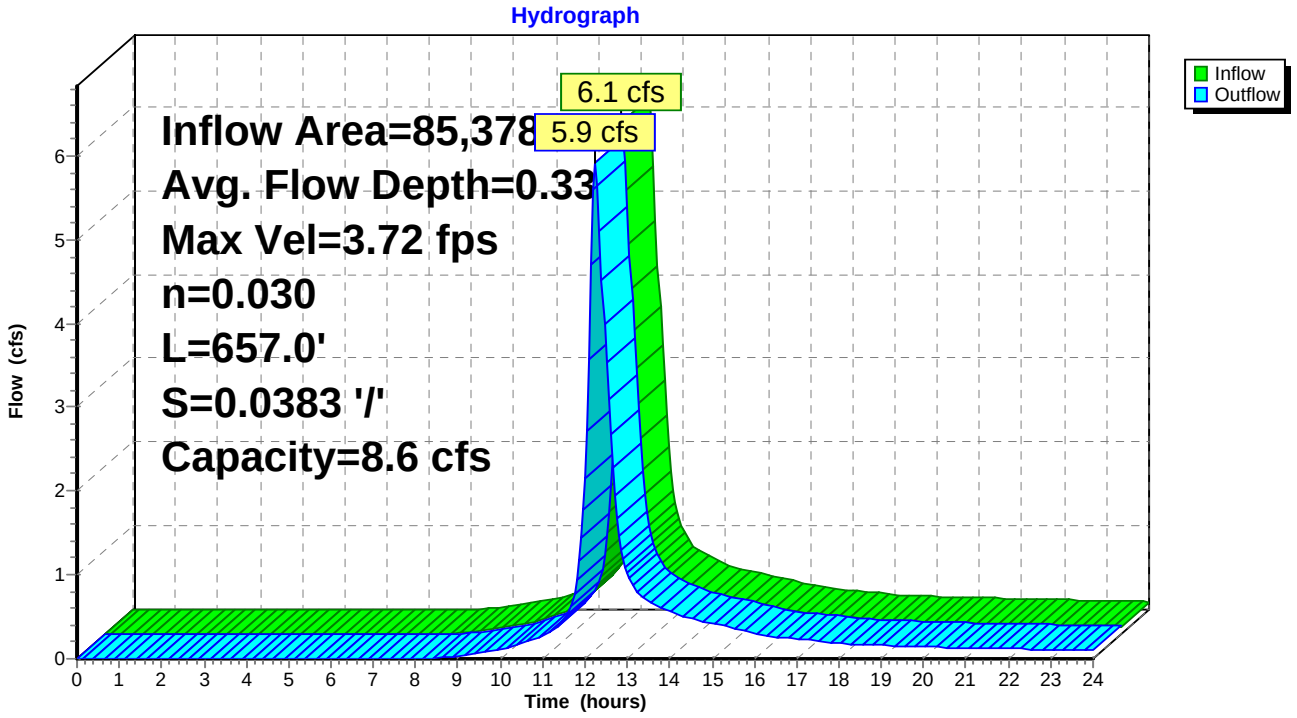
Peak Storage= 1,046 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 0.40' Flow Area= 2.1 sf, Capacity= 8.6 cfs

3.00' x 0.40' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 5.5 '/' Top Width= 7.40'
Length= 657.0' Slope= 0.0383 '/'
Inlet Invert= 274.52', Outlet Invert= 249.36'



‡

Reach 19R: Riprap Swale



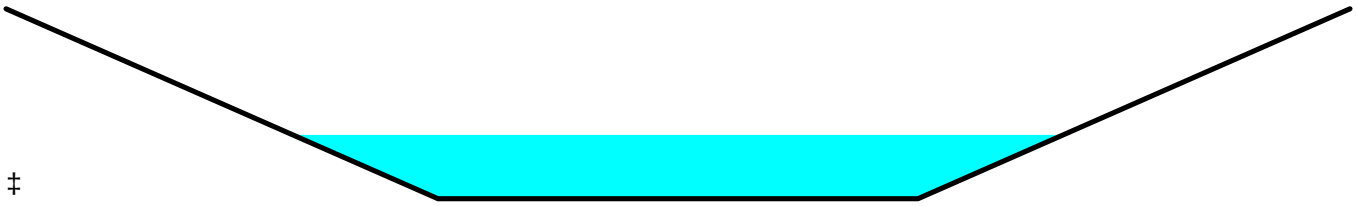
Summary for Reach 21R: Riprap Swale

Inflow Area = 53,317 sf, 4.00% Impervious, Inflow Depth > 3.63" for 50-Year event
Inflow = 4.5 cfs @ 12.14 hrs, Volume= 16,147 cf
Outflow = 4.4 cfs @ 12.17 hrs, Volume= 16,108 cf, Atten= 3%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.68 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 7.6 min

Peak Storage= 624 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 0.90' Flow Area= 5.1 sf, Capacity= 34.5 cfs

3.00' x 0.90' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 3.0 '/' Top Width= 8.40'
Length= 527.0' Slope= 0.0372 '/'
Inlet Invert= 276.70', Outlet Invert= 257.10'



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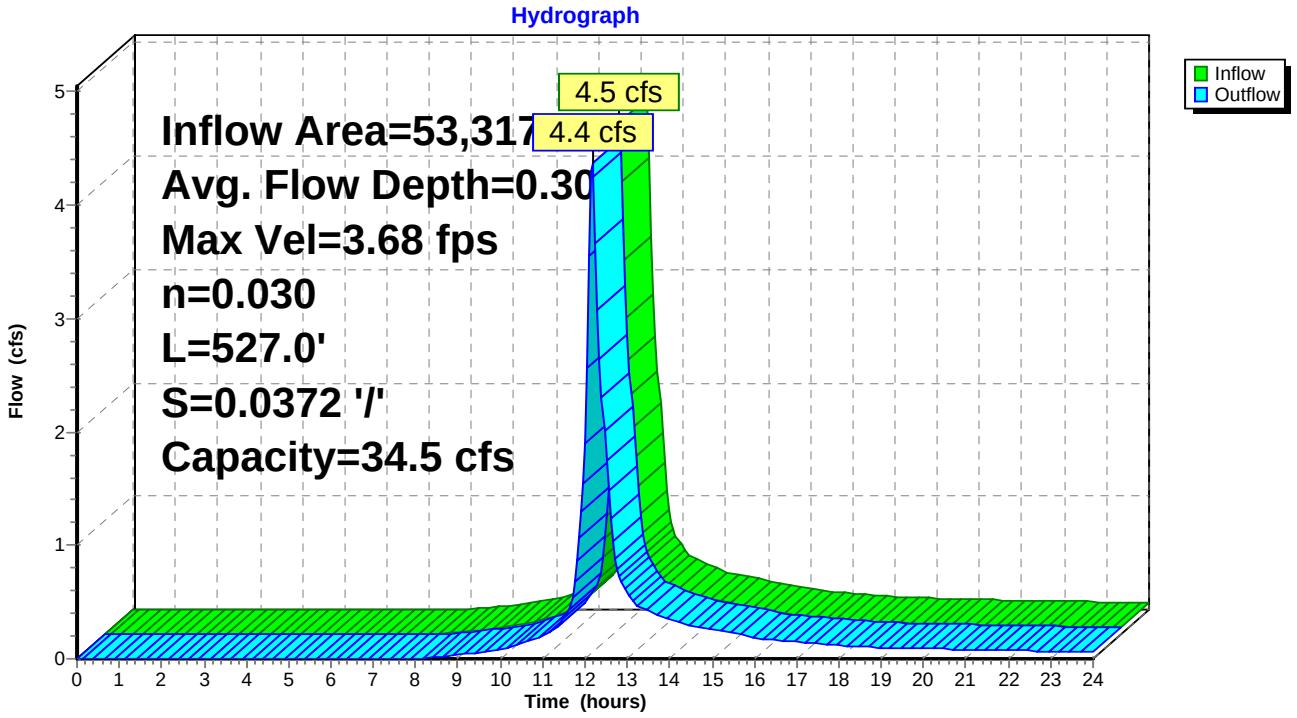
Reach 21R: Riprap Swale

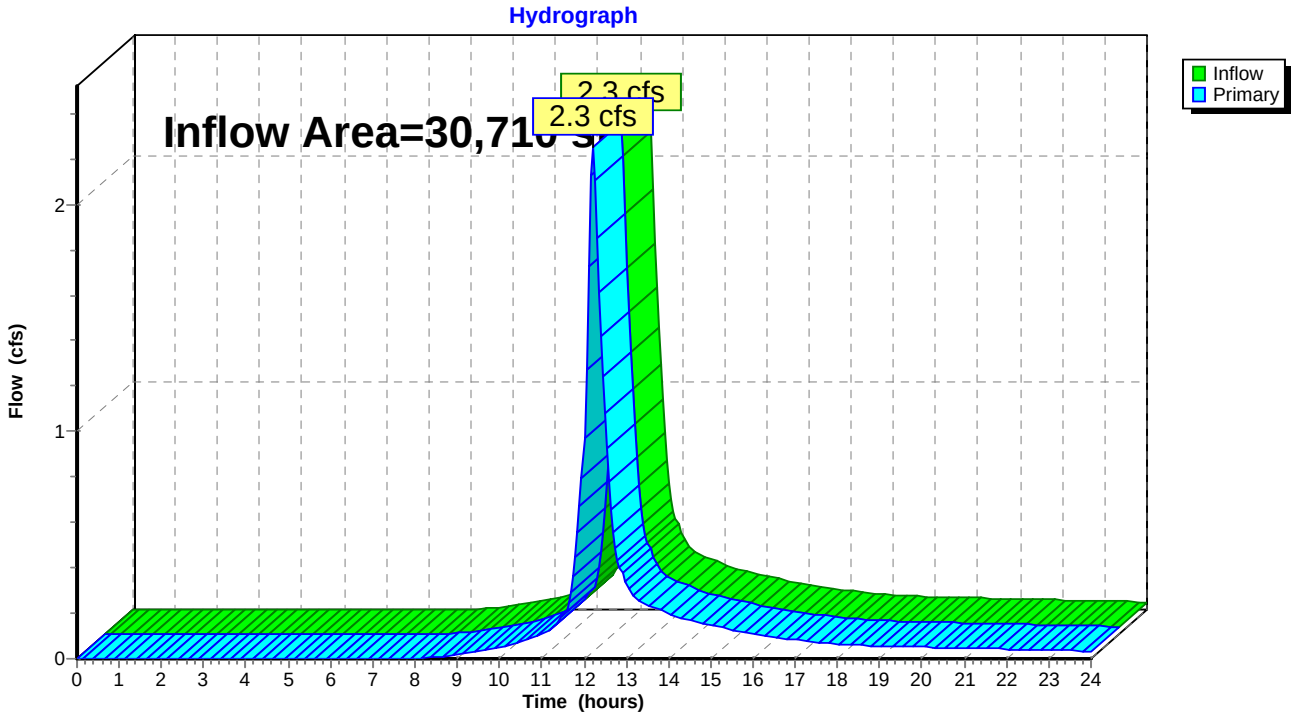


Summary for Link 7L: Wetlands NW

Inflow Area = 30,710 sf, 4.54% Impervious, Inflow Depth > 3.53" for 50-Year event
Inflow = 2.3 cfs @ 12.20 hrs, Volume= 9,034 cf
Primary = 2.3 cfs @ 12.20 hrs, Volume= 9,034 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 7L: Wetlands NW

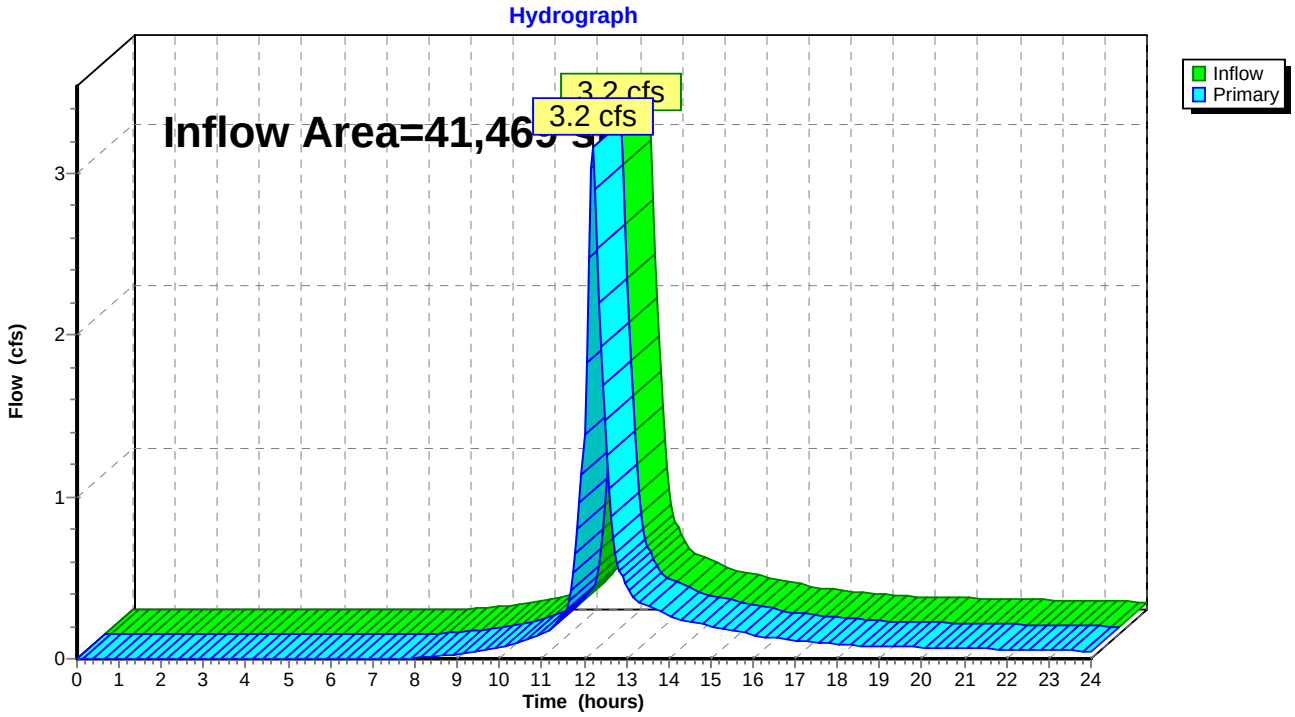


Summary for Link 8L: Depression S

Inflow Area = 41,469 sf, 4.52% Impervious, Inflow Depth > 3.63" for 50-Year event
Inflow = 3.2 cfs @ 12.19 hrs, Volume= 12,550 cf
Primary = 3.2 cfs @ 12.19 hrs, Volume= 12,550 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 8L: Depression S

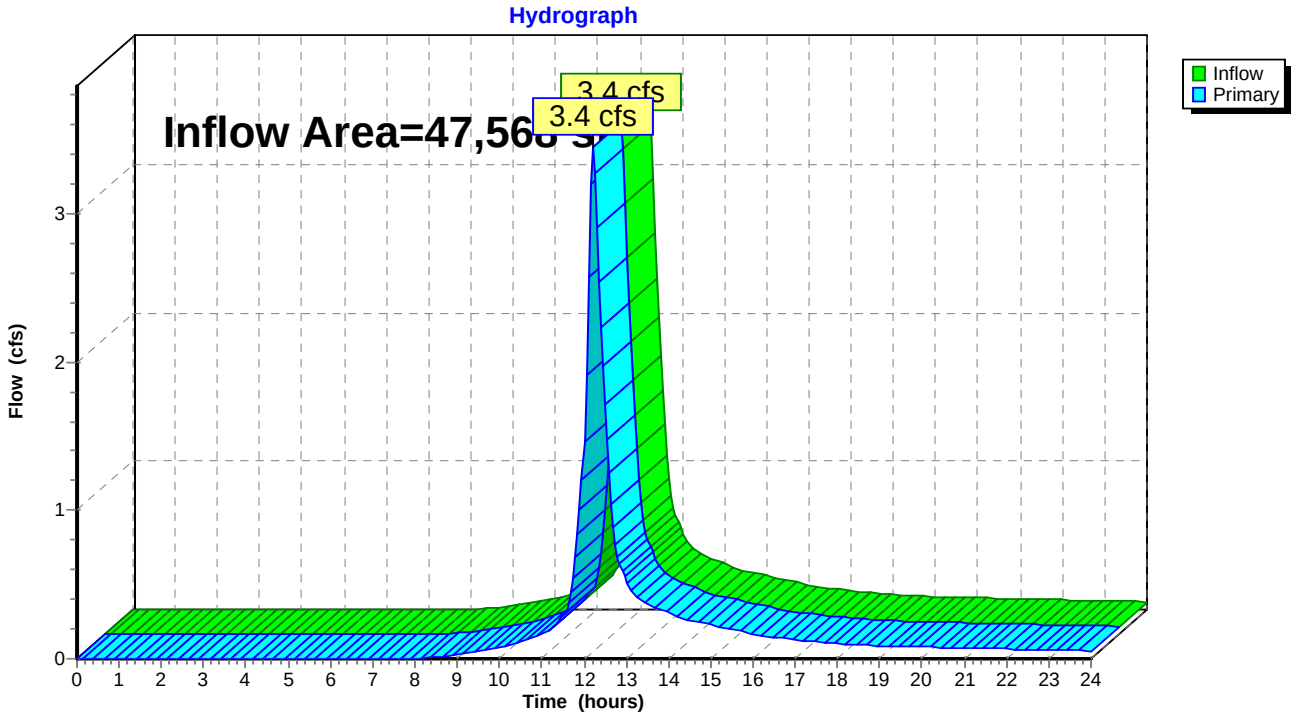


Summary for Link 9L: Wetlands NE

Inflow Area = 47,568 sf, 5.31% Impervious, Inflow Depth > 3.53" for 50-Year event
Inflow = 3.4 cfs @ 12.20 hrs, Volume= 13,992 cf
Primary = 3.4 cfs @ 12.20 hrs, Volume= 13,992 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 9L: Wetlands NE

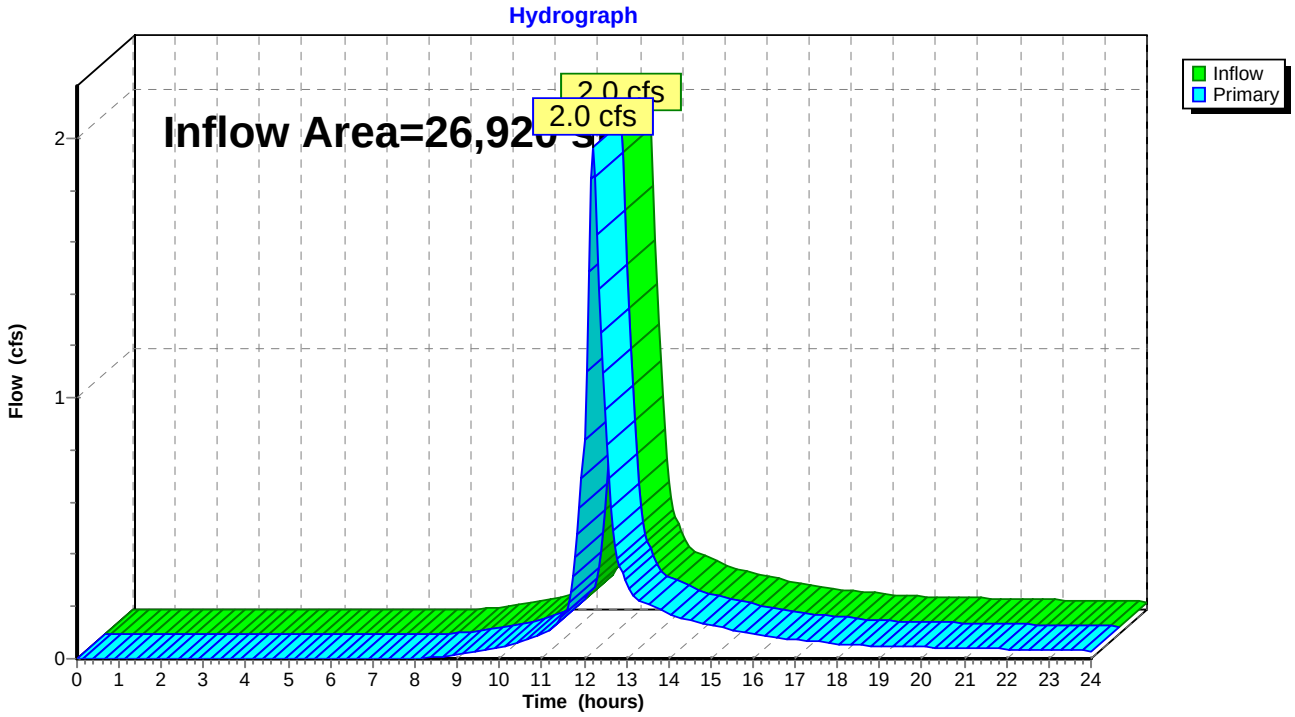


Summary for Link 10L: Wetlands N

Inflow Area = 26,920 sf, 4.53% Impervious, Inflow Depth > 3.53" for 50-Year event
Inflow = 2.0 cfs @ 12.20 hrs, Volume= 7,919 cf
Primary = 2.0 cfs @ 12.20 hrs, Volume= 7,919 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 10L: Wetlands N

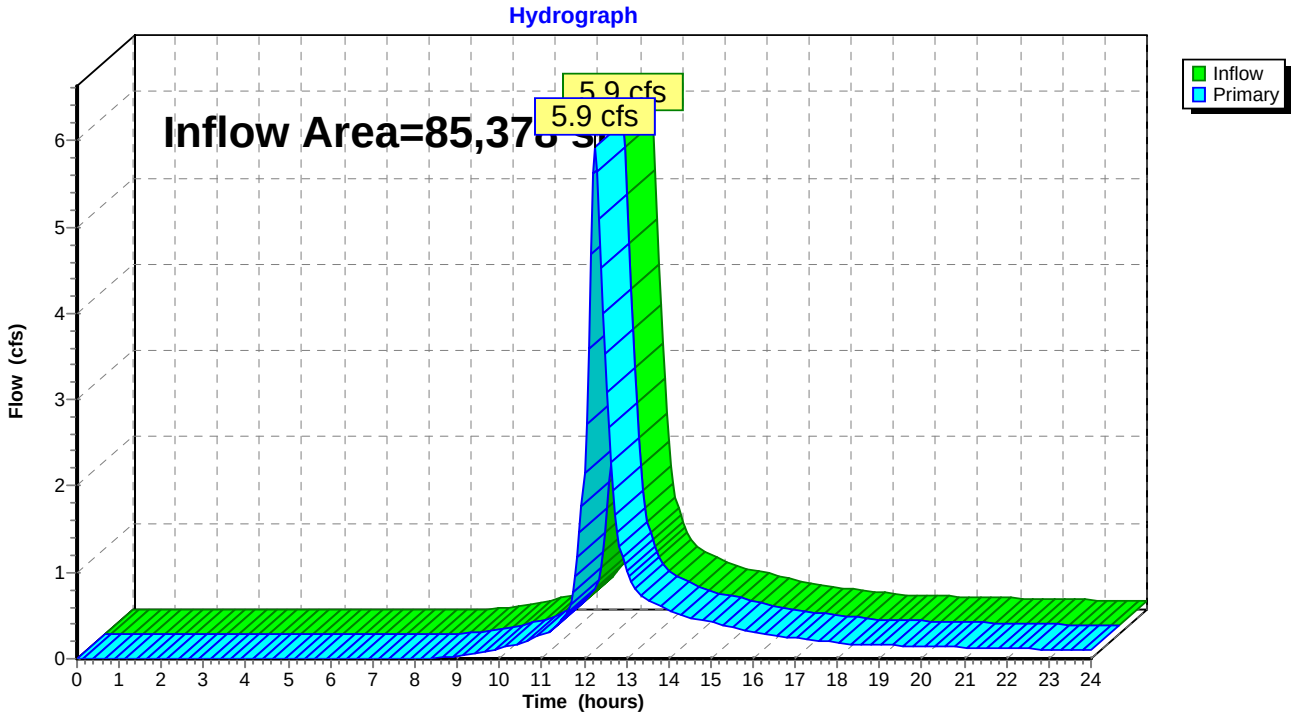


Summary for Link 11L: Collection Swale W

Inflow Area = 85,378 sf, 3.27% Impervious, Inflow Depth > 3.52" for 50-Year event
Inflow = 5.9 cfs @ 12.25 hrs, Volume= 25,044 cf
Primary = 5.9 cfs @ 12.25 hrs, Volume= 25,044 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 11L: Collection Swale W

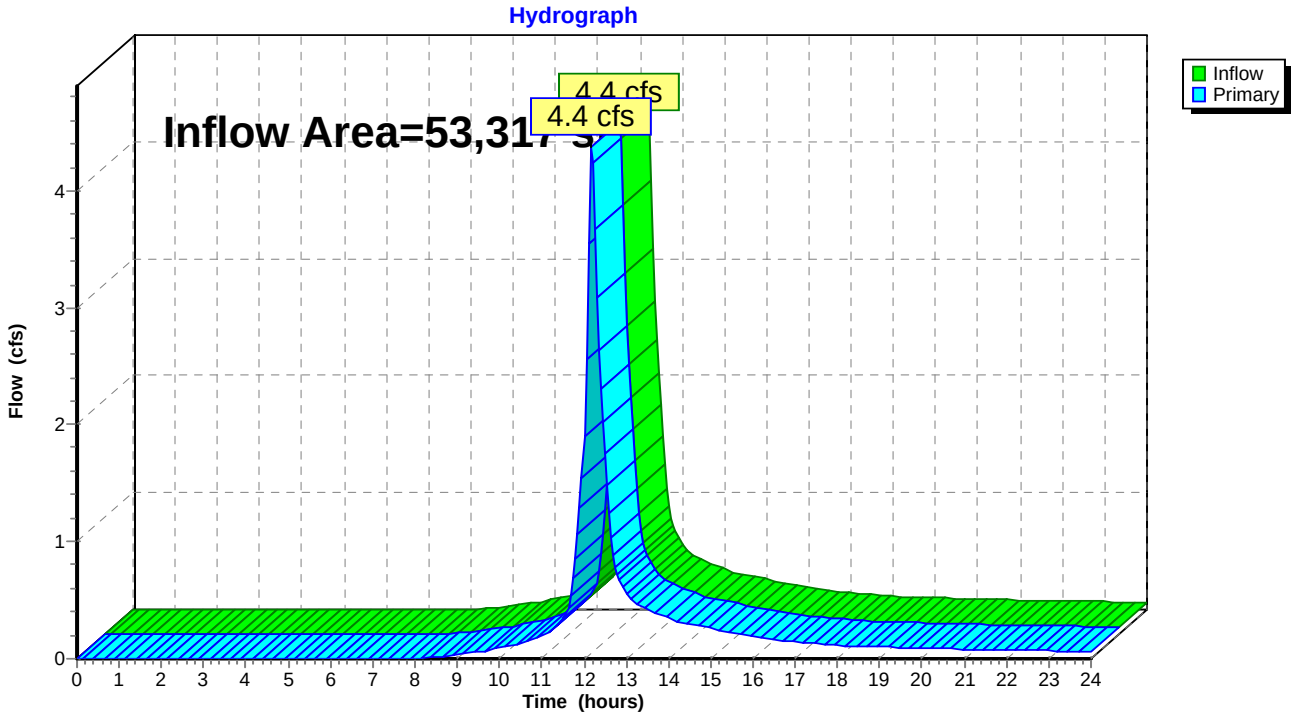


Summary for Link 12L: Collection Swale W

Inflow Area = 53,317 sf, 4.00% Impervious, Inflow Depth > 3.63" for 50-Year event
Inflow = 4.4 cfs @ 12.17 hrs, Volume= 16,108 cf
Primary = 4.4 cfs @ 12.17 hrs, Volume= 16,108 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 12L: Collection Swale W

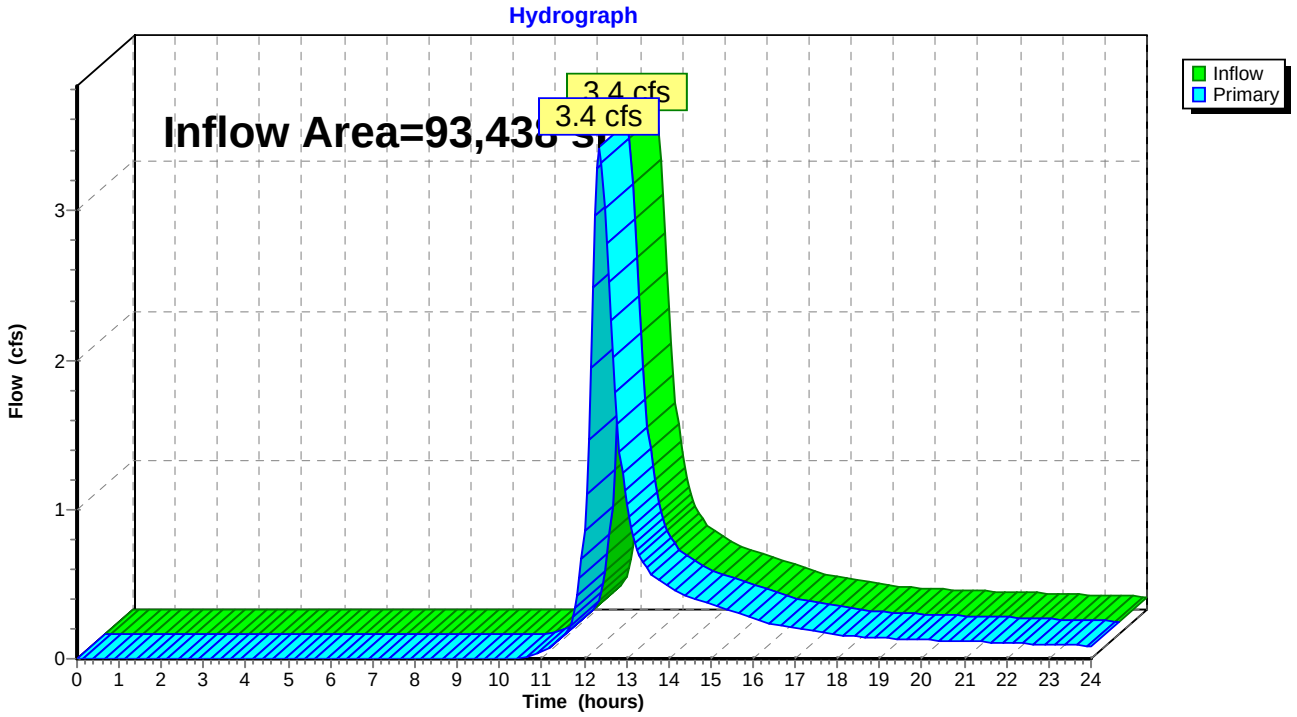


Summary for Link 15L: Wetland W

Inflow Area = 93,438 sf, 0.61% Impervious, Inflow Depth > 2.28" for 50-Year event
Inflow = 3.4 cfs @ 12.37 hrs, Volume= 17,788 cf
Primary = 3.4 cfs @ 12.37 hrs, Volume= 17,788 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 15L: Wetland W

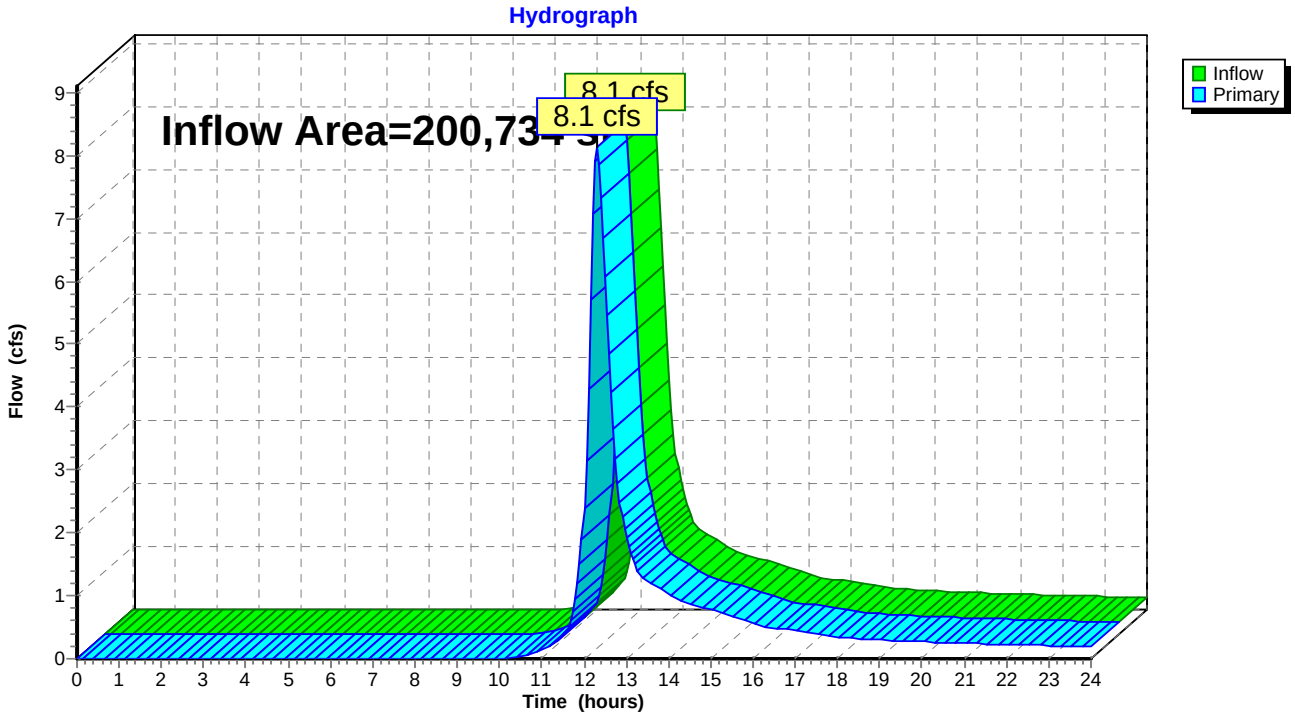


Summary for Link 16L: Wetland E

Inflow Area = 200,734 sf, 0.11% Impervious, Inflow Depth > 2.32" for 50-Year event
Inflow = 8.1 cfs @ 12.30 hrs, Volume= 38,821 cf
Primary = 8.1 cfs @ 12.30 hrs, Volume= 38,821 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 16L: Wetland E



Time span=0.00-24.00 hrs, dt=0.050 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Bulky Waste Landfill SW Runoff Area=0.952 ac 4.52% Impervious Runoff Depth>4.34"
Flow Length=239' Tc=13.7 min CN=76 Runoff=3.8 cfs 14,985 cf

Subcatchment 2S: Bulky Waste Landfill NW Runoff Area=0.705 ac 4.54% Impervious Runoff Depth>4.23"
Flow Length=179' Tc=14.1 min CN=75 Runoff=2.7 cfs 10,818 cf

Subcatchment 3S: Bulky Waste Landfill E Runoff Area=1.092 ac 5.31% Impervious Runoff Depth>4.23"
Flow Length=204' Tc=14.6 min CN=75 Runoff=4.1 cfs 16,755 cf

Subcatchment 4S: Landfill N Runoff Area=0.618 ac 4.53% Impervious Runoff Depth>4.23"
Flow Length=222' Tc=14.3 min CN=75 Runoff=2.4 cfs 9,483 cf

Subcatchment 5S: Landfill W Runoff Area=1.960 ac 3.27% Impervious Runoff Depth>4.23"
Flow Length=752' Tc=15.2 min CN=75 Runoff=7.3 cfs 30,069 cf

Subcatchment 6S: Landfill E Runoff Area=1.224 ac 4.00% Impervious Runoff Depth>4.34"
Flow Length=459' Tc=10.0 min CN=76 Runoff=5.4 cfs 19,281 cf

Subcatchment 7S: Green Field W Runoff Area=93,438 sf 0.61% Impervious Runoff Depth>2.86"
Flow Length=472' Tc=24.7 min CN=62 Runoff=4.3 cfs 22,257 cf

Subcatchment 8S: Green Field E Runoff Area=125,941 sf 0.00% Impervious Runoff Depth>2.86"
Flow Length=305' Tc=20.6 min CN=62 Runoff=6.3 cfs 30,030 cf

Subcatchment 9S: Greenfield 2 Runoff Area=1.717 ac 0.29% Impervious Runoff Depth>2.96"
Flow Length=247' Tc=19.4 min CN=63 Runoff=4.0 cfs 18,468 cf

Reach 19R: Riprap Swale Avg. Flow Depth=0.36' Max Vel=3.92 fps Inflow=7.3 cfs 30,069 cf
n=0.030 L=657.0' S=0.0383 '/' Capacity=8.6 cfs Outflow=7.1 cfs 29,996 cf

Reach 21R: Riprap Swale Avg. Flow Depth=0.33' Max Vel=3.89 fps Inflow=5.4 cfs 19,281 cf
n=0.030 L=527.0' S=0.0372 '/' Capacity=34.5 cfs Outflow=5.2 cfs 19,237 cf

Link 7L: Wetlands NW Inflow=2.7 cfs 10,818 cf
Primary=2.7 cfs 10,818 cf

Link 8L: Depression S Inflow=3.8 cfs 14,985 cf
Primary=3.8 cfs 14,985 cf

Link 9L: Wetlands NE Inflow=4.1 cfs 16,755 cf
Primary=4.1 cfs 16,755 cf

Link 10L: Wetlands N Inflow=2.4 cfs 9,483 cf
Primary=2.4 cfs 9,483 cf

Link 11L: Collection Swale W Inflow=7.1 cfs 29,996 cf
Primary=7.1 cfs 29,996 cf

Link 12L: Collection Swale W Inflow=5.2 cfs 19,237 cf
Primary=5.2 cfs 19,237 cf

Link 15L: Wetland W Inflow=4.3 cfs 22,257 cf
Primary=4.3 cfs 22,257 cf

Link 16L: Wetland E Inflow=10.3 cfs 48,498 cf
Primary=10.3 cfs 48,498 cf

Total Runoff Area = 579,533 sf Runoff Volume = 172,145 cf Average Runoff Depth = 3.56"
97.80% Pervious = 566,801 sf 2.20% Impervious = 12,732 sf

Summary for Subcatchment 1S: Bulky Waste Landfill SW

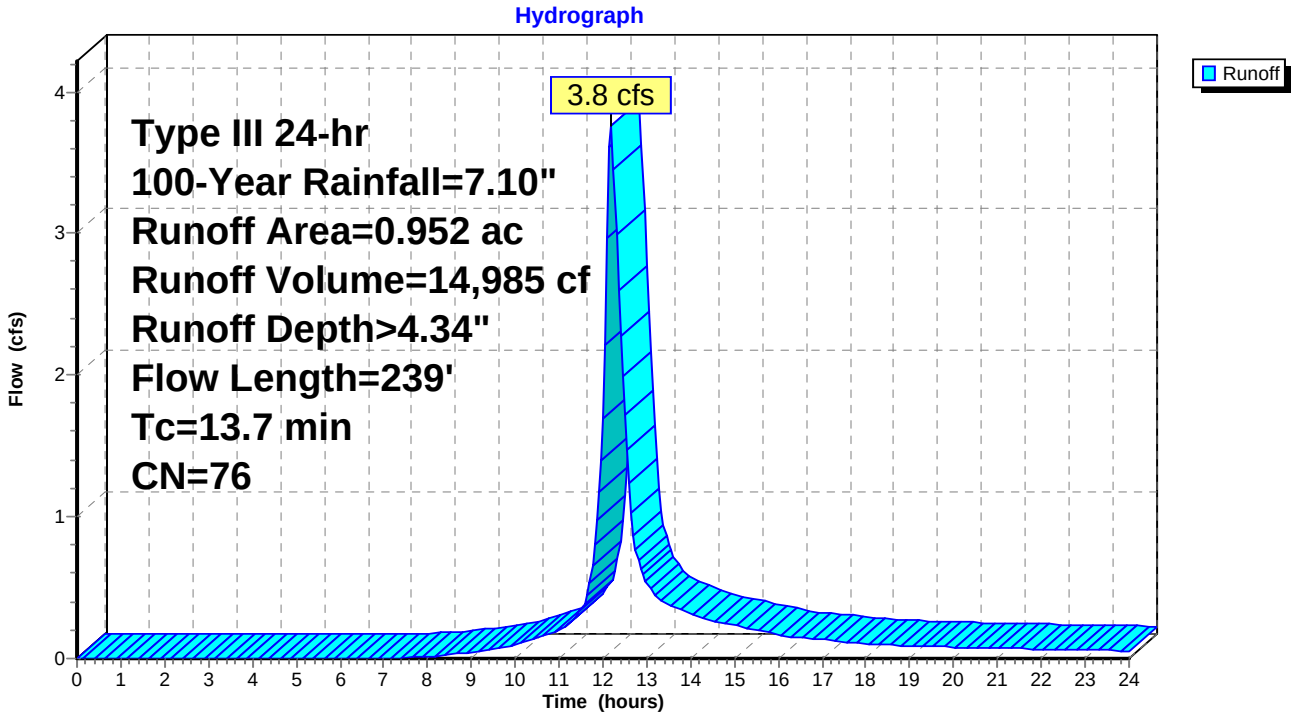
Runoff = 3.8 cfs @ 12.19 hrs, Volume= 14,985 cf, Depth> 4.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (ac)	CN	Description
	0.829	74	>75% Grass cover, Good, HSG C
	0.080	89	Gravel roads, HSG C
*	0.003	98	Equipment Pad, HSG C
*	0.040	98	Solar array Ballasts, HSG C
	0.952	76	Weighted Average
	0.909		95.48% Pervious Area
	0.043		4.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	100	0.0251	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.5	66	0.1137	2.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	46	0.1957	3.10		**Shallow Concentrated Flow, Lanfill Cap** Short Grass Pasture Kv= 7.0 fps
0.4	27	0.0050	1.14		**Shallow Concentrated Flow, Access Drive** Unpaved Kv= 16.1 fps
13.7	239	Total			

Subcatchment 1S: Bulky Waste Landfill SW



Summary for Subcatchment 2S: Bulky Waste Landfill NW

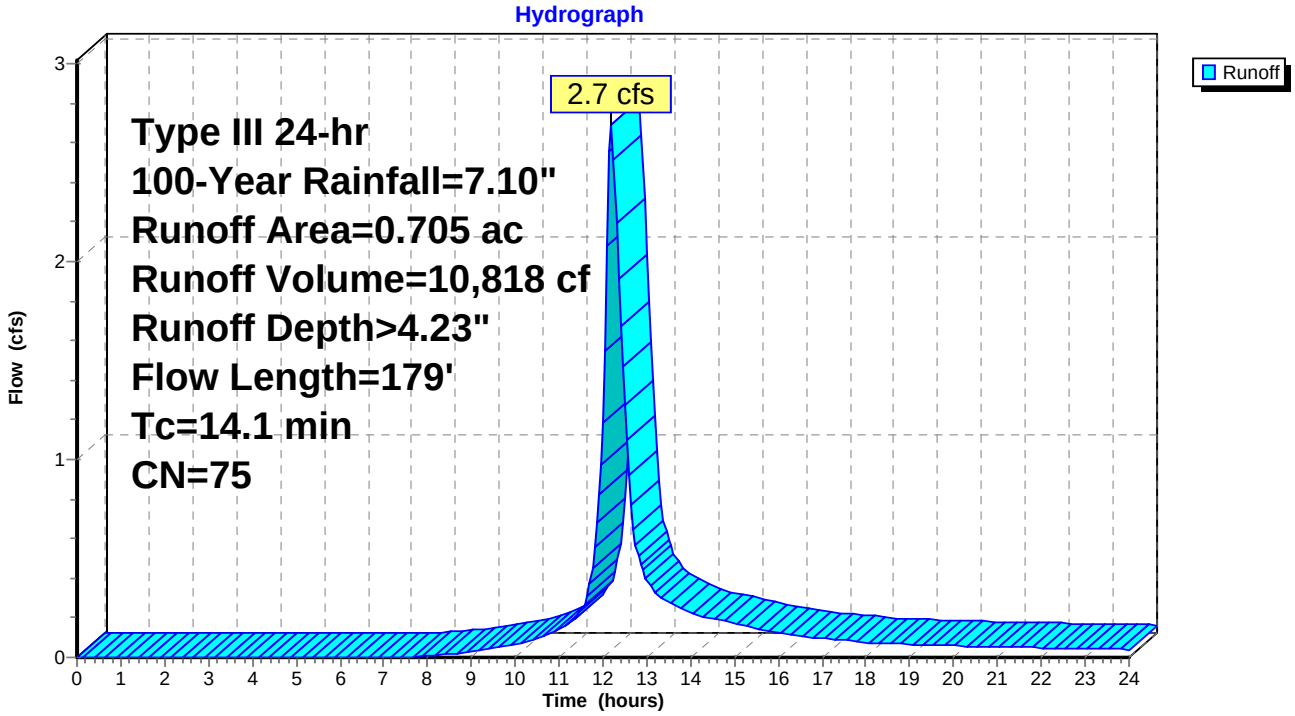
Runoff = 2.7 cfs @ 12.20 hrs, Volume= 10,818 cf, Depth> 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (ac)	CN	Description
	0.659	74	>75% Grass cover, Good, HSG C
*	0.032	98	Solar array ballasts, HSG C
	0.014	89	Gravel roads, HSG C
	0.705	75	Weighted Average
	0.673		95.46% Pervious Area
	0.032		4.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.6	79	0.0886	2.08		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.1	179	Total			

Subcatchment 2S: Bulky Waste Landfill NW



Summary for Subcatchment 3S: Bulky Waste Landfill E

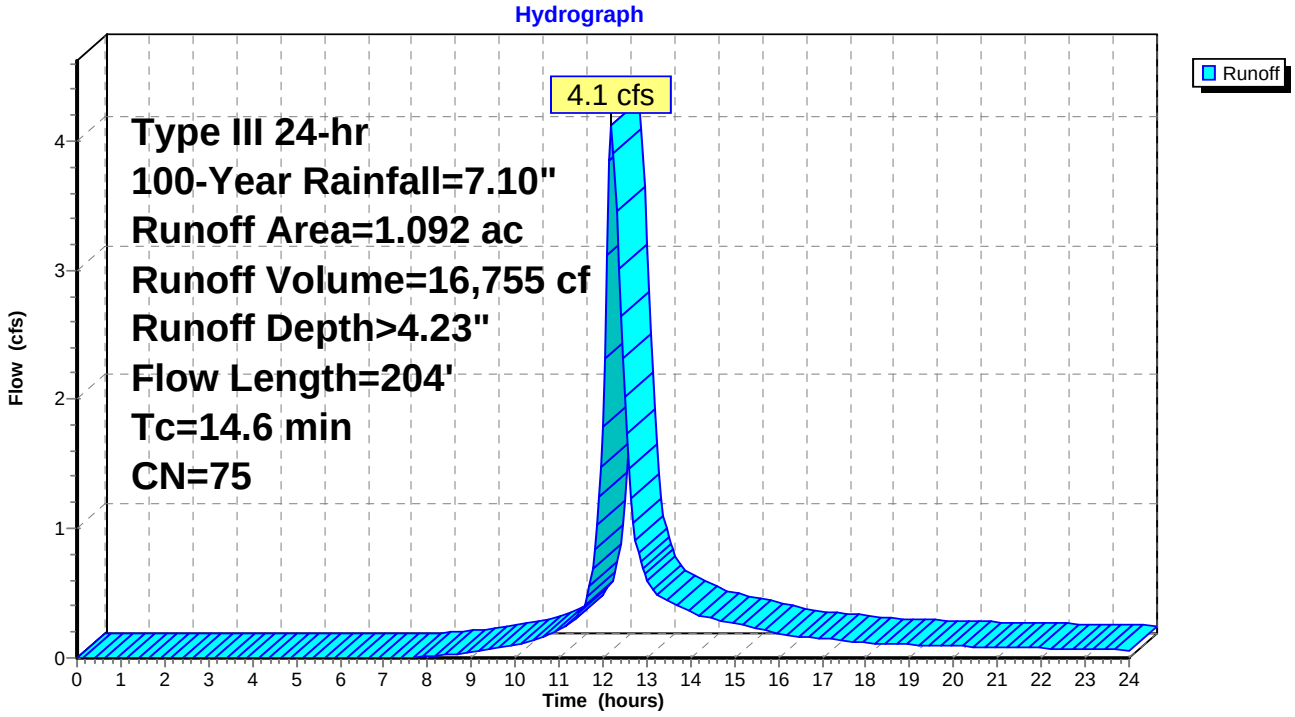
Runoff = 4.1 cfs @ 12.20 hrs, Volume= 16,755 cf, Depth> 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (ac)	CN	Description
	1.034	74	>75% Grass cover, Good, HSG C
*	0.058	98	Solar array ballasts, HSG C
	1.092	75	Weighted Average
	1.034		94.69% Pervious Area
	0.058		5.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0212	0.12		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.1	24	0.1667	2.86		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.6	204	Total			

Subcatchment 3S: Bulky Waste Landfill E



Summary for Subcatchment 4S: Landfill N

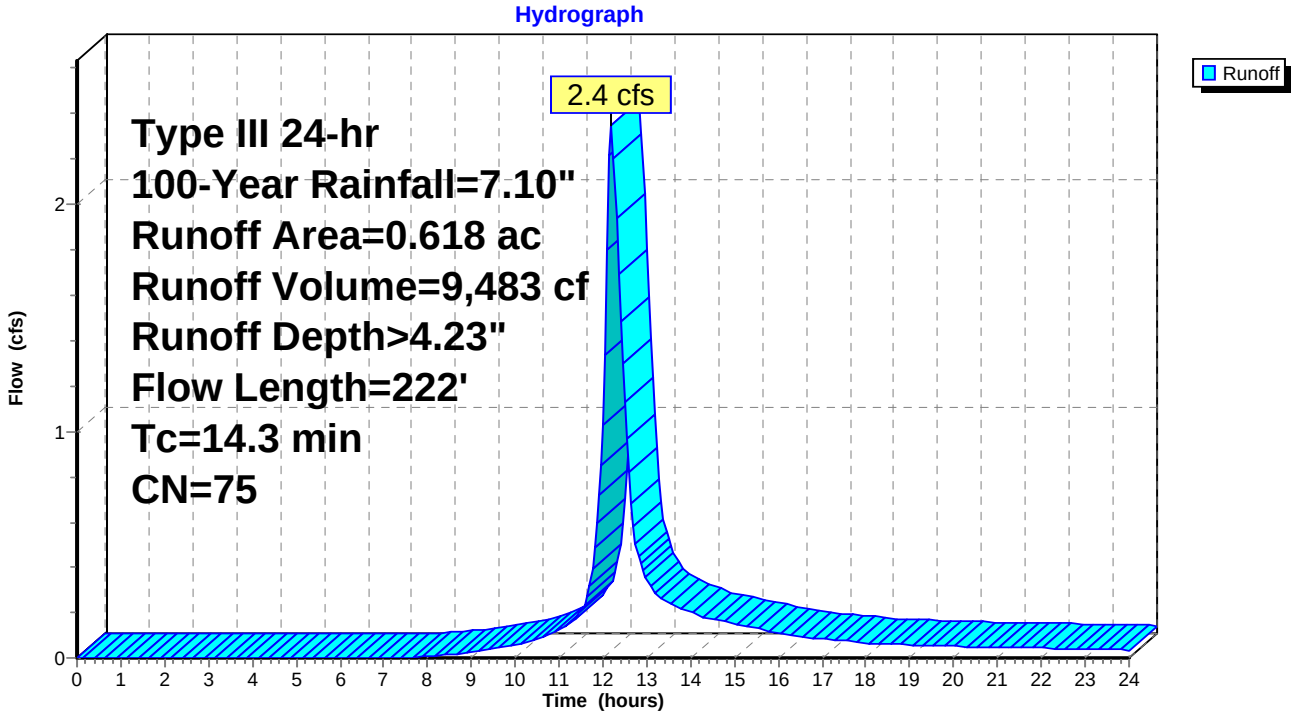
Runoff = 2.4 cfs @ 12.20 hrs, Volume= 9,483 cf, Depth> 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (ac)	CN	Description
	0.590	74	>75% Grass cover, Good, HSG C
*	0.028	98	Solar array ballasts, HSG C
	0.618	75	Weighted Average
	0.590		95.47% Pervious Area
	0.028		4.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0230	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	81	0.0371	1.35		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	41	0.1707	2.89		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
14.3	222	Total			

Subcatchment 4S: Landfill N



Summary for Subcatchment 5S: Landfill W

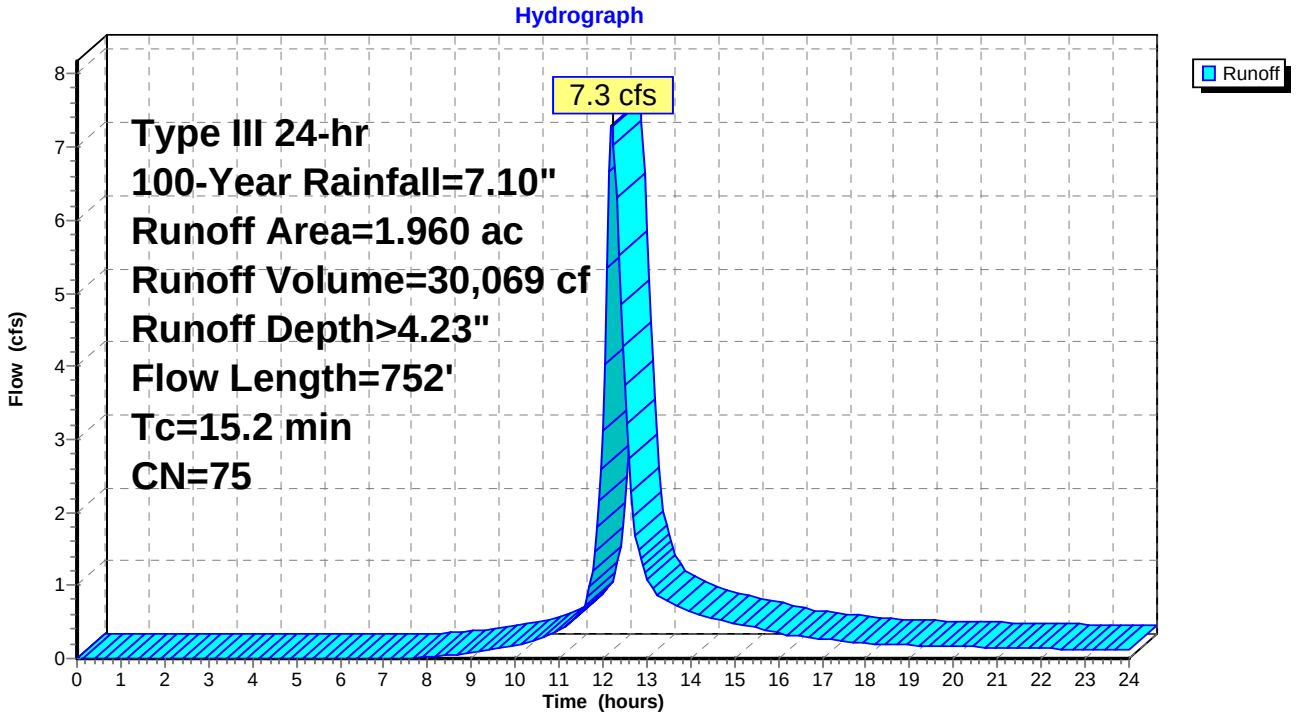
Runoff = 7.3 cfs @ 12.21 hrs, Volume= 30,069 cf, Depth> 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (ac)	CN	Description
	1.896	74	>75% Grass cover, Good, HSG C
*	0.064	98	Solar array ballasts, HSG C
	1.960	75	Weighted Average
	1.896		96.73% Pervious Area
	0.064		3.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.3	100	0.0220	0.13		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
0.3	37	0.0811	1.99		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.3	58	0.1897	3.05		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
1.3	520	0.0200	6.71	50.33	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
0.0	37	0.2160	22.05	165.39	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
15.2	752	Total			

Subcatchment 5S: Landfill W



Summary for Subcatchment 6S: Landfill E

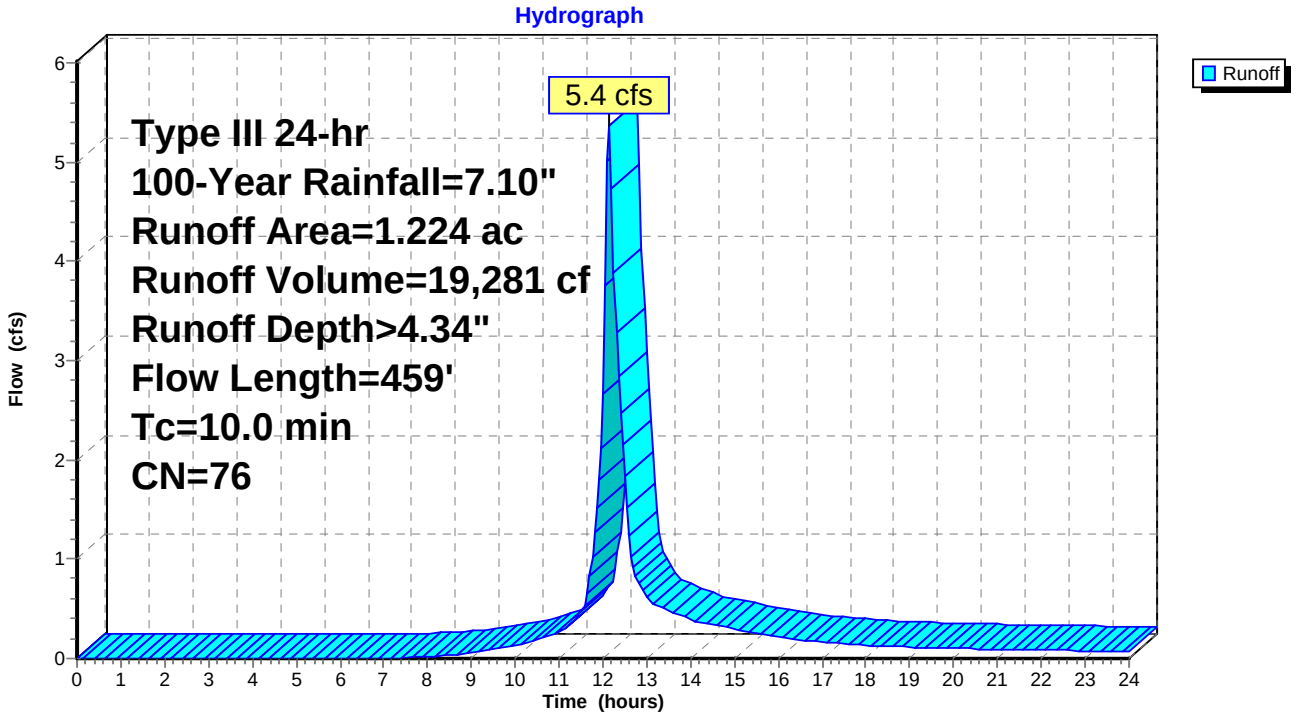
Runoff = 5.4 cfs @ 12.14 hrs, Volume= 19,281 cf, Depth> 4.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (ac)	CN	Description
	1.085	74	>75% Grass cover, Good, HSG C
	0.090	89	Gravel roads, HSG C
*	0.046	98	Solar array ballasts, HSG C
*	0.003	98	Concrete Equipment Pad, HSG C
	1.224	76	Weighted Average
	1.175		96.00% Pervious Area
	0.049		4.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	40	0.0543	0.15		**Sheet Flow, Landfill Cap** Grass: Dense n= 0.240 P2= 3.40"
1.0	60	0.0117	1.03		**Sheet Flow, Gravel** Smooth surfaces n= 0.011 P2= 3.40"
0.5	86	0.0384	3.15		**Shallow Concentrated Flow, Gravel** Unpaved Kv= 16.1 fps
0.7	76	0.0658	1.80		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	49	0.2245	3.32		**Shallow Concentrated Flow, Landfill Cap** Short Grass Pasture Kv= 7.0 fps
0.2	148	0.1081	15.60	117.00	**Channel Flow, Riprap Swale** Area= 7.5 sf Perim= 8.0' r= 0.94' n= 0.030 Rubble masonry, cemented
7.1	459	Total, Increased to minimum Tc = 10.0 min			

Subcatchment 6S: Landfill E



Summary for Subcatchment 7S: Green Field W

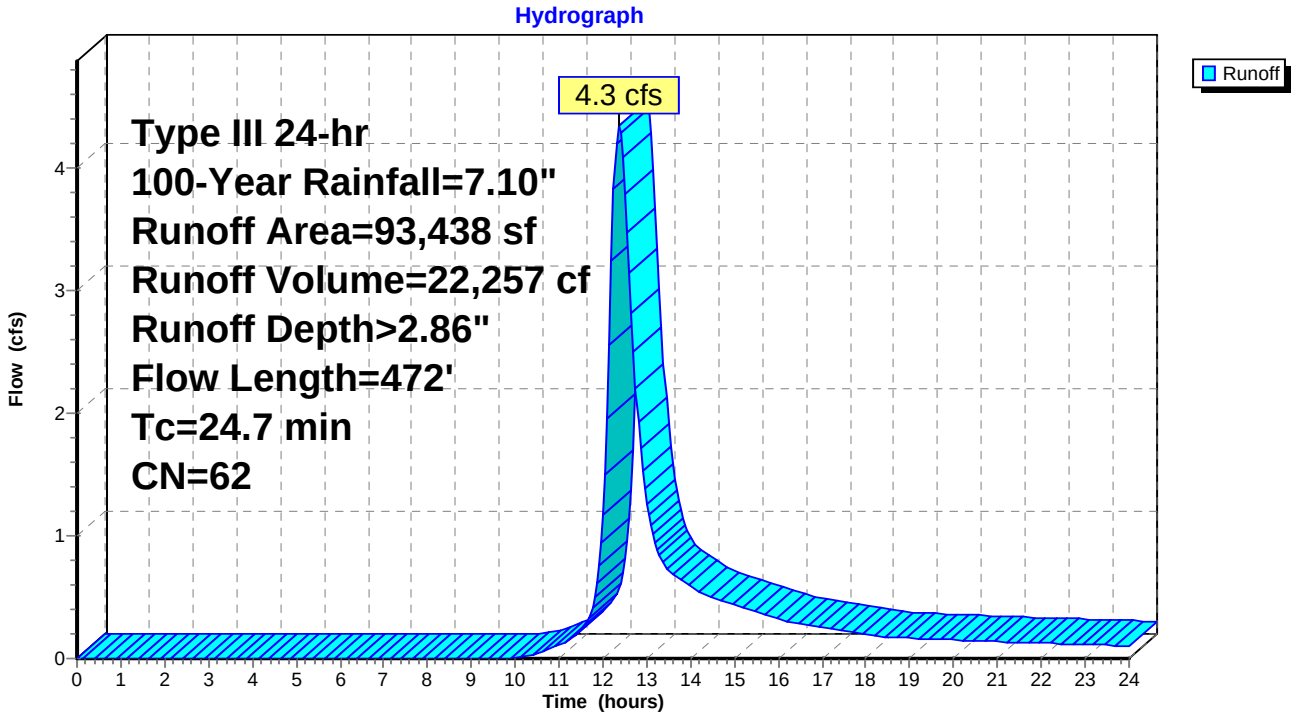
Runoff = 4.3 cfs @ 12.36 hrs, Volume= 22,257 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
	832	74	>75% Grass cover, Good, HSG C
	3,861	80	>75% Grass cover, Good, HSG D
	21,955	61	>75% Grass cover, Good, HSG B
	66,216	61	>75% Grass cover, Good, HSG B
	340	98	Paved parking, HSG C
*	4	98	Solar Array Posts, HSG B
*	230	98	Equipment Pad, HSG B
	93,438	62	Weighted Average
	92,864		99.39% Pervious Area
	574		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	23	0.0217	1.03		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
4.8	160	0.0063	0.56		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.6	51	0.0392	1.39		**Shallow Concentrated Flow, field** Short Grass Pasture Kv= 7.0 fps
1.4	88	0.0227	1.05		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.7	50	0.0300	1.21		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
24.7	472	Total			

Subcatchment 7S: Green Field W



Summary for Subcatchment 8S: Green Field E

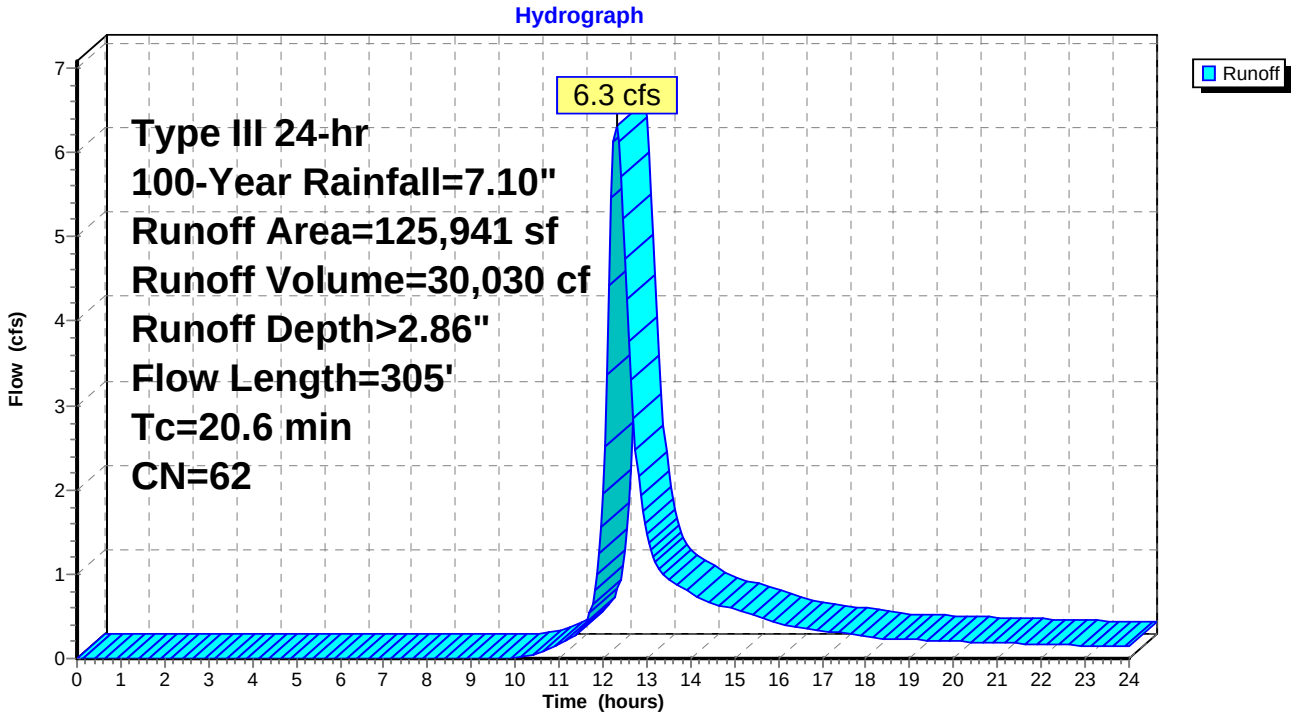
Runoff = 6.3 cfs @ 12.30 hrs, Volume= 30,030 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
	116,936	61	>75% Grass cover, Good, HSG B
	3,129	80	>75% Grass cover, Good, HSG D
	1,452	80	>75% Grass cover, Good, HSG D
	4,419	61	>75% Grass cover, Good, HSG B
*	5	98	Solar Array Posts, HSG B
	125,941	62	Weighted Average
	125,936		100.00% Pervious Area
	5		0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0123	0.10		**Sheet Flow, Field** Grass: Dense n= 0.240 P2= 3.40"
0.4	24	0.0208	1.01		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
2.6	106	0.0094	0.68		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
0.8	75	0.0467	1.51		**Shallow Concentrated Flow, Field** Short Grass Pasture Kv= 7.0 fps
20.6	305	Total			

Subcatchment 8S: Green Field E



Summary for Subcatchment 9S: Greenfield 2

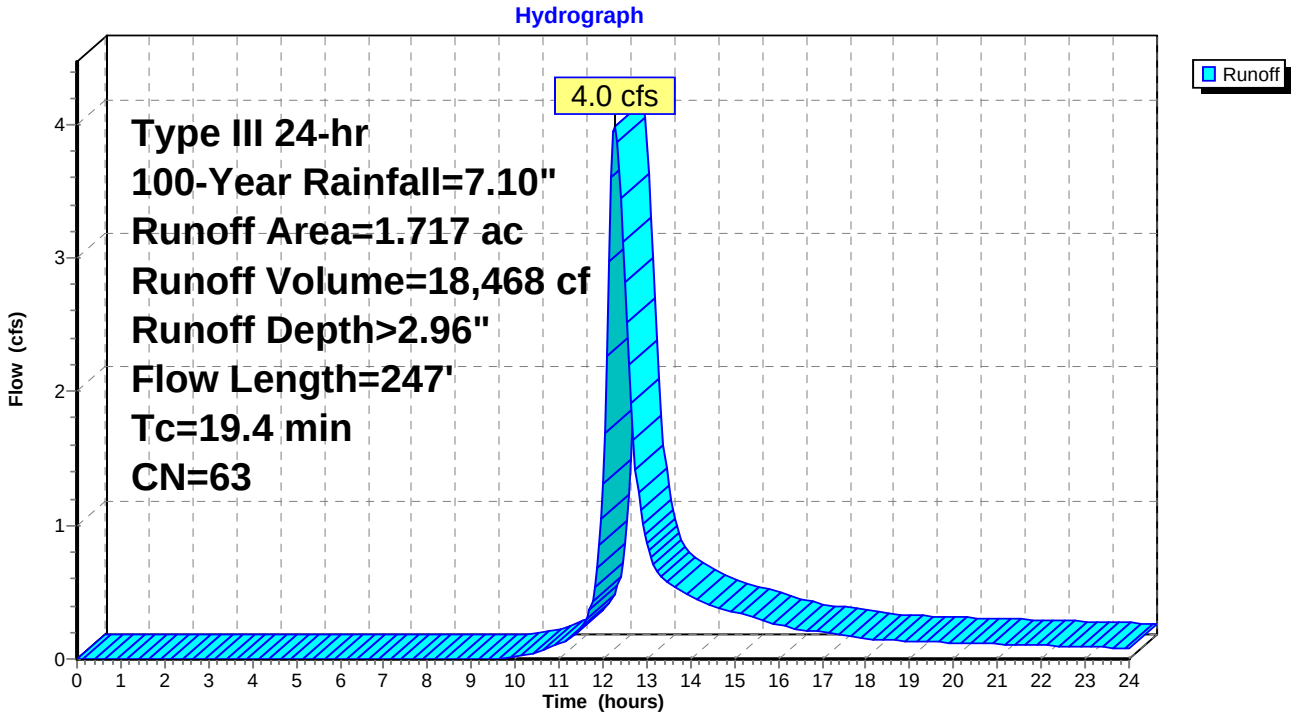
Runoff = 4.0 cfs @ 12.28 hrs, Volume= 18,468 cf, Depth> 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (ac)	CN	Description
	0.091	77	Woods, Good, HSG D
	0.151	55	Woods, Good, HSG B
	1.283	61	>75% Grass cover, Good, HSG B
	0.187	80	>75% Grass cover, Good, HSG D
*	0.000	98	Solar Array Posts, HSG B
	0.005	98	Paved parking, HSG B
	1.717	63	Weighted Average
	1.712		99.71% Pervious Area
	0.005		0.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	100	0.0128	0.10		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.40"
2.9	147	0.0148	0.85		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
19.4	247	Total			

Subcatchment 9S: Greenfield 2



Summary for Reach 19R: Riprap Swale

Inflow Area = 85,378 sf, 3.27% Impervious, Inflow Depth > 4.23" for 100-Year event
Inflow = 7.3 cfs @ 12.21 hrs, Volume= 30,069 cf
Outflow = 7.1 cfs @ 12.25 hrs, Volume= 29,996 cf, Atten= 3%, Lag= 2.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.92 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.39 fps, Avg. Travel Time= 7.9 min

Peak Storage= 1,191 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 0.40' Flow Area= 2.1 sf, Capacity= 8.6 cfs

3.00' x 0.40' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 5.5 '/' Top Width= 7.40'
Length= 657.0' Slope= 0.0383 '/'
Inlet Invert= 274.52', Outlet Invert= 249.36'



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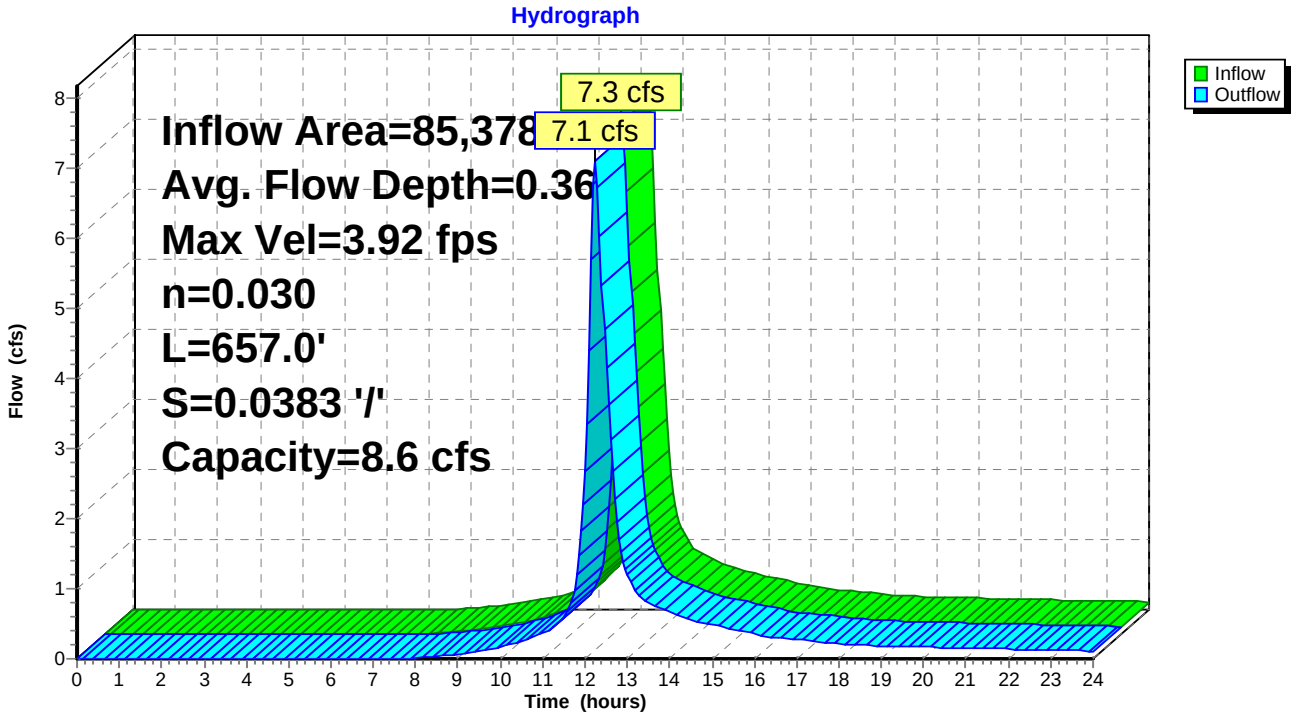
Reach 19R: Riprap Swale



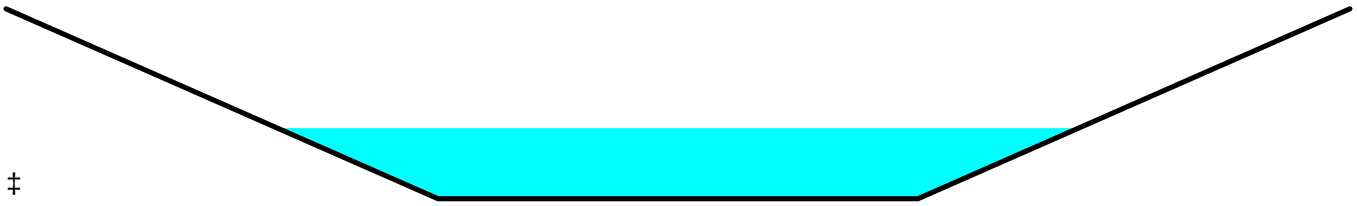
Summary for Reach 21R: Riprap Swale

Inflow Area = 53,317 sf, 4.00% Impervious, Inflow Depth > 4.34" for 100-Year event
Inflow = 5.4 cfs @ 12.14 hrs, Volume= 19,281 cf
Outflow = 5.2 cfs @ 12.17 hrs, Volume= 19,237 cf, Atten= 3%, Lag= 1.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs
Max. Velocity= 3.89 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 1.22 fps, Avg. Travel Time= 7.2 min

Peak Storage= 705 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 0.90' Flow Area= 5.1 sf, Capacity= 34.5 cfs

3.00' x 0.90' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 3.0 '/' Top Width= 8.40'
Length= 527.0' Slope= 0.0372 '/'
Inlet Invert= 276.70', Outlet Invert= 257.10'



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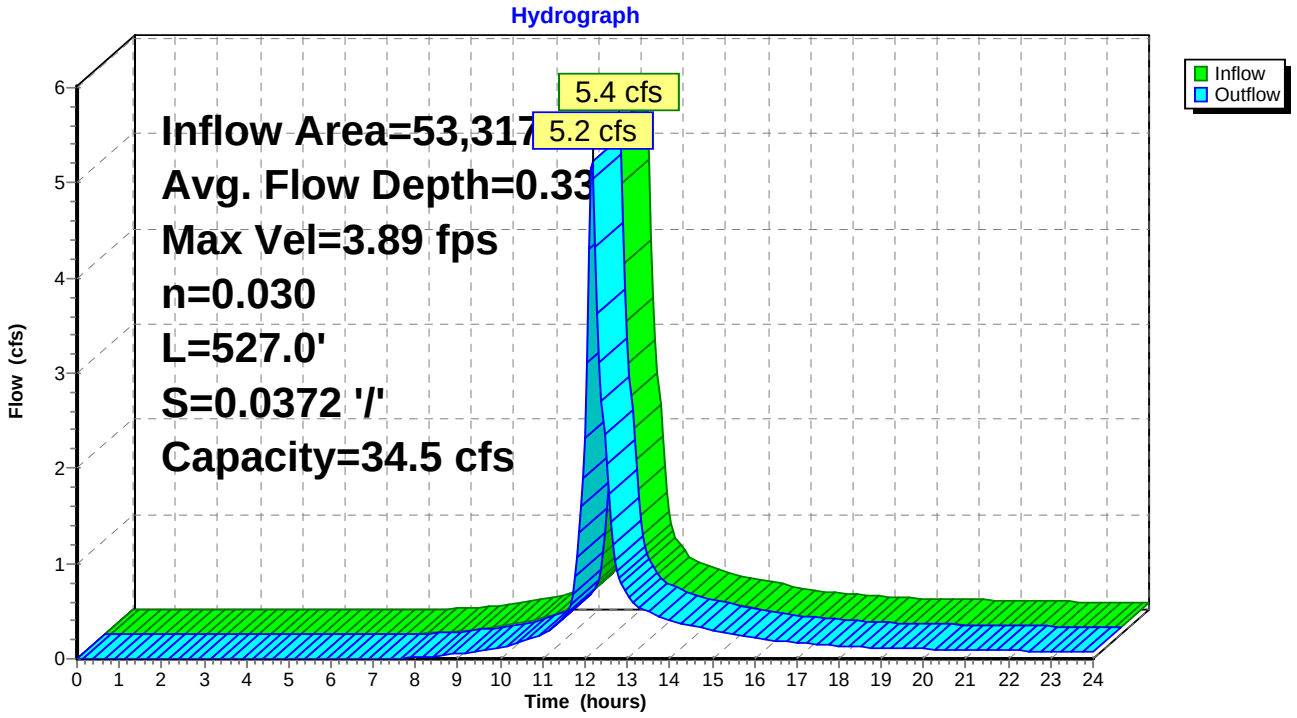
Reach 21R: Riprap Swale

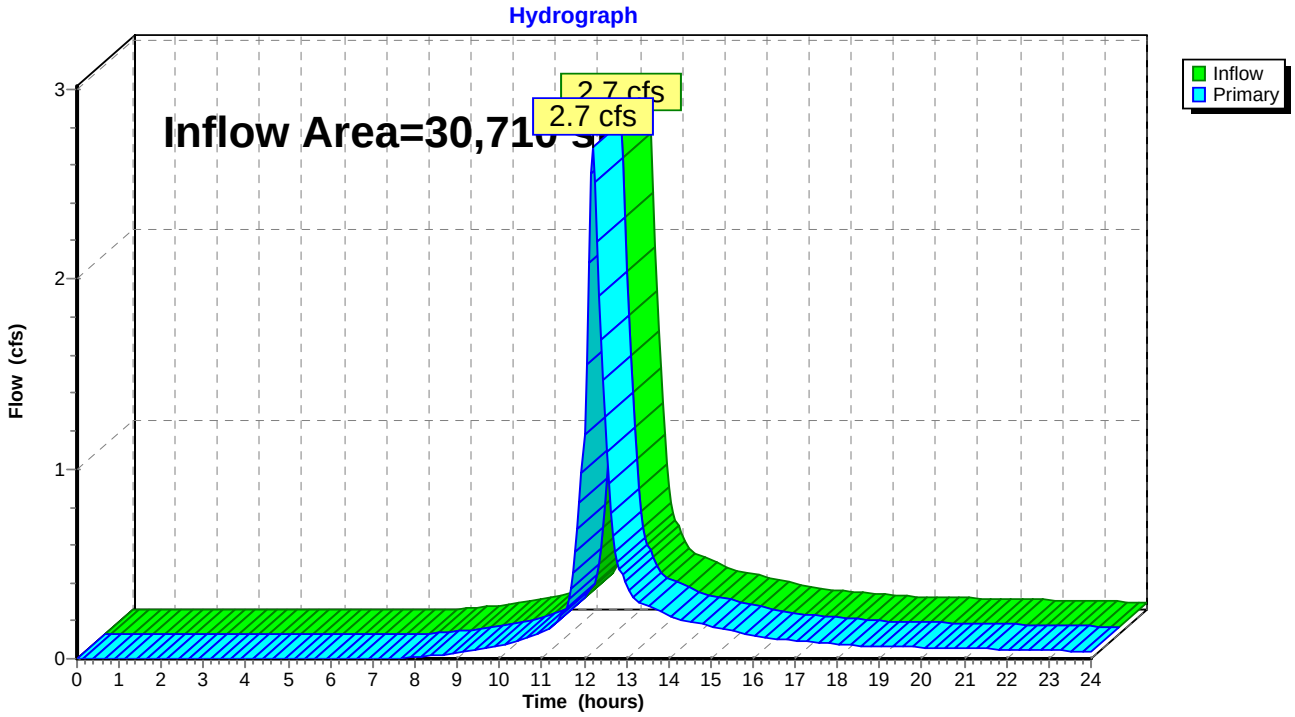


Summary for Link 7L: Wetlands NW

Inflow Area = 30,710 sf, 4.54% Impervious, Inflow Depth > 4.23" for 100-Year event
Inflow = 2.7 cfs @ 12.20 hrs, Volume= 10,818 cf
Primary = 2.7 cfs @ 12.20 hrs, Volume= 10,818 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 7L: Wetlands NW

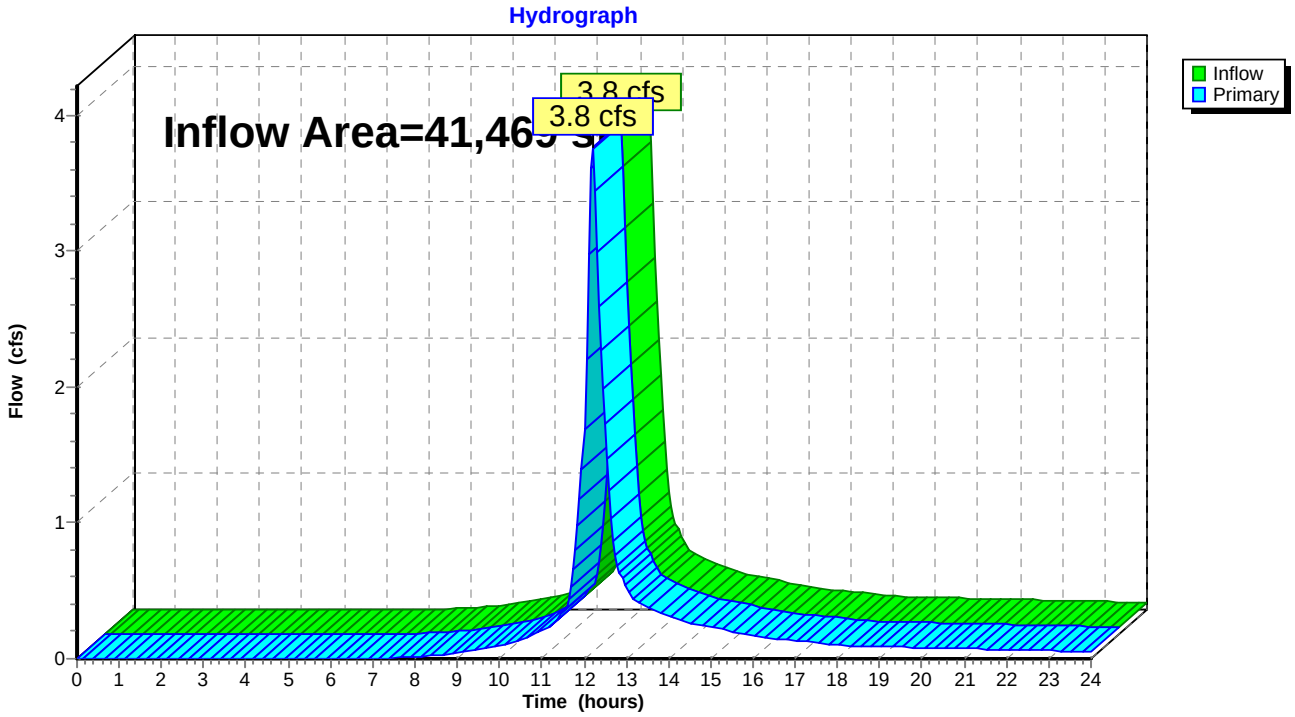


Summary for Link 8L: Depression S

Inflow Area = 41,469 sf, 4.52% Impervious, Inflow Depth > 4.34" for 100-Year event
Inflow = 3.8 cfs @ 12.19 hrs, Volume= 14,985 cf
Primary = 3.8 cfs @ 12.19 hrs, Volume= 14,985 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 8L: Depression S

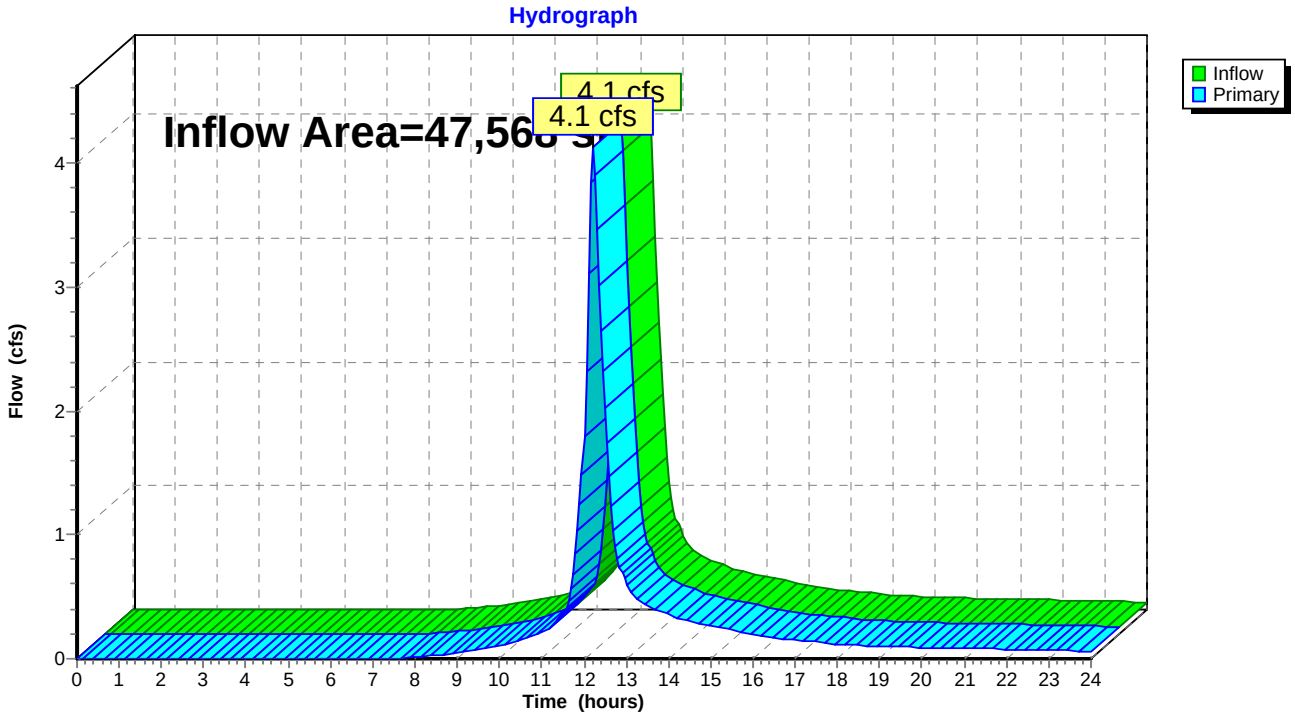


Summary for Link 9L: Wetlands NE

Inflow Area = 47,568 sf, 5.31% Impervious, Inflow Depth > 4.23" for 100-Year event
Inflow = 4.1 cfs @ 12.20 hrs, Volume= 16,755 cf
Primary = 4.1 cfs @ 12.20 hrs, Volume= 16,755 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 9L: Wetlands NE

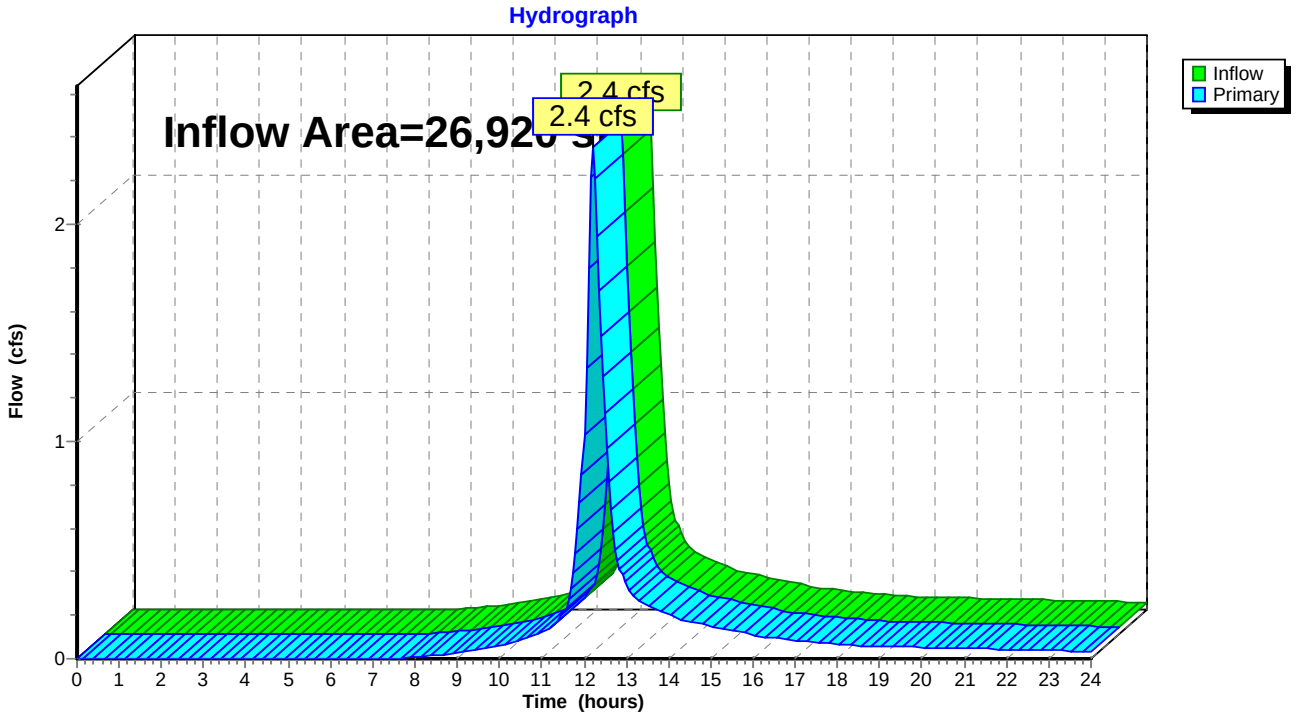


Summary for Link 10L: Wetlands N

Inflow Area = 26,920 sf, 4.53% Impervious, Inflow Depth > 4.23" for 100-Year event
Inflow = 2.4 cfs @ 12.20 hrs, Volume= 9,483 cf
Primary = 2.4 cfs @ 12.20 hrs, Volume= 9,483 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 10L: Wetlands N

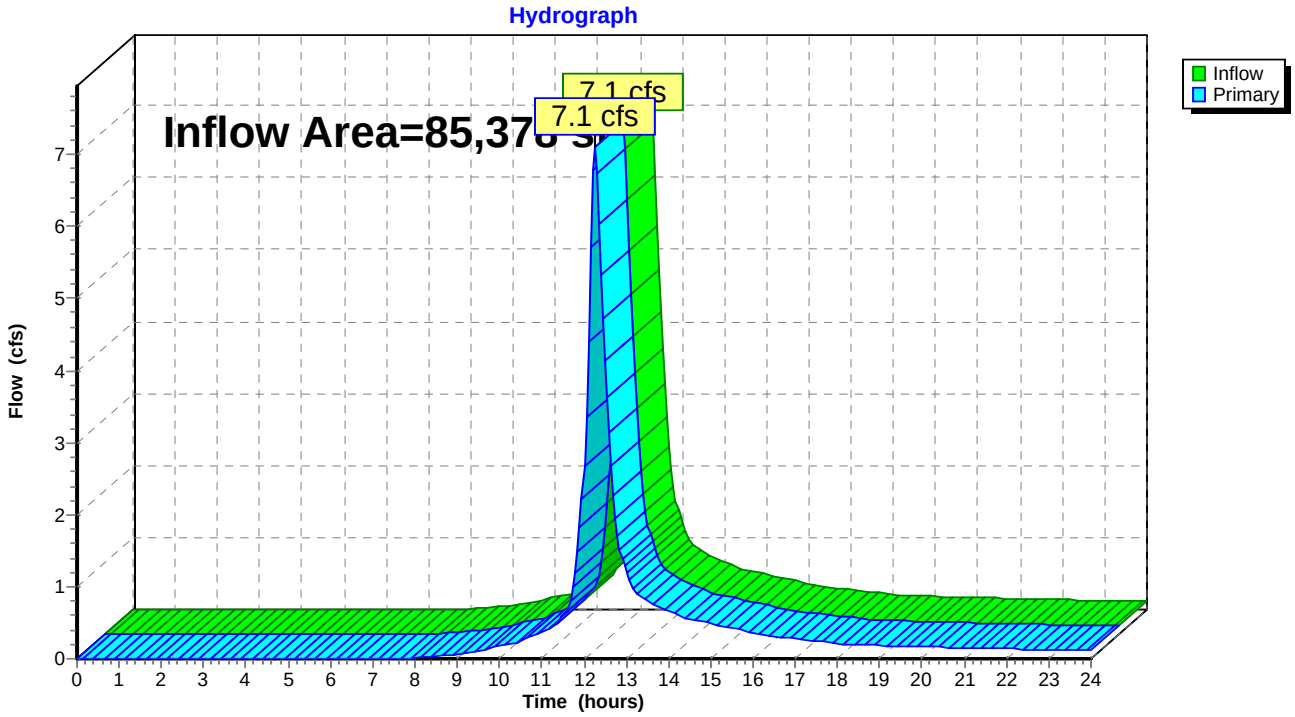


Summary for Link 11L: Collection Swale W

Inflow Area = 85,378 sf, 3.27% Impervious, Inflow Depth > 4.22" for 100-Year event
Inflow = 7.1 cfs @ 12.25 hrs, Volume= 29,996 cf
Primary = 7.1 cfs @ 12.25 hrs, Volume= 29,996 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 11L: Collection Swale W

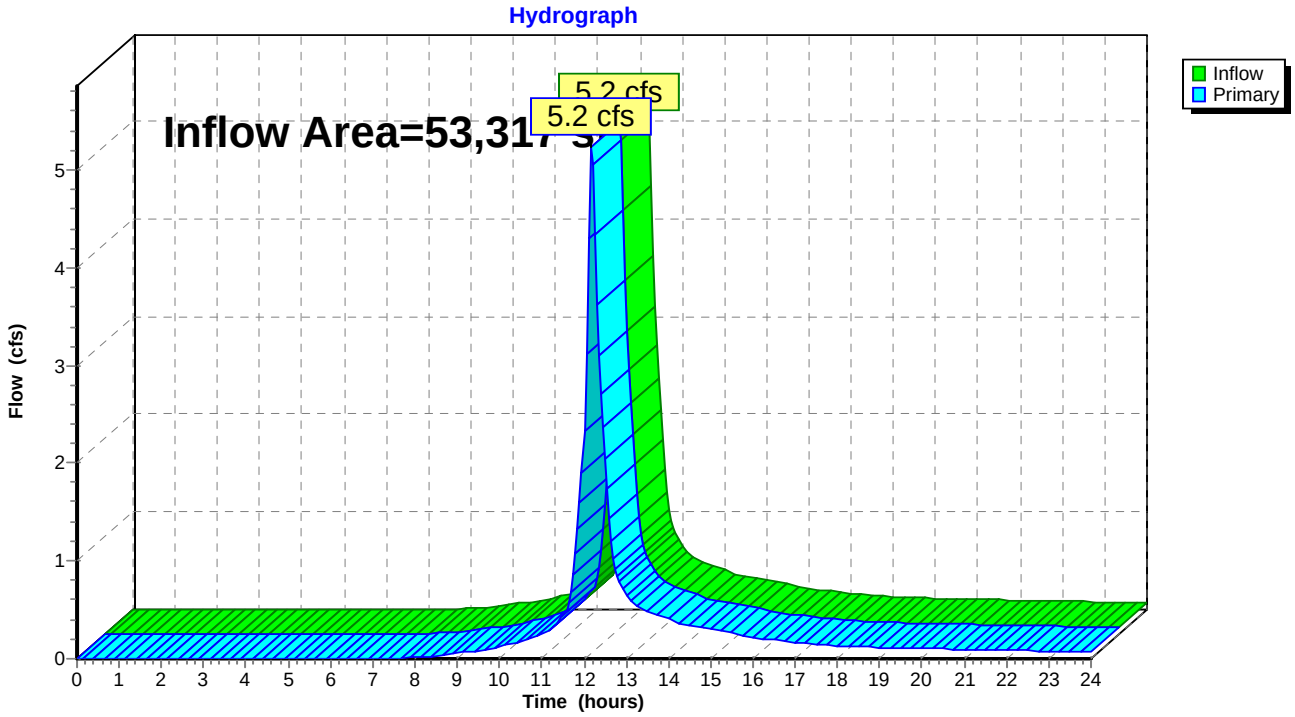


Summary for Link 12L: Collection Swale W

Inflow Area = 53,317 sf, 4.00% Impervious, Inflow Depth > 4.33" for 100-Year event
Inflow = 5.2 cfs @ 12.17 hrs, Volume= 19,237 cf
Primary = 5.2 cfs @ 12.17 hrs, Volume= 19,237 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 12L: Collection Swale W

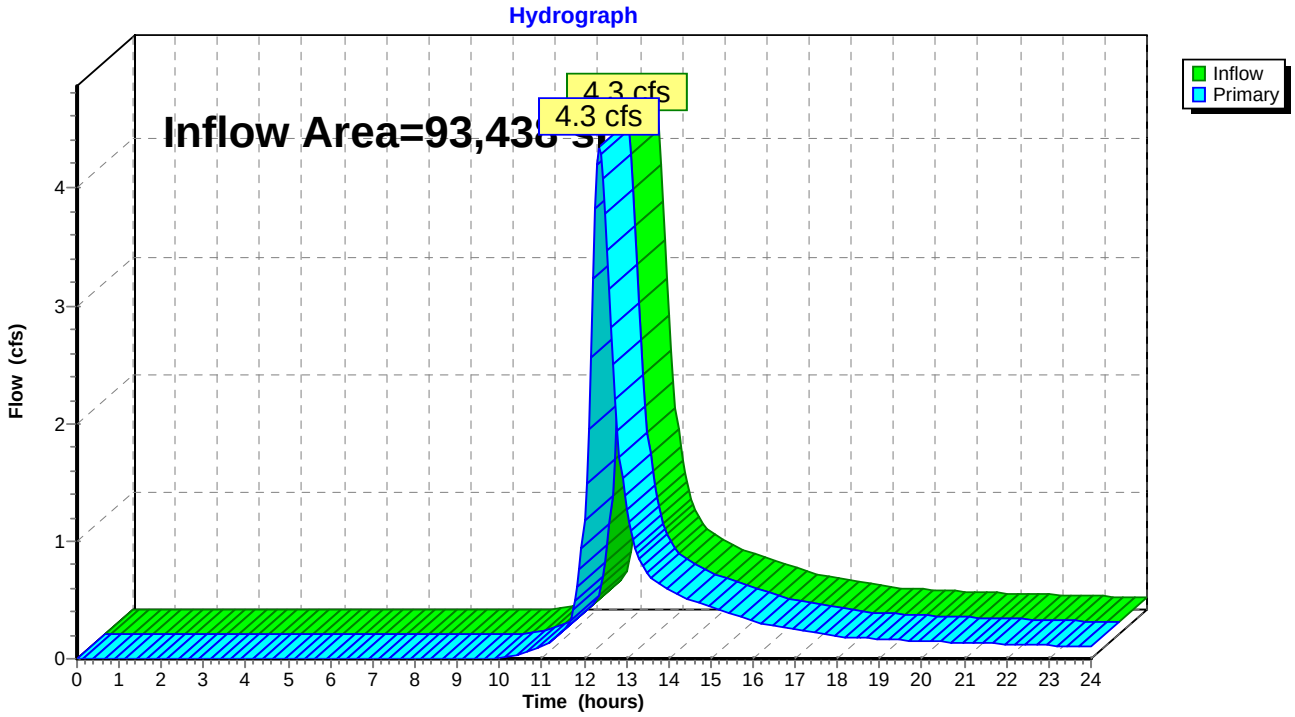


Summary for Link 15L: Wetland W

Inflow Area = 93,438 sf, 0.61% Impervious, Inflow Depth > 2.86" for 100-Year event
Inflow = 4.3 cfs @ 12.36 hrs, Volume= 22,257 cf
Primary = 4.3 cfs @ 12.36 hrs, Volume= 22,257 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

Link 15L: Wetland W

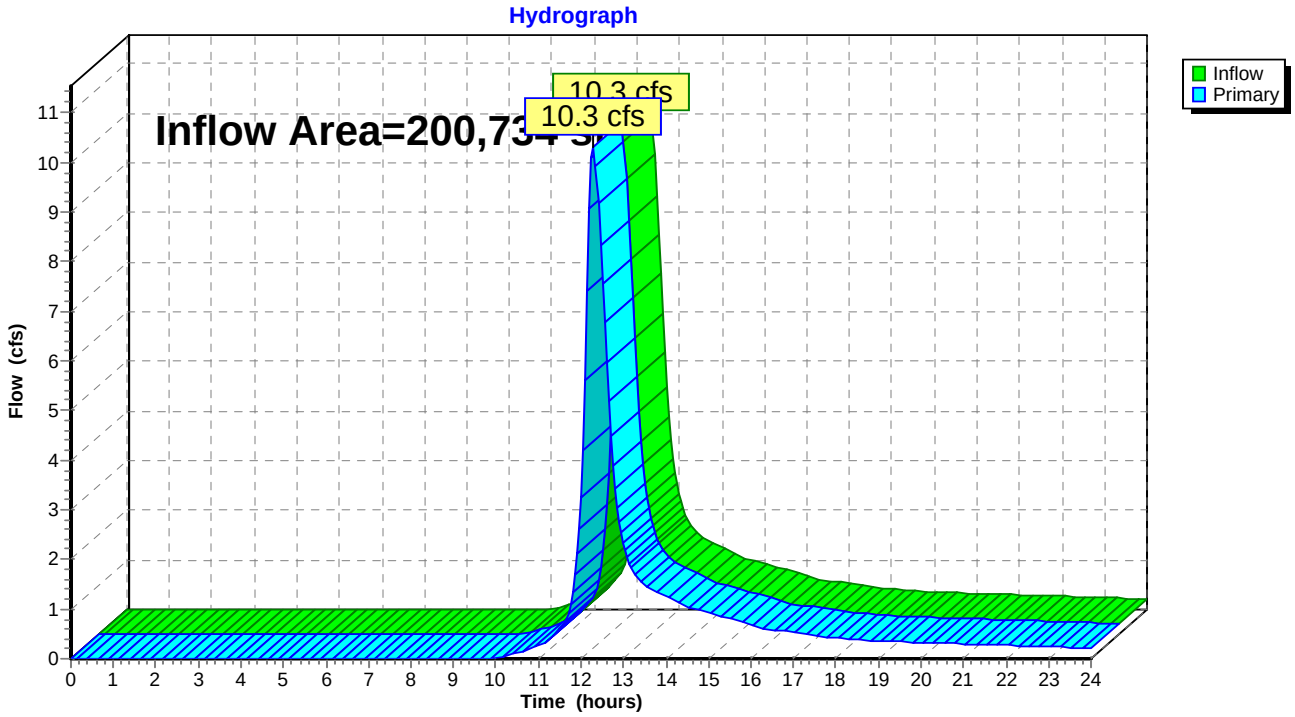


Summary for Link 16L: Wetland E

Inflow Area = 200,734 sf, 0.11% Impervious, Inflow Depth > 2.90" for 100-Year event
Inflow = 10.3 cfs @ 12.29 hrs, Volume= 48,498 cf
Primary = 10.3 cfs @ 12.29 hrs, Volume= 48,498 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.050 hrs

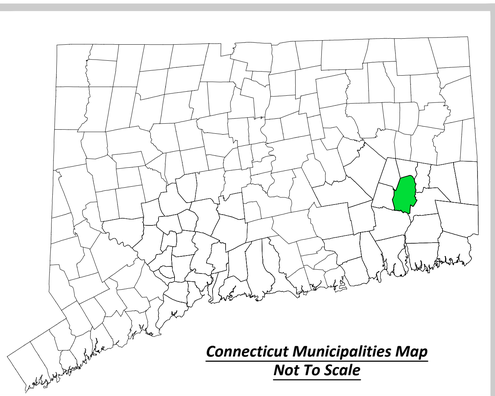
Link 16L: Wetland E



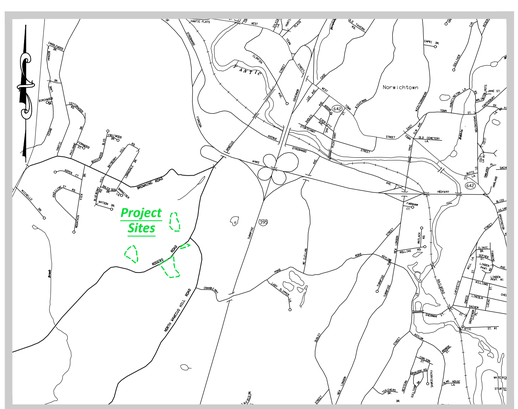
Appendix C
Site Development Plans

ROGERS ROAD LANDFILL SOLAR PROJECT
SOLAR PHOTOVOLTAIC (PV) SYSTEM
Prepared For
SolarCity Corporation
82 Rogers Road - Norwich, Connecticut
September 2015

Revision A - Equipment Pad Details - 9/29/15



Connecticut Municipalities Map
Not To Scale



Site Location Map
Scale: 1"=2000'



Site Location Aerial View
Not To Scale

Project Information	
Developed By: *Brightfields Development, LLC* *41 Walnut Street, Suite 301* *Wellesley, MA 02481* *SolarCity Corporation* *714 Brook Street* *Rocky Hill, CT 06067* *Civil Engineer:* *Boundaries LLC* *179 Pachaug River Drive* *Griswold, CT 06351*	*Electrical Engineer:* *SolarCity Corporation* *714 Brook Street* *Rocky Hill, CT 06067* *Host:* *City of Norwich* *100 Broadway* *Norwich, CT 06360* *Utility:* *Connecticut Municipal Electric Energy Cooperative* *30 Stott Avenue* *Norwich, CT 06360*

Index To Drawings

Sheet	Sheet Title
1	Cover Sheet
	Mounting Plane #1 and Mounting Plane #4
2	Topographic Survey-Existing Conditions
3	Site Development Plan
	Mounting Plane #2
4	Topographic Survey-Existing Conditions
5	Site Development Plan
	Mounting Plane #3
6	Topographic Survey-Existing Conditions
7	Site Development Plan
8	Overall Site Utility Plan
9	Erosion & Sediment Control Narrative and Details
10	Site Details
11	Site Details
12	Structural Details for On-Cap Equipment Pads

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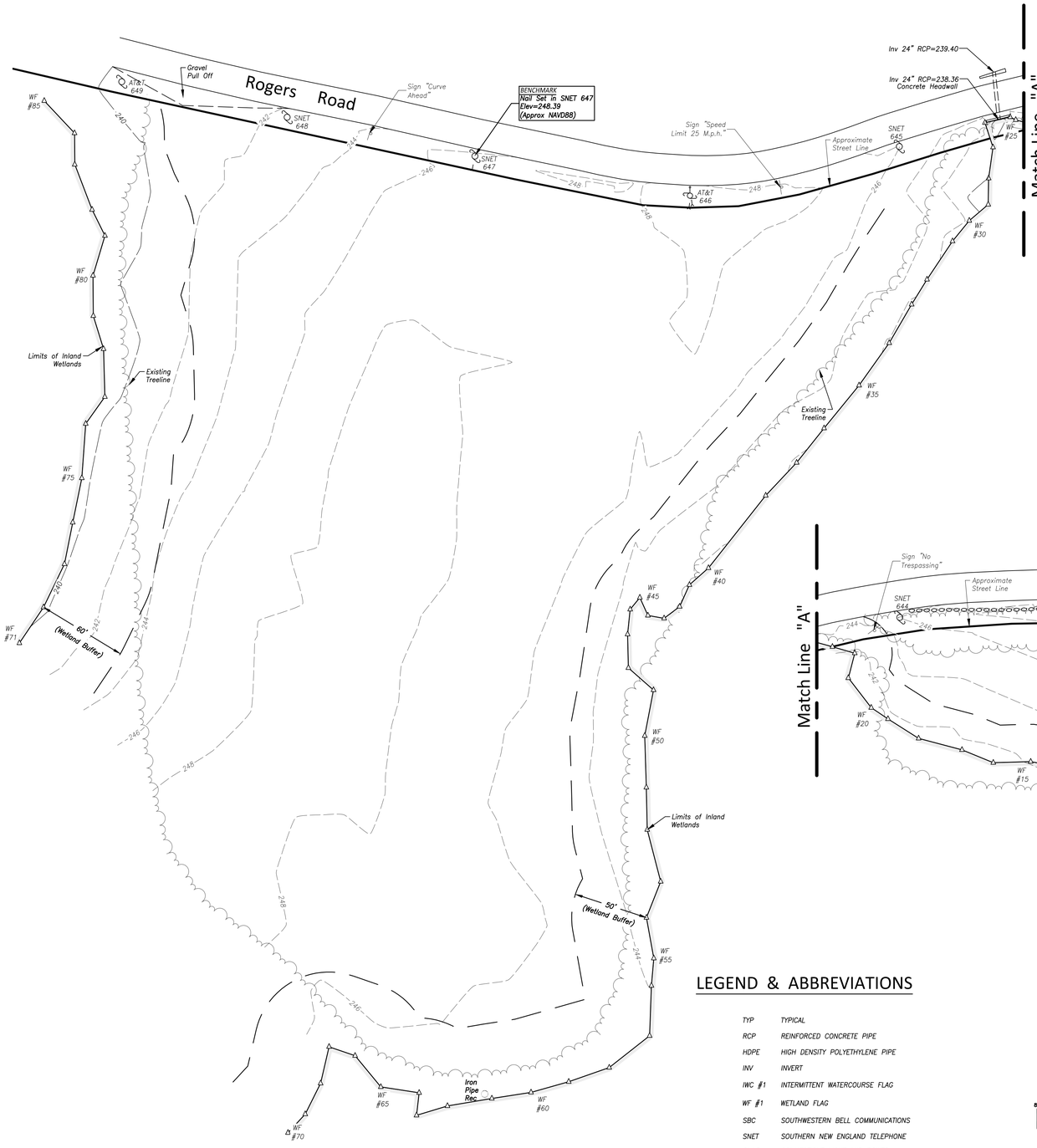

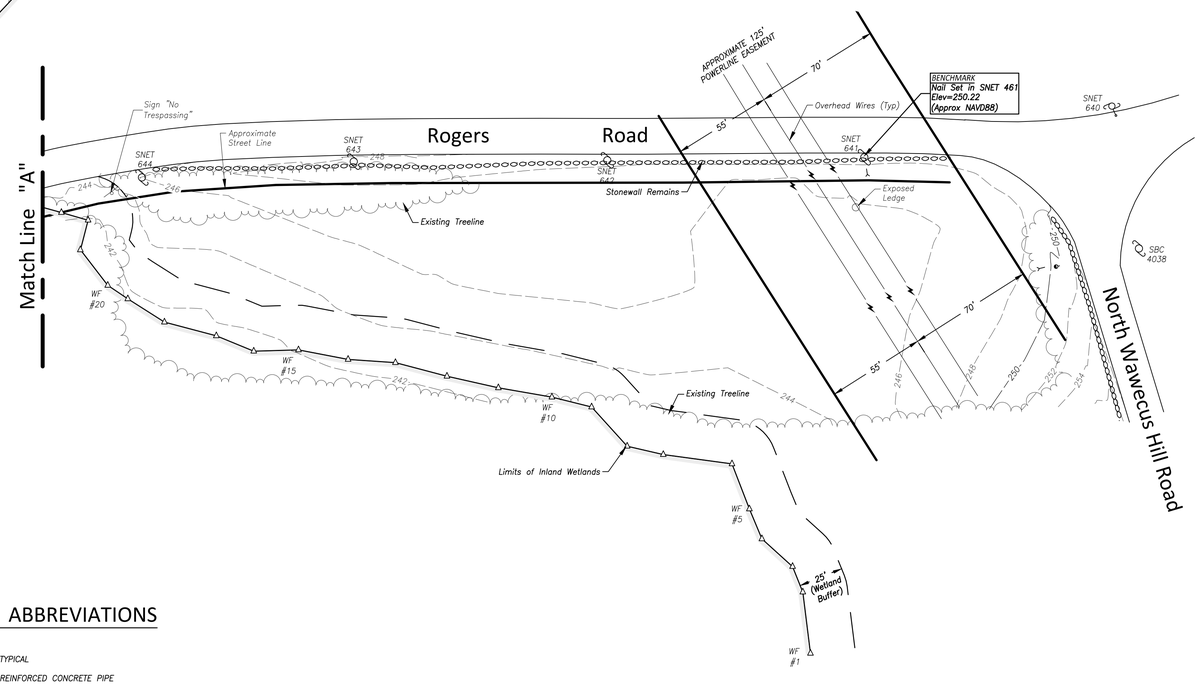

SURVEY NOTES

1. THIS SURVEY HAS BEEN PREPARED PURSUANT TO THE REGULATIONS OF CONNECTICUT STATE AGENCIES SECTIONS 20-300B-1 THROUGH 20-300B-20 AND THE "STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED FOR USE BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON SEPTEMBER 26, 1996. IT IS A TOPOGRAPHIC SURVEY AND CONFORMS TOPOGRAPHIC CLASS T-2 ACCURACY STANDARDS. IT IS INTENDED TO BE USED FOR SITE PLANNING.
2. NORTH ORIENTATION DEPICTED HEREON IS APPROXIMATE NORTH AMERICAN DATUM 1983 (NAD83) BASED UPON GLOBAL POSITIONING SYSTEM OBSERVATIONS, OBSERVED ON OCTOBER 03, 2014 THRU OCTOBER 07, 2014.
3. VERTICAL DATUM DEPICTED HERE ON IS APPROXIMATE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD83) BASED GLOBAL POSITIONING SYSTEM OBSERVATIONS USING GEOIDE12A ON OCTOBER 03, 2014 THRU OCTOBER 07, 2014.
3. ALL SUBTERRANEAN FEATURES AND IMPROVEMENTS MAY NOT BE DEPICTED OR NOTED HEREON.
4. THE FIELD SURVEY WAS COMPLETED ON OCTOBER 07, 2014
5. LIMITS OF INLAND WETLANDS DEPICTED HEREON WERE DELINEATED BY DEMIAN A. SORRENTINO, C.S.S., BOUNDARIES LLC. BUFFER AREAS DEPICTED HEREON ARE PREDICATED ON RECOMMENDED SETBACKS PROVIDED BY ALL POINTS TECHNOLOGY CORPORATION BASED EVALUATION OF SAID INLAND WETLANDS. THE CITY OF NORWICH INLAND WETLAND REGULATIONS REQUIRES AN UPLAND REGULATED AREA OF 100'.
6. THE LOCATIONS OF UNDERGROUND UTILITIES AS SHOWN HEREON ARE BASED ON THE LOCATION OF ABOVEGROUND STRUCTURES AND RECORD DRAWINGS PROVIDED TO THE SURVEYOR. LOCATIONS OF UNDERGROUND UTILITIES MAY VARY FROM LOCATIONS SHOWN HEREON. ADDITIONAL BURIED UTILITIES/STRUCTURES MAY BE ENCOUNTERED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS AND ELEVATIONS AND CONTACT "CALL BEFORE YOU DIG" AT LEAST 48 HOURS PRIOR TO ANY EARTHWORK OPERATIONS.

REFERENCE MAPS

1. AS-BUILT CONDITIONS, PREPARED FOR NUTMEG SAND AND GRAVEL COMPANY, NORWICH BULKY WASTE SITE, ROGERS ROAD, NORWICH, CONNECTICUT, SCALE: 1"=40', DATED: 10/26/99 SHEET No. 1 OF 1, PREPARED BY: ANCHOR ENGINEERING SERVICES, INC.
2. CONSTRUCTION PLANS FOR NORWICH LANDFILL CLOSURE, TOWN OF NORWICH, ROGERS ROAD, NORWICH, CONNECTICUT DATED: APRIL 1996, SHEETS 1 – 7, PREPARED BY: FUSS & O'NEILL

LEGEND & ABBREVIATIONS

TYP	TYPICAL
RCP	REINFORCED CONCRETE PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
INV	INVERT
IWC #1	INTERMITTENT WATERCOURSE FLAG
WF #1	WETLAND FLAG
SBC	SOUTHWESTERN BELL COMMUNICATIONS
SNET	SOUTHERN NEW ENGLAND TELEPHONE
CL&P	CONNECTICUT LIGHT AND POWER
AT&T	AMERICAN TELEPHONE AND TELEGRAPH
248	EXISTING CONTOUR
	IRON PIN
	UTILITY POLE
	GUY WIRE
	SIGN
	WETLAND FLAG

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)
1 inch = 40 ft.

I HAVE CONDUCTED AN ON-SITE SOIL INVESTIGATION OF THE PARCEL OF LAND DEPICTED HEREON. THE INTERMITTENT WATERCOURSES AND INLAND WETLAND BOUNDARIES AS PORTRAYED ARE AN ACCURATE REPRESENTATION OF THE DELINEATION PERFORMED IN THE FIELD.

DEMIAN A. SORRENTINO, C.S.S. DATE

"TO MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON."

70016
JOHN U. FAULISE JR. L.S. LICENSE NO. DATE

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CIVIL ENGINEERING LAND SURVEYING LAND DEVELOPMENT PLANNING
BOUNDARIES
Boundaries LLC
179 Pachaug River Drive Griswold, CT 06351
T 860.376.2006 | www.boundariesllc.net

BRIGHTFIELDS DEVELOPMENT LLC
40 Walnut Street Suite 301
Wellesley, MA 02481
www.solarbrownfields.com

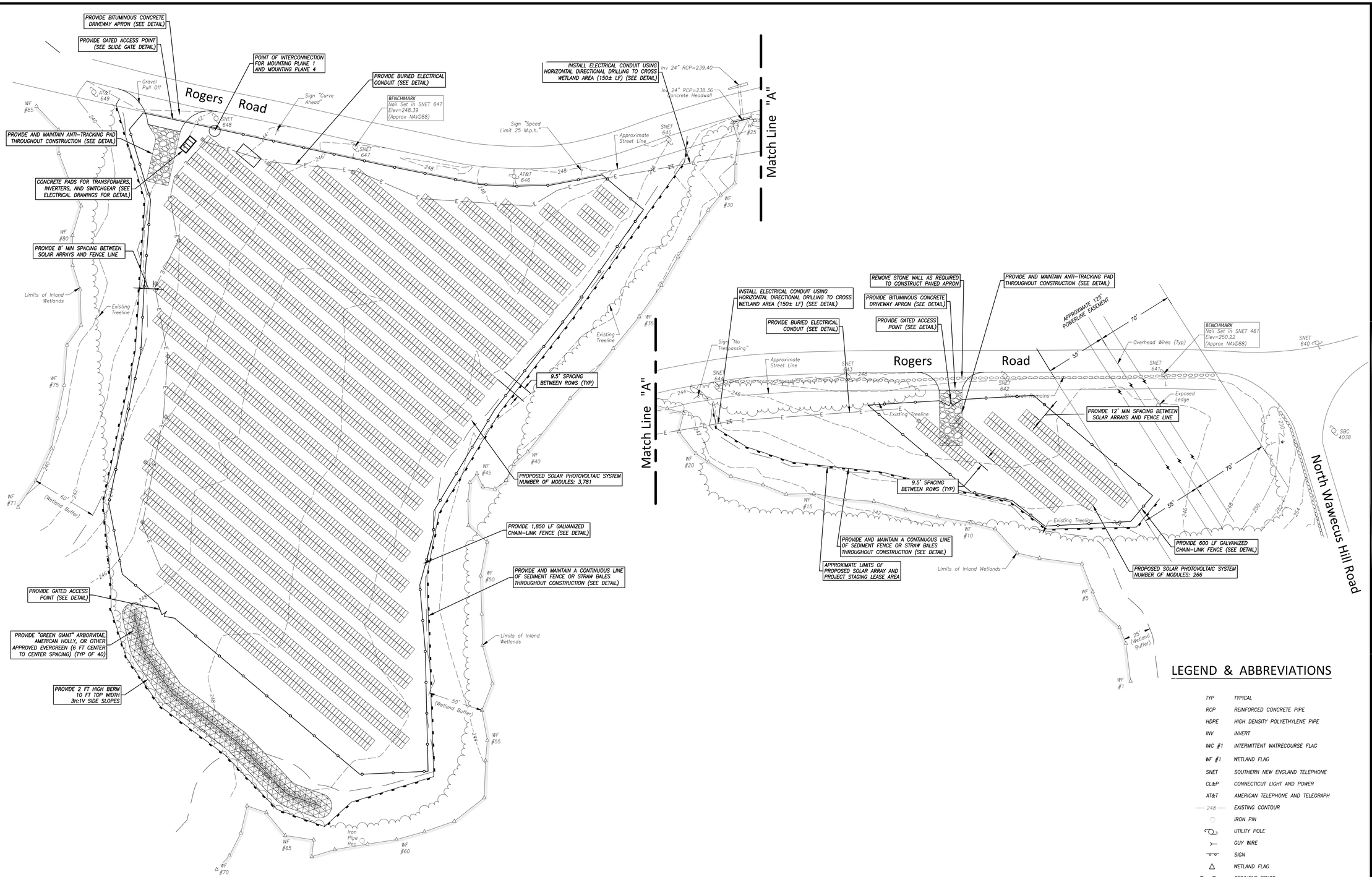
SolarCity
714 Brook Street
Rocky Hill, CT 06067
www.solarcity.com

SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Mounting Plane 1 and Mounting Plane 4
Topographic Survey - Existing Conditions

SCALE: 1" = 40'
DATE: September 2015
JOB I.D. NO. 14-2302

Revisions
Rev. A - Equipment Pad Details - 9/29/15

SHEET NO.
2
12



GRAPHIC SCALE

80 40 20 0 40

(IN FEET)
1 inch = 40 ft.

LEGEND & ABBREVIATIONS

TYP	TYPICAL
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WF #1	WETLAND FLAG
SNET	SOUTHERN NEW ENGLAND TELEPHONE
CL&P	CONNECTICUT LIGHT AND POWER
AT&T	AMERICAN TELEPHONE AND TELEGRAPH
248	EXISTING CONTOUR
	IRON PIN
	UTILITY POLE
	GUY WIRE
	SIGN
	WETLAND FLAG
	SEDIMENT FENCE
	STRAW WATTLE
	CHAIN LINK FENCE
E	ELECTRICAL CONDUIT

29102
DAVID C. McKAY P.E., LICENSE NO. DATE

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SCALE: 1" = 40'
DATE: September 2015
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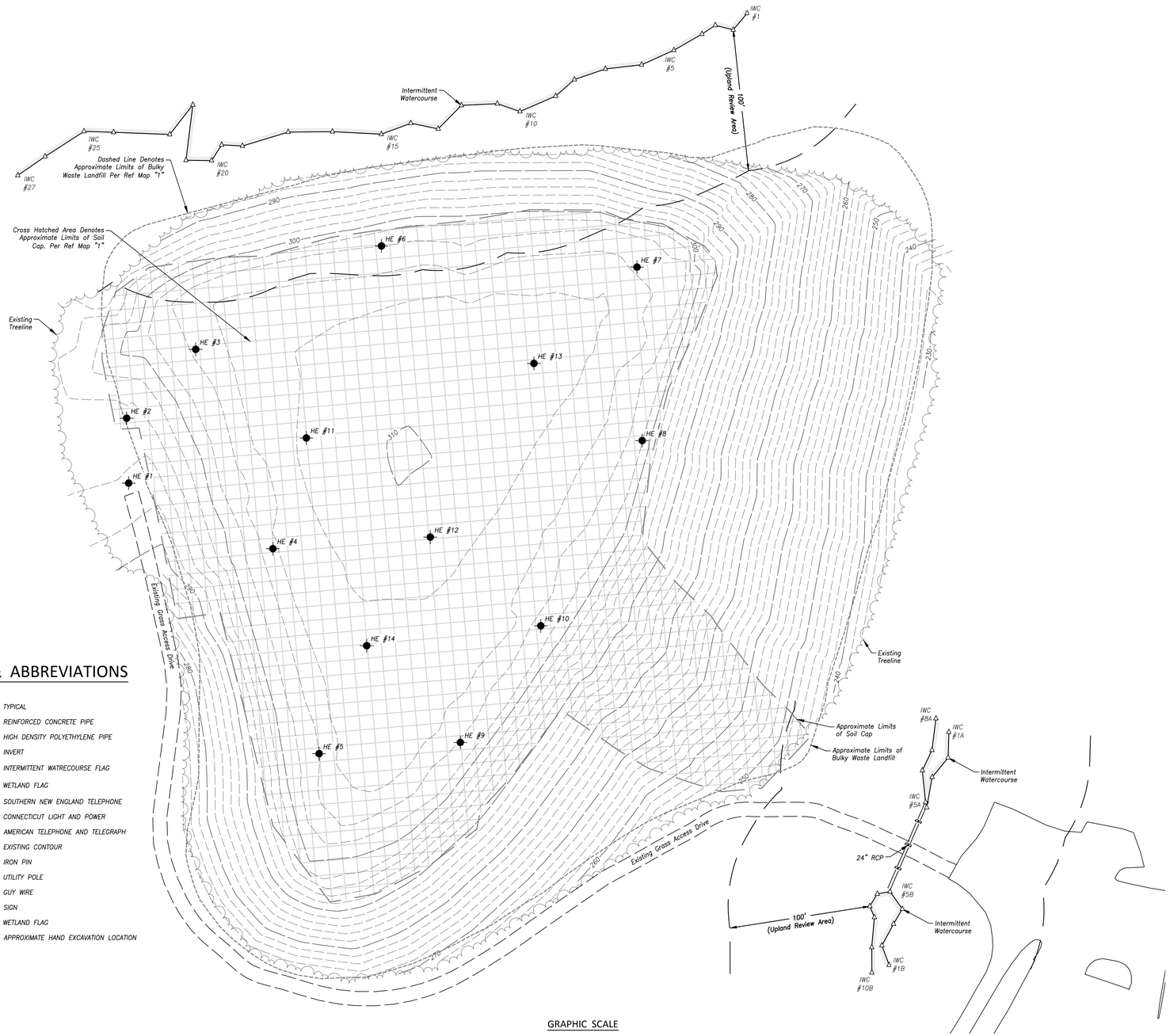
Revisions
Rev. A - Equipment Pad Details - 9/29/15

SHEET NO.
3
12



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AT&T	AMERICAN TELEPHONE AND TELEGRAPH
248	EXISTING CONTOUR
	IRON PIN
	UTILITY POLE
	GUY WIRE
	SIGN
	WETLAND FLAG
HE #1	APPROXIMATE HAND EXCAVATION LOCATION

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)
1 inch = 40 ft.

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HAND EXCAVATION RESULTS

HAND EXCAVATION LOCATIONS ARE APPROXIMATE ONLY. HAND EXCAVATIONS WERE PERFORMED BY WESTON & SAMPSON ENGINEERS, INC. ON JULY 9, 2015.

HAND EXCAVATION #1

SURFACE	COMPACTED SAND/GRAVEL AT BEGINNING OF PROPOSED GRAVEL ACCESS DRIVE
0" – 11"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, SOME SMALL TO LARGE GRAVEL; MOIST. APPEARED TO BE DENSE TO VERY DENSE BASED ON HAND EXCAVATION EFFORT. COULD NOT EXCAVATE BEYOND 11" BELOW GROUND SURFACE.

END OF EXCAVATION AT 11" BELOW GROUND SURFACE.

HAND EXCAVATION #2

SURFACE	TALL FIELD GRASS ALONG PROPOSED GRAVEL ACCESS DRIVE AT BASE OF LANDFILL SLOPE
0" – 4"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
4" – 12"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, SOME MEDIUM TO LARGE GRAVELS. APPEARED TO BE MEDIUM DENSE TO DENSE BASED ON HAND EXCAVATION EFFORT.
12" – 19"	GRAY, GRAVEL FILL (UP TO 4 IN. DIAMETER) WITH FINE TO MEDIUM SILTY SAND; MOIST. APPEARED TO BE VERY DENSE BASED ON HAND EXCAVATION EFFORT. COULD NOT EXCAVATE BEYOND 19" BELOW GROUND SURFACE.

END OF EXCAVATION AT 19" BELOW GROUND SURFACE.

HAND EXCAVATION #3

SURFACE	TALL FIELD GRASS ALONG PROPOSED GRAVEL ACCESS DRIVE AT TOP OF LANDFILL
0" – 2"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS.
2" – 18"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 18" BELOW GROUND SURFACE, END OF EXCAVATION AT 18" BELOW GROUND SURFACE.

HAND EXCAVATION #4

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 3"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
3" – 23"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS), TRACE BRICK DEBRIS; MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 23" BELOW GROUND SURFACE, END OF EXCAVATION AT 23" BELOW GROUND SURFACE.

HAND EXCAVATION #5

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 4"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
4" – 15"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS), TRACE BRICK DEBRIS; MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 15" BELOW GROUND SURFACE, END OF EXCAVATION AT 15" BELOW GROUND SURFACE.

HAND EXCAVATION #6

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 3"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
3" – 17"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 17" BELOW GROUND SURFACE, END OF EXCAVATION AT 17" BELOW GROUND SURFACE.

HAND EXCAVATION #7

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 4"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
4" – 9"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 9" BELOW GROUND SURFACE, END OF EXCAVATION AT 9" BELOW GROUND SURFACE.

HAND EXCAVATION #8

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 4"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
4" – 15"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS), TRACE PLASTIC DEBRIS; MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 15" BELOW GROUND SURFACE, END OF EXCAVATION AT 15" BELOW GROUND SURFACE.

HAND EXCAVATION #9

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 6"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
6" – 15"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS), TRACE PLASTIC DEBRIS; MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 15" BELOW GROUND SURFACE, END OF EXCAVATION AT 15" BELOW GROUND SURFACE.

HAND EXCAVATION #10

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 5"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
5" – 14"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 14" BELOW GROUND SURFACE, END OF EXCAVATION AT 14" BELOW GROUND SURFACE.

HAND EXCAVATION #11

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 2"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
2" – 27"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. SMALL COBBLES AT APPROXIMATELY 15" BELOW GROUND SURFACE. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 27" BELOW GROUND SURFACE, END OF EXCAVATION AT 27" BELOW GROUND SURFACE.

HAND EXCAVATION #12

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 4"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
4" – 17"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 17" BELOW GROUND SURFACE, END OF EXCAVATION AT 17" BELOW GROUND SURFACE.

HAND EXCAVATION #13

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 6"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
6" – 21"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS); MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 21" BELOW GROUND SURFACE, END OF EXCAVATION AT 21" BELOW GROUND SURFACE.

HAND EXCAVATION #14

SURFACE	TALL FIELD GRASS ON TOP OF LANDFILL
0" – 3"	DARK BROWN SILTY TOPSOIL WITH THICK GRASS ROOT SYSTEMS; MOIST.
3" – 25"	BROWN, FINE TO MEDIUM, SILTY SAND FILL, TRACE TO LITTLE GRAVEL, TRACE TO LITTLE ORGANICS (ROOTS, WOOD CHIPS, SMALL TWIGS), TRACE PLASTIC DEBRIS; MOIST. APPEARED TO BE LOOSE BASED ON HAND EXCAVATION EFFORT.

SILTY SAND COVER LAYER OBSERVED AT 25" BELOW GROUND SURFACE, END OF EXCAVATION AT 25" BELOW GROUND SURFACE.

I HAVE CONDUCTED AN ON-SITE SOIL INVESTIGATION OF THE PARCEL OF LAND DEPICTED HEREON. THE INTERMITTENT WATERCOURSES AND INLAND WETLAND BOUNDARIES AS PORTRAYED ARE AN ACCURATE REPRESENTATION OF THE DELINEATION PERFORMED IN THE FIELD.

DEMIAN A. SORRENTINO, C.S.S. — DATE

"TO MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON."

70016
JOHN U. FAULISE JR. L.S. — LICENSE NO. — DATE

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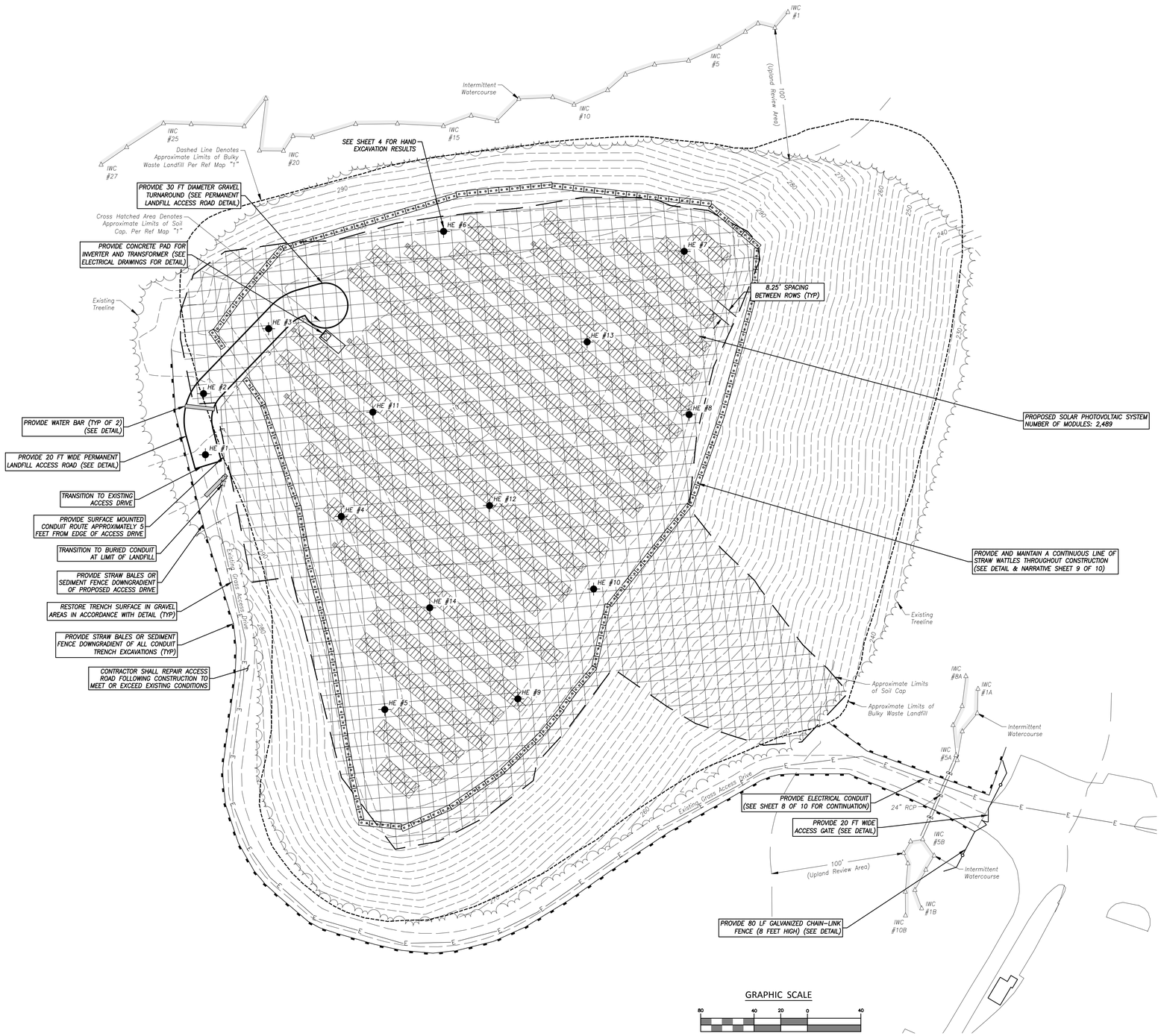
www.solarcity.com

SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Mounting Plane 2 - Bulky Waste Area
Topographic Survey - Existing Conditions

SCALE: 1" = 40'
DATE: September 2015
JOB I.D. NO. 14-2302

Revisions
Rev. A - Equipment Pad Details - 9/29/15

SHEET NO.
4
12



LEGEND & ABBREVIATIONS

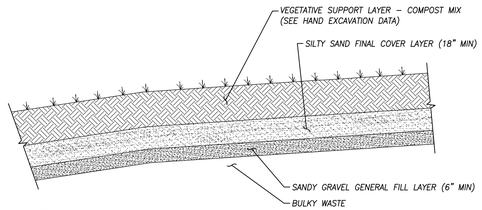
TYP	TYPICAL
RCP	REINFORCED CONCRETE PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
INV	INVERT
IWC #1	INTERMITTENT WATRECOURSE FLAG
WF #1	WETLAND FLAG
SNET	SOUTHERN NEW ENGLAND TELEPHONE
CL&P	CONNECTICUT LIGHT AND POWER
AT&T	AMERICAN TELEPHONE AND TELEGRAPH
248	EXISTING CONTOUR
	IRON PIN
	UTILITY POLE
	GUY WIRE
	SIGN
	WETLAND FLAG
	SEDIMENT FENCE
	STRAW WATTLE
	CHAIN LINK FENCE
E	ELECTRICAL CONDUIT
HE #1	APPROXIMATE HAND EXCAVATION LOCATION

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)

1 inch = 40 ft.



NOTE:
1. NO EXCAVATION WITHIN THE 18" SILTY SAND COVER LAYER.
2. CROSS SECTION DEVELOPED FROM LANDFILL CLOSURE REPORT PREPARED BY OTHERS AND MAY NOT REFLECT ACTUAL CONDITIONS.

BULKY WASTE LANDFILL SOIL CAP CROSS SECTION

NOT TO SCALE

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Mounting Plane 2 - Bulky Waste Area
Site Development Plan

SCALE: 1" = 40'

DATE: September 2015

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LEGEND & ABBREVIATIONS

TYP	TYPICAL
RCP	REINFORCED CONCRETE PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
INV	INVERT
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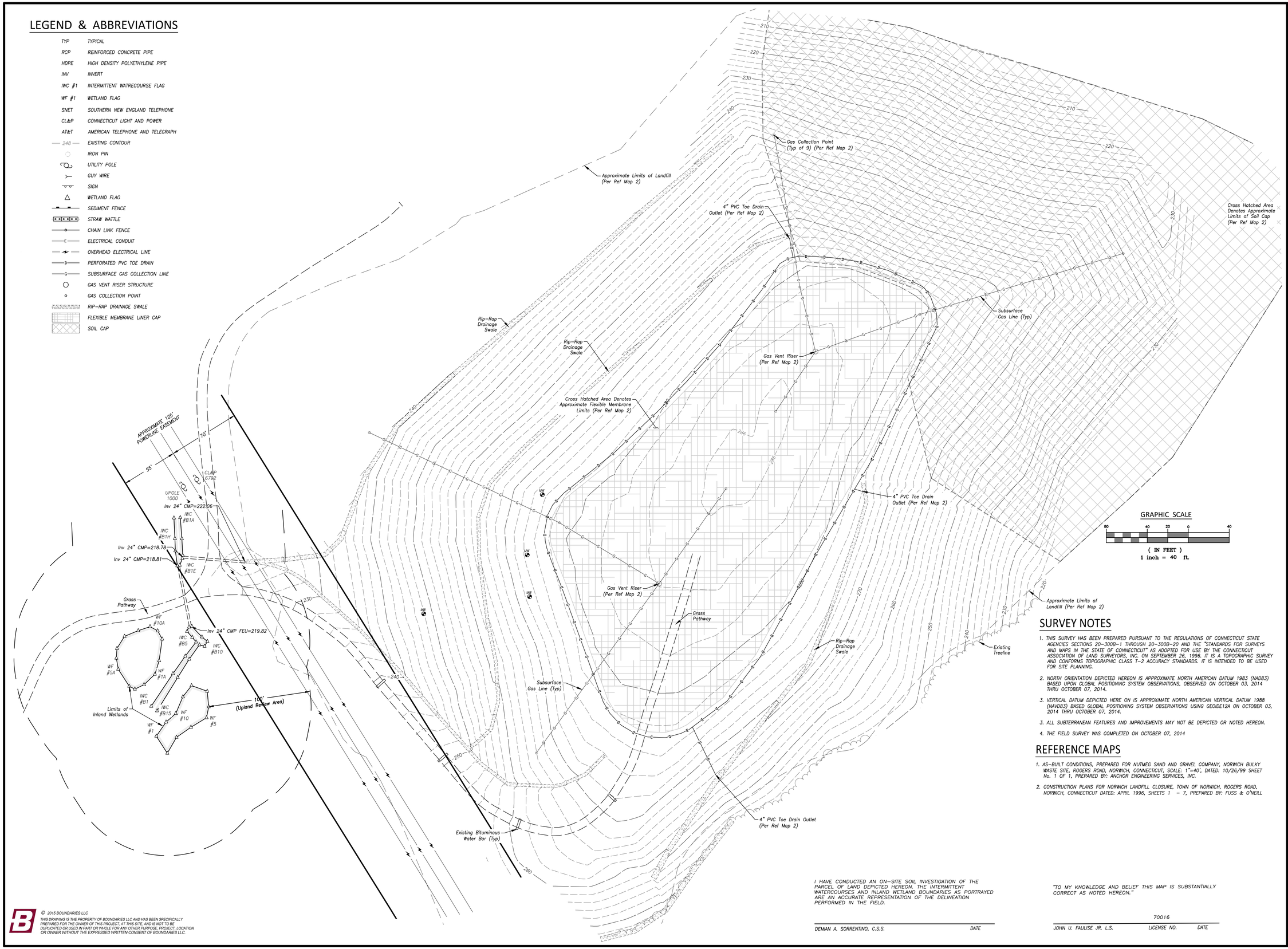
	IRON PIN
	UTILITY POLE
	GUY WIRE
	SIGN
	WETLAND FLAG
	SEDIMENT FENCE
	STRAW WATTLE
	CHAIN LINK FENCE
E	ELECTRICAL CONDUIT
	OVERHEAD ELECTRICAL LINE
D	PERFORATED PVC TOE DRAIN
G	SUBSURFACE GAS COLLECTION LINE
	GAS VENT RISER STRUCTURE
	GAS COLLECTION POINT
	RIP-RAP DRAINAGE SWALE
	FLEXIBLE MEMBRANE LINER CAP
	SOIL CAP



SURVEY NOTES

1. THIS SURVEY HAS BEEN PREPARED PURSUANT TO THE REGULATIONS OF CONNECTICUT STATE AGENCIES SECTIONS 20-300B-1 THROUGH 20-300B-20 AND THE "STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED FOR USE BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON SEPTEMBER 26, 1996. IT IS A TOPOGRAPHIC SURVEY AND CONFORMS TOPOGRAPHIC CLASS T-2 ACCURACY STANDARDS. IT IS INTENDED TO BE USED FOR SITE PLANNING.
2. NORTH ORIENTATION DEPICTED HEREON IS APPROXIMATE NORTH AMERICAN DATUM 1983 (NADB3) BASED UPON GLOBAL POSITIONING SYSTEM OBSERVATIONS, OBSERVED ON OCTOBER 03, 2014 THRU OCTOBER 07, 2014.
3. VERTICAL DATUM DEPICTED HERE ON IS APPROXIMATE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD83) BASED GLOBAL POSITIONING SYSTEM OBSERVATIONS USING GEOIDE12A ON OCTOBER 03, 2014 THRU OCTOBER 07, 2014.
3. ALL SUBTERRANEAN FEATURES AND IMPROVEMENTS MAY NOT BE DEPICTED OR NOTED HEREON.
4. THE FIELD SURVEY WAS COMPLETED ON OCTOBER 07, 2014

REFERENCE MAPS

1. AS-BUILT CONDITIONS, PREPARED FOR NUTMEG SAND AND GRAVEL COMPANY, NORWICH BULKY WASTE SITE, ROGERS ROAD, NORWICH, CONNECTICUT, SCALE: 1"=40', DATED: 10/26/99 SHEET No. 1 OF 1, PREPARED BY: ANCHOR ENGINEERING SERVICES, INC.
2. CONSTRUCTION PLANS FOR NORWICH LANDFILL CLOSURE, TOWN OF NORWICH, ROGERS ROAD, NORWICH, CONNECTICUT DATED: APRIL 1996, SHEETS 1 - 7, PREPARED BY: FUSS & O'NEILL

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DATE: September 2015

JOB I.D. NO. 14-2302

Revisions

Rev. A - Equipment Pad Details - 9/29/15

SHEET NO.

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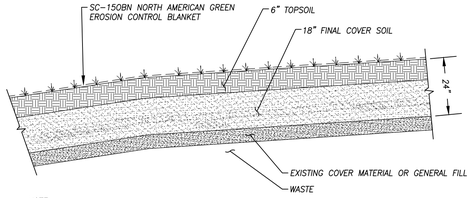
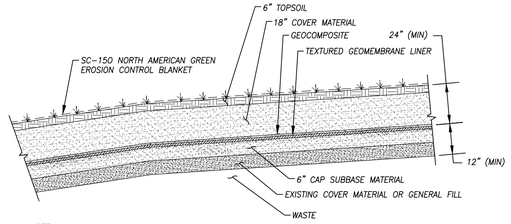


NOTE:
1. NO EXCAVATION WITHIN THE ORIGINAL COVER MATERIAL/GENERAL FILL LAYER.
2. CROSS SECTION DEVELOPED FROM LANDFILL CLOSURE PLANS PREPARED BY OTHERS AND MAY NOT REFLECT ACTUAL CONDITIONS.

NORWICH LANDFILL SOIL CAP CROSS SECTION

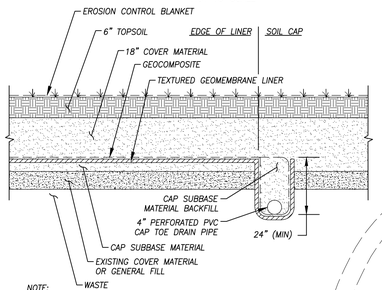
NOT TO SCALE



NOTE:
1. NO EXCAVATION WITHIN THE COVER MATERIAL LAYER.
2. CROSS SECTION DEVELOPED FROM LANDFILL CLOSURE PLANS PREPARED BY OTHERS AND MAY NOT REFLECT ACTUAL CONDITIONS.

NORWICH LANDFILL FLEXIBLE MEMBRANE LINER CAP CROSS SECTION

NOT TO SCALE



NOTE:
1. NO EXCAVATION WITHIN THE COVER MATERIAL LAYER.
2. CROSS SECTION DEVELOPED FROM LANDFILL CLOSURE PLANS PREPARED BY OTHERS AND MAY NOT REFLECT ACTUAL CONDITIONS.

FML CAP AND SOIL CAP INTERFACE CROSS SECTION

NOT TO SCALE

LEGEND & ABBREVIATIONS

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	GUY WIRE
	SIGN
	WETLAND FLAG
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	OVERHEAD ELECTRICAL LINE
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	GAS VENT RISER STRUCTURE
	GAS COLLECTION POINT
	RIP-RAP DRAINAGE SWALE
	FLEXIBLE MEMBRANE LINER CAP
	SOIL CAP

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)
1 inch = 40 ft.

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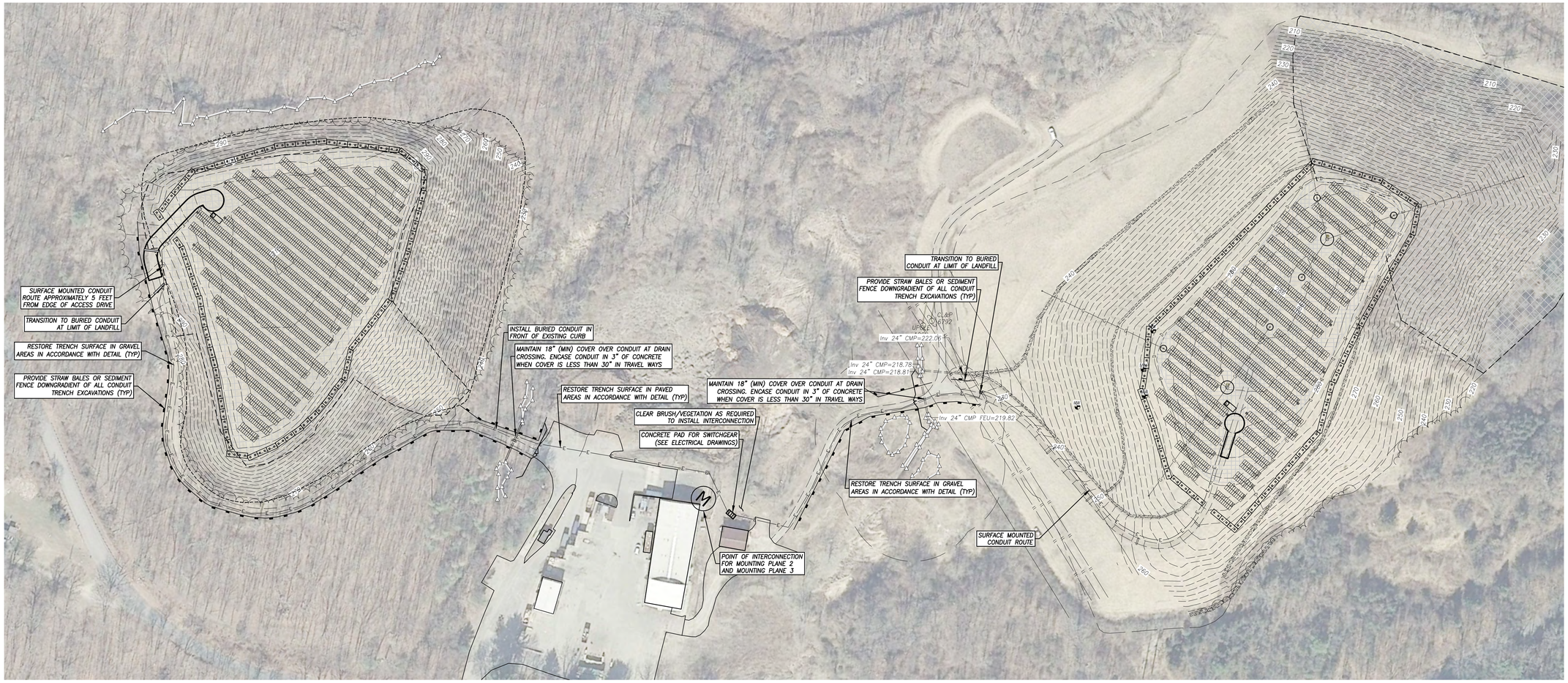

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	WETLAND FLAG
	SEDIMENT FENCE
	STRAW WATTLE
	CHAIN LINK FENCE
E	ELECTRICAL CONDUIT
U	OVERHEAD ELECTRICAL LINE

GRAPHIC SCALE

160 80 40 0 80

(IN FEET)
1 inch = 80 ft.

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Mounting Planes 2 & 3
Overall Site Utility Plan

SCALE: 1" = 80'
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JOB I.D. NO. 14-2302

Revisions
Rev. A - Equipment Pad Details - 9/29/15

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CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL CALL BEFORE YOU DIG AT 811 OR 1-800-922-4455 AT LEAST 72 HOURS, SATURDAY, SUNDAYS, AND HOLIDAYS EXCLUDED, PRIOR TO EXCAVATION AT ANY LOCATION. A COPY OF THE CALL BEFORE YOU DIG PROJECT REFERENCE NUMBER(S) SHALL BE GIVEN TO THE OWNER PRIOR TO EXCAVATION.
2. LOCATIONS OF EXISTING PIPES, CONDUITS, UTILITIES, FOUNDATIONS AND OTHER UNDERGROUND OBJECTS ARE NOT WARRANTED TO BE CORRECT AND THE CONTRACTOR SHALL HAVE NO CLAIM ON THAT ACCOUNT SHOULD THEY BE OTHER THAN THAT SHOWN.
3. STONE WALLS, FENCES, CURBS, ETC. SHALL BE REMOVED AND REPLACED AS NECESSARY TO PERFORM THE WORK. UNLESS OTHERWISE INDICATED, ALL SUCH WORK SHALL BE INCIDENTAL TO CONSTRUCTION OF THE PROJECT.
4. ALL OTHER DISTURBED BY THE CONTRACTOR BEYOND PAYMENT LIMITS SHALL BE RESTORED AT NO ADDITIONAL COST TO THE OWNER.
5. IF SURVEY CONTROL STAKING AND EROSION CONTROL MEASURES ARE REQUIRED, HAND DUG TEST HOLES WILL BE PERFORMED TO CONFIRM THE DEPTH TO THE LINER OR SOIL CAP, PRIOR TO INSTALLATION. ALL TEST HOLES SHALL BE VERIFIED BY THE ON-SITE ENGINEER.
6. ALL WORK SHALL BE DONE IN ACCORDANCE WITH OSHA REQUIREMENTS AND THE CONTRACTOR IS RESPONSIBLE FOR COMPLIANCE WITH THESE REQUIREMENTS. IN ADDITION, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE ANY EXCAVATION SAFEGUARDS, NECESSARY BARRICADES, FLAGMEN, ETC. FOR TRAFFIC CONTROL AND SITE SAFETY.
7. ALL EROSION & SEDIMENTATION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE START OF CONSTRUCTION.
8. ALL FUEL, OIL, PAINT OR OTHER HAZARDOUS MATERIALS USED DURING CONSTRUCTION SHOULD BE STORED IN A SECONDARY CONTAINER AND REMOVED TO A LOCKED INDOOR AREA WITH AN IMPERVIOUS FLOOR DURING NON-WORK HOURS.
9. NO WASTE MATERIALS (SUCH AS STUMPS) ARE ALLOWED TO BE BURIED ON SITE. ALL WASTE MATERIALS SHALL BE DISPOSED OF OFF-SITE AT AN APPROPRIATE LOCATION IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.

SPECIFICATIONS FOR WORK ON LANDFILL:

GENERAL:

1. THE CONTRACTOR SHALL BE AWARE THAT WORK IS LOCATED ON A LANDFILL AND IS SUBJECT TO THE CONNECTICUT SOLID WASTE REGULATIONS AND ANY REQUIREMENTS OUTLINED IN THE CT DEEP LANDFILL DISRUPTION AUTHORIZATION.
2. THE CONTRACTOR SHALL BE AWARE THAT THE WORK IS TO TAKE PLACE ABOVE A LANDFILL COVER SYSTEM, GENERALLY COMPRISED OF A VEGETATIVE SUPPORT LAYER, A SAND DRAINAGE LAYER, AND A LOW PERMEABILITY FLEXIBLE MEMBRANE LINER OR SOIL CAP. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO NOT DISRUPT THE LANDFILL CAP PROFILE OR TO DAMAGE THE LOW PERMEABILITY FLEXIBLE MEMBRANE LINER OR SOIL CAP.
3. WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE CONNECTICUT DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION'S PERMIT APPROVAL.
4. THE CONTRACTOR SHALL HAVE A HEALTH AND SAFETY PLAN WHILE WORKING ON THE LANDFILL.

EQUIPMENT:

1. THE CONTRACTOR SHALL PROVIDE A LIST OF ALL EQUIPMENT PROPOSED TO BE WORKING ON THE LANDFILL. THE LIST SHALL INCLUDE THE EQUIPMENT WEIGHT, GROUND PRESSURE, AND ANY RESTRICTIONS THAT WILL BE IMPOSED ON THE VEHICLE (I.E. LIMITED TO EXISTING ACCESS ROADS, LIMITED TO CARRYING ½ LOADS, ETC.)
2. ALL EQUIPMENT IS SUBJECT TO REVIEW AND APPROVAL BY THE ENGINEER. AS A GENERAL RULE, EQUIPMENT SHALL ADHERE TO THE FOLLOWING REQUIREMENTS:

Equipment Ground Pressure		Minimum Lift Thickness	
KPa	psi	meter	inches
<70	<10	0.30	12
70-140	10-20	0.60	24
>140	>20	0.90	36

SOURCE: GEOMEMBRANE PROTECTION DESIGN MANUAL, GSE; DHANI MAREJO, PH.D. AND GREG CORCORAN, P.E., FIRST EDITION.

EXCAVATIONS:

1. THE CONTRACTOR SHALL PROVIDE AN EXCAVATION PLAN DETAILING HOW THE CONTRACTOR WILL COMPLY WITH ALL PERTINENT PROVISIONS OF THE CONTRACT DOCUMENTS INCLUDING SITE RESTRICTIONS, WORK PROTOCOLS, TEMPORARY ROADS, ON-SITE PARKING AND STORAGE AREAS.
2. EXCAVATIONS ON THE LANDFILL AREA SHALL BE PERFORMED WITH THE GUIDANCE OF A LABORER OR "SPOTTER" AT ALL TIMES. THE LABORER SHALL IDENTIFY THE DEPTH OF THE LINER AND ENSURE THAT THE OPERATOR MAINTAINS A SAFE SEPARATING DISTANCE.
3. IT IS REQUIRED TO USE A SMOOTH BUCKET EXCAVATOR IN LIEU OF BUCKET WITH TEETH FOR EXCAVATIONS IN THE VICINITY OF THE LANDFILLS.

TEMPORARY EROSION CONTROL MEASURES:

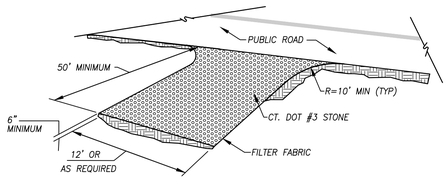
1. EROSION CONTROL MEASURES SHALL BE IMPLEMENTED AS DETERMINED BY THE ON-SITE ENGINEER.
2. THE SMALLEST PRACTICAL AREA OF LAND SHALL BE EXPOSED AT ANY ONE TIME.
3. SEDIMENT/EROSION CONTROL MEASURES SHALL BE INSTALLED AS SHOWN ON PLANS. EROSION CONTROL BARRIERS ARE TO BE MAINTAINED AND CLEANED UNTIL ALL SLOPES HAVE BEEN ADEQUATELY STABILIZED.
4. FILL MATERIAL SHALL BE FREE FROM STUMPS, WOOD, ROOTS, ETC.
5. THE TEMPORARY AND PERMANENT STORMWATER CONTROLS SHALL BE PERIODICALLY CLEANED OF SEDIMENT, AS REQUIRED BY THE ENGINEER. THE SEDIMENT WILL BE REMOVED TO A SECURE LOCATION SO AS TO PREVENT SILTATION OF NATURAL WATER WAYS.
6. STRAW WATTLES MUST BE A MINIMUM TUBE DIAMETER OF 12 INCHES (300MM) FOR SLOPES UP TO 50 FEET (15.24M) IN LENGTH WITH A SLOPE RATIO OF 3H:1V OR STEEPER. LONGER SLOPS OF 3H:1V MAY REQUIRE LARGER TUBE DIAMETER OR ADDITIONAL COURSING OF FILTER TUBES TO CREATE A FILTER BERM. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SITUATIONS WITH LONGER OR STEEPER SLOPES.
7. INSTALL TUBES ALONG CONTOURS AND PERPENDICULAR TO SHEET OR CONCENTRATED FLOW.
8. CONFIGURE TUBES AROUND EXISTING SITE FEATURES TO MINIMIZE SITE DISTURBANCE AND MAXIMIZE CAPTURE AREA OF STORMWATER RUN-OFF.
9. EROSION CONTROL MEASURES SHALL BE REMOVED WHEN DISTURBED AREA IS STABILIZED. DISTURBED AREA RESULTING FROM THE SILT FENCE REMOVAL OPERATION SHALL BE SEEDED IN ACCORDANCE WITH THE SPECIFICATIONS.
10. EROSION CONTROLS OTHER THAT AS SHOWN (I.E. HAY BALES) MUST BE APPROVED BY THE ENGINEER.

EROSION CONTROL NOTES:

1. THE RESPONSIBLE PARTY FOR THE INSTALLATION AND MAINTENANCE OF ALL EROSION CONTROL MEASURES IS ROBERT MILLER AT SOLARCITY AT 914-584-6894.
2. THE "2002 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL" BY THE CONNECTICUT COUNCIL ON SOIL AND WATER CONSERVATION IN COOPERATION WITH THE CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION, DEP BULLETIN 34, SHALL BE USED FOR INSTALLING AND MAINTAINING ALL EROSION CONTROL MEASURES. THE CONTRACTOR SHALL INSTALL ADDITIONAL MEASURES AS NECESSARY IF DIRECTED BY THE ENGINEER.
3. SEEDING FOR PERMANENT STABILIZATION SHALL BE DONE BETWEEN APRIL 15 THROUGH JUNE 15 OR BETWEEN AUGUST 15 THROUGH SEPTEMBER 15. IF SEEDING CANNOT BE DONE WITHIN THESE TIMES, APPLY TEMPORARY MULCH UNTIL NEXT SEEDING TIME. SEED MIXTURE SHALL BE AS FOLLOWS:

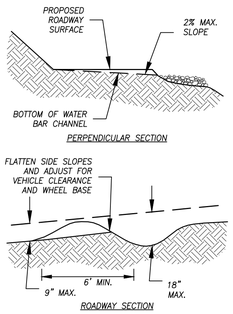
ALL 2:1 SLOPE AREAS			
CROWN VETCH	15 LBS/ACRE	OR	0.35 LBS/1,000 SF
PERENNIAL RYEGRASS	10 LBS/ACRE	OR	0.25 LBS/1,000 SF
ALL OTHER GRASSED AREAS			
CREEPING RED FESCUE	20 LBS/ACRE	OR	0.45 LBS/1,000 SF
REDTOP	2 LBS/ACRE	OR	0.05 LBS/1,000 SF
CROWN VETCH	15 LBS/ACRE	OR	0.35 LBS/1,000 SF

4. MULCH SHALL BE A GOOD QUALITY HAY OR STRAW AND SHALL BE APPLIED AT A RATE OF 2 BALES/1,000 SF.
5. ALL EROSION CONTROL MEASURES SHALL BE INSPECTED WITHIN 24 HOURS AFTER RAIN EVENTS AND REPAIRED OR REPLACED AS NECESSARY TO INSURE COMPLIANCE WITH THE APPROVED SOIL EROSION AND SEDIMENT CONTROL PLAN.
6. DUST CONTROL MEASURES WILL BE IMPLEMENTED DURING DRY CONDITIONS AND INCLUDE WATERING WITH A TANK TRUCK ON AN AS-NEEDED BASIS IN ORDER TO INSURE THAT NO AMBIENT DUST CONDITIONS ARE GENERATED FROM THE PROJECT.
7. THE ANTI-TRACKING PAD SHALL BE INSPECTED ON A WEEKLY BASIS AND MAINTAINED THROUGHOUT THE DURATION OF THE CONSTRUCTION FOR THIS PROJECT. WHEN THE ANTI-TRACKING PAD IS NO LONGER FUNCTIONING EFFICIENTLY OR ACCUMULATED SEDIMENT IS TO A DEPTH OF 2" BELOW THE STONE SURFACE, THE ANTI-TRACKING PAD SHALL BE REMOVED AND REPLACED AS PER THE DETAIL INDICATED ON THESE PLANS.



ANTI-TRACKING PAD

NOT TO SCALE



WATER BAR DETAIL

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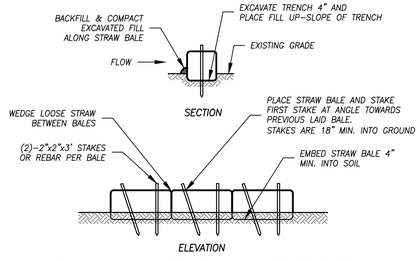
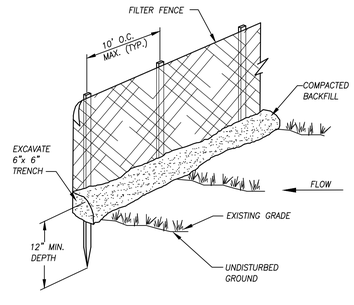


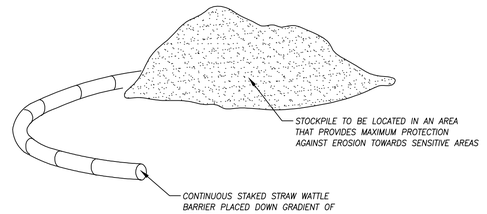
STRAW BALE BARRIER DETAIL (OFF CAP)

NOT TO SCALE



SEDIMENT FENCE DETAIL (OFF CAP)

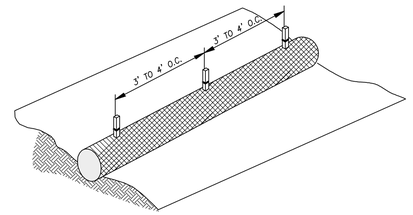
NOT TO SCALE



NOTE: LONG AXIS OF STOCKPILE TO BE PERPENDICULAR TO CONTOUR.

TEMPORARY STOCKPILE BARRIER DETAIL

NOT TO SCALE

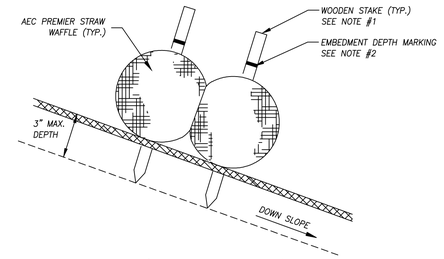


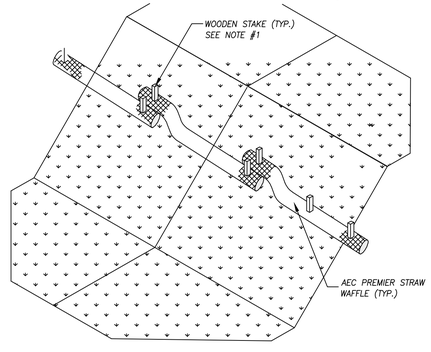
STRAW WATTLE INSTALLATION DETAIL (ON CAP)

NOT TO SCALE

NOTES:

1. PRIOR TO INSTALLATION OF WATTLES OR OTHER APPROVED EROSION CONTROL MEASURES, THE CONTRACTOR MUST PERFORM HAND DUG TEST HOLES UNDER THE SUPERVISION OF THE ON-SITE ENGINEER. IF SUFFICIENT CLEARANCE IS NOT FOUND, CONCRETE BLOCKS WILL BE USED AS A SUBSTITUTE FOR STAKES.
2. WATTLES CAN BE STAKED ON THE LANDFILL PROVIDED THE STAKES DO NOT EXCEED 3 INCHES INTO THE VEGETATIVE SUPPORT LAYER. STAKES SHALL BE CLEARLY MARKED 16 INCHES FROM THE TIP OF THE STAKE (3" MAX. EMBEDMENT DEPTH + 12" WATTLE) AND SHALL BE CLEARLY VISIBLE.





STRAW WATTLE SLOPE INSTALLATION DETAIL (ON CAP)

NOT TO SCALE

29102

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P:\CIVIL 3D PROJECTS\2014\14-2302 - BRIGHTFIELDS-NORWICH\DWG\DESIGN\(9) EROSION & SEDIMENT CTRL NARRATIVE & DETAILS.DWG

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SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Mounting Planes 1-3
Erosion & Sediment Control Narrative and Details

SCALE:

DATE: September 2015

JOB I.D. NO. 14-2302

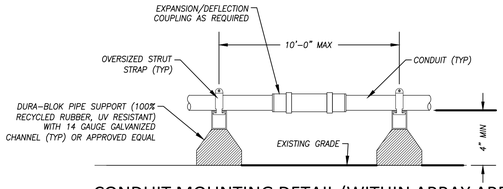
Revisions

Rev. A - Equipment Pad Details - 9/29/15

SHEET NO.

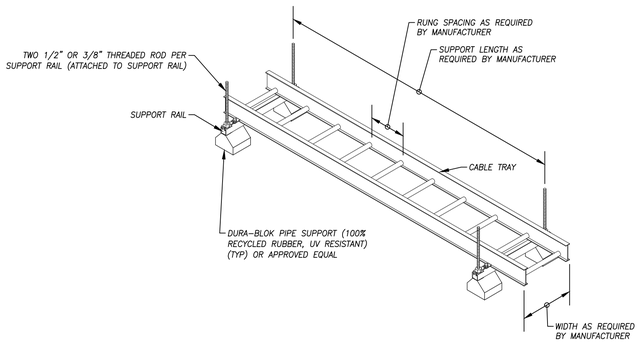
9

12



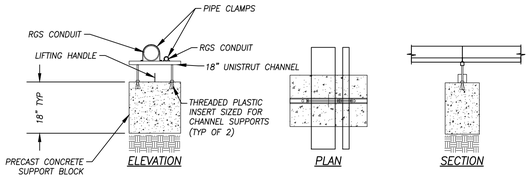
CONDUIT MOUNTING DETAIL (WITHIN ARRAY AREA)

NOT TO SCALE



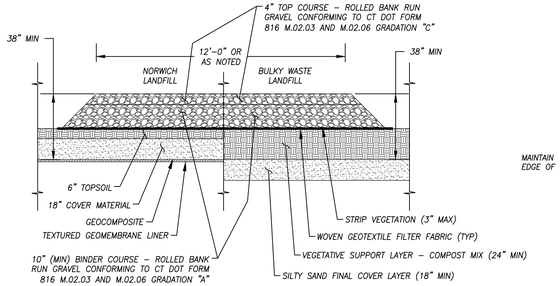
CABLE TRAY DETAIL (WITHIN ARRAY AREA)

NOT TO SCALE



CONCRETE BLOCK RACEWAY DETAIL (ON LANDFILL CAP)

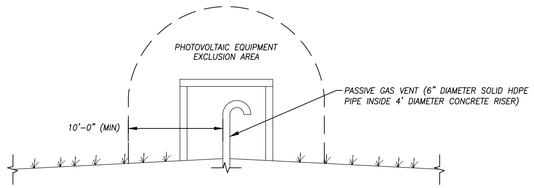
NOT TO SCALE



NOTE:
1. TEST PITS TO DETERMINE EXISTING ACCESS ROAD THICKNESS SHALL BE COMPLETED PRIOR TO UTILIZATION FOR CONSTRUCTION EQUIPMENT. IMPROVE AS REQUIRED FOR CONSTRUCTION EQUIPMENT USE.
2. ACCESS ROAD TO COMPLY WITH H-20 WHEEL LOADING.
3. TEST PITS TO DETERMINE CAPPING SYSTEM AND CONFIRM LAYER THICKNESS SHALL BE PERFORMED PRIOR TO INSTALLATION OF THE ACCESS ROAD.
4. ROADWAY DESIGN TO COMPLY WITH LOCAL EMERGENCY SERVICE REQUIREMENTS.
5. COMPACT PERMANENT ACCESS ROAD TO 95% MAXIMUM DENSITY IN LIFTS NOT TO EXCEED 12".

PERMANENT/TEMPORARY LANDFILL ACCESS ROAD

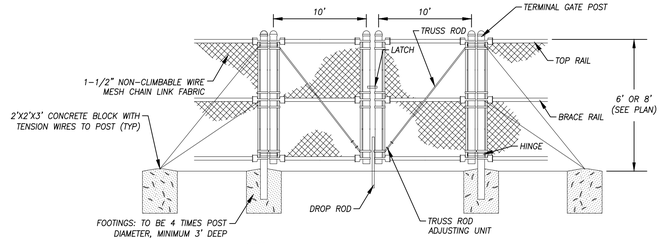
NOT TO SCALE



NOTE:
1. NO EQUIPMENT ASSOCIATED WITH THE PHOTOVOLTAIC SYSTEM SHALL BE LOCATED WITHIN A 10' EXCLUSION AREA OF PASSIVE GAS VENTS.
2. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING THE EXISTING GAS VENTS FROM DAMAGE FROM CONSTRUCTION EQUIPMENT/VEHICLES. ANY DAMAGE TO EXISTING GAS VENTS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER AND REPAIRED AT NO COST TO THE OWNER/DEVELOPER.

PASSIVE GAS VENT (EQUIPMENT FREE AREA) DETAIL

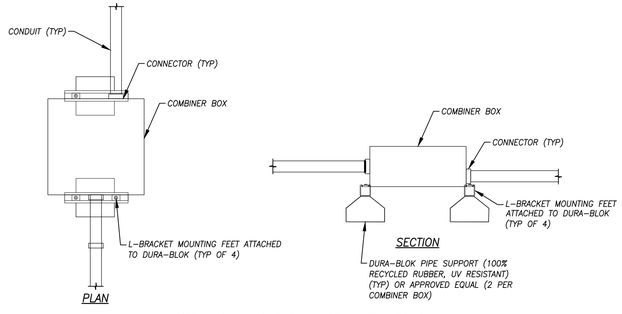
NOT TO SCALE



NOTE:
SWING GATES TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

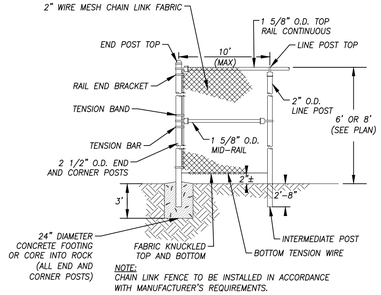
OFF CAP GALVANIZED SWING GATE DETAIL MOUNTING PLANE #1

NOT TO SCALE



COMBINER BOX MOUNTING DETAIL

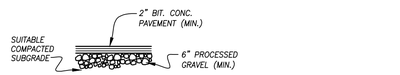
NOT TO SCALE



NOTE:
CHAIN LINK FENCE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

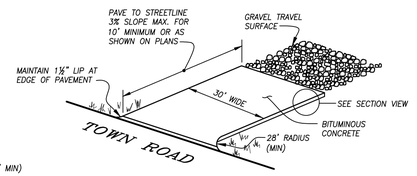
OFF CAP GALVANIZED CHAIN LINK FENCE DETAIL

NOT TO SCALE



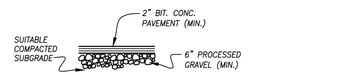
SECTION VIEW

NOT TO SCALE



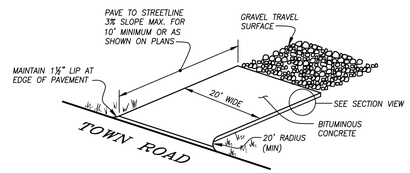
TYPICAL DRIVEWAY APRON MOUNTING PLANE #1

NOT TO SCALE



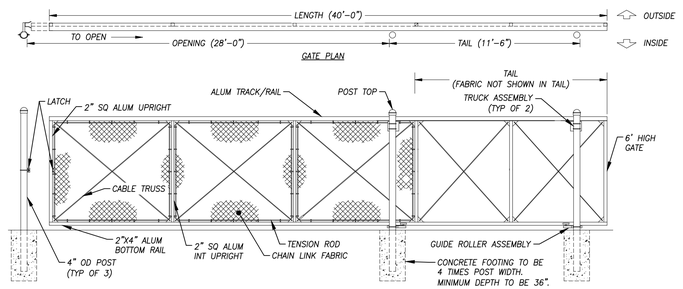
SECTION VIEW

NOT TO SCALE



TYPICAL DRIVEWAY APRON MOUNTING PLANE #4

NOT TO SCALE



NOTES:
1. SLIDE GATE BY MASTER HALCO OR APPROVED EQUAL.
2. SLIDE GATE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

ALUMINUM SINGLE-TRACK CANTILEVERED SLIDE GATE DETAIL

NOT TO SCALE



NOTE:
1. SIGNS MOUNTED ON GATES AT ALL ENTRANCES.
2. SIGNS TO BE RATED FOR OUTDOOR ENVIRONMENTS.

IDENTIFICATION SIGNAGE

NOT TO SCALE

29102

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SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Mounting Planes 1-3
Site Details

SCALE:

DATE: September 2015

JOB I.D. NO. 14-2302

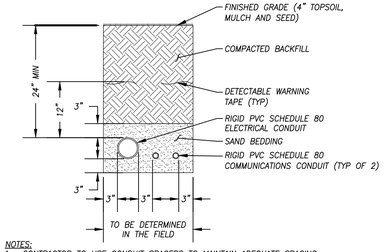
Revisions

Rev. A - Equipment Pad Details - 9/29/15

SHEET NO.

10

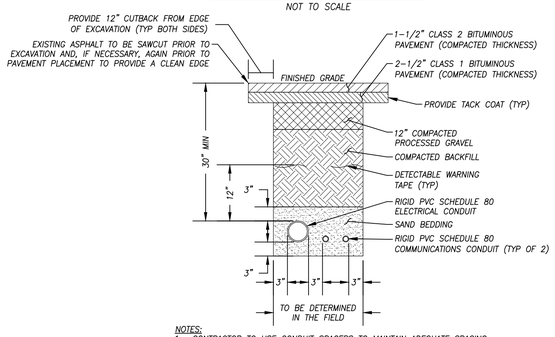
12



NOTES:
1. CONTRACTOR TO USE CONDUIT SPACERS TO MAINTAIN ADEQUATE SPACING.
2. MAINTAIN 3" SPACING BETWEEN OUTER WALLS OF CONDUITS.

OFF CAP TYPICAL MEDIUM VOLTAGE CONDUIT TRENCH DETAIL

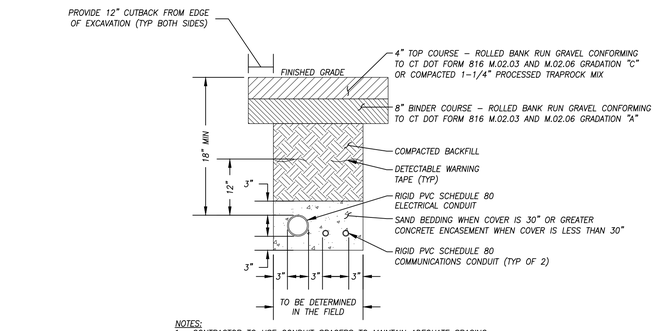
NOT TO SCALE



NOTES:
1. CONTRACTOR TO USE CONDUIT SPACERS TO MAINTAIN ADEQUATE SPACING.
2. MAINTAIN 3" SPACING BETWEEN OUTER WALLS OF CONDUITS.

TYPICAL MEDIUM VOLTAGE CONDUIT TRENCH (IN PAVED AREAS) DETAIL

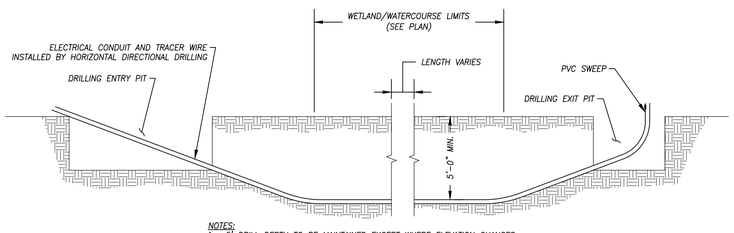
NOT TO SCALE



NOTES:
1. CONTRACTOR TO USE CONDUIT SPACERS TO MAINTAIN ADEQUATE SPACING.
2. MAINTAIN 3" SPACING BETWEEN OUTER WALLS OF CONDUITS.

TYPICAL MEDIUM VOLTAGE CONDUIT TRENCH (IN GRAVEL AREAS) DETAIL

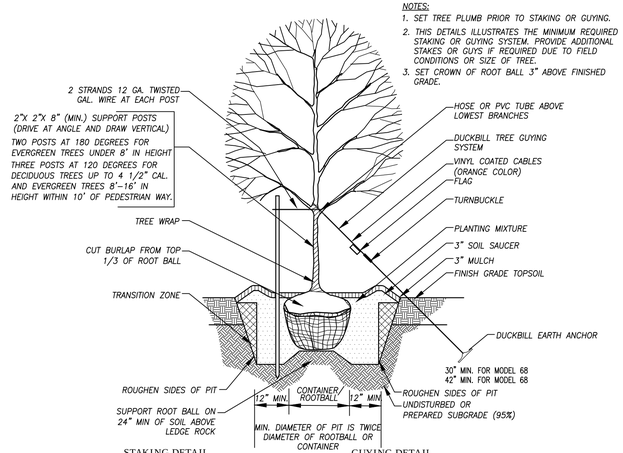
NOT TO SCALE



NOTES:
1. 5' DRILL DEPTH TO BE MAINTAINED EXCEPT WHERE ELEVATION CHANGES ARE REQUIRED TO AVOID OBSTACLES.
2. REFER TO ELECTRICAL PLANS AND WIRE SCHEDULE FOR ACTUAL NUMBER AND LOCATION OF CONDUITS.

TYPICAL HORIZONTAL DIRECTIONAL DRILLING DETAIL

NOT TO SCALE



NOTES:
1. SET TREE PLUMB PRIOR TO STAKING OR GUYING.
2. THIS DETAILS ILLUSTRATES THE MINIMUM REQUIRED STAKING OR GUYING SYSTEM. PROVIDE ADDITIONAL STAKES OR GUYS IF REQUIRED DUE TO FIELD CONDITIONS OR SIZE OF TREE.
3. SET CROWN OF ROOT BALL 3" ABOVE FINISHED GRADE.

STAKING DETAIL

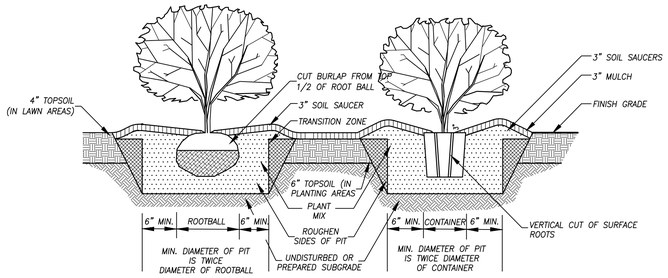
FOR USE WITH:
A. DECIDUOUS TREES UNDER 3" CALIPER.
B. DECIDUOUS TREES 3"–4 1/2" CALIPER WHEN PLANTED WITHIN 10' OF PEDESTRIAN WAYS.
C. EVERGREEN TREES UNDER 8' IN HEIGHT.
D. EVERGREEN TREES 8'–16' IN HEIGHT WHEN PLANTED WITHIN 10' OF PEDESTRIAN WAYS.

GUYING DETAIL

FOR USE WITH:
A. DECIDUOUS TREES 3"–4 1/2" CALIPER WHEN PLANTED GREATER THAN 10' OUTSIDE OF PEDESTRIAN WAYS.
B. DECIDUOUS TREE OVER 4 1/2" CALIPER.
C. EVERGREEN TREES 8'–16' IN HEIGHT WHEN PLANTED GREATER THAN 10' OUTSIDE OF PEDESTRIAN WAYS.
D. EVERGREEN TREES OVER 16' IN HEIGHT.

TREE PLANTING DETAIL

NOT TO SCALE



BALLED AND BURLAPPED MATERIAL — CONTAINER GROWN MATERIAL

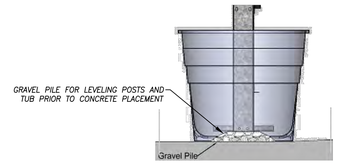
NOTES:
1. SET CROWN OF ROOTBALL 2" ABOVE FINISH GRADE.
2. FOR CONTAINER GROWN STOCK USE FINGERS OR A SHARP KNIFE TO LOOSEN ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS CIRCLING THE PERIMETER OF THE CONTAINER.
3. AT PLANTING THOROUGHLY SOAK THE ROOT MASS AND ADJACENT SOIL. REPEAT SEVERAL TIMES DURING THE FIRST MONTH AND THROUGHOUT THE FOLLOWING TWO SUMMERS.

SHRUB PLANTING DETAIL

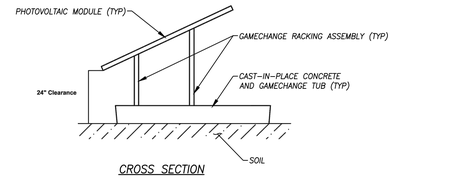
NOT TO SCALE

PLANTING SPECIFICATIONS:

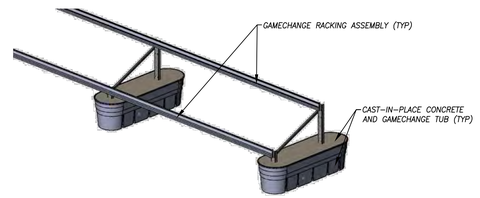
1. All materials and construction methods shall conform to the requirements of the Connecticut Association of Landscape Contractors Specification. All plants shall be nursery grown and conform to the latest edition of ANSI 260.1, AMERICAN STANDARD FOR NURSERY STOCK and also the minimum guidelines established for nursery stock published by the American Association of Nurserymen, Inc.
2. No substitution of plant materials will be allowed without the prior written consent of the Project Owner. Where a plant size range is provided at least 50% of the plants shall be of the larger size.
3. All lawn and planting area soil preparation shall be fertilized and amended according to recommendations of a soil analysis provided by an approved soil testing laboratory.
4. All exterior ground areas disturbed by construction and not covered by buildings, structures, paving, continuous planting beds or other site improvements shall be graded, topsoiled to a minimum depth of 4" and grass seeded. Provide lawn development in all areas of selective clearing as directed.
5. All plant pits must be free draining. Break up the bottom of the hole by fork if necessary to ensure plant has proper drainage.
6. Set all plants in center of plant pits, plumb and straight and as detailed on the drawing. All plant material shall bear the same relationship to finished grade as to original planting grade prior to digging. Trees shall be planted with the junction of roots and stem level with finished grade.
7. Handle balled and burlapped plants from the ball only. Once positioned in the hole, remove the top 1/3 of the burlap from the root ball without disturbing the roots.
8. Face each plant to give the best appearance. Final location of plant material should be approved by the Project Owner in the field.
9. Fill plant pits 2/3 their depth with prepared planting mixture, water thoroughly and allow to settle. Complete back-filling, water thoroughly to eliminate any voids and air pockets. Provide additional back-fill as necessary to conform to required elevation and as detailed.
10. Form saucer and install mulch over entire plant pit and saucer area as detailed.
11. All tree staking or guying shall be completed immediately after planting, but in no instance more than 24 hours after planting. See staking/guying detail. At the completion of the maintenance period remove all stakes, flags, guys, tree wrap, and anchors.
12. Mulch all new shrub beds and plant pits to achieve a 3" depth after settlement. Mulch all ground cover beds to achieve a 2" depth after settlement. Mulch for saucers and planting areas to be a double shredded bark mulch.
13. All plants shall be guaranteed for a period of one full year after inspection and acceptance by the Owner's representative, and shall have at least 80% healthy growth at the end of the guarantee period.
14. Landscape planting materials as proposed by this plan are Connecticut native and/or non-invasive species. This landscape plan has been designed to incorporate species which are prolific in USDA plant hardiness zone 6b and which require minimal energy input for upkeep and maintenance. References utilized for Connecticut native and non-invasive species selection include the Connecticut Botanical Society, the Connecticut agricultural experiment station, the U.S. Department of Transportation Federal Highway Administration, 2004 Connecticut Stormwater Quality Manual, New England Wetland Plants, Inc., and other sources.



GAMECHANGE TUB CROSS SECTION



CROSS SECTION



ISOMETRIC

NOTES:
1. GAMECHANGE RACKING SYSTEM TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.
2. SEE MANUFACTURER'S DETAIL SHEETS FOR ADDITIONAL INFORMATION AND INSTALLATION SEQUENCE.

ON-CAP SOLAR ARRAY AND RACKING SYSTEM

NOT TO SCALE

NOTES:
SEE MANUFACTURER'S DETAIL SHEETS FOR ADDITIONAL INFORMATION REGARDING RACKING SYSTEM REQUIREMENTS AND INSTALLATION PROCEDURES. RACKING SYSTEM TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

TYPICAL POST MOUNTED RACKING SYSTEM DETAIL (OFF-CAP)

NOT TO SCALE

29102

DAVID C. McKAY, P.E. LICENSE NO. DATE

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P:\CIVIL 3D PROJECTS\2014\14-2302 - BRIGHTFIELDS NORWICH\DWG\DESIGN\(10-11) SITE DETAILS.DWG

CIVIL ENGINEERING LAND SURVEYING LAND DEVELOPMENT LAND PLANNING SOLAR DESIGN
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SolarCity
714 Brook Street
Rocky Hill, CT 06067
www.solarcity.com

SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Mounting Planes 1-3
Site Details

SCALE:

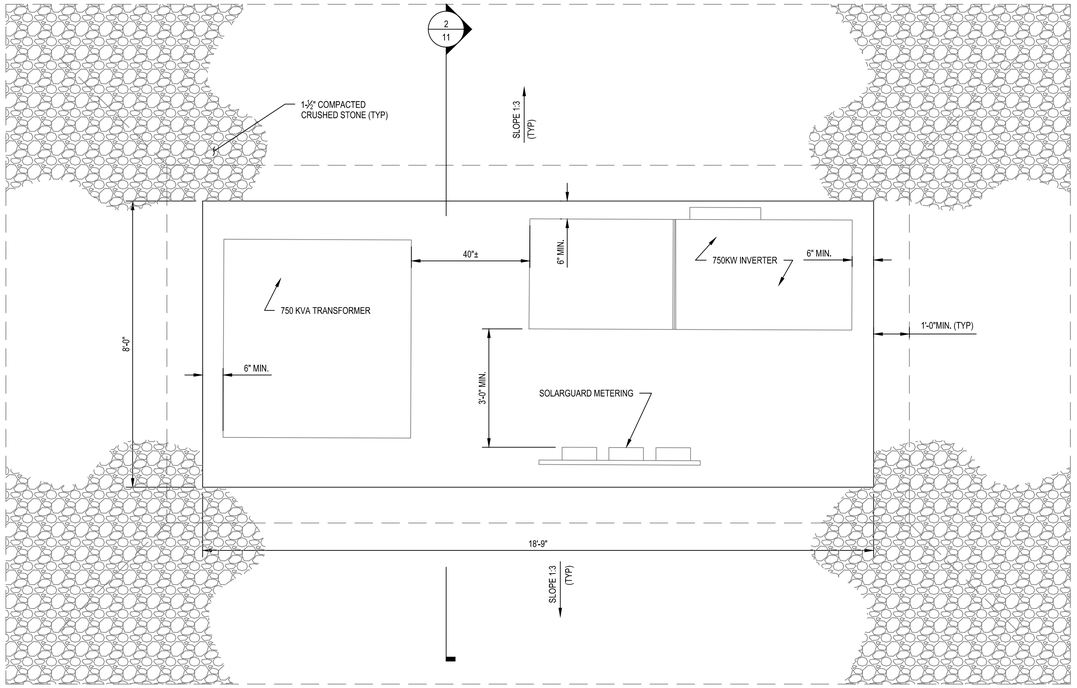
DATE: September 2015

JOB I.D. NO. 14-2302

Revisions

Rev. A - Equipment Pad Details - 9/29/15

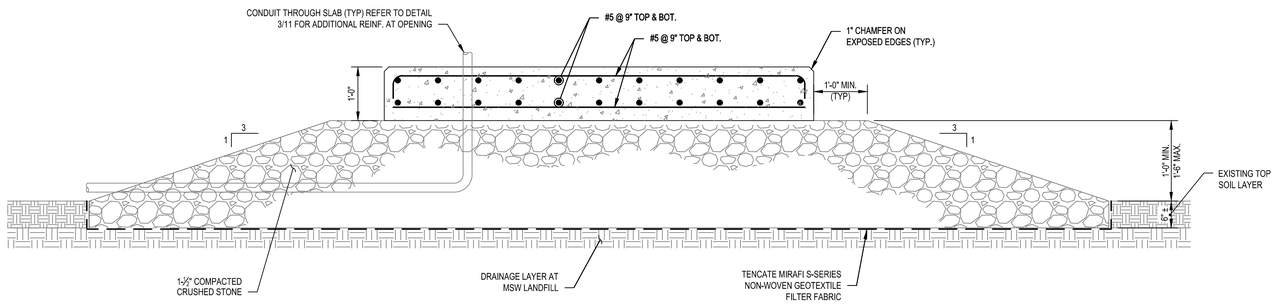
SHEET NO. 11 / 12



1 PLAN VIEW

SCALE: 1/2"=1'-0"

NOTES:
1. COORDINATE DIMENSIONS WITH EQUIPMENT REQUIREMENTS AND ELECTRICAL DRAWINGS.
2. ANCHOR EQUIPMENT TO SLAB PER MANUFACTURER'S REQUIREMENTS
3. TWO (2) PADS ARE REQUIRED: ONE (1) AT MSW LANDFILL AND ONE (1) AT BULKY WASTE LANDFILL.



2 PAD SECTION

SCALE: 3/4"=1'-0"

NOTE:
1. DO NOT DISTURB DRAINAGE LAYER AT MSW LANDFILL.
2. COORDINATE CONDUIT LOCATIONS WITH ELECTRICAL DRAWINGS.

PERMIT SET
9/29/2015

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1.0 GENERAL NOTES:
1. ALL WORK SHALL CONFORM WITH THE CONNECTICUT STATE BUILDING CODE 2005 SUPPLEMENT AND AMENDMENTS, INTERNATIONAL BUILDING CODE (2003), ASCE 7-02, AND THE BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE (ACI 318-02).
2. THE CONTRACTOR IS RESPONSIBLE FOR CHECKING, COORDINATING AND VERIFYING ALL DIMENSIONS IN THE FIELD PRIOR TO COMMENCING WORK.
3. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF UNANTICIPATED CONDITIONS THAT MAY BE UNCOVERED DURING CONSTRUCTION.
4. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING IN THE FIELD THE EXISTENCE OF ALL EMBEDDED UTILITIES AND DETERMINING THE EXISTENCE OF ALL MECHANICAL, ELECTRICAL AND PLUMBING SYSTEMS AFFECTED BY THE WORK OF THIS CONTRACT.

2.0 FOUNDATIONS:
1. THE CONTRACTOR SHALL DESIGN AND PROVIDE ALL TEMPORARY EARTH SUPPORT, SHORING AND BRACING NECESSARY TO PERFORM THE WORK IN ACCORDANCE WITH OSHA, STATE AND LOCAL REQUIREMENTS.
2. FOUNDATIONS SHALL BE INSTALLED IN THE GEOMETRY SHOWN IN THE PLANS.
3. REFER TO THE GEOTECHNICAL MEMOS BY WESTON & SAMPSON DATED 09/02/2015 AND 09/04/2015 FOR ADDITIONAL DATA AND REQUIREMENTS.
4. EXCAVATION FOR SUBGRADE SHALL BE PERFORMED USING A SMOOTH EDGED BUCKET.
5. THOROUGHLY COMPACT SUBGRADE BY MECHANICAL MEANS. THE CONTRACTOR SHALL USE CAUTION TO NOT OVERSTRESS THE FLEXIBLE MEMBRANE LINER WHEN SELECTING EQUIPMENT AND PERFORMING COMPACTION AT THE MSW LANDFILL. REFER TO THE GEOTECHNICAL MEMO BY WESTON & SAMPSON DATED 09/02/2015 FOR ADDITIONAL DATA AND RECOMMENDATIONS.

3.0 CAST IN PLACE CONCRETE
1. CONCRETE WORK SHALL CONFORM TO "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" (ACI 318-02).
2. CONCRETE SHALL BE CONTROLLED CONCRETE, PROPORTIONED, MIXED AND PLACED IN THE PRESENCE OF A REPRESENTATIVE TESTING AGENCY.
3. CONCRETE SHALL BE NORMAL WEIGHT AND HAVE THE FOLLOWING PROPERTIES:
   A. MINIMUM 28 DAY COMPRESSIVE STRENGTH 4000 PSI.
   B. MAXIMUM SLUMP 4"
4. SUBMIT CONCRETE MIX DESIGNS FOR APPROVAL.

4.0 CAST IN PLACE REINFORCEMENT
1. REINFORCEMENT DETAILING, FABRICATION, AND ERECTION SHALL CONFORM TO "ACI DETAILING MANUAL" - SP-66, "CRSI MANUAL OF STANDARD PRACTICE".
2. STEEL REINFORCEMENT, UNLESS NOTED OTHERWISE, SHALL CONFORM TO THE FOLLOWING:
   A. BARS, TIES, AND STIRRUPS ASTM A615 GRADE 60
3. REINFORCING STEEL SHALL BE UNCOATED AND DEFORMED.
4. MINIMUM CONCRETE PROTECTIVE COVERING FOR REINFORCEMENT, UNLESS REQUIRED FOR FIRE PROTECTION OR NOTED OTHERWISE, SHALL BE AS FOLLOWS:
   A. CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH: 3"
   B. CONCRETE EXPOSED TO EARTH OR WEATHER:
      (1) NO. 6 THRU NO. 18 BARS 2"
      (2) NO. 5 BAR, W31 OR D31 WIRE AND SMALLER 1½"
5. FOR REINFORCING STEEL SPLICE LAP LENGTHS REFER TO THE TABLE PROVIDED UNLESS NOTED OTHERWISE.
6. REINFORCEMENT SHALL NOT BE TACK WELDED.
7. DOWELS SHALL MATCH BAR SIZE, NUMBER AND SPACING, UNLESS NOTED OTHERWISE.
8. SUBMIT REINFORCING SHOP DRAWINGS FOR APPROVAL.

5.0 DESIGN LOADS

LOADS, LOADING CONDITIONS AND COMBINATIONS SHALL BE IN ACCORDANCE WITH THE CONNECTICUT STATE BUILDING CODE 2005 SUPPLEMENT AND AMENDMENTS, IBC 2003, AND ASCE 7-02 AS APPLICABLE. LOADS DESIGNATED BY "PSF" ARE UNIFORM LOADS, THOSE DESIGNATED BY "LB" ARE CONCENTRATED LOADINGS AND SHALL BE APPLIED AS REQUIRED BY THE CONNECTICUT STATE BUILDING CODE.

BUILDING OCCUPANCY CATEGORY II

1. DEAD LOADS
   1.1. SELFWEIGHT OF ALL ATTACHED ELEMENTS, CONSULT APPLICABLE DRAWINGS AND TRADES FOR FURTHER INFORMATION
   1.1.1. TRANSFORMER 5,920 LBS.
   1.1.2. INVERTER 3,570 LBS.

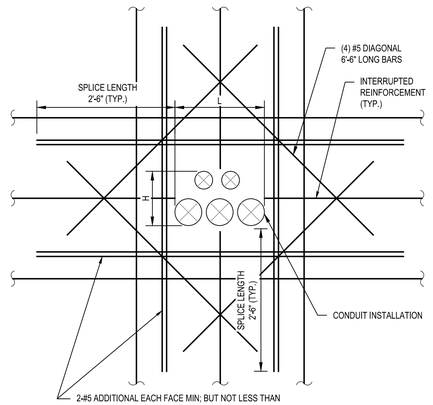
2. SNOW LOAD:
   2.1. GROUND SNOW LOAD, PG 30 PSF
   2.2. HEATED SPACE
   2.2.1. FLAT ROOF SNOW LOAD, PF 30 PSF MIN.
   2.2.2. SNOW EXPOSURE FACTOR, CE 1.0
   2.2.3. SNOW LOAD IMPORTANCE FACTOR, I 1.0 II
   2.2.4. THERMAL FACTOR, CT 1.2

3. WIND DESIGN DATA
   3.1. BASIC WIND SPEED, V 110 MPH
   3.2. WIND IMPORTANCE FACTOR, I 1.0, II
   3.3. WIND EXPOSURE C

4. EARTHQUAKE DESIGN DATA
   4.1. SEISMIC IMPORTANCE FACTOR, I 1.0, II
   4.2. MAPPED SPECTRAL RESPONSE ACCELERATIONS, SS, S1 0.270G, 0.068G
   4.3. SITE CLASS **

5. GEOTECHNICAL INFORMATION
   5.1. ALLOWABLE NET BEARING PRESSURE **

** REFER TO GEOTECHNICAL MEMOS BY WESTON & SAMPSON DATED 09/02/2015 AND 09/04/2015 FOR DATA AND REQUIREMENTS.



2-#5 ADDITIONAL EACH FACE MIN; BUT NOT LESS THAN 50% OF INTERRUPTED SLAB REINF EACH SIDE OF OPENING. SPACE BARS AT 3" OC, EACH FACE. LENGTH OF ADDL REINF = (L + 60") OR (H+60").

NOTES:

1. SLAB OPENINGS SHALL BE COORDINATED AND DETAILED ON THE REINFORCEMENT SHOP DRAWINGS.

3 ADDITIONAL SLAB REINFORCING AT CONDUIT PENETRATIONS

WESTON & SAMPSON ENGINEERS, INC. LICENSE NO. DATE

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SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Structural Details for On-Cap Equipment Pads

SCALE:
DATE: September 2015
JOB I.D. NO. 14-2302
Revisions

SHEET NO.
12
12

APPENDIX G

Geotechnical Recommendation Memorandum

Weston & Sampson Engineers, Inc.
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MEMORANDUM

TO:	Mr. Michael Singer, Principal, Brightfields Development, LLC.
FROM:	Thomas J. Strike, Weston & Sampson Engineers, Inc. Mark Mitsch, P.E., Weston & Sampson Engineers, Inc.
CC:	John Figurelli, P.G., Weston & Sampson Engineers, Inc.
DATE:	September 2, 2015
SUBJECT:	Geotechnical Assessment for Solar PV System Norwich MSW Landfill Norwich, Connecticut
PROJECT NO.	2150304.D

Weston & Sampson Engineers, Inc. (Weston & Sampson) is pleased to present this memorandum discussing our geotechnical assessment and construction considerations for the proposed solar photovoltaic (PV) system on the Norwich Landfill at 82 Rogers Road in Norwich, Connecticut.

The purpose of our assessment was to evaluate potential impacts on the existing landfill liner due to construction of the proposed PV array project. The primary concerns are the increase in stress on the flexible membrane liner (FML) within the landfill cap and for increased risk of sliding along the FML due to the added weight of the proposed solar array foundations. This memorandum documents our assessment of these issues.

LANDFILL AND EXISTING CONDITIONS

The 12 acre landfill was capped with a combination of soil a soil cap on the side slopes of the landfill and a flexible membrane liner (FML) on the top portion of the landfill. Construction plans prepared for the final closure of the MSW landfill were prepared by Fuss & O'Neill in April of 1996 and included details of the soil and FML cap. Generally two acres of the existing approximately 11.4 acre landfill were regraded, covered with a six-inch subbase layer; overlain, by a LLDPE textured geo-membrane liner; overlain by a geo-composite draining layer consisting of an HPDE drainage net heat bonded between two layers of geo-textile; overlain by 18 inches of cover soil having a permeability greater than 1 X 10-5 cm/sec and a six-inch vegetative support layer. The slopes along the southern and western slopes, (6.4 acres of the landfill) was regraded, covered with a six-inch subbase layer; overlain by 18 inches of final cover soil having a permeability of less than 1 X 10-6 cm/sec; and a six-inch vegetative layer. An existing soil cap covers the remaining approximately three acres along the northern and northeastern slopes of the landfill.

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Placement and compaction procedures used, and grain size characteristics and composition of these layers as well as the engineering properties of the FML and geocomposite were not provided on the Project Plans and were not available for review. Additionally, the thickness, composition, and placement procedures of the waste were not available for review. Outside the PV array area, the landfill waste is capped with a soil cover, only.

We have not performed geotechnical investigations at the site to assess the thicknesses, grain size characteristics and composition of the cap soils above the geocomposite and FML.

Project Plans indicate that the ground surface elevations on the landfill cap and within the proposed PV array area range between approximately El. 278 ft. and El. 286 ft. (NAVD88 datum). The ground surface is generally sloped at less than 7 percent.

PROPOSED CONSTRUCTION

According to the Project Plans, the proposed project will include construction of a PV array system on the cap of the Norwich Landfill. Elements of the array include ballast supported solar modules, a concrete equipment pad, an access road, and other site improvements. Proposed elevations were not provided on the plans, but it is assumed that proposed ground surface elevations will essentially match existing grades.

The proposed ballasts will be cast-in-place concrete ballasts using the GC Pour-In-Place Forms manufactured by GameChange Racking LLC. The forms are oval-shaped open bottom “tubs” measuring approximately 1.83 ft. wide by 12 ft. long and 8 to 12 inches tall. The tubs are expendable concrete forms made from recycled plastic. The tubs are placed directly on the ground without removing the upper vegetative soil layer. The racking system legs are placed into the forms and the forms are filled with concrete. Gravel fill can be placed, if necessary, to fill locally low areas below the ballast footprint. GameChange indicates the racking system is sufficiently adjustable to accommodate ballast movement resulting from leaving the vegetative layer in place (i.e. settlement due to compression of the topsoil and heave caused by freezing and expansion).

According to our review of a Calculation Package prepared by Gamechange Racking for this project, the maximum stress imposed on the subgrade soils by each tub will be approximately 370 pounds per square foot (psf). Based on information provided on a detail sheet prepared by Solar City, the approximate 7.5-foot wide by 18.7-foot long by 1-foot thick reinforced concrete equipment pad will support a 750 kW inverter and a 750 kVA transformer. The pad will be supported at least 6-inches below the ground surface on a layer of crushed stone. The total stress imposed by the pad on the subgrade soils will be approximately 250 psf. The stresses from the ballasts and equipment pad will be distributed through the cover soils to the FML, continuing through the underlying cover soil and into the waste.

A permanent access road is proposed at the south section of the landfill, over both the soil and FML cap areas. Temporary access roads which will support construction vehicles, will be required along the cap and in the construction area (if necessary). According to the Project Plans,

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a minimum of 38-inches in thickness of soil cover (including the thickness provided by the topsoil and cover material) must be provided above the FML and the soil cap along permanent and temporary access roads. The project plans specify the use of 4-inches of bank run gravel (ConnDOT Form 816 M.02.06 Gradation C) and a minimum of 10-inches of bank run gravel (ConnDOT Form 816 M.02.03 Gradation A) over the subgrade remaining after stripping 3-inches maximum of the topsoil or the cover soil. A woven geotextile fabric is shown between the gravel and topsoil.

GEOTECHNICAL ASSESSMENT

Direct Bearing Stress on the FML

Typically, geomembrane manufacturers recommend limiting the stress on the FML to less than 7 psi during and after construction. We evaluated stresses on the FML from the existing soil cover and the potential increase on the FML due to the ballasts and electric pad.

The existing cover soil above the FML imparts approximately 212 psf (1.5 psi) of vertical stress on the FML, assuming a topsoil moist unit weight of 95 pcf, a soil cover moist unit weight of 110 pcf, and the layer thicknesses provided on the Project Plans. Our computations indicate that the stress increase on the FML due to each ballast is approximately 294 psf (2 psi) and the net stress increase due to the equipment pad is approximately 182 psf (1.3 psi). The resulting combined net stresses on the FML will be approximately 506 psf (3.5 psi) and 394 psf (2.7 psi) below the ballasts and equipment pad, respectively. The net stress of the equipment pad assumes the topsoil layer will be removed and 6-inches in thickness of cover soil will be replaced with crushed stone (as discussed below). These values are well below 7 psi and can be considered acceptable for the proposed construction.

Potential damage to the FML due to elongation and puncture cannot be evaluated since the properties of the FML and the grain size characteristics of the cover soil and cap subbase material are not known. However, our experience with typical FMLs used for landfill capping and similar stress ranges due to solar array components suggests that potential FML elongation due to the proposed stress increases will fall within acceptable ranges. The risk of FML puncture is dependent on the characteristics of the liner and the cover soil and construction activities. The cover soil should be assessed for presence of angular rock particles to verify that the risk of puncture is tolerable.

Waste Compression

As with all developments on landfills, the site is highly likely to undergo settlement during the design life of the proposed PV system. There is likely to be ongoing settlement of the waste mass that is independent of new loading, In addition, placement of the ballasts and equipment pads will add minor amounts of weight to the surface of the landfill as discussed above and some additional compression of the landfill waste should be anticipated. We have not completed geotechnical investigations or analyses to evaluate the magnitude or range of potential settlement. However, based on our experience with other PV projects on landfills, large but relatively gradual surface elevation changes should not be expected to adversely affect PV array

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performance other than the need for periodic realignment and adjustment of the racking systems. The relatively low additional stresses imposed by the ballasts and equipment pad are not expected to affect the ongoing waste compression.

Sliding Analyses

The potential impact of additional loads over the FML on sliding between the FML and cover soil should be considered. The engineering properties of the cover material and the FML are not known; therefore, we assumed the cohesion between these materials to be zero, which means the factor of safety against sliding failure is governed by an infinite slope analysis. The factor of safety against sliding is determined as the tangent of the interface friction angle divided by the tangent of the slope of the FML. The weight of the overlying soil is not a factor in this analysis.

The slope of the FML is assumed to be 7 percent matching the slope of the ground surface, which is an angle of approximately 4 degrees. The interface friction value between the cover soil and the FML can be conservatively estimated at greater than 16 degrees if the soil is dry and 12 degrees if the soil is saturated. The resulting range of safety factor against sliding is from 3.0 to 4.0. This compares well to a generally accepted minimum value of 1.5 and indicates the risk of sliding along the FML is low.

CONSTRUCTION CONSIDERATIONS

The ballast subgrades should be prepared according to the GameChange Racking, LLC recommendations and guidelines.

The equipment pad subgrades should be prepared by removing the 6-inch thick topsoil layer and replacing it with crushed stone below the equipment pad and within 12 inches laterally of the pad perimeter. The crushed stone should be separated from surrounding soils on all sides with a heavy, non-woven geotextile filter fabric.

Please call if you have any questions.

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MEMORANDUM

TO:	Mr. Michael Singer, Principal, Brightfields Development, LLC.
FROM:	Thomas J. Strike, Weston & Sampson Engineers, Inc. Mark Mitsch, P.E., Weston & Sampson Engineers, Inc.
CC:	John Figurelli, P.G., Weston & Sampson Engineers, Inc.
DATE:	September 4, 2015
SUBJECT:	Geotechnical Assessment for Solar PV System Norwich Bulky Waste Landfill Norwich, Connecticut
PROJECT NO.	2150304.C

Weston & Sampson Engineers, Inc. (Weston & Sampson) is pleased to present this memorandum discussing our subsurface explorations, geotechnical assessment, and construction considerations for the proposed solar photovoltaic (PV) system on the capped Bulky Waste Landfill at 82 Rogers Road in Norwich, Connecticut.

The primary concern for PV array construction on the bulky waste landfill is compression of the near surface vegetative support layer under stresses imposed by the proposed foundations and continued decomposition of the organic components of this layer, which could result in foundation settlement. A subsurface exploration program consisting of fourteen (14) hand excavations was performed to provide information on the variability of the composition, consistency, and thickness of the vegetation support layer across the landfill needed to evaluate potential compression and decomposition of this layer.

LANDFILL HISTORY

According to information contained in a Landfill Closure Report prepared by Fuss & O'Neill, Inc. (date unknown), prior to installation of the capping system, the top of the landfill was regraded to meet a minimum slope of 4 percent and then compacted. The thickness and composition of the bulky waste landfill material was not available. The final capping system for the Bulky Waste Landfill consisted of the following layers from the ground surface down to the landfill waste:

- Minimum 24-inches of compost material containing a mixture of sewage sludge, sand, leaves, and wood chips. This material was placed in one lift. The degree of compaction (if any) is not known;
- Minimum of 18-inches of silty sand cover soil containing between 38 and 48 percent material passing the No. 200 sieve. The first lift was approximately 12-inches thick and the second lift was approximately 6-inch thick. According to the Landfill Post Closure

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Report, both lifts were compacted to a minimum of 90 percent of the materials maximum dry density as determined from ASTM D698 (Standard Proctor); and

- Minimum of 6-inches compacted sand gravel soil. The degree of compaction (if any) is not known.

EXISTING SURFACE CONDITIONS

The landfill surface is currently covered with high grass and weeds. The top of the landfill is accessed from a compacted gravel road located along the southwest side of the landfill. According to a topographic survey plan prepared by Boundaries, LLC, ground surface elevations on the landfill cap and within the proposed development area range between approximately El. 300 ft. and El. 310 ft. (NAVD88 datum). The ground surface is generally sloped at less than 5 percent; however, the south section of the development area is sloped at approximately 13 percent.

PROPOSED CONSTRUCTION

According to August 2015 plans prepared by Boundaries, LLC titled "Rogers Road Landfill Solar Project – Solar Photovoltaic (PV) System (Project Plans), the proposed project will include construction of a PV array system on the cap of the Bulky Waste Landfill. Elements of the array include ballast-supported solar modules, a concrete equipment pad, an access road, and other site improvements. Proposed elevations were not provided on the plans, but it is assumed that proposed ground surface elevations will essentially match existing grades.

The proposed ballasts will be cast-in-place concrete ballasts using the GC Pour-In-Place Forms manufactured by GameChange Racking LLC. The forms are oval-shaped open bottom "tubs" measuring approximately 1.83 ft. wide by 12 ft. long and 8 to 12 inches tall. The tubs are expendable concrete forms made from recycled plastic. The tubs are placed directly on the ground without removing the vegetative soil layers. The racking system legs are placed into the forms and the forms are filled with concrete. Gravel fill can be placed, if necessary, to fill locally low areas below the ballast footprint. GameChange indicates the racking system is sufficiently adjustable to accommodate ballast movement resulting from leaving the vegetative layer in place (i.e. settlement due to compression of the topsoil and heave caused by freezing and expansion).

According to our review of a Calculation Package prepared by GameChanger Racking for this project, the maximum stress imposed on the subgrade soils by each tub will be 370 pounds per square foot (psf). Based on information provided on a detail sheet prepared by Solar City, the approximate 7.5-foot wide by 18.7-foot long by 1-foot thick reinforced concrete equipment pad will support a 750 kW inverter and a 750 kVA transformer. The pad will be supported at least 6-inches below the ground surface on a layer of crushed stone. The total stress imposed by the pad on the subgrade soils will be approximately 250 psf.

The permanent access road will extend from the existing access road approximately 120 ft. onto the landfill cap. Temporary access roads, which will support construction vehicles, will be required along the cap and in the construction area. The locations of these roads were not provided to us. According to the Project Plans, a minimum of 38-inches in thickness of soil cover

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(including the thickness provided by the vegetation support layer) must be provided above the silty sand cover layer along permanent and temporary access roads. The project plans specify the use of 4-inches thick of bank run gravel (ConnDOT Form 816 M.02.06 Gradation C) and a minimum of 10-inches of bank run gravel (ConnDOT Form 816 M.02.03 Gradation A) over the subgrade remaining after stripping 3-inches maximum of vegetation or the vegetation support layer. A woven geotextile fabric designed to be installed between the gravel and vegetation support layer.

FIELD EXPLORATION PROGRAM AND CONDITIONS ENCOUNTERED

Subsurface conditions were explored at the bulky waste landfill on July 9, 2015 by excavating fourteen (14) hand excavations labeled HE-1 through HE-14 at the approximate locations shown on the attached Site Development Plan (Sheet No. 5 of 11 of the Project Plans) prepared by Boundaries, LLC. Personnel from Weston & Sampson completed the excavations using a shovel, pry bar, and pick ax. Hand excavation logs are attached to this memorandum.

Hand excavations HE-1 and HE-2 were performed in the existing gravel access road to the south of the capped landfill area to assess the thickness and composition of the gravel fill layer. Subsurface conditions in these excavations generally consisted of brown, fine to coarse SAND FILL with varying amounts of gravel and trace to little silt. The fill was assessed to be dense based on the excavation effort. Refusals on very dense soils were encountered at depths of 11-inches and 19-inches below the ground surface (BGS) in hand excavations HE-1 and HE-2, respectively.

Hand excavations HE-3 through HE-14 were performed in the capped landfill area and in the area of the proposed foundations to assess the thickness and composition of the vegetation support layer. We were informed that excavations should not extend into the silty sand cover layer; therefore, each hand excavation was terminated when this layer was exposed. Below approximately 2 to 6-inches of organic topsoil material (sandy silt with numerous fine roots), the vegetation support layer generally consisted of brown, fine to coarse SAND with trace to little gravel, trace to little silt, and trace amounts of roots, wood chips, and brick fragments. This layer was approximately 5 to 25-inches thick (excluding the topsoil thickness) and was assessed to be loose based on the excavation effort.

LABORATORY TESTING

Five (5) samples of the vegetation support layer were submitted for laboratory moisture, ash, and organic matter testing in accordance with ASTM D2974. Results of these analyses reveal that this layer possesses a moisture content between 8 and 22 percent, an ash (soil) content between 94.5 and 98.2 percent, and an organic matter content between 1.8 and 5.5 percent. According to the results of this analyses, the vegetation support layer is primarily composed of granular soil material with minimal organic matter.

Four (4) samples of the vegetation support layer and one (1) sample of the sand fill layer were submitted for laboratory particle grain size analysis in accordance with ASTM D422 to aid in our description of these layers. Results of this analysis reveal that the granular soil portion of the

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vegetation support layer consists of fine to coarse sand with trace to some gravel, and trace to little silt. The sand fill layer consists of fine to coarse sand and gravel with little silt. Results of all laboratory testing are attached to this memorandum.

GEOTECHNICAL ASSESSMENT

As discussed above, laboratory testing revealed the vegetation support layer primarily consists of fine to coarse sand with trace to some gravel and trace to little silt with an organic content between 1.8 to 5.5 percent. Given the relatively low organic content, long term compression of the vegetation support layer due to continued decomposition of its organic components will be minor and therefore will not contribute significantly to foundation settlement. The racking system can be supported by the proposed ballast system following the GameChange Racking, LLC recommendations and guidelines without risk to the landfill liner.

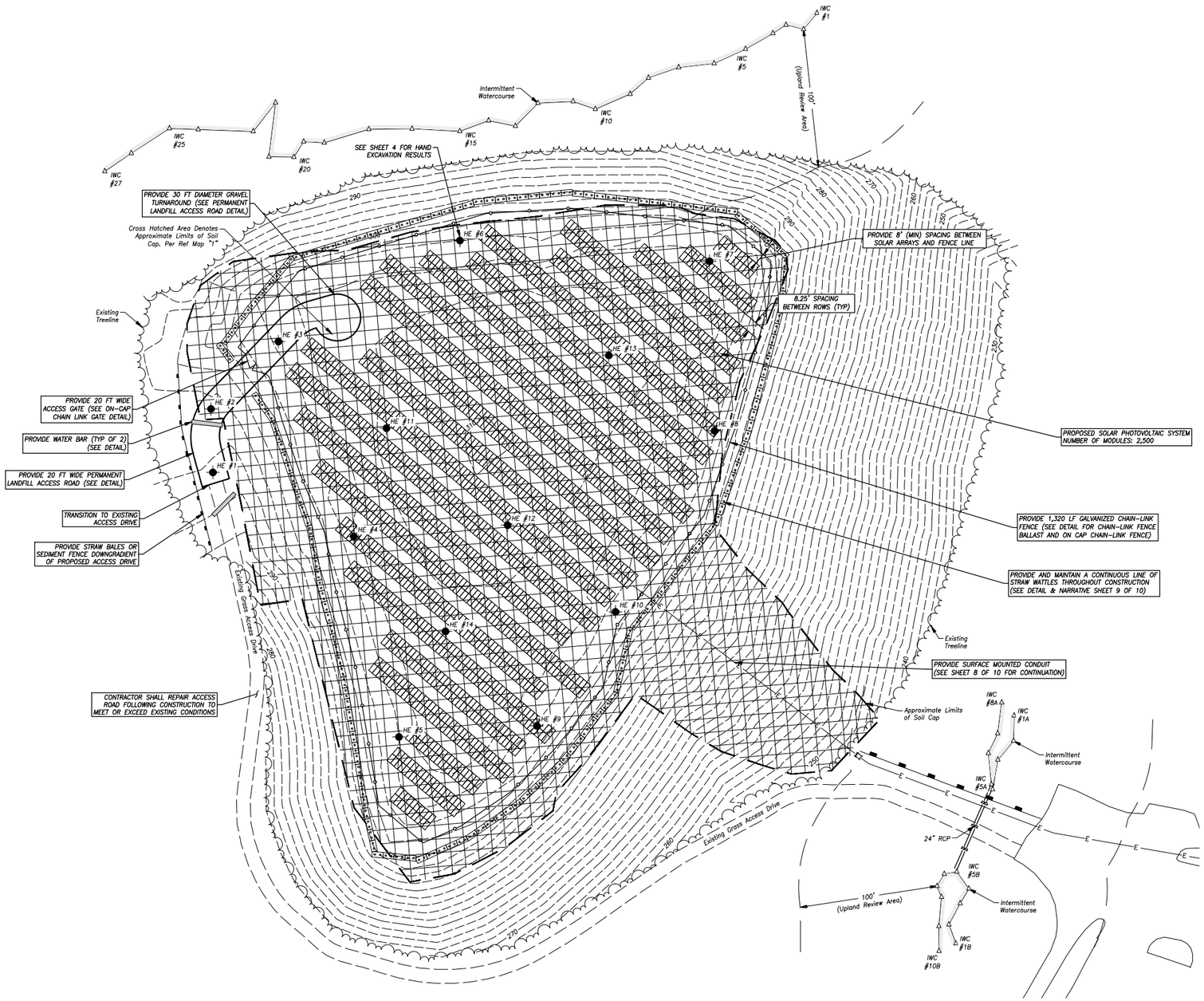
As with all developments on landfills, the site is highly likely to undergo settlement during the design life of the proposed PV system. There is likely to be ongoing settlement of the waste mass that is independent of new loading, In addition, placement of the ballasts and equipment pads will add minor amounts of weight to the surface of the landfill as discussed above and some additional compression of the landfill waste should be anticipated. We have not completed geotechnical investigations into the waste or analyses to evaluate the magnitude or range of potential settlement. However, based on our experience with other PV projects on landfills, large but relatively gradual surface elevation changes should not be expected to adversely affect PV array performance other than the need for periodic realignment and adjustment of the racking systems. The relatively low additional stresses imposed by the ballasts and equipment pad are not expected to affect the ongoing waste compression.

CONSTRUCTION CONSIDERATIONS

The ballast subgrades should be prepared according to the GameChange Racking, LLC recommendations and guidelines.

The equipment pad subgrades should be prepared by removing the 6-inch thick topsoil layer and replacing it with crushed stone below the equipment pad and within 12 inches laterally of the pad perimeter. The crushed stone should be separated from surrounding soils on all sides with a heavy, non-woven geotextile filter fabric.
Please call if you have any questions.

Attachments: Site Development Plan
Hand Excavation Logs
Laboratory Data



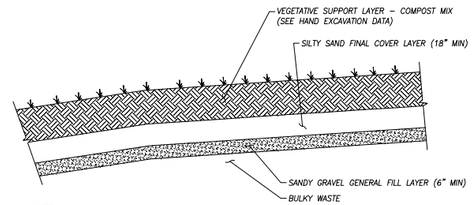
GRAPHIC SCALE

80 40 20 0 40

(IN FEET)
1 inch = 40 ft.

LEGEND & ABBREVIATIONS

TYP	TYPICAL
RCP	REINFORCED CONCRETE PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
INV	INVERT
IWC #1	INTERMITTENT WATRECOURSE FLAG
WF #1	WETLAND FLAG
SNET	SOUTHERN NEW ENGLAND TELEPHONE
CL&P	CONNECTICUT LIGHT AND POWER
AT&T	AMERICAN TELEPHONE AND TELEGRAPH
248	EXISTING CONTOUR
	IRON PIN
	UTILITY POLE
	GUY WIRE
	SIGN
	WETLAND FLAG
	SEDIMENT FENCE
	STRAW WATTLE
	CHAIN LINK FENCE
E	ELECTRICAL CONDUIT
HE #1	APPROXIMATE HAND EXCAVATION LOCATION



NOTE:
1. NO EXCAVATION WITHIN THE 18" SILTY SAND COVER LAYER.
2. CROSS SECTION DEVELOPED FROM LANDFILL CLOSURE REPORT PREPARED BY OTHERS AND MAY NOT REFLECT ACTUAL CONDITIONS.

BULKY WASTE LANDFILL SOIL CAP
CROSS SECTION

NOT TO SCALE

PROGRESS PRINT
AUGUST 3, 2015

29102

DAVID C. McKAY P.E., LICENSE NO. DATE

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SolarCity
714 Brook Street
Rocky Hill, CT 06067
www.solarcity.com

SolarCity Corporation
Proposed Solar Photovoltaic System
82 Rogers Road - Norwich, Connecticut
Mounting Plane 2 - Bulky Waste Area
Site Development Plan

SCALE:

DATE: August 2015

JOB I.D. NO. 14-2302

Revisions

SHEET NO.
5
11

HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-1	
CLIENT	Brightfields Development, LLC	GROUND SURFACE ELEVATION (ft.)	294 ft. +/-
WSE ENGINEER	Timothy Blair	DEPTH TO GROUNDWATER	Not observed.
DATE	9-Jul-15		

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Compacted sand/gravel at beginning of proposed gravel access drive.	**GROUND SURFACE**
1	(0 - 11") - Brown, fine to medium, SAND FILL, some fine to coarse gravel, little silt; moist. Appeared to be dense to very dense based on hand excavation effort. Could not excavate beyond 11" BGS.	**11" SAND FILL**
2	End of excavation at 11" BGS.	
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-1

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HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-2	
CLIENT	Brightfields Development, LLC	GROUND SURFACE	
WSE ENGINEER	Timothy Blair	ELEVATION (ft.)	296 ft. +/-
		DEPTH TO	
DATE	9-Jul-15	GROUNDWATER	Not observed.

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass along proposed gravel access drive at base of landfill slope.	**GROUND SURFACE**
	(0 - 4") - Dark brown silty sand topsoil with thick grass root systems; moist.	**4" TOPSOIL**
1	(4" - 12") - Brown, fine to medium, SAND FILL, some fine to coarse gravel, little silt. Appeared to be medium dense to dense based on hand excavation effort.	**7" SAND FILL**
2	(12" - 19") - Gray, GRAVEL FILL (up to 4 in. diameter) with fine to coarse sand and trace silt; moist. Appeared to be very dense based on hand excavation effort. Could not excavate beyond 19" BGS.	**7" GRAVEL FILL**
3	End of excavation at 19" BGS.	
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-2

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HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Landfill Solar Project	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-3	
CLIENT	Brightfields Development, LLC	GROUND SURFACE	
WSE ENGINEER	Timothy Blair	ELEVATION (ft.)	304 ft. +/-
		DEPTH TO	
DATE	9-Jul-15	GROUNDWATER	Not observed.

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass along proposed gravel access drive at top of landfill.	**LANDFILL SURFACE**
	(0 - 2") - Dark brown silty sand topsoil with thick grass root systems.	**2" TOPSOIL**
1	(2" - 18") - Brown, fine to medium SAND FILL, little silt, trace to little gravel, trace organic material (roots, wood chips, small twigs); moist. Appeared to be loose based on hand excavation effort.	**16" VEGETATIVE SUPPORT LAYER**
2	Silty sand cover layer observed at 18" BGS. End of excavation at 18" BGS.	**SILTY SAND COVER**
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-3

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HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-4	
CLIENT	Brightfields Development, LLC	GROUND SURFACE	
WSE ENGINEER	Timothy Blair	ELEVATION (ft.)	304 ft. +/-
		DEPTH TO	
DATE	9-Jul-15	GROUNDWATER	Not observed.

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass on top of landfill.	**LANDFILL SURFACE**
	(0 - 3") - Dark brown silty sand topsoil with thick grass root systems; moist.	**3" TOPSOIL**
1	(3" - 20") - Brown, fine to medium SAND FILL, little silt, trace to little gravel, trace organic material (roots, wood chips, small twigs), trace brick debris; moist. Appeared to be loose based on hand excavation effort.	**20" VEGETATIVE SUPPORT LAYER**
2		
	Silty sand cover layer observed at 23" BGS.	**SILTY SAND COVER**
3	End of excavation at 23" BGS.	
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-4

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O:\Brightfields\Norwich, CT\Geotech\Field\[Hand Excavation Logs - Norwich Landfill Solar Project.xlsx]HE-14

HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-5	
CLIENT	Brightfields Development, LLC	GROUND SURFACE	
WSE ENGINEER	Timothy Blair	ELEVATION (ft.)	304 ft. +/-
		DEPTH TO	
DATE	9-Jul-15	GROUNDWATER	Not observed.

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass on top of landfill.	**LANDFILL SURFACE**
	(0 - 4") - Dark brown silty sand topsoil with thick grass root systems; moist.	**4" TOPSOIL**
1	(4" - 15") - Brown, fine to medium SAND FILL, little silt, trace to little gravel, trace organic material (roots, wood chips, small twigs), trace brick debris; moist. Appeared to be loose based on hand excavation effort.	**11" VEGETATIVE SUPPORT LAYER**
	Silty sand cover layer observed at 15" BGS.	**SILTY SAND COVER**
2	End of excavation at 15" BGS.	
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-5

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HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-6	
CLIENT	Brightfields Development, LLC	GROUND SURFACE	
WSE ENGINEER	Timothy Blair	ELEVATION (ft.)	304 ft. +/-
		DEPTH TO	
DATE	9-Jul-15	GROUNDWATER	Not observed.

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass on top of landfill.	**LANDFILL SURFACE**
	(0 - 3") - Dark brown silty sand topsoil with thick grass root systems; moist.	**3" TOPSOIL**
1	(3" - 17") - Brown, fine to medium SAND FILL, little silt, trace to little gravel, trace organic material (roots, wood chips, small twigs); moist. Appeared to be loose based on hand excavation effort.	**14" VEGETATIVE SUPPORT LAYER**
2	Silty sand cover layer observed at 17" BGS. End of excavation at 17" BGS.	**SILTY SAND COVER**
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-6

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HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-7	
CLIENT	Brightfields Development, LLC	GROUND SURFACE	
WSE ENGINEER	Timothy Blair	ELEVATION (ft.)	306 ft. +/-
		DEPTH TO	
DATE	9-Jul-15	GROUNDWATER	Not observed.

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass on top of landfill.	**LANDFILL SURFACE**
	(0 - 4") - Dark brown silty sand topsoil with thick grass root systems; moist.	**4" TOPSOIL**
1	(4" - 9") - Brown, fine to medium SAND FILL,trace silt, trace to little gravel, trace organic material (roots, wood chips, small twigs); moist. Appeared to be loose based on hand excavation effort.	**5" VEGETATIVE SUPPORT LAYER**
2	Silty sand cover layer observed at 9" BGS. End of excavation at 9" BGS.	**SILTY SAND COVER**
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-7

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HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-8	
CLIENT	Brightfields Development, LLC	GROUND SURFACE	
WSE ENGINEER	Timothy Blair	ELEVATION (ft.)	302 ft. +/-
		DEPTH TO	
DATE	9-Jul-15	GROUNDWATER	Not observed.

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass on top of landfill.	**LANDFILL SURFACE**
	(0 - 4") - Dark brown silty sand topsoil with thick grass root systems; moist.	**4" TOPSOIL**
1	(4" - 15") - Brown, fine to medium SAND FILL, little silt, trace to little gravel, trace organic material (roots, wood chips, small twigs), trace plastic debris; moist. Appeared to be loose based on hand excavation effort.	**11" VEGETATIVE SUPPORT LAYER**
2	Silty sand cover layer observed at 15" BGS. End of excavation at 15" BGS.	**SILTY SAND COVER**
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-8

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HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-9	
CLIENT	Brightfields Development, LLC	GROUND SURFACE	
WSE ENGINEER	Timothy Blair	ELEVATION (ft.)	304 ft. +/-
		DEPTH TO	
DATE	9-Jul-15	GROUNDWATER	Not observed.

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass on top of landfill.	**LANDFILL SURFACE**
	(0 - 6") - Dark brown silty sand topsoil with thick grass root systems; moist.	**6" TOPSOIL**
1	(6" - 15") - Brown, fine to medium SAND FILL, little silt, trace to little gravel, trace organic material (roots, wood chips, small twigs), trace plastic debris; moist. Appeared to be loose based on hand excavation effort.	**9" VEGETATIVE SUPPORT LAYER**
	Silty sand cover layer observed at 15" BGS.	**SILTY SAND COVER**
2	End of excavation at 15" BGS.	
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-9

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HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-10	
CLIENT	Brightfields Development, LLC	GROUND SURFACE	
WSE ENGINEER	Timothy Blair	ELEVATION (ft.)	304 ft. +/-
		DEPTH TO	
DATE	9-Jul-15	GROUNDWATER	Not observed.

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass on top of landfill.	**LANDFILL SURFACE**
	(0 - 5") - Dark brown silty sand topsoil with thick grass root systems; moist.	**5" TOPSOIL**
1	(5" - 14") - Brown, fine to medium SAND FILL, little silt, trace to little gravel, trace organic material (roots, wood chips, small twigs); moist. Appeared to be loose based on hand excavation effort.	**9" VEGETATIVE SUPPORT LAYER**
	Silty sand cover layer observed at 14" BGS.	**SILTY SAND COVER**
2	End of excavation at 14" BGS.	
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-10

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HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-11	
CLIENT	Brightfields Development, LLC	GROUND SURFACE	
WSE ENGINEER	Timothy Blair	ELEVATION (ft.)	308 ft. +/-
		DEPTH TO	
DATE	9-Jul-15	GROUNDWATER	Not observed.

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass on top of landfill.	**LANDFILL SURFACE**
	(0 - 2") - Dark brown silty sand topsoil with thick grass root systems; moist.	**2" TOPSOIL**
1	(2" - 27") - Brown, fine to medium SAND FILL, little silt, trace to little gravel, trace organic material (roots, wood chips, small twigs); moist. Small cobbles at approximately 15" BGS. Appeared to be loose based on hand excavation effort.	**25" VEGETATIVE SUPPORT LAYER**
2		
	Silty sand cover layer observed at 27" BGS.	**SILTY SAND COVER**
3	End of excavation at 27" BGS.	
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-11

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HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-12	
CLIENT	Brightfields Development, LLC	GROUND SURFACE	
WSE ENGINEER	Timothy Blair	ELEVATION (ft.)	309 ft. +/-
		DEPTH TO	
DATE	9-Jul-15	GROUNDWATER	Not observed.

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass on top of landfill.	**LANDFILL SURFACE**
	(0 - 4") - Dark brown silty sand topsoil with thick grass root systems; moist.	**4" TOPSOIL**
1	(4" - 17") - Brown, fine to medium SAND FILL, some gravel, trace silt, trace organic material (roots, wood chips, small twigs); moist. Appeared to be loose based on hand excavation effort.	**13" VEGETATIVE SUPPORT LAYER**
2	Silty sand cover layer observed at 17" BGS. End of excavation at 17" BGS.	**SILTY SAND COVER**
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-12

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HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-13	
CLIENT	Brightfields Development, LLC	GROUND SURFACE ELEVATION (ft.)	309 ft. +/-
WSE ENGINEER	Timothy Blair	DEPTH TO GROUNDWATER	Not observed.
DATE	9-Jul-15		

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass on top of landfill.	**LANDFILL SURFACE**
—	(0 - 6") - Dark brown silty sand topsoil with thick grass root systems; moist.	**6" TOPSOIL**
1	(6" - 21") - Brown, fine to medium SAND FILL, little silt, trace to little gravel, trace organic material (roots, wood chips, small twigs); moist. Appeared to be loose based on hand excavation effort.	**15" VEGETATIVE SUPPORT LAYER**
2	Silty sand cover layer observed at 21" BGS.	**SILTY SAND COVER**
	End of excavation at 21" BGS.	
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-13

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HAND EXCAVATION LOG

PROJECT NAME/NO.	Norwich Bulky Waste Landfill Solar PV	**HAND EXCAVATION NUMBER**	
LOCATION	Norwich, CT	HE-14	
CLIENT	Brightfields Development, LLC	GROUND SURFACE	
WSE ENGINEER	Timothy Blair	ELEVATION (ft.)	307 ft. +/-
		DEPTH TO	
DATE	9-Jul-15	GROUNDWATER	Not observed.

DEPTH BELOW GROUND SURFACE (ft.)	SOIL DESCRIPTION	STRATUM DESCRIPTION
Surface	Tall field grass on top of landfill.	**LANDFILL SURFACE**
	(0 - 3") - Dark brown silty sand topsoil with thick grass root systems; moist.	**3" TOPSOIL**
1	(3" - 25") - Brown, fine to medium SAND FILL, little silt, trace to little gravel, trace organic material (roots, wood chips, small twigs), trace platic debris; moist. Appeared to be loose based on hand excavation effort.	**22" VEGETATIVE SUPPORT LAYER**
2		
	Silty sand cover layer observed at 25" BGS.	**SILTY SAND COVER**
3	End of excavation at 25" BGS.	
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NOTES:

1. Hand excavation completed with a steel shovel.

HAND EXCAVATION NUMBER

HE-14

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Client:	Weston & Sampson Engineers				
Project:	Norwich Landfill				
Location:	Norwich, CT			Project No:	GTX-303445
Boring ID:	---	Sample Type:	---	Tested By:	cam
Sample ID:	---	Test Date:	07/17/15	Checked By:	emm
Depth :	---	Test Id:	338897		

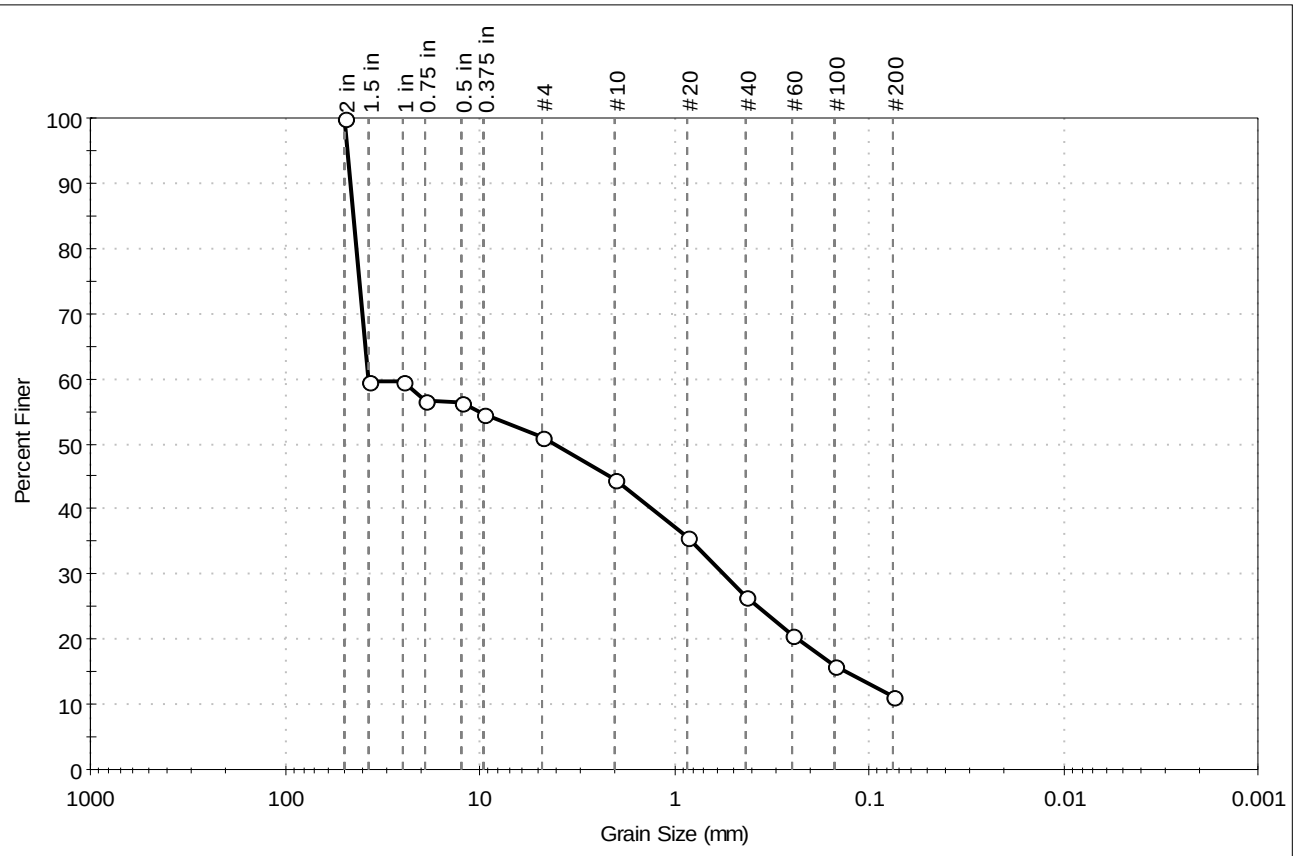
Moisture, Ash, and Organic Matter - ASTM D2974

Boring ID	Sample ID	Depth	Description	Moisture Content, %	Ash Content, %	Organic Matter, %
---	HE-3	---	Moist, brown sandy silt	22	97.5	2.5
---	HE-8	---	Moist, brown sandy silt with gravel	8	98.2	1.8
---	HE-9	---	Moist, brown silty sand with gravel	13	97.5	2.5
---	HE-10	---	Moist, brown sandy silt	14	97.1	2.9
---	HE-11	---	Moist, brown sandy silt with organics	20	94.5	5.5

Notes: Moisture content determined by Method A and reported as a percentage of oven-dried mass; dried to a constant mass at temperature of 105º C
Ash content and organic matter determined by Method C; dried to constant mass at temperature 440º C

Client:	Weston & Sampson Engineers				
Project:	Norwich Landfill				
Location:	Norwich, CT			Project No:	GTX-303445
Boring ID:	---	Sample Type:	bag	Tested By:	jbr
Sample ID:	HE-1	Test Date:	07/20/15	Checked By:	emm
Depth :	---	Test Id:	338898		
Test Comment:	---				
Sample Description:	Moist, brown gravel with silt and sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	48.9	40.0	11.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 in	50.00	100		
1.5 in	37.50	60		
1 in	25.00	60		
0.75 in	19.00	57		
0.5 in	12.50	56		
0.375 in	9.50	54		
#4	4.75	51		
#10	2.00	44		
#20	0.85	36		
#40	0.42	27		
#60	0.25	21		
#100	0.15	16		
#200	0.075	11		

Coefficients

D_{85} = 44.9227 mm	D_{30} = 0.5475 mm
D_{60} = 37.5801 mm	D_{15} = 0.1307 mm
D_{50} = 4.1221 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (0))

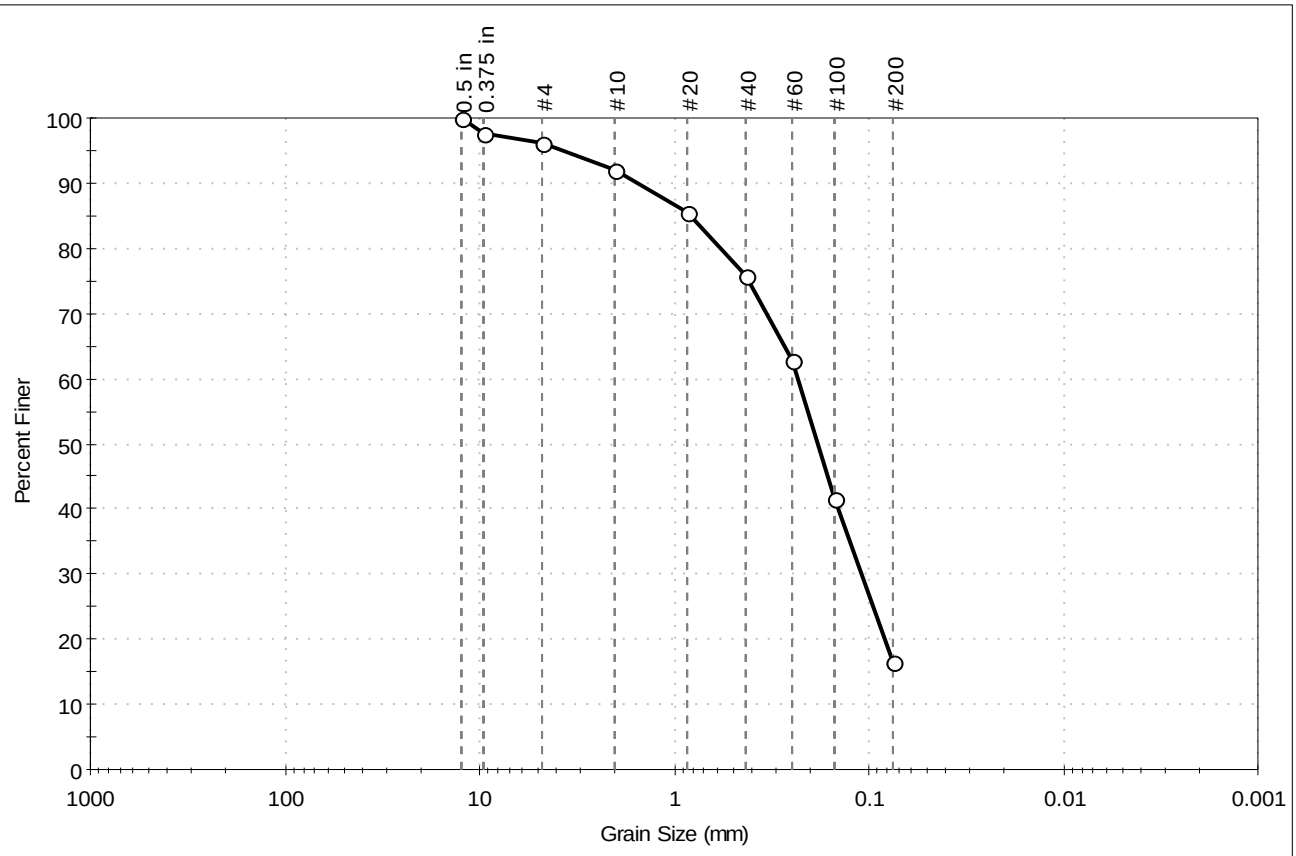
Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Client:	Weston & Sampson Engineers				
Project:	Norwich Landfill				
Location:	Norwich, CT			Project No:	GTX-303445
Boring ID:	---	Sample Type:	bag	Tested By:	jbr
Sample ID:	HE-6	Test Date:	07/20/15	Checked By:	emm
Depth :	---	Test Id:	338899		
Test Comment:	---				
Sample Description:	Moist, brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	3.9	79.6	16.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	98		
#4	4.75	96		
#10	2.00	92		
#20	0.85	86		
#40	0.42	76		
#60	0.25	63		
#100	0.15	42		
#200	0.075	16		

Coefficients

D_{85} = 0.8141 mm	D_{30} = 0.1088 mm
D_{60} = 0.2341 mm	D_{15} = N/A
D_{50} = 0.1836 mm	D_{10} = N/A
C_u = N/A	C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

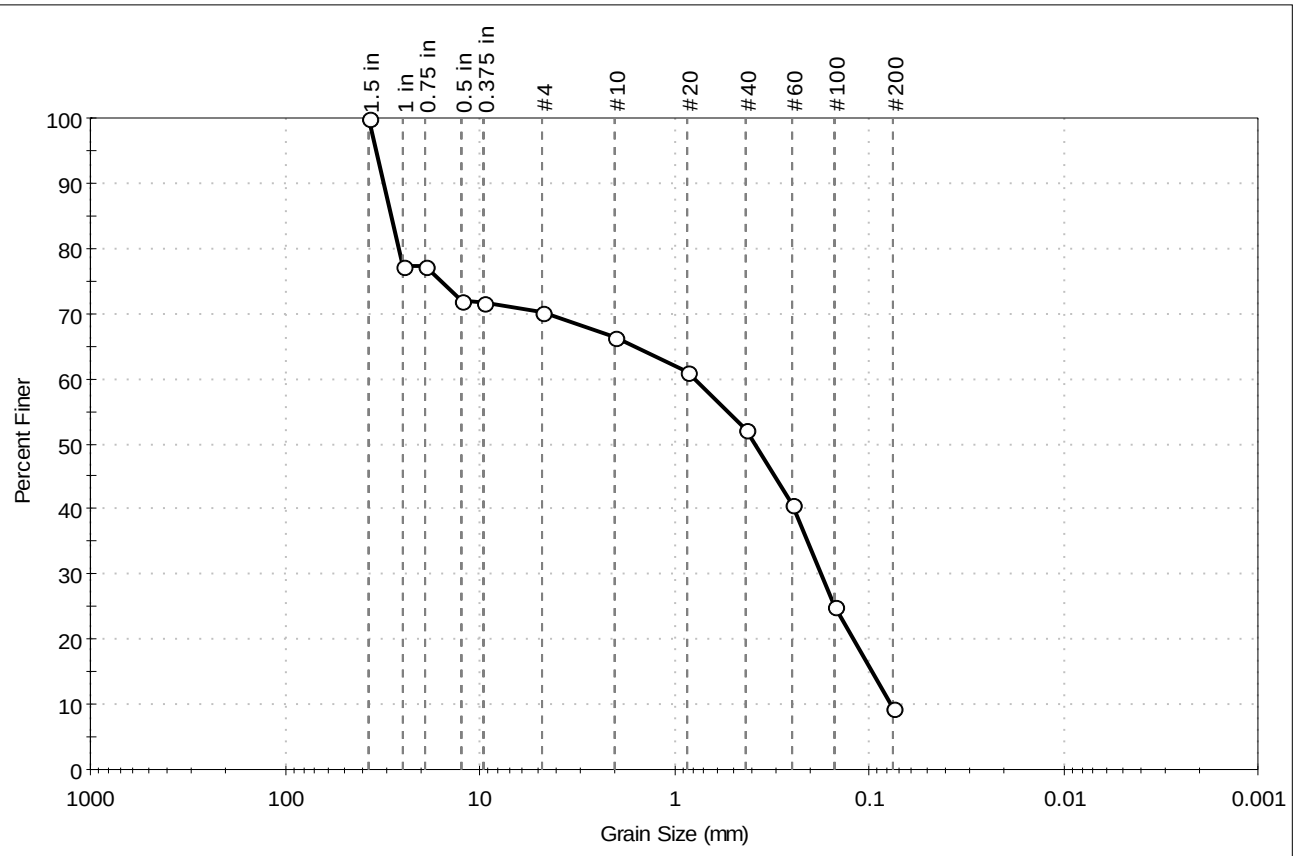
Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

Client:	Weston & Sampson Engineers				
Project:	Norwich Landfill				
Location:	Norwich, CT			Project No:	GTX-303445
Boring ID:	---	Sample Type:	bag	Tested By:	jbr
Sample ID:	HE-12	Test Date:	07/20/15	Checked By:	emm
Depth :	---	Test Id:	338900		
Test Comment:	---				
Sample Description:	Moist, brown sand with silt and gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	29.6	61.0	9.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	77		
0.75 in	19.00	77		
0.5 in	12.50	72		
0.375 in	9.50	72		
#4	4.75	70		
#10	2.00	66		
#20	0.85	61		
#40	0.42	52		
#60	0.25	41		
#100	0.15	25		
#200	0.075	9.4		

Coefficients

D_{85} = 28.7358 mm	D_{30} = 0.1765 mm
D_{60} = 0.7888 mm	D_{15} = 0.0963 mm
D_{50} = 0.3859 mm	D_{10} = 0.0772 mm
C_u = 10.218	C_c = 0.512

Classification

ASTM N/A

AASHTO Fine Sand (A-3 (1))

Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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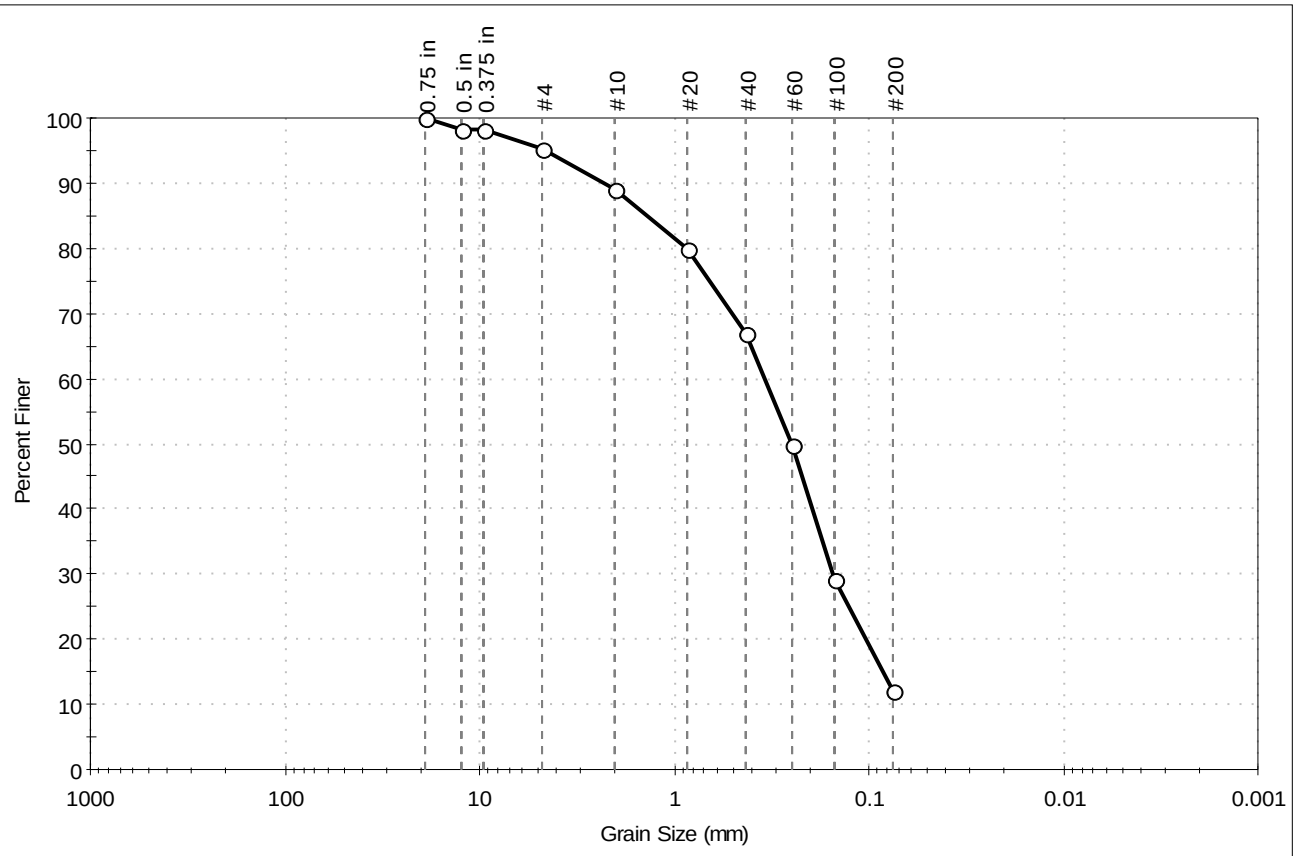
Client:	Weston & Sampson Engineers				
Project:	Norwich Landfill				
Location:	Norwich, CT			Project No:	GTX-303445
Boring ID:	---	Sample Type:	bag	Tested By:	jbr
Sample ID:	HE-13	Test Date:	07/20/15	Checked By:	emm
Depth :	---	Test Id:	338901		
Test Comment:	---				
Sample Description:	Moist, brown sand with silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	4.6	83.4	12.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	98		
0.375 in	9.50	98		
#4	4.75	95		
#10	2.00	89		
#20	0.85	80		
#40	0.42	67		
#60	0.25	50		
#100	0.15	29		
#200	0.075	12		

Coefficients

D_{85} = 1.3691 mm
D_{30} = 0.1532 mm
D_{60} = 0.3421 mm
D_{15} = 0.0846 mm
D_{50} = 0.2502 mm
D_{10} = N/A
C_u = N/A
C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

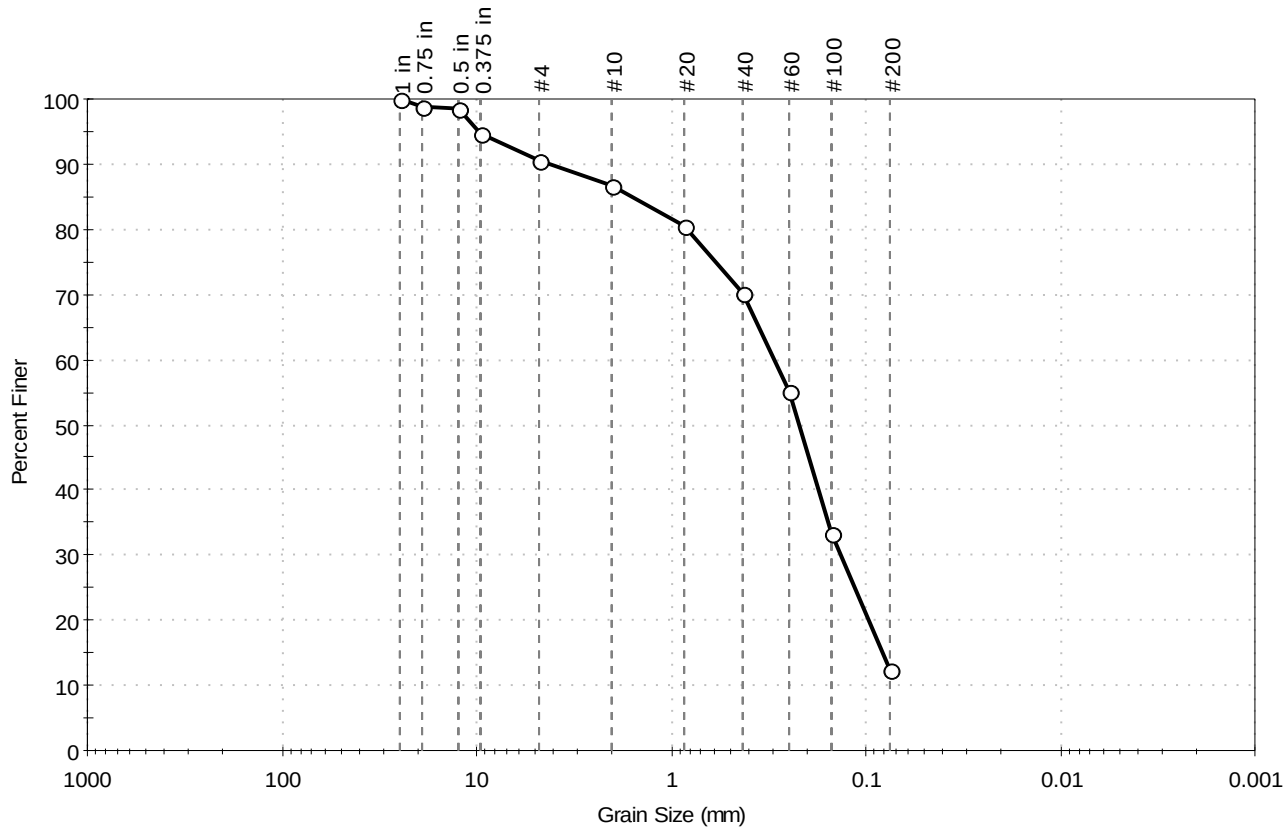
Sample / Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

Client:	Weston & Sampson Engineers				
Project:	Norwich Landfill				
Location:	Norwich, CT			Project No:	GTX-303445
Boring ID:	---	Sample Type:	bag	Tested By:	jbr
Sample ID:	HE-14	Test Date:	07/20/15	Checked By:	emm
Depth :	---	Test Id:	338902		
Test Comment:	---				
Sample Description:	Moist, brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D422



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	9.5	78.1	12.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	99		
0.5 in	12.50	99		
0.375 in	9.50	95		
#4	4.75	90		
#10	2.00	87		
#20	0.85	81		
#40	0.42	70		
#60	0.25	55		
#100	0.15	33		
#200	0.075	12		

Coefficients

D_{85} = 1.5587 mm
D_{30} = 0.1340 mm
D_{60} = 0.2978 mm
D_{15} = 0.0817 mm
D_{50} = 0.2219 mm
D_{10} = N/A
C_u = N/A
C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

GAMECHANGE RACKING®
QUALITY. VALUE. INNOVATION.

Calculation package for GameChange Racking PIP system

Project Solar City - Norwich Landfill - Brightfields
Address 82 Rogers Rd, Norwich, CT 06360
Update 6/19/2015

General Information:

PIP	2UP	
Setup	Continuous	
Tilt	15	degree
Clearance	24	in

Loading Code	ASCE7-10	
Risk Category	I	
Exposure Category	B	
Site Class	D	
Load Bearing Capacity of Soil	1	ksf
Dead Load	3	psf
Ground Snow Load (Pg)	30	psf
Basic Wind Speed	121	mph
Panel Length	77	in
Panel Width	39.05	in
Panels per Span (mid zone)	12.00	
Panels Supported per Tub (edge)	8.00	

1. Loading Calculations

1.1 Snow Load

P_g (psf)	30.00
C_e	0.90
C_t	1.20
I_s	0.80
C_s	1.00

$P_s=C_s*P_f$ = 18.14 psf

1.2 Wind Load

V (mph)	121.00
K_d	0.85
K_z	0.57
K_{zt}	1.00

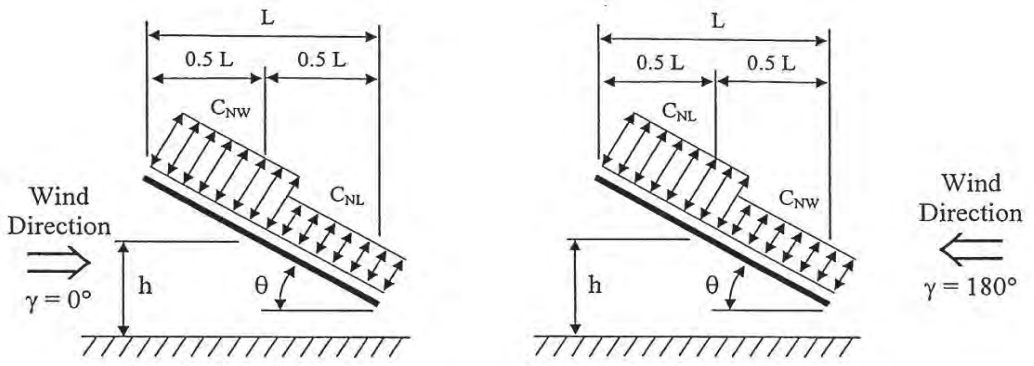
q_h = 18.16

Wind pressure on the open roof according to ASCE7-10 .

$P=q_hGC_N$

G	0.85
Iw	1.00

C_N are given in the following Fig.



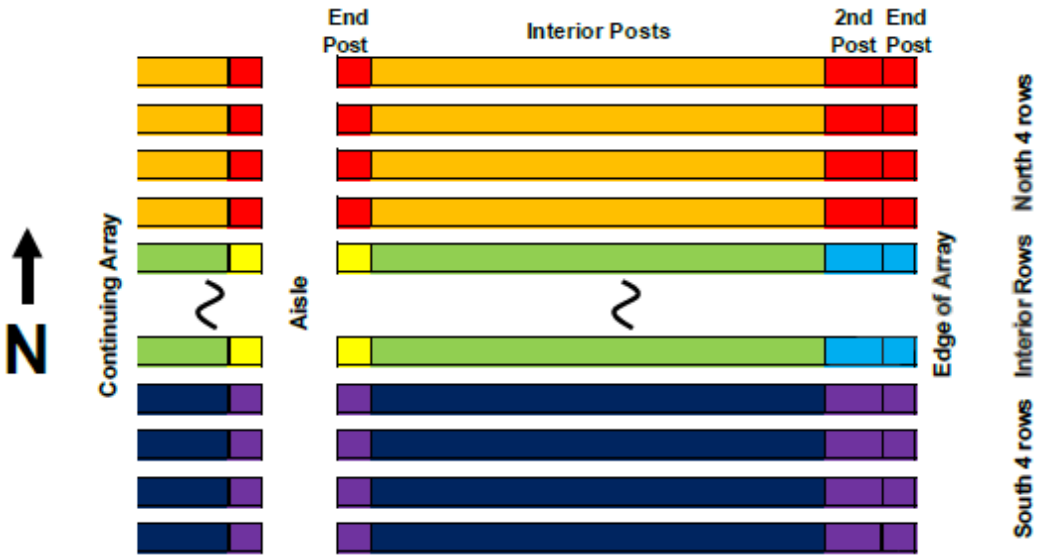
	CASE B		CASE A	
Windward	GC_W	1.80	GC_W	1.30
	GC_N	0.60	GC_N	1.60
Leeward	GC_W	-1.90	GC_W	-0.90
	GC_N	0.00	GC_N	-1.30

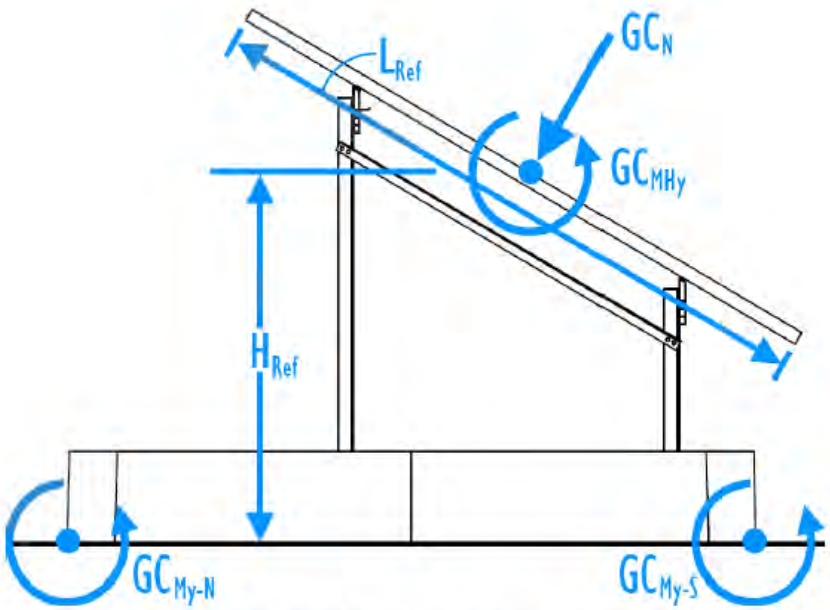
2. Foundation

The results of wind load factors including normal and overturning moments provided by CPP are located in the calculation sheets. The results are given for two opposite directions of wind which causes upward and downward wind forces calculated based on worst case design wind loads.

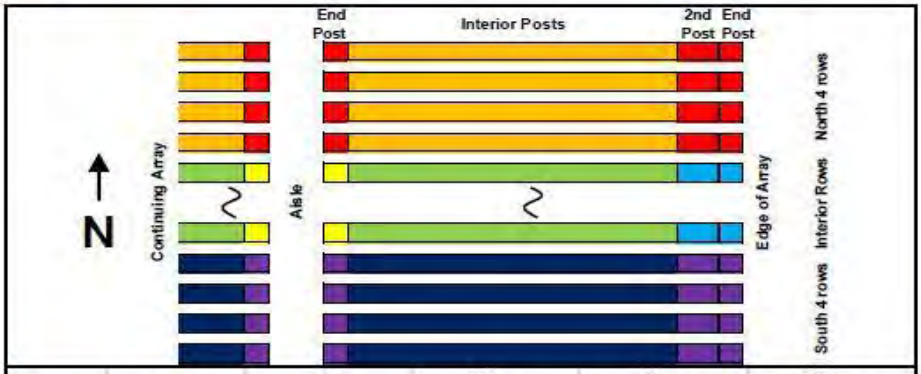
GC_N is the normal force factor, GC_{MyN} is the moments about northern pivot point and GC-My-S is the moment about southern pivot point. As it is apparent and highlighted in worksheets, the overturning moment about the southern point due the wind forces in upward direction is the critical case. Northern interior posts receive the highest upward force.

The factor of safety is calculated based on the worst case scenario, when the dead load and full wind loads are present. The resisting ballast weight and moments (about the southern pivot point) are calculated based on the superstructure and tub weight as given in the worksheet.





Schematic of wind load coefficients – PourInPlace System



Zone	Tilt/height*	GC_N		GC_{MHy}		$GC_{My\text{-}N}$		$GC_{My\text{-}S}$	
		Min	Max	Min	Max	Min	Max	Min	Max
	15° / 0.12	-0.72	0.62	-0.16	0.03	-1.83	1.43	-1.76	0.89
	15° / 0.46	-0.84	0.60	-0.18	0.04	-0.66	0.54	-1.00	0.47
	30° / 0.12	-1.14	1.14	-0.17	0.04	-1.65	1.14	-1.94	1.36
	30° / 0.46	-1.20	1.24	-0.22	0.05	-0.64	0.29	-1.40	1.05
	15° / 0.12	-0.66	0.28	-0.10	0.02	-0.84	1.48	-1.40	0.44
	15° / 0.46	-0.71	0.26	-0.16	0.02	-0.29	0.50	-0.84	0.19
	30° / 0.12	-0.85	0.47	-0.09	0.04	-0.60	0.95	-1.31	0.65
	30° / 0.46	-0.86	0.45	-0.14	0.06	-0.23	0.27	-0.94	0.39
	15° / 0.12	-0.34	0.50	-0.09	0.02	-1.48	0.72	-0.81	0.70
	15° / 0.46	-0.58	0.59	-0.11	0.03	-0.66	0.40	-0.66	0.42
	30° / 0.12	-0.56	0.88	-0.09	0.03	-1.31	0.58	-0.93	1.02
	30° / 0.46	-0.63	1.11	-0.12	0.03	-0.59	0.19	-0.69	0.92
	15° / 0.12	-0.43	0.24	-0.10	0.01	-0.72	0.80	-1.09	0.33
	15° / 0.46	-0.46	0.25	-0.12	0.01	-0.27	0.29	-0.57	0.19
	30° / 0.12	-0.53	0.38	-0.07	0.03	-0.51	0.56	-0.86	0.52
	30° / 0.46	-0.57	0.43	-0.10	0.02	-0.23	0.16	-0.64	0.36
	15° / 0.12	-0.54	0.44	-0.11	0.02	-1.28	1.12	-1.24	0.67
	15° / 0.46	-0.77	0.51	-0.15	0.03	-0.54	0.53	-0.88	0.38
	30° / 0.12	-1.03	0.95	-0.16	0.02	-1.39	0.99	-1.78	1.12
	30° / 0.46	-1.19	1.12	-0.20	0.02	-0.57	0.32	-1.35	0.96
	15° / 0.12	-0.49	0.52	-0.11	0.02	-1.70	0.90	-1.22	0.57
	15° / 0.46	-0.48	0.87	-0.14	0.02	-1.02	0.28	-0.62	0.56
	30° / 0.12	-0.65	0.67	-0.08	0.03	-1.03	0.69	-1.05	0.74
	30° / 0.46	-0.75	0.88	-0.13	0.02	-0.47	0.20	-0.85	0.73
	15° / 0.12	-0.67	0.47	-0.12	0.03	-1.48	1.36	-1.55	0.72
	15° / 0.46	-0.88	0.76	-0.17	0.03	-0.89	0.60	-1.02	0.48
	30° / 0.12	-1.31	0.92	-0.20	0.02	-1.35	1.20	-2.28	1.08
	30° / 0.46	-1.42	1.10	-0.25	0.03	-0.57	0.32	-1.66	0.93

* Height is expressed as the ratio of the gap from the ground to the low edge of the PV divided by the cl
Interpolation between configurations is allowed

Figure 5: Peak wind load coefficients – Pour-in-Place System

GC_N Factors (Pour-in-Place)								
		North Row Ends	North Row Mid	Mid Aisles	Mid Row Mid	Mid Row Ends	South Row Mid	South Row Ends
Tilt	H* Ratio	Min	Min	Min	Min	Min	Min	Min
15	0.12	-0.72	-0.66	-0.34	-0.43	-0.54	-0.49	-0.67
15	0.46	-0.84	-0.71	-0.58	-0.46	-0.77	-0.48	-0.88
30	0.12	-1.14	-0.85	-0.56	-0.53	-1.03	-0.65	-1.31
30	0.46	-1.2	-0.86	-0.63	-0.57	-1.19	-0.75	-1.42
15	0.16	-0.733	-0.665	-0.365	-0.433	-0.564	-0.489	-0.692
Pressure (psf)	0	-8	-7	-4	-5	-6	-5	-8
Uplift per Panel (lbs)	0	-167	-151	-83	-99	-128	-111	-157
Uplift (vertical) per panel	0	-161	-146	-80	-95	-124	-107	-152
Horizontal force (lb) per panel	0	-43	-39	-22	-26	-33	-29	-41
Number of panels supported	0	8.00	12.00	8.00	12.00	8.00	12.00	8.00
Total uplift (lb)	0	-1288	-1754	-642	-1142	-992	-1289	-1217
Total horizontal force (lb)	0	-345	-470	-172	-306	-266	-346	-326

GC_My-S Factors (Pour-in-Place)								
		North Row Ends	North Row Mid	Mid Aisles	Mid Row Mid	Mid Row Ends	South Row Mid	South Row Ends
Tilt	H* Ratio	Min	Min	Min	Min	Min	Min	Min
15	0.12	-1.76	-1.4	-0.81	-1.09	-1.24	-1.22	-1.55
15	0.46	-1	-0.84	-0.66	-0.57	-0.88	-0.62	-1.02
30	0.12	-1.94	-1.31	-0.93	-0.86	-1.78	-1.05	-2.28
30	0.46	-1.4	-0.94	-0.69	-0.64	-1.35	-0.85	-1.66
15	0.16	-1.680	-1.341	-0.794	-1.036	-1.202	-1.157	-1.495
Overturning moment per panel supported (ft-lbs)		-1401	-1118	-662	-863	-1002	-964	-1246
Number of panels supported		8.00	12.00	8.00	12.00	8.00	12.00	8.00
Overturning moment (ft-lbs)		-11205	-13416	-5296	-10357	-8017	-11574	-9965

Uplift, overturning, and sliding control

Friction coefficient	0.5
Safety factor	1.5
Dead load on post (lb)	626

	Combination	North Row Ends	North Row Mid	Mid Aisles	Mid Row Mid	Mid Row Ends	South Row Mid	South Row Ends
Total uplift vertical (lb)	W	-1288	-1754	-642	-1142	-992	-1289	-1217
Effective weight on tubs (lb)	0.6D(post)+W	-912	-1378	-266	-766	-616	-914	-841
Total Horiz. force (lb)	W	345	470	172	306	266	346	326

Min tub weight based on assumed safety factor (lb)		North Row Ends	North Row Mid	Mid Aisles	Mid Row Mid	Mid Row Ends	South Row Mid	South Row Ends
	Control							
	Friction control	2190	3120	903	1900	1600	2193	2048
	Uplift control	1368	2068	399	1150	924	1370	1261
	Overturning control	2237	2790	760	2026	1440	2330	1928
	Minimum needed	**2237**	**3120**	**903**	**2026**	**1600**	**2330**	**2048**

Soil pressure control on the tub edge

		North Row Ends		North Row Mid		Mid Aisles		Mid Row Mid		Mid Row Ends		South Row Mid		South Row Ends	
Vertical force	D+0.75W+0.75S (or0.45W)	4094	5874	5724	7590	3244	4397	5089	6422	3679	5012	5283	7351	3958	5530
Moment (lb-ft)		-3500	1098	-3691	900	-1943	825	-3269	587	-2509	770	-3635	1274	-2817	974
e/L		0.86	0.19	0.64	0.12	0.60	0.19	0.64	0.09	0.68	0.15	0.69	0.17	0.71	0.18
Soil Stress (ksf)		0.11	0.29	0.18	0.37	0.10	0.22	0.16	0.31	0.11	0.25	0.16	0.36	0.12	0.27
Soil Stress (psi)		0.74	2.03	1.23	2.54	0.72	1.52	1.09	2.12	0.77	1.71	1.10	2.53	0.81	1.90
Vertical force (lb)	0.6D+0.6W (or0.45W)	1325	3700	1741	4229	637	2175	1259	3037	984	2762	1416	4173	1208	3304
Moment (lb-ft)		-4667	1464	-4921	1200	-2591	1101	-4359	783	-3345	1027	-4846	1699	-3756	1299
e/L		3.52	0.40	2.83	0.28	4.07	0.51	3.46	0.26	3.40	0.37	3.42	0.41	3.11	0.39
Soil Stress (ksf)		0.19	0.20	0.20	0.22	0.12	0.12	0.18	0.16	0.14	0.15	0.20	0.23	0.15	0.18
Soil Stress (psi)		1.35	1.40	1.39	1.53	0.83	0.86	1.25	1.08	0.96	1.04	1.39	1.59	1.06	1.25
Max soil pressure (ksf)		0.37			< 1.0 ksf Ok										
Max Soil Stress (psi)		2.54			< 5.2 psi Ok										

Tub bottom dimensions (ft) 1.83 * 12

APPENDIX H

Material Management Report

Materials Management Plan

1.0 Overview

This Material Management Plan (Plan) provides a summary of measures that will be implemented during the minor disruption activities planned as part of the installation of solar panels at the City of Norwich former bulky waste landfill and former MSW landfill. The intent of this plan is to protect the public health, safety and the environment. The proposed work includes the installation of a 1.49 MW (DC) solar photovoltaic (PV) system and related infrastructure within the footprint of the landfills. A detailed description of proposed work and design plans are attached to the application package.

2.0 Objectives

The objective of this Plan is to set guidelines for the management of any encountered/generated municipal solid waste (MSW) material during any subsurface work/activities that will occur within the area of the landfill boundaries.

3.0 Nature of Material

Closure documents for the Bulky Waste Landfill indicate that there is 24" of cover material that meets the 1 x 10^{-5} cm/sec impermeability requirements of 40 CFR Part 258 (low permeability soil), along with a vegetative support layer. Test pits were conducted to determine the vegetative support layer thickness and composition prior to any potential site work.

The area of the array on the MSW landfill is generally a six-inch subbase layer; overlain, by a LLDPE textured geo-membrane liner; overlain by a geo-composite draining layer consisting of an HPDE drainage net heat bonded between two layers of geo-textile; overlain by 18 inches of cover soil having a permeability greater than 1 X 10-5 cm/sec and a six-inch vegetative support layer. Test pits will be required prior to any site work on the MSW landfill to confirm thickness of the vegetative support layer.

4.0 Exposure Profile

Exposure profiles provide the narrative description of the mechanisms by which exposure to the identified impacted material may occur at a site. Profiles are developed for each of the receptors identified for current and foreseeable future uses of the site in order to assist in identifying appropriate values for exposure variables. Exposure profiles are developed by identifying: 1) the exposure setting, 2) receptors, 3) exposure points, 4) exposure routes, and 5) exposure pathways.

As described in the previous sections, the source for the greatest potential for human exposure is from the MSW. For a complete exposure pathway to occur a person would need to come into direct contact with the MSW and/or breathe landfill gas. Exposure via these routes could occur by disturbing the MSW or from inhaling fugitive dust and or landfill gas generated while penetrating the MSW. The site is a closed landfill. MSW located at the site is currently

encapsulated by a low permeability flexible membrane liner and soil layer in addition to a vegetative support layer; therefore, a typical site worker would not have direct contact with the MSW while performing non-intrusive activities that do not penetrate the two soil layers and therefore individuals that conduct disturbances that do not extend beyond these two layers that are not considered to be a receptor for the purposes of this Plan. A contractor may have direct contact with the MSW while conducting the excavation for the installation of the PV related equipment (ballasts, pads, etc.) since this type of work could expose areas that have less than the expected cover material. The maximum anticipated excavation is the depth of the vegetative support layer, which will be confirmed by test pitting. The design plans indicate no disruption to the 24" thick low permeability soil layer. If excavation exceeds this depth, potential pathways for exposure for this type of worker would be incidental ingestion, dermal contact, and inhalation of fugitive dust and/or landfill gas.

The site is not readily assessable to the public. The use of the site and surrounding area is likely to remain the same in the foreseeable future based on zoning and historical uses. The selected contractor for the project will be required to prepare and follow Occupation Safety and Health Administration standards and the requirements of their Health and Safety plan during all on-site activities for the both the safety of workers and for others entering the site.

5.0 Exposure Profile

The purpose of this section is to provide general guidelines for the management of disturbed waste, either Bulky Waste or MSW during any intrusive work that breaches the low permeability and vegetative support layers and to address the required supporting documents section of the disruption permit application. It should be noted that no work should occur below the vegetative support layer on either landfill.

6.0 Management of Encountered Waste

All excavated Bulky Waste or MSW, if encountered, will be backfilled into the excavations to the maximum extent prudent pursuant to the construction drawings. Any excavated waste material not re-deposited on-site in the manner described above will be disposed of off-site at a licensed solid waste disposal facility. A minimum of 6 inches of clean soil will be placed over any exposed waste at the end of each work day or more frequently if odors or vectors are identified to be of concern. A minimum of 12 inches of clean soil will be applied to any waste that is exposed for any period exceeding 24 hours.

7.0 Dust Control

Work areas that penetrate the existing cover material will be wetted the extent prudent in order to minimize the generation of dust. Excessive wetting that may cause ponding or erosion of the disturbance area will not be permitted.

8.0 Landfill Gas Control

Work areas that penetrate the existing cover material may allow landfill gas to escape to the surrounding atmosphere. Landfill gas contains methane at levels that might be explosive when mixed with proper amounts of oxygen. Receptors working at the site should wear personnel methane monitors to warn them of possible releases of methane. Also, the Contractor should monitor the air around the working area to make sure that landfill gas is not becoming an issue.

9.0 Odor Control

The Contractor will provide odor control measures as needed including limiting areas of disturbance, covering exposed waste in a timely fashion, and/or applying odor control agents.

10.0 Fire Control

An adequate water supply and fire-fighting equipment will be maintained at the facility or be readily available to extinguish any and all types of fires.

11.0 Vector/Litter Control

Vectors and blowing litter will be controlled by the application of cover soil. If vectors persist, a control program will be implemented in compliance with Department Regulations.

12.0 Repairs of Cover Material

On the Bulky Waste Landfill, a minimum of 6 inches of hydrated bentonite grout will be used within any areas where waste is encountered or exposed. In all cases, the 24 inch low permeability soil layer must be re-established to 24 inches thick. In areas where there is no waste encountered, the cover material shall be repaired with 6 inches of clean granular material and shall be properly compacted around the footings.

No excavation is planned on the MSW landfill. However if the flexible membrane liner is encountered and damaged, the CT DEEP will be notified and an appropriate liner repair firm will be contracted to repair the liner and provide testing data for any welding of the liner required. The material above liner will then be replaced with like material existing on site but no less than the 18 inches of cover soil having permeability less than 1 X 10-5 cm/sec.

13.0 Project Schedule

The Bureau of Materials Management and Compliance Assurance will be notified at least 72 hours prior to the initiation of any disruption activities.

Health and Safety Plan
for the
Operation/Maintenance of a PV Solar Landfill Facility

Rodger Road Landfill
Norwich, Connecticut

Prepared by
Weston & Sampson Engineers, Inc.

August 2015

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Attachment A
Emergency Pre-Planning Information

Attachment B
Employee HASP Review Signature Sheet

1. Introduction

This Health and Safety Plan (HASP) has been prepared for operation and maintenance activities to be performed by employees at the Rodgers Road Landfill Solar Project (the Site), Norwich, Connecticut. The HASP has been prepared in response to site conditions likely to be encountered at the Site. This HASP will be reviewed by employees working on this project and a copy will be kept on site during field activities associated with this project area.

2. Description of Work

Employees will oversee and perform operation and maintenance activities at the solar project. This might include such activities as repair of PV panels, supporting racks, electrical lines, etc. Also, this might include any monitoring and maintenance activities such as vegetation control, erosion repairs, mowing, etc.

3. Project Organization

Management of the landfill project is as follows:

Developer (Brightfields Development, LLC) will be responsible for construction, operation, and management of the solar facility. Contact information:

Michael Singer
Brightfields Development, LLC,
40 Walnut Street Suite 301,
Wellesley, MA 02481
860-214-7195 (phone)
msinger@renovapartners.com

The City of Norwich owns the entire landfill property, including the property leased to the solar facility, and operates a materials transfer station and processing facility area. The City of Norwich will be responsible for monitoring and maintenance activities for those parts of the site that are not occupied by the solar facility and will be responsible for environmental monitoring activities in all areas of the site including the solar facility. Contact information:

Barry Ellison, Jr., P.E.
Director of Public Works
City of Norwich
50 Clinton Avenue
Norwich, CT 06360
(860) 823-3798

bellison@cityofnorwich.org

The Health & Safety Coordinator position will be established by the developer before the project begins. The Health & Safety Coordinator will be consulted regarding the information in this HASP and can be consulted for health and safety advice and guidance. The HASP was prepared by staff familiar with the Site-specific project aspects and reviewed by the above-listed Health & Safety Coordinator. In addition, any project-related injuries or accidents shall be reported to the Health & Safety Coordinator and the Human Resources Manager, within 24 hours of occurrence.

4. Project Staff

Site personnel are responsible for their personal health and safety and that of their colleagues, and must adhere to the procedures established in this plan. Personnel shall maintain an awareness of site conditions and exercise sound judgment when confronted with an unsafe and/or (potentially) hazardous condition. If the procedures identified in this HASP do not address an unsafe and/or (potentially) hazardous condition present at the project Site, then Site personnel shall follow a safe course of action and contact the Project Manager or Health & Safety Coordinator.

5. Hazard Evaluation and Control

a. Operation and Maintenance Services

During operation activities associated with the site, personnel have the potential to experience cold weather conditions, trip and fall conditions, and levels of methane gas above ten (10) percent of the Lower Explosive Limit. During operation activities, if the concentration of methane reaches 10% of the Lower Explosive Limit (LEL), Site personnel should cease work and allow methane concentrations to subside before activities continue. Personnel must be diligent when working in proximity to the gas vents. Site employees should dress appropriately (Level D) including safety glasses, steel-toe boots, and outerwear consistent with the anticipated temperatures.

The same precautions should be taken when the maintenance activities such as mowing take place at the site and the use of ANSI Class II High Visibility Vests must be worn when there is mowing or other vehicle traffic in the vicinity of workers.

6. Chemical Contaminants

Historical landfill gas monitoring has identified methane as the primary contaminant of concern (COC) at the site at the limit of waste. This COC has been identified in soil at the site. The source of the COC is a result of the decomposition of waste under anaerobic conditions. Further information regarding methane is summarized in the table below.

Contaminant	Physical Properties	OSHA PEL	Exposure Routes	Signs/ Symptoms of Acute Exposure
Methane	Colorless, odorless, lighter than air, highly explosive		Inhalation	Suffocation

Personnel should adhere to the following safe work practices when conducting operation and maintenance:

- Avoid open flames and sparks
- Avoid closed systems
- No smoking while on site

a. Other Physical Hazards

Wet weather conditions can present slip, trip, and fall hazards. Roadway vehicular traffic and other vehicles, such as a mower, can potentially contact personnel and equipment, and can impair visual communications. Employees shall carefully observe walking surfaces in their work areas and equipment shall be inspected prior to use to assess that it is safe and in good operating condition.

7. Communication Methods

Site personnel shall have ready access to a mobile telephone or other means of communication (e.g., cellular telephone, two-way radio) for external emergency contact purposes during work activities.

8. Personal Protective Equipment

Personal protective equipment (PPE) will be used when necessary to reduce exposures to worksite hazards. PPE is used when engineering and/or work practice controls cannot eliminate or minimize the hazard to an acceptable safe level. Optional items are identified but may become mandatory PPE as site hazard conditions change.

Level D protection shall be used during site activities. This PPE has been selected based on hazards associated with scheduled work activities and anticipated site conditions. Level D protection includes the mandatory use of the following PPE:

- American National Standards Institute (ANSI) approved safety glasses with side shields
- Steel-toed safety shoes
- Traffic safety vests as required
- Nitrile gloves

The following are required equipment for on-site activities but are not PPE or Level D requirements:

- First aid kits

9. Training and Medical Surveillance

a. Training

Supervisory personnel overseeing site work shall have completed the Initial Training as required by the Occupational Safety and Health Administration (OSHA) in 29 CFR 1910.120 (Hazardous Waste Operations and Emergency Response (HAZWOPER) course and a minimum of three days of supervised actual field experience and shall also receive annual 8-hour HAZWOPER refresher training.

Site employees will be provided with a copy of this HASP. Site employees are expected to thoroughly read and understand information contained in the HASP prior to conducting site activities.

10. Site Control Measures

a. General Control Measures

The following general site control measures shall be implemented by Site employees working on this project:

- The work area shall be carefully assessed for safety hazards prior to conducting work.
- Visibly contaminated areas should be avoided when possible.
- No eating, drinking, or smoking is allowed in contaminated areas or decontamination zones.
- Chemicals brought to the work area shall be properly stored and labeled.

b. Safety Briefings

The On-Site Coordinator shall conduct a site safety briefing before starting field activities or as tasks and/or site conditions change.

Site safety briefings will consist of a general discussion of the HASP, site-specific hazards, location of work zones, PPE requirements, equipment, special procedures, emergency procedures, and any other pertinent health and safety information.

c. Worksite Set Up

When setting up the worksite, Site employees shall review these procedures. However, based on location and traffic, a work set-up zone as described may not be necessary. Therefore, portions of the section will be used as appropriate:

- Secure area from unauthorized entry by erecting traffic cones around work zone.

- Establish decontamination procedures.
- Utilize access control at the entry and exit from the work zone.
- Establish on-site communications, as appropriate. These consist of line-of-sight signals, hand signals, and verbal communication.
- Establish emergency signals, as appropriate.
- Establish a "buddy system."
- Establish procedures for disposal of waste materials generated on site.

The On-Site Coordinator will conduct periodic assessments of work practices to evaluate the effectiveness of this HASP, as necessary. Deficiencies in personnel adherence to work practices identified in this HASP will immediately be corrected. Deficiencies in the HASP itself will be corrected by the Health & Safety Coordinator prior to implementation.

Personnel shall wash hands and other affected body parts with soap and water prior to breaks, when leaving the site, and when potentially contaminated equipment/material comes in direct contact with the skin.

Wastes (e.g., PPE – gloves, safety glasses, etc.) generated from decontamination activities shall be bagged and properly disposed.

11. Emergency Response

a. Pre-Planning Activities

The On-Site Coordinator shall perform the following pre-planning activities prior to the initiation of field activities:

- Locate nearest telephone to the work site and assess on-site communications.
- Identify chemical and safety hazards.
- Confirm emergency telephone numbers and route(s) to hospital.
- Review project plan for anticipated site conditions, any alterations in on-site operations, and personnel availability.
- Ensure that project team has travel first aid kit and portable eyewash.
- Check site emergency equipment operational status and supply inventory.
- Locate emergency information (e.g., evacuation routes) and designated assembly point on site map.
- Assemble emergency contact, hospital route, evacuation route, and assembly point information.

Emergency pre-planning information is detailed in Attachment A of this HASP.

b. Evacuation Procedures

In the event of an emergency at the worksite, Site personnel will immediately evacuate the work area and proceed to the designated assembly point. Site personnel shall then begin notifying appropriate emergency and site contacts as identified in this HASP.

c. Medical Emergencies

The following procedures shall be implemented by Site employees in the event of a medical emergency:

- Stop field work activities.
- Summon assistance (on and off site), as necessary.
- Prevent further injury and maintain personal safety.
- If the scene is safe, and if trained in and comfortable with performing first aid tasks, initiate first aid, as appropriate.
- Supply medical providers with information about the accident/incident.
- Notify the Project Manager, the Health & Safety Coordinator and the HR Manager of the accident/incident.

d. Accident/Incident Reports

The On-Site Coordinator shall complete an Incident Report Form (obtained from the Health & Safety Coordinator) as soon as possible, but no later than 24 hours, after any accident/incident occurrence. Copies of these forms shall be sent to the Health & Safety Coordinator and the Human Resources Manager.

12. Plan Approval

This Health and Safety Plan (HASP) for the *Rodgers Road Landfill Operation/Maintenance of a PV Solar Landfill Facility* project has been written for use by Site employees. This HASP is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if these conditions change.

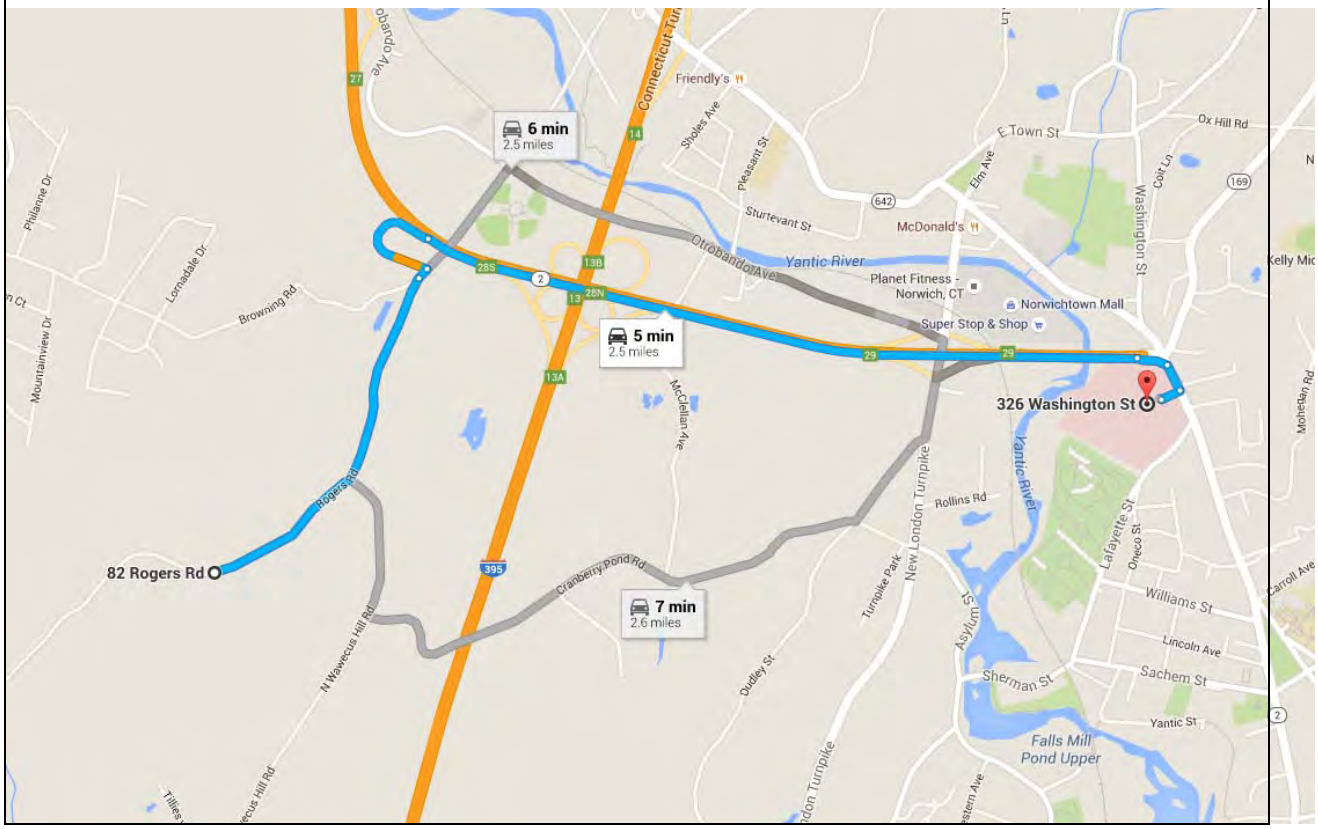
ATTACHMENT A

EMERGENCY PRE-PLANNING INFORMATION

Nearest Telephone:	Cell phone
Chemical and Safety Hazards Not Covered in General HASP:	None
Emergency Telephone Numbers:	
Local Police:	911
Fire Department:	911
Ambulance:	911
State Police (Norwich, CT)	(860) 848-6500
Hospital	(860) 823-6389

Directions from Site to Hospital:

BACKUS HOSPITAL
Emergency Care & Trauma Center
326 Washington Street, Norwich



ATTACHMENT B

EMPLOYEE HASP REVIEW SIGNATURE SHEET

"By signing this form, I verify that I have been provided with a copy of this HASP, and have read it. I understand and agree to abide by the provisions of this HASP."

EMPLOYEE NAME (print)	EMPLOYEE SIGNATURE	DATE

ATTACHMENT C

FIGURE 1 – PV MAINTENANCE AREA ON LANDFILL CAP

(Attached)