Proposed 5.8MW DC Ground Mount Photovoltaic Solar Array

0 MBTA Roadway (Map 13 Lot 138)
Ashland, MA

Issued for:

- Site Plan Review
  Town of Ashland
  Planning Board
  ByLaw Section §8.3 and §9.4
  Photovoltaic Installations
  Overlay District

Applicant:

CITIZENS
ENERGY
CORPORATION
a non-profit energy company

Ashland Solar LLC
88 Black Falcon Avenue, Suite 342
Boston, MA 02210

Prepared by:

ALLEN & MAJOR
ASSOCIATES, INC.

10 Main Street
Lakeville, MA 02347

Tel: (508) 923-1010

A&M PROJECT #2356-01

May 1, 2018

PROJECT TEAM

APPLICANT

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Owner

Megunko Transit District, LLC
62 Temple Drive
Alton, NH 03809
Contact: Robert Gayner
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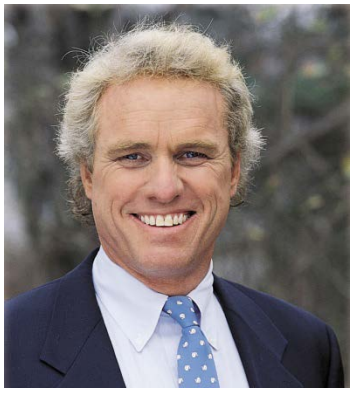
E-mail: regayner@reginterests.com

The information presented herein this report has been a collaborate effort from the various members/personnel of the Project Team.

Citizens Energy Corporation

"No one should be left out in the cold."
-Joseph P. Kennedy II



Citizens Energy Corporation was founded by Joseph P. Kennedy II in 1979 to channel revenues from successful energy ventures to provide low-cost heating oil to the poor and elderly. Under Kennedy's leadership, the Boston-based non-profit grew to encompass seven separate companies, including a major oil trading firm, one of the largest energy conservation firms in the U.S. and one of the largest independent movers of natural gas. As a precursor to market changes under electricity deregulation in the late 1990s, Citizens was a pioneer in moving and marketing electrical power over the grid.

Upon returning to the helm of Citizens Energy after serving 12 years in the U.S. Congress, Kennedy expanded the company's oil heat program to serve millions of poor Americans in 23 states and the District of Columbia, including Native American tribal members, residents of homeless shelters, and low-income renters and homeowners.

Kennedy also launched innovative health care initiatives to make prescription drugs and medical care more affordable and developed an extensive portfolio of renewable energy projects. In addition, Kennedy started a pioneering company that develops high-voltage transmission lines and uses revenues from the venture to help low-income families who struggle to keep up with the increasing costs of energy. Over the course of its history, Citizens Energy has consistently identified and capitalized on market opportunities generating millions of dollars in profits to support social ventures and charitable causes throughout the United States and the world.

Renewable Energy

Citizens Solar develops, builds, owns, and operates ground-mounted utility-scale solar projects. With a portfolio of 30 projects totaling nearly 90 megawatts on the East Coast, Citizens Solar continues to build its solar assets, which represent over $200 million of total value in operation and development. Profits from the arrays help fund Citizens Energy's charitable programs and finance further business investment.

Citizens Wind has completed development of over 230 megawatts of wind power throughout the United States and Canada, with another 200 megawatts in the pipeline. All the projects are conducted in a socially responsible manner, with particular focus on environmental sensitivity and respect for the local communities where we operate.

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Transmission

Citizens Transmission develops high-voltage power lines to deliver renewable power to major energy markets and strengthen the electric grid. Its first project, completed in 2012, was a partnership with San Diego Gas & Electric to construct the $1.9 billion, 120-mile, 500 kV Sunrise PowerLink, which connects the City of San Diego to one of the largest sources of renewable power in the United States—over 1,000 megawatts of geothermal, solar, and wind resources in the Imperial Valley. Citizens Transmission channels 50% of its profits from the project to fund its Solar Homes Program, which over the next 30 years will install thousands of solar collectors atop the homes of low-income residents in Imperial County, helping to reduce their electricity bills. Citizens Transmission is currently developing three other major projects: the 230-kV Central Valley Power Connect in partnership with Pacific Gas & Electric and Berkshire Hathaway Transmission, the 230-kV Sycamore-Penasquitos line in Southern California with San Diego Gas & Electric, and the underground/underwater high-voltage direct-current (HVDC) Vermont Green Line with National Grid.

Global Ventures & Reinvestment

Citizens Energy's first international venture was to purchase crude oil on the global market, ship it to a Caribbean refinery and sell off all the by-products with the exception of heating oil, which was then delivered to New England to be sold at a discount to low-income families struggling with the rising cost of heating their homes. Citizens soon expanded oil-trading activities to nations throughout Latin America and Africa, while launching a unique social reinvestment program – putting a significant share of profits back into the countries where we were doing business, including solar hot water systems serving hospitals in Jamaica and Venezuela, biomass energy projects in Costa Rica, and the development of the Catholic University of Angola. At the same time, Citizens continued to run programs in the U.S. to help the poor with their energy needs.

Citizens seeks to replicate this model in initiating commercial-scale renewable energy and transmission projects in the United States and the developing world, reinvesting profits to support innovative programs to help the poor. Whether using profits from utility-scale wind and solar projects to finance distributed generation systems for low-income households or funding other high-impact social ventures at home and abroad, Citizens Energy is a different kind of company, committed to channeling profits to help the needy wherever we operate.

Contacts

Peter Smith
Chief Executive Officer
Citizens Energy Corp.

Brian Morrissey
Managing Director
Citizens Solar

Kristina Perez
Director
Charitable Programs

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Citizens Solar

Citizens Solar, a major developer of utility-scale solar arrays, is a division of Citizens Energy Corporation, a non-profit company founded in 1979 by former Congressman Joseph P. Kennedy II to use revenues from successful commercial ventures to make life's basic needs more affordable for working families. Citizens Solar joins a list of innovative companies launched by Citizens over the past three decades in the oil and gas, health care, electricity trading, energy conservation, wind and transmission industries to produce profits to help the poor.

Launched in 2010, Citizens Solar develops, finances, constructs, owns, and operates utility-scale projects that generate green energy while producing a positive local economic impact and creating local jobs. To date, the team has about 90 megawatts of solar assets in operation across 30 projects representing over $225 million in total project value. Our integrated development process means we stick with our partners from the first evaluation through the life of their project. Citizens is a leader in turning brownfields to brightfields by installing solar arrays on capped and closed landfills, including nine in Massachusetts.

Specializing in photovoltaic technology, Citizens Solar builds projects in partnership with municipalities, utilities, schools, individuals, and industrial clients. We offer fully integrated solar energy solutions paired with the flexibility to meet the needs of each partner. The business ranks among the largest solar developers in Massachusetts and Georgia and we have projects under development across the country.

Citizens Solar is looking to expand our portfolio to bring the promise of clean, carbon-free energy and a reliable stream of local revenue and jobs to communities across the United States.

Why Citizens Solar?

Proven track record and experience

Strong financial capabilities

Mission-driven leadership

Fully integrated development & ownership

"Solar will solve our country's energy problems for the future."

- Joseph P. Kennedy II
Citizens Energy Chairman

Site Selection Criteria

We conduct site evaluations to determine project feasibility.

Citizens Solar is searching for sites with the following criteria:

- Capped and closed landfills
- Brownfields
- Former industrial sites
- Former agricultural sites

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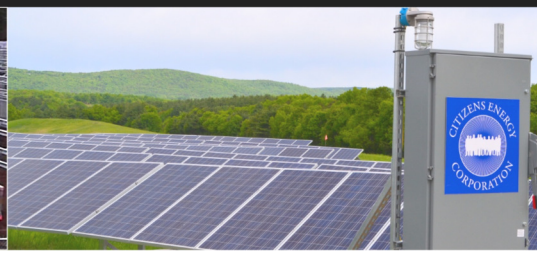
Partnership Opportunities





Landowners

Citizens Solar works with landowners to bring solar power generation to their property through land-lease agreements. Citizens Solar develops, finances, constructs, owns, and operates our projects to provide competitive prices and seamless partnerships. Once operational, a solar lease with Citizens provides years of low-maintenance revenue from clean energy development. Please contact us if you are interested in developing your property for solar, or would like an evaluation of your land's suitability for a solar project.

Energy Offtakers

Citizens Solar contracts with a wide array of end users to provide energy customers with savings through Power Purchase Agreements (PPA), Net-metering Credit Sales Agreements, or Community Solar models. Citizens' partners are saving millions of dollars through these arrangements on their electricity costs.

Developers

Citizens Solar has full financing capability and is interested in solar projects at any stage in their development. We can fund and manage early- and late-stage development activities from origination to construction, and serve as the long-term owner and operator of projects. Please contact us to help make your project a success.



Citizens Solar Team

Brian Morrissey - *Managing Director, Citizens Solar*

Emma Kosciak - *Director of Solar Development*

Michael Kennedy - *Director of Business Development*

Emily Mann - *Manager of Solar Development*

Nick Stahl - *Solar Project Manager*

If you would like to do business with us, or would like to inquire about a solar project, please contact us at **617.443.1304** or send an email to solar@citizensenergy.com for more information.

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Brownfield & Superfund Development

Citizens Solar, a division of Citizens Energy Corporation, has nearly a decade of experience putting unused landfills and brownfields back to work for the communities and residents who live with them.

Under the leadership of former Congressmen Joseph P. Kennedy II, the founder and chairman of Citizens Energy Corporation, we have built over 26 megawatts (MW) of solar generation across nine projects with these challenging site characteristics.

Citizens Solar knows that no two brownfields share the same history or local context, and we work with municipal leaders and communities to understand the needs and challenges that new development faces. We have expertise developing ground-mounted, ballasted solar arrays that preserve the protective caps on sensitive sites, even while producing new jobs, local revenue, and clean, green power.

***Citizens Solar** has extensive knowledge and expertise in developing, owning and operating solar assets on environmentally distressed sites.*

The Citizens Solar Advantage

- **Proven Track Record and Experience** – From our earliest projects, Citizens Solar has built a strong track record of permitting, installation, and operation on 124 acres of landfills and EPA superfund sites.
- **Mission Driven Leadership** – Founded in 1979 to make life's basic needs more accessible and affordable, Citizens Energy is known across the nation as an energy company with a firm commitment to helping out families in need.
- **Financial Capabilities** – With over 30 years of energy industry financing experience, Citizens' financing capabilities and experience set us apart from our competitors. Our corporate leadership has financed solar project portfolios valued at over $225 million, along with raising $98 million of a $1.9 billion investment in a 500-kV high-voltage transmission project in collaboration with San Diego Gas & Electric, and managing Citizens' home heating oil assistance program valued at over $60 million annually. Citizens funds 100% of development costs and sponsor equity on our balance sheet.

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Massachusetts Projects

	Project Location	Commissioned	Size (MW DC)	Type
1	Devens EBZ Solar *Devens, MA*	January 2013	3.0	Ground-Mount
2	Holyoke - County Road Solar *Holyoke, MA*	Februrary 2013	0.8	Ground-Mount
3	Whatley *Whatley, MA*	March 2013	1.8	Ground-Mount
4	Agawam Landfill *Agawam, MA*	March 2013	1.8	Landfill
5	Route 57 *Agawam, MA*	March 2013	1.8	Ground-Mount
6	Rehoboth Solar *Rehoboth, MA*	December 2014	2.6	Ground-Mount
7	Chicopee Solar *Chicopee, MA*	December 2014	3.9	Ground-Mount
8	Chicopee Elks *Chicopee, MA*	January 2015	2.0	Landfill
9	Chicopee River *Springfield, MA*	January 2015	2.6	Landfill
10	Twiss Street *Westfield, MA*	January 2015	2.0	Landfill
11	Hunt Road Solar *Amesbury, MA*	December 2016	6.0	Landfill
12	Norton Solar *Norton, MA*	December 2016	2.0	Landfill
13	Tyngsborough Solar *Tyngsborough, MA*	March 2017	2.3	EPA Superfund Site
14	Dunstable Solar *Dunstable, MA*	March 2017	1.2	EPA Superfund Site
15	Agawam Avenue *West Springfield, MA*	March 2017	2.6	Landfill
16	Falmouth Solar *East Falmouth, MA*	April 2017	4.0	Landfill

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Project Datasheet

Agawam Landfill Solar

Agawam, Massachusetts

Owner and Operator:	Citizens Enterprises Corp.
Developer:	Citizens Enterprises Corp.
General Contractor:	Toshiba, Tokyo, Japan
Electrical Contractor:	Fischbach & Moore, Boston, Mass.
Permitting Support:	Tighe and Bond, Westfield, Mass.
Installed Capacity:	1.8 MW DC
Commissioned:	March 2013
Jobs Created:	30 during construction
Site Area:	10 acres
Energy Production:	2,300,000 kWh per year
CO_2 Displacement:	2,000 tons per year
Mounting Type:	Ground-Mount, ballasted
Racking Manufacturer:	Schletter Inc.
Inverter Manufacturer:	Solectria
Inverter Type:	SGI 500
Inverter Quantity:	3
Module Manufacturer:	Hyundai
Module Wattage:	250 Watts
Module Quantity:	7,254
Module Type:	Mono-crystalline
Tilt:	32°

Project Overview

Located on 10 acres of a capped and closed landfill, formerly Mushy's Driving Range, the Agawam Landfill Solar project is a 1.8-megawatt (MW) solar installation on Main Street in Agawam, Massachusetts.

"The Agawam Solar project provides HP Hood with a competitive advantage through lower cost power."

-Mike Suever
Senior VP,
HP Hood

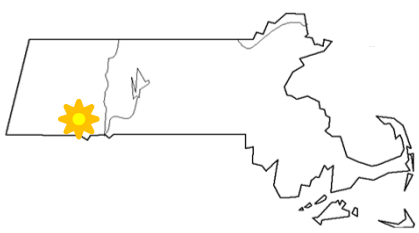
Development for this project began in 2010 and the project became operational in Q1 2013.

The installation is comprised of 7,254 Hyundai solar panels, three Solectria SGI 500 inverters, and a Schletter ballasted racking system. Because this project is located on top of a landfill, all equipment and wiring was installed above-grade in order to prevent any disturbance of the landfill cap.

This project generates over 2 million kilowatt hours (kWh) of clean electricity per year, enough to power approximately 200 homes in New England. It will also prevent the annual release of over 2,000 tons of carbon dioxide from non-renewable power plants.

The output of this facility is being sold to an HP Hood dairy processing plant, which abuts the installation. The partnership will make this Hood plant more energy efficient and competitive in today's challenging business environment.

Project Location



Project Partners

Hood

TOSHIBA
Leading Innovation

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Project Datasheet

Chicopee Elks Landfill

Chicopee, Massachusetts

Owner and Operator:	Citizens Enterprises Corp.
Developer:	Citizens Enterprises Corp.
Electrical Contractor:	M.A. Mortenson Co., Minneapolis, Minn.
Electrical Contractor:	Mass. Electric Co., Waltham, Mass.
Permitting Support:	Tighe and Bond, Westfield, Mass.
Installed Capacity:	2.0 MW DC
Commissioned:	January 2015
Jobs Created:	55 during construction
Site Area:	10 acres
Energy Production:	2,700,000 kWh per year
CO_2 Displacement:	2,000 tons per year
Mounting Type:	Ground-Mount, ballasted
Racking Manufacturer:	GameChange
Inverter Manufacturer:	SMA
Inverter Type:	Sunny Central 800 CP-US
Inverter Quantity:	2
Module Manufacturer:	JA Solar
Module Wattage:	310 Watts
Module Quantity:	6,588
Module Type:	Poly-crystalline
Tilt:	25°

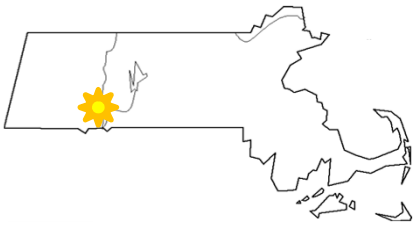
Project Overview

The Chicopee Elks Solar project is located on a capped and closed landfill that was serving no benefit to the Elks Club, the city, or the community. The Elks have a long history of social responsibility, so when the opportunity arose to convert the unused land into a solar array, they welcomed the project.

The 2.0-megawatt (MW) installation is comprised of 6,588 JA Solar solar panels, two Sunny Central 800 CP-US inverters, and a "pour-in-place" GameChange ballasted ground-mount racking system. Completed in January 2015, the facility produces over 2 million kilowatt hours (kWh) of electricity per year, enough to power approximately 200 homes and prevent the annual release of over 2,000 tons of carbon dioxide from non-renewable power plants.

The power from this facility is being sold to the local utility, Chicopee Electric & Light. In addition to the environmental benefits of solar energy, low-cost power produced by this facility will benefit all residents and businesses in Chicopee by contributing to lower electricity rates.

Project Location



Project Partners

CHICOPEE ELECTRIC LIGHT

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Project Datasheet

Chicopee River Landfill

Springfield, Massachusetts

Owner and Operator:	Citizens Enterprises Corp.
Developer:	Citizens Enterprises Corp.
General Contractor:	M.A. Mortenson Co., Minneapolis, Minn.
Electrical Contractor:	Mass. Electric Co., Waltham, Mass.
Permitting Support:	Tighe and Bond, Westfield, Mass.
Installed Capacity:	2.6 MW DC
Commissioned:	January 2015
Jobs Created:	55 during construction
Site Area:	13 acres
Energy Production:	3,400,000 kWh per year
CO_2 Displacement:	3,000 tons per year
Mounting Type:	Ground-Mount, ballasted
Racking Manufacturer:	GameChange
Inverter Manufacturer:	SMA
Inverter Type:	Sunny Central 500 CP-US
Inverter Quantity:	4
Module Manufacturer:	JA Solar
Module Wattage:	310/315 Watts
Module Quantity:	8,388
Module Type:	Poly-crystalline
Tilt:	25°

Project Overview

Chicopee River Solar under construction

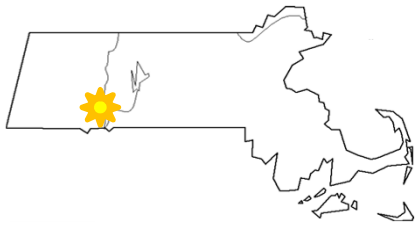
The Chicopee River Solar project was constructed on a capped landfill located in the Chicopee River Business Park in the city of Springfield, Massachusetts. Development for this project began in 2014 and the project became operational in Q1 2015.

The installation is comprised of 8,388 JA Solar photovoltaic panels, four SMA SunnyCentral 500 CP-US inverters, and a GameChange ballasted racking system. Because this project is located on top of a landfill, all equipment and wiring was installed above-grade in order to prevent any disturbance to the landfill cap.

This project generates over 3 million kilowatt hours (kWh) of clean electricity per year, enough to power approximately 300 homes in New England. It will also prevent the annual release of over 3,000 tons of carbon dioxide from non-renewable power plants.

For both the landowner, Westmass Area Development Corporation, and the city of Springfield, this project represents their dedication to clean energy and their commitment to finding innovative ways to increase sustainability and reduce municipal operating expenses.

Project Location



Project Partners

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Westmass
Westmass Area Development Corporation

Project Datasheet

Twiss Street Solar

Westfield, Massachusetts

Owner and Operator:	Citizens Enterprises Corp.
Developer:	Citizens Enterprises Corp.
General Contractor:	M.A. Mortenson Co., Minneapolis, Minn.
Electrical Contractor:	Mass. Electric Co., Waltham, Mass.
Permitting Support:	Tighe and Bond, Westfield, Mass.
Installed Capacity:	2 MW DC
Commissioned:	January 2015
Jobs Created:	55 during construction
Site Area:	10 acres
Energy Production:	2,600,000 kWh per year
CO_2 Displacement:	2,000 tons per year
Mounting Type:	Ground-Mount, ballasted
Racking Manufacturer:	GameChange
Inverter Manufacturer:	SMA
Inverter Type:	Sunny Central 750 CP-US
Inverter Quantity:	2
Module Manufacturer:	JA Solar
Module Wattage:	310 Watts
Module Quantity:	6,300
Module Type:	Poly-crystalline
Tilt:	25°

Project Overview

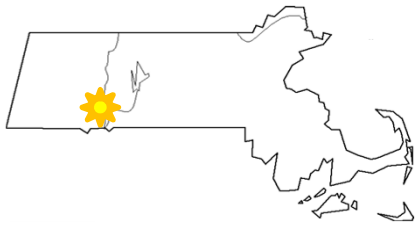
"This is a good project for Westfield, Westfield Gas and Electric, Citizens Energy and the residents of Westfield. It will provide green energy and we get to distribute it at a reasonable cost."

-Daniel Knapik
Mayor,
City of Westfield

During Mayor Knapik's administration, the city of Westfield completed several energy efficiency and cost savings renovation projects. They knew that the city's 10 acre capped and closed landfill was an ideal location for solar PV that could further build out their clean energy efforts. But, while being serviced by the local Westfield Gas and Electric utility has many benefits to the local community, the city struggled to find a solar developer who could navigate working outside of the large investor owned utilities that dominate the rest of the state. Until Citizens, that is. Citizens was able to come up with pricing structures that were beneficial for the local WG&E as well as the city. It was, and continues to be, a win-win-win for all parties.

Due to the 2.0-megawatt (MW) project's proximity to an airport, Citizens worked with the FAA to perform glare studies to ensure the project would not pose any safety concerns for aircraft. Citizens also worked closely with the city's Health Department, and with the MassDEP, the entity responsible for maintenance and regulating solid waste sites. To ensure no disturbance of the landfill cap, all equipment and wiring was installed above-grade, and only low ground pressure equipment was allowed on the cap, even during construction of the facility. Development for this project began in 2014 and the project became operational in Q1 2015.

Project Location



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Project Datasheet

Hunt Road Solar

Amesbury, Massachusetts

Owner and Operator:	Citizens Enterprises Corp.
Developer:	Citizens Enterprises Corp.
General Contractor:	Fischbach & Moore, Boston, Mass.
Electrical Contractor:	J&J Contractors, Billerica, Mass.
Permitting Support:	Tighe and Bond, Westfield, Mass.
Installed Capacity:	6.0 MW DC
Commissioned:	December 2016
Jobs Created:	50 during construction
Site Area:	28 acres
Energy Production:	8,214,000 kWh per year
CO_2 Displacement:	6,000 tons per year
Mounting Type:	Ground-Mount, ballasted
Racking Manufacturer:	GameChange
Inverter Manufacturer:	Solectria
Inverter Type:	SGI XTM 750kW
Inverter Quantity:	6
Module Manufacturer:	LG
Module Wattage:	340 Watts
Module Quantity:	17,647
Module Type:	Mono-crystalline
Tilt:	20°

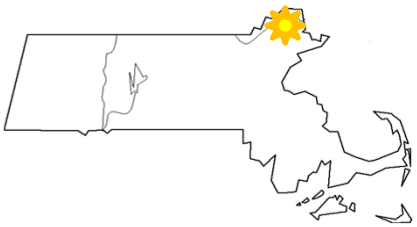
Project Overview

The Hunt Road Solar project is located on a private landfill in Amesbury. The project allowed this unused landfill with little development potential to produce energy, tax revenue, and local construction jobs.

The 6.0-megawatt (MW) installation is comprised of 17,647 LG solar panels, six Solectria SGI XTM 750kW inverters, and a GameChange ground-mount, ballasted racking system. Completed in December 2016, the facility produces over 8 million kilowatt hours (kWh) of electricity per year, enough to power approximately 800 New England homes and prevent the annual release of over 6,000 tons of carbon dioxide from non-renewable power plants.

The power from this facility is being sold at a discount to a local municipality. In addition to the environmental benefits of solar energy, the city of Amesbury will receive substantial tax revenues from the project.

Project Location



Project Partners

WASTE MANAGEMENT

Conti

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Project Datasheet

Norton Solar

Norton, Massachusetts

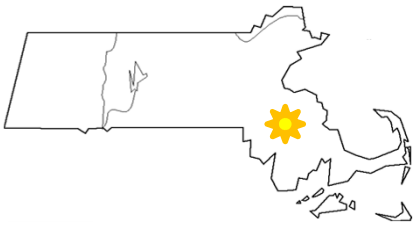
Owner and Operator:	Citizens Enterprises Corp.
Developer:	Citizens Enterprises Corp.
General Contractor:	Conti Solar, Edison, N.J.
Electrical Contractor:	Fischbach & Moore, Boston, Mass.
Permitting Support:	Tighe and Bond, Westfield, Mass.
Installed Capacity:	2.0 MW DC
Commissioned:	December 2016
Jobs Created:	50 during construction
Site Area:	9 acres
Energy Production:	2,820,000 kWh per year
CO_2 Displacement:	2,000 tons per year
Mounting Type:	Ground-Mount, ballasted
Racking Manufacturer:	GameChange
Inverter Manufacturer:	Solectria
Inverter Type:	SGI XTM 750kW
Inverter Quantity:	2
Module Manufacturer:	LG
Module Wattage:	340 Watts
Module Quantity:	5,882
Module Type:	Mono-crystalline
Tilt:	20°

Project Overview

The Norton Solar project is located on the town of Norton's capped and closed municipal landfill. Since the landfill was closed, it was not providing any benefit, but required on-going maintenance and liability, costing the town time and money. The town of Norton recognized the fiscally responsible opportunity to go solar and turn the landfill from an environmental and cost liability, into an environmental asset and revenue generator. The town selected Citizens through a competitive public procurement.

The 2.0-megawatt (MW) installation is comprised of 5,882 LG solar panels, two Solectria SGI XTM 750kW inverters, and a GameChange ground-mount, ballasted racking system. Completed in December 2016, the facility produces over 2.8 million kilowatt hours (kWh) of electricity per year, enough to power approximately 280 homes in New England and prevent the annual release of over 2,000 tons of carbon dioxide from non-renewable power plants.

Project Location



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Project Datasheet

Tyngsborough Solar

Tyngsborough, Massachusetts

Owner and Operator:	Citizens Enterprises Corp.
Developer:	Citizens Enterprises Corp.
General Contractor:	Conti Solar, Edison, N.J.
Electrical Contractor:	Fischbach & Moore, Boston, Mass.
Permitting Support:	Tighe and Bond, Westfield, Mass.
Installed Capacity:	3.5 MW DC
Commissioned:	March 2017
Jobs Created:	100 during construction
Site Area:	19 acres
Energy Production:	4,644,000 kWh per year
CO_2 Displacement:	3,500 tons per year
Mounting Type:	Ground-Mount, ballasted
Racking Manufacturer:	GameChange
Inverter Manufacturer:	Solectria
Inverter Type:	TL 36 kW String
Inverter Quantity:	72
Module Manufacturer:	LG
Module Wattage:	340 Watts
Module Quantity:	10,294
Module Type:	Mono-crystalline
Tilt:	20°

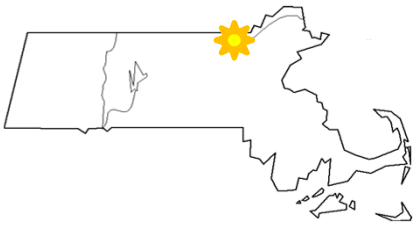
Project Overview

Citizens Solar built two projects in a 3.5-megawatt (MW) array across the town lines of Tyngsborough and Dunstable that run through the Charles George Landfill. This project is a great example of collaboration between municipalities, state government, and federal agencies to ensure the environment and human health are protected, while also responsibly re-developing a landfill for clean energy that will increase local tax revenues.

The 3.5-megawatt (MW) installation is comprised of 10,294 LG solar panels, 72 Solectria TL 36 kW string inverters, and a GameChange ground-mount, ballasted racking system. Completed in March 2017, the facility produces nearly 4.6 million kilowatt hours (kWh) of electricity per year, enough to power approximately 460 homes in New England and prevent the annual release of over 3,500 tons of carbon dioxide from non-renewable power plants.

The solar projects provide environmental benefits to the public, while producing low-cost power for a local municipality.

Project Location



Project Partners

Conti

IBEW CODE OF EXCELLENCE

CITIZENS ENERGY CORPORATION
a non-profit energy company

88 Black Falcon Avenue • Center Lobby Suite 342 • Boston, Massachusetts 02210
617.338.6300 FAX 617.542.4467

Project Datasheet

Agawam Avenue Solar

Agawam, Massachusetts

Owner and Operator:	Citizens Enterprises Corp.
Developer:	Citizens Enterprises Corp.
General Contractor:	Conti Solar, Edison, N.J.
Electrical Contractor:	ML Schmitt, Springfield, Mass.
Permitting Support:	Tighe and Bond, Westfield, Mass.
Installed Capacity:	2.6 MW DC
Commissioned:	March 2017
Jobs Created:	50 during construction
Site Area:	9 acres
Energy Production:	3,538,000 kWh per year
CO_2 Displacement:	2,500 tons per year
Mounting Type:	Ground-Mount, ballasted
Racking Manufacturer:	GameChange
Inverter Manufacturer:	SMA
Inverter Type:	630CP-US (2) / 500 CP-US (1)
Inverter Quantity:	2 and 1
Module Manufacturer:	LG
Module Wattage:	340 Watts
Module Quantity:	7,647
Module Type:	Mono-crystalline
Tilt:	20°

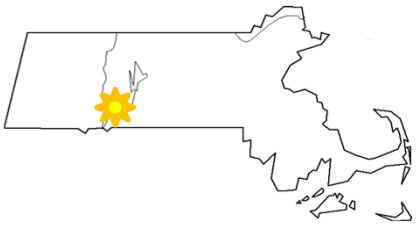
Project Overview

The Agawam Avenue Solar project is located on a closed private landfill in an industrial area surrounded by a power plant, an electrical sub-station, a waste water treatment plant, and an active landfill. Solar is an ideal re-use of this contaminated industrial property.

The 2.6-megawatt (MW) installation is comprised of 7,547 LG solar panels, two SMA 630CP-US and one SMA 500CP-US inverters, and a GameChange ground-mount, ballasted racking system. Completed in March 2017, the facility produces over 3.5 million kilowatt hours (kWh) of electricity per year, enough to power approximately 350 homes and prevent the annual release of over 2,500 tons of carbon dioxide from non-renewable power plants.

The power from this facility will yield electricity savings for a local college, as well as provide educational opportunities for students to learn about clean renewable power sources.

Project Location



Project Partners

ESSENTIAL POWER

Conti

IBEW CODE OF EXCELLENCE

CITIZENS ENERGY CORPORATION
a non-profit energy company

88 Black Falcon Avenue • Center Lobby Suite 342 • Boston, Massachusetts 02210
617.338.6300 FAX 617.542.4467

"This truly is a project that is being done at no cost to the town,"

- Jim Fox, EDIC member

Project Datasheet

Falmouth Landfill Solar Project

Falmouth, Massachusetts

Owner and Operator:	Citizens Enterprises Corp.
Developer:	Citizens Enterprises Corp.
General Contractor:	Conti Solar, Edison, N.J.
Electrical Contractor:	Fischbach & Moore, Boston, Mass.
Permitting Support:	Tighe and Bond, Westfield, Mass.
Installed Capacity:	4.0 MW DC
Commissioned:	April2017
Jobs Created:	50 during construction
Site Area:	16 acres
Energy Production:	5,137,000 kWh per year
CO_2 Displacement:	4,000 tons per year
Mounting Type:	Ground-Mount, ballasted
Racking Manufacturer:	GameChange
Inverter Manufacturer:	Solectria
Inverter Type:	SGI XTM 750kW
Inverter Quantity:	4
Module Manufacturer:	LG
Module Wattage:	340 Watts
Module Quantity:	11,765
Module Type:	Mono-crystalline
Tilt:	25°

Project Overview

The town of Falmouth owns a 40-acre capped and closed landfill that, until solar was introduced, was sitting vacant and providing no benefits to the town or the local community, but requiring on-going maintenance and expense to keep up.

The Falmouth Economic Development and Industrial Corporation ("EDIC"), the primary municipal agency responsible for creating jobs and developing increased economic opportunities, recognized the opportunity to go solar at the landfill. Instead of being an eyesore, it could generate tax revenue for the town, provide lower cost, clean, local electricity, while also earning lease revenue to help fund the EDIC's important economic development goals.

The EDIC worked collaboratively with the town to perform initial feasibility studies, obtain town meeting approvals, and an interconnection agreement. Through a competitive public procurement process, Citizens was selected as the winning vendor to develop, design, finance, construct, and own the solar asset. The total economic benefit to the community over the life of the project is projected to be over $14 million!

Project Location

Project Partners

Falmouth EDIC | Economic Development & Industrial Corporation

Conti

IBEW CODE OF EXCELLENCE

CITIZENS ENERGY CORPORATION
a non-profit energy company

88 Black Falcon Avenue • Center Lobby Suite 342 • Boston, Massachusetts 02210
617.338.6300 FAX 617.542.4467

Section 0 – Cover letter, Application, Certified Abutters List

Section 1 - Narrative

TABLE OF CONTENTS

SECTION 0

Cover letter

Application

Certified Abutters List

ALLEN & MAJOR ASSOCIATES, INC.

SECTION 0

ALLEN & MAJOR ASSOCIATES, INC.

10 Main Street
Lakeville, MA 02347
Tel: (508) 923-1010
Fax: (508) 923-6309

May 1, 2018

Sheila Page, Town Planner
Office of the Planning Board
Town of Ashland
101 Main Street
Ashland, MA 01721

RE: A&M Project # 2356-01
0 MBTA Road
Map 13 Lot 138
Planning Board Submission

Dear Ms. Page:

On behalf of the applicant, Ashland Solar LLC, Allen & Major Associates, Inc. is pleased to submit an application to the Planning Board for approval under the Photovoltaic Installation Overlay District (§8.3) and Site Plan Review (§9.4). The applicant is proposing to construct two (2) ground-mounted photovoltaic solar facilities. The property is shown and identified on Map 13 as Lot 138 with approximately 123 acres with frontage on MBTA Road, Cherry Street and Megunko Road.

The first ground-mounted photovoltaic solar array, identified as Array 1 on the site plan submission drawings, will be located on the cap of the Nyanza Superfund site, which is closed and capped in accordance with the EPA and MassDEP regulations. Solar array 1 will be constructed utilizing pre-cast concrete ballast blocks placed directly on the existing grade of the cap. Conduits will be located within above-grade wire trays and directed to the proposed equipment pad. A newly constructed access road will be built off the existing gravel road and will be located along the easterly side heading northerly to the equipment pad. This path follows the flattest grade for access to the cap surface. Array 1 is located within the Rail Transit District (RTD) B zone as designated on the 2015 Zoning Map of the Town of Ashland and the Photovoltaic Installations Overlay District (PIOD) allowing large scale photovoltaic arrays 'as-of-right' subject to Site Plan Review by the Planning Board. The second ground-mounted photovoltaic solar array, identified as Array 2, will be located between the southerly end of the landfill and the MBTA Road. Solar array 2 will be installed utilizing post-driven methods and conduits will be directly buried to the equipment pad. New utility poles will be installed with overhead wires from both equipment pads to the point of interconnection at utility pole #30 5/6 located on Megunko Road. The solar facility will generate 5.84 MW DC (4.45 MW AC) utilizing 15,570 HANWHA 375W PV Modules.

The proposed improvements are shown in detail on the site plans. Attached herewith are the following items:

- Site Development Plans (2 full size and 8 reduced copies);
- Drainage Report (2 copies);
- Application for Planning Board Approval/Permit (10 copies);
- Check #1025 – Site Plan Review Fee ($750.00)
- Check #1029 – CoUrbanize Fee ($600.00)
- Check #724 – Abutter fee ($50.00)

A&M looks forward to discussing the project at the next Planning Board public hearing. Please notify us to the time of the hearing for the proposed filing. Thank you for your time and consideration. If you have any questions regarding this submittal please contact me at (508) 923-1010.

Very truly yours,
ALLEN & MAJOR ASSOCIATES, INC.

Philip Cordeiro, PE
Branch Manager
pcordeiro@allenmajor.com

cc: E. Mann - Ashland Solar LLC
R. Gayner – Megunko RTD
File

Enclosure: Application & Site Development Package

Town of Ashland
Planning Department
101 Main St.
Ashland, MA 01721
508.881.0101
Ashlandmass.com/193/Planning

Application for Planning Board Approval/Permit

Note: Application must be complete, with a certified plot plan and all application fees to be accepted.

Property Information:

Street Address: 0 MBTA Roadway

Zoning District: Rail Transit District B & E Overlay District: Photovoltaic Installation

Assessor's Map: 13 Lot: 138 Deed Book: 1259 Page: 23

Current Property Owner: Megunko Transit District LLC

Permit/Approval Sought:

____Special Permit (§9.3) ____Special Permit Amendment/Modification ____Design Plan Review (§9.6)

Grass Channel with check ____Site Plan Review (§9.4) ____Site Plan Modification ____Scenic Road Permit (Ch. 249 §20)

____Earth Removal Permit (Ch. 242 §3) ____Site Alteration Special Permit (§5.8)

50% ____Subdivision (Include Subdivision Application Form) ____Wireless Communication Facilities (§6.4)

Use Type: Residential:____ Commercial:X Industrial:____ Mixed Use:____

Applicant Information: Owner:____ Tenant:____ Prospective Purchaser/Tenant:X

Name: Ashland Solar, LLC

Address: 88 Black Falcon Avenue Center Lobby Suite 342 Boston, MA 02210

Phone: 617-951-0418 Email: emann@citizensenergy.com

Agent's Name: Allen & Major Associates, Inc. - Phil Cordeiro, P.E.

Agent's Address: 10 Main Street Lakeville, MA 02347

Agent's Phone: 508-923-1010 Agent's Email: pcordeiro@allenmajor.com

Additional Information:

Are all real estate taxes and other assessments to the Town current?: Yes

Is the parcel on a scenic road?: Yes Is the parcel in a flood plain?: No

Is the parcel within 100 feet of a wetland or 200 feet of a river: Yes

Is this an amendment to a previously issued Special Permit? (attach approved permit): No

Date structure(s) built?: N/A

Description of the Relief Sought: (attach additional pages if needed)

N/A

What specific zoning bylaws and/or Special Permit types are relevant to this application?:

The Applicant is seeking approvals from Chapter 282 Zoning §8.3.3 and §9.4 for the proposed solar project.

Benefits of Project:

Producing clean energy, utilizing land area on the Nyanza cap that would not be available for any other purpose.

Existing use and condition of the property and surrounding neighborhood: (Please list all non-conformities.)

A portion of the development property is the Nyanza cap with access to Megunko Rd. The remaining portion of the property is undeveloped, forested land with frontage on Cherry St., Megunko Rd & the MBTA Rd. Adjacent land was developed into apartments. Surrounding land is single family residential and the MBTA commuter rail station.

Attach Building Permit Denial letter if applicable.

By signing below you assert this application is complete and accurate to the best of your knowledge:

Signatures:

Applicant/Agent: Emily Mann Applicant's Name: Emily Mann

Agent's Relationship to Applicant: _____ Firm: _____

Owner: Megunko Transit District LLC Owner's Name: RE Ca[illegible] / Manager

Note: If the applicant is not the owner, please have the owner sign above or submit a letter of permission with the application.

Commercial Property Record Card

Parcel ID: **014/013.0-0138-0000.0** MAP: **013.0** BLOCK: **0138** LOT: **0000.0** Parcel Address: **0 MBTA ACCESS RD** FY: **2018**

PARCEL INFORMATION	Use-Code:	**131**	Sale Price:	**100**	Book:	**01259**	Road Type:	**T**	Inspect Date:	**02/12/2010**
Owner:	Tax Class:	**T**	Sale Date:	**10/04/2002**	Page:	**0023**	Rd Condition:	**P**	Meas Date:	
MEGUNKO TRANSIT DISTRICT LLC	Tot Fin Area:	**44654**	Sale Type:	**L**	Cert/Doc:	**225773/123191 4**	Traffic:	**M**	Entrance:	
Address:	Tot Land Area:	**123.223**	Sale Valid:	**B**			Water:		Collect Id:	**REB**
PO BOX 300	Sewer:		Grantor:	**GAYNER ROBERT E**			Sewer:		Inspect Reas:	**A**
ALTON NH 03809	Exempt-B/L%	**0/0**	Resid-B/L%	**100/100**	Comm-B/L%	**0/0**	Indust-B/L%	**0/0**	Open Sp-B/L%	**0/0**

COMMERCIAL SECTIONS/GROUPS

Section: **ID:101** Use-Code:400

Category	Grnd-Fl-Area	Story Height	Bldg-Class	Yr-Built	Eff-Yr-Built	Cost Bldg
3	15271	1.0	C	1965	1965	186300

Groups:

Id	Cd	B-FL-A	Flrs	Flrs
1	400	13860	1	1
2	400	867	1	1
3	400	1411	1	1

Section: **ID:201** Use-Code:400

Category	Grnd-Fl-Area	Story Height	Bldg-Class	Yr-Built	Eff-Yr-Built	Cost Bldg
3	1000	1.0	C	1965		16300

Groups:

Id	Cd	B-FL-A	Flrs	Flrs
1	400	1000	1	1

Section: **ID:301** Use-Code:400

Category	Grnd-Fl-Area	Story Height	Bldg-Class	Yr-Built	Eff-Yr-Built	Cost Bldg
3	4100	1.0	C	1910	1965	75400

Groups:

Id	Cd	B-FL-A	Flrs	Flrs
1	400	2400	1	1
2	400	1700	1	1
3	400	850	1	1
4	400	850	1	1

Section: **ID:401** Use-Code:331

Category	Grnd-Fl-Area	Story Height	Bldg-Class	Yr-Built	Eff-Yr-Built	Cost Bldg
3	7200	1.0	C	1960	1965	135100

Groups:

Id	Cd	B-FL-A	Flrs	Flrs
1	331	5760	1	1
2	331	1440	2	1

Section: **ID:501** Use-Code:404

Category	Grnd-Fl-Area	Story Height	Bldg-Class	Yr-Built	Eff-Yr-Built	Cost Bldg
3	4256	1.0	C	1920	1965	126200

Groups:

Id	Cd	B-FL-A	Flrs	Flrs
1	404	4256	1	1
2	404	1900	2	1
3	404	2300	2	1
4	404	420	1	1

Sketch

LAND INFORMATION

NBHD CODE: **404** NBHD CLASS: **1** ZONE: **R4**

Seg	Type	Code	Method	Sq-Ft	Acres	Influ-Y/N	Value	Class
1	P	131	S	30056	0.690	N	182,374	
2	P	131	S	30056	0.690	N	182,374	
3	P	131	S	30056	0.690	N	182,374	
4	P	131	S	30056	0.690	N	182,374	
5	P	131	S	30056	0.690	N	182,374	
6	P	131	S	30056	0.690	N	182,374	
7	P	131	S	30056	0.690	N	170,976	
17	P	131	S	30000	0.689	N	171,000	
18	P	131	S	30000	0.689	N	171,000	
19	U	131	A	3267000	75.000	N	57,656	
20	R	131	A	1830173	42.015	N	64,598	

DETACHED STRUCTURE INFORMATION

Str	Unit	Msr-1	Msr-2	E-YR-Blt	Grade	Cond	%Good P/F/E/R	Cost	Class
AS	S	6372		1965	A	A	50///50	9,100	4
AS	S	7520		1965	A	A	50///50	10,800	3

VALUATION INFORMATION

Current Total:	**2,288,700**	Bldg:	**559,200**	Land:	**1,729,500**	MktLnd:	**1,729,500**
Prior Total:	**2,193,700**	Bldg:	**532,600**	Land:	**1,661,100**	MktLnd:	**1,661,100**

Photo

No Sketch Available

No Picture Available

January 2, 2018

To The Planning Board
MBTA Access Road
Abutters To Map 13 Parcel 138
Megunko Transit District LLC
Abutters To Map 13 Parcel 154
Ashland RTD Apartments LLC

PARCEL ID	PARCEL ADDRESS	OWNER	NAME	MAILING ADDRESS	CITY/TOWN	STATE	ZIP
12-154-00-000	12 RAMBLEWOOD DR	MONTES DE OCA ROLDAN MARCO ANTONIO	MONTES DE OCA CAITLIN DEWILDE	12 RAMBLEWOOD DR	ASHLAND	MA	01721
12-155-00-000	16 RAMBLEWOOD DR	HARDY ERIN E	JOHN A HARDY	16 RAMBLEWOOD DR	ASHLAND	MA	01721
12-163-00-000	0 RAMBLEWOOD DR	OWNER UNKNOWN		101 MAIN ST	ASHLAND	MA	01721
12-190-00-000	106 HIGH ST	SAYED AMY E	WALEED SAYED	106 HIGH ST	ASHLAND	MA	01721
13-022-00-000	0 VALLEY RD	NORFOLK FREDERICK J JR	REGINA M NORFOLK	65 HIGH ST	ASHLAND	MA	01721
13-023-00-000	29 HIGH ST	GARCIA DAVID R	LOUISE M GARCIA	29 HIGH ST	ASHLAND	MA	01721
13-024-00-000	65 HIGH ST	NORFOLK FREDERICK J JR	REGINA M NORFOLK	65 HIGH ST	ASHLAND	MA	01721
13-085-00-000	60 PLEASANT ST	SIXTY PLEASANT REALTY LLC		60 PLEASANT ST / SUITE 1	ASHLAND	MA	01721
13-095-00-000	15 METCALF AVE	CICSCM LLC		36 SHORE RD	ASHLAND	MA	01721
13-096-00-000	0 PLEASANT ST	TOWN OF ASHLAND	TAX TITLE	101 MAIN ST	ASHLAND	MA	01721
13-101-00-000	116 PLEASANT ST	PRATT WILLIAM F JR & SYLVIA J	MCCURLEY SHERRY L	116 PLEASANT ST	ASHLAND	MA	01721
13-104-00-000	146 PLEASANT ST	WTHJR LLC		26 PERRY ST	SHERBORN	MA	01770
13-105-00-000	180 PLEASANT ST	190 PLEASANT STREET LLC		190 PLEASANT ST	ASHLAND	MA	01721
13-106-00-000	190 PLEASANT ST	190 PLEASANT STREET LLC		190 PLEASANT ST	ASHLAND	MA	01721
13-107-00-000	200 PLEASANT ST	BORELLI GERALD & SUZANNE	TRUSTEES SRGA BORELLI REAL ESTATE	49 OREGON RD	ASHLAND	MA	01721
13-108-00-000	240 PLEASANT ST	METROWEST FACILITIES LLC		350 PLEASANT ST	ASHLAND	MA	01721
13-109-00-000	260 PLEASANT ST	METROWEST FACILITIES LLC		350 PLEASANT ST	ASHLAND	MA	01721
13-110-00-000	280 PLEASANT ST	METROWEST FACILITIES LLC		350 PLEASANT ST	ASHLAND	MA	01721
13-111-00-000	330 PLEASANT ST	METROWEST FACILITIES LLC		350 PLEASANT ST	ASHLAND	MA	01721
13-112-00-000	350 PLEASANT ST	METROWEST FACILITIES LLC		350 PLEASANT ST	ASHLAND	MA	01721
13-118-00-000	0 HIGH ST	MASS BAY TRANSPORTATION AUTHORITY		TEN PARK PLAZA	BOSTON	MA	02116
13-127-00-000	171 MEGUNKO RD	CAMILLE E J FAMILY LIMITED PARTNERSHIP	EDWARD J CAMILLE GENERAL PARTNER	183 B MEGUNKO RD	ASHLAND	MA	01721
13-128-00-000	165 MEGUNKO RD	NO SMILE LLC		183B MEGUNKO RD	ASHLAND	MA	01721
13-129-00-000	135 MEGUNKO RD	LEACU WILLIAM M		PO BOX 182	ASHLAND	MA	01721
13-130-00-000	123 MEGUNKO RD	LEFTER CLAUDIA J & JAMES L	TRUSTEES FOUNTAIN STREET RLTY TR	105 S SPENCER RD	SPENCER	MA	01562
13-131-00-000	101 MEGUNKO RD	LEFTER CLAUDIA J & JAMES L	TRUSTEES FOUNTAIN STREET RLTY TR	105 S SPENCER RD	SPENCER	MA	01562
13-132-00-000	93 MEGUNKO RD	MCL DEVELOPMENT CORP		62 TEMPLE DR / PO BOX 300	ALTON	NH	03809
13-139-00-000	0 MEGUNKO RD	POSTIZZI JOHN A	C/O JANICE ROGERS	79 FRANKLIN ST	FRAMINGHAM	MA	01702
13-140-00-000	70 MEGUNKO RD	ALBERINI FAMILY REALTY TRUST	RICHARD ALBERINI TRUSTEE	306 CHESTNUT ST	ASHLAND	MA	01721
13-141-00-000	50 MEGUNKO RD	POSTIZZI JOHN A	C/O JANICE ROGERS	79 FRANKLIN ST	FRAMINGHAM	MA	01702
13-142-00-000	0 MEGUNKO RD REAR	BRUEN PETER A & FRANCES A	MEGUNKO-CHERRY REALTY TRUST	111 CHERRY ST	ASHLAND	MA	01721
13-143-00-000	0 CHERRY ST	MURPHY WILLIAM E		143 CHERRY ST	ASHLAND	MA	01721
13-144-00-000	155 CHERRY ST	CAFFELLE ALEXI I	TYLER D CAFFELLE	155 CHERRY ST	ASHLAND	MA	01721
13-152-00-000	1 CIRRUS DR	ASHLAND TRANSIT APARTMENTS OWNER LLC		ONE CAMPANELLI DR	BRAINTREE	MA	02184
13-155-00-000	0 HIGH ST REAR	GROVER MARK R		120 HIGH ST	ASHLAND	MA	01721
13-156-00-000	7 BALDWIN CIRCLE	BLACK STEPHEN D	KATZENBERG BARBARA	7 BALDWIN CIRCLE	ASHLAND	MA	01721
13-157-00-000	11 BALDWIN CIRCLE	GRUSZKA CHRISTOPHER G	CHERYL A GRUSZKA	11 BALDWIN CIRCLE	ASHLAND	MA	01721
13-159-00-000	98 HIGH ST	STEEVES FREDERICK J	JANICE M STEEVES	98 HIGH ST	ASHLAND	MA	01721
13-160-00-000	0 HIGH ST	MORRISETTE R & HARTMANN L &	TRUSTEES OF THE MORRISETTE REALTY TR	34 HIGH ST	ASHLAND	MA	01721
13-161-00-000	0 HIGH ST	MORRISETTE R & HARTMANN L &	TRUSTEES OF THE MORRISETTE REALTY	34 HIGH ST	ASHLAND	MA	01721
13-162-00-000	0 HIGH ST	MORRISETTE R & HARTMANN L &	TRUSTEES OF THE MORRISETTE REALTY	34 HIGH ST	ASHLAND	MA	01721
13-163-00-000	34 HIGH ST	MORRISETTE R & HARTMANN L &	TRUSTEES OF THE MORRISETTE REALTY	34 HIGH ST	ASHLAND	MA	01721
13-164-00-000	30 HIGH ST	KLUG BRIAN K	JENNIFER L KLUG	30 HIGH ST	ASHLAND	MA	01721
13-165-00-000	26 HIGH ST	WALBRIDGE LINDA	BRUCE WALBRIDGE	26 HIGH ST	ASHLAND	MA	01721
14-044-00-000	0 MEGUNKO RD	ASHLAND LANDSCAPE SUPPLY LLC		18 WAVERLY ST	ASHLAND	MA	01721

January 2, 2018

To The Planning Board
MBTA Access Road
Abutters To Map 13 Parcel 138
Megunko Transit District LLC
Abutters To Map 13 Parcel 154
Ashland RTD Apartments LLC

PARCEL ID	PARCEL ADDRESS	OWNER	NAME	MAILING ADDRESS	CITY/TOWN	STATE	ZIP
14-045-00-000	111 CHERRY ST	BRUEN PETER A & FRANCES A	MEGUNKO-CHERRY REALTY TRUST	111 CHERRY ST	ASHLAND	MA	01721
14-049-00-000	143 CHERRY ST	MURPHY WILLIAM E		143 CHERRY ST	ASHLAND	MA	01721
14-050-00-000	145 CHERRY ST	CORONELLA JUSTIN J		145 CHERRY ST	ASHLAND	MA	01721
14-051-00-000	149 CHERRY ST	TRACY JENNIFER L	SEPULVEDA JUAN	149 CHERRY ST	ASHLAND	MA	01721
14-052-00-000	151 CHERRY ST	MARTIN KAREN		151 CHERRY ST	ASHLAND	MA	01721
14-053-00-000	161 CHERRY ST	MAGNANI RICHARD A		145 LORRAINE CIRCLE	WEST SAYVILLE	NY	11796
14-054-00-000	163 CHERRY ST	HASKELL PATRICIA H		165 CHERRY ST	ASHLAND	MA	01721
14-055-00-000	167 CHERRY ST	BRADLEY JOSEPH		1273 S AMMONS ST	LAKEWOOD	CO	80232
14-056-00-000	85 SUMMER ST	TOWN OF ASHLAND	STONE PARK	101 MAIN ST	ASHLAND	MA	01721
19-043-00-000	16 RUSSET HILL RD	WILKINSON ALYSE B	PAUL K WILKINSON	16 RUSSET HILL RD	ASHLAND	MA	01721
19-044-00-000	20 RUSSET HILL RD	KRUMHOLZ DAVID B & COHEN-KRUMHOLZ SHARC	TRUSTEES 20 RUSSET HILL ROAD NOMINEE	20 RUSSET HILL RD	ASHLAND	MA	01721
19-045-00-000	24 RUSSET HILL RD	FOGAREN PETER B	TERESA FOGAREN	24 RUSSET HILL RD	ASHLAND	MA	01721
19-046-00-000	28 RUSSET HILL RD	SCHULMAN LYNN E	DAVID W SCHULMAN	28 RUSSET HILL RD	ASHLAND	MA	01721
19-047-00-000	32 RUSSET HILL RD	APKE JOSEPH H	SARA S APKE	32 RUSSET HILL RD	ASHLAND	MA	01721
19-048-00-000	38 WILBUR DR	TASCIONE RICHARD L	ELIZABETH G TASCIONE	38 WILBUR DR	ASHLAND	MA	01721
19-049-00-000	42 WILBUR DR	RICHMOND DEV. CORP.		P.O. BOX 539	ASHLAND	MA	01721
19-050-00-000	46 WILBUR DR	MELTZER MITCHELL S	THERESA M MELTZER	46 WILBUR DR	ASHLAND	MA	01721
19-051-00-000	50 WILBUR DR	POTTHOFF PETER P	M ELIZABETH POTTHOFF	50 WILBUR DR	ASHLAND	MA	01721
19-052-00-000	54 WILBUR DR	DALY DAVID	DEBORAH DALY	54 WILBUR DR	ASHLAND	MA	01721
19-053-00-000	58 WILBUR DR	SOLTYS STEPHEN N	HOLLY M SOLTYS	58 WILBUR DR	ASHLAND	MA	01721
19-054-00-000	62 WILBUR DR	KUANG WO XI	JANE KUANG	62 WILBUR DR	ASHLAND	MA	01721
19-055-00-000	15 LORRAINE DR	WEIDLICH KEITH W	JENNIFER L WEIDLICH	15 LORRAINE DR	ASHLAND	MA	01721
19-056-00-000	11 LORRAINE DR	TERRY MARC L	TRACY S TERRY	11 LORRAINE DR	ASHLAND	MA	01721
19-057-00-000	7 LORRAINE DR	ALMEIDA RAYMOND J JR & SUSAN J	TRUSTEES OF THE RJC FAMILY TRUST	7 LORRAINE DR	ASHLAND	MA	01721
19-060-00-000	87 WEST UNION ST	TOWN OF ASHLAND	MIDDLE SCHOOL	101 MAIN ST	ASHLAND	MA	01721
19-061-00-000	0 WEST UNION ST REAR	TOWN OF ASHLAND	SENIOR HIGH SCHOOL	101 MAIN ST	ASHLAND	MA	01721
19-062-00-000	55 WEST UNION ST	RICHMOND DEV. CORP.		P.O. BOX 539	ASHLAND	MA	01721
19-063-00-000	59 WEST UNION ST	BOND EMERY ALLEN & BRANDON THOMAS	TRUSTEES OF THE ISLAND POND TRUST	59 WEST UNION ST	ASHLAND	MA	01721
19-067-00-000	81 WEST UNION ST	81 WEST UNION STREET LLC		70 BARTZAK DR	HOLLISTON	MA	01746
19-140-00-000	79 PENNOCK RD	MORRISSEY MICHAEL	MARIBETH MORRISSEY	79 PENNOCK RD	ASHLAND	MA	01721
19-141-00-000	80 PENNOCK RD	WILSON BENNET W & ALLISON L	TRUSTESS PENNOCK ROAD REALTY TRU	80 PENNOCK RD	ASHLAND	MA	01721
19-150-00-000	18 LORRAINE DR	SHEEHAN TERRENCE	PATRICIA BUSCH SHEEHAN	18 LORRAINE DR	ASHLAND	MA	01721
19-151-00-000	12 LORRAINE DR	VARSHAVER YEVGENY	MARINA VARCHAVER	12 LORRAINE DR	ASHLAND	MA	01721
19-152-00-000	8 LORRAINE DR	ROMANO SCOTT J	LAPAGLIA LAUREN	8 LORRAINE DR	ASHLAND	MA	01721
19-153-00-000	4 LORRAINE DR	MAILLET ALAN J	JULIANE R MAILLET	4 LORRAINE DR	ASHLAND	MA	01721
19-197-00-000	41 WILBUR DR	DANA PETER H	TEIBER VIRGINIA S	41 WILBUR DR	ASHLAND	MA	01721
19-198-00-000	49 WILBUR DR	DZIUBECK THOMAS R	DAWNA J DZIUBECK	49 WILBUR DR	ASHLAND	MA	01721
19-199-00-000	53 WILBUR DR	CHIN PETER Y & PATRICE P	TRUSTEES 53 WILBUR DRIVE REALTY TR	53 WILBUR DR	ASHLAND	MA	01721
19-205-00-000	0 CHERRY ST REAR	BRADLEY JOSEPH		1273 S AMMONS ST	LAKEWOOD	CO	80232
19-206-00-000	0 WEST UNION ST REAR	SKIPTON PET LODGE LLC		33 WEST UNION ST	ASHLAND	MA	01721
19-207-00-000	41 WEST UNION ST	ARTLO FAMILY LIMITED PARTNERSHIP		41 WEST UNION ST	ASHLAND	MA	01721
20-001-00-000	0 CHERRY ST REAR	PAPADELLIS CHRIS S	TRUSTEE NIRALO RLTY NOMINEE TR	730 OLD CONNECTICUT PATH / PO BOX 1236	FRAMINGHAM	MA	01701
20-002-00-000	171 CHERRY ST	DONALD ALANSON J III	HALLORAN-DONALD BRENDA E	171 CHERRY ST	ASHLAND	MA	01721
20-006-00-000	15 WEST UNION ST	UNION VILLAGE INC		P O BOX 325	ASHLAND	MA	01721
20-007-00-000	25 WEST UNION ST	CNRL INC		P O BOX 325	ASHLAND	MA	01721

January 2, 2018

To The Planning Board
MBTA Access Road
Abutters To Map 13 Parcel 138
Megunko Transit District LLC
Abutters To Map 13 Parcel 154
Ashland RTD Apartments LLC

PARCEL ID	PARCEL ADDRESS	OWNER	NAME	MAILING ADDRESS	CITY/TOWN	STATE	ZIP
20-008-00-000	33 WEST UNION ST	SKIPTON PET LODGE LLC		33 WEST UNION ST	ASHLAND	MA	01721
20-150-00-000	36 WEST UNION ST	PERCHASE CARI L		36 WEST UNION ST	ASHLAND	MA	01721
20-151-00-000	101 PRESIDENTS ROW	ASHLAND COMMONS ASSOCIATES	C/O AMERICAN PROPERTIES TEAM	500 WEST CUMMINGS PARK / SUITE 6050	WOBURN	MA	01801
20-153-00-000	16 WEST UNION ST	LESVOS REALTY LLC		16 WEST UNION ST	ASHLAND	MA	01721
20-154-00-000	14 WEST UNION ST	WEST CENTRAL LICENSEE INC	C/O CLAIRE MEDEIROS	467 S WORCESTER ST	NORTON	MA	02766

The above reflects the latest information available on our records.

Richard E. Ball, M.A.A.
Assistant Assessor

Date 1/3/18

SECTION 1

Project Narrative

ALLEN & MAJOR ASSOCIATES, INC.

SECTION 1

1.0 – PROJECT SUMMARY

The applicant, Ashland Solar, LLC, is proposing to construct two (2) ground-mounted photovoltaic solar facilities on Assessor Map 13 Lot 138 in accordance with Section §8.3 Photovoltaic Installation Overlay District (PIOD) of the Town of Ashland Zoning By-Law. The Applicant is seeking approvals from Chapter 282 Zoning §8.3.3 and §9.4 from the Planning Board and simultaneously seeking approval from the Conservation Commission for a Notice of Intent and Stormwater Management Permit.

The site has frontage on multiple streets which include Cherry Street, Megunko Road and the MBTA Road. The first ground-mounted photovoltaic solar array, identified as Array 1 on the site plan submission drawings, will be located on the cap of the Nyanza Superfund site, which is closed and capped in accordance with the EPA and MassDEP regulations. Solar array 1 will be constructed utilizing pre-cast concrete ballast blocks placed directly on the existing grade of the cap. Conduits will be located within above-grade wire trays and directed to the proposed equipment pad. This path follows the flattest grade for access to the cap surface. Array 1 is located within the Rail Transit District (RTD) B zone as designated on the 2015 Zoning Map of the Town of Ashland and the Photovoltaic Installations Overlay District (PIOD) allowing large scale photovoltaic arrays 'as-of-right' subject to Site Plan Review by the Planning Board. The second ground-mounted photovoltaic solar array, identified as Array 2, will be located between the southerly end of the Nyanza Superfund site and the MBTA Road. Solar array 2 will be installed utilizing post-driven methods and conduits will be directly buried to the equipment pad. New utility poles will be installed with overhead wires from both equipment pads to the point of interconnection at utility pole #30 5/6 located on Megunko Road. The solar facility will generate 5.84 MW DC (4.45 MW AC) utilizing 15,570 LG NeON^{tm}2 or equivalent 375W PV Modules.

2.0 – EXISTING CONDITIONS

2.1 – SITE LOCATION & DESCRIPTION

The Town of Ashland Assessor's office currently identifies the site as Map 13 Lot 138 with a total area of approximately 123.3± acres with access off of Cherry Street, Megunko Road and the MBTA Road. The property is located in the Rail Transit District (RTD) and portions of the property, RTD-B, RTD-C, RTD-D, and RTD-E, located within the Photovoltaic Installation Overlay District (PIOD) as shown on the current Zoning Map.

Figure 1 - Google Earth

The landfill site is located on the northerly side of the site with direct access off of Megunko Road. The area encompasses approximately 16 acres of previously altered/disturbed area as part of the original development use and closure of the solid waste facility. The cap contains disturbed soils with grassed meadow vegetation cut several times annually. The side slopes of the cap are generally at a 2:1 slope and consist of gravel borrow and gravel for stabilization. The slopes within the cap are generally flat. The topography ranges in elevation from 271 to 200. The site drains in all directions and is intercepted by drainage swales, sediment ponds and/or existing wetlands that isolated the cap stormwater from surrounding areas. The southerly portion of the site, near the MBTA Road consists of woodlands with good groundcover and grasslands with good groundcover in the location of the abandoned shell gas easement. The topography ranges in elevation from 292 to 230. The site drains in a northeast directions towards the drainage swales and/or existing wetlands.

The underlying soils have been mapped by the U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS) and consist of the following:

- 416B Narragansett silt loam, 3-8% slopes Hydrologic Soil Group "A"
- 416C Narragansett silt loam, 8-15% slopes Hydrologic Soil Group "A"
- 416D Narragansett silt loam, 8-15% slopes Hydrologic Soil Group "A"
- 654 Udorthents, loamy Hydrologic Soil Group "C"

Figure 2 - Soil's Map

No new on-site soil investigations were done as part of this filing. Drainage infiltration basins have been located in soils categorized as Hydrologic Soil Group A which are known to have soils that are well draining and suitable for subsurface infiltration.

2.2 – EXISTING STORMWATER PATTERNS

In order to compare the difference between pre and post-development peak flows and run-off volumes, existing and proposed watersheds were developed. The design points for existing watersheds were picked based on the extent of development to ensure proper analysis from pre and post-development conditions. All flow paths represent the longest time of concentration for stormwater runoff. The site topography is well defined and runoff is directed to either the easterly wetland or the westerly wetland. A very detail study was conducted in 2007 for the entire RTD district under previous site plan review applications. This report concentrates on the alterations associated with this proposed development.

See the rear of this report for a copy of the Existing Watershed Plan (EWP-1).

3.0 – PROPOSED CONDITIONS

3.1 – PROPOSED OVERVIEW

The proposed project includes construction of two (2) solar photovoltaic (PV) arrays on the site. Components of the system to be installed at the site include solar panels, on ground footings, wiring connections, power inverters, service and metering equipment and an interconnection point. Solar Array 1 will be located on the Nyanza Superfund site and will be constructed utilizing pre-cast concrete ballast which will be placed directly on the existing grades of the landfill. Conduits will be located within above-grade wire trays and directed to the proposed equipment pad. Solar Array 2 will be located southerly of Array 1 and will be installed utilizing post-driven methods and conduits will be directly buried to the equipment pad. New utility poles will be installed with overhead wires from the both equipment pads to the point of interconnection at utility pole #30 5/6 located on Megunko Road. The solar facility will generate 5.84 MW DC (4.45 MW AC) utilizing 15,570 LG NeON^{tm}2 or equivalent 375W PV Modules.

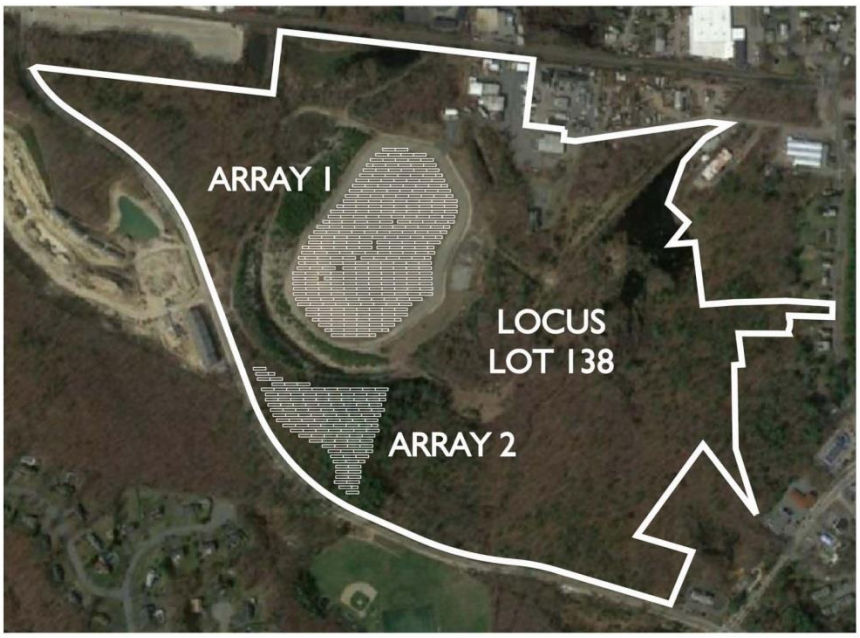


Figure 3 - Proposed Solar Layout

Access will be provided via the existing paved entrance off of Megunko Road and a newly created access off MBTA Road. A stormwater management system is being proposed for solar array 2 due to the change in land cover from woodlands to open space consisting of a low maintenance meadow grass. The proposed stormwater management plan calls for the use of appropriate best management practices, including grass swales with stone check dams and an infiltration basin. The combination of these BMP's will remove greater than 80% of TSS from the anticipated stormwater runoff. No impervious area will be added to the proposed conditions which would alter the existing drainage patterns.

3.2 – CONSTRUCTION IMPACTS

Several temporary and permanent impacts are expected during or as a result of construction of the facility on the Landfill. The site will be accessed via one access road. Only low ground pressure (LGP) equipment with less than 7 pounds per square inch ground pressure will be allowed on the landfill cap. Details and design of the access road, array perimeter roads and internal access are provided on the site plans.

Construction staging, parking and stockpiling of materials will be located to the east of the Landfill on the subject parcel. There will be no off-site construction staging or parking. The Applicant anticipates that the construction period of the Project will last four months, and expects 40 cars and light trucks parked on site by construction workers, with an expected average of ten to fifteen large delivery trucks on site each day during the construction phase.

Installation of the PV system on the Landfill will be initiated with the installation of leveling pads of crushed stone or crushed uncoated ABC (if needed) and the pre-cast ballast blocks. The ballast blocks will be placed on the Landfill surface and the racking system will be constructed on the ballast blocks. Following ballast installation, the rack systems, panels, and supplies will be transported to installation locations with LGP equipment. The racks themselves will be mounted either by hand or with a rubber tracked excavator. Additionally, the panels are two panels high in portrait orientation which enables manual installation. This will reduce the need for vehicular assistance during installation and serve to reduce vehicular traffic on the landfill. Following rack and panel installation, impacted vegetated surfaces will be repaired and seeded as soon as reasonably possible to minimize the potential for erosion.

3.3 – PROPOSED STORMWATER PATTERNS

The drainage patterns under proposed conditions will remain the same as existing conditions and will have the same design point. The existing watershed has been further subdivided. Please refer to the following tables:

Table 3.3.1 – Design Point (Easterly Wetlands) Existing vs Proposed peak rate of runoff

Design Storm	Existing (cfs)	Proposed (cfs)	Difference (cfs)
Water Quality (1")	0.00	0.00	0.00
2-year	5.76	5.76	0.00
10-year	15.60	15.60	0.00
25-year	23.76	23.76	0.00
100-year	34.99	35.55	+0.56*

*Note: slight increase is due to change in land cover type, the runoff volume has been decreased, no discharge occurs from the infiltration basin.

Table 3.3.2 – Design Point (Easterly Wetland) Existing vs Proposed runoff volume

Design Storm	Existing (ac-ft)	Proposed (ac-ft)	Difference (ac-ft)
Water Quality (1")	0.00	0.00	0.00
2-year	0.595	0.595	0.00
10-year	1.386	1.396	+0.010*
25-year	2.116	2.105	-0.011
100-year	3.232	3.130	-0.102

*Note: slight increase is due to change in land cover type, no discharge occurs from the infiltration basin.

Table 3.3.3 – Design Point (Westerly Wetlands) Existing vs Proposed peak rate of runoff

Design Storm	Existing (cfs)	Proposed (cfs)	Difference (cfs)
Water Quality (1")	0.02	0.02	0.00
2-year	9.09	9.09	0.00
10-year	18.87	18.87	0.00
25-year	26.43	26.43	0.00
100-year	36.43	36.43	0.00

Table 3.3.4 – Design Point (Westerly Wetlands) Existing vs Proposed runoff volume

Design Storm	Existing (ac-ft)	Proposed (ac-ft)	Difference (ac-ft)
Water Quality (1")	0.010	0.010	0.00
2-year	0.735	0.735	0.00
10-year	1.467	1.467	0.00
25-year	2.044	2.044	0.00

100-year	2.820	2.820	0.00

The design point tables above note an increase during certain storm events at various design points. This increase is due to the change in ground cover type and all impervious areas are directed towards infiltration BMP's. The net increases are de minimus in the context of the entirety of the site development and scale of the project and wetland systems. Please note that a very detailed study was conducted in 2007 for the entire RTD district, therefore this report is only concentrating on the alterations associated with this proposed development.

See the rear of this report for a copy of the Proposed Watershed Plans (PWP-1).

3.4 – METHODOLOGY

The peak rate of runoff was determined using techniques and data found in the following:

1. Urban Hydrology for Small Watersheds – Technical Release 55 by the United States Department of Agriculture Soils Conservation Service, June 1986. Runoff curve numbers and 24-hour precipitation values were obtained from this reference.

2. HydroCAD© Stormwater Modeling System by HydroCAD Software Solutions LLC, version 10.18. The HydroCAD program was used to generate the runoff hydrographs for the watershed areas, to determine discharge/stage/storage characteristics for the infiltration systems, to perform drainage routing and to combine the results of the runoff hydrographs.

3. Soil Survey of Middlesex County, Massachusetts by United States Department of Agriculture, National Resource Conservation Service. Soil types and boundaries were obtained from this reference.

4. Rainfall Data for each of the storm events was based on the National Weather Service Technical Paper 40 (TP-40) 24-hour rainfall maps as published in the TR-55 book. The total rainfall for each event is shown in the following table:

Table 3.4.1 – Rainfall (TP-40)

Water Quality	2-year	10-year	25-year	100-year
1.0 inches	3.2 inches	4.55 inches	5.5 inches	6.7 inches

3.5 – EROSION AND SEDIMENT CONTROL

The site along the wetland resource areas and within the 100-ft buffer zone to the resource areas will be protected with a staked silt fence or wattle to prevent incidental conveyance of sediment from disturbed areas off-site or into the existing drainage system. All existing drainage inlets adjacent to the site will have silt sacks installed prior to any construction activities. A stabilized construction entrance will be installed in the vicinity of the existing/proposed curb cut. The erosion and control measures will remain in place until all construction activities are complete and all disturbed areas have been stabilized. The contractor will be required to inspect all controls regularly to ensure that they are working properly and to see if they need to be cleaned and/or replaced on an as-needed basis. The proposed project will disturb greater than one (1) acre of land requiring the filing of a National Pollutant Discharge Elimination System (NPDES) Stormwater Construction General Permit. A stormwater Pollution Prevention Plan (SWPPP) will be prepared prior to any construction activity. The SWPPP will prescribe in detail the performance standards to which the contractor for the project will be responsible for. The SWPPP will be maintained at the construction trailer on-site throughout the duration of the project.

4.0 – STORMWATER MANAGEMENT

STANDARD #1

No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

The proposed stormwater management system will discharge treated runoff utilizing several Best Management Practices which include a grassed swale and infiltration basin.

STANDARD #2

Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

Calculations have been provided to show that the proposed development will not cause an increase in peak discharge rates. Refer to the HydroCAD calculations provided within Appendix A of this report for detailed breakdowns.

STANDARD #3

Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

The USDA Soil Survey of Middlesex County was used to determine soil types on site. The project proposes no change to the soils and no impervious areas have been added that require mitigation. The solar panel surfaces are not considered an impervious surface under stormwater standards and do not require mitigation. All stormwater associated with Solar array 2 land alteration will be directed towards the grass swales and eventually into the infiltration basin which has been designed to retain all storm events up to and including the 100-yr event.

STANDARD 4

Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;
b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook and
c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook

The project proposes no change to the soils and no impervious areas have been added that require mitigation. All stormwater associated with Solar array 2 land alteration will be directed towards the grass swales and eventually into the infiltration basin. The use of the grass swale with check dams and the infiltration basin will achieve and exceed the required 80% TSS removal. Refer to the TSS Removal Calculation Worksheets included in this report.

STANDARD 5

For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the

discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

The proposed project is not a Land Use with Higher Potential Pollutant Loads and therefore Standard 5 does not apply.

STANDARD 6

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

The project site does not discharge to or near a critical area therefore Standard 6 does not apply.

STANDARD 7

A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

This project is considered a new development, therefore not applicable.

STANDARD 8

A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

An Erosion Control plan has been incorporated with the design plans. Also, the project requires a Stormwater Pollution Prevention Plan. This plan will be prepared and submitted prior to construction of the proposed roadways. The SWPPP shall also be kept on file as required under the NPDES Construction General Permit program.

STANDARD 9

A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed

An operations and maintenance (O&M) plan has been included in this report that outlines the general maintenance for the stormwater systems during and after construction.

STANDARD 10

All illicit discharges to the stormwater management system are prohibited.

No illicit discharges exist on site. A signed statement shall be provided by the owner in concurrence with issuance of the final site plan.

5.0 – STORMWATER MANAGEMENT SYSTEM MAINTENANCE

In accordance with the standards set forth by the Stormwater Management Policy issued by the Department of Environmental Protection (DEP), Allen & Major Associates, Inc. (A&M) has prepared the following Operation and Maintenance plan for the proposed stormwater management system.

This plan focuses on post construction maintenance of the on-site drainage system. Operation and Maintenance (O&M) practices discussed below are recommendations made by the Design Engineer based on available reference material on Best Management Practices (BMP's) and experience. The property owner is responsible for implementation of the plan, and is encouraged to revise / supplement this plan accordingly based on actual site conditions. All inspection reports shall be submitted to the Town Engineer annually.

This plan is broken into two major sections. The first section describes construction-related erosion and sedimentation controls. The second section is devoted to a post-development operation and maintenance plan.

Basic Information

Proponent: Ashland Solar, LLC
Address: 88 Black Falcon Avenue, Center Lobby Suite 342
City: Boston, MA 02210

Section 1 Construction Activities

1. Schedule a meeting with the various Town Department, Design Engineer and Owner at least three (3) days prior to start of construction.
2. Install the wattles, silt fence, construction fencing and silt sacks in the catch basins as shown on the Erosion and Sediment Control Plan.
3. All erosion and sedimentation controls shall be in accordance with DEP's Erosion and Sedimentation Control guidelines revised through May 2003 and the USDA SCS Erosion and Sedimentation Control in site development dated September 1983.
4. Site access shall be achieved only from the designated construction entrance.
5. All erosion control measures shall be inspected weekly and after any rainfall event greater than 0.5", and shall be maintained, repaired or replaced as required or at the direction of the owner's engineer, or the Town Engineer.
6. Sediment accumulation up-gradient of the wattles and silt fence greater than 6" in depth shall be removed and disposed of in accordance with all applicable regulations.
7. If it appears that sediment is exiting the site, additional silt sacks shall be installed in all catch basins adjacent to the site as directed by the Engineer. Sediment accumulation on all adjacent catch basin inlets shall be removed and the silt sack replaced if torn or damaged.
8. The contractor shall comply with the General and Erosion Notes as shown on the Site Development Plans.
9. All disturbed areas shall be stabilized with mulch or seed immediately upon completion of the construction activity that disturbed the soil or at 6 months whichever is less.
10. All slopes greater than 3:1 shall be stabilized with an erosion control blanket.
11. The contractor shall keep on site additional silt fence and hay bales to mitigate any emergency condition.

Section 2 Post-Development Activities

1. The entire project area shall be stabilized with vegetation upon completion of construction and prior to removal of the erosion control devices.
2. Grass swales should be inspected within the first three months after construction to ensure proper vegetation is established; thereafter, Inspect 2 times per year (preferably in Spring and Fall) to ensure they are working in their intended fashion and that they are free of sediment and debris. Remove any obstructions to flow, including accumulated sediments and debris and vegetated growth. Repair any erosion of the ditch lining. Vegetated ditches will be mowed at least annually or otherwise maintained to control the growth of woody vegetation and maintain flow capacity. Any woody vegetation growing through riprap linings must also be removed. Repair any slumping side slopes as soon as practicable and correct any erosion of the channel's bottom or side slopes.
3. Stone check dams shall be inspected twice per year for erosion, debris accumulation, and unwanted vegetation. Erosion will be stabilized and sediment, debris, and woody vegetation will be removed.
4. Infiltration basin shall be inspected within the first three months after construction to ensure proper vegetation is established; thereafter, Inspect 2 times per year (preferably in Spring and Fall) to ensure they are working in their intended fashion and that they are free of sediment and debris. Vegetated infiltration areas and buffers will be mowed at least semi-annually and organic matter will be removed. Observed trash and debris will removed at each inspection. Sediment will be removed as necessary.
5. Inspect culverts 2 times per year (preferably in Spring and Fall) to ensure that the culverts are working in their intended fashion and that they are free of debris. Remove any obstructions to flow; remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit and to repair any erosion damage at the culvert’s inlet and outlet.
6. Maintenance Responsibilities - All post-construction maintenance activities shall be documented and kept on file and made available upon request.

6.0 – LONG-TERM POLLUTION PREVENTION

As required under stormwater Standard 4, the project requires the "development and implementation of suitable practices for source control and pollution prevention. These measures must be identified in a long term pollution prevention plan. The plan shall include the proper procedures for the following:

- good housekeeping;
- storing materials and waste products inside or under cover;
- vehicle washing;
- routine inspections and maintenance of stormwater BMPs;
- spill prevention and response;
- maintenance of lawns, gardens, and other landscaped areas;
- storage and use of fertilizers, herbicides, and pesticides;
- pet waste management;
- operation and management of septic systems (where applicable); and
- proper management of deicing chemicals and snow.

The proposed project consists of the construction of two (2) solar array facilities and infrastructure to connect to existing utility pole. Upon completion of the projects the maintenance and pollution prevention activities will be the responsibility of the property owner. The Pollution prevention items noted herein shall be followed post construction. Additional constraints shall be followed per the Stormwater Pollution Prevention Plan prepared at the time of construction.

Good Housekeeping

The following good housekeeping practices will be followed onsite during the construction project:

- An effort will be made to store only the amount of material required to do the job.
- All materials stored onsite will be stored in a near, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturer's recommendations for proper use and disposal will be followed.
- The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.

Hazardous Products

These practices are used to reduce the risks associated with hazardous materials:

- Products will be kept in the original containers unless they are not re-sealable.
- Original labels and material safety data will be retained; they contain important product information.
- If surplus product must be disposed of, manufacturers or local and State recommended methods for proper disposal will be followed.

Product Specific Practices

The following product specific practices will be followed onsite:

Petroleum Products

All onsite vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers that are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

Fertilizers

Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to stormwater. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to the manufacturer's instructions or State and local regulations.

Concrete Trucks

Concrete Trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.

Spill Control Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and clean-up:

- Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dustpans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately upon discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous substances will be reported to the appropriate State or local government agency, regardless of the size.
- The spill prevention plan will be adjusted to include measure to prevent this type of spill from reoccurring and how to clean up the spill if there should be another. A description of the spill, what caused it, and the cleanup measure will also be included.
- The Site Superintendent responsible for the day-to-day site operation will be the spill prevention and cleanup coordinator.

Waste Disposal

All trash and construction debris from the site will be deposited in the dumpster. The dumpster will meet all local and State solid waste management regulations. All trash and construction debris from the site will be deposited in the dumpster. No construction waste materials will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the office trailer and the individual who manages day-to-day site operations, will be responsible for seeing that these practices are followed.

Hazardous Waste

All hazardous waste materials will be disposed of in the manner specified by local or State regulation or by the manufacturer. Site personnel will be instructed in these practices and the individual whom manages day-to-day site operations, will be responsible for seeing that these practices are followed.

Sanitary Waste

All sanitary waste will be collected from the portable units a minimum of once per week by a licensed sanitary waste management contractor, as required by the local or State regulation.

Pet Waste

The Owner shall implement a cleanup program where pet owners must put the pet waste into bags and dispose of the waste in the trash.

Sanitary Waste (septic)

There is no septic component to this project that will require long term maintenance.

Landscaping

1) **Mulching and Netting** – Mulching will provide immediate protection to exposed soils during the period of short construction delays, or over winter months through the application of plant residues, or other suitable materials, to exposed soil areas. In areas which have been seeded either for temporary or permanent cover, mulching should immediately follow seeding. On steep slopes, mulch must be supplemented with netting. The preferred mulching material is straw.

Mulch (Hay or Straw) Materials and Installation

a) Straw has been found to be one of the most effective organic mulch materials. The specifications for straw are described below, but other material may be appropriate. The straw should be air-dried; free of undesirable seeds & coarse materials. The application rate per 1,000 sq.ft. is 90-100 lbs. (2-3 bales) and the application rate per acre is 2 tons (100-120 bales). The application should cover about 90% of the surface. The use of straw mulch is appropriate where mulch is maintained for more than three months. Straw mulch is subject to wind blowing unless anchored, is the most commonly used mulching material, and has the best microenvironment for germinating seeds.

Mulch Maintenance

a) Inspect after rainstorms to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, repair surface, reseed, remulch, and install new netting.

b) Straw or grass mulches that blow or wash away should be repaired promptly.

c) If plastic netting is used to anchor mulch, care should be taken during initial mowings to keep the mower height high. Otherwise, the netting can wrap up on the mower blade shafts. After a period of time, the netting degrades and becomes less of a problem.

d) Continue inspections until vegetation is well established.

Vehicle Washing & Construction Access

A stabilized construction entrance has been provided to help reduce vehicle tracking of sediments. Any paved streets adjacent to the site entrance will be swept daily to remove any excess mud, dirt or rock tracked from the site. Dump trucks hauling material from the construction site will be covered with a tarpaulin.

1) **Stabilized Construction Entrance** – An existing stabilized construction entrance shall be used for the duration of construction activity for this project.

Construction Entrance Inspection/Maintenance

a) The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto adjacent properties. This may require periodic topdressing with additional stone
b) The construction entrance and sediment disposal area shall be inspected weekly and after heavy rains or heavy use.
c) Mud and sediment tracked or washed onto public road shall be immediately removed.
d) Once mud and soil particles clog the voids in the gravel and the effectiveness of the gravel pad is no longer satisfactory, the pad must be topdressed with new stone. Replacement of the entire pad may be necessary when the pad becomes completely clogged.
e) If washing facilities are used, the sediment traps should be cleaned out as often as necessary to assure that adequate trapping efficiency and storage volume is available.
f) The pad shall be reshaped as needed for drainage and runoff control.
g) Broken road pavement on adjacent access roadways shall be repaired immediately.
h) All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized.

2) **Construction Road Stabilization** – Existing internal construction roads shall be used for the duration of construction activity for this project. Additional construction road shall be constructed as required with the following requirements:

The proposed stabilization of existing gravel and/or paved roadways will provide a means for construction vehicles to move around the site without causing significant erosion. The road stabilization will significantly speed up on-site work and generally improve site efficiency and working conditions during adverse weather. The construction roads will be stabilized at the beginning of construction and maintained throughout construction. The stabilized construction road will not be located in a cut or fill area until after grading has been performed. Some of the stone used will remain in place for use as part of the final base course of the road. The permanent roadway and cul-de-sac will be paved as soon as possible.

Construction Road Stabilization Design/Construction Requirements

a) A 6-inch course of 2 to 4-inch crushed rock, gravel base, or crushed surfacing base course should be applied immediately after grading or the completion of utility installation. The temporary roads should follow the contour of the natural terrain to the maximum extent possible and/or the existing gravel and/or paved roadways. Slope should not exceed 15 percent. Roadways should be carefully graded to drain to the edge of the road, forcing storm water to travel the shortest route. Provide drainage swales on each side of the roadway in the case of a crowned section, or one side in the case of a super-elevated section.
b) Drain inlets should be protected to prevent sediment-laden water entering.
c) Areas adjacent to culvert crossings and steep slopes should be seeded and mulched.
d) Dust control should be used when necessary. (Please refer to page 15 of 19)

Construction Road Stabilization Inspection/Maintenance

a) Inspect stabilized areas regularly, especially after large storm events. Add 2 to 4-inch crushed rock if necessary and restabilize any areas found to be eroding.

b) All temporary erosion and sediment control measures should be removed with 30 days after final site stabilization is achieved or after the temporary practices are no longer needed.
c) Trapped sediment should be removed or stabilized on site. Disturbed soil areas resulting from removal should be permanently stabilized.

Structural BMP Maintenance

1) **Temporary Diversion** – Temporary Diversion channels will be constructed alongside the proposed roadway until it is paved. The temporary diversion channels will route storm water to temporary sediment basins to remove sediment-laden storm water, before the storm water is allowed to discharge to the permanent detention basin. Check dams need to be utilized along the diversion channels. The maximum spacing of temporary diversion channels should be no greater than the following:

Land Slope (%)	Spacing (feet)
1% or less	300 ft
2%	200 ft
3% to 5%	150 ft
5% or greater	100 ft

Temporary Diversion Design/Construction Requirements

a) The temporary diversion channel cross-section should have a top width between two and four feet, a minimum height of 1.5 ft, and side slopes between 2:1 and 4:1.
b) The grade may be variable depending on the topography and must have a positive grade to the outlet. The maximum channel grade should be limited to 1.0 %.
c) The diverted runoff will outlet through check dams and then to a temporary sediment basin.
d) Diversions that are to serve longer than 30 working days should be seeded and mulched as soon as they are constructed, in order to preserve dike height and reduce maintenance.
e) Once the temporary diversion channels are no longer needed, they should be brought to the design grade and permanently stabilized.

Temporary Diversion Inspection/Maintenance

a) Inspect temporary diversion channels once a week and after every rainfall.
b) Damage caused by construction traffic or other activity should be repaired before the end of each working day.
c) Immediately remove sediment from the flow area and repair the diversion ridge.
d) Check outlets carefully and make timely repairs as needed.
e) When the area protected has been permanently stabilized, remove the ridge and the channel to blend with the natural ground level, and appropriately stabilize it.

2) **Check Dam** – Temporary check dams should be installed along the temporary diversion channels alongside the proposed roadway until it is paved. The check dams will lower the velocities of concentrated flows, thereby reducing erosion in the channel and promoting the settlement of sediments.

Check Dam Design/Construction Requirements

a) Check dams can be constructed of stone, sand bags filled with pea-gravel, or logs. Provide a sump immediately upstream.
b) The maximum spacing between the dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.
c) The stone must be placed by hand or mechanical placement (do not dump rock to form dam) to achieve complete coverage of the ditch or swale and to ensure that the center of the dam is lower than the edges. The stone used should be 2 to 4-inch size.
d) Log check dams should be constructed of 4 to 6-inch diameter logs embedded into the soil at least 18 inches.

Check Dam Inspection/Maintenance

a) Inspect after each rainfall event.

Erosion and Sediment Control Inspection and Maintenance Practices

The following are the inspection and maintenance practices that will be used to maintain erosion and sediment controls:

- All control measures will be inspected at least once each week and following any storm event of 0.5 inches or greater.
- All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report.
- Built up sediment will be removed from haybales when it has reached a depth of 6-inches.
- Haybales will be inspected to ensure secured posts, continuous coverage and proper alignment.
- Temporary and permanent seeding and planting will be inspected for bare spots, washouts and to ensure healthy growth.
- A maintenance inspection report will be made after each inspection. A copy of the report form to be completed by the inspector is attached.
- The Site Superintendent will be responsible for inspection, maintenance and repair activities and reports.
- Personnel selected to aid the Site Superintendent in the above responsibilities will be knowledgeable in all of the inspection and maintenance practices necessary for keeping the erosion and sediment controls used onsite in good working order.

Non-Storm Water Discharges

During construction activities at the site, some water from the site will be suitable for discharge to the detention areas and/or temporary sediment basin areas. Non-stormwater discharges will be directed to recharge groundwater and to replenish wetland resource areas as follows:

1) Water from line flushing will be recharged if in compliance with MA Surface and Ground Water Quality Regulations.
2) Uncontaminated groundwater from de-watering excavations will also be recharged.

The construction de-watering and all non-stormwater discharges will be directed into a storm drain inlet equipped with a siltsack (or equivalent) inlet protection or a sediment basin. The developer and site general contractor will comply with the E.P.A.'s Final General Permit for Construction De-watering Discharges, (N.P.D.E.S., Section 402 and 40 C.F.R. 122.26(b)(14)(x).

INVENTORY FOR POLLUTION PREVENTION PLAN

The materials and substances listed below are expected to be present on site during construction:

- Concrete
- Detergents
- Paints (enamel and latex)
- Concrete
- Tar
- Fertilizers
- Petroleum Based Products
- Cleaning Solvents
- Wood
- Masonry Block
- Roofing Shingles

SPILL PREVENTION

Material Management Practices

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

Paints

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to the manufacturer's instructions or State and local regulations.

Concrete Trucks

Concrete Trucks will be allowed to wash out on-site to a designated area as directed by the Site Superintendent. Concrete waste will be disposed of in accordance with Federal, State and Local regulations.

Spill Control Practices
In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and clean-up: • Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies. • Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dustpans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose. • All spills will be cleaned up immediately upon discovery. • The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance. • Spills of toxic or hazardous substances will be reported to the appropriate State or local government agency, regardless of the size. • The spill prevention plan will be adjusted to include measure to prevent this type of spill from reoccurring and how to clean up the spill if there should be another. A description of the spill, what caused it, and the cleanup measure will also be included. • The Site Superintendent responsible for the day-to-day site operation will be the spill prevention and cleanup coordinator.

Deicing and Snow Removal
Relative to the agricultural area that surrounds the project, environmentally appropriate deicing tools will be used. Standard snow removal plowing techniques shall be used.

7.0 – COMPLIANCE WITH ZONING BY-LAW

7.1 – COMPLIANCE WITH §8.3 PHOTOVOLTAIC INSTALLATION OVERLAY DISTRICT

The proposed project lies within the Photovoltaic Installation Overlay District therefore considered as-of right and is subject to Site Plan Review by the Planning Board prior to construction, installation or modification thereof and upon compliance with the procedural and substantive requirements of §8.3.

7.1.1 – §8.3.6 SITE PLAN REVIEW

a) A site plan showing:

i. *Property lines and physical features, including roads for the project site;*
Please refer to the plans entitled "Site Development Plans for Ashland Solar Lot 138 off Megunko Rd & MBTA Roadway" prepared by Allen & Major Associates dated May 1, 2018.

ii. *Proposed changes to the landscape of the site, grading, vegetation clearing and plants, exterior lighting, screening vegetation or structures;*
Grading associated with the proposed solar array facility will be limited, since the panels will be installed on existing grade. Vegetation clearing will occur in the vicinity of solar array 2. No exterior lighting or structures are proposed. Please refer to the plans entitled "Site Development Plans for Ashland Solar Lot 138 off Megunko Rd & MBTA Roadway" prepared by Allen & Major Associates dated May 1, 2018.

iii. *Blueprints or drawings of the large-scale ground mounted solar photovoltaic installation signed by a professional engineer licensed to practice in the Commonwealth of Massachusetts showing the proposed layout of the system and any potential shading from nearby structures;*
Please refer to the plans entitled "Site Development Plans for Ashland Solar Lot 138 off Megunko Rd & MBTA Roadway" prepared by Allen & Major Associates dated May 1, 2018. For potential shading, please refer to figure in Appendix A.

iv. *One or three line electrical diagram detailing the Large-scale Ground-mounted Solar Photovoltaic Installation, associated components and electrical interconnection methods, with all National Electrical Code compliant disconnects and overcurrent devices;*
Please refer to plan entitled "Preliminary PV AC One Line" prepared by Conti dated May 01, 2017, Sheet No. E-100 & E-101 which is included in the Site Development Plan set.

v. *Documentation of the major system components to be used, including the PV panels, mounting system and inverter;*

- DC system size: 5,838.75 kW DC
- AC system size: 4,450 kW AC
- Modules: 15,570 375 watt modules
- Inverters: (2) 1,335 kW + (1) 1,780 kW Power Electronics
- Transformer: (3) Pad Mounted Transformers
- Mounting System: RBI Ballasted Ground Mount & RBI Post Driven

Please see additional detail information of the components located in Appendix B.

vi. *Name, address and contact information for the proposed system installer;*
Ashland Solar LLC
88 Black Falcon Avenue, Center Lobby Suite 342
Boston, MA 02210
Contact: Emily Mann
Tel: 617-951-0418
E-mail: emann@citizensenergy.com

vii. *Name, address, phone number and signature of the project proponent, as well as all co-proponents or property owners, if any;*

Applicant: Citizens Energy Corporation
88 Black Falcon Avenue, Center Lobby Suite 342

Boston, MA 02210
Contact: Emily Mann
Tel: 617-951-0418
E-mail: emann@citizensenergy.com

Owner: Megunko Transit District, LLC
62 Temple Drive
Alton NH 03809
Contact: Robert Gayner
Tel: 603-998-1008
E-mail: regayner@reginterests.com

viii. The name, contact information and signature of any agent(s) representing the project proponent;
Civil Engineer: Allen & Major Associates, Inc.
10 Main Street
Lakeville, MA 02347
Contact: Phil Cordeiro, P.E.
Tel: 508-923-1010
E-mail: pcordeiro@allenmajor.com

b) Documentation of actual or prospective access and control of the project site.
Please see Memorandum of Lease and Easement Agreement located in Appendix C.

c) An operation and maintenance plan.
Please see Operation and Maintenance Plan located in Appendix D.

d) Zoning district designation for the parcel(s) of land comprising the project site, via submission of a copy of the town's Zoning Map with parcel(s) identified thereon;

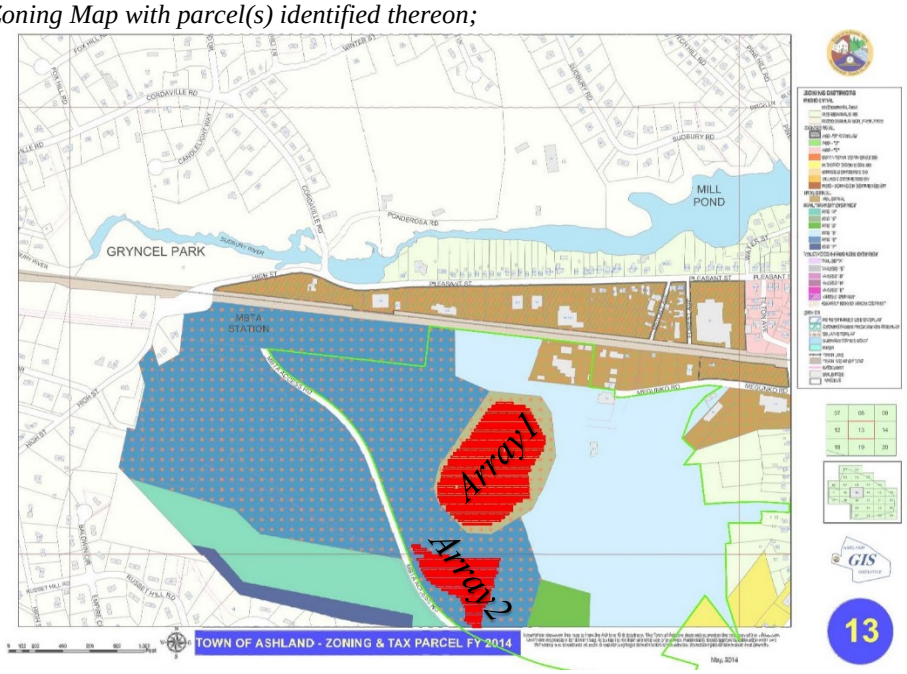


Figure 4 - Zoning Map Atlas 13

e) Proof of Liability insurance;
Please see Certificate of Liability Insurance located in Appendix E.

f) Description of financial surety that satisfies Section 8.3.11.3;
In accordance with Section 8.3.11.3 of the Zoning Bylaw, Ashland Solar will provide financial surety for the project. The Proponent will develop a financial surety with the MassDEP, which will be a condition of the Post Closure Use Permit (PCUP). The MassDEP financial surety is

known as a Financial Assurance Mechanism (FAM). Per the PCUP conditions, the Proponent will not be permitted to commence construction activities until the FAM has been approved and is in place. The FAM will be in a form (typically a bond or letter of credit), in an amount, and with an institution approved by MassDEP. The amount is determined based on the project size. Once the FAM is executed, a copy will be forwarded to the Town of Ashland. The applicant requests that the FAM meet the Town's requirement for a surety.

g) *Utility Notification;*
Please see Interconnection Service Agreement with Eversource located in Appendix F.

7.1.2 – §8.3.7 DIMENSIONAL AND DENSITY REQUIREMENTS

1. *Setbacks. For Large-scale Ground-mounted Solar Photovoltaic Installations, front, side and rear setbacks shall be as follows:*
   a. *Front yard: the front yard depth shall be at least 10 feet; provided, however, that where the lot abuts or lies within a residential district, the front yard shall not be less than 50 feet;*
      The proposed project is located in the Rail Transit District and within the Photovoltaic Installation Overlay District. The required front setback is 10 feet, but the project has been designed to provide a minimum of 50 feet from the MBTA right of way.
   b. *Side yard: each side yard shall have a depth at least 15 feet; provided, however, that where the lot abuts or lies within a residential district, the side yard shall not be less than 50 feet;*
      The required side yard setback is 15 feet, the closest panel is located over 465 feet to the closest sideline.
   c. *Rear yard: the rear yard depth shall be at least 25 feet; provided, however, that where the lot abuts or lies within a residential district, the rear yard shall not be less than 50 feet.*
      The rear yard setback is not applicable due to the property being bordered on the northern side by Megunko Road and on the southerly side by the MBTA Roadway. The proposed solar array exceeds the minimum setback requirements.

2. *Appurtenant Structures. All appurtenant structures to Large-scale Ground-mounted Solar Photovoltaic Installations shall be subject to reasonable regulations concerning the bulk and height of structures, lot area, setbacks, open space, parking and building coverage requirements. All such appurtenant structures, including but not limited to equipment shelters, storage facilities, transformers and substations, shall be architecturally compatible with each other. Whenever reasonable, structures should be shaded from view by vegetation and/or joined or clustered to avoid adverse visual impacts.*
   The proposed project does not include any outdoor storage or structures. The proposed equipment pads will be shielded by the array and are setback from the right of way.

7.1.3 – §8.3.8 DESIGN STANDARDS

1. *Lighting. Lighting of Large-scale Ground-mounted Solar Photovoltaic Installations shall be consistent with local, state and federal law. Lighting of other parts of the installation, such as appurtenant structures, shall be limited to that required for safety and operational purposes, and shall be reasonably shielded from abutting properties. Where feasible, lighting of the Large-scale Ground-mounted Solar Photovoltaic Installation shall be directed downward and shall incorporate full cut-off fixtures to reduce light pollution.*
   No site/exterior lighting is proposed.
2. *Signage. Signs on Large-scale Ground-mounted Solar Photovoltaic Installations shall comply with Section 5.3 of this Zoning Bylaw. In accordance therewith, all signs shall be required to identify the owner and provide a 24-hour emergency contact phone number. Large-scale Ground-mounted Solar Photovoltaic Installations shall not be used for displaying any advertising except for reasonable identification of the manufacturer or operator of the installation.*
   No signage is being proposed at this time.
3. *Utility Connections. Reasonable efforts, as determined by the Planning Board, shall be made to place all utility connections from the Large-scale Ground-mounted Solar Photovoltaic Installations underground, depending on appropriate soil conditions, shape and topography of the project site and any requirements of the utility provider. Electrical transformers for utility interconnections may be above-ground if required by the utility provider.*

All reasonable efforts have been made to place/locate utilities underground. The conduits associated with Solar Array 2 will be underground, but Solar Array 1 will be installed above-grade in wire racks due to the nature of the site with the inability to bury anything within the Nyanza cap. Utility poles and overhead wires will be utilized from the equipment pads to the point of interconnection at the existing UP #30 5/6.

7.1.4 – §8.3.9 SAFETY AND ENVIRONMENTAL STANDARDS

1. *Emergency Services. The Large-scale Ground-mounted Solar Photovoltaic Installation owner or operator shall provide a copy of the project summary, electrical schematic and site plan to the Fire Chief. Upon request, the owner or operator shall cooperate with local emergency services in developing an emergency response plan. All means of shutting down the Large-scale Ground-mounted Solar Photovoltaic Installation shall be clearly marked. The owner or operator shall identify a responsible person for public inquiries throughout the life of the installation.*

   A copy of the Site Development Plans, project summary and electrical schematic will be provided to the Fire Chief. If an emergency response plan is requested, Ashland Landfill, LLC will work with the Town and appropriate local services in developing a plan. Installation will be clearly marked and the owner will identify a responsible person for public inquires throughout the life of the installation.
2. *Land Clearing. Clearing of natural vegetation shall be limited to what is necessary for the construction, operation and maintenance of the Large-scale Ground-mounted Solar Photovoltaic Installation or otherwise prescribed by applicable laws, bylaws and regulations.*

   Land clearing in the vicinity of Solar Array 2 is limited to what is necessary for the construction, operation and maintenance of the facility.
3. *Landscape Architectural Plan. For any Large-scale Ground-mounted Solar Photovoltaic Installation that will be constructed in the Residence A, Residence B, or Residence Multifamily Zoning Districts, a stamped and signed landscape architectural plan indicating how the Installation will be sufficiently buffered from residential neighbors shall be produced. Such plan shall require a minimum of eight (8) foot tall vegetative screening from adjacent uses and shall include a maintenance plan lasting as long as the Photovoltaic Installation is in place, whether operating or not. Such plan shall be approved by the Planning Board prior to installation construction.*

   The proposed project is not located within the Residence A, Residence B or Residence Multifamily Zoning Districts, therefore not applicable.

7.1.5 – §8.3.10 MONITORING AND MAINTENANCE

1. *Condition of the Installation. The Large-scale Ground-mounted Solar Photovoltaic Installation owner or operator shall maintain the facility in good condition. Maintenance shall include, but not be limited to, painting, structural repairs and integration of security measures. Site access shall be maintained to a level acceptable to the local Fire Chief and Emergency Medical Services. The owner or operator shall be responsible for the cost of maintaining the Solar Photovoltaic Installation and any access road(s), unless accepted as a public way.*

   The owner or operator will be responsible for the cost of maintaining the solar array and access roads. The area will be mowed twice per year. A security fence will be installed along the MBTA road and will connect to the existing chain link fence surrounding the landfill.
2. *Modifications. All material modifications to a Large-scale Ground-mounted Solar Photovoltaic Installation made following site plan approval by the Planning Board shall require an amendment thereto.*

   No modifications are anticipated at this time, but if a modification is required a site plan amendment will be filed with the Planning Board.

7.1.6 – §8.3.11 ABANDONMENT OR DECOMMISSIONING

1. *Removal Requirements. Any Large-scale Ground-mounted Solar Photovoltaic Installation which has reached the end of its useful life or has been abandoned consistent with Section 8.3.11.2, below, shall be removed. The owner or operator shall physically remove the installation no more than 150 days after the date of discontinued operations. The owner or operator shall notify the Planning Board by certified mail of the proposed date of discontinued operations and plans for removal. Decommissioning shall consist of.*

a. *Physical removal of all Large-scale Ground-mounted Solar Photovoltaic Installations, structures, equipment, security barriers and transmission lines from the site;*
b. *Disposal of all solid and hazardous waste in accordance with local, state and federal waste disposal regulations;*
c. *Stabilization or re-vegetation of the site as necessary to minimize erosion. The Planning Board may allow the owner or operator to leave landscaping or designated below-grade foundations in order to minimize erosion and disruption to vegetation.*

The applicant will comply with the requirements outlined above.

2. *Abandonment. Absent notice of a proposed date of decommissioning or written notice of extenuating circumstances, the Large-scale Ground-mounted Solar Photovoltaic Installation shall be considered abandoned when it falls to operate for more than one year without the written consent of the Planning Board. If the owner or operator of the Large-scale Ground-mounted Solar Photovoltaic Installation fails to remove the installation in accordance with the requirements of this Section 8.3.11 within 150 days of abandonment or the proposed date of decommissioning, the Town may enter the property and physically remove the installation at the expense of the Proponent.*

   The applicant will comply with the requirements outlined above.

3. *Financial Surety. Proponents of Large-scale Ground-mounted Solar Photovoltaic Installations shall provide a form of surety, either through an escrow account, bond or otherwise, to cover the cost of removal of the installation in the event that the Town must remove it and remediate the landscape. Said surety shall be in an amount and form determined to be reasonable by the Planning Board, but in no event shall exceed more than 125 percent of the cost of removal and compliance with the additional requirements set forth herein. Such surety will not be required for municipally- or state-owned installations. The project proponent shall submit a fully-inclusive estimate of the costs associated with removal, prepared by a qualified engineer. The amount shall include a mechanism for calculating increased removal costs due to inflation.*

   In accordance with Section 8.3.11.3 of the Zoning Bylaw, Ashland Solar will provide financial surety for the project. The Proponent will develop a financial surety with the MassDEP, which will be a condition of the Post Closure Use Permit (PCUP). The MassDEP financial surety is known as a Financial Assurance Mechanism (FAM). Per the PCUP conditions, the Proponent will not be permitted to commence construction activities until the FAM has been approved and is in place. The FAM will be in a form (typically a bond or letter of credit), in an amount, and with an institution approved by MassDEP. The amount is determined based on the project size. Once the FAM is executed, a copy will be forwarded to the Town of Ashland. The applicant requests that the FAM meet the Town's requirement for a surety.

7.2 – COMPLIANCE WITH §9.4 SITE PLAN REVIEW

7.2.1 – §9.4.4 REQUIRED SITE PLAN CONTENTS

1. *The location and boundaries of the lot and adjacent streets or ways and the location and owners' names of all adjacent properties;*

   Please refer to the plans entitled "Site Development Plans for Ashland Solar Lot 138 off Megunko Rd & MBTA Roadway" prepared by Allen & Major Associates dated May 1, 2018.

2. *Existing and proposed topography, including contours, the location of the wetlands (as defined by the Massachusetts Wetlands Protection Act), streams, water bodies, drainage swales, areas subject to flooding and unique natural land features;*

   Please refer to the plans entitled "Site Development Plans for Ashland Solar Lot 138 off Megunko Rd & MBTA Roadway" prepared by Allen & Major Associates dated May 1, 2018.

3. *Existing and proposed structures, including dimensions and elevations;*

   Not applicable, no existing or proposed structure are included.

4. *The location of parking and loading areas, driveways, walkways, access and egress points, curb cuts, handicapped spaces and fire lanes. Such information shall be provided on a separate sheet which also depicts and assures accessibility and travel flow compatibility, using recognized standards (DOT), for all types of vehicles intended to utilize the proposed site;*

   The proposed project will utilize the existing site entrance off of Megunko Road and will construct two new curb cuts along the MBTA Road through a road opening permit issued by the

Department of Public Works. It is estimated that large construction type vehicles will be used during tree clearing operation, grading operation and construction of the solar arrays. Once construction is complete, limited vehicles, most likely passenger trucks, will access the site for maintenance purposes. Traffic impacts associated with the project will be temporary during construction and will not have any significant impact on local roads.

5. *The location and description of all proposed septic systems, water supply, storm drainage systems, utilities and refuse and other waste disposal methods, including compactors, dumpsters and the equivalent;*
   An infiltration basin is being constructed in the vicinity of solar array 2 to offset the impacts of the change in land cover from woods to a low maintenance grass meadow. Solid waste generated from the project during construction will be disposed of in accordance with Local, State and Federal regulations.
6. *Proposed landscape features, including the location and description of screening, fencing and plantings;*
   Chain link fencing is proposed along the MBTA road and will connect to the existing chain link fence surrounding Nyanza.
7. *The location, dimensions, height and characteristics of proposed signs;*
   Not applicable, no signage is proposed at this time.
8. *The location and description of all outdoor and street lighting, including methods of screening adjacent properties and public ways from glare;*
   Not applicable, no exterior lighting is being proposed.
9. *The location and description of proposed open space or recreation areas, if provided;*
   Not applicable.
10. *In the case of commercial or industrial projects, information on the types of business that may be operating on the property, so as to plan accordingly for the needs of specific types of businesses. In the case of projects where it is unclear what specific use will be involved, the applicant shall be required to provide information on the general characteristics to which uses on the site shall conform;*
    Not applicable.
11. *A construction timetable indicating estimated startup and completion dates;*
    Approximate schedule includes the following:
    - Interconnection Study – July 2017 – April 2018;
    - System Design – April 2018 – May 2018;
    - Permitting – May 2018 – August 2018;
    - Equipment Procurement – December 2018;
    - Construction – February 2019 – June 2019.
12. *An architectural rendering and/or cross-section of the development shall be submitted;*
    Not applicable, no structures are proposed.

8.0 – CONCLUSION

The solar array project is being proposed in accordance with §8.3 and §9.4. The project has been designed to minimize to the extent feasible:

1. *Minimize use of wetlands, steep slopes, floodplains and hilltops;*
2. *Minimize obstruction of scenic views;*
3. *Preserve unique natural or historical features;*
4. *Minimize tree, vegetation and soil removal and grade changes;*
5. *Maximize open space retention;*
6. *Screen objectionable features from neighboring properties and roadways;*
7. *Consideration shall be given to the impacts of the project on town services and infrastructure;*
8. *Electric, telephone, cable television, gas, water, sewer, drainage and other such utilities shall be underground except in cases of extreme physical and environmental constraints;*
9. *Exposed storage areas, machinery, service areas, truck loading areas, utility buildings and structures and other unsightly uses shall be set back or screened to protect the neighbors and those using public ways from objectionable features. Such areas shall not impede the flow of traffic on public ways;*
10. *When applicable, the site plan shall show measures to reduce and abate noise generated from the site that will impact surrounding properties;*
11. *The site plan shall comply with all zoning requirements for parking, loading, signage, dimensions and environmental performances standards and all other provisions of the By-Law;*
12. *The site plan shall be consistent with the objectives of the Comprehensive Plan and other applicable specific plans adopted by the Planning Board.*

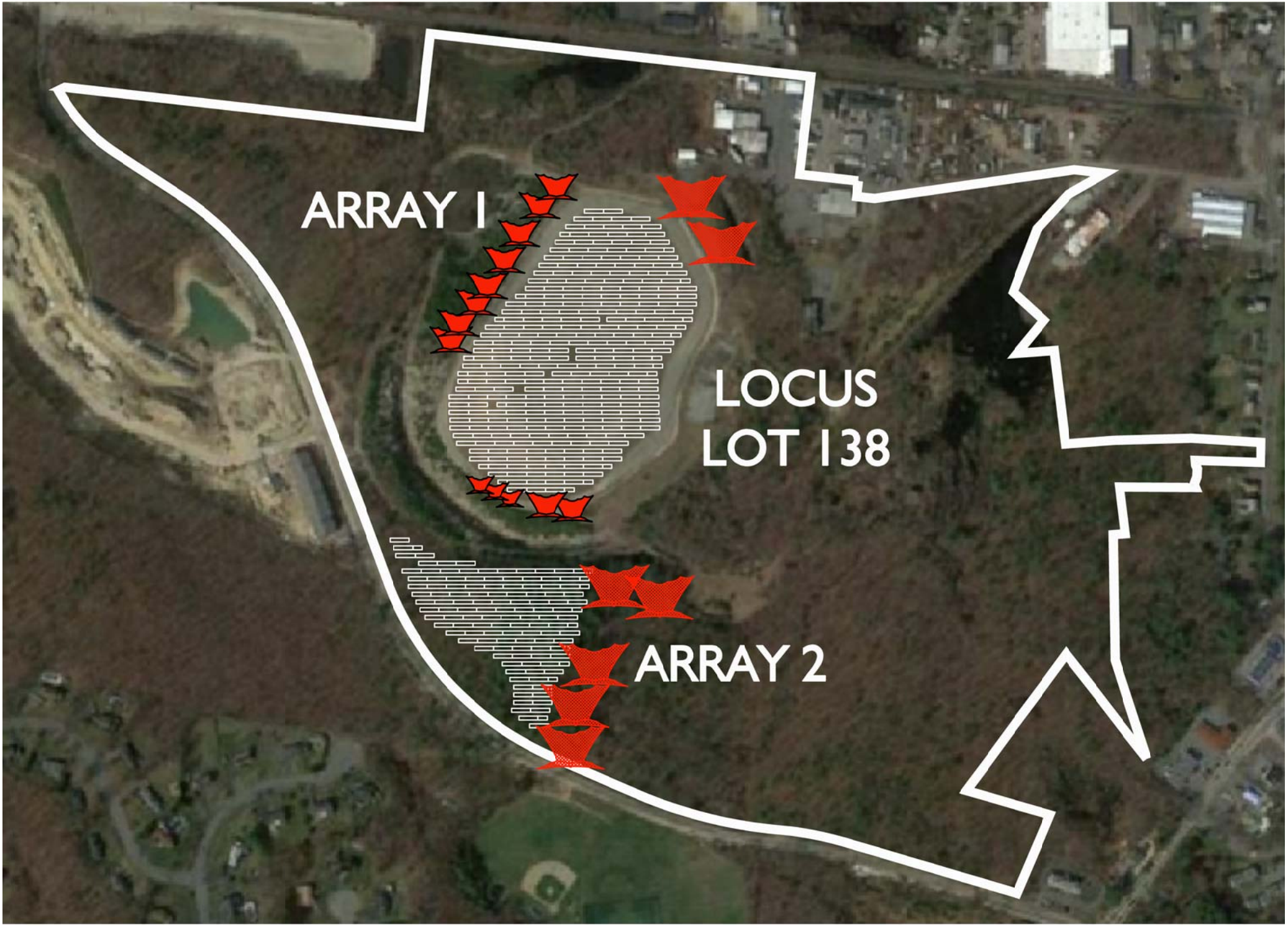
The project is in harmony with the objectives set forth in the Town of Ashland's Zoning By-Laws, is consistent with the land use goals of the Rail Transit Zoning District and the Photovoltaic Installation Overlay District. The applicant requests that the Board grant the Site Plan Review approval based on the information described within this report and accompanying plans.

APPENDIX A

Ground Mount Site Plan with Shading

ALLEN & MAJOR ASSOCIATES, INC.

APPENDIX A


ARRAY 1
LOCUS
LOT 138
ARRAY 2

APPENDIX B

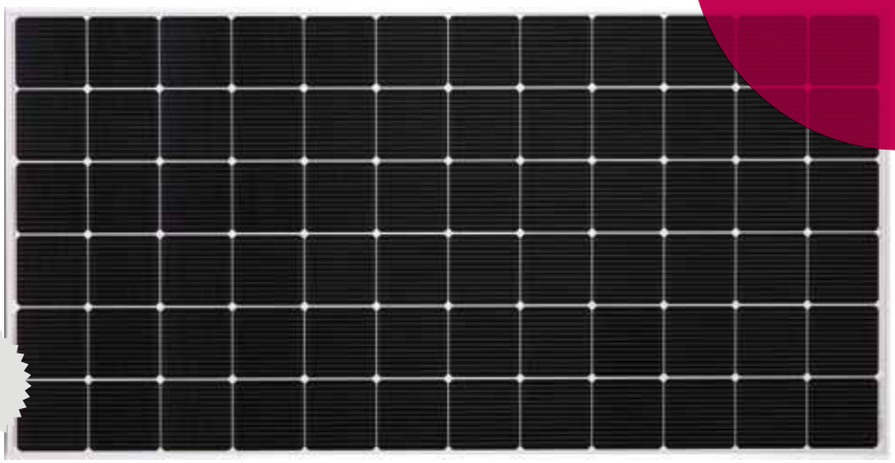
PV System Components

ALLEN & MAJOR ASSOCIATES, INC.

APPENDIX B

LG
Life's Good

Innovation for a Better Life



Extended 2 years Product 12 years Warranty

Power 25 years Warranty

LG NeON™ 2 *72cell*

LG375N2W-G4 **LG370N2W-G4** **LG365N2W-G4**

72 cell

LG New module, NeON™ 2 *72cell* adopts Cello technology. Cello technology replaces 3 busbars with 12 thin wires to enhance power output and reliability. NeON™ 2 72cell demonstrates LG's efforts to increase customer's values beyond efficiency. It features enhanced warranty, durability and performance in a real environment.

Enhanced Performance Warranty

LG NeON™ 2 *72cell* has an enhanced performance warranty. The annual degradation has fallen from 0.7%/yr to 0.6%/yr. Even after 25 years, module guarantees 2.4%p more output than the previous LG NeON™ modules.

Improved Product Warranty

As well as the enhanced performance warranty, LG has extended the product warranty of the LG NeON™ 2 *72cell* for an additional 2 years.

Better Performance on a Sunny Day

LG NeON™ 2 *72cell* now performs better on a sunny days thanks to its improved temperature coefficiency.

High Power Output

Compared with previous models, the LG NeON™ 2 *72cell* has been designed to significantly enhance its output efficiency, hereby making space management more efficient even in limited areas.

Double-Sided Cell Structure

The rear of the cell used in LG NeON™ 2 *72cell* will contribute to generation, just like the front; the light beam reflected from the rear of the module is reabsorbed to generate a great amount of additional power.

BOS (Balance Of System) Saving

LG NeON™ 2 *72cell* can reduce the total number of strings due to its high module efficiency resulting in a more cost effective and efficient solar power system.

About LG Electronics

LG Electronics is a global player who has been committed to expanding its capacity, based on solar energy business as its future growth engine. We embarked on a solar energy source research program in 1985, supported by LG Group's rich experience in semi-conductor, LCD, chemistry, and materials industry. We successfully released first Mono X® series to the market in 2010, which were exported to 32 countries in the following 2 years, thereafter. In 2013, NeON™ (previously known as Mono X® NeON) & 2015 NeON2 with CELLO technology won "Intersolar Award", which proved LG is the leader of innovation in the industry.

LG NeON 2 72cell

LG375N2W-G4 **LG370N2W-G4** **LG365N2W-G4**

Mechanical Properties

Cells	6 x 12
Cell Vendor	LG
Cell Type	Monocrystalline / N-type
Cell Dimensions	156.75 x 156.75 mm / 6 inches
# of Busbar	12 (Multi Wire Busbar)
Dimensions (L x W x H)	1960 x 1000 x 46 mm
Front Load	5400 Pa
Rear Load	2400 Pa
Weight	20.3 ± 0.5 kg
Connector Type	MC4
Junction Box	IP67 with 3 Bypass Diodes
Length of Cables	1200 mm x 2 ea
Glass	High Transmission Tempered Glass
Frame	Anodized Aluminum

Certifications and Warranty

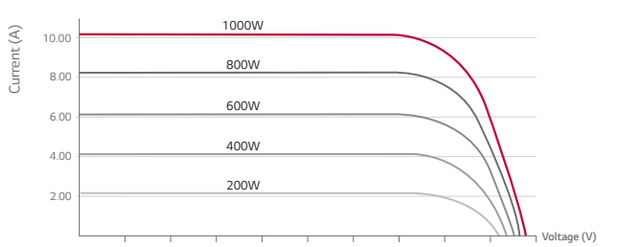
Certifications	IEC 61215, IEC 61730-1/-2
	UL1703
	IEC 61701 (Salt corrosion test)*
	IEC 62716 (Ammonia corrosion test)*
	ISO 9001
Module Fire Performance	Type 2 (UL1703)
Fire Rating (for CANADA)	Class C (ULC/ORD C1703)
Product Warranty	12 years
Output Warranty of Pmax	Linear warranty**

* in progress
**1) 1st year: 98%, 2) After 2nd year: 0.6%p annual degradation, 3) 83.6% for 25 years

Temperature Characteristics

NOCT	45 ± 3 °C
Pmpp	-0.38 %/°C
Voc	-0.28 %/°C
Isc	0.03 %/°C

Characteristic Curves



Electrical Properties (STC *)

Module Type	375W	370 W	365 W
MPP Voltage (Vmpp)	39.6	39.2	38.9
MPP Current (Impp)	9.50	9.44	9.39
Open Circuit Voltage (Voc)	48.3	48.0	47.7
Short Circuit Current (Isc)	10.04	9.98	9.92
Module Efficiency (%)	19.1	18.9	18.6
Operating Temperature (°C)		-40 ~ +90	
Maximum System Voltage (V)		1000	
Maximum Series Fuse Rating (A)		20	
Power Tolerance (%)		0 ~ +3	

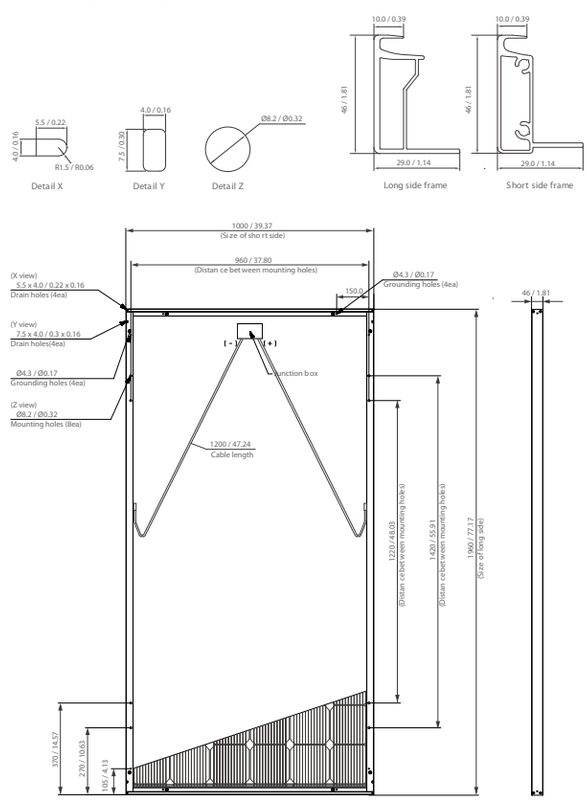
* STC (Standard Test Condition): Irradiance 1000 W/m², Module Temperature 25 °C, AM 1.5
* The nameplate power output is measured and determined by LG Electronics at its sole and absolute discretion.

Electrical Properties (NOCT*)

Module Type	375 W	370 W	365 W
Maximum Power (Pmax)	277	273	269
MPP Voltage (Vmpp)	36.6	36.3	36.0
MPP Current (Impp)	7.57	7.52	7.48
Open Circuit Voltage (Voc)	45.0	44.7	44.4
Short Circuit Current (Isc)	8.08	8.03	7.98

* NOCT (Nominal Operating Cell Temperature): Irradiance 800 W/m², ambient temperature 20 °C, wind speed 1 m/s

Dimensions (mm/in)



* The distance between the center of the mounting/grounding holes.

North America Solar Business Team
LG Electronics U.S.A. Inc
1000 Sylvan Ave, Englewood Cliffs, NJ 07632

Contact: lg.solar@lge.com
www.lgsolarusa.com

Product specifications are subject to change without notice.

01/01/2016

Innovation for a Better Life

HEC-US V1500

UTILITY SCALE SOLAR INVERTER

EXTENDED MPPT · AUTOMATIC REDUNDANT POWER MODULE SYSTEM · iCOOL V · ADJUSTABLE POWER · OUTDOOR DURABILITY · INGRESS PROTECTION · ACTIVE HEATING · 3 LEVEL TOPOLOGY

HEC-US V1500

The Power Electronics HEC-US V1500 outdoor inverters are powerful and reliable 1500Vdc utility scale PV units for the US market. The HEC-US V1500 inverter family has 20 different UL-1741 certified models ranging from 1MW to 3MW with no derating at 50°C and a 98.5% CEC rated efficiency.

Power Electronics designs and manufactures 1700Vdc power converters for market leading customers in the mining, oil & gas and water industries and for the most demanding environments. With up to 7 425KW power modules connected in parallel, the HEC-US V1500 is a multilevel 1500Vdc system built on the Power Electronics expertise in >1,000Vdc systems and the proven Freesun HEC modular topology. The HEC-US V1500 has a standard stainless steel enclosure and best-in-class cooling at 50°C without derating to ensure reliable performance in the most demanding conditions.

Power Electronics offers customized NEC2014 compliant FSDK15 external DC Recombiner cabinets. The FSDK15 includes user specified overcurrent protection up to 400 Amps with 16 or 32 inputs to support higher ratio DC:AC PV designs. FSDK15 cabinets include current monitoring.

Power Electronics continues to evolve with the solar industry and the HEC-US V1500 is designed specifically to meet the new demand for 1500Vdc PV systems.

THE MOST POWERFUL AND RELIABLE 1500VDC UL-1741 CERTIFIED UTILITY-SCALE PV INVERTER IN THE MARKET

HEC-US V1500

TECHNICAL CHARACTERISTICS

		565VAC - MPPt Window 800V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCE		FS1050CU15	FS1400CU15	FS1750CU15	FS2100CU15	FS2450CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1050	1400	1750	2100	2450
	AC Output Power(kVA/kW) @25°C [1]	1250	1675	2090	2510	2930
	AC Output Power(kW) @50°C; PF=0.9	945	1260	1575	1890	2205
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	565V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC) [1]	800V - 1310V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1050V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.2%	98.4%	98.5%	98.5%	98.5%
	CEC (η)	98.0%	98.0%	98.0%	98.5%	98.5%
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC–6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Active Power derating >50°C/122°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 70 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol	Modbus TCP/IP				
	Power Plant Controller	Optional / Compatible with Third Party SCADA Systems				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

HEC-US V1500

TECHNICAL CHARACTERISTICS

		600VAC - MPPt Window 849V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCE		FS1100CU15	FS1475CU15	FS1850CU15	FS2225CU15	FS2600CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1100	1475	1850	2225	2600
	AC Output Power(kVA/kW) @25°C [1]	1335	1780	2225	2660	3110
	AC Output Power(kW) @50°C; PF=0.9	990	1325	1665	2000	2340
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	600V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC) [1]	849V - 1310V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1050V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.4%	98.5%	98.6%	98.6%	98.6%
	CEC (η)	98.0%	98.0%	98.5%	98.5%	98.5%
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC–6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Active Power derating >50°C/122°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 70 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol	Modbus TCP/IP				
	Power Plant Controller	Optional / Compatible with Third Party SCADA Systems				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

HEC-US V1500

TECHNICAL CHARACTERISTICS

		630VAC - MPPt Window 891V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCE		FS1270CU15	FS1695CU15	FS2120CU15	FS2540CU15	FS3001CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1180	1570	1965	2360	2750
	AC Output Power(kVA/kW) @40°C [1]	1270	1695	2120	2540	3000
	AC Output Power(kVA/kW) @25°C [1]	1400	1870	2340	2800	3275
	Max. AC Output Current (A) @50°C	1080	1440	1800	2160	2520
	Max. AC Output Current (A) @40°C	1165	1550	1940	2330	2715
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	630V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC)	@50°C 891V-1310V / @40°C 891V-1285V / @25°C 891V-1250V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1050V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η) Preliminary	98.5%				
	CEC (η) Preliminary	98.5%				
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC-6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Power derating >40°C/104°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 70 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol	Modbus TCP/IP				
	Power Plant Controller	Optional / Compatible with Third Party SCADA Controls				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01 (pending)				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

HEC-US V1500

TECHNICAL CHARACTERISTICS

		645VAC - MPPt Window 913V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCE		FS1200CU15	FS1600CU15	FS2000CU15	FS2400CU15	FS2800CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1200	1600	2000	2400	2800
	AC Output Power(kVA/kW) @25°C [1]	1430	1910	2390	2860	3345
	AC Output Power(kW) @50°C; PF=0.9	1080	1440	1800	2160	2520
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	645V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC) [1]	913V - 1310V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1075V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.4%	98.5%	98.6%	98.6%	98.6%
	CEC (η)	98.0%	98.0%	98.5%	98.5%	98.5%
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC–6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Active Power derating >50°C/122°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 70 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display				
	Communication protocol	Modbus TCP/IP				
	Power Plant Controller	Optional / Compatible with Third Party SCADA Systems				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

HEC-US V1500

TECHNICAL CHARACTERISTICS

		690VAC - MPPt Window 976V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCE		FS1275CU15	FS1700CU15	FS2125CU15	FS2550CU15	FS3000CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1275	1700	2125	2550	3000
	AC Output Power(kVA/kW) @25°C [1]	1530	2040	2550	3060	3500
	AC Output Power(kW) @50°C; PF=0.9	1150	1530	1910	2250	2700
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	690V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC) [1]	976V - 1310V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1100V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.5%	98.7%	98.7%	98.7%	98.7%
	CEC (η)	98.0%	98.5%	98.5%	98.5%	98.5%
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC–6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
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	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Active Power derating >50°C/122°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol	Modbus TCP/IP				
	Power Plant Controller	Optional / Compatible with Third Party SCADA Systems				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

POWER ELECTRONICS
PURE **ENERGY**

For more information on
Power Electronics Product Families

Contact:

Engineering and Sales Support,
Power Electronics USA
Email: sales@power-electronics.com
Phone: (602) 354-4890

Or visit us at
www.Power-Electronics.com

RBI SOLAR

Ballasted Landfill Solutions | GM-BL

Our commitment to testing and innovation allows us to develop stronger, more cost-effective mounting solutions that can handle even the toughest site conditions. Non-penetrating ground mount solutions are now available as a precast foundation or cast-in-place. Pre-assembled post foundations and pre-assembled top chords reduce the amount of field connections to reduce installation labor time and costs.

Why choose RBI Solar?

- Precast or cast-in-place solutions
- Non-penetrating alternative to driven systems
- Racking is mechanically attached to concrete block foundations to allow for easy disassembly for future maintenance on landfill caps
- ETL classified to UL 2703
- Pre-assembly options available
- Customizable to site-specific requirements
- Options for providing concrete material, concrete placement and racking installation

Ballasted Landfill Ground Mount Solution Features

Foundation and racking design	Site wind speeds 170+ mph and ground snow loads 90+ psf
Signed and sealed drawings	Available in all 50 states
Proprietary on-site testing	Engineered for site specific coefficient of friction
Pre-assembled parts	On-site labor reduction
Variable slope	Accommodates slopes up to 30% (with topographic site map)
20-yr standard warranty	Proven rack reliability and bankability
G115 minimum galvanized coating	Exceeds ASTM and UL standards for 30% extended life
Post options	Cost-effective cee channel or I-beam posts
Driven post refusal alternative	Ability to address challenging soils or impenetrable sites
Module configurations	Portrait, landscape (all module types)
Raised purlins	Integrated bonding and grounding to UL 2703
Corrosion class	System available for all corrosion classes
Wire management and electrical	Integrated wire management and auxiliary mounting options

Precast Solution

- No weather delays and less susceptible to freeze/thaw cycles
- Reduces on-site man hours, ability to relocate or re-use
- Vast network of RBI Solar precasters
- Cleaner sites! Eliminates concrete trucks washout areas
- No risk for hidden costs such as accelerators, retarders, curing requirements, concrete pumps, or winter mixes

Cast-in-Place Solution

- Reduced initial lead time
- Independent of precaster's capacity or costs
- Heavy transportation equipment not required
- Option for remote areas or for international projects
- RBI Solar can assist in concrete mix design, QA/QC, and inspections to validate concrete meets ACI/ASTM standards

Contact us at info@rbisolar.com or (513) 242-2051

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RBI SOLAR

RBI SOLAR

Ground Mount Solution | GM-NextGen

When EPCs and project developers across the USA need dependable, low-maintenance ground mount racking, they turn to RBI Solar. As a single-source provider, we take responsibility for the Design, Engineering, Manufacturing, and Installation of PV mounting solutions. When you choose RBI Solar for your next ground mount, you're choosing peace of mind that your project is in the hands of the most trusted solar racking team in the industry.

Why choose RBI Solar?

- Professional Engineers licensed in all 50 states
- Quick response & efficient communication
- National installation capabilities
- Our in-house team members are an extension of your staff
- 85+ years manufacturing experience
- Complete turn-key process, reduction in your vendor coordination
- Company owned post driving equipment
- National project management capabilites with roaming site service personnel
- More time to focus on your business

www.rbisolar.com

Driven Ground Mount Solution Features

Foundation and racking design	Site wind speeds 170+ mph and ground snow loads 90+ psf
Signed and sealed drawings	Available in all 50 states
Proprietary on-site testing	Pull testing & corrosion testing - no geotechnical report required
Pre-assembled parts	Reduction in installation time
Variable slope	Accommodates slopes up to 30% (with topographic site map)
20-yr standard warranty	Proven rack reliability and bankability
G115 minimum galvanized coating	Exceeds ASTM and UL standards for 30% extended life
Driven posts	Cost-effective cee channel or I-beam post options available
Up to 24’ long post driving	Ability to address challenging soils or elevate array structure
Module configurations	Portrait, landscape (all module types)
Raised purlins	Integrated bonding and grounding to UL 2703
Corrosion class	System available for all corrosion classes
Wire management and electrical	Integrated wire management solution and inverter mounting

Contact us at info@rbisolar.com or (513) 242-2051

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RBI SOLAR

APPENDIX C

Lease and Easement Agreement

ALLEN & MAJOR ASSOCIATES, INC.

APPENDIX C

EXHIBIT C

FORM OF MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Citizens Enterprises Corporation
88 Black Falcon Avenue
Center Lobby, Suite 342
Boston, MA 02210
Attn: Brian Morrissey
Phone: 617-951-0405

(Space above this line for Recorder's use only)

MEMORANDUM OF LEASE AND EASEMENT AGREEMENT

THIS MEMORANDUM OF LEASE AND EASEMENT AGREEMENT is made and entered into as of June 5, 2017 (this "Memorandum"), by and between Ashland Solar LLC, a Massachusetts limited liability company (the "Tenant"), and Megunko Transit District LLC, a Massachusetts limited liability company (the "Landlord").

WHEREAS:

A. On the date hereof, Tenant and Landlord have entered into a Lease and Easement Agreement (the "Agreement") which by its terms grants to Tenant, its successors and assigns, a leasehold and easement interest in certain land located in Middlesex County, Massachusetts, which is more particularly described on Exhibit "A" attached hereto and incorporated herein by reference (the "Property") for exclusive solar energy development and related rights, transmission lines and communication facilities, solar and weather monitoring and access on, over, under and across the Property.

B. The Permitting Term of this Agreement shall commence on the Effective Date and shall run until the earlier of (i) eighteen (18) months, or (ii) the start of construction activities on site (the "Start of Construction") (the "Permitting Term"), unless terminated earlier as permitted herein. The Construction Term of this Agreement shall commence at the end of the Permitting Term and shall run until the date that the Solar Farm is granted permission to operate the system in parallel with the utility grid (the "Commercial Operation Date"). Provided that the Commercial Operation Date has triggered the end of the Construction Term, the Initial Term of this Agreement shall commence on the Commercial Operation Date and shall run for twenty (20) years (the "Initial Term") and thereafter, the Initial Term shall automatically be extended by up to three (3) terms of five (5) years each (the "Renewal Terms"), unless Tenant gives Landlord written notice of its intent not to renew at least sixty (60) days prior to expiration of the Initial

Term or Renewal Term then in effect. Once the Tenant determines the Solar Farm has reached the end of its useful life, which will be at the completion of either the Initial Term or one of the Renewal Terms, the Tenant shall remove all equipment associated with the Solar Farm and bring the site back to its original condition (the "Removal Term"). The Permitting Term, the Construction Term, the Initial Term, the Renewal Terms, and the Removal Term are sometimes collectively referred to herein as the "Term".

C. The Parties desire to enter into this Memorandum which is to be recorded in order that third parties may have notice of the existence of the Agreement, of the leasehold and easement interests of Tenant in the Property, and related rights granted to Tenant in the Property as part of the Agreement.

NOW, THEREFORE, in consideration of the rents and covenants provided in the Agreement to be paid and performed by Tenant, Landlord hereby leases the Property to Tenant and Tenant leases the Property from Landlord. Landlord further grants to Tenant those easements and related rights on, over, under and across the Property on the terms and conditions set forth in the Agreement. All of the terms, conditions, provisions and covenants of the Agreement are hereby incorporated into this Memorandum by reference as though fully set forth herein, and the Agreement and this Memorandum shall be deemed to constitute a single instrument or document. Should there be any inconsistency between the terms of this Memorandum and the Agreement, the terms of the Agreement shall prevail.

The Parties have executed this Memorandum of Lease and Easement Agreement as of the date set forth above.

"LANDLORD"

By: _____

Print Name: Robert Gaynor

"TENANT"

ASHLAND SOLAR LLC,
a Massachusetts limited liability company

By: _____

Name: Ernest J. Panos

Its: Manager

APPENDIX D

Operation and Maintenance

ALLEN & MAJOR ASSOCIATES, INC.

APPENDIX D

Operations & Maintenance Plan

The Operation & Maintenance (O&M) plan for the solar array is explained below. It is not intended that the protocol listed here will replace the current O&M activities for the landfill, rather include additional O&M activities and procedures to meet the needs of the solar array.

Prior to the start of construction, the site will be inspected to document current conditions and areas identified as needing maintenance, if any, will be addressed as appropriate. Following construction and re-establishment of any vegetation impacted during construction, the operation and maintenance of the landfill should not be significantly altered from the current requirements. The site should continue to be inspected regularly for erosion and to ensure the stormwater system is operating as designed. Any erosion to the landfill surface should be stabilized and repaired immediately upon discovery. Additionally, vegetation management in the vicinity of the panels and at the interface of the ballast/gravel base will require careful, manual maintenance.

Ashland Solar, LLC (Ashland Solar) is responsible for maintaining and servicing the solar electric system post construction. This work will be performed through a combination of Ashland Solar's personnel, their-approved subcontractors, or authorized vendor (manufacturer of components used in the solar PV system) representatives. The area where the solar electric system is located and the immediate proximity of the electrical equipment shall be treated as a secure facility, accessible only by authorized personnel. Access to these locations should be arranged by contacting the Owner or Operator.

Operations at the site will be minimal. The panels are static and are monitored remotely on a continuous basis over the internet. On a daily basis, the applicant will be responsible for responding to alerts from system's automated alert system regarding potential system malfunction.

Additional maintenance at the site will typically consist of the following:

Equipment Maintenance

Ashland Solar and/or its authorized sub-contractors will conduct the following tasks to ensure maintenance and proper operation of the solar PV system equipment.

- Perform a visual inspection of the equipment including subassemblies, wiring harnesses, contacts and major components and record ambient operating temperature.
- Check inverter modules for the following:
    - IGBT's and inverter boards for discoloration
    - Power capacitors for signs of damage
    - Record all voltage and current readings via the front display panel
    - Check appearance/cleanliness of the cabinet, ventilation system and insulated surfaces
    - Check for corrosion on terminals and cables
    - Torque terminals, connectors and bolts as needed
    - Check all fuses for open or signs of heating (Inverter & Combiner)
    - Check the condition of both the AC & DC Surge Suppressors
    - Check the operation of all safety devices (E-Stop, Door Switches, GFDI)
    - Correct all deficiency detected
- Inspect (clean or replace) air filter elements

- Complete Maintenance Schedule Card and issue a written inspection report
- Install and perform any recommended Engineering Field Modifications, including software upgrades.

Site Maintenance

Ashland Solar and/or its authorized sub-contractors will perform site maintenance activities as follows, to ensure safety and to maintain site aesthetics.

- Mowing the grass between the rows of racks a minimum of twice a year, possibly more if the growth of grass requires it. The height of the grass will be similar to the adjacent cleared area of the site and will be maintained at a level to reduce the risk of grass fires. No herbicides or chemicals will be used to manage vegetation.
- Personnel in a pickup-type truck will visit the site monthly to inspect the inverters for proper performance and perform maintenance as needed. The condition of signage and proper functioning of access gates will be inspected as well.

Array Cleaning Procedure

Ashland Solar and/or its authorized sub-contractor will clean the PV panels if the system is outputting a noticeably lower wattage AC or there is an accumulation of dirt on the modules. Maintaining module cleanliness is crucial to maximizing system performance. No harmful chemicals shall be used in the cleaning of the modules. Cleaning of the panels will be done with water and a soft-bristled broom if needed. Note that the PV system does not need to be turned off during cleaning.

APPENDIX E

Certificate of Liability Insurance

ALLEN & MAJOR ASSOCIATES, INC.

APPENDIX E

ACORD®

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 03/06/2018

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
Willis of Massachusetts, Inc. c/o 26 Century Blvd P.O. Box 305191 Nashville, TN 372305191 USA	PHONE (A/C, No, Ext): 1-877-945-7378	FAX (A/C, No): 1-888-467-2378
	E-MAIL ADDRESS: certificates@willis.com	

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Westchester Fire Insurance Company	10030
INSURER B : Federal Insurance Company	20281
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED
Citizens Energy Corporation
88 Black Falcon Avenue
Center Lobby, Suite 342
Boston, MA 02210

COVERAGES **CERTIFICATE NUMBER:** W5459999 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	[X] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [ ] POLICY [X] PRO-JECT [ ] LOC [ ] OTHER:			G24917757 006	05/11/2017	07/01/2018	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 100,000 $ 10,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
B	AUTOMOBILE LIABILITY [X] ANY AUTO [ ] OWNED AUTOS ONLY [ ] SCHEDULED AUTOS [ ] HIRED AUTOS ONLY [ ] NON-OWNED AUTOS ONLY			(14)9948-09-79	07/01/2017	07/01/2018	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $
A	[X] UMBRELLA LIAB [X] OCCUR EXCESS LIAB [ ] CLAIMS-MADE DED [X] RETENTION $ 10,000			G2759511A003	05/11/2017	07/01/2018	EACH OCCURRENCE AGGREGATE	$ 10,000,000 $ 10,000,000
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N [ ] (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		(15)7174-15-43	07/01/2017	07/01/2018	[X] PER STATUTE [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 500,000 $ 500,000 $ 500,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

Proof of Liability

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Julia M Powers

APPENDIX F

Interconnection Service Agreement

ALLEN & MAJOR ASSOCIATES, INC.

APPENDIX F

EVERSOURCE 247 Station Drive
Westwood, Massachusetts 02090

Exhibit G - Interconnection Service Agreement

4-4-2018

1. Parties. This Interconnection Service Agreement ("Agreement"), dated as of ~~**TBD**~~ is entered into, by and between **NSTAR Electric d/b/a Eversource Energy**, a Massachusetts corporation with a principal place of business at **247 Station Drive, Westwood, MA 02090** (hereinafter referred to as the "Company"), and **Ashland Solar, LLC** a corporation with a principal place of business at **88 Black Falcon Ave, Suite 342, Boston MA 02210** ("Interconnecting Customer"). (The Company and Interconnecting Customer are collectively referred to as the "Parties"). Terms used herein without definition shall have the meanings set forth in Section 1.2 of the Interconnection Tariff which is hereby incorporated by reference. **WO# 2220627 (4,450 kW AC).**

2. Basic Understandings. This Agreement provides for parallel operation of an Interconnecting Customer's Facility with the Company EPS to be installed and operated by the Interconnecting Customer at **Landfill on Megunko Rd, Ashland, MA 01721, Acct# TBD.** A description of the Facility is located in Attachment 1. If the Interconnecting Customer is not the Customer, an Agreement between the Company and the Company's Retail Customer, attached as Exhibit H to the Interconnection Tariff, must be signed and included as an Attachment to this Agreement. If neither the Interconnecting Customer nor the Customer is the Landowner of the property where the Facility is sited, a Landowner Consent Agreement, attached as Exhibit I to the Interconnection Tariff, must be signed and included as an Attachment to this Agreement, unless the Company, in its sole discretion, waives this requirement.

   The Interconnecting Customer has the right to operate its Facility in parallel with the Company EPS immediately upon successful completion of the protective relays testing as witnessed by the Company and receipt of written notice from the Company that interconnection with the Company EPS is authorized ("Authorization Date").

3. Term. This Agreement shall become effective as of the Effective Date. The Agreement shall continue in full force and effect until terminated pursuant to Section 4 of this Agreement.

4. Termination.

   This Agreement may be terminated under the following conditions.

   4.1 a) The Parties agree in writing to terminate the Agreement.

   The Interconnecting Customer may terminate this agreement at any time by providing sixty (60) days written notice to Company.

   The Company may terminate this Agreement upon the occurrence of an Event of Default by the Interconnecting Customer as provided in Section 18 of this Agreement.

The Company may terminate this Agreement if the Interconnecting Customer either: (1) fails to energize the Facility within 12 months of the Authorization Date; or, (2) permanently abandons the Facility. Failure to operate the Facility for any consecutive 12 month period after the Authorization Date shall constitute permanent abandonment unless otherwise agreed to in writing between the Parties.

The Company, upon 30 days notice, may terminate this Agreement if there are any changes in Department regulations or state law that have a material adverse effect on the Company's ability to perform its obligations under the terms of this Agreement.

Survival of Obligations. The termination of this Agreement shall not relieve either Party of its liabilities and obligations, owed or continuing at the time of termination. Sections 5, 10, 12, 13, and 25 as it relates to disputes pending or for wrongful termination of this Agreement shall survive the termination of this Agreement.

Related Agreements. Any agreement attached to and incorporated into this Agreement shall terminate concurrently with this Agreement unless the Parties have agreed otherwise in writing. If the Interconnection Service Agreement is signed prior to a Detailed Study (if applicable), the System Modifications construction schedule from the Detailed Study when finalized shall be deemed a part of the signed Interconnection Service Agreement.

5. General Payment Terms. The Interconnecting Customer shall be responsible for the System Modification costs and payment terms identified in Attachment 3of this Agreement and any approved cost increases pursuant to the terms of the Interconnection Tariff. Interconnecting Customers shall not be required to pay any costs related to Company infrastructure upgrades or System Modifications upon execution of the Interconnection Service Agreement (or once the Interconnecting Customer receives the construction schedule). Interconnecting Customers shall have 120 Business Days from the date of execution of an Interconnection Service Agreement to pay 25 percent of those costs;if an Interconnecting Customer pays such cost within the 120 Business Day Time Frame, the Interconnecting Customer shall have an additional 120 Business Days from the date of first payment to pay the remainder of the costs. If the system modifications exceed $25,000, the Interconnecting Customer is eligible for a payment plan, including a payment and construction schedule with milestones for both parties, and any such payment plan shall be set forth in Attachment 3. The payment plan may include a payment schedule different than the 120 Business Day payment schedule requirements set forth in this paragraph above.

Construction estimates are valid for 60 Business Days from when they are delivered to the Interconnecting Customer. If an Interconnecting Customer payment is not received within 60 Business Days of receiving the Interconnection Service Agreement in the Expedited Process, or the Impact Study in the Standard Process, the Company has the right to reassess construction costs and Time Frames. In the event that the Interconnecting Customer fails to pay the Company within the Time Frame required by this provision, the Company will

require the Interconnecting Customer to reapply for interconnection. Further, any fees paid will not be refunded. The construction schedule will commence once the Interconnecting Customer's financial payment has been made in fullor as otherwise provided in Attachment 3. The Company's obligation to the construction schedule (as it appears in either the Interconnection Service Agreement or the Detailed Study, if the Interconnecting Customer has opted to sign the Interconnection Service Agreement without a Detailed Study) begins on the next Business Day after the Company receives full payment for such construction or as otherwise provided in Attachment 3.

Cost or Fee Adjustment Procedures.

The Company will, in writing, advise the Interconnecting Customer in advance of any cost increase for work to be performed up to a total amount of increase of 10% only. Interconnecting Customers who elected to execute an Interconnection Services Agreement following the completion of the Impact Study but prior to the commencement of any required Detailed Study, pursuant to Section 3.4(g) of the Interconnection Tariff, shall be responsible for any System Modifications costs, ±25%, as identified by the Company in the Impact Study.All costs that exceed the above caps will be borne solely by the Company. Any such changes to the Company's costs for the work shall be subject to the Interconnecting Customer's consent. The Interconnecting Customer shall, within thirty (30) Business Days of the Company's notice of increase, authorize such increase and make payment in the amount up to the above caps, or the Company will suspend the work and the corresponding agreement will terminate.

Final Accounting.

An Interconnecting Customer may request a final accounting report of any difference between (a) Interconnecting Customer's cost responsibility under this Agreement for the actual cost of the System Modifications, and (b) Interconnecting Customer's previous aggregate payments to the Company under the Interconnection Service Agreement for such System Modifications within 120 Business days after completion of the construction and installation of the System Modifications described in an attached exhibit to the Interconnection Service Agreement. Upon receipt of such a request from an Interconnecting Customer, the Company shall have 120 Business days to provide the requested final accounting report to the Interconnecting Customer. To the extent that Interconnecting Customer's cost responsibility in the Interconnection Service Agreement exceeds Interconnecting Customer's previous aggregate payments, the Company shall invoice Interconnecting Customer and Interconnecting Customer shall make payment to the Company within 45 Business Days. To the extent that Interconnecting Customer's previous aggregate payments exceed Interconnecting Customer's cost responsibility under this agreement, the Company shall refund to Interconnecting Customer an amount equal to the difference within forty five (45) Business Days of the provision of such final accounting report.

6. Operating Requirements.

General Operating Requirements.

Interconnecting Customer shall operate and maintain the Facility in accordance with the applicable manufacturer's recommended maintenance schedule, in compliance with all aspects of the Company's Interconnection Tariff. The Interconnecting Customer will continue to comply with all applicable laws and requirements after interconnection has occurred. In the event the Company has reason to believe that the Interconnecting Customer's installation may be the source of problems on the Company EPS, the Company has the right to install monitoring equipment at a mutually agreed upon location to determine the source of the problems. If the Facility is determined to be the source of the problems, the Company may require disconnection as outlined in Section 7.0 of this Interconnection Tariff. The cost of this testing will be borne by the Company unless the Company demonstrates that the problem or problems are caused by the Facility or if the test was performed at the request of the Interconnecting Customer.

No Adverse Effects; Non-interference.

Company shall notify Interconnecting Customer if there is evidence that the operation of the Facility could cause disruption or deterioration of service to other Customers served from the same Company EPS or if operation of the Facility could cause damage to Company EPS or Affected Systems. The deterioration of service could be, but is not limited to, harmonic injection in excess of IEEE Standard 1547-2003, as well as voltage fluctuations caused by large step changes in loading at the Facility. Each Party will notify the other of any emergency or hazardous condition or occurrence with its equipment or facilities which could affect safe operation of the other Party's equipment or facilities. Each Party shall use reasonable efforts to provide the other Party with advance notice of such conditions.

The Company will operate the EPS in such a manner so as to not unreasonably interfere with the operation of the Facility. The Interconnecting Customer will protect itself from normal disturbances propagating through the Company EPS, and such normal disturbances shall not constitute unreasonable interference unless the Company has deviated from Good Utility Practice. Examples of such disturbances could be, but are not limited to, single-phasing events, voltage sags from remote faults on the Company EPS, and outages on the Company EPS. If the Interconnecting Customer demonstrates that the Company EPS is adversely affecting the operation of the Facility and if the adverse effect is a result of a Company deviation from Good Utility Practice, the Company shall take appropriate action to eliminate the adverse effect.

Safe Operations and Maintenance.

Each Party shall operate, maintain, repair, and inspect, and shall be fully responsible for, the facility or facilities that it now or hereafter may own unless otherwise specified in this Agreement. Each Party shall be responsible for the maintenance, repair and condition of its respective lines and appurtenances on their respective side of the PCC. The Company and the Interconnecting Customer shall each provide equipment on its respective side of the PCC that adequately protects the Company's EPS, personnel, and other persons from damage and injury.

Access.

The Company shall have access to the disconnect switch of the Facility at all times.

6.4 a) Company and Interconnecting Customer Representatives.

Each Party shall provide and update as necessary the telephone number that can be used at all times to allow either Party to report an emergency.

6.4 b) Company Right to Access Company-Owned Facilities and Equipment.

If necessary for the purposes of the Interconnection Tariff and in the manner it describes, the Interconnecting Customer shall allow the Company access to the Company's equipment and the Company's facilities located on the Interconnecting Customer's or Customer's premises. To the extent that the Interconnecting Customer does not own all or any part of the property on which the Company is required to locate its equipment or facilities to serve the Interconnecting Customer under the Interconnection Tariff, the Interconnecting Customer shall secure and provide in favor of the Company the necessary rights to obtain access to such equipment or facilities, including easements if the circumstances so require. In addition to any rights and easements required by the Company in accordance with the above provision, the Interconnecting Customer shall obtain an executed Landowner Consent Agreement (Exhibit I) from the Landowner, unless the Company, in its sole discretion, waives this requirement.

6.4 c) Right to Review Information.

The Company shall have the right to review and obtain copies of Interconnecting Customer's operations and maintenance records, logs, or other information such as, unit availability, maintenance outages, circuit breaker operation requiring manual reset, relay targets and unusual events pertaining to Interconnecting Customer's Facility or its interconnection with the Company EPS. This information will be treated as customer-

confidential and only used for the purposes of meeting the requirements of Section 4.2.4 in the Interconnection Tariff.

7. Disconnection

Temporary Disconnection

Emergency Conditions. Company shall have the right to immediately and temporarily disconnect the Facility without prior notification in cases where, in the reasonable judgment of Company, continuance of such service to Interconnecting Customer is imminently likely to (i) endanger persons or damage property or (ii) cause a material adverse effect on the integrity or security of, or damage to, Company EPS or to the electric systems of others to which the Company EPS is directly connected. Company shall notify Interconnecting Customer promptly of the emergency condition. Interconnecting Customer shall notify Company promptly when it becomes aware of an emergency condition that affects the Facility that may reasonably be expected to affect the Company EPS. To the extent information is known, the notification shall describe the emergency condition, the extent of the damage or deficiency, or the expected effect on the operation of both Parties' facilities and operations, its anticipated duration and the necessary corrective action.

Routine Maintenance, Construction and Repair. Company shall have the right to disconnect the Facility from the Company EPS when necessary for routine maintenance, construction and repairs on the Company EPS. The Company shall provide the Interconnecting Customer with a minimum of seven calendar days planned outage notification consistent with the Company's planned outage notification protocols. If the Interconnecting Customer requests disconnection by the Company at the PCC, the Interconnecting Customer will provide a minimum of seven days notice to the Company. Any additional notification requirements will be specified by mutual agreement in the Interconnection Service Agreement. Company shall make an effort to schedule such curtailment or temporary disconnection with Interconnecting Customer.

Forced Outages. During any forced outage, Company shall have the right to suspend interconnection service to effect immediate repairs on the Company EPS; provided, however, Company shall use reasonable efforts to provide the Interconnecting Customer with prior notice. Where circumstances do not permit such prior notice to Interconnecting Customer, Company may interrupt Interconnection Service and disconnect the Facility from the Company EPS without such notice.

Non-Emergency Adverse Operating Effects. The Company may disconnect the Facility if the Facility is having an adverse operating effect on the Company EPS or other Customers that is not an emergency, and the Interconnecting Customer fails to

correct such adverse operating effect after written notice has been provided and a maximum of 45 days to correct such adverse operating effect has elapsed.

Modification of the Facility. Company shall notify Interconnecting Customer if there is evidence of a material modification to the Facility and shall have the right to immediately suspend interconnection service in cases where such material modification has been implemented without prior written authorization from the Company.

Re-connection. Any curtailment, reduction or disconnection shall continue only for so long as reasonably necessary. The Interconnecting Customer and the Company shall cooperate with each other to restore the Facility and the Company EPS, respectively, to their normal operating state as soon as reasonably practicable following the cessation or remedy of the event that led to the temporary disconnection.

Permanent Disconnection.

The Interconnecting Customer has the right to permanently disconnect at any time with 30 days written notice to the Company.

7.2 a) The Company may permanently disconnect the Facility upon termination of the Interconnection Service Agreement in accordance with the terms thereof.

8. Metering. Metering of the output from the Facility shall be conducted pursuant to the terms of the Interconnection Tariff.

9. Assignment. Except as provided herein, Interconnecting Customer shall not voluntarily assign its rights or obligations, in whole or in part, under this Agreement without Company's written consent. Any assignment Interconnecting Customer purports to make without Company's written consent shall not be valid. Company shall not unreasonably withhold or delay its consent to Interconnecting Customer's assignment of this Agreement. Notwithstanding the above, Company's consent will not be required for any assignment made by Interconnecting Customer to an Affiliate or as collateral security in connection with a financing transaction. In all events, the Interconnecting Customer will not be relieved of its obligations under this Agreement unless, and until the assignee assumes in writing all obligations of this Agreement and notifies the Company of such assumption.

10. Confidentiality. Company shall maintain confidentiality of all Interconnecting Customer confidential and proprietary information except as otherwise required by applicable laws and regulations, the Interconnection Tariff, or as approved by the Interconnecting Customer in the Simplified or Expedited/Standard Application form or otherwise.

11. Insurance Requirements.

General Liability.

11.1 a) In connection with Interconnecting Customer's performance of its duties and obligations under the Interconnection Service Agreement, Interconnecting Customer shall maintain, during the term of the Agreement, general liability insurance with a combined single limit of not less than:

i) Five million dollars ($5,000,000) for each occurrence and in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than five (5) MW.

ii) Two million dollars ($2,000,000) for each occurrence and five million dollars ($5,000,000) in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than one (1) MW and less than or equal to five (5) MW;

iii) One million dollars ($1,000,000) for each occurrence and in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than one hundred (100) kW and less than or equal to one (1) MW;

iv) Five hundred thousand dollars ($500,000) for each occurrence and in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than ten (10) kW and less than or equal to one hundred (100) kW, except for as provide below in subsection 11.1(b).

11.1 b) Pursuant to 220 CMR §18.03(2), no insurance is required for Interconnecting Customers with facilities eligible for Class 1 Net Metering (facilities less than or equal to sixty (60) kW. However, the Company recommends that the Interconnecting Customer obtain adequate insurance to cover potential liabilities.

11.1 c) Any combination of General Liability and Umbrella/Excess Liability policy limits can be used to satisfy the limit requirements stated above.

11.1 d) The general liability insurance required to be purchased in this Section 11 may be purchased for the direct benefit of the Company and shall respond to third party claims asserted against the Company (hereinafter known as "Owners Protective Liability"). Should this option be chosen, the requirement of Section 11.2(a) will not apply but the Owners Protective Liability policy will be purchased for the direct benefit of the Company and the Company will be designated as the primary and "Named Insured" under the policy.

11.1 e) The insurance hereunder is intended to provide coverage for the Company solely with respect to claims made by third parties against the Company.

11.1 f) In the event the Commonwealth of Massachusetts, or any other governmental subdivision thereof subject to the claims limits of the Massachusetts Tort Claims Act, G.L. c. 258 (hereinafter referred to as the "Governmental Entity") is the Interconnecting Customer, any insurance maintained by the Governmental Entity shall contain an endorsement that strictly prohibits the applicable insurance company from interposing the claims limits of G.L. c. 258 as a defense in either the adjustment of any claim, or in the defense of any lawsuit directly asserted against the insurer by the Company. Nothing herein is intended to constitute a waiver or indication of an intent to waive the protections of G.L. c. 258 by the Governmental Entity.

11.1 g) Notwithstanding the requirements of section 11.1(a) through (f), insurance for certain Governmental Entity facilities may be provided as set forth in section 11.1(g)(i) and (ii) below. Nothing herein changes the provision in subsection 11.1(a)(iv) that exempts Class I Net Metering facilities (less than or equal to 60 kW) from the requirement to obtain insurance. In addition, nothing shall prevent the Governmental Entity from obtaining insurance consistent with the provisions of subsection 11.1(a) through (f), if it is able and chooses to do so.

i) For solar photovoltaic (PV) facilities with a Gross Nameplate Rating in excess of 60 kW up to 500 kW, the Governmental Entity is not required to obtain liability insurance. Any liability costs borne by the Company associated with a third-party claim for damages in excess of the claims limit of the Massachusetts Tort Claims Act, M.G.L. c. 258, and market-based premium-related costs, if any, borne by the Company associated with insurance for such third-party claims shall be recovered annually on a reconciling basis in Company rates in a manner that shall be reviewed and approved by the Department.

ii) For (a) PV facilities with a Gross Nameplate Rating in excess of 500 kW up to 5 MW, (b) wind facilities with a Gross Nameplate Rating in excess of 60 kW up to 5 MW, and (c) highly efficient combined heat and power facilities with a Gross Nameplate Rating of in excess of 60 kW up to 5 MW, the Governmental Entity is not required to obtain liability insurance, subject to the requirements of the following paragraph.

The Company shall either self-insure for any risk associated with possible third-party claims for damages in excess of the Massachusetts Tort Claims Act limit, or obtain liability insurance for such third-party claims, and the Company is authorized to charge and collect from the Governmental Entity its pro-rata allocable share of the cost of so doing, plus all reasonable administrative costs. The coverage and cost may vary with the size and type of facility, and may change (increase or decrease) over time, based on insurance market conditions, and such cost shall be added to, and paid for as part of the Governmental Entity's electric bill.

Insurer Requirements and Endorsements.

All required insurance shall be carried by reputable insurers qualified to underwrite insurance in MA having a Best Rating of at least "A-". In addition, all insurance shall, (a) include Company as an additional insured; (b) contain a severability of interest clause or cross-liability clause; (c) provide that Company shall not incur liability to the insurance carrier for payment of premium for such insurance; and (d) provide for thirty (30) calendar days' written notice to Company prior to cancellation, termination, or material change of such – insurance; provided that to the extent the Interconnecting Customer is satisfying the requirements of subpart (d) of this paragraph by means of a presently existing insurance policy, the Interconnecting Customer shall only be required to make good faith efforts to satisfy that requirement and will assume the responsibility for notifying the Company as required above.

If the requirement of clause (a) in the paragraph above prevents Interconnecting Customer from obtaining the insurance required without added cost or due to written refusal by the insurance carrier, then upon Interconnecting Customer's written Notice to Company, the requirements of clause (a) shall be waived.

Evidence of Insurance.

Evidence of the insurance required shall state that coverage provided is primary and is not in excess to or contributing with any insurance or self-insurance maintained by Interconnecting Customer.

The Interconnecting Customer is responsible for providing the Company with evidence of insurance in compliance with the Interconnection Tariff on an annual basis.

Prior to the Company commencing work on System Modifications, and annually thereafter, the Interconnecting Customer shall have its insurer furnish to the Company certificates of insurance evidencing the insurance coverage required above. The Interconnecting Customer shall notify and send to the Company a certificate of insurance for any policy written on a "claims-made" basis. The Interconnecting Customer will maintain extended reporting coverage for three years on all policies written on a "claims-made" basis.

In the event that an Owners Protective Liability policy is provided, the original policy shall be provided to the Company.

Self Insurance.

If Interconnecting Customer has a self-insurance program established in accordance with commercially acceptable risk management practices.

Interconnecting Customer may comply with the following in lieu of the above requirements as reasonably approved by the Company:

- Interconnecting Customer shall provide to Company, at least thirty (30) calendar days prior to the Date of Initial Operation, evidence of such program to self-insure to a level of coverage equivalent to that required.

- If Interconnecting Customer ceases to self-insure to the standards required hereunder, or if Interconnecting Customer is unable to provide continuing evidence of Interconnecting Customer's financial ability to self-insure, Interconnecting Customer agrees to promptly obtain the coverage required under Section 11.1.

This section shall not allow any Governmental Entity to self-insure where the existence of a limitation on damages payable by a Government Entity imposed by the Massachusetts Tort Claims Act, G.L. c. 258, or similar law, could effectively limit recovery (by virtue of a cap on recovery) to an amount lower than that required in Section 11.1(a).

All insurance certificates, statements of self-insurance, endorsements, cancellations, terminations, alterations, and material changes of such insurance shall be issued and submitted to the following:

Eversource
Attention: **DG Group, SW 340**
Phone: **508-790-9035**
DG Account Executive
Melanie.Khederian@eversource.com

12. Indemnification. Except as the Commonwealth is precluded from pledging credit by Section 1 of Article 62 of the Amendments to the Constitution of the Commonwealth of Massachusetts, and except as the Commonwealth's cities and towns are precluded by Section 7 of Article 2 of the Amendments to the Massachusetts Constitution from pledging their credit without prior legislative authority, Interconnecting Customer and Company shall each indemnify, defend and hold the other, its directors, officers, employees and agents (including, but not limited to, Affiliates and contractors and their employees), harmless from and against all liabilities, damages, losses, penalties, claims, demands, suits and proceedings of any nature whatsoever for personal injury (including death) or property damages to unaffiliated third parties that arise out of or are in any manner connected with the performance of this Agreement by that Party except to the extent that such injury or damages to unaffiliated third parties may be attributable to the negligence or willful misconduct of the Party seeking indemnification.

13. Limitation of Liability. Each Party's liability to the other Party for any loss, cost, claim, injury, liability, or expense, including court costs and reasonable attorney's fees, relating to

or arising from any act or omission in its performance of this Agreement, shall be limited to the amount of direct damage or liability actually incurred. In no event shall either Party be liable to the other Party for any indirect, incidental, special, consequential, or punitive damages of any kind whatsoever.

14. Amendments and Modifications. No amendment or modification of this Agreement shall be binding unless in writing and duly executed by both Parties.

15. Permits and Approvals. Interconnecting Customer shall obtain all environmental and other permits lawfully required by governmental authorities for the construction and operation of the Facility. Prior to the construction of System Modifications the Interconnecting Customer will notify the Company that it has initiated the permitting process. Prior to the commercial operation of the Facility the Interconnecting Customer will notify the Company that it has obtained all permits necessary. Upon request the Interconnecting Customer shall provide copies of one or more of the necessary permits to the Company.

16. Force Majeure. For purposes of this Agreement, "Force Majeure Event" means any event:

    a) that is beyond the reasonable control of the affected Party; and

    b) that the affected Party is unable to prevent or provide against by exercising commercially reasonable efforts, including the following events or circumstances, but only to the extent they satisfy the preceding requirements: acts of war or terrorism, public disorder, insurrection, or rebellion; floods, hurricanes, earthquakes, lightning, storms, and other natural calamities; explosions or fire; strikes, work stoppages, or labor disputes; embargoes; and sabotage. If a Force Majeure Event prevents a Party from fulfilling any obligations under this Agreement, such Party will promptly notify the other Party in writing, and will keep the other Party informed on a continuing basis of the scope and duration of the Force Majeure Event. The affected Party will specify in reasonable detail the circumstances of the Force Majeure Event, its expected duration, and the steps that the affected Party is taking to mitigate the effects of the event on its performance. The affected Party will be entitled to suspend or modify its performance of obligations under this Agreement, other than the obligation to make payments then due or becoming due under this Agreement, but only to the extent that the effect of the Force Majeure Event cannot be mitigated by the use of reasonable efforts. The affected Party will use reasonable efforts to resume its performance as soon as possible. In no event will the unavailability or inability to obtain funds constitute a Force Majeure Event.

17. Notices.

Any written notice, demand, or request required or authorized in connection with this Agreement ("Notice") shall be deemed properly given on the date actually delivered in person or five (5) Business Days after being sent by certified mail, e-mail or fax with confirmation of receipt to the person specified below:

If to Company:	Name **Eversource** Attention: **DG Group, WO#2220527** Phone: **508-790-9035** Email:**Melanie.khederian@eversource.com**
If to Interconnecting Customer:	Name: **Ashland Solar LLC** Attention: **Emily Mann** Address: **88 Black Falcon Ave, Suite 342** City: **Boston, MA 02210** Phone: **617-951-0418** Email: **emann@citizensenergy.com**
	A Party may change its address for Notices at any time by providing the other Party Notice of the change in accordance with Section 17.1.

The Parties may also designate operating representatives to conduct the daily communications, which may be necessary or convenient for the administration of this Agreement. Such designations, including names, addresses, email addresses, and phone numbers may be communicated or revised by one Party's Notice to the other.

18. Default and Remedies.

Defaults. Any one of the following shall constitute "An Event of Default."

i) One of the Parties shall fail to pay any undisputed bill for charges incurred under this Agreement or other amounts which one Party owes the other Party as and when due, and such failure shall continue for a period of thirty (30) days after written notice of nonpayment from the affected Party to the defaulting Party, or

ii) One of the Parties fails to comply with any other provision of this Agreement or breaches any representation or warranty in any material respect and fails to cure or remedy that default or breach within sixty (60) days after notice and written demand by the affected Party to cure the same or such longer period reasonably required to cure (not to exceed an additional 90 days unless otherwise mutually agreed upon), provided that the defaulting Party diligently continues to cure until such failure is fully cured.

Remedies. Upon the occurrence of an Event of Default, the affected Party may at its option, in addition to any remedies available under any other provision herein, do any, or any combination, as appropriate, of the following:

a) Continue to perform and enforce this Agreement;

b) Recover damages from the defaulting Party except as limited by this Agreement;

c) By written notice to the defaulting Party terminate this Agreement;

d) Pursue any other remedies it may have under this Agreement or under applicable law or in equity.

19. Entire Agreement. This Agreement, including any attachments or appendices, is entered into pursuant to the Interconnection Tariff. Together the Agreement and the Interconnection Tariff represent the entire understanding between the Parties, their agents, and employees as to the subject matter of this Agreement. Each Party also represents that in entering into this Agreement, it has not relied on any promise, inducement, representation, warranty, agreement or other statement not set forth in this Agreement or in the Company's Interconnection Tariff.

20. Supercedence. In the event of a conflict between this Agreement, the Interconnection Tariff, or the terms of any other tariff, Exhibit or Attachment incorporated by reference, the terms of the Interconnection Tariff, as the same may be amended from time to time, shall control. In the event that the Company files a revised tariff related to interconnection for Department approval after the effective date of this Agreement, the Company shall, not later than the date of such filing, notify the signatories of this Agreement and provide them a copy of said filing.

21. Governing Law. This Agreement shall be interpreted, governed, and construed under the laws of the Commonwealth of Massachusetts without giving effect to choice of law provisions that might apply to the law of a different jurisdiction.

22. Non-waiver. None of the provisions of this Agreement shall be considered waived by a Party unless such waiver is given in writing. The failure of a Party to insist in any one or more instances upon strict performance of any of the provisions of this Agreement or to take advantage of any of its rights hereunder shall not be construed as a waiver of any such provisions or the relinquishment of any such rights for the future, but the same shall continue and remain in full force and effect.

23. Counterparts. This Agreement may be signed in counterparts.

24. No Third Party Beneficiaries. This Agreement is made solely for the benefit of the Parties hereto. Nothing in the Agreement shall be construed to create any rights in or duty to, or standard of care with respect to, or any liability to, any person not a party to this Agreement.

25. Dispute Resolution. Unless otherwise agreed by the Parties, all disputes arising under this Agreement shall be resolved pursuant to the Dispute Resolution Process set forth in the Interconnection Tariff.

26. Severability. If any clause, provision, or section of this Agreement is ruled invalid by any court of competent jurisdiction, the invalidity of such clause, provision, or section, shall not affect any of the remaining provisions herein.

27. Signatures.

IN WITNESS WHEREOF, the Parties hereto have caused two (2) originals of this Agreement to be executed under seal by their duly authorized representatives.

Customer		Company	
By:		By:	
Name:	Ernest J. Panos	Name:	**Melanie Khederian**
Title:	Manager	Title:	**Account Executive**
Date:	4/4/18	Date:	4-4-2018

APPENDIX G

Drainage Calculations

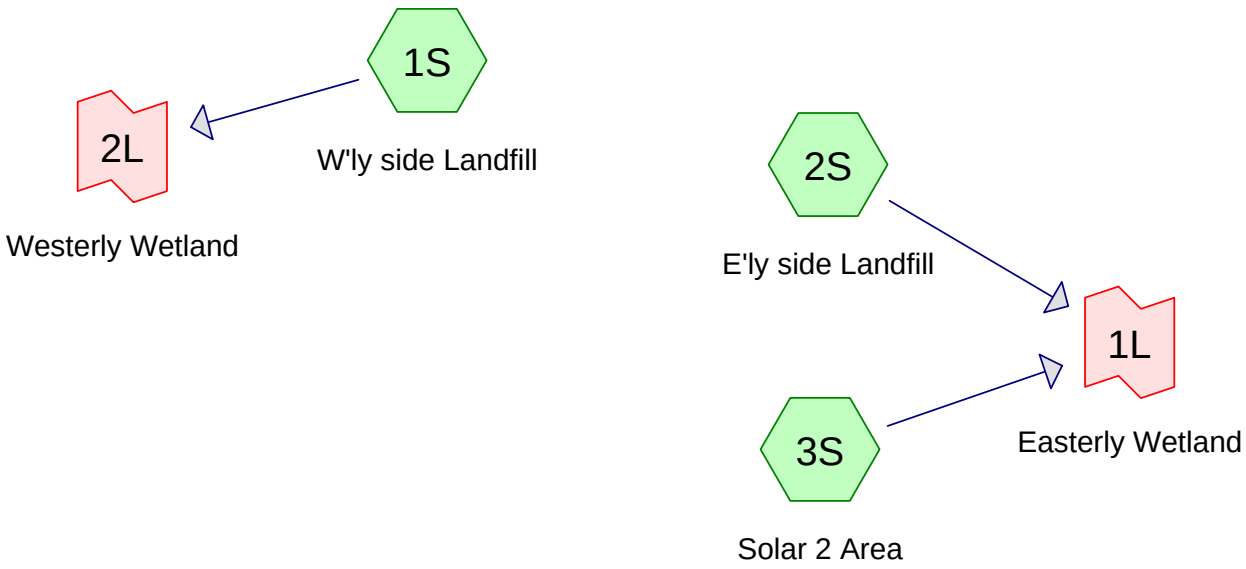
ALLEN & MAJOR ASSOCIATES, INC.

APPENDIX G

Pre-Development

Drainage Calculations

ALLEN & MAJOR ASSOCIATES, INC.



Subcat Reach Pond Link

Routing Diagram for Existing Conditions
Prepared by Allen & Major Associates, Inc., Printed 4/27/2018

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
8.010	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S)
18.314	74	>75% Grass cover, Good, HSG C (1S, 2S)
8.813	30	Woods, Good, HSG A (2S, 3S)
1.687	70	Woods, Good, HSG C (1S, 2S)
36.824	**56**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
16.823	HSG A	1S, 2S, 3S
0.000	HSG B	
20.001	HSG C	1S, 2S
0.000	HSG D	
0.000	Other	
36.824		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
8.010	0.000	18.314	0.000	0.000	26.324	>75% Grass cover, Good	1S, 2S, 3S
8.813	0.000	1.687	0.000	0.000	10.500	Woods, Good	1S, 2S, 3S
16.823	**0.000**	**20.001**	**0.000**	**0.000**	**36.824**	**TOTAL AREA**	

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

Subcatchment 1S: W'ly side Landfill Runoff Area=9.885 ac 0.00% Impervious Runoff Depth>0.89"
Flow Length=526' Tc=10.4 min CN=73 Runoff=9.09 cfs 0.735 af

Subcatchment 2S: E'ly side Landfill Runoff Area=13.443 ac 0.00% Impervious Runoff Depth>0.53"
Flow Length=592' Tc=13.3 min CN=65 Runoff=5.76 cfs 0.595 af

Subcatchment 3S: Solar 2 Area Runoff Area=13.496 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=966' Slope=0.0600 '/' Tc=12.1 min CN=33 Runoff=0.00 cfs 0.000 af

Link 1L: Easterly Wetland Inflow=5.76 cfs 0.595 af
Primary=5.76 cfs 0.595 af

Link 2L: Westerly Wetland Inflow=9.09 cfs 0.735 af
Primary=9.09 cfs 0.735 af

Total Runoff Area = 36.824 ac Runoff Volume = 1.330 af Average Runoff Depth = 0.43"
100.00% Pervious = 36.824 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: W'ly side Landfill

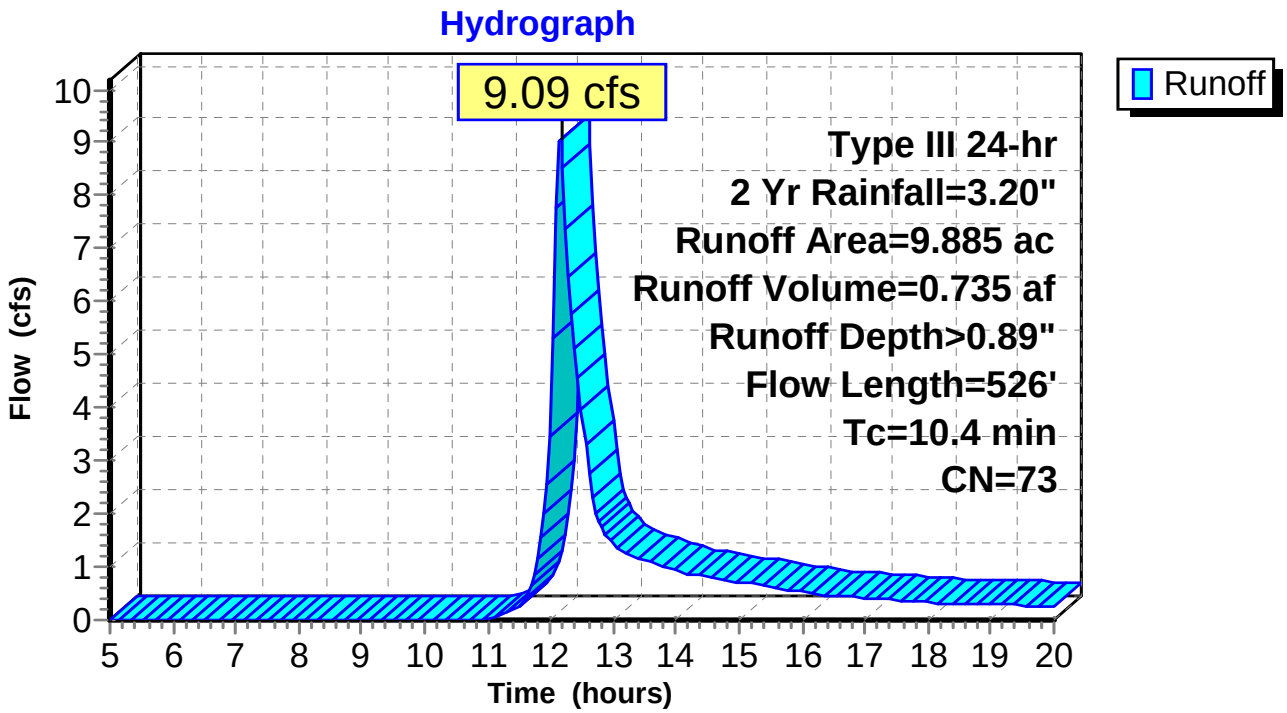
Runoff = 9.09 cfs @ 12.16 hrs, Volume= 0.735 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
0.114	39	>75% Grass cover, Good, HSG A
1.352	70	Woods, Good, HSG C
8.419	74	>75% Grass cover, Good, HSG C
9.885	73	Weighted Average
9.885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0170	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
1.2	225	0.0400	3.22		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	251	0.2270	7.67		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
10.4	526	Total			

Subcatchment 1S: W'ly side Landfill



Summary for Subcatchment 2S: E'ly side Landfill

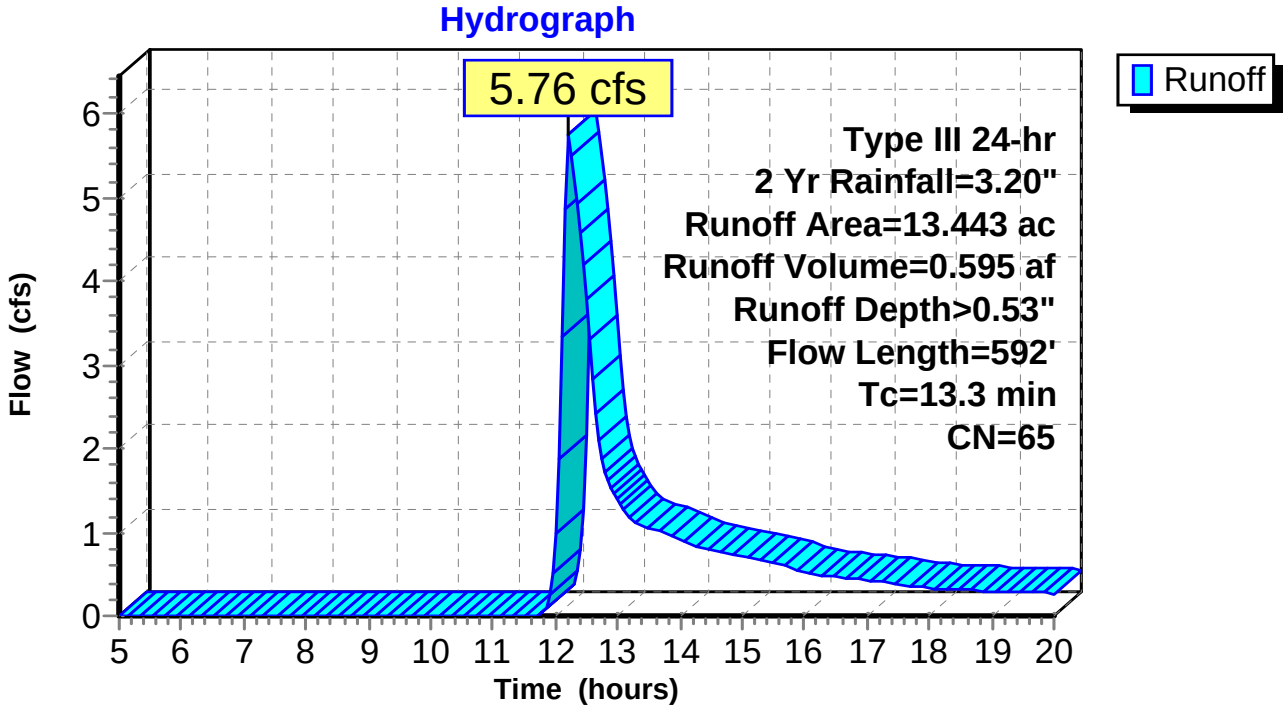
Runoff = 5.76 cfs @ 12.22 hrs, Volume= 0.595 af, Depth> 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
0.225	30	Woods, Good, HSG A
2.988	39	>75% Grass cover, Good, HSG A
0.335	70	Woods, Good, HSG C
9.895	74	>75% Grass cover, Good, HSG C
13.443	65	Weighted Average
13.443		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
2.0	356	0.0330	2.92		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	186	0.1600	6.44		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
13.3	592	Total			

Subcatchment 2S: E'ly side Landfill



Summary for Subcatchment 3S: Solar 2 Area

[45] Hint: Runoff=Zero

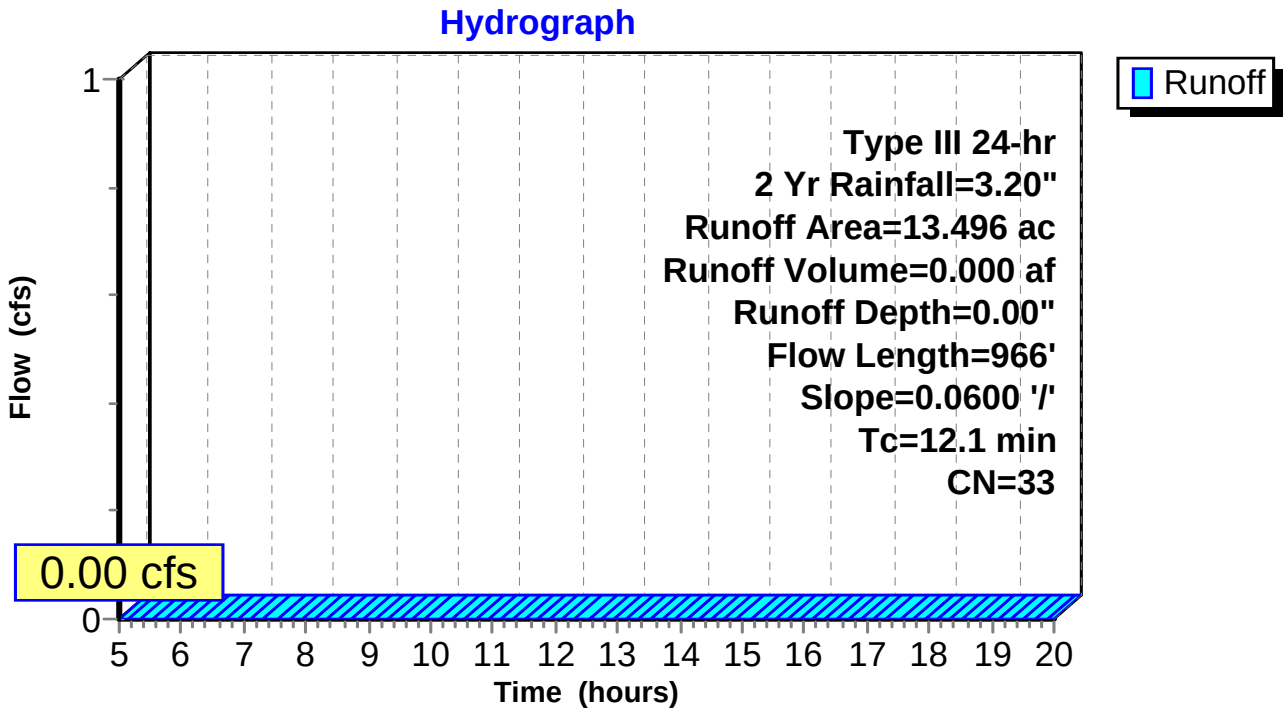
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
8.588	30	Woods, Good, HSG A
4.908	39	>75% Grass cover, Good, HSG A
13.496	33	Weighted Average
13.496		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
4.2	916	0.0600	3.67		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
12.1	966	Total			

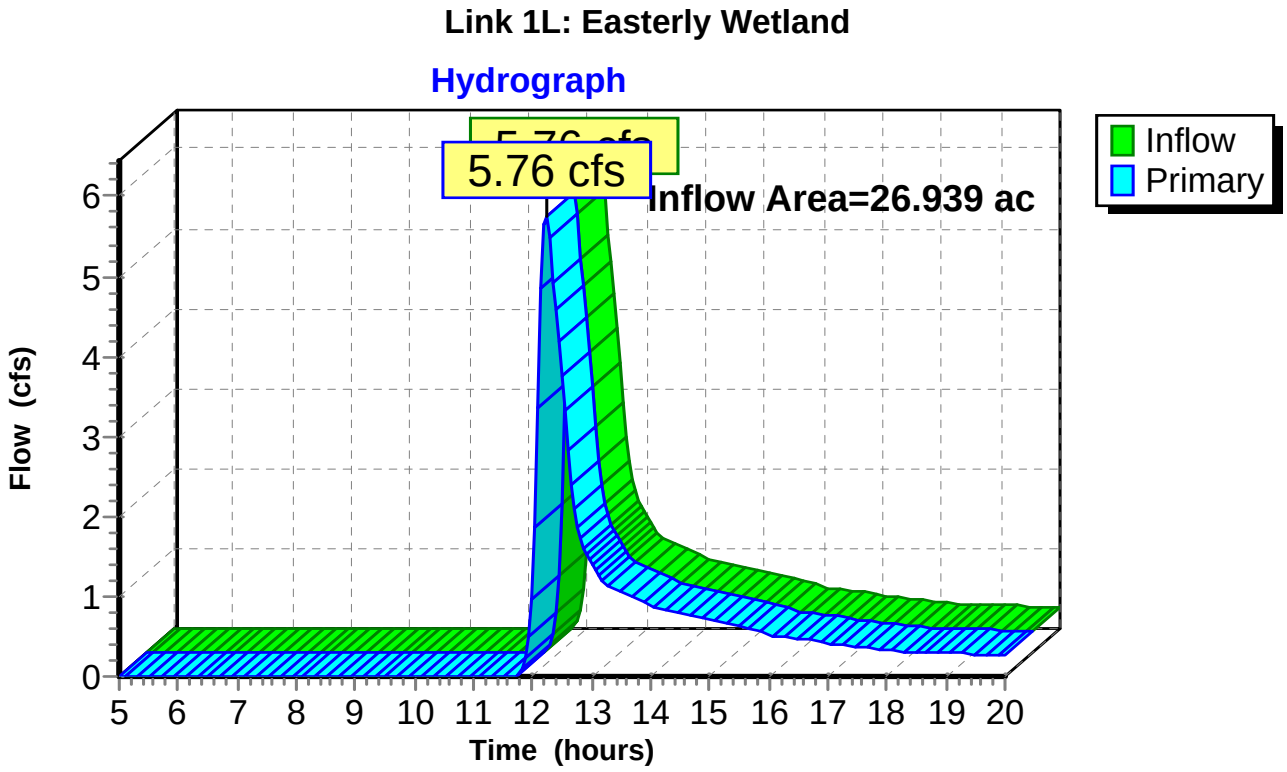
Subcatchment 3S: Solar 2 Area



Summary for Link 1L: Easterly Wetland

Inflow Area = 26.939 ac, 0.00% Impervious, Inflow Depth > 0.27" for 2 Yr event
Inflow = 5.76 cfs @ 12.22 hrs, Volume= 0.595 af
Primary = 5.76 cfs @ 12.22 hrs, Volume= 0.595 af, Atten= 0%, Lag= 0.0 min

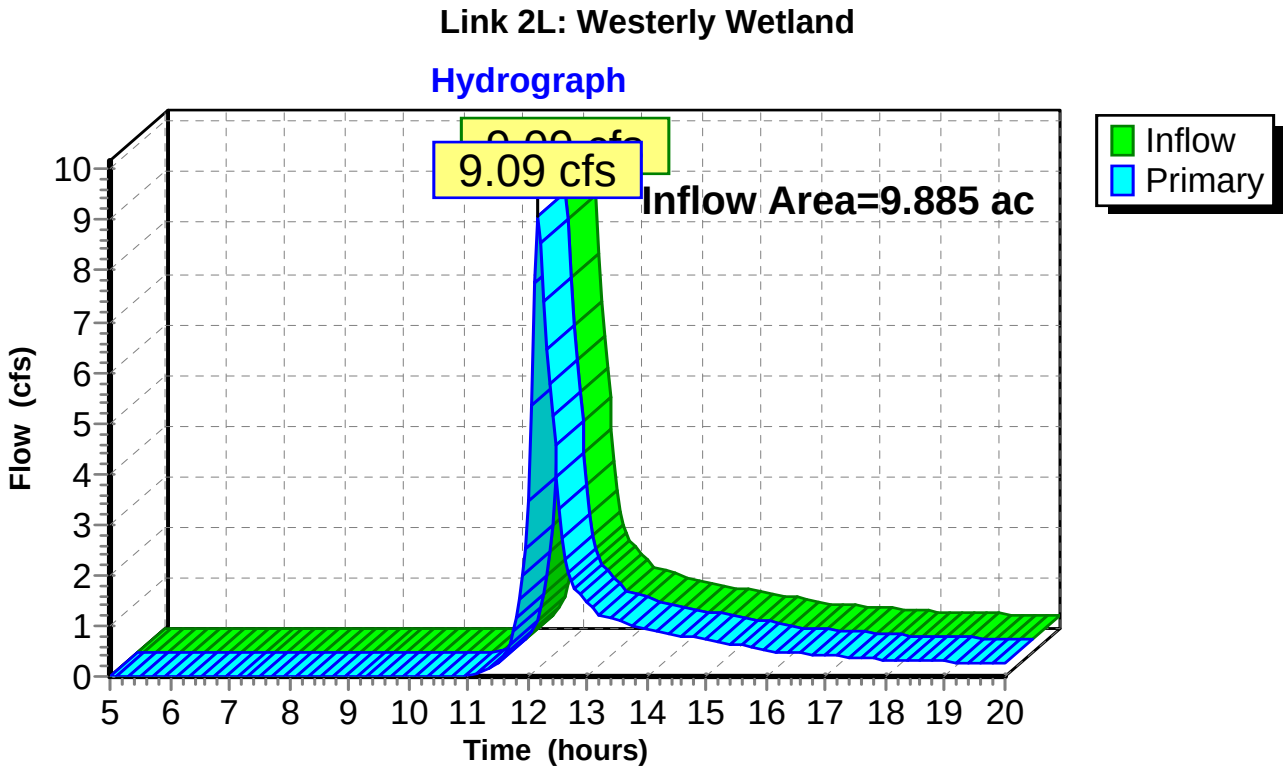
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Summary for Link 2L: Westerly Wetland

Inflow Area = 9.885 ac, 0.00% Impervious, Inflow Depth > 0.89" for 2 Yr event
Inflow = 9.09 cfs @ 12.16 hrs, Volume= 0.735 af
Primary = 9.09 cfs @ 12.16 hrs, Volume= 0.735 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



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

Subcatchment 1S: W'ly side Landfill Runoff Area=9.885 ac 0.00% Impervious Runoff Depth>1.78"
Flow Length=526' Tc=10.4 min CN=73 Runoff=18.87 cfs 1.467 af

Subcatchment 2S: E'ly side Landfill Runoff Area=13.443 ac 0.00% Impervious Runoff Depth>1.23"
Flow Length=592' Tc=13.3 min CN=65 Runoff=15.60 cfs 1.382 af

Subcatchment 3S: Solar 2 Area Runoff Area=13.496 ac 0.00% Impervious Runoff Depth>0.00"
Flow Length=966' Slope=0.0600 '/' Tc=12.1 min CN=33 Runoff=0.02 cfs 0.004 af

Link 1L: Easterly Wetland Inflow=15.60 cfs 1.386 af
Primary=15.60 cfs 1.386 af

Link 2L: Westerly Wetland Inflow=18.87 cfs 1.467 af
Primary=18.87 cfs 1.467 af

Total Runoff Area = 36.824 ac Runoff Volume = 2.853 af Average Runoff Depth = 0.93"
100.00% Pervious = 36.824 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: W'ly side Landfill

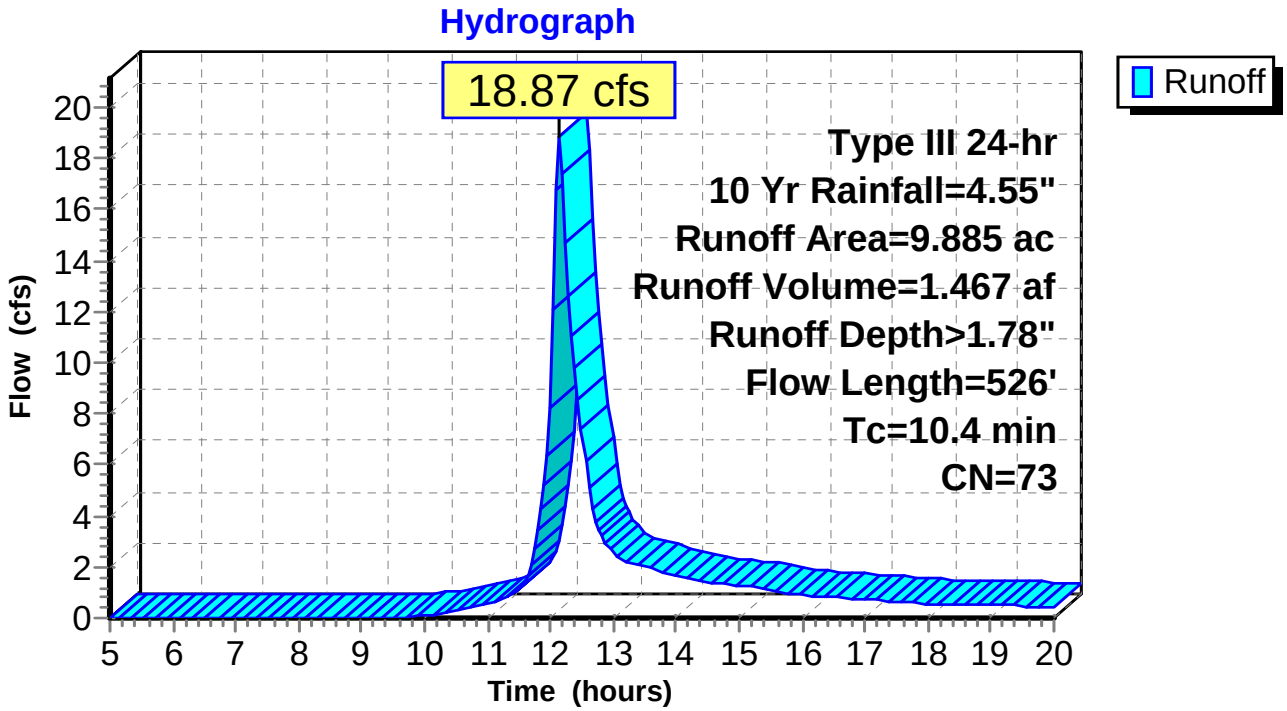
Runoff = 18.87 cfs @ 12.15 hrs, Volume= 1.467 af, Depth> 1.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Yr Rainfall=4.55"

Area (ac)	CN	Description
0.114	39	>75% Grass cover, Good, HSG A
1.352	70	Woods, Good, HSG C
8.419	74	>75% Grass cover, Good, HSG C
9.885	73	Weighted Average
9.885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0170	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
1.2	225	0.0400	3.22		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	251	0.2270	7.67		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
10.4	526	Total			

Subcatchment 1S: W'ly side Landfill



Summary for Subcatchment 2S: E'ly side Landfill

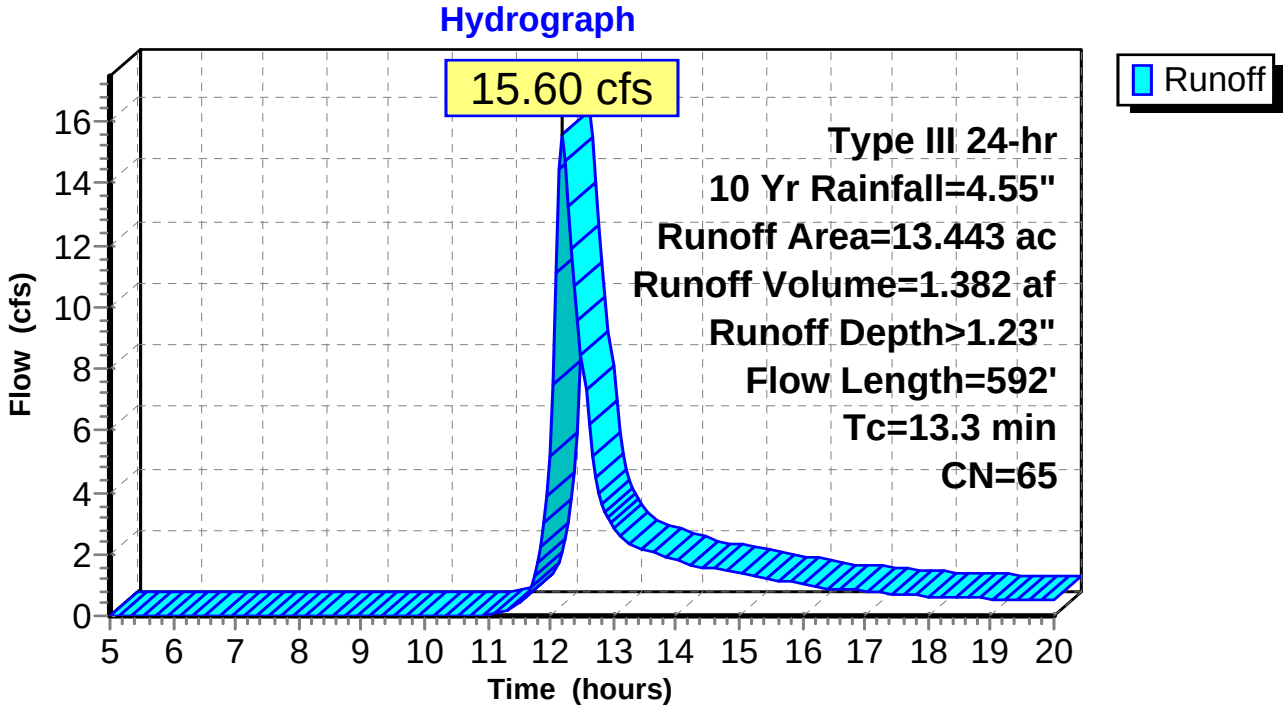
Runoff = 15.60 cfs @ 12.20 hrs, Volume= 1.382 af, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Yr Rainfall=4.55"

Area (ac)	CN	Description
0.225	30	Woods, Good, HSG A
2.988	39	>75% Grass cover, Good, HSG A
0.335	70	Woods, Good, HSG C
9.895	74	>75% Grass cover, Good, HSG C
13.443	65	Weighted Average
13.443		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
2.0	356	0.0330	2.92		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	186	0.1600	6.44		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
13.3	592	Total			

Subcatchment 2S: E'ly side Landfill



Summary for Subcatchment 3S: Solar 2 Area

[73] Warning: Peak may fall outside time span

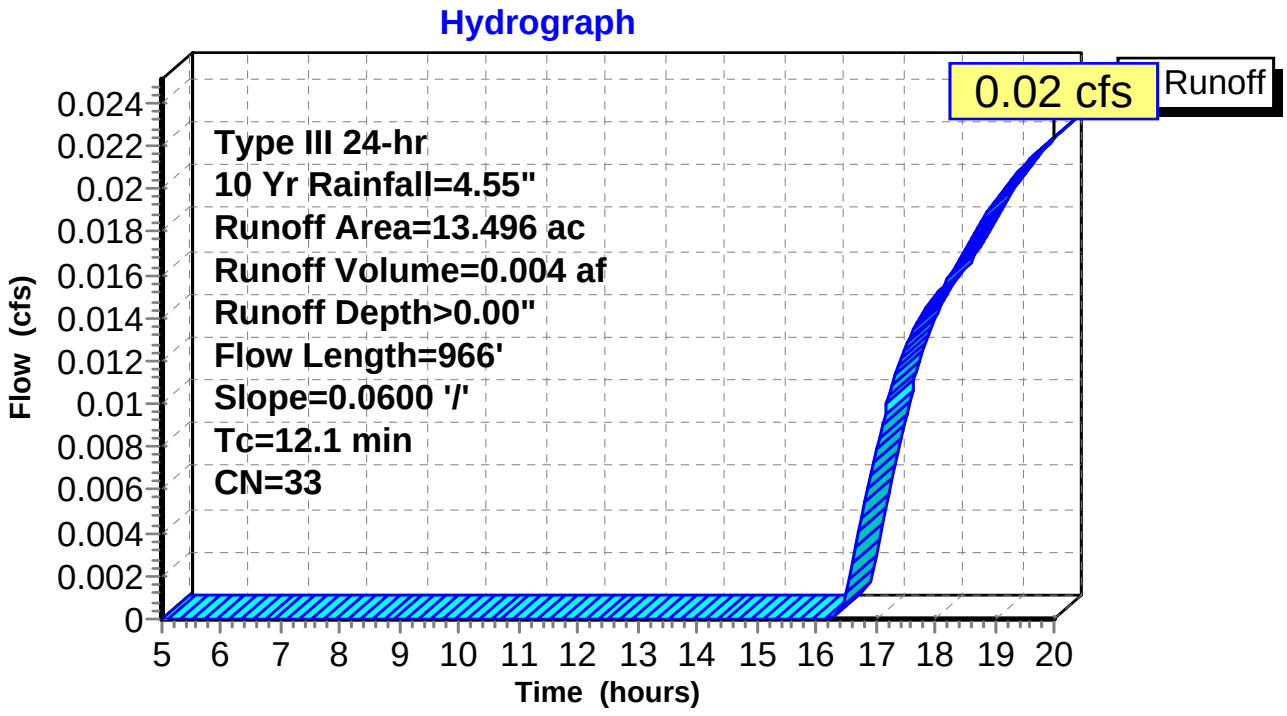
Runoff = 0.02 cfs @ 20.00 hrs, Volume= 0.004 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Yr Rainfall=4.55"

Area (ac)	CN	Description
8.588	30	Woods, Good, HSG A
4.908	39	>75% Grass cover, Good, HSG A
13.496	33	Weighted Average
13.496		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
4.2	916	0.0600	3.67		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
12.1	966	Total			

Subcatchment 3S: Solar 2 Area

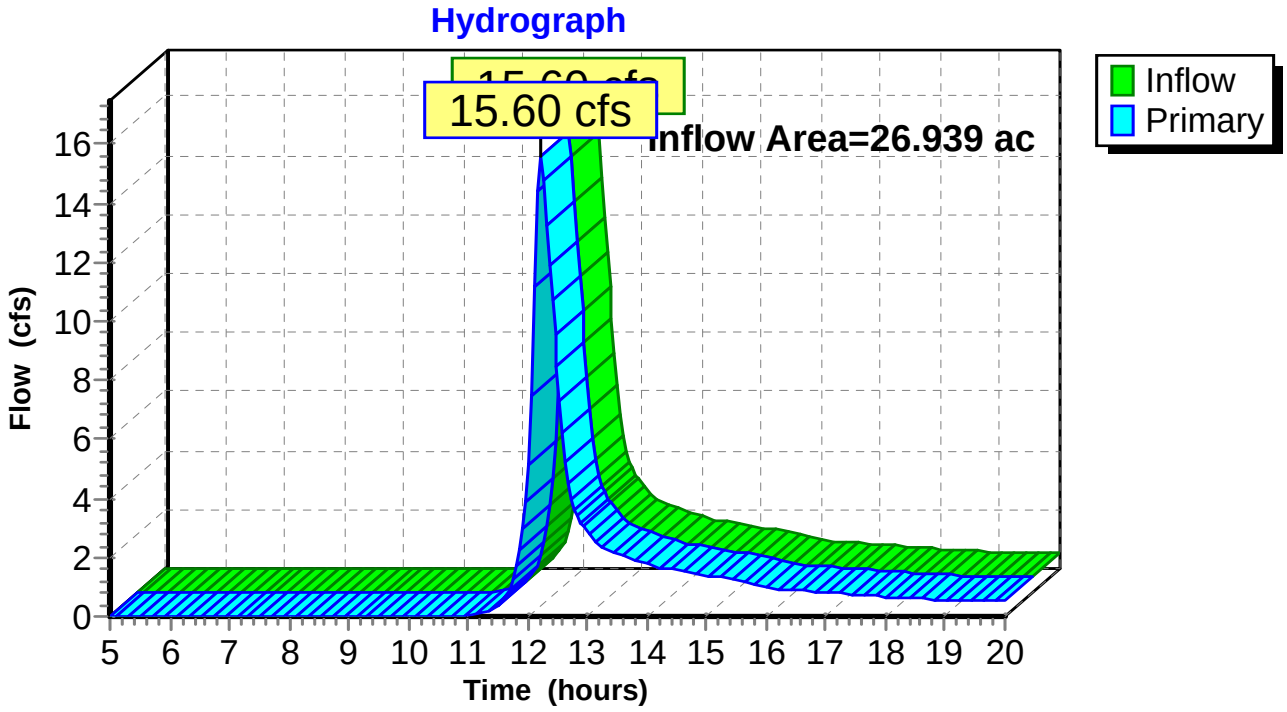


Summary for Link 1L: Easterly Wetland

Inflow Area = 26.939 ac, 0.00% Impervious, Inflow Depth > 0.62" for 10 Yr event
Inflow = 15.60 cfs @ 12.20 hrs, Volume= 1.386 af
Primary = 15.60 cfs @ 12.20 hrs, Volume= 1.386 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

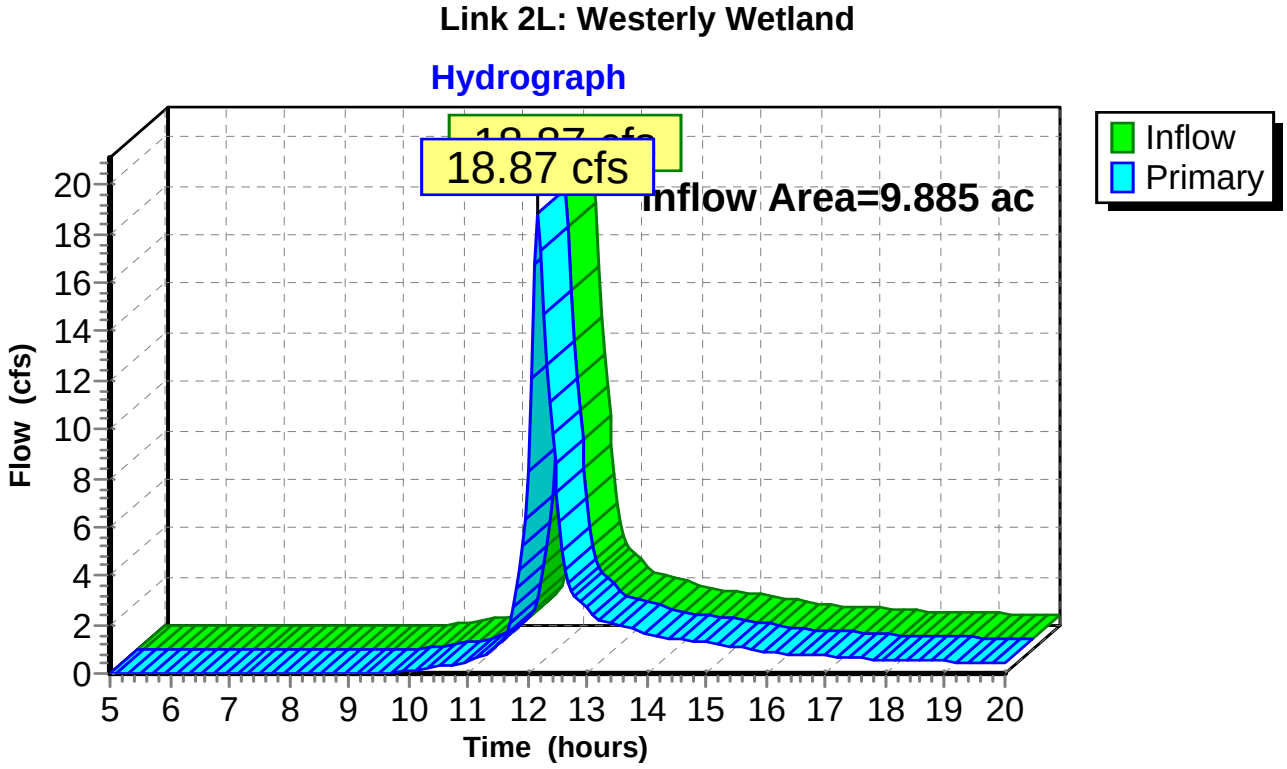
Link 1L: Easterly Wetland



Summary for Link 2L: Westerly Wetland

Inflow Area = 9.885 ac, 0.00% Impervious, Inflow Depth > 1.78" for 10 Yr event
Inflow = 18.87 cfs @ 12.15 hrs, Volume= 1.467 af
Primary = 18.87 cfs @ 12.15 hrs, Volume= 1.467 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



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

Subcatchment 1S: W'ly side Landfill Runoff Area=9.885 ac 0.00% Impervious Runoff Depth>2.48"
Flow Length=526' Tc=10.4 min CN=73 Runoff=26.43 cfs 2.044 af

Subcatchment 2S: E'ly side Landfill Runoff Area=13.443 ac 0.00% Impervious Runoff Depth>1.82"
Flow Length=592' Tc=13.3 min CN=65 Runoff=23.76 cfs 2.041 af

Subcatchment 3S: Solar 2 Area Runoff Area=13.496 ac 0.00% Impervious Runoff Depth>0.07"
Flow Length=966' Slope=0.0600 '/' Tc=12.1 min CN=33 Runoff=0.17 cfs 0.074 af

Link 1L: Easterly Wetland Inflow=23.76 cfs 2.116 af
Primary=23.76 cfs 2.116 af

Link 2L: Westerly Wetland Inflow=26.43 cfs 2.044 af
Primary=26.43 cfs 2.044 af

Total Runoff Area = 36.824 ac Runoff Volume = 4.159 af Average Runoff Depth = 1.36"
100.00% Pervious = 36.824 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: W'ly side Landfill

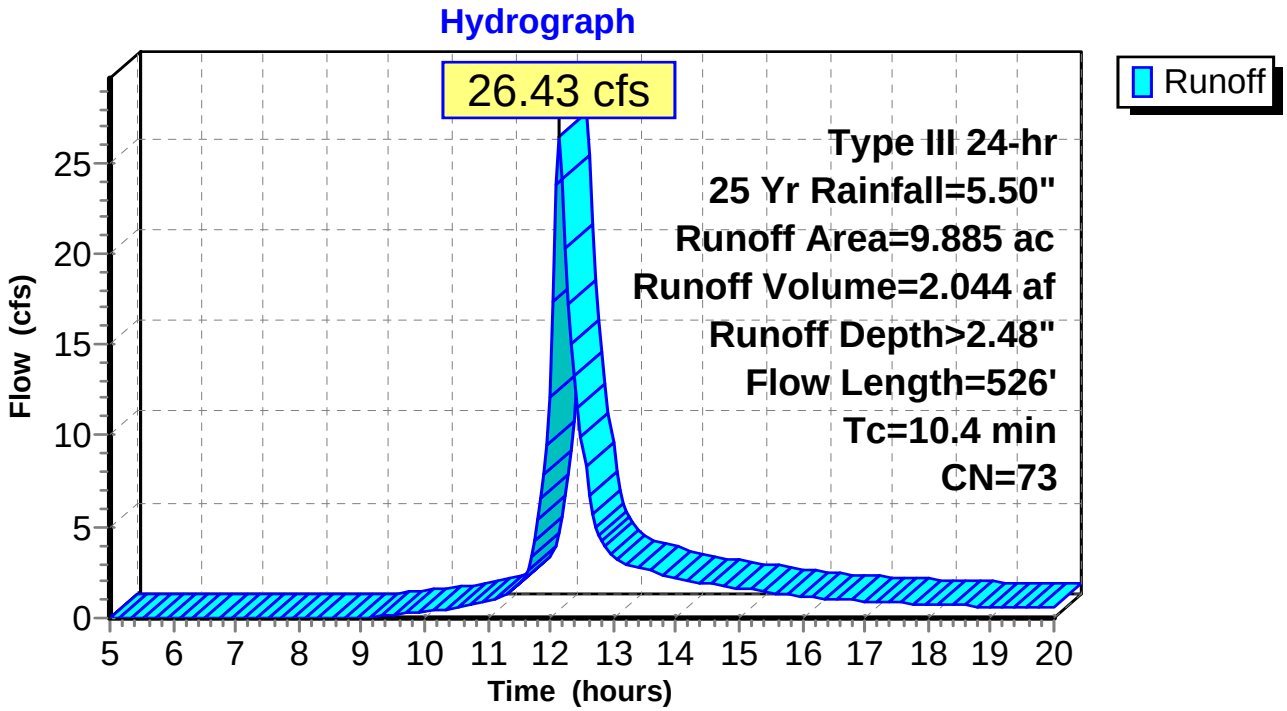
Runoff = 26.43 cfs @ 12.15 hrs, Volume= 2.044 af, Depth> 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Yr Rainfall=5.50"

Area (ac)	CN	Description
0.114	39	>75% Grass cover, Good, HSG A
1.352	70	Woods, Good, HSG C
8.419	74	>75% Grass cover, Good, HSG C
9.885	73	Weighted Average
9.885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0170	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
1.2	225	0.0400	3.22		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	251	0.2270	7.67		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
10.4	526	Total			

Subcatchment 1S: W'ly side Landfill



Summary for Subcatchment 2S: E'ly side Landfill

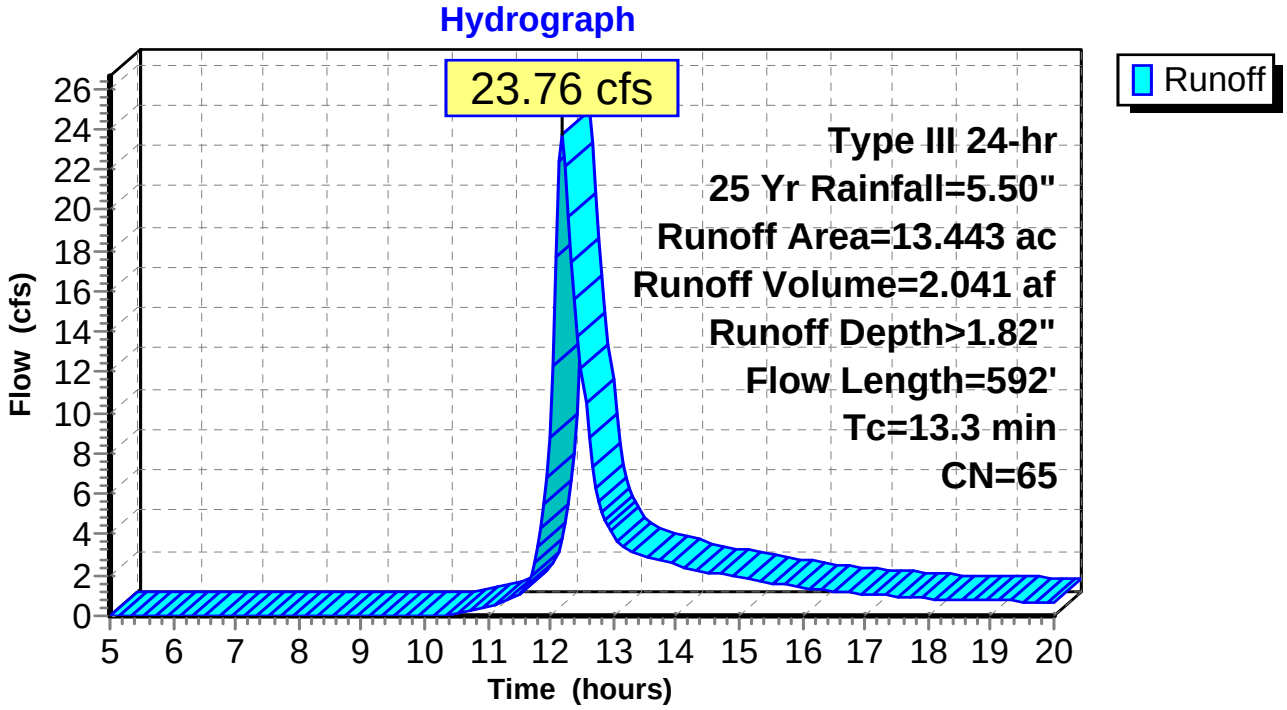
Runoff = 23.76 cfs @ 12.20 hrs, Volume= 2.041 af, Depth> 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Yr Rainfall=5.50"

Area (ac)	CN	Description
0.225	30	Woods, Good, HSG A
2.988	39	>75% Grass cover, Good, HSG A
0.335	70	Woods, Good, HSG C
9.895	74	>75% Grass cover, Good, HSG C
13.443	65	Weighted Average
13.443		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
2.0	356	0.0330	2.92		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	186	0.1600	6.44		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
13.3	592	Total			

Subcatchment 2S: E'ly side Landfill



Summary for Subcatchment 3S: Solar 2 Area

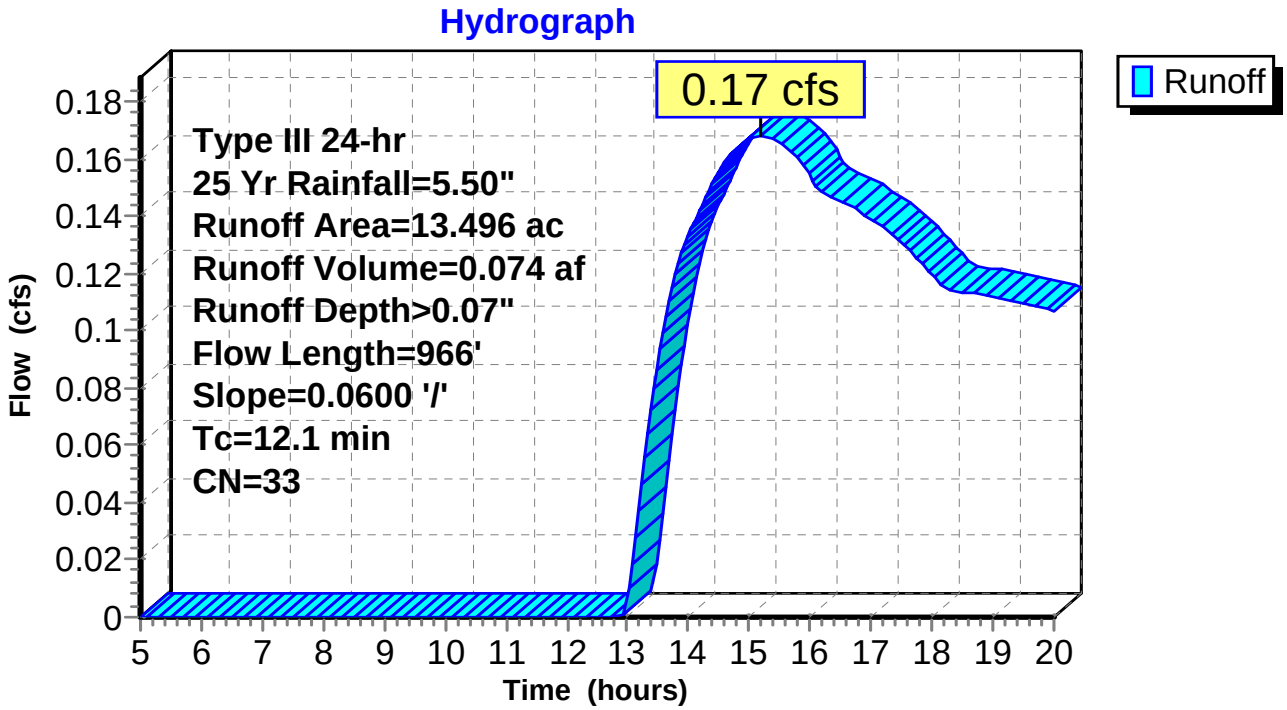
Runoff = 0.17 cfs @ 15.20 hrs, Volume= 0.074 af, Depth> 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Yr Rainfall=5.50"

Area (ac)	CN	Description
8.588	30	Woods, Good, HSG A
4.908	39	>75% Grass cover, Good, HSG A
13.496	33	Weighted Average
13.496		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
4.2	916	0.0600	3.67		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
12.1	966	Total			

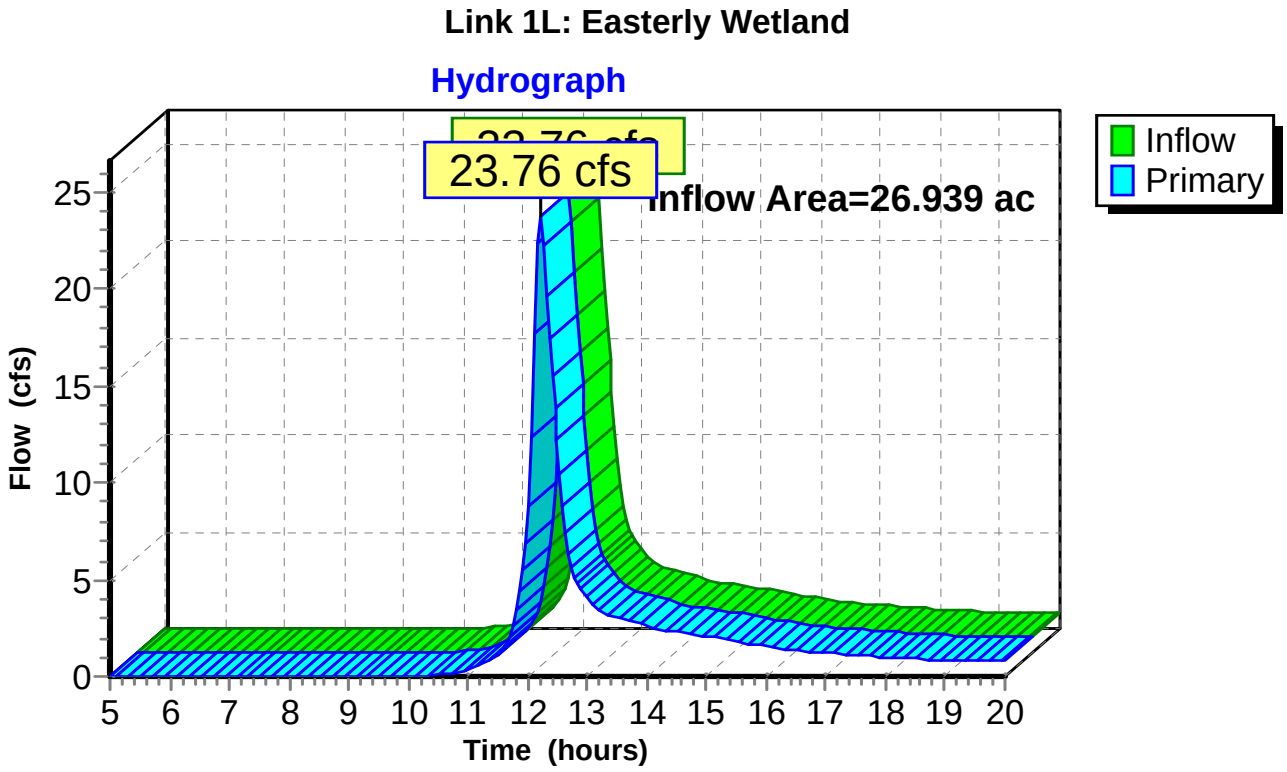
Subcatchment 3S: Solar 2 Area



Summary for Link 1L: Easterly Wetland

Inflow Area = 26.939 ac, 0.00% Impervious, Inflow Depth > 0.94" for 25 Yr event
Inflow = 23.76 cfs @ 12.20 hrs, Volume= 2.116 af
Primary = 23.76 cfs @ 12.20 hrs, Volume= 2.116 af, Atten= 0%, Lag= 0.0 min

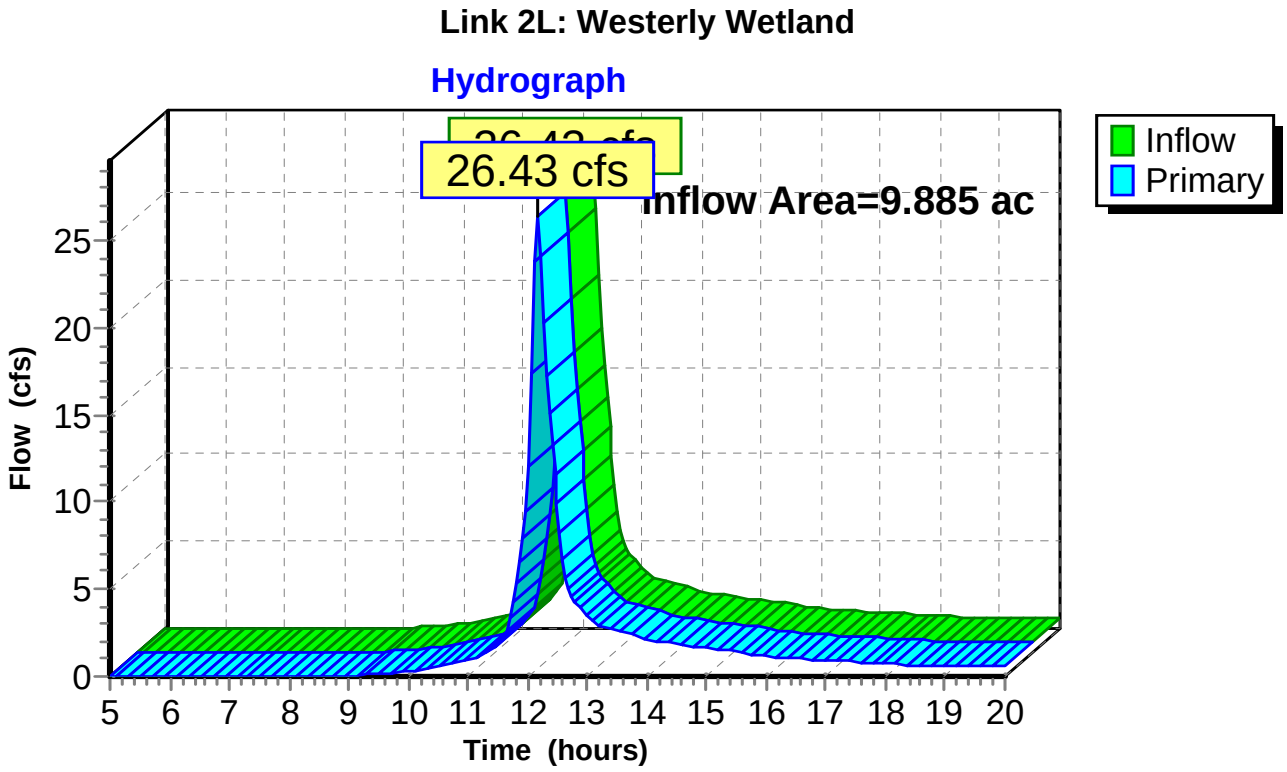
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Summary for Link 2L: Westerly Wetland

Inflow Area = 9.885 ac, 0.00% Impervious, Inflow Depth > 2.48" for 25 Yr event
Inflow = 26.43 cfs @ 12.15 hrs, Volume= 2.044 af
Primary = 26.43 cfs @ 12.15 hrs, Volume= 2.044 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



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

Subcatchment 1S: W'ly side Landfill Runoff Area=9.885 ac 0.00% Impervious Runoff Depth>3.42"
Flow Length=526' Tc=10.4 min CN=73 Runoff=36.43 cfs 2.820 af

Subcatchment 2S: E'ly side Landfill Runoff Area=13.443 ac 0.00% Impervious Runoff Depth>2.64"
Flow Length=592' Tc=13.3 min CN=65 Runoff=34.99 cfs 2.961 af

Subcatchment 3S: Solar 2 Area Runoff Area=13.496 ac 0.00% Impervious Runoff Depth>0.24"
Flow Length=966' Slope=0.0600 '/' Tc=12.1 min CN=33 Runoff=0.86 cfs 0.271 af

Link 1L: Easterly Wetland Inflow=34.99 cfs 3.232 af
Primary=34.99 cfs 3.232 af

Link 2L: Westerly Wetland Inflow=36.43 cfs 2.820 af
Primary=36.43 cfs 2.820 af

Total Runoff Area = 36.824 ac Runoff Volume = 6.052 af Average Runoff Depth = 1.97"
100.00% Pervious = 36.824 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: W'ly side Landfill

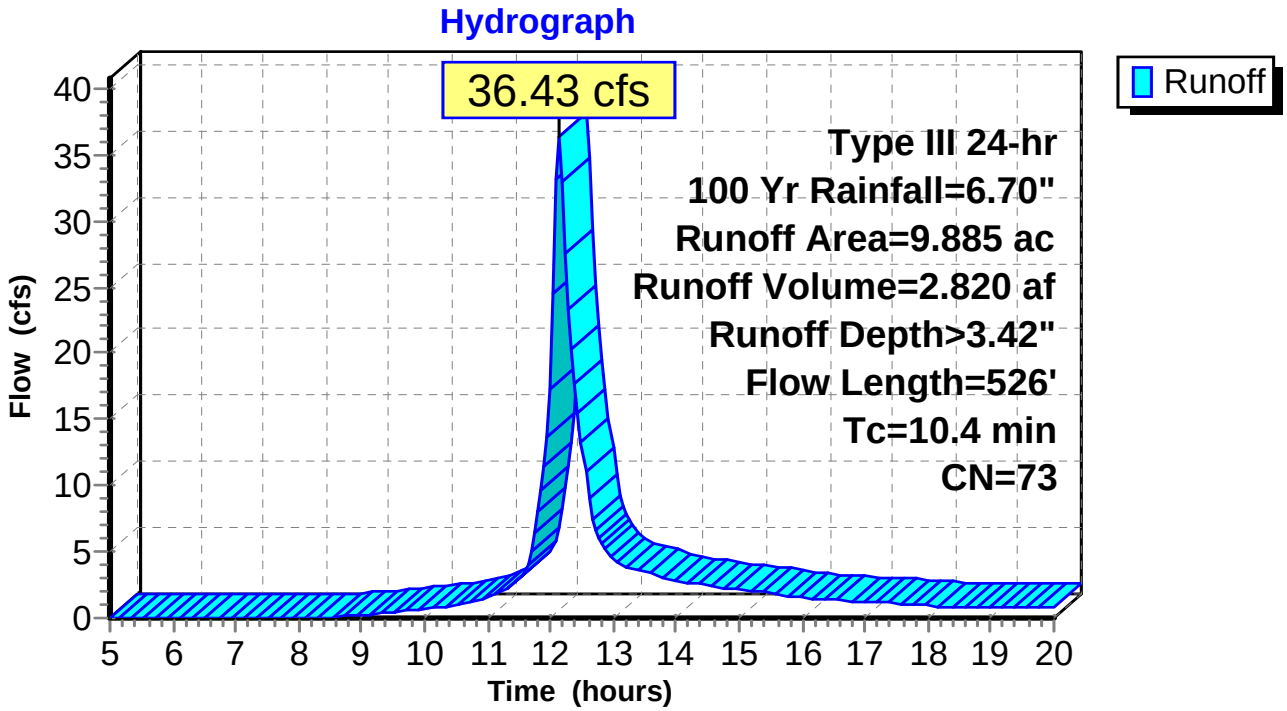
Runoff = 36.43 cfs @ 12.15 hrs, Volume= 2.820 af, Depth> 3.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Yr Rainfall=6.70"

Area (ac)	CN	Description
0.114	39	>75% Grass cover, Good, HSG A
1.352	70	Woods, Good, HSG C
8.419	74	>75% Grass cover, Good, HSG C
9.885	73	Weighted Average
9.885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0170	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
1.2	225	0.0400	3.22		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	251	0.2270	7.67		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
10.4	526	Total			

Subcatchment 1S: W'ly side Landfill



Summary for Subcatchment 2S: E'ly side Landfill

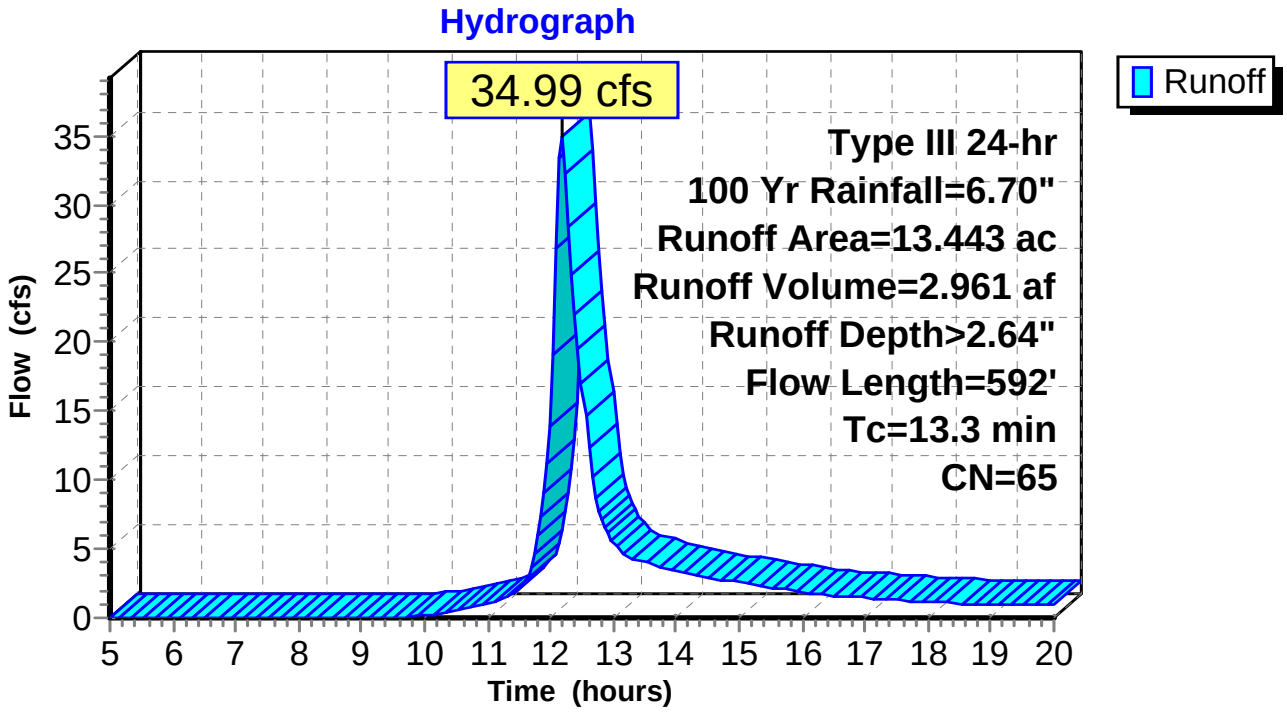
Runoff = 34.99 cfs @ 12.19 hrs, Volume= 2.961 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Yr Rainfall=6.70"

Area (ac)	CN	Description
0.225	30	Woods, Good, HSG A
2.988	39	>75% Grass cover, Good, HSG A
0.335	70	Woods, Good, HSG C
9.895	74	>75% Grass cover, Good, HSG C
13.443	65	Weighted Average
13.443		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
2.0	356	0.0330	2.92		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	186	0.1600	6.44		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
13.3	592	Total			

Subcatchment 2S: E'ly side Landfill



Summary for Subcatchment 3S: Solar 2 Area

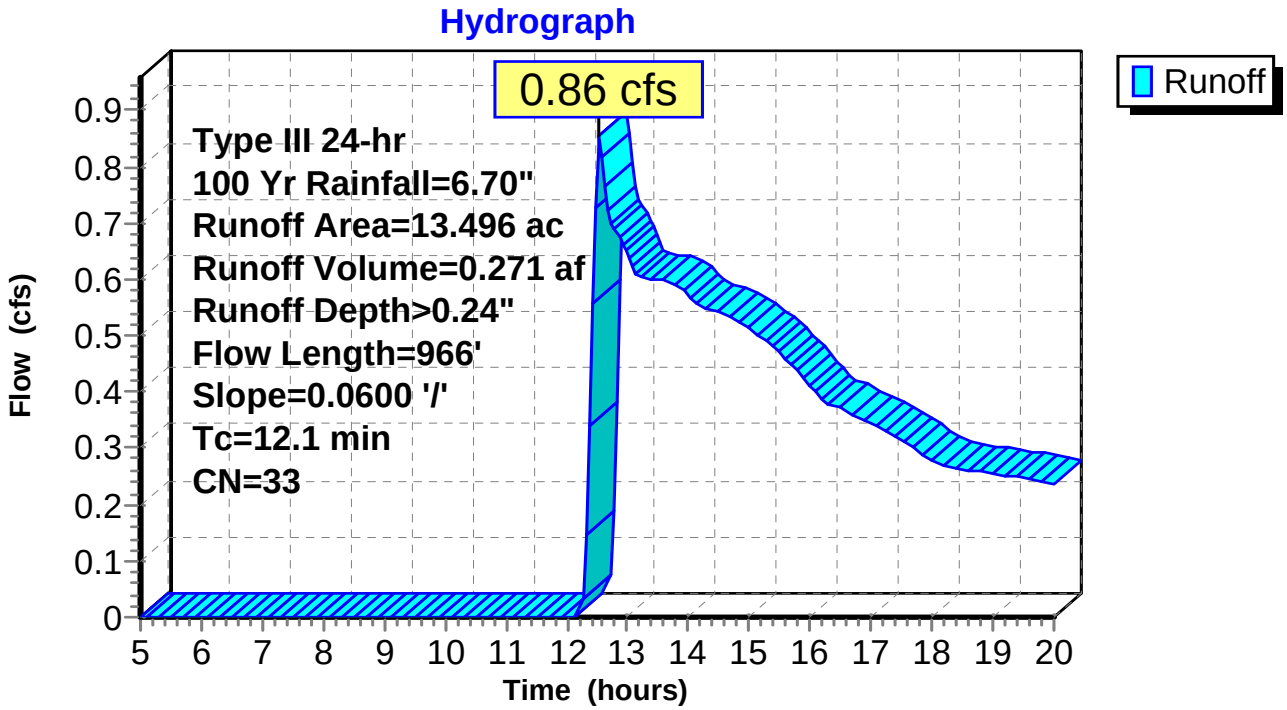
Runoff = 0.86 cfs @ 12.54 hrs, Volume= 0.271 af, Depth> 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Yr Rainfall=6.70"

Area (ac)	CN	Description
8.588	30	Woods, Good, HSG A
4.908	39	>75% Grass cover, Good, HSG A
13.496	33	Weighted Average
13.496		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
4.2	916	0.0600	3.67		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
12.1	966	Total			

Subcatchment 3S: Solar 2 Area

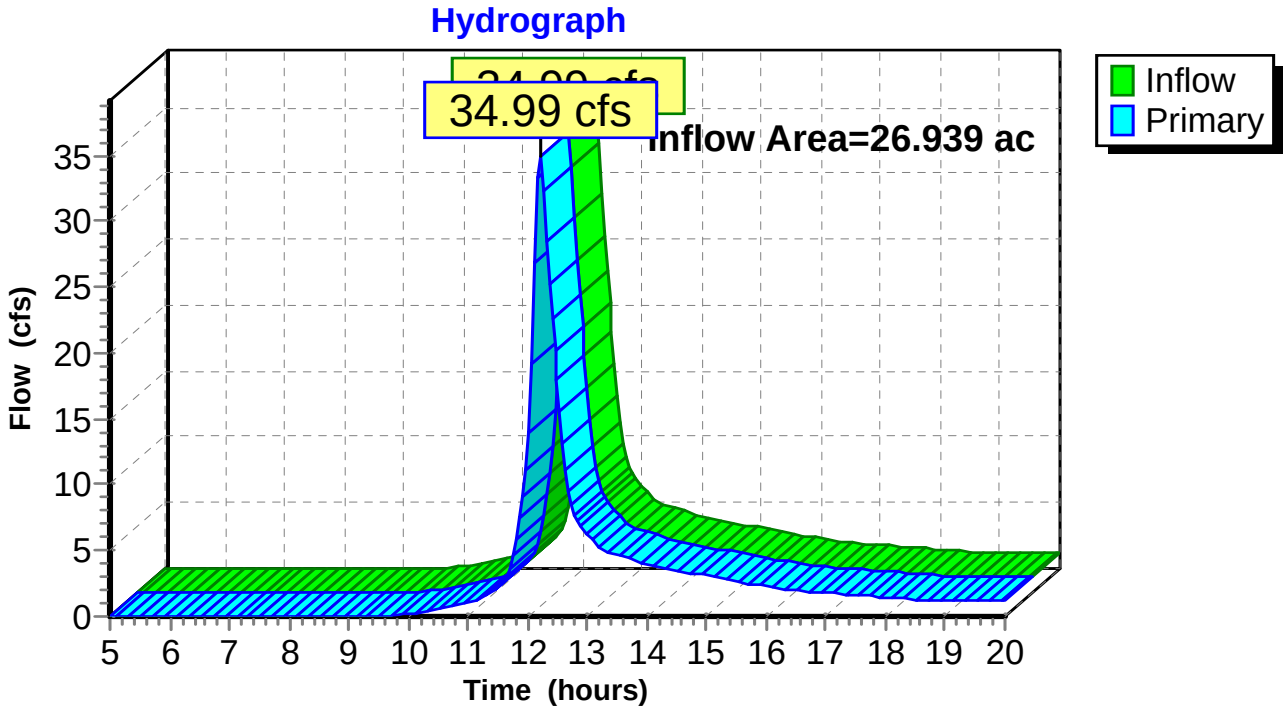


Summary for Link 1L: Easterly Wetland

Inflow Area = 26.939 ac, 0.00% Impervious, Inflow Depth > 1.44" for 100 Yr event
Inflow = 34.99 cfs @ 12.19 hrs, Volume= 3.232 af
Primary = 34.99 cfs @ 12.19 hrs, Volume= 3.232 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

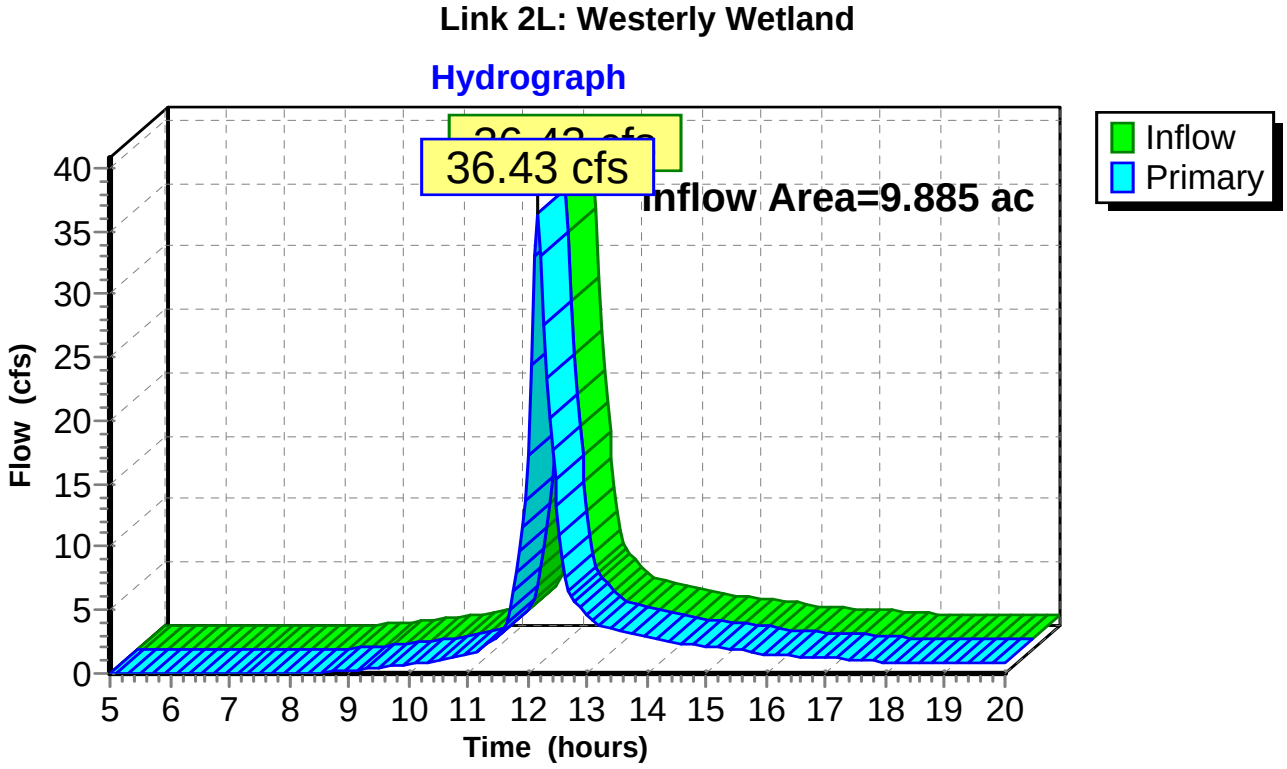
Link 1L: Easterly Wetland



Summary for Link 2L: Westerly Wetland

Inflow Area = 9.885 ac, 0.00% Impervious, Inflow Depth > 3.42" for 100 Yr event
Inflow = 36.43 cfs @ 12.15 hrs, Volume= 2.820 af
Primary = 36.43 cfs @ 12.15 hrs, Volume= 2.820 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



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

Subcatchment 1S: W'ly side Landfill Runoff Area=9.885 ac 0.00% Impervious Runoff Depth>0.01"
Flow Length=526' Tc=10.4 min CN=73 Runoff=0.02 cfs 0.010 af

Subcatchment 2S: E'ly side Landfill Runoff Area=13.443 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=592' Tc=13.3 min CN=65 Runoff=0.00 cfs 0.000 af

Subcatchment 3S: Solar 2 Area Runoff Area=13.496 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=966' Slope=0.0600 '/' Tc=12.1 min CN=33 Runoff=0.00 cfs 0.000 af

Link 1L: Easterly Wetland Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 2L: Westerly Wetland Inflow=0.02 cfs 0.010 af
Primary=0.02 cfs 0.010 af

Total Runoff Area = 36.824 ac Runoff Volume = 0.010 af Average Runoff Depth = 0.00"
100.00% Pervious = 36.824 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: W'ly side Landfill

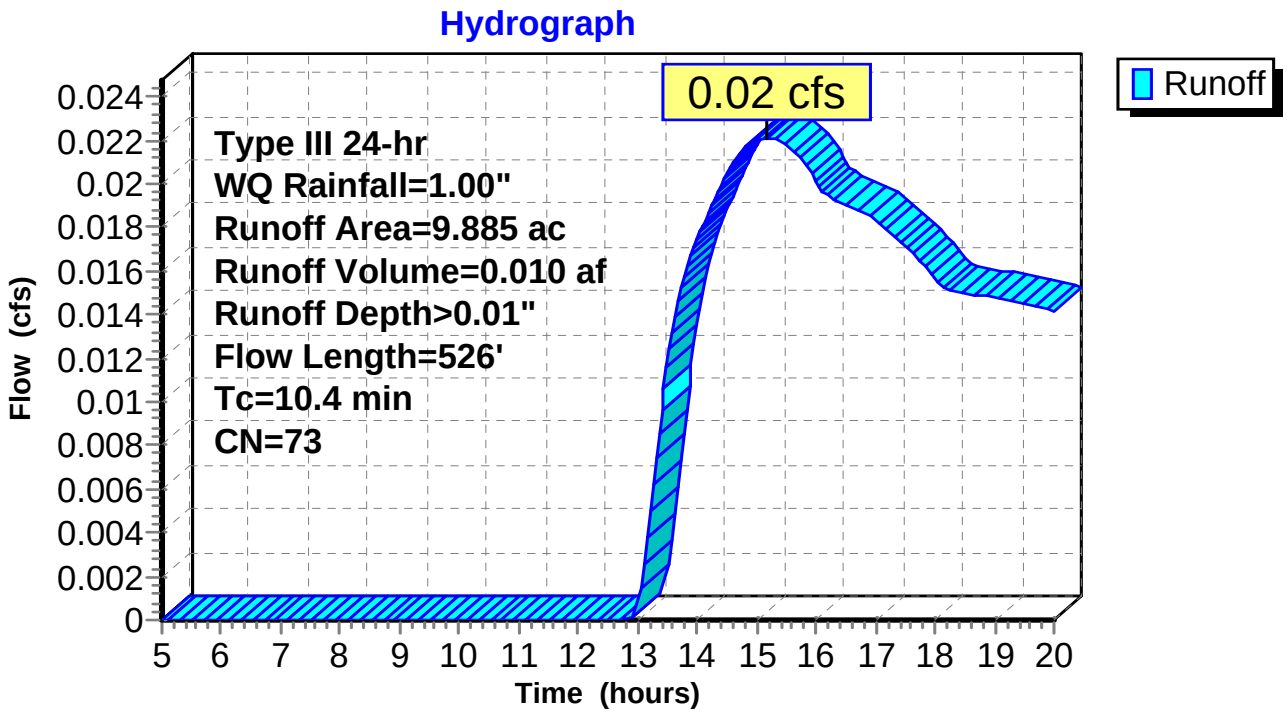
Runoff = 0.02 cfs @ 15.18 hrs, Volume= 0.010 af, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=1.00"

Area (ac)	CN	Description
0.114	39	>75% Grass cover, Good, HSG A
1.352	70	Woods, Good, HSG C
8.419	74	>75% Grass cover, Good, HSG C
9.885	73	Weighted Average
9.885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0170	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
1.2	225	0.0400	3.22		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	251	0.2270	7.67		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
10.4	526	Total			

Subcatchment 1S: W'ly side Landfill



Summary for Subcatchment 2S: E'ly side Landfill

[45] Hint: Runoff=Zero

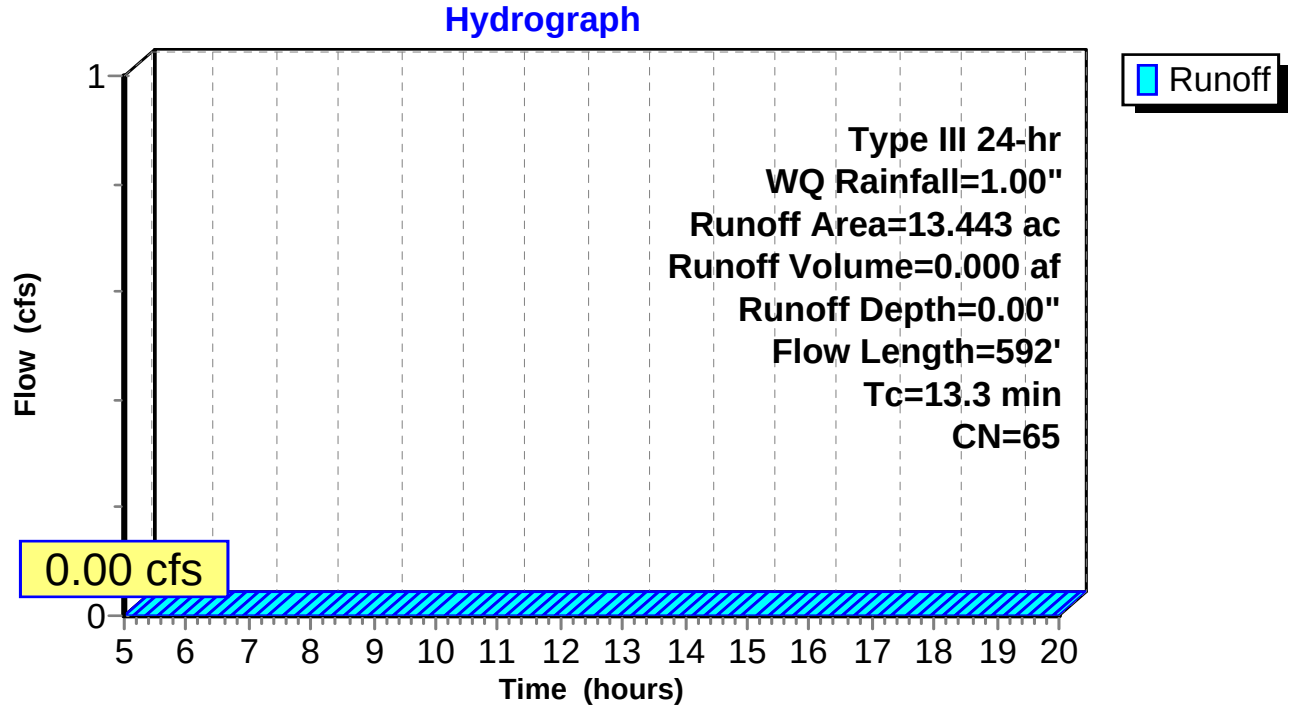
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=1.00"

Area (ac)	CN	Description
0.225	30	Woods, Good, HSG A
2.988	39	>75% Grass cover, Good, HSG A
0.335	70	Woods, Good, HSG C
9.895	74	>75% Grass cover, Good, HSG C
13.443	65	Weighted Average
13.443		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
2.0	356	0.0330	2.92		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	186	0.1600	6.44		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
13.3	592	Total			

Subcatchment 2S: E'ly side Landfill



Summary for Subcatchment 3S: Solar 2 Area

[45] Hint: Runoff=Zero

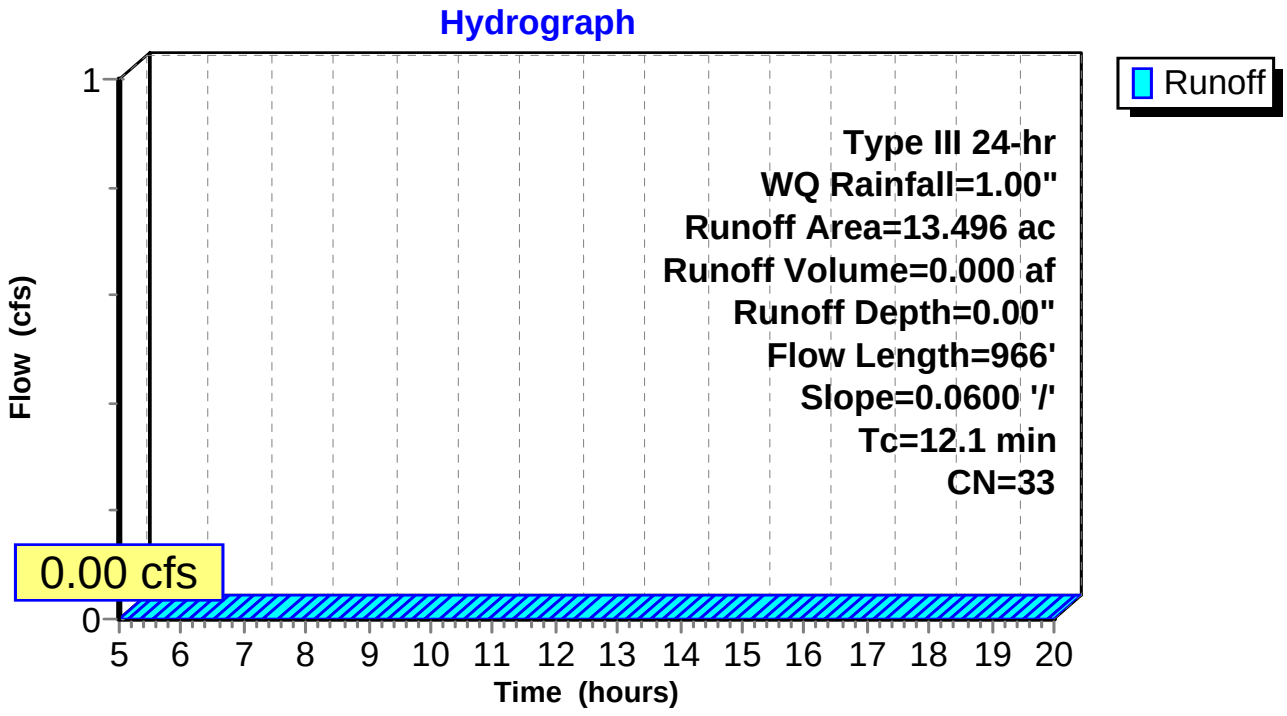
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=1.00"

Area (ac)	CN	Description
8.588	30	Woods, Good, HSG A
4.908	39	>75% Grass cover, Good, HSG A
13.496	33	Weighted Average
13.496		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
4.2	916	0.0600	3.67		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
12.1	966	Total			

Subcatchment 3S: Solar 2 Area

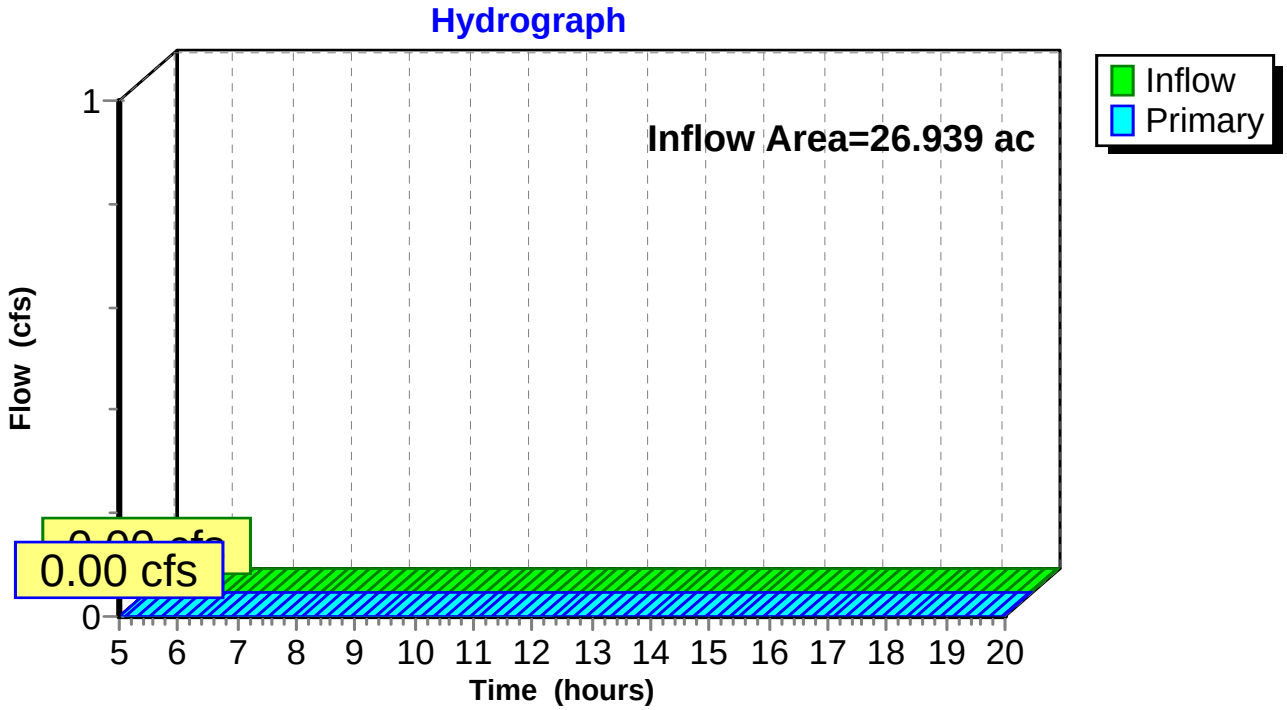


Summary for Link 1L: Easterly Wetland

Inflow Area = 26.939 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQ event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 1L: Easterly Wetland

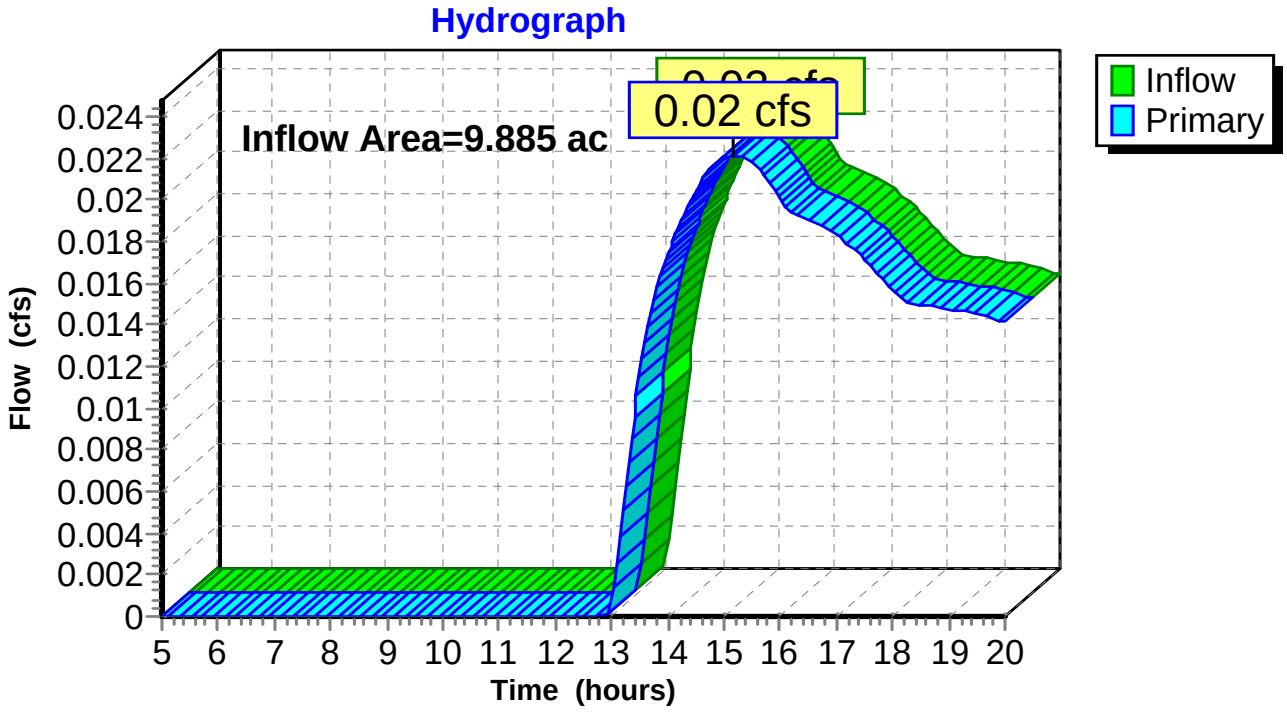


Summary for Link 2L: Westerly Wetland

Inflow Area = 9.885 ac, 0.00% Impervious, Inflow Depth > 0.01" for WQ event
Inflow = 0.02 cfs @ 15.18 hrs, Volume= 0.010 af
Primary = 0.02 cfs @ 15.18 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

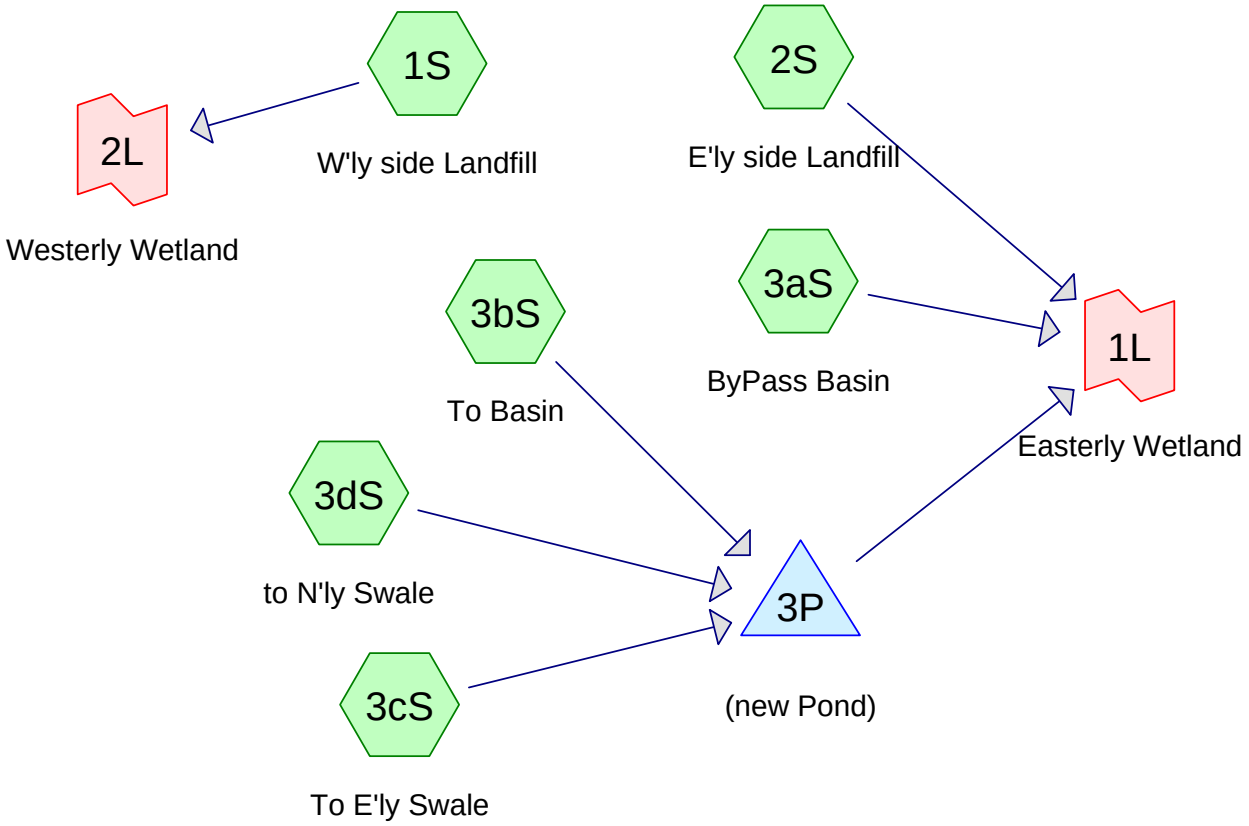
Link 2L: Westerly Wetland



Post-Development

Drainage Calculations

ALLEN & MAJOR ASSOCIATES, INC.



Subcat Reach Pond Link

Routing Diagram for Proposed Conditions
Prepared by Allen & Major Associates, Inc., Printed 4/27/2018

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
6.377	49	50-75% Grass cover, Fair, HSG A (3bS, 3cS, 3dS)
8.389	39	>75% Grass cover, Good, HSG A (1S, 2S, 3aS, 3cS, 3dS)
18.314	74	>75% Grass cover, Good, HSG C (1S, 2S)
0.226	98	Water Surface, 0% imp, HSG A (3bS)
1.831	30	Woods, Good, HSG A (2S, 3aS, 3dS)
1.687	70	Woods, Good, HSG C (1S, 2S)
36.824	**59**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
16.823	HSG A	1S, 2S, 3aS, 3bS, 3cS, 3dS
0.000	HSG B	
20.001	HSG C	1S, 2S
0.000	HSG D	
0.000	Other	
36.824		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
6.377	0.000	0.000	0.000	0.000	6.377	50-75% Grass cover, Fair	3bS, 3cS, 3dS
8.389	0.000	18.314	0.000	0.000	26.703	>75% Grass cover, Good	1S, 2S, 3aS, 3cS, 3dS
0.226	0.000	0.000	0.000	0.000	0.226	Water Surface, 0% imp	3bS
1.831	0.000	1.687	0.000	0.000	3.518	Woods, Good	1S, 2S, 3aS, 3dS
16.823	**0.000**	**20.001**	**0.000**	**0.000**	**36.824**	**TOTAL AREA**	

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

Subcatchment 1S: W'ly side Landfill Runoff Area=9.885 ac 0.00% Impervious Runoff Depth>0.89"
Flow Length=526' Tc=10.4 min CN=73 Runoff=9.09 cfs 0.735 af

Subcatchment 2S: E'ly side Landfill Runoff Area=13.443 ac 0.00% Impervious Runoff Depth>0.53"
Flow Length=592' Tc=13.3 min CN=65 Runoff=5.76 cfs 0.595 af

Subcatchment 3aS: ByPass Basin Runoff Area=5.143 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=148' Tc=7.3 min CN=36 Runoff=0.00 cfs 0.000 af

Subcatchment 3bS: To Basin Runoff Area=0.527 ac 0.00% Impervious Runoff Depth>0.75"
Tc=6.0 min CN=70 Runoff=0.45 cfs 0.033 af

Subcatchment 3cS: To E'ly Swale Runoff Area=5.521 ac 0.00% Impervious Runoff Depth>0.05"
Flow Length=859' Tc=10.2 min CN=47 Runoff=0.05 cfs 0.024 af

Subcatchment 3dS: to N'ly Swale Runoff Area=2.305 ac 0.00% Impervious Runoff Depth>0.04"
Flow Length=832' Slope=0.0600 '/' Tc=11.4 min CN=46 Runoff=0.02 cfs 0.008 af

Pond 3P: (new Pond) Peak Elev=238.76' Storage=54 cf Inflow=0.45 cfs 0.065 af
Discarded=0.42 cfs 0.065 af Primary=0.00 cfs 0.000 af Outflow=0.42 cfs 0.065 af

Link 1L: Easterly Wetland Inflow=5.76 cfs 0.595 af
Primary=5.76 cfs 0.595 af

Link 2L: Westerly Wetland Inflow=9.09 cfs 0.735 af
Primary=9.09 cfs 0.735 af

Total Runoff Area = 36.824 ac Runoff Volume = 1.395 af Average Runoff Depth = 0.45"
100.00% Pervious = 36.824 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: W'ly side Landfill

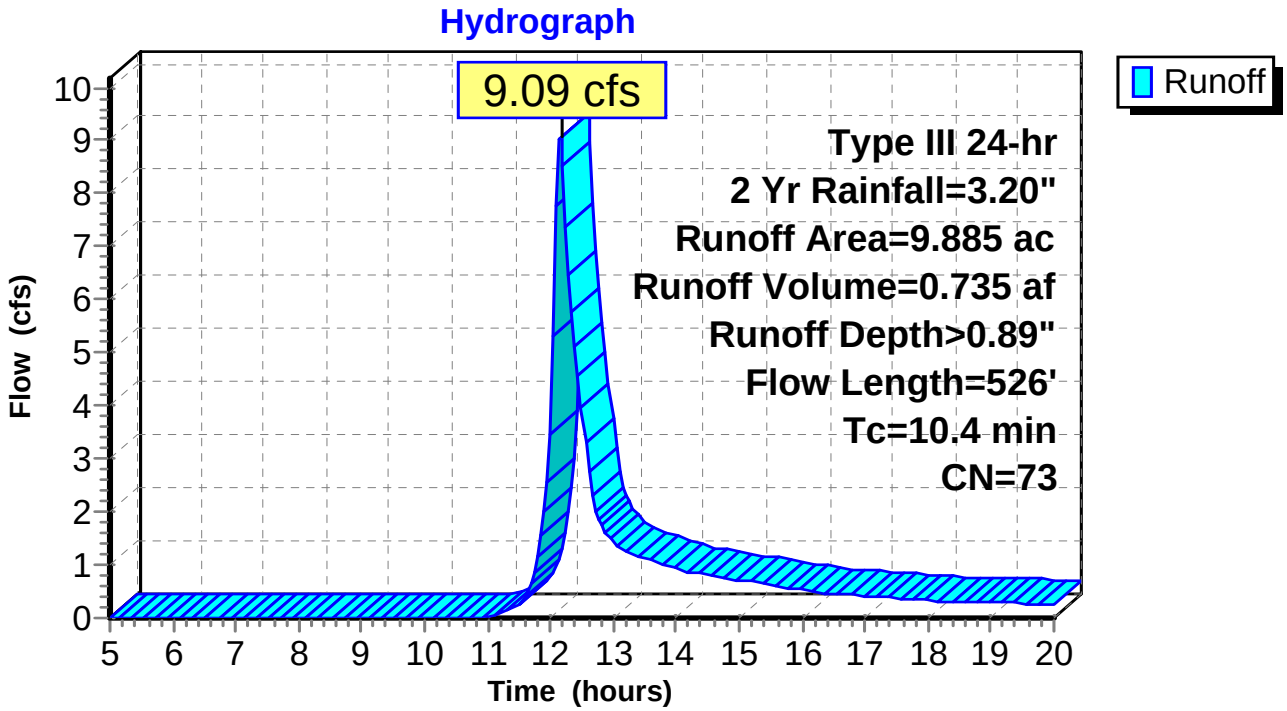
Runoff = 9.09 cfs @ 12.16 hrs, Volume= 0.735 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
0.114	39	>75% Grass cover, Good, HSG A
1.352	70	Woods, Good, HSG C
8.419	74	>75% Grass cover, Good, HSG C
9.885	73	Weighted Average
9.885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0170	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
1.2	225	0.0400	3.22		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	251	0.2270	7.67		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
10.4	526	Total			

Subcatchment 1S: W'ly side Landfill



Summary for Subcatchment 2S: E'ly side Landfill

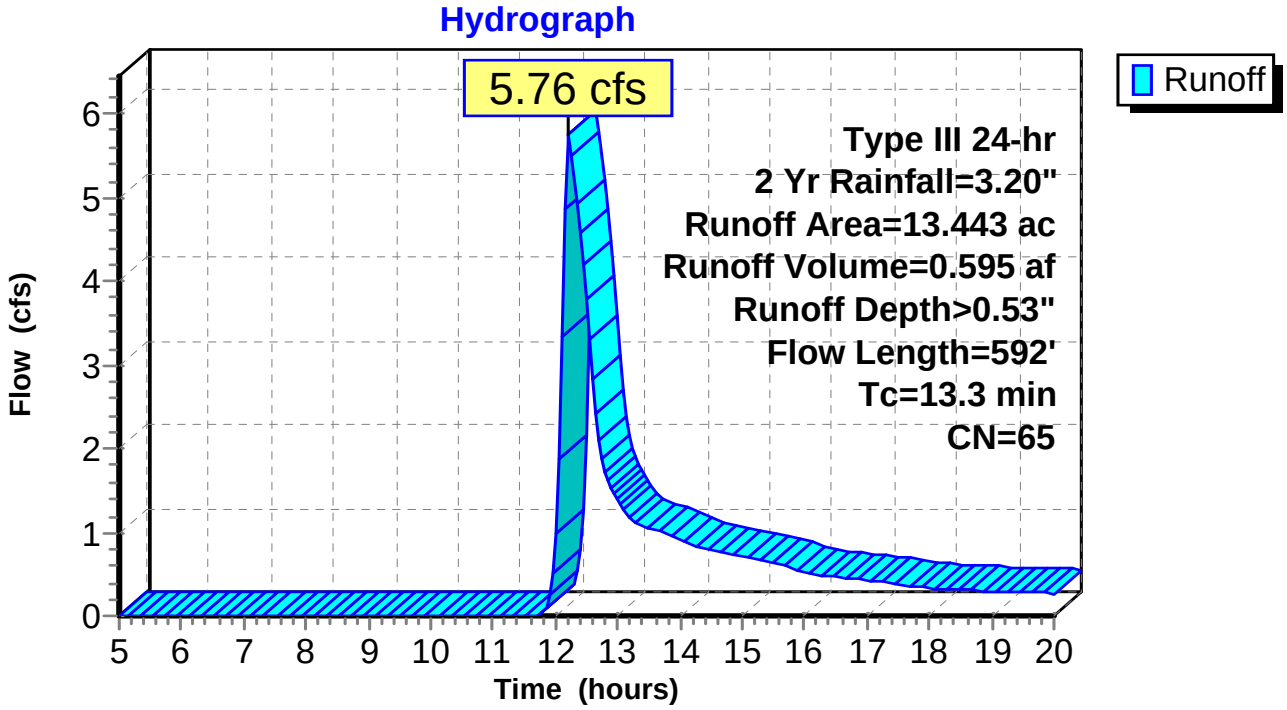
Runoff = 5.76 cfs @ 12.22 hrs, Volume= 0.595 af, Depth> 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
0.225	30	Woods, Good, HSG A
2.988	39	>75% Grass cover, Good, HSG A
0.335	70	Woods, Good, HSG C
9.895	74	>75% Grass cover, Good, HSG C
13.443	65	Weighted Average
13.443		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
2.0	356	0.0330	2.92		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	186	0.1600	6.44		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
13.3	592	Total			

Subcatchment 2S: E'ly side Landfill



Summary for Subcatchment 3aS: ByPass Basin

[45] Hint: Runoff=Zero

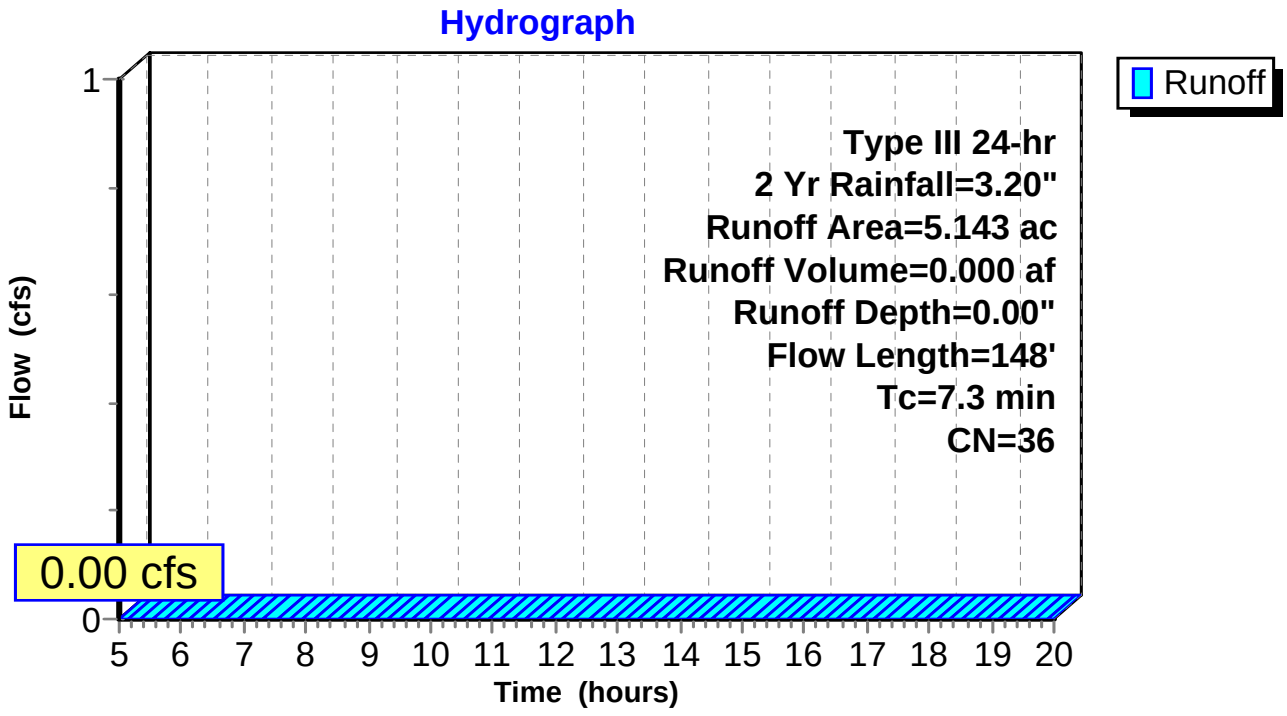
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
1.504	30	Woods, Good, HSG A
3.639	39	>75% Grass cover, Good, HSG A
5.143	36	Weighted Average
5.143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
0.2	98	0.4500	10.80		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
7.3	148	Total			

Subcatchment 3aS: ByPass Basin



Summary for Subcatchment 3bS: To Basin

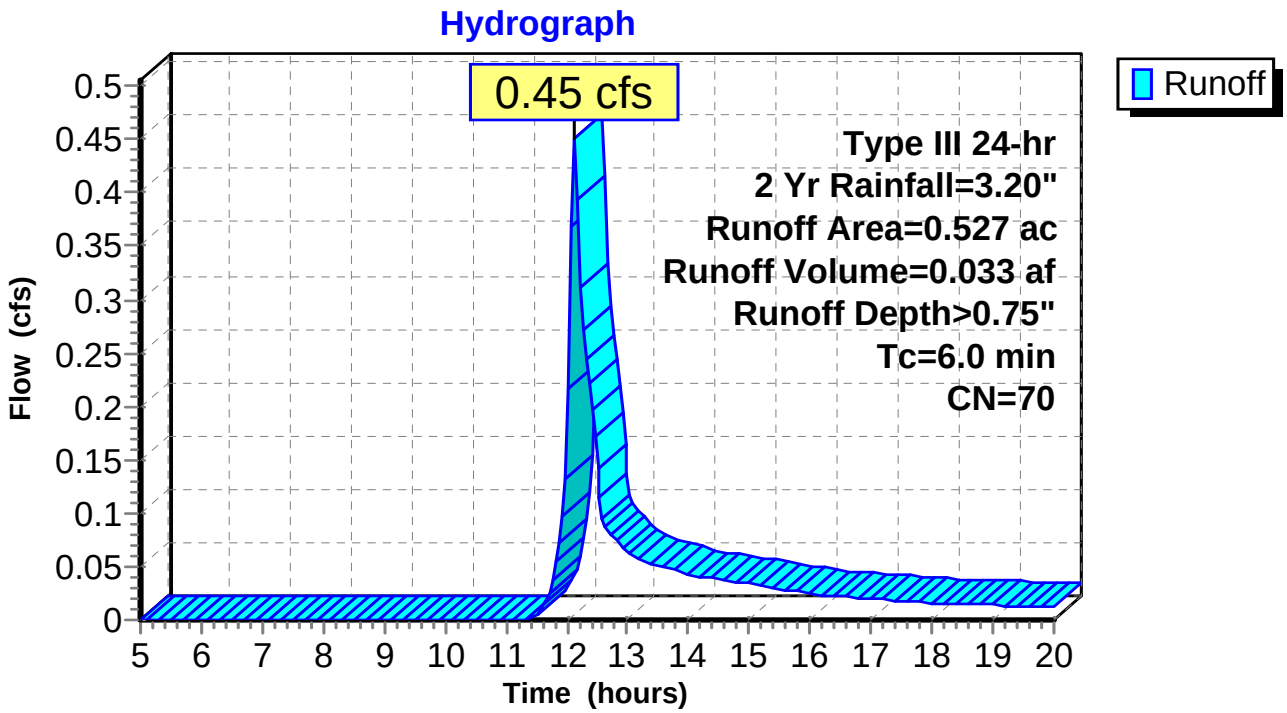
Runoff = 0.45 cfs @ 12.10 hrs, Volume= 0.033 af, Depth> 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
0.301	49	50-75% Grass cover, Fair, HSG A
0.226	98	Water Surface, 0% imp, HSG A
0.527	70	Weighted Average
0.527		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 3bS: To Basin



Summary for Subcatchment 3cS: To E'ly Swale

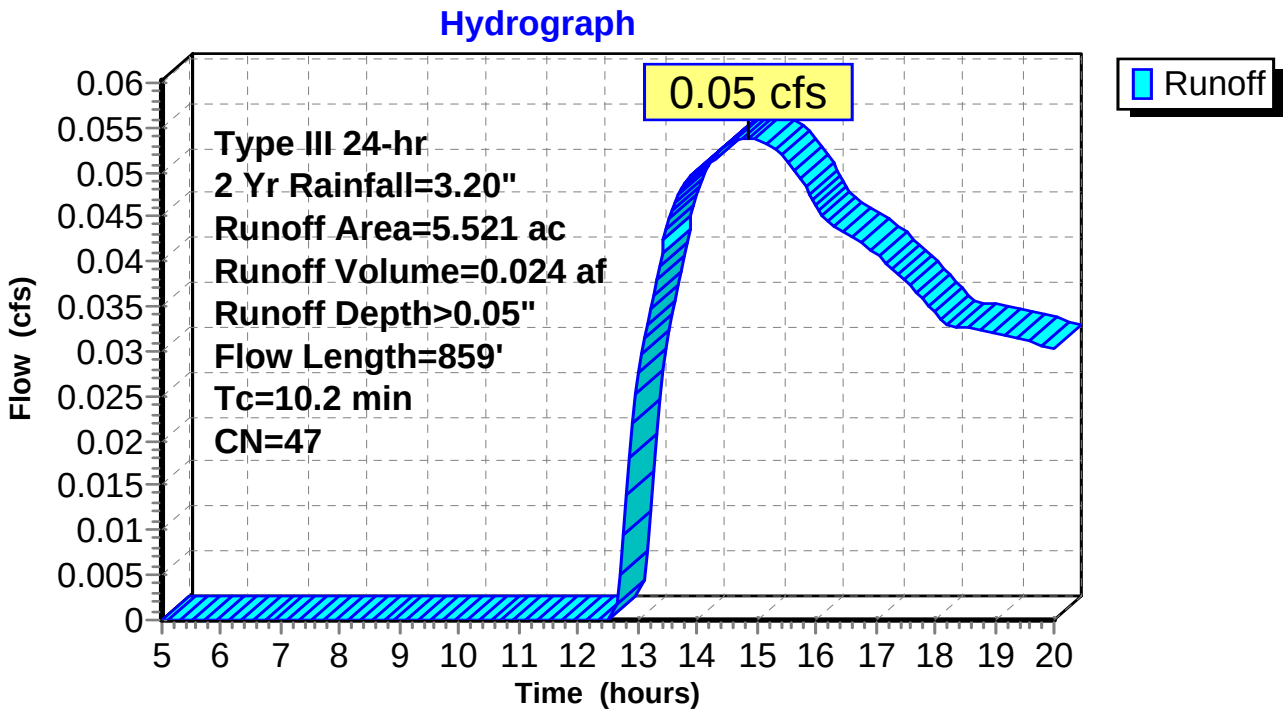
Runoff = 0.05 cfs @ 14.86 hrs, Volume= 0.024 af, Depth> 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
1.220	39	>75% Grass cover, Good, HSG A
4.301	49	50-75% Grass cover, Fair, HSG A
5.521	47	Weighted Average
5.521		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	606	0.0700	4.26		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
1.3	203	0.0100	2.70	6.22	**Channel Flow, C-D** Area= 2.3 sf Perim= 5.7' r= 0.40' n= 0.030 Earth, grassed & winding
10.2	859	Total			

Subcatchment 3cS: To E'ly Swale



Summary for Subcatchment 3dS: to N'ly Swale

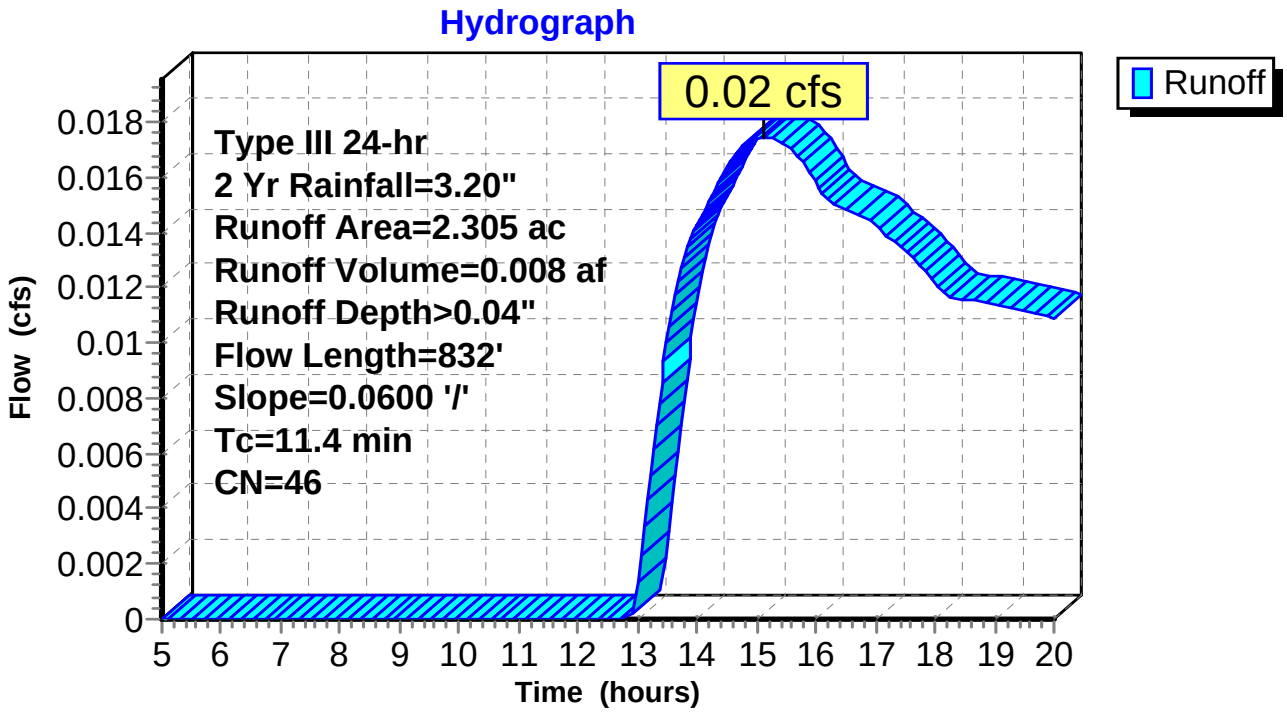
Runoff = 0.02 cfs @ 15.14 hrs, Volume= 0.008 af, Depth> 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Yr Rainfall=3.20"

Area (ac)	CN	Description
0.102	30	Woods, Good, HSG A
0.428	39	>75% Grass cover, Good, HSG A
1.775	49	50-75% Grass cover, Fair, HSG A
2.305	46	Weighted Average
2.305		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.5	782	0.0600	3.67		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
11.4	832	Total			

Subcatchment 3dS: to N'ly Swale



Summary for Pond 3P: (new Pond)

Inflow Area = 8.353 ac, 0.00% Impervious, Inflow Depth > 0.09" for 2 Yr event
Inflow = 0.45 cfs @ 12.10 hrs, Volume= 0.065 af
Outflow = 0.42 cfs @ 12.14 hrs, Volume= 0.065 af, Atten= 8%, Lag= 2.4 min
Discarded = 0.42 cfs @ 12.14 hrs, Volume= 0.065 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 238.76' @ 12.14 hrs Surf.Area= 7,014 sf Storage= 54 cf

Plug-Flow detention time= 2.2 min calculated for 0.065 af (99% of inflow)
Center-of-Mass det. time= 1.4 min (901.7 - 900.2)

Volume	Invert	Avail.Storage	Storage Description
#1	238.75'	24,746 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

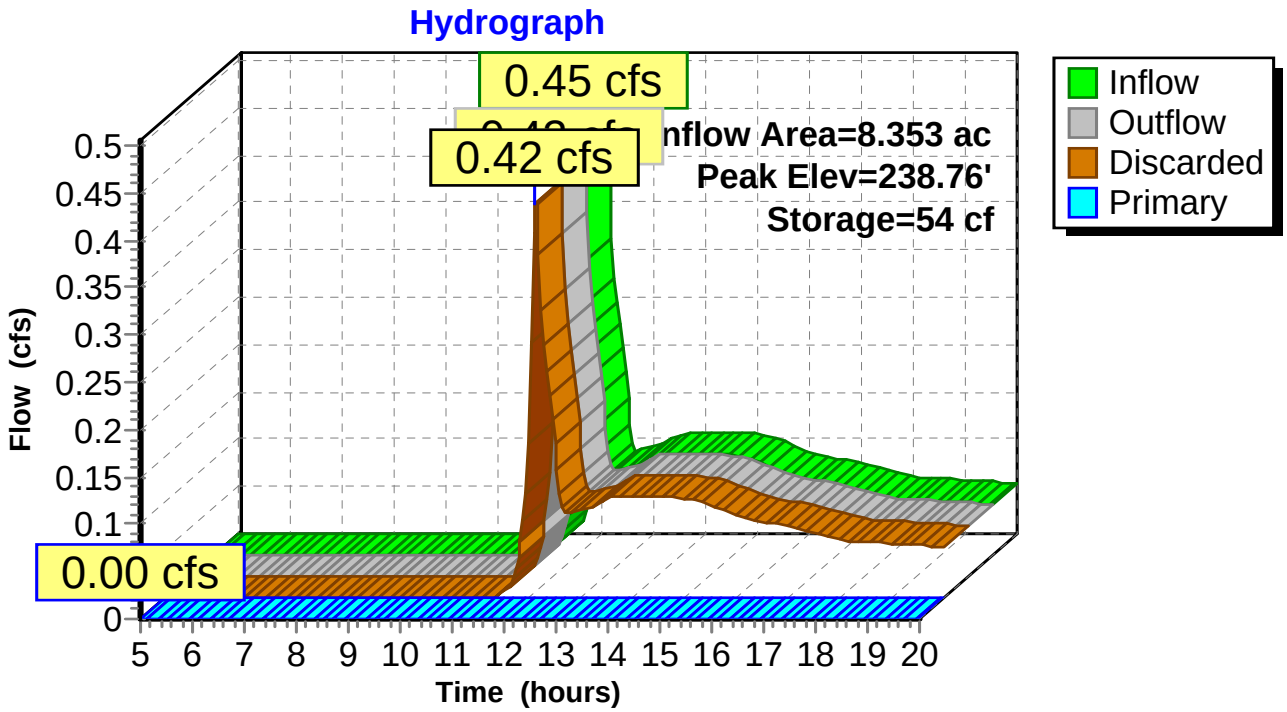
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
238.75	7,000	0	0
239.00	7,460	1,808	1,808
240.00	9,848	8,654	10,462
241.00	12,393	11,121	21,582
241.25	12,921	3,164	24,746

Device	Routing	Invert	Outlet Devices
#1	Discarded	238.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	240.05'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.34 cfs @ 12.14 hrs HW=238.76' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 1.34 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=238.75' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

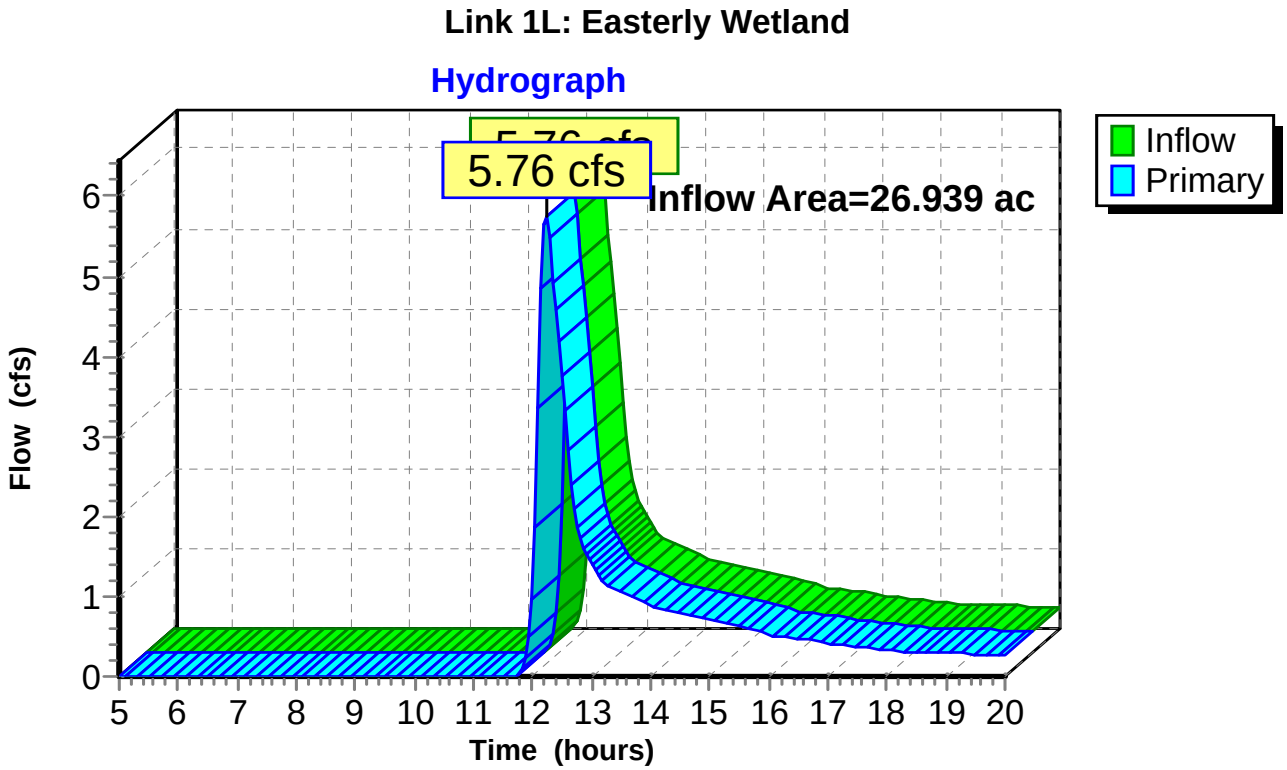
Pond 3P: (new Pond)



Summary for Link 1L: Easterly Wetland

Inflow Area = 26.939 ac, 0.00% Impervious, Inflow Depth > 0.27" for 2 Yr event
Inflow = 5.76 cfs @ 12.22 hrs, Volume= 0.595 af
Primary = 5.76 cfs @ 12.22 hrs, Volume= 0.595 af, Atten= 0%, Lag= 0.0 min

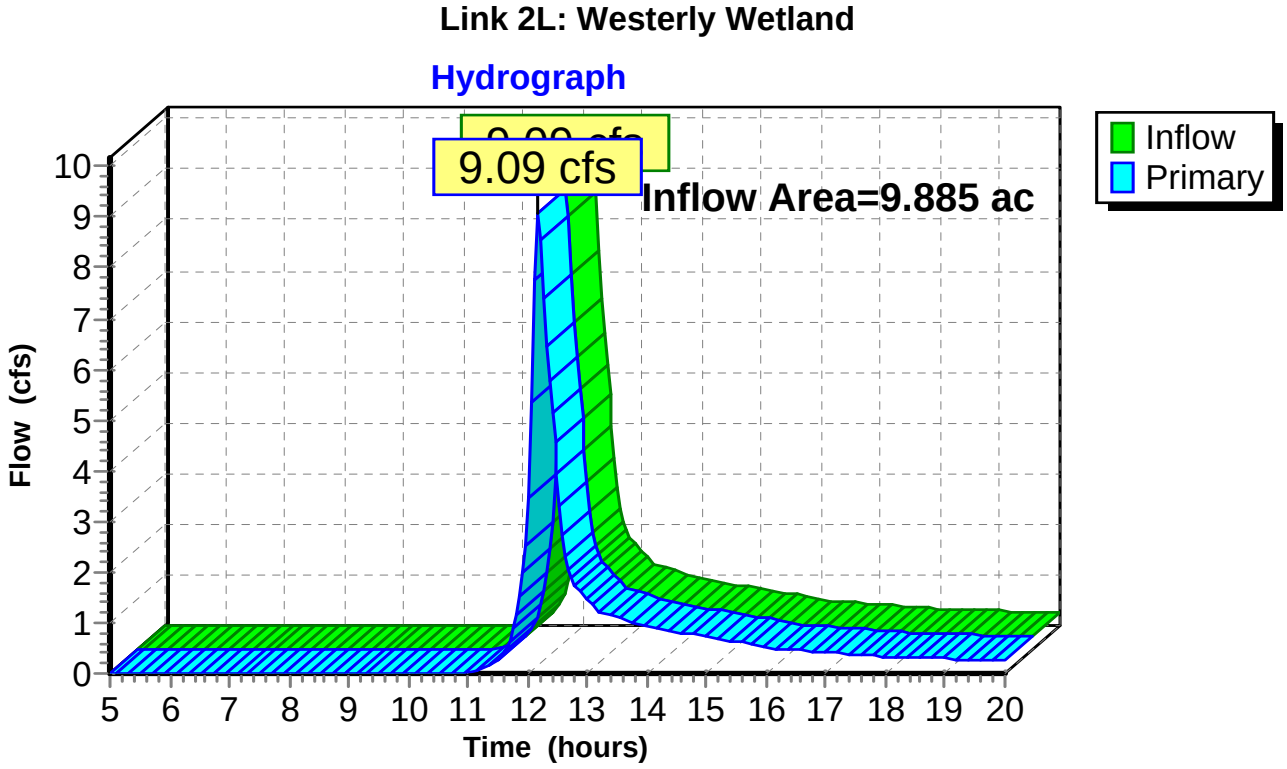
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Summary for Link 2L: Westerly Wetland

Inflow Area = 9.885 ac, 0.00% Impervious, Inflow Depth > 0.89" for 2 Yr event
Inflow = 9.09 cfs @ 12.16 hrs, Volume= 0.735 af
Primary = 9.09 cfs @ 12.16 hrs, Volume= 0.735 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



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

Subcatchment 1S: W'ly side Landfill Runoff Area=9.885 ac 0.00% Impervious Runoff Depth>1.78"
Flow Length=526' Tc=10.4 min CN=73 Runoff=18.87 cfs 1.467 af

Subcatchment 2S: E'ly side Landfill Runoff Area=13.443 ac 0.00% Impervious Runoff Depth>1.23"
Flow Length=592' Tc=13.3 min CN=65 Runoff=15.60 cfs 1.382 af

Subcatchment 3aS: ByPass Basin Runoff Area=5.143 ac 0.00% Impervious Runoff Depth>0.03"
Flow Length=148' Tc=7.3 min CN=36 Runoff=0.03 cfs 0.015 af

Subcatchment 3bS: To Basin Runoff Area=0.527 ac 0.00% Impervious Runoff Depth>1.57"
Tc=6.0 min CN=70 Runoff=1.01 cfs 0.069 af

Subcatchment 3cS: To E'ly Swale Runoff Area=5.521 ac 0.00% Impervious Runoff Depth>0.33"
Flow Length=859' Tc=10.2 min CN=47 Runoff=0.90 cfs 0.150 af

Subcatchment 3dS: to N'ly Swale Runoff Area=2.305 ac 0.00% Impervious Runoff Depth>0.29"
Flow Length=832' Slope=0.0600 '/' Tc=11.4 min CN=46 Runoff=0.31 cfs 0.056 af

Pond 3P: (new Pond) Peak Elev=238.80' Storage=382 cf Inflow=1.63 cfs 0.275 af
Discarded=1.36 cfs 0.275 af Primary=0.00 cfs 0.000 af Outflow=1.36 cfs 0.275 af

Link 1L: Easterly Wetland Inflow=15.60 cfs 1.396 af
Primary=15.60 cfs 1.396 af

Link 2L: Westerly Wetland Inflow=18.87 cfs 1.467 af
Primary=18.87 cfs 1.467 af

Total Runoff Area = 36.824 ac Runoff Volume = 3.138 af Average Runoff Depth = 1.02"
100.00% Pervious = 36.824 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: W'ly side Landfill

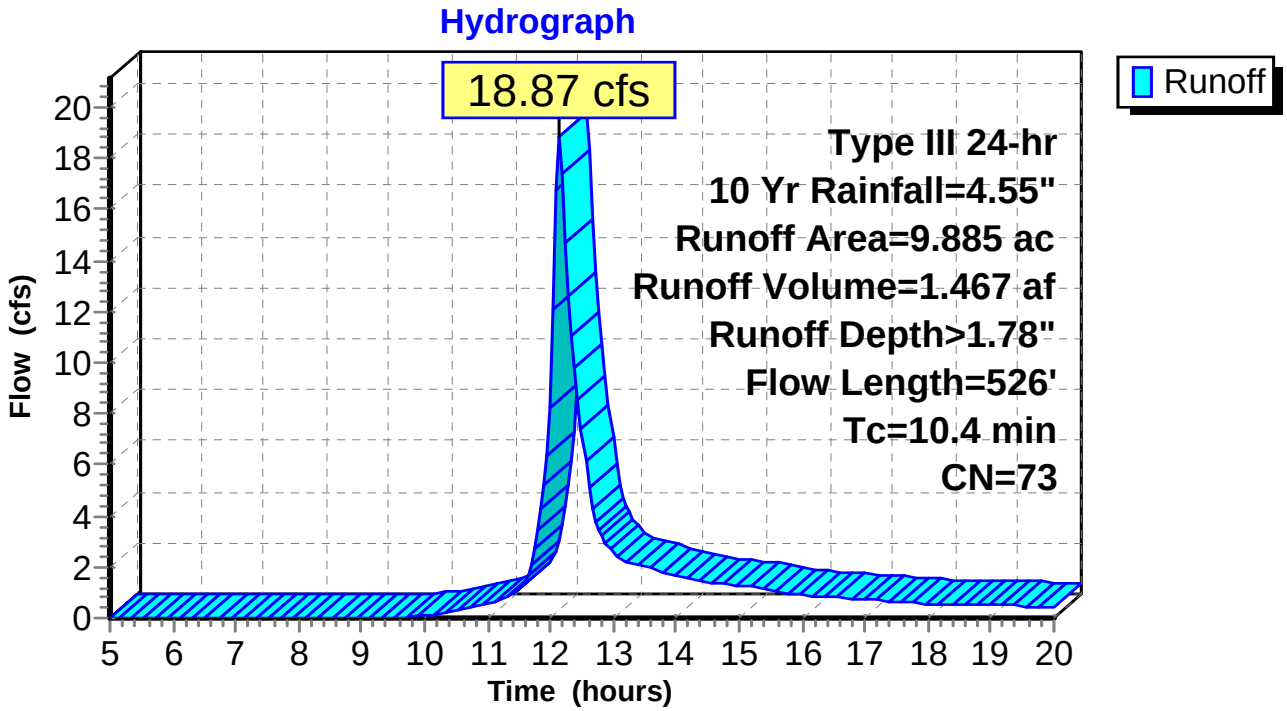
Runoff = 18.87 cfs @ 12.15 hrs, Volume= 1.467 af, Depth> 1.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Yr Rainfall=4.55"

Area (ac)	CN	Description
0.114	39	>75% Grass cover, Good, HSG A
1.352	70	Woods, Good, HSG C
8.419	74	>75% Grass cover, Good, HSG C
9.885	73	Weighted Average
9.885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0170	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
1.2	225	0.0400	3.22		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	251	0.2270	7.67		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
10.4	526	Total			

Subcatchment 1S: W'ly side Landfill



Summary for Subcatchment 2S: E'ly side Landfill

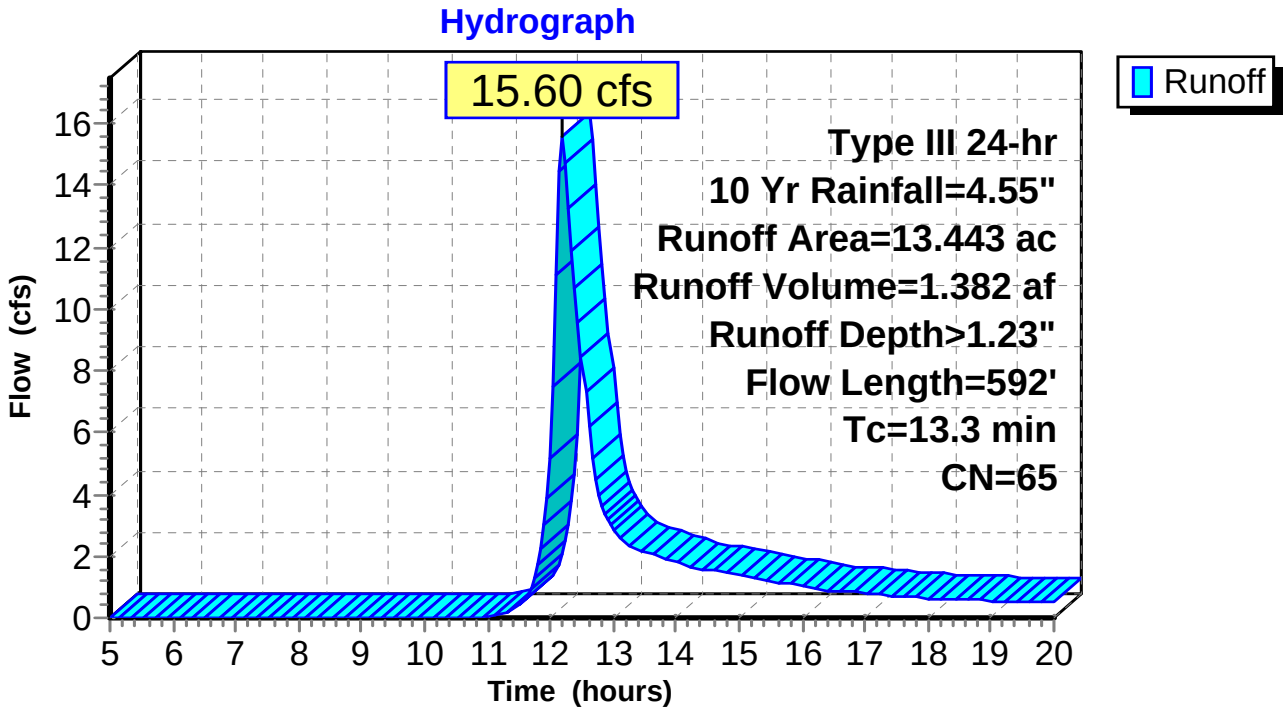
Runoff = 15.60 cfs @ 12.20 hrs, Volume= 1.382 af, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Yr Rainfall=4.55"

Area (ac)	CN	Description
0.225	30	Woods, Good, HSG A
2.988	39	>75% Grass cover, Good, HSG A
0.335	70	Woods, Good, HSG C
9.895	74	>75% Grass cover, Good, HSG C
13.443	65	Weighted Average
13.443		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
2.0	356	0.0330	2.92		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	186	0.1600	6.44		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
13.3	592	Total			

Subcatchment 2S: E'ly side Landfill



Summary for Subcatchment 3aS: ByPass Basin

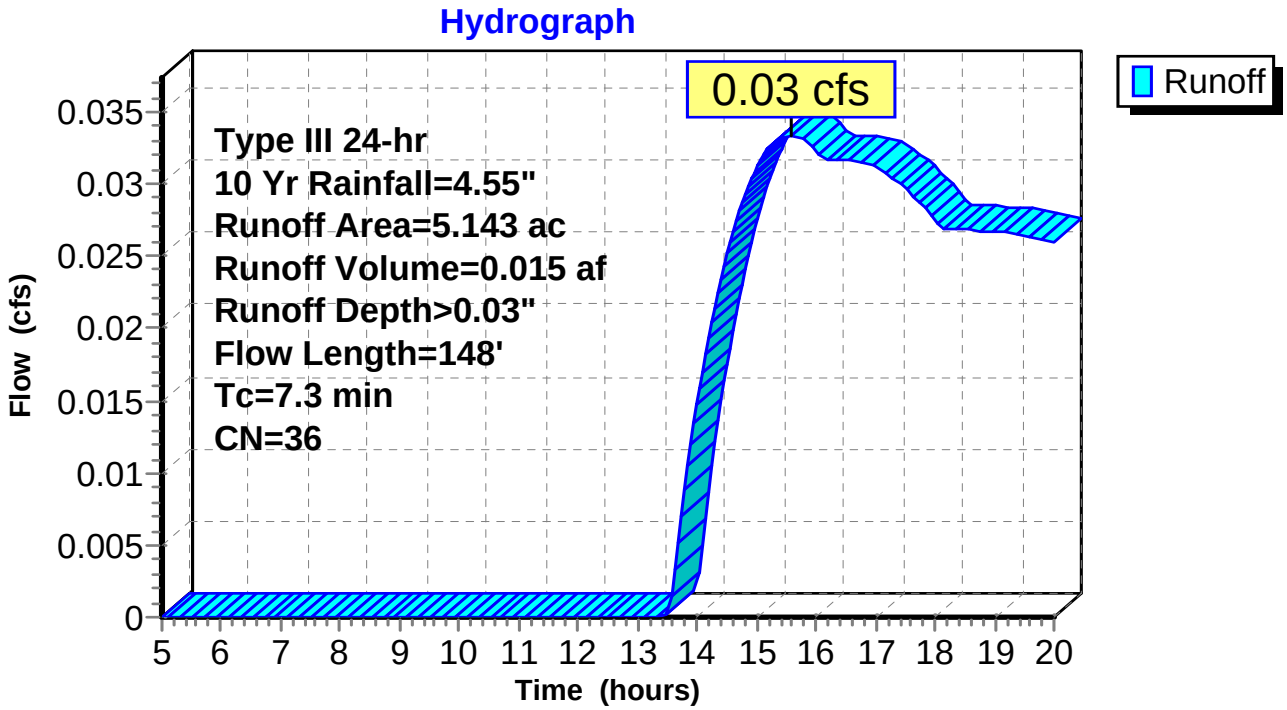
Runoff = 0.03 cfs @ 15.56 hrs, Volume= 0.015 af, Depth> 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Yr Rainfall=4.55"

Area (ac)	CN	Description
1.504	30	Woods, Good, HSG A
3.639	39	>75% Grass cover, Good, HSG A
5.143	36	Weighted Average
5.143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
0.2	98	0.4500	10.80		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
7.3	148	Total			

Subcatchment 3aS: ByPass Basin



Summary for Subcatchment 3bS: To Basin

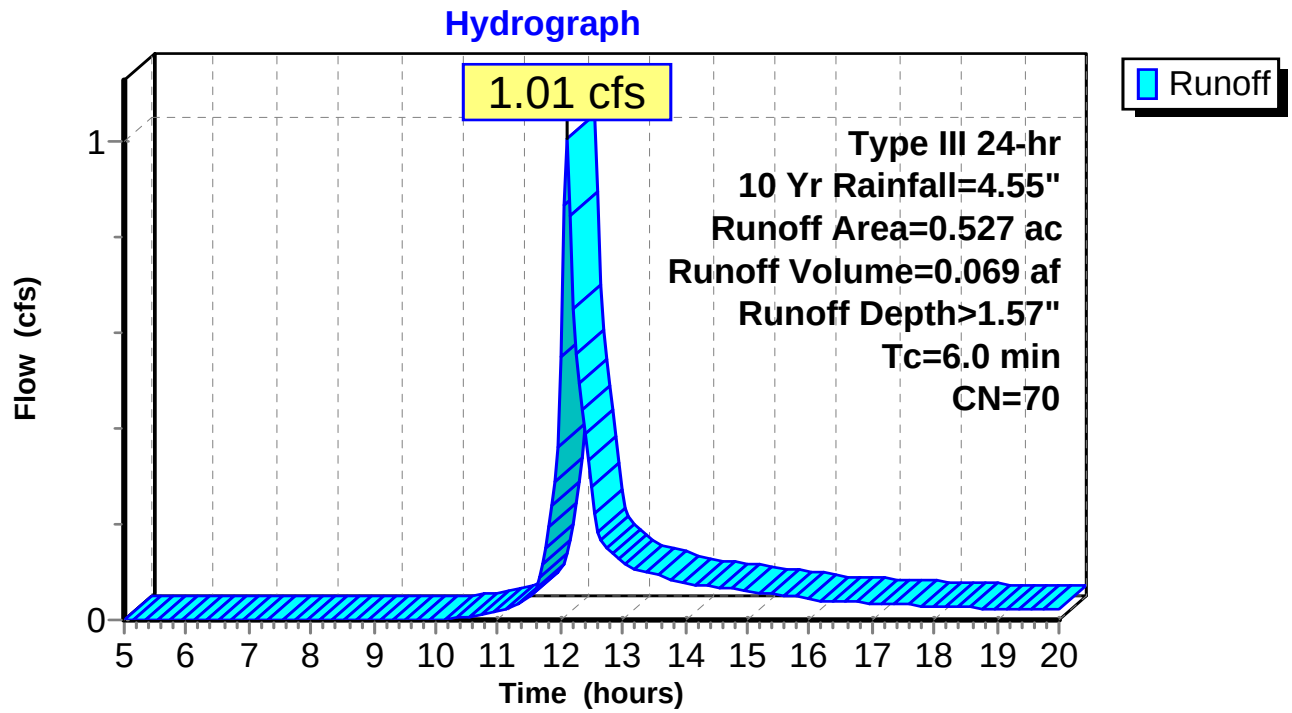
Runoff = 1.01 cfs @ 12.10 hrs, Volume= 0.069 af, Depth> 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Yr Rainfall=4.55"

Area (ac)	CN	Description
0.301	49	50-75% Grass cover, Fair, HSG A
0.226	98	Water Surface, 0% imp, HSG A
0.527	70	Weighted Average
0.527		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 3bS: To Basin



Summary for Subcatchment 3cS: To E'ly Swale

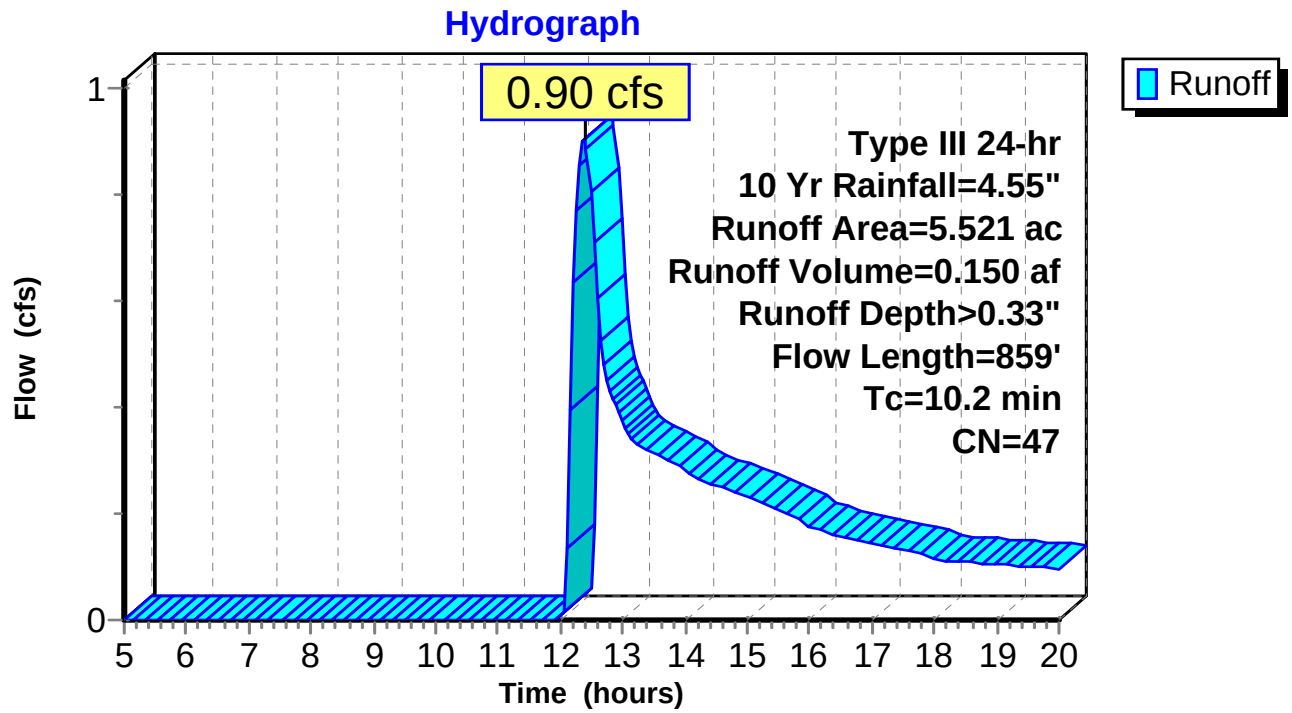
Runoff = 0.90 cfs @ 12.38 hrs, Volume= 0.150 af, Depth> 0.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Yr Rainfall=4.55"

Area (ac)	CN	Description
1.220	39	>75% Grass cover, Good, HSG A
4.301	49	50-75% Grass cover, Fair, HSG A
5.521	47	Weighted Average
5.521		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	606	0.0700	4.26		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
1.3	203	0.0100	2.70	6.22	**Channel Flow, C-D** Area= 2.3 sf Perim= 5.7' r= 0.40' n= 0.030 Earth, grassed & winding
10.2	859	Total			

Subcatchment 3cS: To E'ly Swale



Summary for Subcatchment 3dS: to N'ly Swale

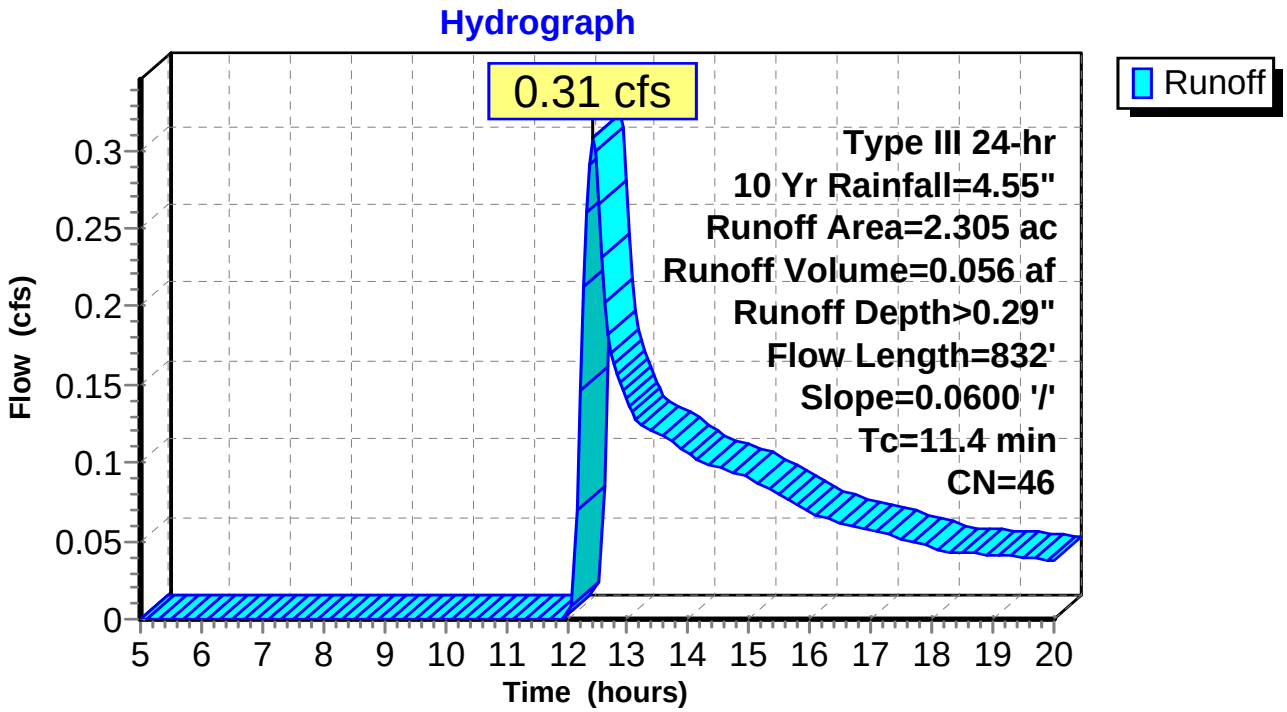
Runoff = 0.31 cfs @ 12.42 hrs, Volume= 0.056 af, Depth> 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Yr Rainfall=4.55"

Area (ac)	CN	Description
0.102	30	Woods, Good, HSG A
0.428	39	>75% Grass cover, Good, HSG A
1.775	49	50-75% Grass cover, Fair, HSG A
2.305	46	Weighted Average
2.305		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.5	782	0.0600	3.67		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
11.4	832	Total			

Subcatchment 3dS: to N'ly Swale



Summary for Pond 3P: (new Pond)

Inflow Area = 8.353 ac, 0.00% Impervious, Inflow Depth > 0.40" for 10 Yr event
Inflow = 1.63 cfs @ 12.35 hrs, Volume= 0.275 af
Outflow = 1.36 cfs @ 12.50 hrs, Volume= 0.275 af, Atten= 17%, Lag= 9.3 min
Discarded = 1.36 cfs @ 12.50 hrs, Volume= 0.275 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 238.80' @ 12.50 hrs Surf.Area= 7,100 sf Storage= 382 cf

Plug-Flow detention time= 2.5 min calculated for 0.275 af (100% of inflow)
Center-of-Mass det. time= 1.9 min (869.9 - 868.0)

Volume	Invert	Avail.Storage	Storage Description
#1	238.75'	24,746 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

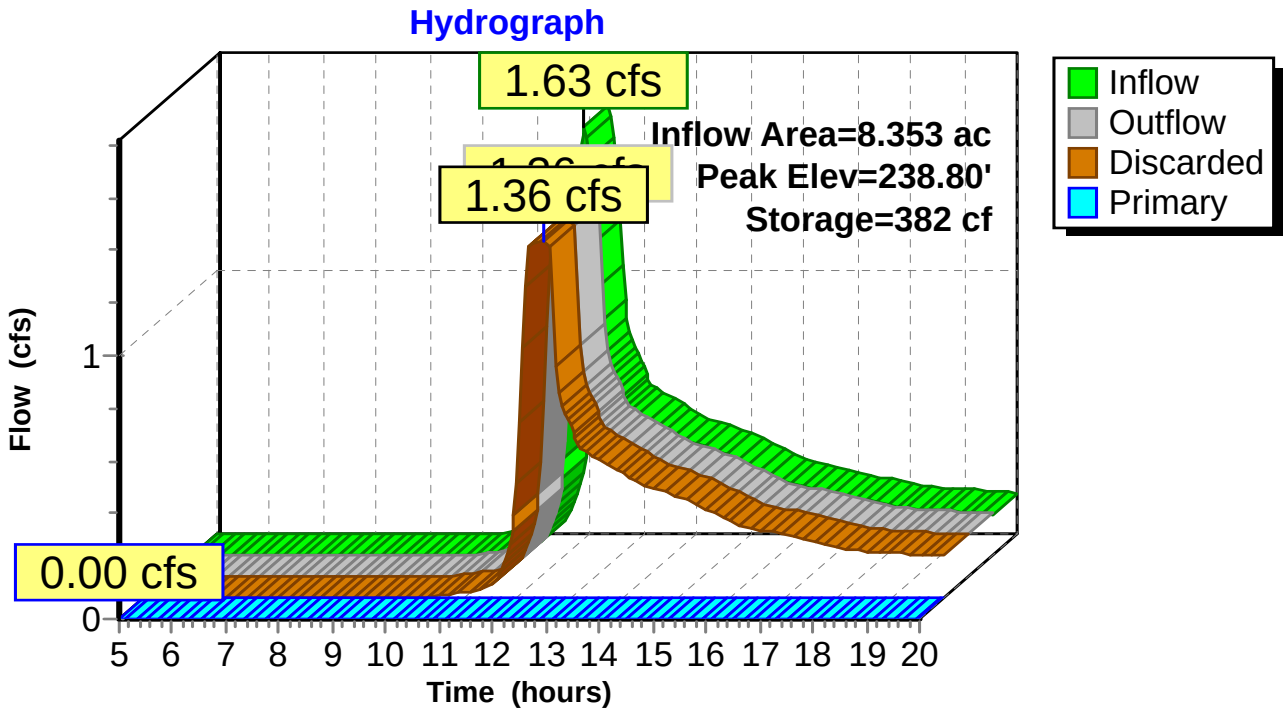
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
238.75	7,000	0	0
239.00	7,460	1,808	1,808
240.00	9,848	8,654	10,462
241.00	12,393	11,121	21,582
241.25	12,921	3,164	24,746

Device	Routing	Invert	Outlet Devices
#1	Discarded	238.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	240.05'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.36 cfs @ 12.50 hrs HW=238.80' (Free Discharge)
1=Exfiltration (Exfiltration Controls 1.36 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=238.75' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: (new Pond)

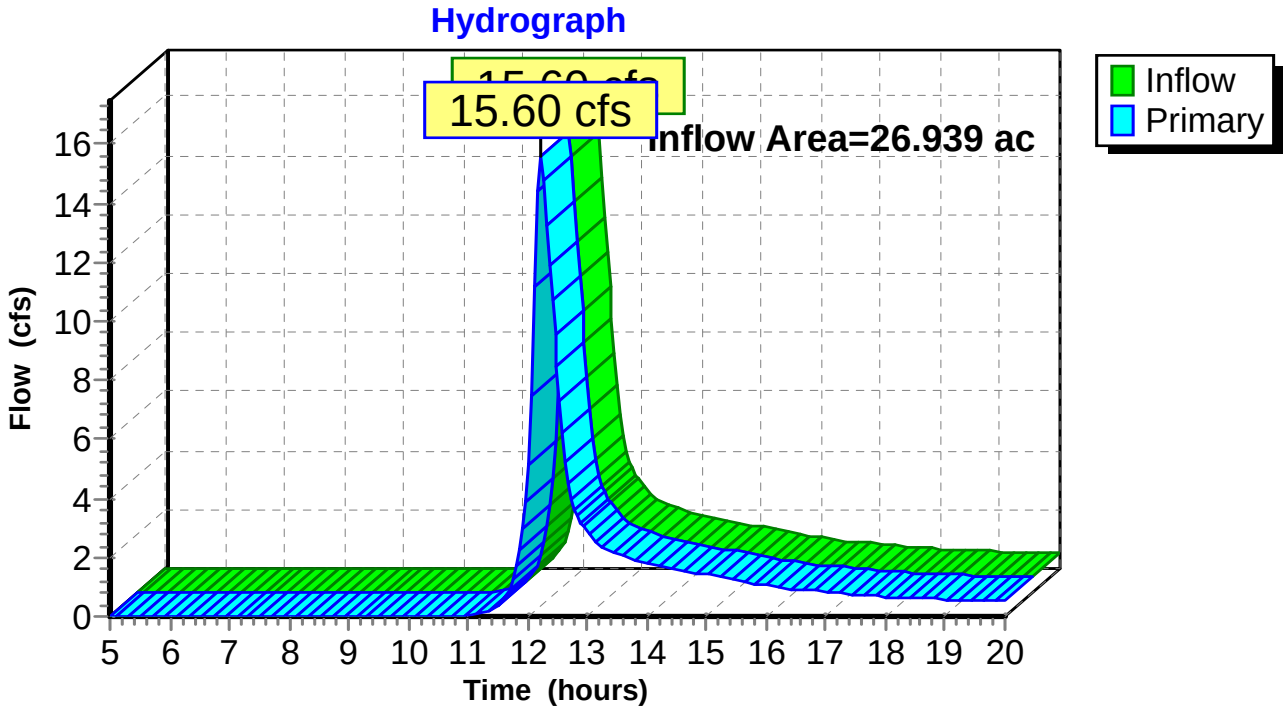


Summary for Link 1L: Easterly Wetland

Inflow Area = 26.939 ac, 0.00% Impervious, Inflow Depth > 0.62" for 10 Yr event
Inflow = 15.60 cfs @ 12.20 hrs, Volume= 1.396 af
Primary = 15.60 cfs @ 12.20 hrs, Volume= 1.396 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

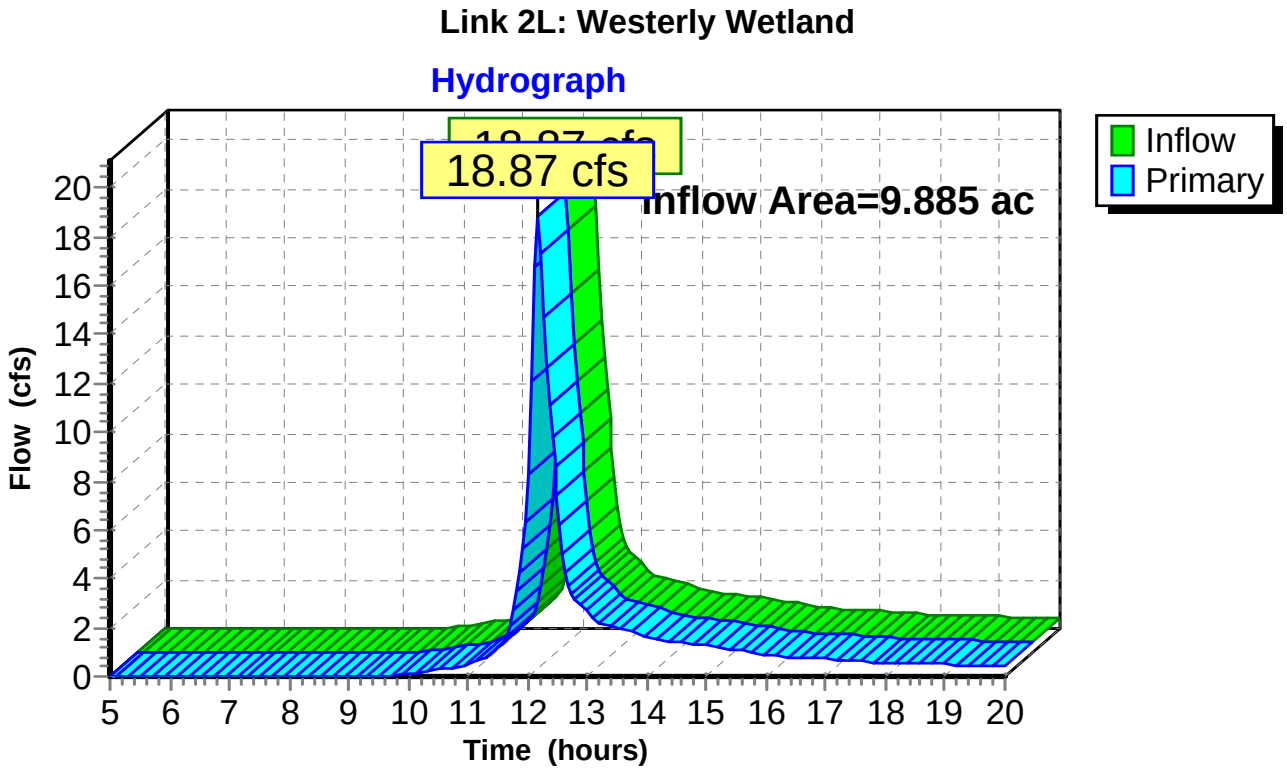
Link 1L: Easterly Wetland



Summary for Link 2L: Westerly Wetland

Inflow Area = 9.885 ac, 0.00% Impervious, Inflow Depth > 1.78" for 10 Yr event
Inflow = 18.87 cfs @ 12.15 hrs, Volume= 1.467 af
Primary = 18.87 cfs @ 12.15 hrs, Volume= 1.467 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



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

Subcatchment 1S: W'ly side Landfill Runoff Area=9.885 ac 0.00% Impervious Runoff Depth>2.48"
Flow Length=526' Tc=10.4 min CN=73 Runoff=26.43 cfs 2.044 af

Subcatchment 2S: E'ly side Landfill Runoff Area=13.443 ac 0.00% Impervious Runoff Depth>1.82"
Flow Length=592' Tc=13.3 min CN=65 Runoff=23.76 cfs 2.041 af

Subcatchment 3aS: ByPass Basin Runoff Area=5.143 ac 0.00% Impervious Runoff Depth>0.15"
Flow Length=148' Tc=7.3 min CN=36 Runoff=0.14 cfs 0.064 af

Subcatchment 3bS: To Basin Runoff Area=0.527 ac 0.00% Impervious Runoff Depth>2.23"
Tc=6.0 min CN=70 Runoff=1.45 cfs 0.098 af

Subcatchment 3cS: To E'ly Swale Runoff Area=5.521 ac 0.00% Impervious Runoff Depth>0.63"
Flow Length=859' Tc=10.2 min CN=47 Runoff=2.39 cfs 0.290 af

Subcatchment 3dS: to N'ly Swale Runoff Area=2.305 ac 0.00% Impervious Runoff Depth>0.58"
Flow Length=832' Slope=0.0600 '/' Tc=11.4 min CN=46 Runoff=0.83 cfs 0.111 af

Pond 3P: (new Pond) Peak Elev=239.25' Storage=3,762 cf Inflow=4.09 cfs 0.498 af
Discarded=1.54 cfs 0.498 af Primary=0.00 cfs 0.000 af Outflow=1.54 cfs 0.498 af

Link 1L: Easterly Wetland Inflow=23.76 cfs 2.105 af
Primary=23.76 cfs 2.105 af

Link 2L: Westerly Wetland Inflow=26.43 cfs 2.044 af
Primary=26.43 cfs 2.044 af

Total Runoff Area = 36.824 ac Runoff Volume = 4.647 af Average Runoff Depth = 1.51"
100.00% Pervious = 36.824 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: W'ly side Landfill

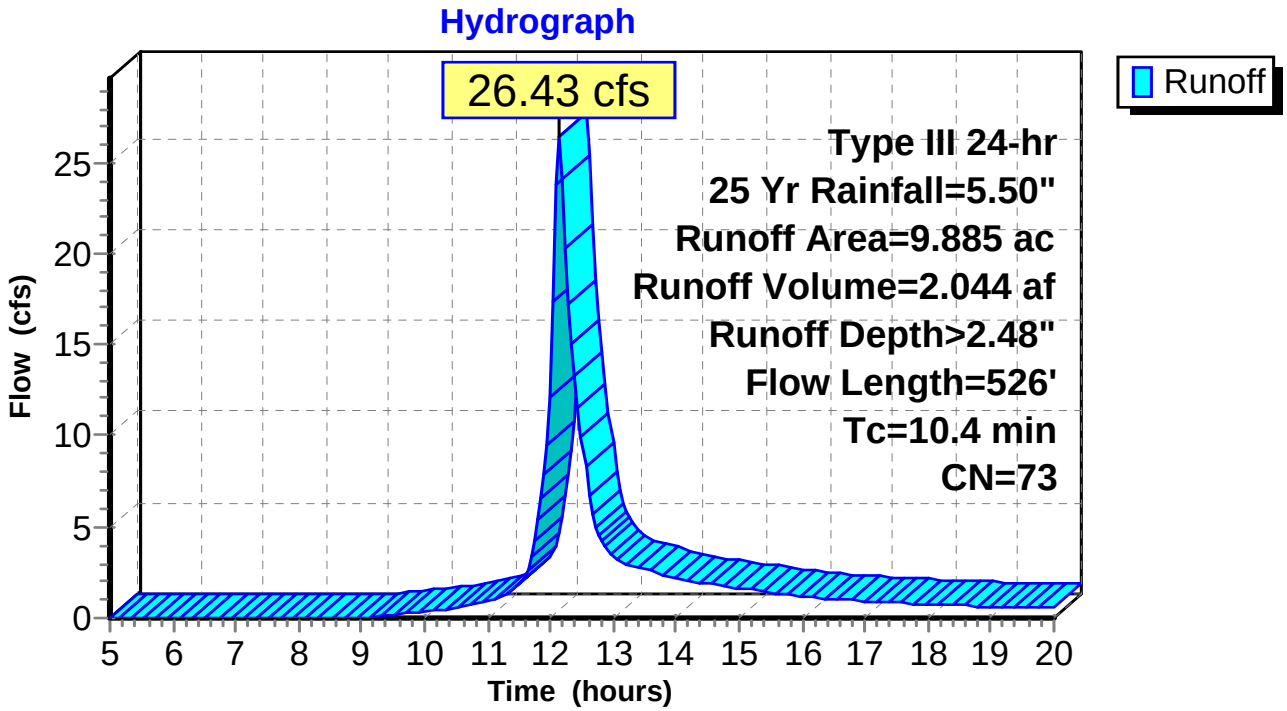
Runoff = 26.43 cfs @ 12.15 hrs, Volume= 2.044 af, Depth> 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Yr Rainfall=5.50"

Area (ac)	CN	Description
0.114	39	>75% Grass cover, Good, HSG A
1.352	70	Woods, Good, HSG C
8.419	74	>75% Grass cover, Good, HSG C
9.885	73	Weighted Average
9.885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0170	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
1.2	225	0.0400	3.22		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	251	0.2270	7.67		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
10.4	526	Total			

Subcatchment 1S: W'ly side Landfill



Summary for Subcatchment 2S: E'ly side Landfill

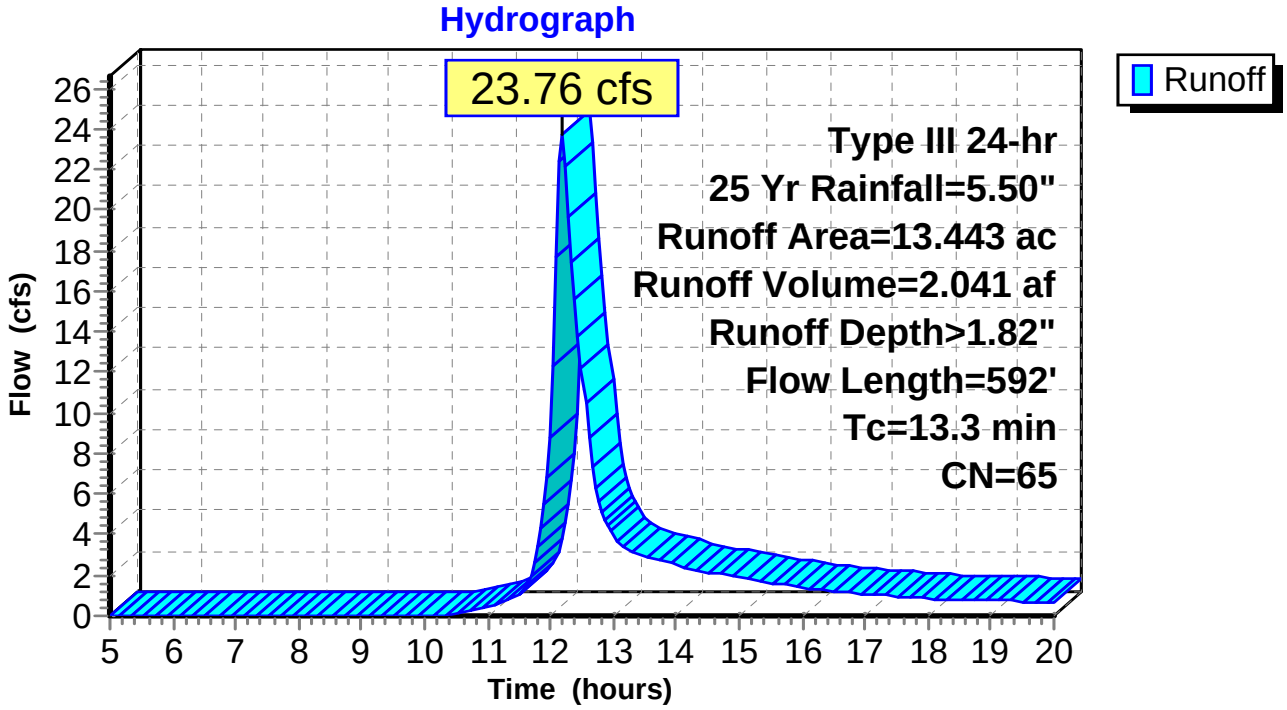
Runoff = 23.76 cfs @ 12.20 hrs, Volume= 2.041 af, Depth> 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Yr Rainfall=5.50"

Area (ac)	CN	Description
0.225	30	Woods, Good, HSG A
2.988	39	>75% Grass cover, Good, HSG A
0.335	70	Woods, Good, HSG C
9.895	74	>75% Grass cover, Good, HSG C
13.443	65	Weighted Average
13.443		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
2.0	356	0.0330	2.92		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	186	0.1600	6.44		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
13.3	592	Total			

Subcatchment 2S: E'ly side Landfill



Summary for Subcatchment 3aS: ByPass Basin

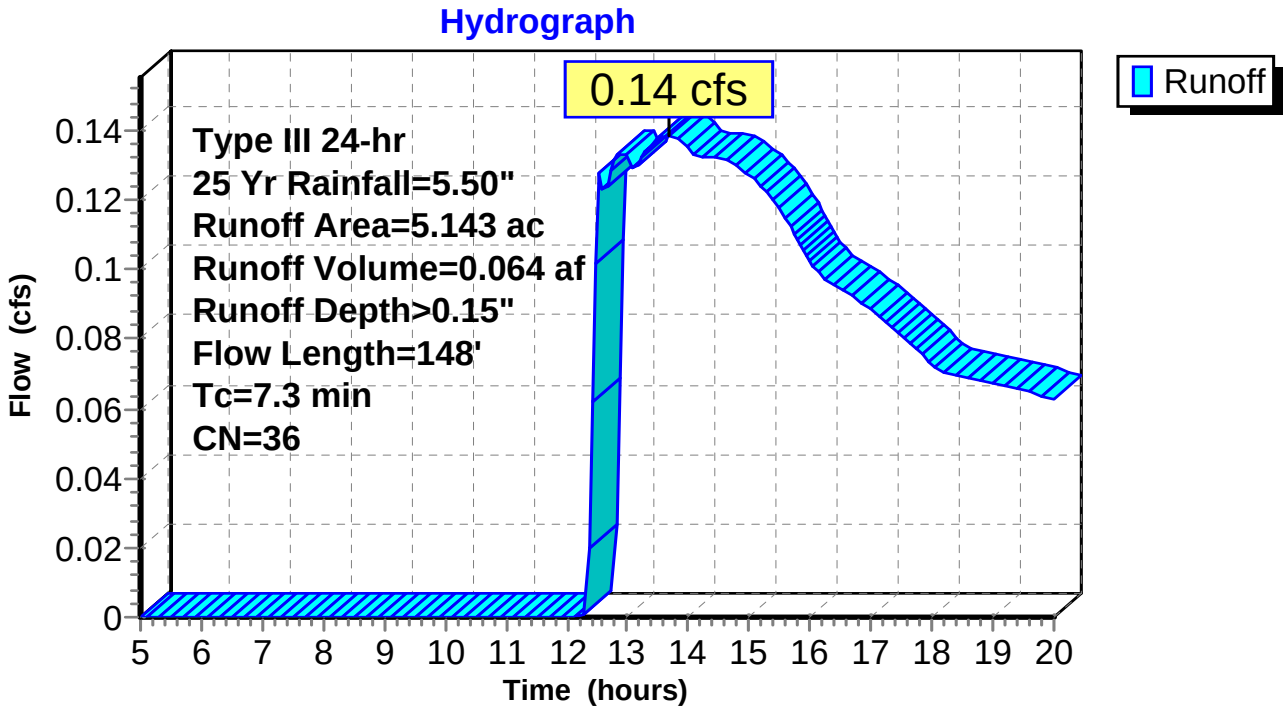
Runoff = 0.14 cfs @ 13.66 hrs, Volume= 0.064 af, Depth> 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Yr Rainfall=5.50"

Area (ac)	CN	Description
1.504	30	Woods, Good, HSG A
3.639	39	>75% Grass cover, Good, HSG A
5.143	36	Weighted Average
5.143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
0.2	98	0.4500	10.80		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
7.3	148	Total			

Subcatchment 3aS: ByPass Basin



Summary for Subcatchment 3bS: To Basin

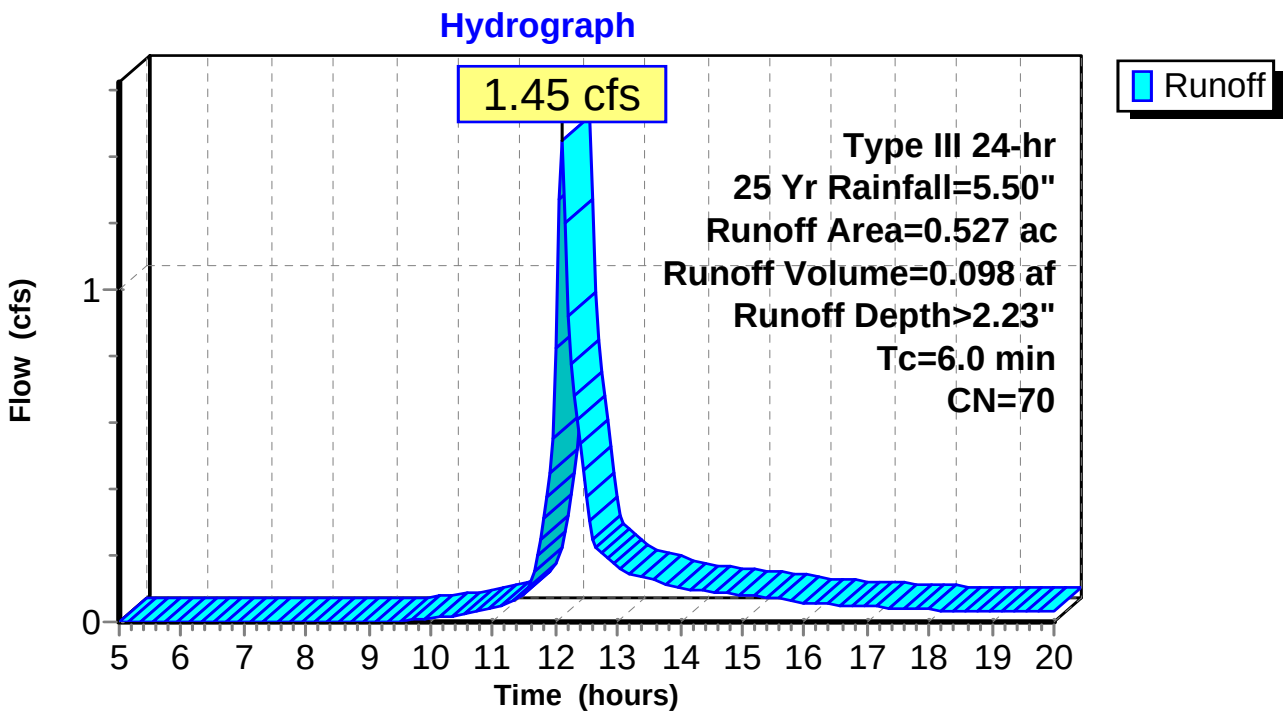
Runoff = 1.45 cfs @ 12.10 hrs, Volume= 0.098 af, Depth> 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Yr Rainfall=5.50"

Area (ac)	CN	Description
0.301	49	50-75% Grass cover, Fair, HSG A
0.226	98	Water Surface, 0% imp, HSG A
0.527	70	Weighted Average
0.527		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 3bS: To Basin



Summary for Subcatchment 3cS: To E'ly Swale

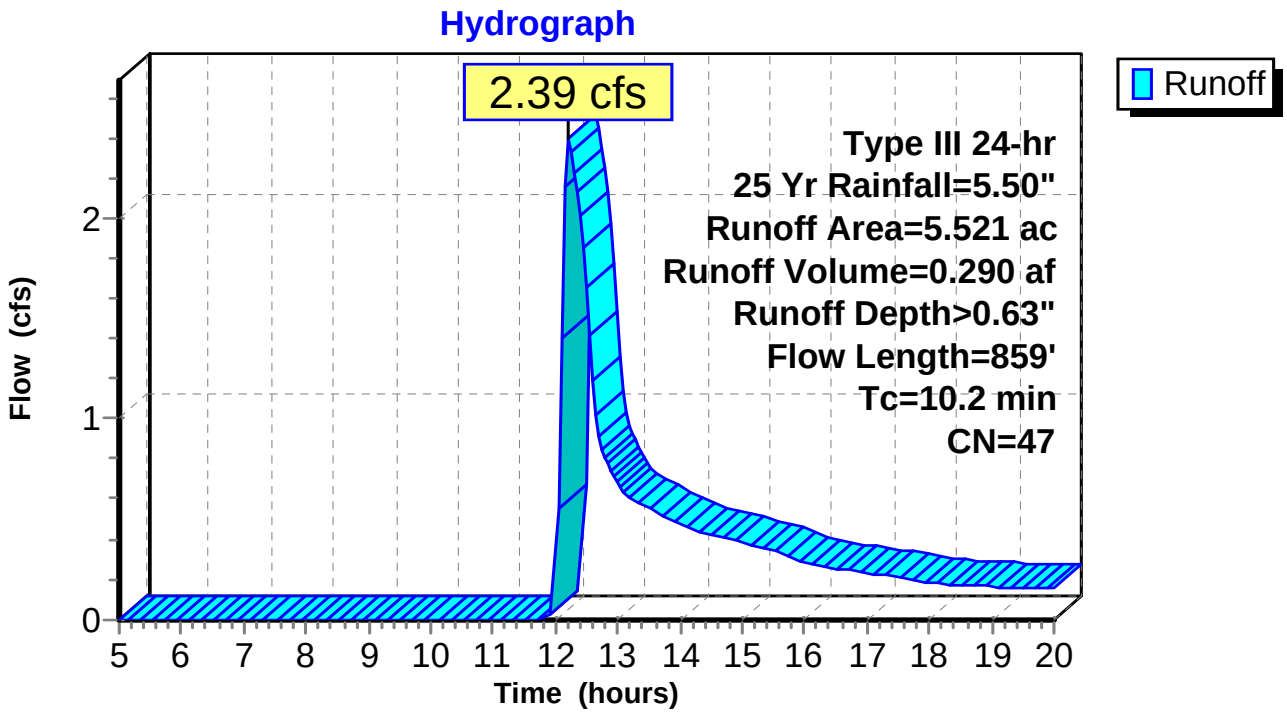
Runoff = 2.39 cfs @ 12.21 hrs, Volume= 0.290 af, Depth> 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Yr Rainfall=5.50"

Area (ac)	CN	Description
1.220	39	>75% Grass cover, Good, HSG A
4.301	49	50-75% Grass cover, Fair, HSG A
5.521	47	Weighted Average
5.521		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	606	0.0700	4.26		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
1.3	203	0.0100	2.70	6.22	**Channel Flow, C-D** Area= 2.3 sf Perim= 5.7' r= 0.40' n= 0.030 Earth, grassed & winding
10.2	859	Total			

Subcatchment 3cS: To E'ly Swale



Summary for Subcatchment 3dS: to N'ly Swale

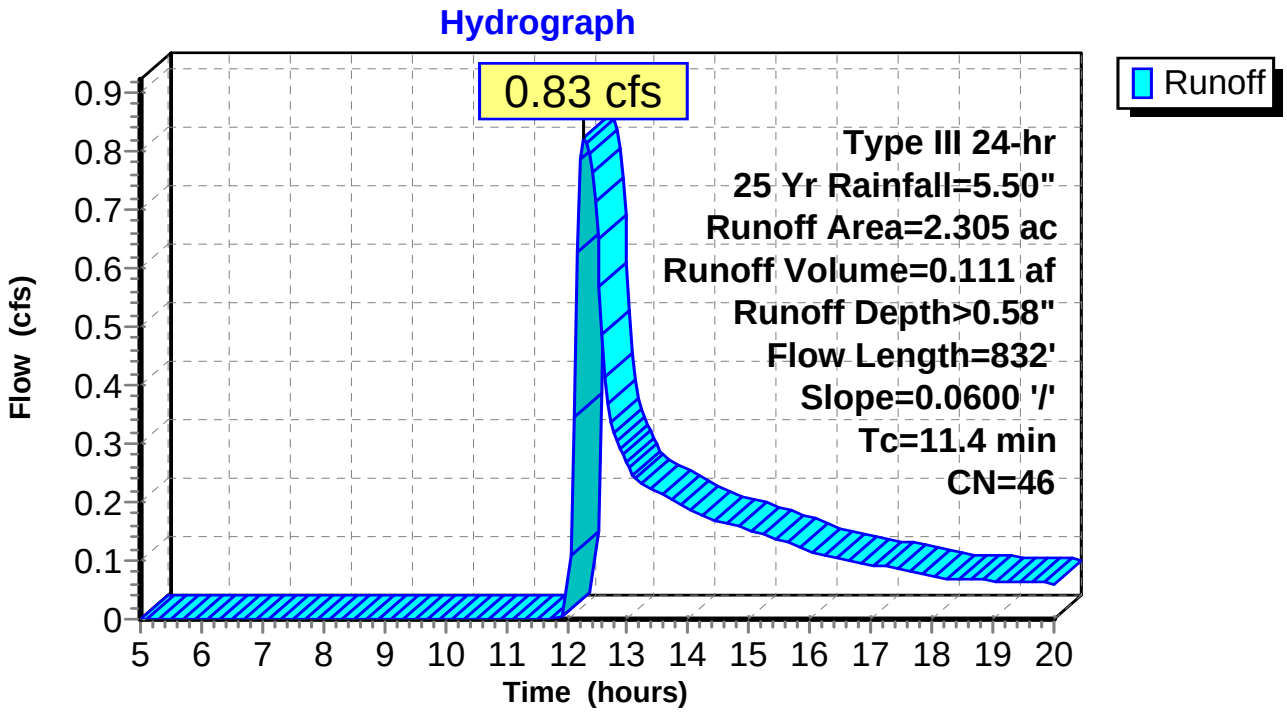
Runoff = 0.83 cfs @ 12.27 hrs, Volume= 0.111 af, Depth> 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Yr Rainfall=5.50"

Area (ac)	CN	Description
0.102	30	Woods, Good, HSG A
0.428	39	>75% Grass cover, Good, HSG A
1.775	49	50-75% Grass cover, Fair, HSG A
2.305	46	Weighted Average
2.305		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.5	782	0.0600	3.67		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
11.4	832	Total			

Subcatchment 3dS: to N'ly Swale



Summary for Pond 3P: (new Pond)

Inflow Area = 8.353 ac, 0.00% Impervious, Inflow Depth > 0.72" for 25 Yr event
Inflow = 4.09 cfs @ 12.19 hrs, Volume= 0.498 af
Outflow = 1.54 cfs @ 12.69 hrs, Volume= 0.498 af, Atten= 62%, Lag= 29.5 min
Discarded = 1.54 cfs @ 12.69 hrs, Volume= 0.498 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 239.25' @ 12.69 hrs Surf.Area= 8,061 sf Storage= 3,762 cf

Plug-Flow detention time= 16.4 min calculated for 0.498 af (100% of inflow)
Center-of-Mass det. time= 15.9 min (867.8 - 851.9)

Volume	Invert	Avail.Storage	Storage Description
#1	238.75'	24,746 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

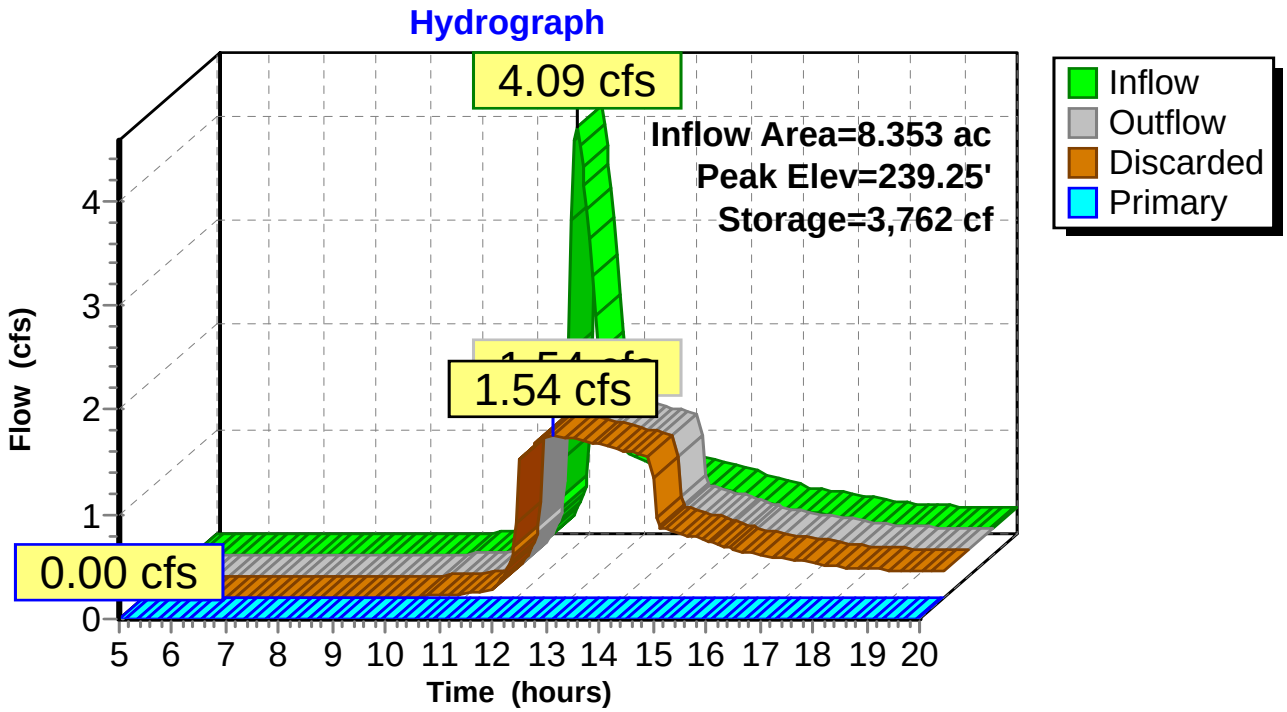
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
238.75	7,000	0	0
239.00	7,460	1,808	1,808
240.00	9,848	8,654	10,462
241.00	12,393	11,121	21,582
241.25	12,921	3,164	24,746

Device	Routing	Invert	Outlet Devices
#1	Discarded	238.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	240.05'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.54 cfs @ 12.69 hrs HW=239.25' (Free Discharge)
1=Exfiltration (Exfiltration Controls 1.54 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=238.75' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

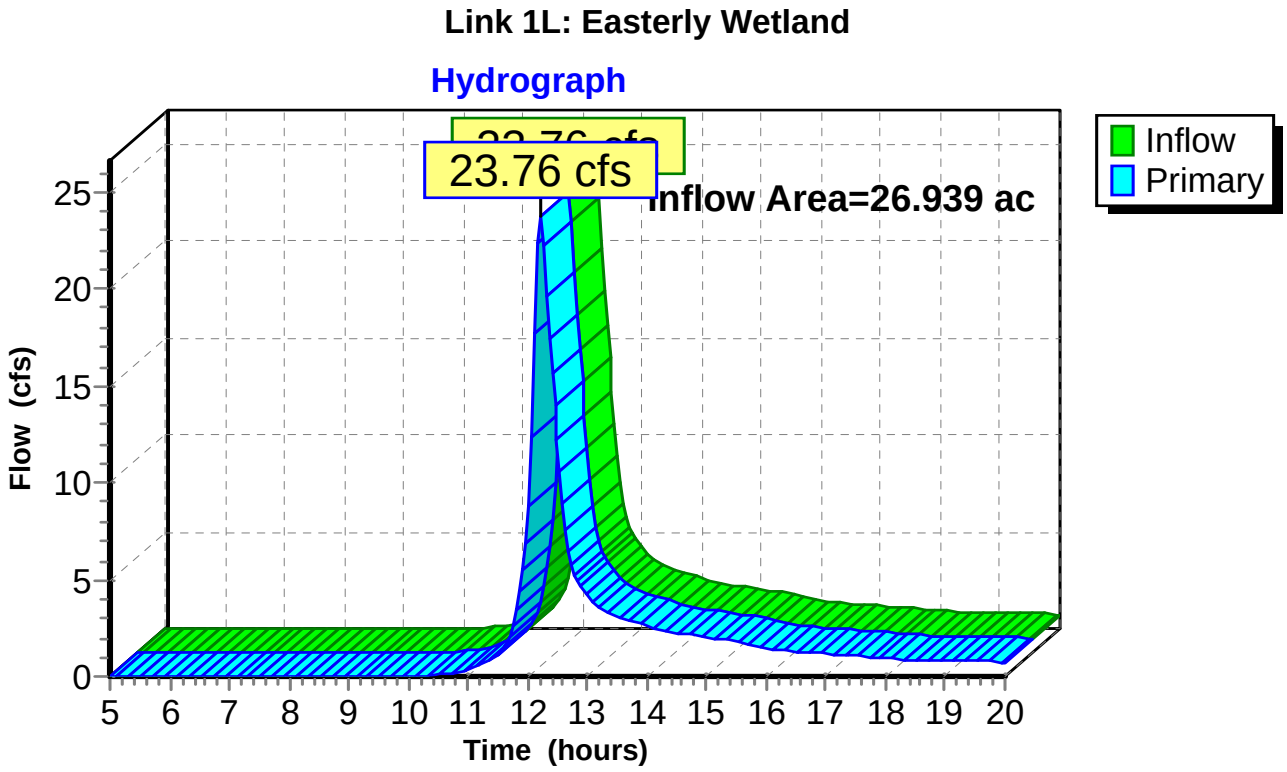
Pond 3P: (new Pond)



Summary for Link 1L: Easterly Wetland

Inflow Area = 26.939 ac, 0.00% Impervious, Inflow Depth > 0.94" for 25 Yr event
Inflow = 23.76 cfs @ 12.20 hrs, Volume= 2.105 af
Primary = 23.76 cfs @ 12.20 hrs, Volume= 2.105 af, Atten= 0%, Lag= 0.0 min

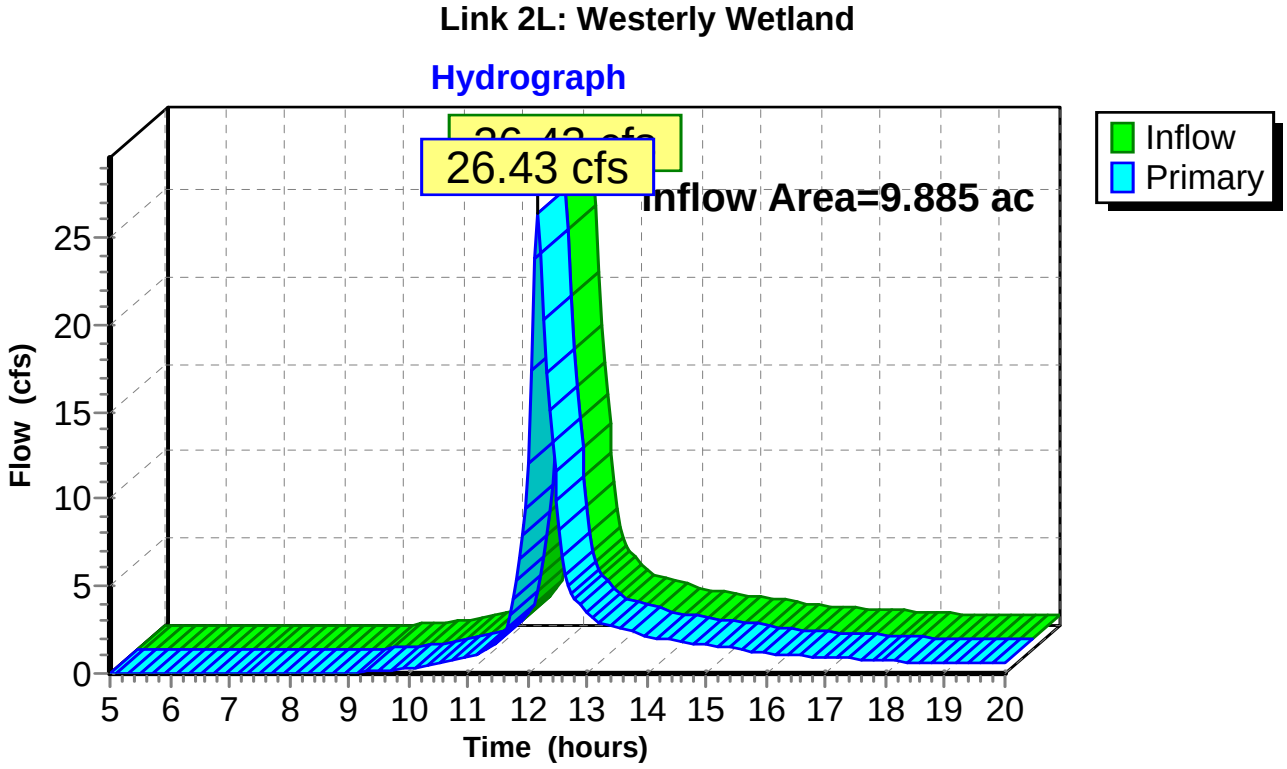
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Summary for Link 2L: Westerly Wetland

Inflow Area = 9.885 ac, 0.00% Impervious, Inflow Depth > 2.48" for 25 Yr event
Inflow = 26.43 cfs @ 12.15 hrs, Volume= 2.044 af
Primary = 26.43 cfs @ 12.15 hrs, Volume= 2.044 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



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

Subcatchment 1S: W'ly side Landfill Runoff Area=9.885 ac 0.00% Impervious Runoff Depth>3.42"
Flow Length=526' Tc=10.4 min CN=73 Runoff=36.43 cfs 2.820 af

Subcatchment 2S: E'ly side Landfill Runoff Area=13.443 ac 0.00% Impervious Runoff Depth>2.64"
Flow Length=592' Tc=13.3 min CN=65 Runoff=34.99 cfs 2.961 af

Subcatchment 3aS: ByPass Basin Runoff Area=5.143 ac 0.00% Impervious Runoff Depth>0.39"
Flow Length=148' Tc=7.3 min CN=36 Runoff=0.92 cfs 0.169 af

Subcatchment 3bS: To Basin Runoff Area=0.527 ac 0.00% Impervious Runoff Depth>3.13"
Tc=6.0 min CN=70 Runoff=2.04 cfs 0.137 af

Subcatchment 3cS: To E'ly Swale Runoff Area=5.521 ac 0.00% Impervious Runoff Depth>1.11"
Flow Length=859' Tc=10.2 min CN=47 Runoff=5.42 cfs 0.513 af

Subcatchment 3dS: to N'ly Swale Runoff Area=2.305 ac 0.00% Impervious Runoff Depth>1.04"
Flow Length=832' Slope=0.0600 '/' Tc=11.4 min CN=46 Runoff=1.95 cfs 0.200 af

Pond 3P: (new Pond) Peak Elev=240.01' Storage=10,538 cf Inflow=8.84 cfs 0.850 af
Discarded=1.89 cfs 0.849 af Primary=0.00 cfs 0.000 af Outflow=1.89 cfs 0.849 af

Link 1L: Easterly Wetland Inflow=35.55 cfs 3.130 af
Primary=35.55 cfs 3.130 af

Link 2L: Westerly Wetland Inflow=36.43 cfs 2.820 af
Primary=36.43 cfs 2.820 af

Total Runoff Area = 36.824 ac Runoff Volume = 6.799 af Average Runoff Depth = 2.22"
100.00% Pervious = 36.824 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: W'ly side Landfill

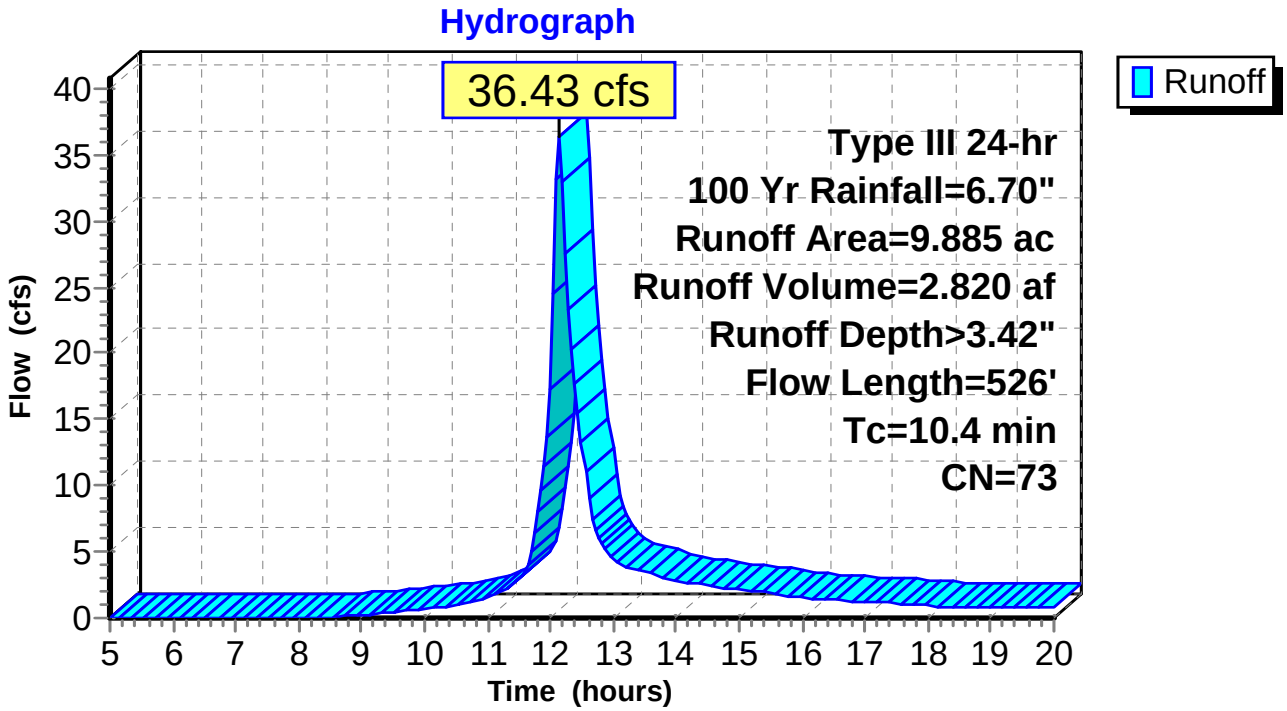
Runoff = 36.43 cfs @ 12.15 hrs, Volume= 2.820 af, Depth> 3.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Yr Rainfall=6.70"

Area (ac)	CN	Description
0.114	39	>75% Grass cover, Good, HSG A
1.352	70	Woods, Good, HSG C
8.419	74	>75% Grass cover, Good, HSG C
9.885	73	Weighted Average
9.885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0170	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
1.2	225	0.0400	3.22		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	251	0.2270	7.67		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
10.4	526	Total			

Subcatchment 1S: W'ly side Landfill



Summary for Subcatchment 2S: E'ly side Landfill

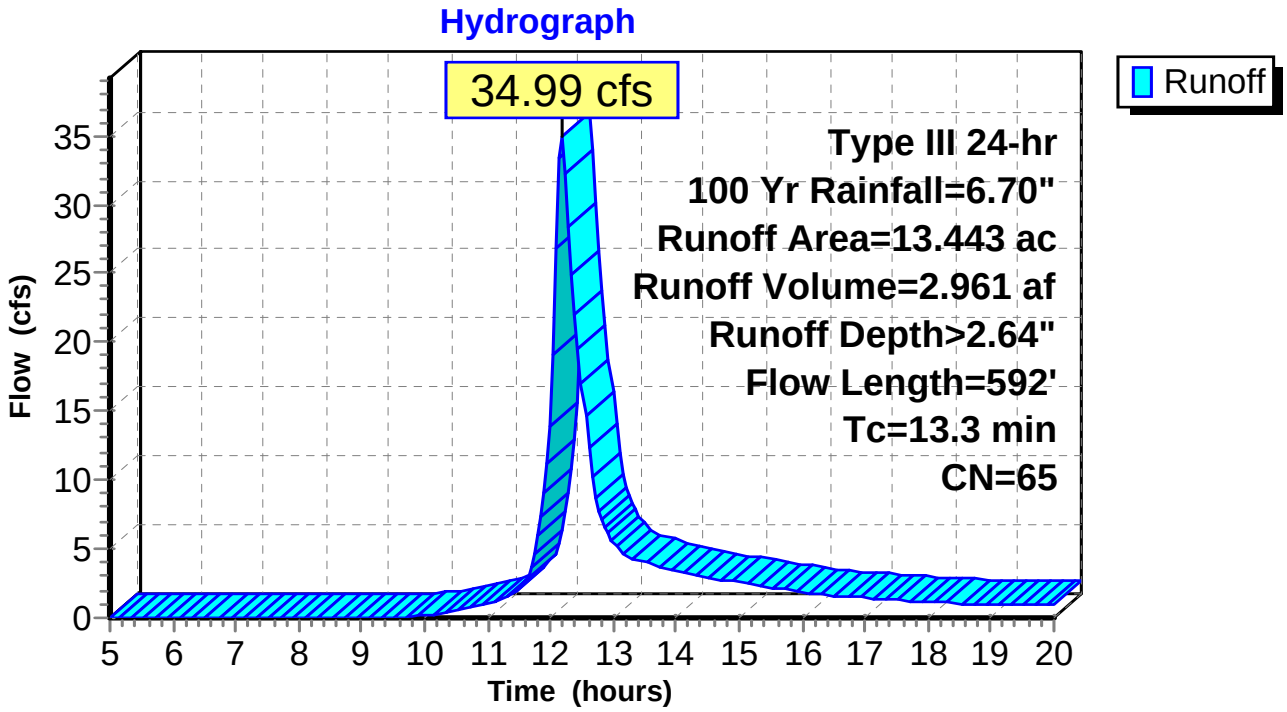
Runoff = 34.99 cfs @ 12.19 hrs, Volume= 2.961 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Yr Rainfall=6.70"

Area (ac)	CN	Description
0.225	30	Woods, Good, HSG A
2.988	39	>75% Grass cover, Good, HSG A
0.335	70	Woods, Good, HSG C
9.895	74	>75% Grass cover, Good, HSG C
13.443	65	Weighted Average
13.443		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
2.0	356	0.0330	2.92		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	186	0.1600	6.44		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
13.3	592	Total			

Subcatchment 2S: E'ly side Landfill



Summary for Subcatchment 3aS: ByPass Basin

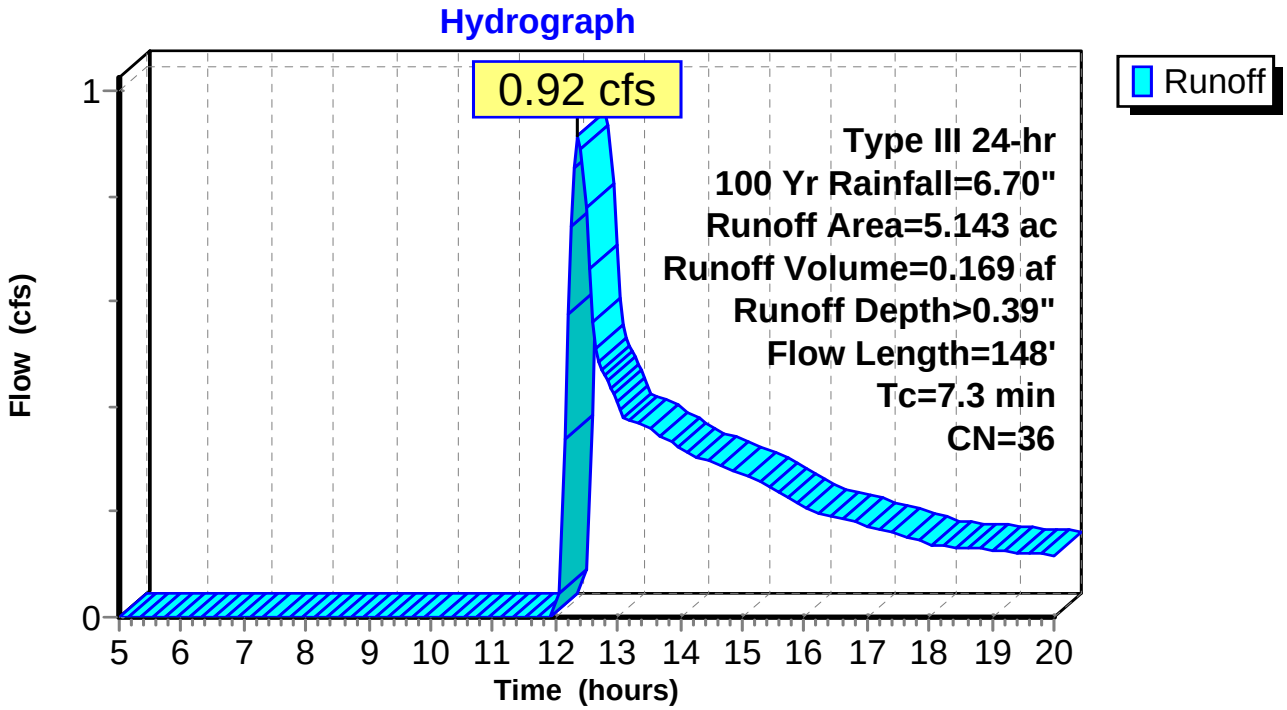
Runoff = 0.92 cfs @ 12.38 hrs, Volume= 0.169 af, Depth> 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Yr Rainfall=6.70"

Area (ac)	CN	Description
1.504	30	Woods, Good, HSG A
3.639	39	>75% Grass cover, Good, HSG A
5.143	36	Weighted Average
5.143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
0.2	98	0.4500	10.80		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
7.3	148	Total			

Subcatchment 3aS: ByPass Basin



Summary for Subcatchment 3bS: To Basin

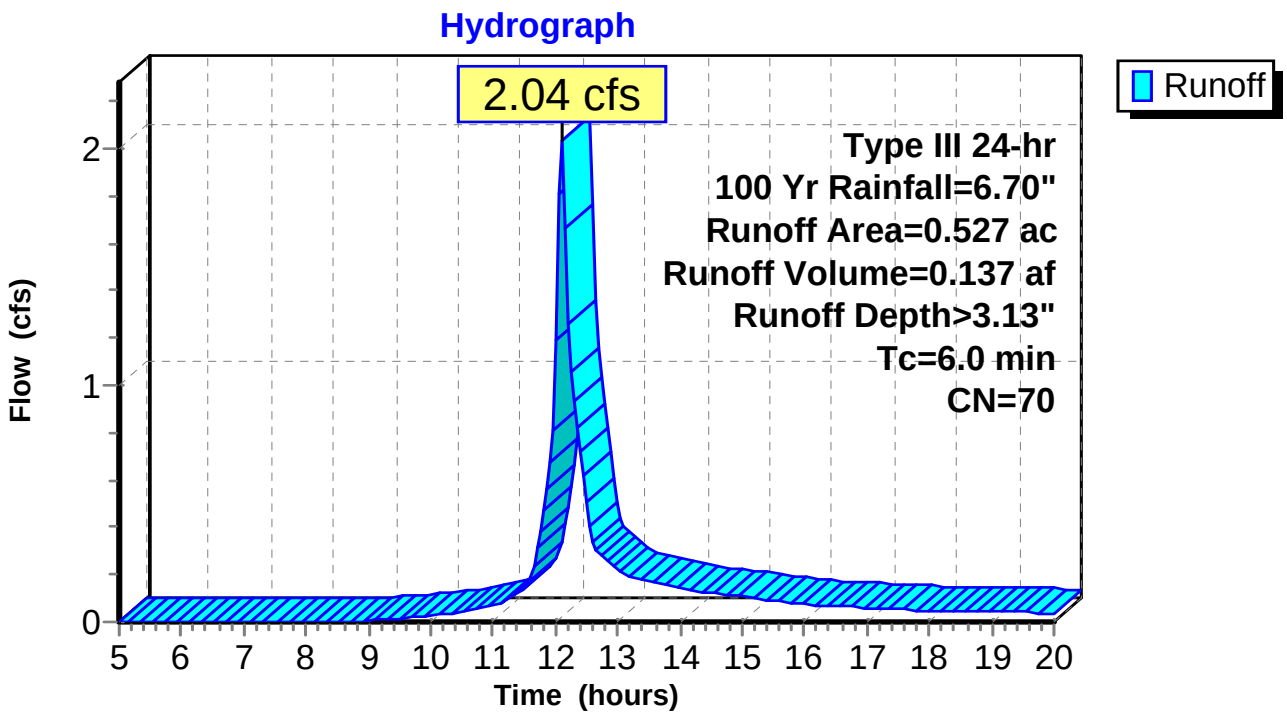
Runoff = 2.04 cfs @ 12.09 hrs, Volume= 0.137 af, Depth> 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Yr Rainfall=6.70"

Area (ac)	CN	Description
0.301	49	50-75% Grass cover, Fair, HSG A
0.226	98	Water Surface, 0% imp, HSG A
0.527	70	Weighted Average
0.527		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 3bS: To Basin



Summary for Subcatchment 3cS: To E'ly Swale

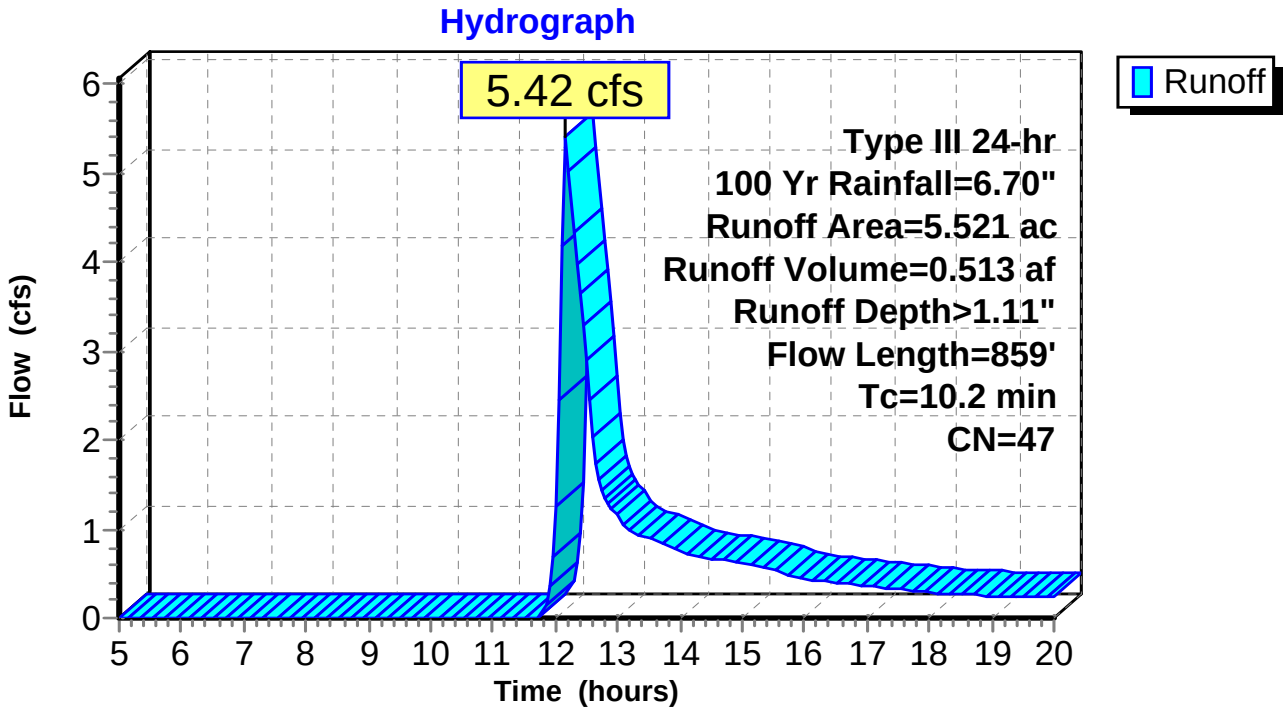
Runoff = 5.42 cfs @ 12.17 hrs, Volume= 0.513 af, Depth> 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Yr Rainfall=6.70"

Area (ac)	CN	Description
1.220	39	>75% Grass cover, Good, HSG A
4.301	49	50-75% Grass cover, Fair, HSG A
5.521	47	Weighted Average
5.521		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	606	0.0700	4.26		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
1.3	203	0.0100	2.70	6.22	**Channel Flow, C-D** Area= 2.3 sf Perim= 5.7' r= 0.40' n= 0.030 Earth, grassed & winding
10.2	859	Total			

Subcatchment 3cS: To E'ly Swale



Summary for Subcatchment 3dS: to N'ly Swale

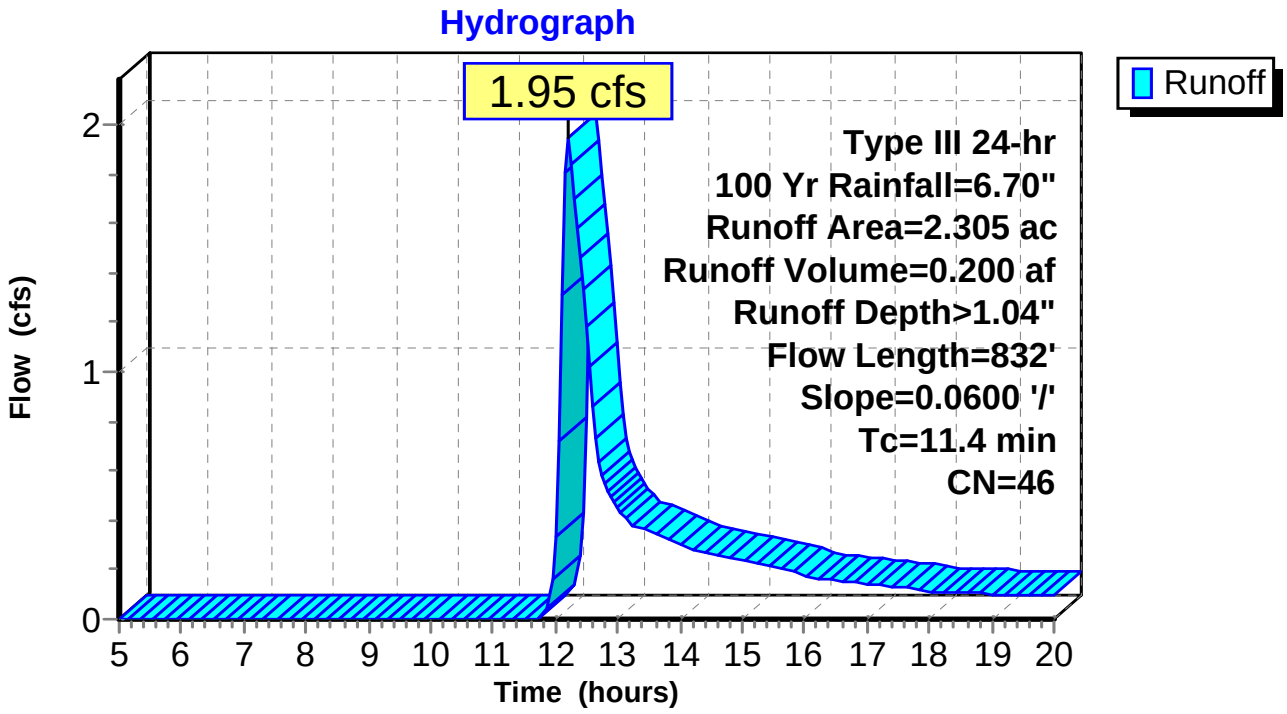
Runoff = 1.95 cfs @ 12.20 hrs, Volume= 0.200 af, Depth> 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Yr Rainfall=6.70"

Area (ac)	CN	Description
0.102	30	Woods, Good, HSG A
0.428	39	>75% Grass cover, Good, HSG A
1.775	49	50-75% Grass cover, Fair, HSG A
2.305	46	Weighted Average
2.305		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.5	782	0.0600	3.67		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
11.4	832	Total			

Subcatchment 3dS: to N'ly Swale



Summary for Pond 3P: (new Pond)

Inflow Area = 8.353 ac, 0.00% Impervious, Inflow Depth > 1.22" for 100 Yr event
Inflow = 8.84 cfs @ 12.17 hrs, Volume= 0.850 af
Outflow = 1.89 cfs @ 12.95 hrs, Volume= 0.849 af, Atten= 79%, Lag= 47.0 min
Discarded = 1.89 cfs @ 12.95 hrs, Volume= 0.849 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 240.01' @ 12.95 hrs Surf.Area= 9,868 sf Storage= 10,538 cf

Plug-Flow detention time= 53.5 min calculated for 0.846 af (100% of inflow)
Center-of-Mass det. time= 52.9 min (891.5 - 838.6)

Volume	Invert	Avail.Storage	Storage Description
#1	238.75'	24,746 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

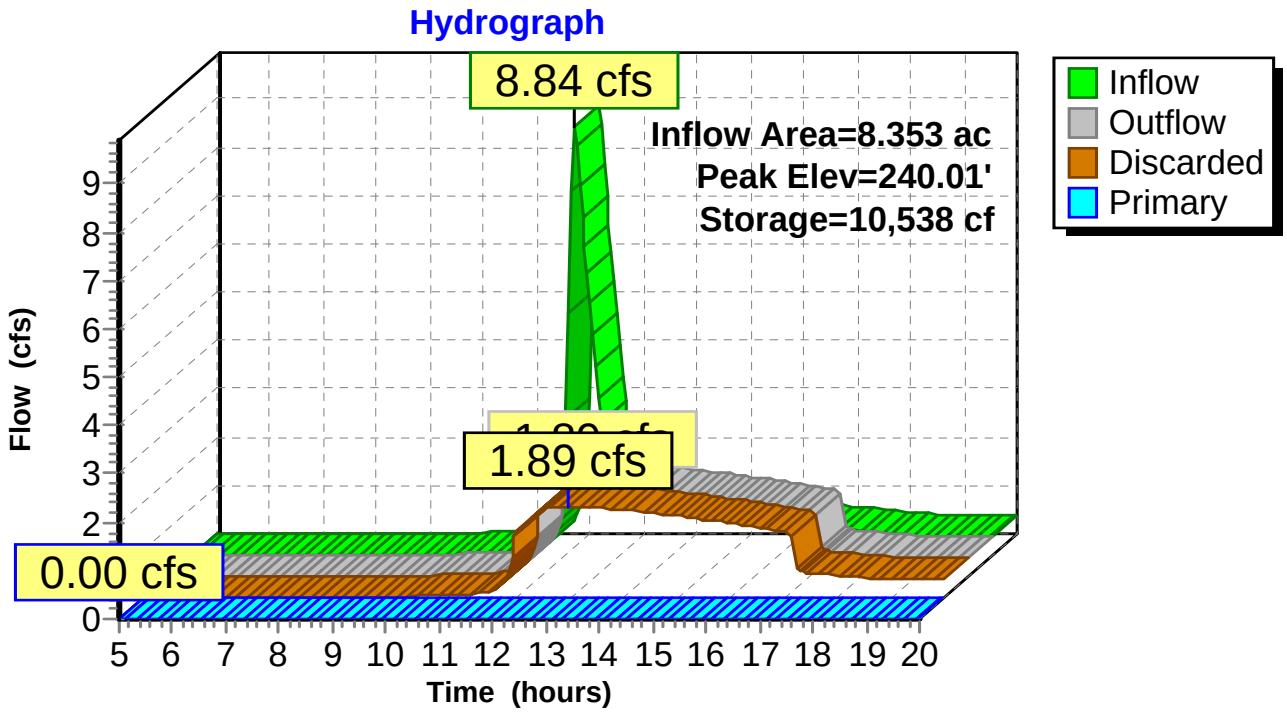
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
238.75	7,000	0	0
239.00	7,460	1,808	1,808
240.00	9,848	8,654	10,462
241.00	12,393	11,121	21,582
241.25	12,921	3,164	24,746

Device	Routing	Invert	Outlet Devices
#1	Discarded	238.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	240.05'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.89 cfs @ 12.95 hrs HW=240.01' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 1.89 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=238.75' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

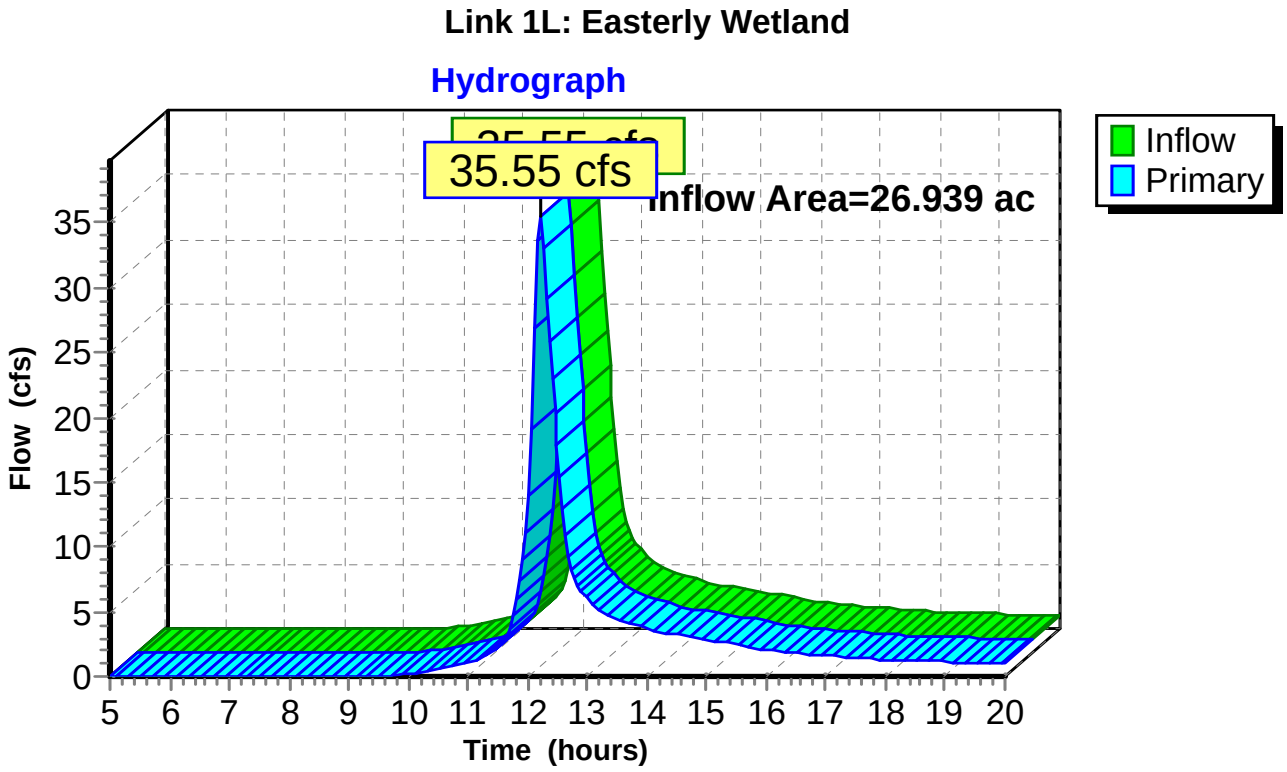
Pond 3P: (new Pond)



Summary for Link 1L: Easterly Wetland

Inflow Area = 26.939 ac, 0.00% Impervious, Inflow Depth > 1.39" for 100 Yr event
Inflow = 35.55 cfs @ 12.20 hrs, Volume= 3.130 af
Primary = 35.55 cfs @ 12.20 hrs, Volume= 3.130 af, Atten= 0%, Lag= 0.0 min

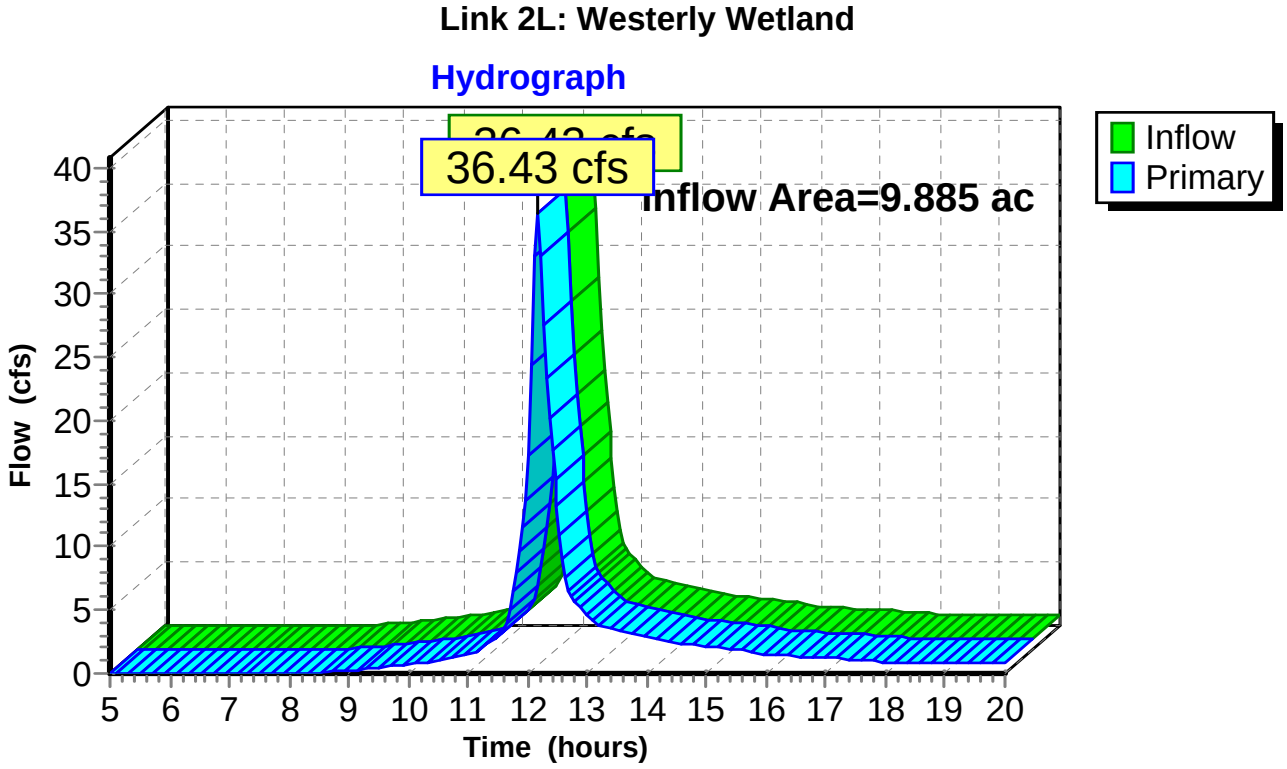
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Summary for Link 2L: Westerly Wetland

Inflow Area = 9.885 ac, 0.00% Impervious, Inflow Depth > 3.42" for 100 Yr event
Inflow = 36.43 cfs @ 12.15 hrs, Volume= 2.820 af
Primary = 36.43 cfs @ 12.15 hrs, Volume= 2.820 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



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

Subcatchment 1S: W'ly side Landfill Runoff Area=9.885 ac 0.00% Impervious Runoff Depth>0.01"
Flow Length=526' Tc=10.4 min CN=73 Runoff=0.02 cfs 0.010 af

Subcatchment 2S: E'ly side Landfill Runoff Area=13.443 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=592' Tc=13.3 min CN=65 Runoff=0.00 cfs 0.000 af

Subcatchment 3aS: ByPass Basin Runoff Area=5.143 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=148' Tc=7.3 min CN=36 Runoff=0.00 cfs 0.000 af

Subcatchment 3bS: To Basin Runoff Area=0.527 ac 0.00% Impervious Runoff Depth>0.00"
Tc=6.0 min CN=70 Runoff=0.00 cfs 0.000 af

Subcatchment 3cS: To E'ly Swale Runoff Area=5.521 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=859' Tc=10.2 min CN=47 Runoff=0.00 cfs 0.000 af

Subcatchment 3dS: to N'ly Swale Runoff Area=2.305 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=832' Slope=0.0600 '/' Tc=11.4 min CN=46 Runoff=0.00 cfs 0.000 af

Pond 3P: (new Pond) Peak Elev=238.75' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Link 1L: Easterly Wetland Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 2L: Westerly Wetland Inflow=0.02 cfs 0.010 af
Primary=0.02 cfs 0.010 af

Total Runoff Area = 36.824 ac Runoff Volume = 0.010 af Average Runoff Depth = 0.00"
100.00% Pervious = 36.824 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: W'ly side Landfill

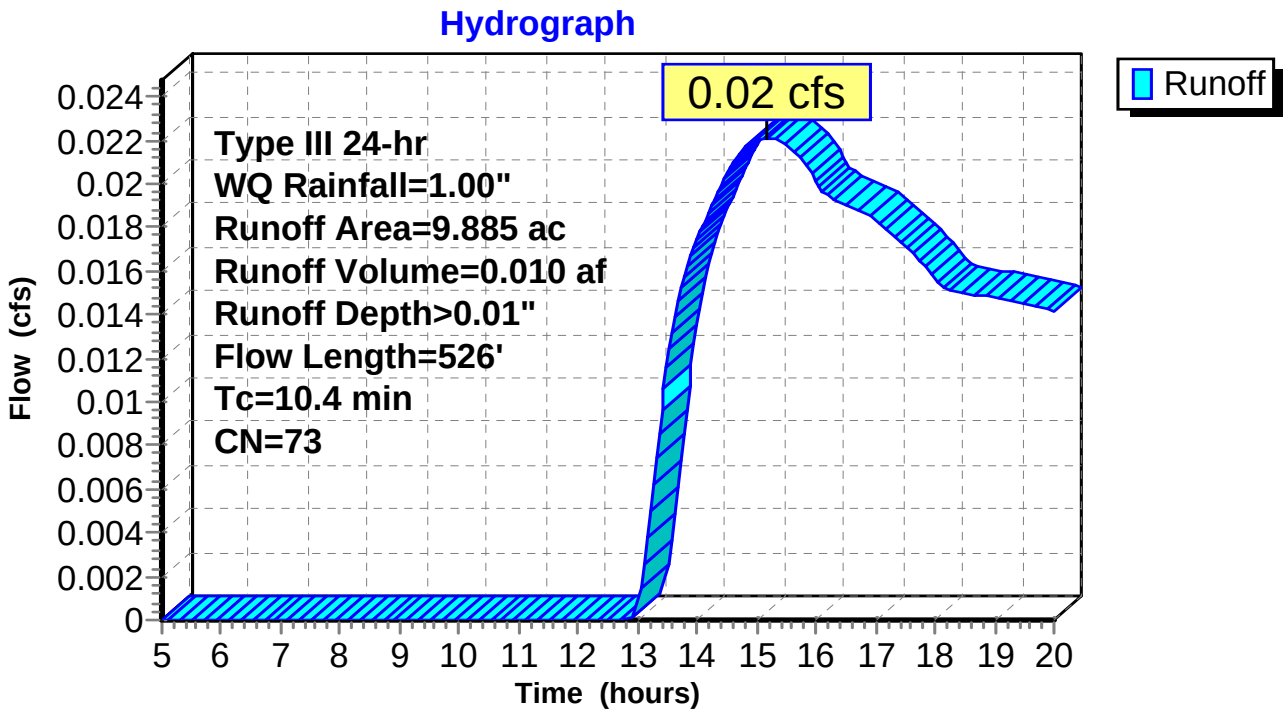
Runoff = 0.02 cfs @ 15.18 hrs, Volume= 0.010 af, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=1.00"

Area (ac)	CN	Description
0.114	39	>75% Grass cover, Good, HSG A
1.352	70	Woods, Good, HSG C
8.419	74	>75% Grass cover, Good, HSG C
9.885	73	Weighted Average
9.885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0170	0.10		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
1.2	225	0.0400	3.22		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	251	0.2270	7.67		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
10.4	526	Total			

Subcatchment 1S: W'ly side Landfill



Summary for Subcatchment 2S: E'ly side Landfill

[45] Hint: Runoff=Zero

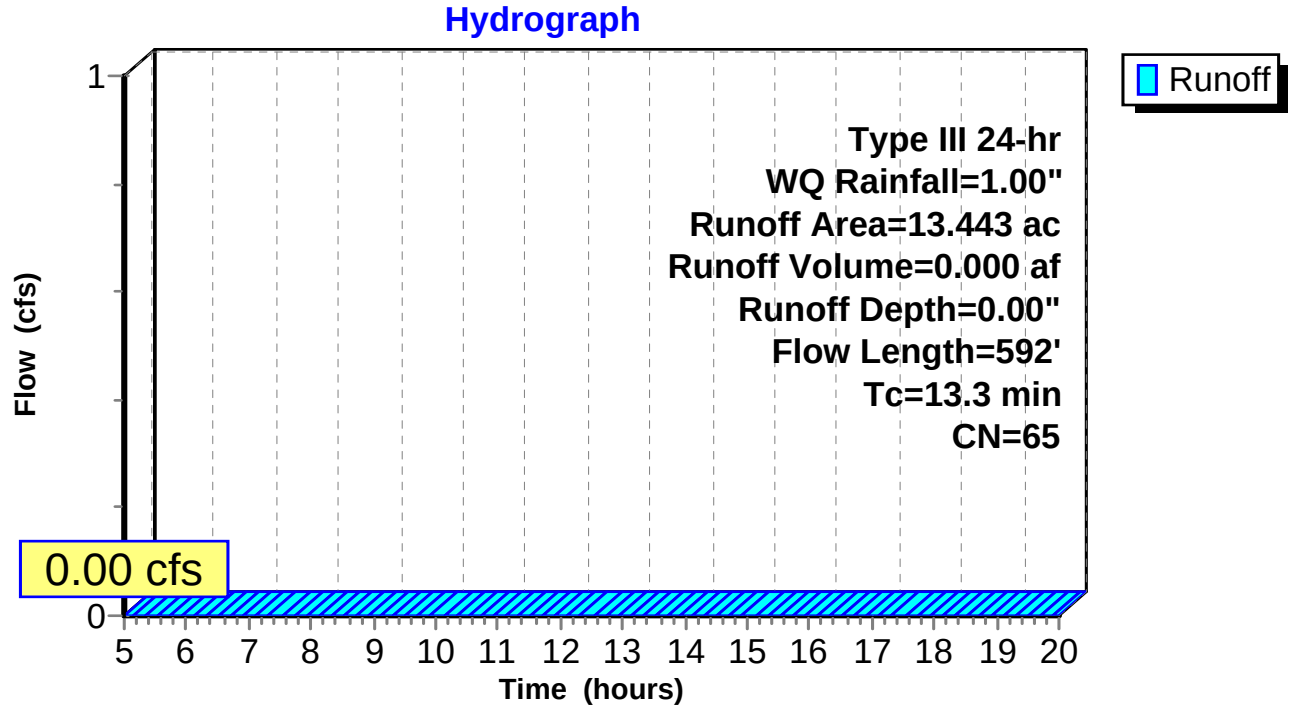
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=1.00"

Area (ac)	CN	Description
0.225	30	Woods, Good, HSG A
2.988	39	>75% Grass cover, Good, HSG A
0.335	70	Woods, Good, HSG C
9.895	74	>75% Grass cover, Good, HSG C
13.443	65	Weighted Average
13.443		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
2.0	356	0.0330	2.92		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.5	186	0.1600	6.44		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
13.3	592	Total			

Subcatchment 2S: E'ly side Landfill



Summary for Subcatchment 3aS: ByPass Basin

[45] Hint: Runoff=Zero

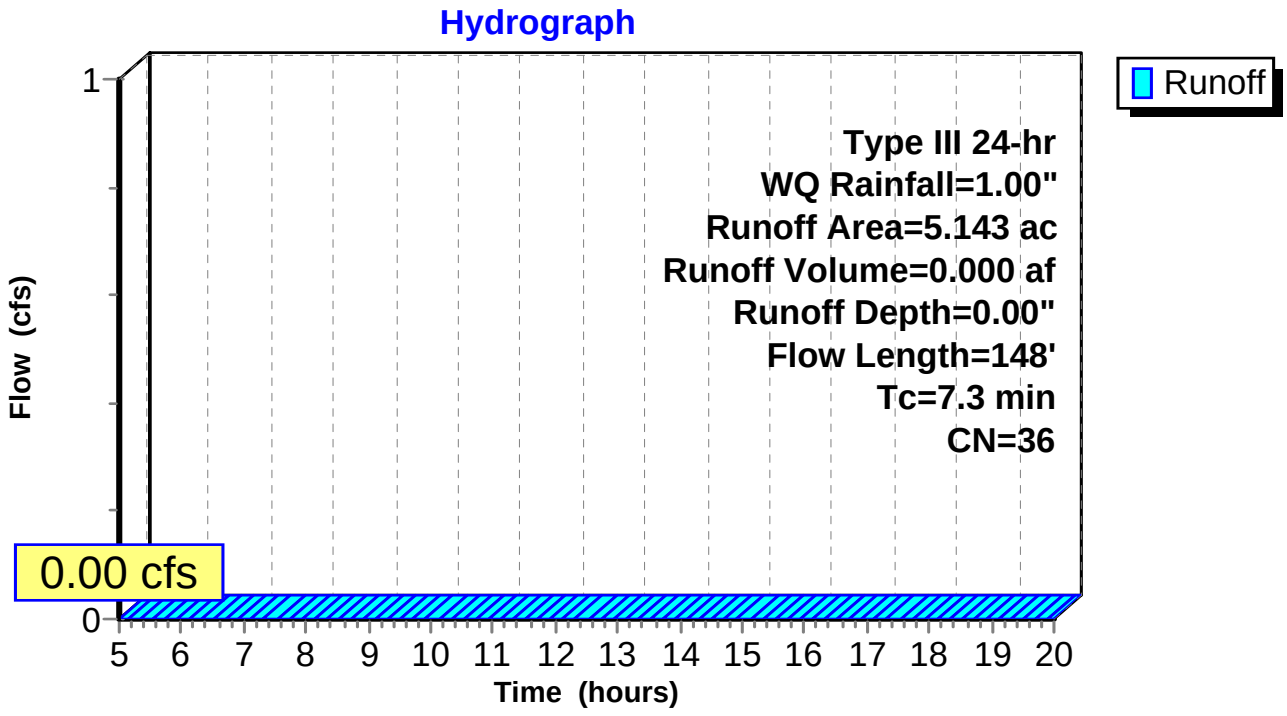
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=1.00"

Area (ac)	CN	Description
1.504	30	Woods, Good, HSG A
3.639	39	>75% Grass cover, Good, HSG A
5.143	36	Weighted Average
5.143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
0.2	98	0.4500	10.80		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
7.3	148	Total			

Subcatchment 3aS: ByPass Basin



Summary for Subcatchment 3bS: To Basin

[73] Warning: Peak may fall outside time span

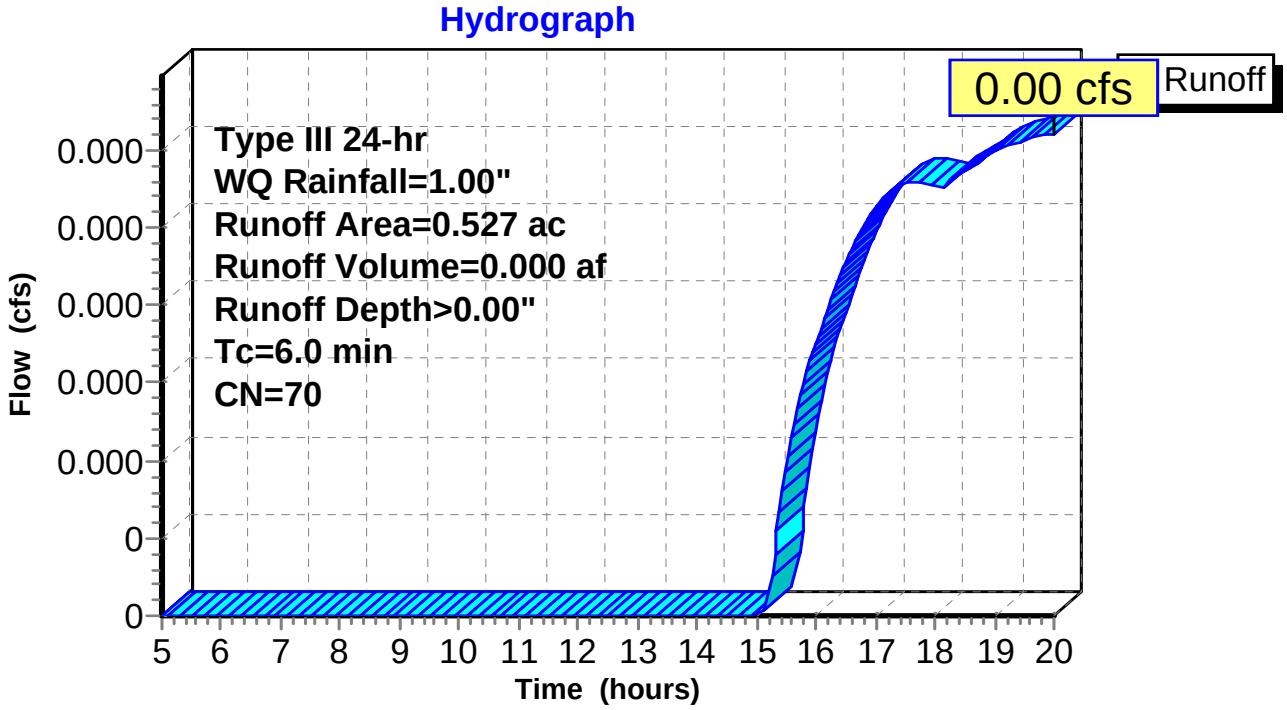
Runoff = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=1.00"

Area (ac)	CN	Description
0.301	49	50-75% Grass cover, Fair, HSG A
0.226	98	Water Surface, 0% imp, HSG A
0.527	70	Weighted Average
0.527		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 3bS: To Basin



Summary for Subcatchment 3cS: To E'ly Swale

[45] Hint: Runoff=Zero

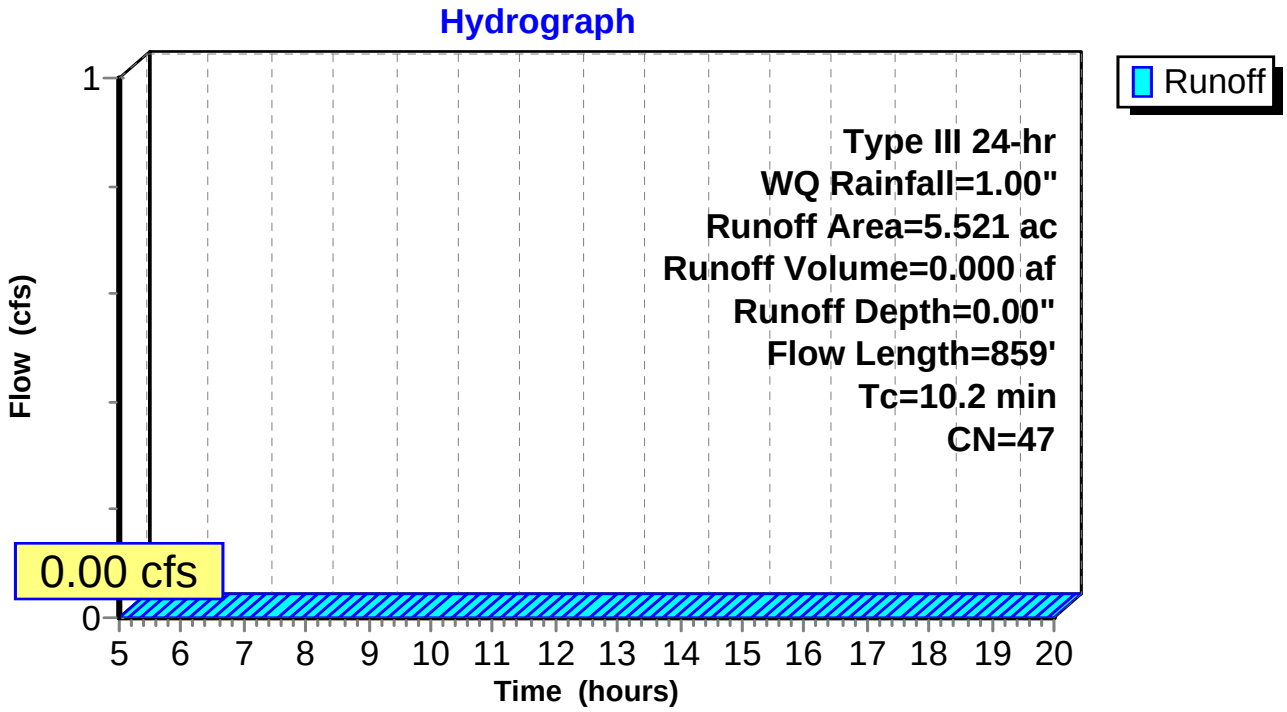
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=1.00"

Area (ac)	CN	Description
1.220	39	>75% Grass cover, Good, HSG A
4.301	49	50-75% Grass cover, Fair, HSG A
5.521	47	Weighted Average
5.521		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	606	0.0700	4.26		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
1.3	203	0.0100	2.70	6.22	**Channel Flow, C-D** Area= 2.3 sf Perim= 5.7' r= 0.40' n= 0.030 Earth, grassed & winding
10.2	859	Total			

Subcatchment 3cS: To E'ly Swale



Summary for Subcatchment 3dS: to N'ly Swale

[45] Hint: Runoff=Zero

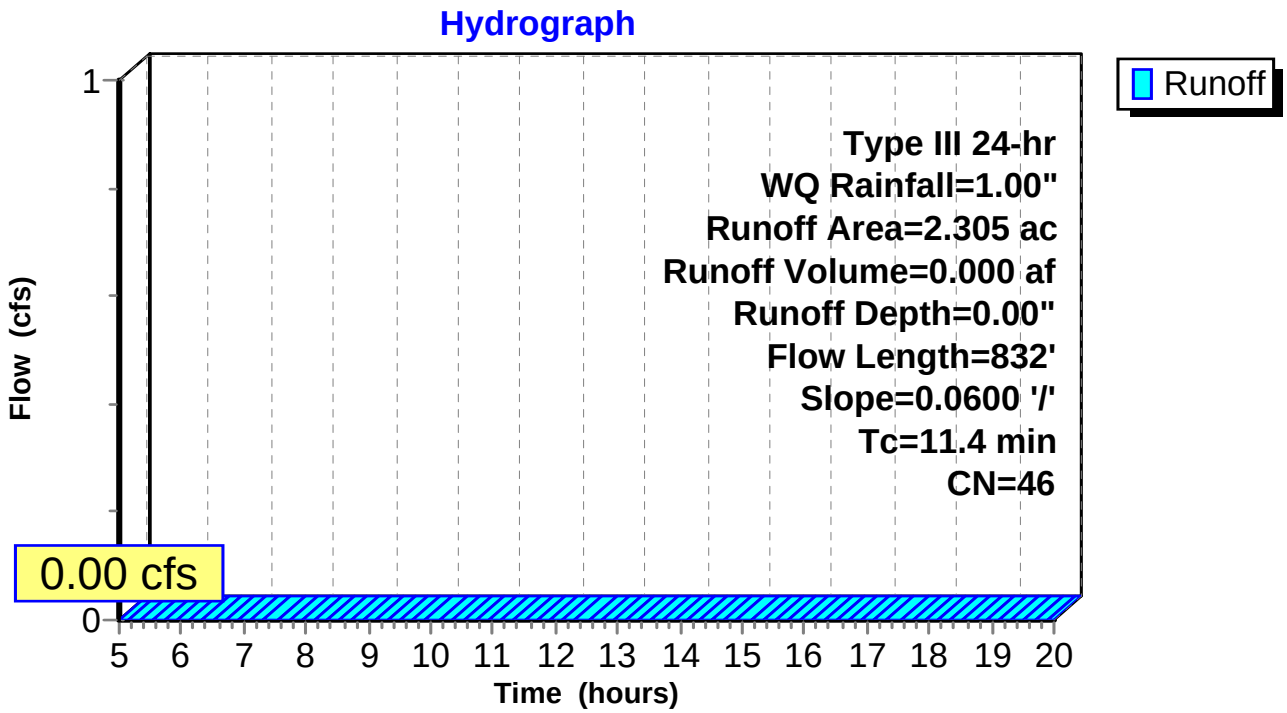
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=1.00"

Area (ac)	CN	Description
0.102	30	Woods, Good, HSG A
0.428	39	>75% Grass cover, Good, HSG A
1.775	49	50-75% Grass cover, Fair, HSG A
2.305	46	Weighted Average
2.305		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.5	782	0.0600	3.67		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
11.4	832	Total			

Subcatchment 3dS: to N'ly Swale



Summary for Pond 3P: (new Pond)

Inflow Area = 8.353 ac, 0.00% Impervious, Inflow Depth > 0.00" for WQ event
Inflow = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 238.75' @ 20.00 hrs Surf.Area= 7,000 sf Storage= 0 cf

Plug-Flow detention time= 2.2 min calculated for 0.000 af (99% of inflow)
Center-of-Mass det. time= 1.0 min (1,078.8 - 1,077.8)

Volume	Invert	Avail.Storage	Storage Description
#1	238.75'	24,746 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

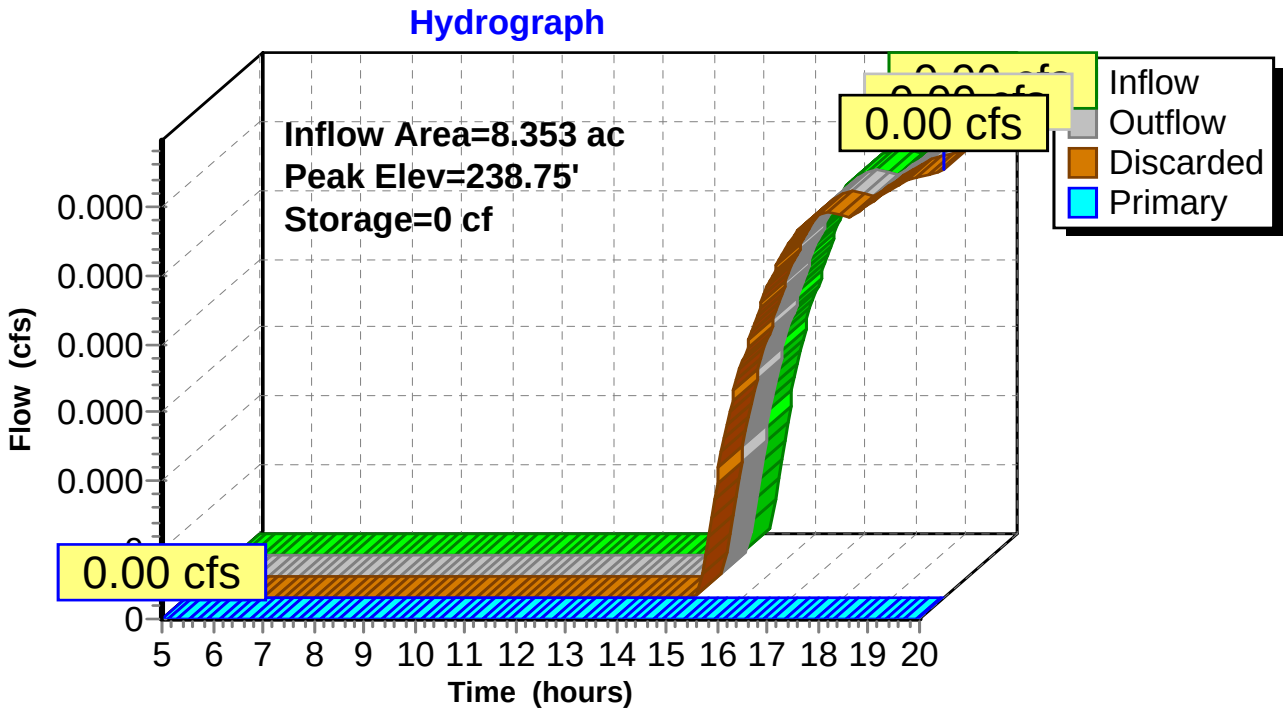
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
238.75	7,000	0	0
239.00	7,460	1,808	1,808
240.00	9,848	8,654	10,462
241.00	12,393	11,121	21,582
241.25	12,921	3,164	24,746

Device	Routing	Invert	Outlet Devices
#1	Discarded	238.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	240.05'	**25.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.34 cfs @ 20.00 hrs HW=238.75' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.34 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=238.75' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: (new Pond)

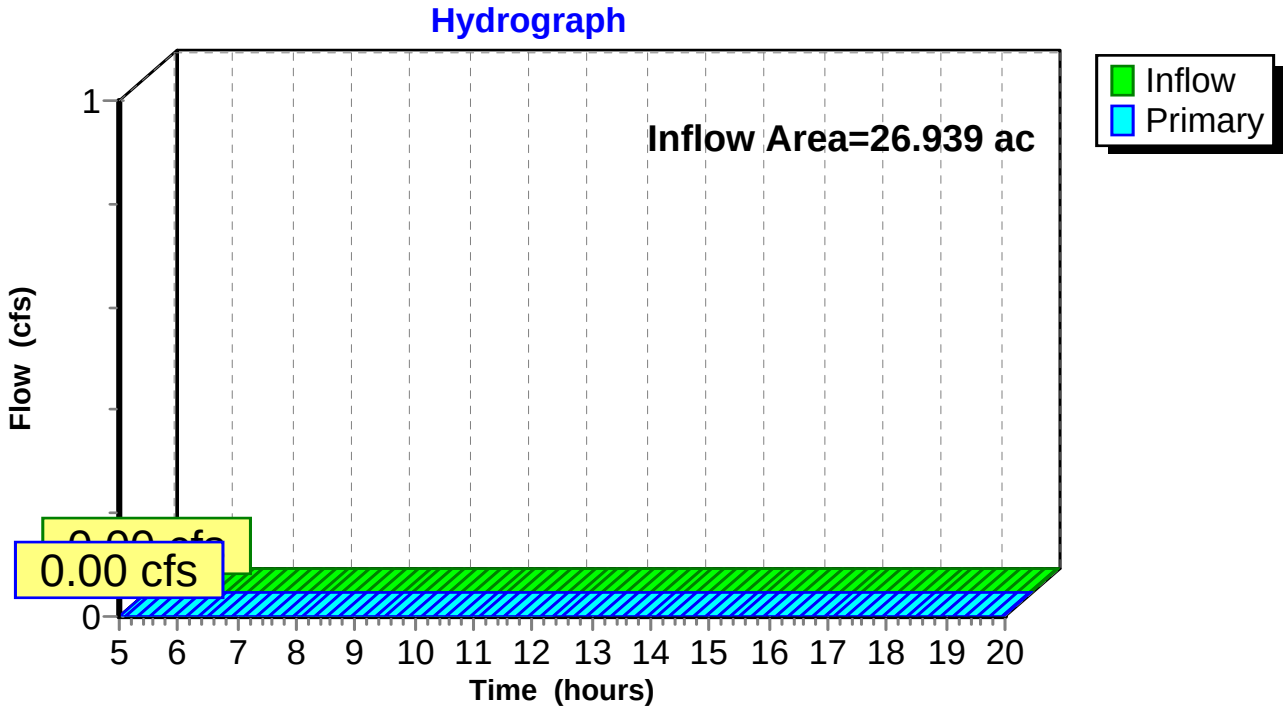


Summary for Link 1L: Easterly Wetland

Inflow Area = 26.939 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQ event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 1L: Easterly Wetland

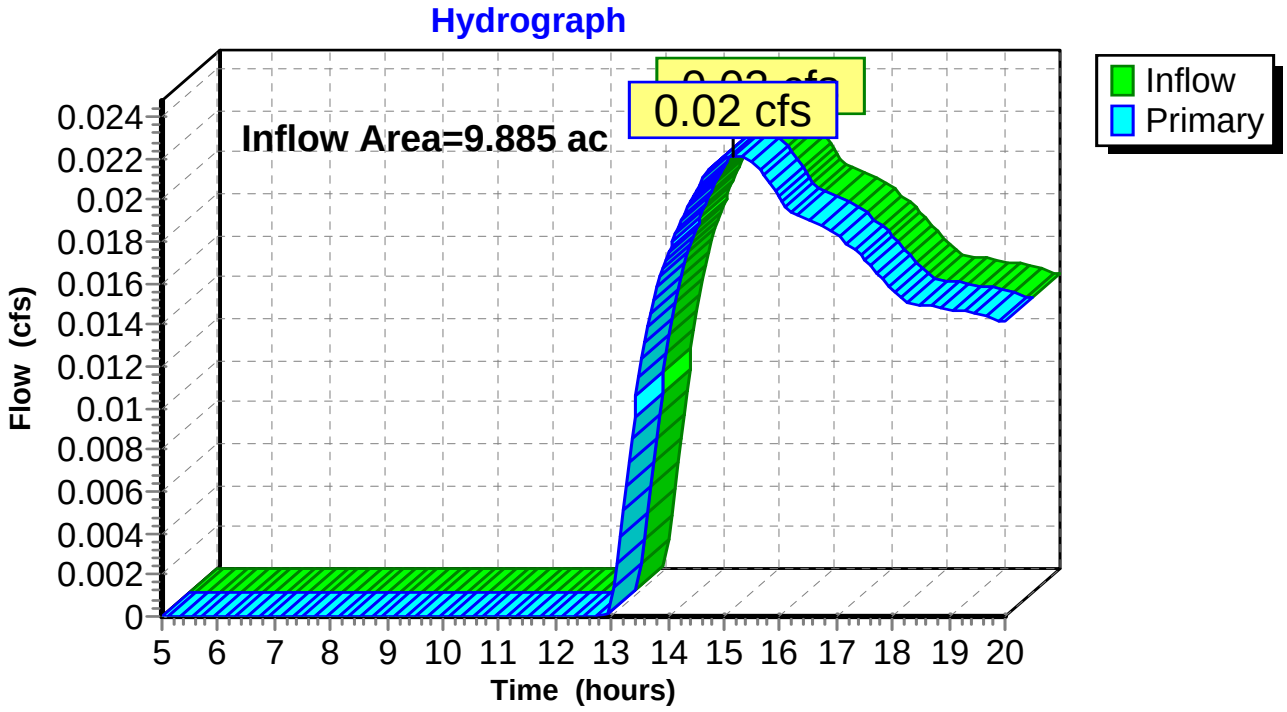


Summary for Link 2L: Westerly Wetland

Inflow Area = 9.885 ac, 0.00% Impervious, Inflow Depth > 0.01" for WQ event
Inflow = 0.02 cfs @ 15.18 hrs, Volume= 0.010 af
Primary = 0.02 cfs @ 15.18 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 2L: Westerly Wetland



MassDEP Stormwater Checklist

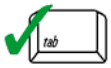
ALLEN & MAJOR ASSOCIATES, INC.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Paul G Matos 5-1-2018

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☒ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☒ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☐ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

☐ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☐ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: Infiltration Basin

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Grass Channel with check dams	50%	**1.00**	0.50	0.50
Infiltration Basin	80%	0.50	0.40	0.10

Total TSS Removal = 90%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Ashland Solar

Prepared By: PGM

Date: 5/1/18

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

ILLICIT DISCHARGE STATEMENT

Project: Ashland Solar
Megunko Road & MBTA Road
Ashland, MA

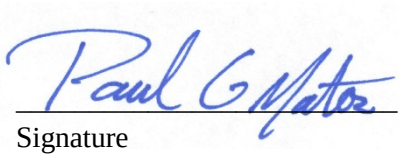
Date: May 1, 2018

The stormwater management system proposed shall not be connected to the wastewater management system and shall not be contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease per Massachusetts DEP stormwater standard 10. As an undeveloped site, there are no existing illicit discharges.

Engineer:

Allen & Major Associates, Inc.
10 Main Street
Lakeville, MA 02347

Paul G Matos, P.E.
Print Name



Signature

Owner:

Megunko Transit District, LLC
62 Temple Drive
Alton, NH 03809

_____
Print Name

_____
Signature

Soil Information

ALLEN & MAJOR ASSOCIATES, INC.

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 Middlesex County, Massachusetts

November 28, 2017

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 (https://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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

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: 1:8,720 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 400 800 1600 2400

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N 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 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 17, Oct 6, 2017

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

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
53A	Freetown muck, ponded, 0 to 1 percent slopes	15.4	6.3%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	2.5	1.0%
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	13.7	5.6%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	5.7	2.4%
106C	Narragansett-Hollis-Rock outcrop complex, 3 to 15 percent slopes	6.1	2.5%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	7.9	3.2%
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	30.3	12.5%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	11.1	4.6%
336B	Rainbow silt loam, 3 to 8 percent slopes, very stony	0.6	0.2%
415B	Narragansett silt loam, 3 to 8 percent slopes	2.0	0.8%
416B	Narragansett silt loam, 3 to 8 percent slopes, very stony	64.3	26.5%
416C	Narragansett silt loam, 8 to 15 percent slopes, very stony	22.7	9.4%
416D	Narragansett silt loam, 15 to 25 percent slopes, very stony	14.9	6.2%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	11.6	4.8%
654	Udorthents, loamy	20.7	8.5%
655	Udorthents, wet substratum	1.9	0.8%
656	Udorthents-Urban land complex	11.0	4.6%
Totals for Area of Interest		**242.5**	**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.

Middlesex County, Massachusetts

53A—Freetown muck, ponded, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2qc
Elevation: 0 to 1,140 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: Farmland of unique importance

Map Unit Composition

Freetown, ponded, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freetown, Ponded

Setting

Landform: Bogs, depressions, depressions, kettles, marshes, swamps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Percent of area covered with surface fragments: 0.0 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 low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Whitman, ponded

Percent of map unit: 5 percent
Landform: Depressions on ground moraines
Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea, ponded

Percent of map unit: 5 percent
Landform: Bogs, depressions, depressions, kettles, marshes, swamps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

71B—Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w69c
Elevation: 0 to 1,290 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: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgebury, Extremely Stony

Setting

Landform: Depressions, drumlins, ground moraines, drainageways, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 6 inches: fine sandy loam
Bw - 6 to 10 inches: sandy loam
Bg - 10 to 19 inches: gravelly sandy loam
Cd - 19 to 66 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 15 to 35 inches to densic material
Natural drainage class: Poorly drained
Runoff class: Very high
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 (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: Yes

Minor Components

Woodbridge, extremely stony

Percent of map unit: 10 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Footslope, summit, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Whitman, extremely stony

Percent of map unit: 8 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Paxton, extremely stony

Percent of map unit: 2 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

73B—Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w695
Elevation: 0 to 1,580 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

Whitman, extremely stony, and similar soils: 81 percent
Minor components: 19 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Whitman, Extremely Stony

Setting

Landform: Depressions, drumlins, ground moraines, drainageways, hills
Landform position (two-dimensional): Toeslope
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: peat
A - 1 to 10 inches: fine sandy loam
Bg - 10 to 17 inches: gravelly fine sandy loam
Cdg - 17 to 61 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 7 to 38 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 low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D

Hydric soil rating: Yes

Minor Components

Ridgebury, extremely stony

Percent of map unit: 10 percent
Landform: Depressions, drumlins, ground moraines, drainageways, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Depressions, outwash terraces, drainageways, outwash deltas
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 3 percent
Landform: Bogs, marshes, swamps
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Woodbridge, extremely stony

Percent of map unit: 1 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

104C—Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w69p
Elevation: 0 to 1,270 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

Hollis, extremely stony, and similar soils: 35 percent
Charlton, extremely stony, and similar soils: 25 percent
Rock outcrop: 25 percent

Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Side slope, nose slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Charlton, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 15 percent
Percent of area covered with surface fragments: 9.0 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 low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges, hills
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Canton, extremely stony

Percent of map unit: 7 percent
Landform: Ridges, hills, moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 6 percent
Landform: Ridges, hills

Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Montauk, extremely stony

Percent of map unit: 1 percent
Landform: Drumlins, ground moraines, recessionial moraines, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Scituate, extremely stony

Percent of map unit: 1 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Footslope, backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

106C—Narragansett-Hollis-Rock outcrop complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 98yk
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Narragansett and similar soils: 45 percent
Hollis and similar soils: 20 percent
Rock outcrop: 10 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Narragansett

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope

Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable silty eolian deposits and/or friable loamy eolian deposits over loose sandy glaciofluvial deposits derived from metamorphic rock and/or friable sandy basal till derived from metamorphic rock

Typical profile

H1 - 0 to 2 inches: slightly decomposed plant material
H2 - 2 to 7 inches: silt loam
H3 - 7 to 35 inches: silt loam
H4 - 35 to 60 inches: very gravelly loamy sand
H5 - 60 to 65 inches: very gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 18 to 35 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Hollis

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Head slope, crest
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 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: 8 to 20 inches to lithic bedrock
Natural drainage class: Well drained
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Granite and gneiss

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Minor Components

Canton

Percent of map unit: 9 percent
Landform: Hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton

Percent of map unit: 6 percent
Landform: Swales, hills
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent

Scituate

Percent of map unit: 5 percent
Landform: Depressions, hillslopes
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

307B—Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w675
Elevation: 0 to 1,580 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

Paxton, extremely stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paxton, Extremely Stony

Setting

Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 10 inches: fine sandy loam
Bw1 - 10 to 17 inches: fine sandy loam
Bw2 - 17 to 28 inches: fine sandy loam
Cd - 28 to 67 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: 20 to 43 inches to densic material
Natural drainage class: 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 37 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Woodbridge, extremely stony

Percent of map unit: 10 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Charlton, extremely stony

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 4 percent
Landform: Depressions, drumlins, ground moraines, drainageways, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman, extremely stony

Percent of map unit: 1 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

307D—Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w67l
Elevation: 0 to 1,570 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days

Farmland classification: Not prime farmland

Map Unit Composition

Paxton, extremely stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paxton, Extremely Stony

Setting

Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 10 inches: fine sandy loam
Bw1 - 10 to 17 inches: fine sandy loam
Bw2 - 17 to 28 inches: fine sandy loam
Cd - 28 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 15 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Natural drainage class: Well drained
Runoff class: High
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 37 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Charlton, extremely stony

Percent of map unit: 9 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge, extremely stony

Percent of map unit: 5 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 1 percent
Landform: Depressions, drumlins, ground moraines, drainageways, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

312B—Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2t2qs
Elevation: 0 to 1,580 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

Woodbridge, extremely stony, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Extremely Stony

Setting

Landform: Drumlins, ground moraines, hills
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

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 9 inches: fine sandy loam
Bw1 - 9 to 20 inches: fine sandy loam
Bw2 - 20 to 32 inches: fine sandy loam

Cd - 32 to 67 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: 20 to 43 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 19 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Paxton, extremely stony

Percent of map unit: 10 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 8 percent
Landform: Depressions, drumlins, ground moraines, drainageways, hills
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

336B—Rainbow silt loam, 3 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9932
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Rainbow and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rainbow

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder, toeslope
Landform position (three-dimensional): Nose slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable fine-loamy eolian deposits over dense loamy lodgment till derived from metamorphic rock

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 22 inches: silt loam
H3 - 22 to 32 inches: very fine sandy loam
H4 - 32 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 18 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Broadbrook

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Paxton

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Head slope, side slope

Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder, toeslope
Landform position (three-dimensional): Head slope, base slope, nose slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

415B—Narragansett silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: vqrp
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Narragansett and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Narragansett

Setting

Landform: Ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits and/or friable silty eolian deposits over loose sandy glaciofluvial deposits derived from metamorphic rock and/or friable sandy basal till derived from metamorphic rock

Typical profile

H1 - 0 to 2 inches: slightly decomposed plant material
H2 - 2 to 7 inches: silt loam
H3 - 7 to 35 inches: silt loam
H4 - 35 to 60 inches: very gravelly loamy sand
H5 - 60 to 65 inches: very gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 18 to 35 inches to strongly contrasting textural stratification

Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Canton

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Haven

Percent of map unit: 10 percent
Landform: Terraces, plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

416B—Narragansett silt loam, 3 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9940
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Narragansett and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Narragansett

Setting

Landform: Ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits and/or friable silty eolian deposits over loose sandy glaciofluvial deposits derived from metamorphic rock and/or friable sandy basal till derived from metamorphic rock

Typical profile

H1 - 0 to 2 inches: slightly decomposed plant material
H2 - 2 to 7 inches: silt loam
H3 - 7 to 35 inches: silt loam
H4 - 35 to 60 inches: very gravelly loamy sand
H5 - 60 to 65 inches: very gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 18 to 35 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Haven

Percent of map unit: 10 percent
Landform: Terraces, plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Canton

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex

Hydric soil rating: No

Scituate

Percent of map unit: 5 percent
Landform: Depressions, hillslopes
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

416C—Narragansett silt loam, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9941
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Narragansett and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Narragansett

Setting

Landform: Ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable silty eolian deposits and/or friable loamy eolian deposits over loose sandy glaciofluvial deposits derived from metamorphic rock and/or friable sandy basal till derived from metamorphic rock

Typical profile

H1 - 0 to 2 inches: slightly decomposed plant material
H2 - 2 to 7 inches: silt loam
H3 - 7 to 35 inches: silt loam
H4 - 35 to 60 inches: very gravelly loamy sand
H5 - 60 to 65 inches: very gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 18 to 35 inches to strongly contrasting textural stratification
Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Charlton

Percent of map unit: 10 percent
Landform: Drumlins, ground moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Canton

Percent of map unit: 7 percent
Landform: Hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Scituate

Percent of map unit: 3 percent
Landform: Depressions, hillslopes
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

416D—Narragansett silt loam, 15 to 25 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9942
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Narragansett and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Narragansett

Setting

Landform: Ground moraines
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable silty eolian deposits and/or friable loamy eolian deposits over loose sandy glaciofluvial deposits derived from metamorphic rock and/or friable sandy basal till derived from metamorphic rock

Typical profile

H1 - 0 to 2 inches: slightly decomposed plant material
H2 - 2 to 7 inches: silt loam
H3 - 7 to 35 inches: silt loam
H4 - 35 to 60 inches: very gravelly loamy sand
H5 - 60 to 65 inches: very gravelly loamy sand

Properties and qualities

Slope: 15 to 25 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 18 to 35 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Charlton

Percent of map unit: 10 percent
Landform: Drumlins, ground moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Canton

Percent of map unit: 10 percent

Landform: Hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9
Elevation: 0 to 820 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: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Eskers, kames, outwash plains, outwash terraces, moraines
Landform position (two-dimensional): Backslope, footslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Calcium carbonate, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Deltas, dunes, outwash plains, outwash terraces
Landform position (three-dimensional): Riser, tread
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, eskers, kames, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, crest, head slope, side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear

Hydric soil rating: No

654—Udorthents, loamy

Map Unit Setting

National map unit symbol: vr1l
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, loamy, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Loamy

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Minor Components

Udorthents, sandy

Percent of map unit: 10 percent
Hydric soil rating: No

Udorthents, wet substratum

Percent of map unit: 5 percent
Hydric soil rating: Yes

Urban land

Percent of map unit: 5 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear

655—Udorthents, wet substratum

Map Unit Setting

National map unit symbol: vr1n
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, wet substratum, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Wet Substratum

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Minor Components

Urban land

Percent of map unit: 8 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear

Freetown

Percent of map unit: 4 percent
Landform: Bogs, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 3 percent
Landform: Bogs, depressions

Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

656—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 995k
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 40 percent
Urban land: 40 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Canton

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope, toeslope

Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Terraces, plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Paxton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Head slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

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Watershed Plans

ALLEN & MAJOR ASSOCIATES, INC.

M:\PROJECTS\2356-01\CIVIL\DRAWINGS\CURRENT\C-2356-01_WATERSHED-EXISTING.DWG

COMMONWEALTH OF MASSACHUSETTS
PAUL G. MATOS
CIVIL
NO. 52850
REGISTERED PROFESSIONAL ENGINEER

05-01-18
PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION

APPLICANT\OWNER:
CITIZENS ENERGY CORPORATION
88 BLACK FALCON AVENUE
CENTER LOBBY, SUITE 342
BOSTON, MA 02210

PROJECT:
ASHLAND SOLAR
OFF MEGUNKO RD & MBTA RD
ASHLAND, MA

PROJECT NO.	2356-01	DATE:	MAY 1, 2018
SCALE:	1" = 100'	DWG. NAME:	C-2356-01_
DESIGNED BY:	PGM	CHECKED BY:	PLC

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
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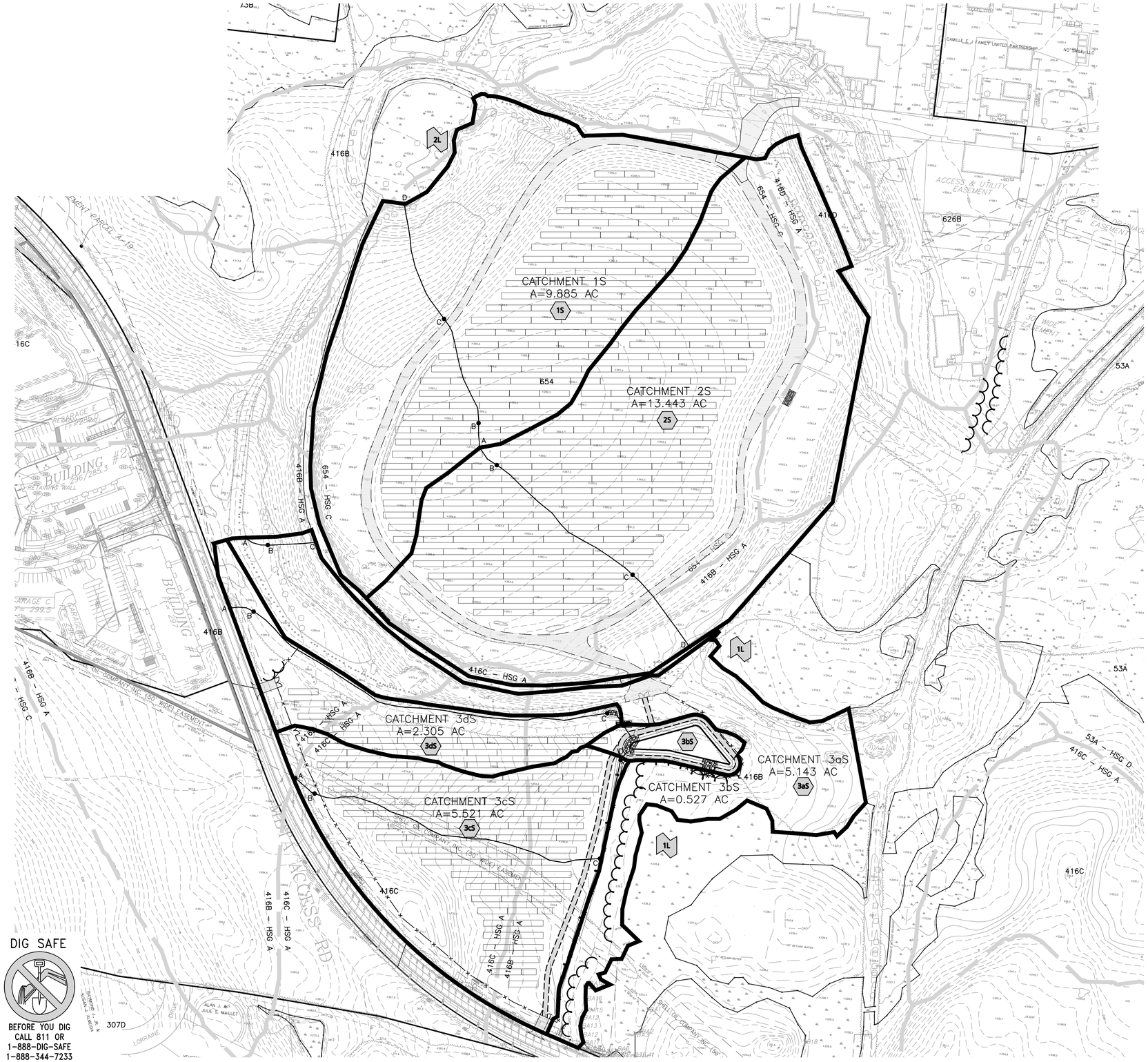
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:
EXISTING WATERSHED PLAN

SHEET No.
EWS-1



LEGEND

- EXISTING WATERSHED
- PROPOSED WATERSHED
- SCS SOILS BOUNDARY
- Tc FLOW PATH (A → B)
- SUBCATCHMENT LABEL (P-1)
- SUBCATCHMENT BOUNDARY
- FLOW DIRECTION

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

DIG SAFE

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M:\PROJECTS\2356-01\CIVIL\DRAWINGS\CURRENT\C-2356-01_WATERSHED-PROPOSED.DWG

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DRAWING TITLE:
PROPOSED WATERSHED PLAN

SHEET No.
PWS-1