

**APPLICATION FOR
SPECIAL PERMIT AND SITE PLAN
REVIEW**

for

**95 MAIN STREET
WILLIAMSBURG, MASSACHUSETTS**

Prepared for:

ZPT Energy Solutions II, LLC
6 Park Avenue, Suite 100, Lower Level
Worcester, Massachusetts 01605

Prepared by:

Meridian Associates, Inc.
500 Cummings Center, Suite 5950
Beverly, Massachusetts 01915
(978) 299-0447

October 25, 2018

Revised: January 25, 2018





VIA: HAND DELIVERY

October 25, 2018

Town Clerk
Town of Williamsburg
141 Main Street
PO Box 447
Williamsburg, Massachusetts 01039

**Re: Application of Special Permit and Site Plan Review
Large-Scale Ground-Mounted Solar Photovoltaic Facilities
95 Main Street
Williamsburg, Massachusetts**

Dear Sir/Madam,

On behalf of ZPT Energy Solutions II, LLC (Applicant), Meridian Associates, Inc. (MAI) is submitting Special Permit and Site Plan Review Applications to the Town of Williamsburg Planning Board and Zoning Board of Appeals. These applications are being submitted in accordance with Section 5 (Special Permits) of the Town's Zoning Bylaw, as well as Section 6 (Site Plan Review). This submittal has also been prepared in accordance with Section 9.30 (Ground-mounted Solar Photovoltaic Installation Requirements). The locus properties (site) is located within the Rural (RU) District. The parcels are identified as Map G Lots 75 & 76 (95 Main Street).

The applicant is proposing to install a Large-Scale Ground-Mounted Solar Photovoltaic Facility (SPF), a total of 10,900 modules (4.2± Megawatt (DC)), comprised of two arrays within an undeveloped portion of the parcel totaling 35.8± acres, 13.8± acres of which is the SPF.

The applicant has signed a development agreement with the owner to develop the SPF on the parcel. The array is located within an area of undeveloped, wooded land that has been partially cleared from logging operations and will have limited to no visibility from neighbor's view.

The solar panels will be installed using a racking system elevated above the ground utilizing posts. This installation method limits the need to regrade large areas within the proposed array, minimizing impact. Access to and from each array shall consist of a proposed 18-foot wide gravel access drive and an associated 20-foot wide turnaround area. These shall serve as access to the systems for scheduled maintenance and emergency access from an easement granted by Lee Lashaway. The SPFs will also include, but not limited to, the installation of inverter/transformer stations on concrete pads, battery storage, underground conduit, fencing, gates, and associated seeding and stabilization.



The proposed activities within the locus area will not result in an increase in stormwater runoff. Haybales, Silt fencing, Filtermitt, or equivalent has been proposed to ensure sedimentation control. Following the installation of the SPF, the area within the array and all disturbed areas shall be seeded with a "New England Conservation/Wildlife mix". This seed mix contains a variety of low-growing, low-maintenance fescues that will stabilize the ground surface.

In support of this filing we are providing the following information:

- One (1) original and sixteen (16) full size copies of the "ZPT-222 Solar Array 95 Main Street" (set of 13 sheets) dated October 3, 2018.
- Three (3) copies of the "Stormwater Analysis & Calculations for 95 Main Street" dated October 3, 2018;
- Seventeen (17) copies of this Cover Letter dated October 25, 2018;
- Seventeen (17) copies of the "Applications for Special Permit & Site Plan Review" Package dated October 25, 2018;
- Two electronic disks containing PDF's of the above items.

Thank you for your attention to this Application. Please do not hesitate to contact us if you have any questions or require additional information.

Sincerely,

MERIDIAN ASSOCIATES, INC.

Chris Ryan, EIT
Project Manager

P:\6091_ZPII-Haydenville\ADMIN\Reports\Site Plan Review and Special Permit\00.0A [6091] Cover Letter.doc

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**OWNER AFFIDAVIT AUTHORIZATION
LETTER**



VIA: HAND DELIVERY

October 5, 2018

Williamsburg Zoning Board of Appeals & Planning Board
141 Main Street
PO Box 447
Haydenville, Massachusetts 01039

**Re: 95 Main Street Solar Development
95 Main Street
Williamsburg, Massachusetts**

Dear Zoning Board of Appeals and Planning Board Members,

As the land owners of record for the property located at 95 Main Street, as referenced in the accompanying Engineering plans and further defined as Lots 75 and 76 on Assessors Map G, we hereby authorize ZPT Energy Solutions II, LLC to apply for a special permit and site plan review for the installation of a solar energy generating facility on this property.

Sincerely,

Lawrence E. & Linda A. West
95 Main Street
Williamsburg, Massachusetts 01096

**COPY OF SPECIAL PERMIT AND SITE PLAN
REVIEW APPLICATIONS**

The Commonwealth of Massachusetts
Town of Williamsburg
Office of the Board of Appeals

Application for an appeal, a Special Permit, or a Variance

To the Town Clerk of Williamsburg, Massachusetts,

Pursuant to the provisions of Chapter 40A of the Massachusetts General Laws and the Protective Bylaw of the Town of Williamsburg, application is hereby made to the Board of Appeals for:

_____ An Appeal from a decision of an Official or Board of the Town or

 X A Special Permit, as required by Section 9.30 , paragraph 2 or

_____ A Variance, as required by Section _____, paragraph _____, of

the Zoning Bylaw of the Town, to do the following:

Install a Ground-mounted Solar Photovoltaic array between 1.25 & 20 Acres in the Rural (RU) district.

(use another page if more room is needed)

On premises located at 95 Main Street

Assessor's Map and Parcel number Map G Lots 75 & 76

Owned by Lawrence E. & Linda A. West

Deed recorded Book – page 7762 - 195 & 12308 - 108

Applicant Signature _____ Phone No. (508) 713-2793

Adam Christie, Vice President
ZPT Energy Solutions II, LLC

A complete Application includes Plans, List of Abutters and Map, Fees, narrative and other supportive materials

*** Administrative Use Only ***

Completed application received by Town Clerk on _____ at _____
Date time

Town Clerk Stamp:

Town Clerk _____ Appeals Board _____
Signature Signature

Filing Fee Computation: _____ x 1.50 = Certificate of Mailing Expense of \$ _____

Expense of regular mail and publication in periodical \$ 150.00

Application No. _____ Administrative Expense \$ 100.00

Date of Hearing _____ Total Filing Fee Received \$ _____

*****A COMPLETE application must include documentation and plans as outlined on page 3 of this packet *****

The Commonwealth of Massachusetts
TOWN OF WILLIAMSBURG

Office of the
Planning Board
APPLICATION FOR SITE PLAN REVIEW


Non-residential, non-agricultural structure or structures, which have an aggregate footprint
exceeding five thousand (5000) square feet. (Section 6.0)
And not in excess of ten thousand (10,000) square feet (section 4.3)

To the Town Clerk
Williamsburg, Massachusetts:

Pursuant to the provisions the Protective Bylaw of the Town of Williamsburg, application is hereby
made to the Planning Board for Site Plan Review

On premises located at 95 Main Street Map G Lots 75 & 76
Street and number assessor's map and parcel number

Owned by Lawrence E. & Linda A. West 95 Main Street 7762 - 195 & 12308 - 108
Name address deed recorded Book - Page

Applicant  Phone (508) 713-2793
Signature Adam Christie, Vice President

Applicant ZPT Energy Solutions II, LLC address 6 Park Avenue, Suite 100, Lower Level, Worcester, MA 01605
Please print name street town zip

Please include the attached check list of application elements as part of the application.

*****ADMINISTRATIVE USE ONLY*****

Completed application received by Town Clerk _____ and _____
(date) (time)

Filing fee \$ _____
(\$250.00)

Signature of Town Clerk _____

Received by Planning Board _____
Signature date

Application No. _____ Date of Joint Public Hearing _____

**Application elements to be included as part of the application for
Site Plan Review**

		The Planning Board may request any additional information it judges to be necessary or convenient, or waive any information requirements it finds unnecessary, for the review of a particular plan.
Admini- strative Use	Included	Application Elements
		A. Fee paid. Town of Williamsburg exempted.
		B. Each application for Site Plan Review shall be submitted to the Planning Board by the current owner of record, accompanied by eleven (11) copies of the site plan.
		C. A registered architect, surveyor, landscape architect, or professional engineer shall prepare all site plans. All site plans shall be on standard 24" x 36" sheets and shall be prepared at a sufficient scale to show:
		D. The location and boundaries of the lot, adjacent streets or ways, and the location and owners names of all adjacent properties.
		E. Existing and proposed topography including two foot contours, the location of wetlands, streams, water bodies, drainage swales, areas subject to flooding, and unique natural land features.
		F. Existing and proposed structures, including dimensions and elevations.
		G. The location of existing and proposed parking and loading areas, driveways, walkways, access and egress points.
		H. The location and description of all existing and proposed septic systems, water supplies, storm drainage systems, utilities, and refuse and other waste disposal methods.
		I. Proposed landscape features including the location and a description of screening, fencing and plantings.
		J. The location, dimensions height, and characteristics of proposed signs and lighting.
		K. The location and a description of proposed open space or recreation areas.

Meets	Does Not Meet	For Administrative Response Included for Applicant Information
		6.5 Site Plan Review Criteria
		6.51 The following criteria shall be considered by the Planning Board in the review and evaluation of a site plan, consistent with a reasonable use of the site for the purposes permitted or permissible by the regulations of the district in which it is located:
		a. The development shall be integrated into the existing terrain and surrounding landscape, and shall be designed to protect abutting properties and community amenities. Building sites shall, to the extent feasible: 1) minimize impact on wetlands, steep slopes, flood plains, hilltops; 2) minimize obstruction of scenic views from publicly accessible locations; 3) preserve unique natural or historical features; 4) minimize tree, vegetation and soil removal and grade changes; 5) maximize open space retention; and 6) screen objectionable features from neighboring properties and roadways.
		b. In the absence of town services, the development shall be served with adequate water supply and waste disposal systems provided by the applicant. For structures to be served by an on-site waste disposal system, the applicant shall submit a septic system design prepared by a Certified Engineer and approved by the Board of Health.
		c. The plan shall maximize the convenience and safety of vehicular and pedestrian movement within the site and in relation to adjacent ways. The plan shall describe estimated average daily and peak- hour vehicular traffic to be generated by the site, traffic flow patterns for vehicles and pedestrians showing adequate access to and from the site, and adequate circulation within the site.
		d. The site plan shall show adequate measures to prevent pollution of surface or groundwater, to minimize erosion and sedimentation, to prevent changes in groundwater levels, and to prevent increased run-off and potential for flooding. Drainage shall be designed so that run-off shall not be increased and that neighboring properties will not be adversely affected. A system of groundwater recharge shall be provided that does not degrade groundwater quality. Recharge shall be by storm water infiltration basins or a similar system covered with natural vegetation. Dry wells shall be used only where other methods are not feasible. All basins and wells shall be preceded by oil, grease and sediment traps to facilitate removal of contamination. Any and all recharge areas shall be permanently maintained in full working order by the owner.
		e. Electric, telephone, cable TV, and other such utilities are required to be underground unless proven to be physically and environmentally unfeasible.

		f. Exposed storage areas, machinery, service areas, truck loading areas, utility buildings and other unsightly structures or uses shall be set back or visually screened to protect the neighbors from objectionable site characteristics.
		g. Outdoor lighting shall be designed to prevent glare or light, which reflects, strays or scatters beyond the subject structure of structures.
		h. Noise generated by machinery or equipment shall not extend beyond the property line.
		i. The site plan shall comply with all other provisions of this Bylaw.
		6.52 Before a finding on a site plan, the Planning Board may request the applicant to make modifications in the proposed design of the project to ensure that the above criteria are met.
		6.53 After a public hearing, the Planning Board may waive, for good cause shown, any or all requirements of site plan review where such action is in the public interest and not inconsistent with the purpose and intent of the Protective Bylaw.

COPY OF APPLICATION FEES

MERIDIAN ASSOCIATES INC.
500 CUMMINGS CENTER SUITE 5950
BEVERLY, MA 01915

210 Essex, St
Salem, MA 01970

CHECK NO.

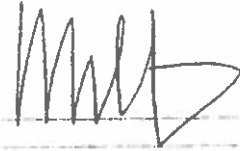
Exactly Two hundred fifty and no / 100 Dollars

DATE
10/26/2018

AMOUNT
\$250.00

PAY
TO THE
ORDER
OF

Town of Williamsburg



MP

⑈003098⑈ ⑆211370558⑆ 0889857108⑈

MERIDIAN ASSOCIATES INC.
500 CUMMINGS CENTER SUITE 5950
BEVERLY, MA 01915

SALEM FIVE
210 Essex, St
Salem, MA 01970

53-7055/2113

003099
3099

CHECK NO.

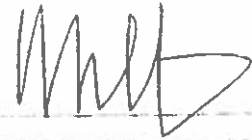
Exactly One hundred fifty and no / 100 Dollars

DATE
10/26/2018

AMOUNT
\$150.00

PAY
TO THE
ORDER
OF

Town of Williamsburg



MP

⑈003099⑈ ⑆211370558⑆ 0889857108⑈

MERIDIAN ASSOCIATES INC.
500 CUMMINGS CENTER SUITE 5950
BEVERLY, MA 01915

SALEM FIVE
210 Essex, St
Salem, MA 01970

53-7055/2113

003100
3100

CHECK NO.

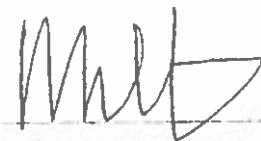
Exactly One hundred and no / 100 Dollars

DATE
10/26/2018

AMOUNT
\$100.00

PAY
TO THE
ORDER
OF

Town of Williamsburg



MP

⑈003100⑈ ⑆211370558⑆ 0889857108⑈

MERIDIAN ASSOCIATES INC.
500 CUMMINGS CENTER SUITE 5950
BEVERLY, MA 01915

SALEM FIVE
210 Essex, St
Salem, MA 01970

53-7055/2113

003101
3101

CHECK NO.

Exactly Twenty-two and 50 / 100 Dollars

DATE
10/26/2018

AMOUNT
\$22.50

PAY
TO THE
ORDER
OF

Town of Williamsburg



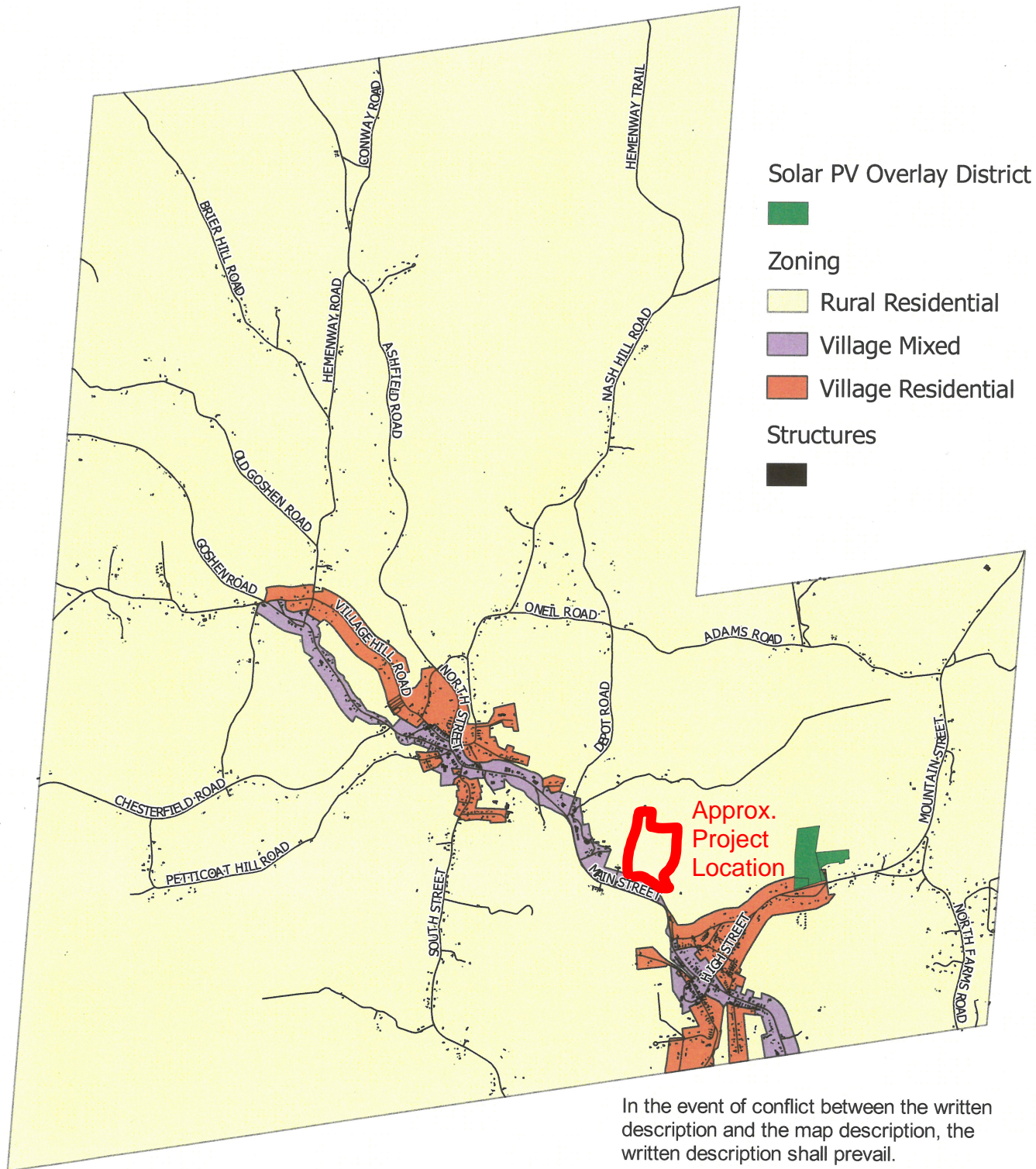
MP

⑈003101⑈ ⑆211370558⑆ 0889857108⑈

ZONING MAP

Town of Williamsburg Zoning Map

May 14, 2013



In the event of conflict between the written description and the map description, the written description shall prevail.

CERTIFIED ABUTTERS LIST

16-Oct-18

The following is a list of abutters within 300' to 95 Main St., Haydenville, MA 01039. This is further identified as G-77 on the Assessors' Maps and is owned by Lawrence and Linda West. The mailing address is 95 Main St, Haydenville, MA 01039.

<u>Name</u>	<u>Street Address</u>	<u>Mailing Address</u>	<u>Town</u>	<u>State</u>	<u>Zipcode</u>	<u>Map & Parcel</u>
Linda & Lawrence West	97 Main St	same	Haydenville	MA	1039	K-3 & G58.2
Robert Allen & Robin Karlin, TRS	99 Main St	same	Haydenville	MA	01039	K-4
Terry Lenkowski	101 Main St	same	Haydenville	MA	01039	K-5
Lisa & William Dietz	103 Main St	same	Haydenville	MA	01039	K-6
Philip Skwira	107 Main St	same	Haydenville	MA	00139	K-7
Poverty Mountain Partners, LLP	109 Main St	same	Haydenville	MA	01039	K-8
Richard & Beverly Schmith	9 Pondview Dr	same	Haydenville	MA	01039	K-9
Penelope Johnson	5 Hatfield Rd	same	Haydenville	MA	01039	K-33 & G76.1
Lee Lashway	7 Kellogg Rd	same	Leeds	MA	01053	G-47
Wmass Electric Co, Property Tax Dept	40 Walpole Rd	PO Box 270	Haydenville	MA	01039	G-66
Martha Arnold	92 Main St	PO Box 162	Williamsburg	MA	01096	G-69
David Zimicki	89 Main St	same	Haydenville	MA	01039	G-72
Mark & Annette Larareo	93 Main St	same	Haydenville	MA	01039	G-73
Susan Stebbins	91 Main St	same	Haydenville	MA	01039	G-74
Town of Williamsburg	96 Main St	PO Box 447	Haydenville	MA	01039	G-78

We certify, to the best of our abilities, that this is a list of all the abutters to 95 Main St, Haydenville, MA 01039

Williamsburg Board of Assessors

Linda & Lawrence West
Robin Karlin
Ellen Karlin

DEED INFORMATION

Affected Premises:
95 Main Street
Haydenville, MA



2016 00011638

Bk: 12308Pg: 108 Page: 1 of 2

Recorded: 06/17/2016 03:34 PM

QUITCLAIM DEED

KNOW ALL PERSONS BY THESE PRESENTS

THAT I, **LEONARD C. JEKANOWSKI**, of Northampton, Massachusetts

in consideration of **ONE AND NO/100THS (\$1.00) DOLLAR**

grant to **LAWRENCE E. WEST and LINDA A. WEST**, husband and wife, as Tenants by the Entirety

of 95 Main Street
Haydenville, MA 01039

with **QUITCLAIM COVENANTS**

The real estate known and designated as 95 Main Street, Haydenville (Williamsburg), Hampshire County, Massachusetts, bounded and described as follows:

The land with structures thereon located in Williamsburg, Hampshire County, Massachusetts, located on the northerly side of Main Street - Route 9, and being shown as Lot 1, on a Plan of Land entitled, "Plan of Land in Williamsburg, Massachusetts, prepared for Lawrence & Linda West", prepared by Holmberg & Howe, Inc., Land Surveyors & Civil Engineers, and recorded in the Hampshire County Registry of Deeds in Plan Book 236, Page 93, said parcel of land being further bounded and described as shown on said survey.

Containing 2.822 acres, more or less, according to said Plan.

Being the same premises described in deed of said Lawrence E. West and Linda A. West to the grantor herein, recorded just prior hereto in the Hampshire County Registry of Deeds.

Subject to the reservation of the Declaration of Homestead recorded in said Registry in Book 7311, Page 105.

Executed as a sealed instrument this 13th day of June, 2016.



LEONARD C. JEKANOWSKI

COMMONWEALTH OF MASSACHUSETTS

HAMPSHIRE County

On this 13th day of June, 2016, before me, the undersigned notary public, personally appeared **LEONARD C. JEKANOWSKI**, proved to me through satisfactory evidence of identification, being: [☒] driver's license or other state or federal governmental document bearing a photograph image, [] oath or affirmation of a credible witness known to me who knows such signatory, or [] my own personal knowledge of the identity of such signatory, to be the person whose name is signed above, and acknowledges to me that the foregoing instrument was signed voluntarily of the signatory's own free act and deed.



Notary Public

My Commission Expires: 4/13/18

(STAMP OR SEAL)



STEPHANIE K. BROWN
Notary Public
Commonwealth of Massachusetts
My Commission Expires
April 13, 2018

ATTEST: HAMPSHIRE, Mary Olberding, REGISTER
MARY OLBERDING



2004 00010325

Bk: 7762Pg: 195 Page: 1 of 5
Recorded: 04/20/2004 10:23 AMRELEASE DEED

MASSACHUSETTS ELECTRIC COMPANY, a Massachusetts corporation (the "Grantor"), having an address at 25 Research Drive, Westborough, Massachusetts 01582, for consideration of One Dollar (\$1.00) paid, releases and grants to **LAWRENCE E. WEST** and **LINDA A. WEST**, as tenants by the entirety (collectively, the "Grantees"), having an address at 95 Main Road, Haydenville, Massachusetts 01039, in the Town of Williamsburg, without covenants, all of its right, title, and interest, if any, in and to five (5) certain parcels of land located in the Town of Williamsburg, County of Hampshire, Commonwealth of Massachusetts, that were conveyed to the Grantor by Deed from George P. Baker, Richard C. Bond, Jervis Langdon, Jr., and Willard Wirtz, Trustees of the Property of Penn Central Transportation Company dated June 2, 1971, and recorded with the Hampshire County Registry of Deeds in Book 1605, Page 375, which five (5) parcels of land are more particularly described on Exhibit A attached hereto and made a part hereof (collectively, the "Granted Premises").

Excepting and excluding from the Granted Premises and reserving unto the Grantor the following: (1) All of the Grantor's right, title, and interest in and to any and all parcels of land that are not described on Exhibit A attached hereto and made a part hereof and (2) the rights and easements set forth on Exhibit B attached hereto and made a part hereof.

Subject to and together with the benefit of all easements, encumbrances, covenants, conditions, restrictions and other matters of record.

This conveyance does not constitute a conveyance of all or substantially all of the Grantor's assets in The Commonwealth of Massachusetts. The consideration for this conveyance is less than One Hundred Dollars (\$100) and therefore no deed stamps are required.

The Granted Premises constitute five (5) of the parcels of land conveyed to the Grantor by Deed from George P. Baker, Richard C. Bond, Jervis Langdon, Jr., and Willard Wirtz, Trustees of the Property of Penn Central Transportation Company dated June 2, 1971, and recorded with the Hampshire County Registry of Deeds in Book 1605, Page 375.

EXECUTED as an instrument under seal this 17th day of March, 2004.

MASSACHUSETTS ELECTRIC COMPANY

By: Cheryl A. LaFleur
Name: Cheryl A. LaFleur
Title: President

By: Robert G. Seega
Name: Robert G. Seega
Title: Assistant Treasurer

95 Main Rd, Haydenville, Ma

THE COMMONWEALTH OF MASSACHUSETTS

County of Worcester, ss:

On this 18th day of March, 2004, before me, the undersigned notary public, personally appeared Robert G. Seega, as Assistant Treasuere for Massachusetts Electric Company, a corporation, proved to me through satisfactory evidence of identification, which were personally known by me, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose.

(AFFIX SEAL)

Gail L. Beaulieu
My Commission Expires _____



GAIL L. BEAULIEU
Notary Public
Commonwealth of Massachusetts
My Commission Expires
October 15, 2010

EXHIBIT A

Parcel One

That certain parcel of land located in the Town of Williamsburg, County of Hampshire, Commonwealth of Massachusetts, being the same as conveyed by that certain deed recorded with the Hampshire County Registry of Deeds in Book 255, Page 131.

Parcel Two

That certain parcel of land located in the Town of Williamsburg, County of Hampshire, Commonwealth of Massachusetts, being the same as conveyed by that certain deed recorded with the Hampshire County Registry of Deeds in Book 258, Page 46.

Parcel Three

That certain parcel of land located in the Town of Williamsburg, County of Hampshire, Commonwealth of Massachusetts, being the same as conveyed by that certain deed recorded with the Hampshire County Registry of Deeds in Book 255, Page 130.

Parcel Four

That certain parcel of land located in the Town of Williamsburg, County of Hampshire, Commonwealth of Massachusetts, being the same as conveyed by that certain deed recorded with the Hampshire County Registry of Deeds in Book 249, Page 164.

Parcel Five

That certain parcel of land located in the Town of Williamsburg, County of Hampshire, Commonwealth of Massachusetts, being the same as conveyed by that certain deed recorded with the Hampshire County Registry of Deeds in Book 249, Page 155.

EXHIBIT B

EXCEPTING AND EXCLUDING FROM THIS CONVEYANCE, AND RESERVING UNTO THE GRANTOR the following perpetual rights and easements:

The exclusive perpetual right and easement to construct, reconstruct, install, repair, replace, maintain, operate, use, inspect and patrol for the transmission and distribution of high and low voltage electric energy and for the transmission of intelligence associated with the business of the Grantor, its affiliates, successors, and/or assigns, by any means, whether now existing or hereafter devised: (i) lines of buried cables or conduits or both or any combination of the same (any of which may be erected and/or constructed at the same or different times), together with all ducts, raceways, conductors, terminals, sustaining and protective fixtures, underground expansion stabilizers, manholes, hand holes, junction boxes, foundations, fittings, and all housings, connectors, switches and any other equipment or appurtenances reasonably required; and (ii) lines of towers or poles or both or any combination of the same with wires and cables strung upon and from the same (any of which may be erected and/or constructed at the same or different times), together with all guy wires, foundations, anchors, antennae, braces, fittings, buried ground wires and any other equipment or appurtenances reasonably required (collectively (i) and (ii) are hereinafter referred to as the "Facilities"), including without limitation such footbridges, causeways, and ways of access, if any, as may be necessary for the convenient construction, reconstruction, installation, repair, replacement, maintenance, operation, use, inspection and patrolling of said Facilities over, under, through, across and upon the land conveyed herein (hereinafter the "Easement Area").

ALSO, EXCEPTING AND EXCLUDING FROM THIS CONVEYANCE AND RESERVING UNTO GRANTOR, the perpetual right and easement from time to time, without further payment therefor, to (i) excavate and/or change the grade so much of said Easement Area as is reasonable, necessary and proper in connection with the exercise of the foregoing rights; (ii) clear and keep cleared by physical, chemical or other means the Easement Area of trees, underbrush, buildings, structures, and obstructions both above and below grade (the first clearing may be for less than the full width and may be widened from time to time to the full width) as is reasonable, necessary and proper in connection with the exercise of the foregoing rights; (iii) renew, repair, replace, add to and otherwise change the Facilities and each and every part thereof and all appurtenances thereto and the locations thereof within the Easement Area; and (iv) pass and repass with vehicles and equipment along the Easement Area, for the Grantor's exercise of the rights herein reserved.

By acceptance hereof, the Grantees for themselves, their respective heirs, legal representatives, successors and assigns, hereby covenant and agree that (i) no acts will be permitted within the Easement Area which are inconsistent with the rights hereby excepted, excluded and reserved unto Grantor; (ii) no permanent or temporary buildings, structures or obstructions will be erected or constructed above or below grade within the Easement Area; and (iii) the Grantees shall not excavate or fill or otherwise change or alter the present grade or ground level of the Easement Area. Notwithstanding clause (ii)

above to the contrary, the Grantees may place above grade temporary portable structures having no below grade components (collectively referred to hereinafter as "Temporary Structures" and individually as a "Temporary Structure") on the Easement Area, subject to the Grantor's right to require the removal, at the Grantees' sole cost and expense, of any such Temporary Structures from the Easement Area within sixty (60) days by giving written notice to the Grantees that Grantor, its affiliates, successors, and/or assigns, in its or their sole discretion, require(s) removal in connection with the business of the Grantor, its affiliates, successors, and/or assigns. In the event that the Grantees fail to remove the Temporary Structures from the Easement Area within said sixty (60) day period, the Grantor shall have the right, at the Grantees' sole cost and expense, to remove such Temporary Structures from the Easement Area and to dispose of the same as the Grantor deems appropriate, in its sole discretion, without liability to the Grantees.

It is the intention of the Grantor and the Grantees to except and exclude from this conveyance, and to reserve unto Grantor, its successors and assigns, all the rights and easements aforesaid and any and all additional and/or incidental rights needed to construct, reconstruct, repair, renew, replace, add to, maintain, operate, patrol, use, inspect and otherwise change, for the transmission and distribution of high and low voltage electric energy and for the transmission of intelligence associated with the business of the Grantor, its affiliates, successors, and/or assigns, the Facilities in, on, over, under, across, upon and through the Easement Area, subject to the terms and conditions contained herein, and the Grantees hereby agree to execute, acknowledge and deliver to the Grantor, its successors and assigns, such further deeds and instruments as may be necessary to secure to them the rights and easements intended to be herein reserved.

It is agreed that the Facilities shall remain the property of Grantor, its successors and assigns, and that Grantor, its successors and assigns, shall pay all taxes assessed thereon.

This easement is a commercial easement in gross for the benefit of Grantor, its successors and assigns, and the parties agree that these provisions shall run with the land conveyed herein and shall inure to the benefit of and bind the heirs, legal representatives, successors and assigns of the respective parties. It is the intention of the parties that the rights and easements reserved herein shall be assignable and apportionable by Grantor, its successors and assigns.

ATTEST: HAMPSHIRE, Marianne L. Donohue, REGISTER
 MARIANNE L. DONOHUE



TO: TOWN OF WILLIAMSBURG
FROM: CHRIS RYAN
**SUBJECT: SUPPORTING DOCUMENTATION FOR A SPECIAL PERMIT / SITE
PLAN REVIEW APPLICATION FOR A LARGE-SCALE GROUND-
MOUNTED SOLAR PHOTOVOLTAIC FACILITY (SPF)**
DATE: OCTOBER 24, 2018
CC: ZPT ENERGY SOLUTIONS II, LLC

Project Objective:

The proposed Solar Photovoltaic Facilities Project (“SPF”) shall enhance the public health, safety, and welfare of the inhabitants of the town by generating onsite clean, renewable energy which directly offsets brown power generated from the electric utility eliminating greenhouse gas emissions.

The project consists of the installation of a 13.8± acre ground-mounted solar array in the Rural (RU) Zoning District; per Section 3.0 “Use Table” an SPF is a Permitted Use with Site Plan Review (Planning Board) and a Special Permit (Zoning Board of Appeals). In support of this use we offer the following based on the criteria set forth in the “The Commonwealth of Massachusetts Town of Williamsburg Application for Site Plan Review” document; Section 5 “Special Permits”, Section 6 “Site Plan Review, and Section 9.30 “Ground-mounted Solar Photovoltaic Installation requirements”.

Application Elements to be Included as Part of the Application for Site Plan Review

- A. Fee paid. Town of Williamsburg exempted.**
- **A copy of the \$250.00 application fee has been included as a part of the submittal package.**
- Each application for Site Plan Review shall be submitted to the Planning Board by the current owner of record, accompanied by eleven (11) copies of the site plan.**
- **Eleven (11) copies of the Site Plan and associated supporting materials have been provided to the Town as a part of the submittal package.**
- B. A registered architect, surveyor, landscape architect, or professional engineer shall prepare all site plans. All site plans shall be on standard 24" x 36" sheets and shall be prepared at a sufficient scale to show:**
- **The Site Plans have been prepared on 24” x 36” paper and have been signed and sealed by a registered professional engineer.**



- C. **The location and boundaries of the lot, adjacent streets or ways, and the location and owners names of all adjacent properties.**
 - **The required information has been provided in the Permit Plan Set.**
- D. **Existing and proposed topography including two foot contours, the location of wetlands, streams, water bodies, drainage swales, areas subject to flooding, and unique natural land features.**
 - **The required information has been provided in the Permit Plan Set.**
- E. **Existing and proposed structures, including dimensions and elevations.**
 - **The only proposed structures are the solar racks. A detail is shown on sheet 13 of the Permit Plan Set.**
- F. **The location of existing and proposed parking and loading areas, driveways, walkways, access and egress points.**
 - **The required information has been provided in the Permit Plan Set.**
- G. **The location and description of all existing and proposed septic systems, water supplies, storm drainage systems, utilities, and refuse and other waste disposal methods.**
 - **The proposed storm drainage system is depicted on the plan set and stormwater report. MAI has contacted Williamsburg's utility providers and depicted all utilities that were provided. No waste will be generated from the project.**
- H. **Proposed landscape features including the location and a description of screening, fencing and plantings.**
 - **Due to the isolated proximity of the panels the existing wooded land will provide adequate screening.**
- I. **The location, dimensions height, and characteristics of proposed signs and lighting.**
 - **There will be no proposed lighting. There will be one proposed site identification sign whose location is depicted on the plan set.**
- J. **The location and a description of proposed open space or recreation areas.**
 - **Not applicable.**



SECTION 5.3 Special Permit Actions by the Applicant

- 5.31** The applicant shall file a Special Permit Application, a filing fee, a list of the abutters, and six (6) copies of the required site plan with the Zoning Board of Appeals. Applications are available from the Town Clerk.
- Six (6) copies of the Site Plan, the application, the filing fee and a certified abutters list have been provided to the Zoning Board of Appeals as a part of the submittal package.
- 5.32** The applicant is responsible for filing one (1) copy of the Special Permit Application with the Town Clerk. The effective date of filing is the date the application is filed with the Town Clerk.
- A copy of the Special Permit Application has been filed with the Town Clerk.
- 5.33** Filing fee to cover the expense of legal notices and administration costs shall be set by the Zoning Board of Appeals (See paragraph 5.41). The fee shall be delivered with the application.
- Understood.
- 5.34** The applicant shall file with the application a list of abutters with their addresses as they appear on the most recent applicable tax list. Abutters include all landowners within three hundred (300) feet of the property line of the petitioner, notwithstanding that the land of any owner is located in another city or town, as deigned by Section 11, Chapter 40A, General Laws, as amended.
- A certified abutters list has been submitted in the package.
- 5.35** The applicant shall file with the application a plan(s) of any proposed sign(s) showing the location and design. Such signs shall conform to all provisions of this Bylaw.
- A signage plan is not necessary since there will only be one proposed sign.

5.5 Criteria

Where a Special Permit may be authorized by the Zoning Board of Appeals under this Bylaw, said Authority may grant, upon written application, such Special Permit if it finds among other findings:

- a. That the structure and use will be reasonably compatible with the character and scale of other uses permitted as of right in the same district.



- **There are no proposed structures.**
- b. **That the use will not constitute a nuisance by reason of an unacceptable level of air or water pollution, or excessive noise.**
- **There will be no air or water pollution. The noise generated by the solar panels is minor and will not be audible to any abutters.**
- c. **The proposed use shall comply with any and all additional Special Permit criteria or special use regulation imposed by this Bylaw.**
- **Understood.**
- d. **The proposed project shall not create a significant adverse impact to the quality of surface water or groundwater during and after construction, and provision shall be made for maximizing groundwater recharge.**
- **A stormwater system has been proposed to address the above items.**
- e. **The design of the project shall provide for adequate methods of disposal of sewage, refuse or other waste generated by the proposed use.**
- **No waste will be generated from the project once completed.**
- f. **The design of the project shall minimize the visibility of visually degrading elements and protect the neighboring properties from potentially detrimental or offensive uses through the use screening or vegetated buffer zones.**
- **Due to the isolated proximity of the panels the existing wooded land will provide adequate screening.**

5.6 Site Plan Requirements

In all instances where a Special Permit is required for the proposed uses as specified in the Schedule of Use Requirements, no building or structure shall be erected or externally enlarged, or operation conducted, and no area for parking, loading or vehicular service (including driveways giving access thereto) shall be established or changed, except in conformity with a site plan bearing the endorsement of approval of the Zoning Board of Appeals. Said site plan shall show, the following and any other relevant items that the Zoning Board of Appeals may require: All existing and proposed buildings and structures and their uses, parking areas, loading areas, driveways, service areas, and all other open space areas, all facilities for sewer, refuse and other waste disposal and for surface water drainage, zoning district boundaries, and all landscape features (such as walks, planting areas, trees, fences, and signs) on the lot. Said plan shall be subject to such rules relating to



scale, dimensions, legend, form and preparation as may from time to time be promulgated by the Zoning Board of Appeals.

➤ **Understood.**

5.7 Conditions, Safeguards, Limitations

In granting a Special Permit, the Zoning Board of Appeals may, in accordance with MGL Chapter 40A, impose conditions, safeguards and limitations to be enforced in accordance with section 7. Such conditions, safeguards, and limitations shall be in writing and may include but are not limited to the following:

a. **Front, side and rear yards greater than the minimum required by this Bylaw; screening buffers or planting strips, fencing or wall as specified by the Zoning Board of Appeals.**

➤ **Understood.**

b. **Limitations of size, number of occupants, method or time of operation or extent of facilities.**

➤ **Understood.**

c. **Regulations of number and location of driveways, or other traffic features and off street parking or loading requirements, or special permit features beyond the minimum required by this Bylaw.**

➤ **Understood.**

d. **Screening of parking areas or other parts of the premises from adjoining properties or from streets by the use of walls, fences, plantings or other such devices.**

➤ **Understood.**

e. **Measures to protect against environmental pollution.**

➤ **Understood.**

f. **Performance bond or other security to ensure that the project meets the conditions specified in the Special Permits. Any conditions, safeguards or limitations shall be imposed in writing and shall be made a part of the special permit.**

➤ **Understood.**



Section 6.3 Required Site Plan Content

A registered architect, surveyor, landscape architect, or professional engineer shall prepare all Site Plans. All Site Plans shall be on standard 24" x 36" sheets and shall be prepared at a sufficient scale to show:

- a. The location and boundaries of the lot, adjacent streets or ways, and the location and owners' names of all adjacent properties.**
 - **The required information has been provided in the Permit Plan Set.**
- b. Existing and proposed topography including two-foot contours, the location of wetlands, streams, water bodies, drainage swales, areas subject to flooding, and unique natural land features.**
 - **The required information has been provided in the Permit Plan Set.**
- c. Existing and proposed structures, including dimensions and elevations.**
 - **There are no proposed structures.**
- d. The location of existing and proposed parking and loading areas, driveways, walkways, access and egress points.**
 - **The required information has been provided in the Permit Plan Set.**
- e. The location and description of all existing and proposed septic systems, water supplies, storm drainage systems, utilities, and refuse and other waste disposal methods.**
 - **The proposed storm drainage system is depicted on the plan set and stormwater report. MAI has contacted Williamsburg's utility providers and depicted all utilities that were provided. No waste will be generated from the project.**
- f. Proposed landscape features including the location and a description of screening, fencing and plantings.**
 - **Due to the isolated proximity of the panels the existing wooded land will provide adequate screening.**
- g. The location, dimensions height, and characteristics of proposed signs and lighting.**
 - **There will be no proposed lighting. There will be one proposed site identification sign whose location is depicted on the plan set.**



- h. The location and a description of proposed open space or recreation areas.**

- **Not Applicable.**

- i. The Planning Board may request any additional information it judges to be necessary or convenient, or waive any information requirements it finds unnecessary, for the review of a particular plan.**

- **Understood.**

Section 6.5 Site Plan Review Criteria

6.51 The following criteria shall be considered by the Planning Board in the review and evaluation of a Site Plan, consistent with a reasonable use of the site for the purposes permitted or permissible by the regulations of the district in which it is located:

- a. The development shall be integrated into the existing terrain and surrounding landscape, and shall be designed to protect abutting properties and community amenities. Building sites shall, to the extent feasible:**

- 1. Minimize impact on wetlands, steep slopes, flood plains, hilltops**

- **The proposed SPF has been designed to avoid any wetland buffers or areas of potential flooding. See the Erosion Control Plan for measures used to protect steep slopes.**

- 2. Minimize obstruction of scenic views from publicly accessible locations**

- **The proposed SPF project will not obstruct any scenic views.**

- 3. Preserve unique natural or historical features**

- **The proposed SPF project does not affect unique natural and historical features.**

- 4. Minimize tree, vegetation and soil removal and grade changes**

- **The proposed SPF project has minimal grading and the minimum tree clearing in order for the system to function efficiently.**

- 5. Maximize open space retention**

- **The proposed SPF project maximizes the retention of open space.**

- 6. Screen objectionable features from neighboring properties and roadways**



- **The existing wooded land will screen objectionable features from neighboring properties and roadways.**
- b. **In the absence of town services, the development shall be served with adequate water supply and waste disposal systems provided by the applicant. For structures to be served by an on-site waste disposal system, the applicant shall submit a septic system design prepared by a Certified Engineer and approved by the Board of Health.**
- **The proposed SPF project will not require domestic water or an on-site sanitary sewage disposal system.**
- c. **The plan shall maximize the convenience and safety of vehicular and pedestrian movement within the site and in relation to adjacent ways. The plan shall describe estimated average daily and peak- hour vehicular traffic to be generated by the site, traffic flow patterns for vehicles and pedestrians showing adequate access to and from the site, and adequate circulation within the site.**
- **Access for the proposed solar development is achieved from an easement provided by Lee H. Lashaway. The access is not open to the public and the proposed development will not have any effect on daily traffic conditions. The expected traffic generation from the project consists of one or two maintenance vehicles every three to six months. The low growth grass seed utilized across the site will only require maintenance two to four times per year. As a result, any traffic generated by the proposed development will be very minimal at an irregular frequency and will have no impacts on traffic. As such, existing traffic conditions will be unaffected, traffic flow patterns will remain unchanged and there will be no impact upon existing abutting public and private ways.**
- d. **The siteplan shall show adequate measures to prevent pollution of surface or groundwater, to minimize erosion and sedimentation, to prevent changes in groundwater levels, and to prevent increased run-off and potential for flooding. Drainage shall be designed so that run-off shall not be increased and that neighboring properties will not be adversely affected. A system of groundwater recharge shall be provided that does not degrade groundwater quality. Recharge 'shall be by storm water infiltration basins or a similar system covered with natural vegetation. Dry wells shall be used only where other methods are not feasible. All basins and wells shall be preceded by oil, grease and sediment traps to facilitate removal of contamination. Any and all recharge areas shall be permanently maintained in full working order by the owner.**
- **The project as designed will not increase runoff to neighboring properties. The proposed SPF project will implement stormwater features that will provide for infiltration and treatment of stormwater runoff. A stormwater management plan has been prepared and included with this submittal packet.**



- e. **Electric, telephone, cable TV, and other such utilities are required to be underground unless proven to be physically and environmentally unfeasible.**
 - **Onsite electric will be in underground conduit in all feasible locations.**
- f. **Exposed storage areas, machinery, service areas, truck loading areas, utility buildings and other unsightly structures or uses shall be set back or visually screened to protect the neighbors from objectionable site characteristics.**
 - **Exposed storage areas, and other unsightly structures or uses have been set back and/or visually screened to protect the neighbors from objectionable site characteristics.**
- g. **Outdoor lighting shall be designed to prevent glare or light, which reflects, strays or scatters beyond the subject structure of structures.**
 - **The proposed SPF project does not propose exterior lighting.**
- h. **Noise generated by machinery or equipment shall not extend beyond the property line.**
 - **The proposed SPF project generates minimal noise from machinery that will not be audible to any abutters.**
- i. **The site plan shall comply with all other provisions of this Bylaw.**
 - **The proposed SPF project Site Plans comply with all other provisions of the bylaw.**
- 6.52 **Before a finding on a site plan, the Planning Board may request the applicant to make modifications in the proposed design of the project to ensure that the above criteria are met.**
 - **Should changes to the Site Plan be requested, the applicant will work with the town to address any requested plan changes.**
- 6.53 **After a public hearing, the Planning Board may waive, for good cause shown, any or all requirements of site plan review where such action is in the public interest and not inconsistent with the purpose and intent of the Protective Bylaw.**
 - **The Applicant concurs that after a public hearing, the Planning Board may waive, for good cause shown, any or all requirements of Site Plan Review where such action is in the public interest and not inconsistent with the purpose and intent of this Bylaw.**



Section 9.30-4 Site Plan Review

9.30-4.1 All plans and maps shall be prepared, stamped and signed by a Professional Engineer licensed to practice in Massachusetts.

- **The proposed Site Plans have been prepared by and stamped by a Professional Engineer.**

9.30-4.2 Pursuant to the required site plan content described in Section 6.3 of the Zoning Bylaw, the project proponent shall provide the following additional documents and information. The Planning Board (or Zoning Board of Appeals, if special permit as applicable) may waive any of these requirements as it deems appropriate.

(a) A site plan showing:

- i. Property lines and physical features, including roads for the project site, wetlands, wildlife corridors and other relevant features;**

- **Included in the proposed Site Plans.**

- ii. Location and approximate height of tree cover, including any trees on public property that are age 75 years and older or with a diameter of 36 inches or greater, and any trees that are within the jurisdiction of the Tree Warden;**

- **Tree heights are shown on the Record Conditions Plan. No trees on public property or within the jurisdiction of the tree warden will be altered.**

- iii. Proposed changes to the landscape of the site, including roads, grading, vegetation clearing and planting, roads, parking areas, exterior lighting, screening vegetation or structures;**

- **Included in the proposed Site Plans.**

- iv. Blueprints or drawings of the 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 structures and vegetation, including those on abutting property(ies);**

- **Included in the proposed Site Plans.**

- v. A three-line electrical diagram detailing the solar photovoltaic installation, associated components, and electrical interconnection methods, with all National Electrical Code compliant disconnects and overcurrent devices;**



- **Included in the submittal package. (See attachment #4)**
- vi. **Documentation of the major system components to be used, including the photovoltaic panels, mounting system, and inverter;**
 - **Included in the submittal package. (See attachment #7)**
- vii. **Name, address, and contact information for the proposed system installer;**
 - **Pro-Tech Energy Solutions, 215 Executive Drive, Moorestown, NJ 08057, (856) 437-6220 (office)**
- viii. **Name, address, phone number and signature of the project proponent, as well as all co-proponents and property owners, if any;**
 - **Included in the submittal package. (See attachment #6)**
- ix. **The name, contact information and signature of any agents representing the project proponent; and**
 - **Included in the submittal package. (See attachment #6)**
- (b) **Documentation of actual or prospective access and control of the project site (see also Section 9.30-5);**
 - **Documentation of actual or prospective access and control of the project site has been provided in the submittal package. (See attachment #2)**
- (c) **An operation and maintenance plan (see also Section 9.30-6);**
 - **An Operations and Maintenance Plan has been provided in the submittal package. (See attachment #6). See the stormwater report for a detailed Stormwater O&M.**
- (d) **Zoning district designation for the parcel(s) of land comprising the project site (submission of a copy of a zoning map with the parcel(s) identified is suitable for this purpose);**
 - **A copy of the Zoning Map has been included in the submittal package.**
- (e) **Proof of liability insurance consistent with industry standards for the proposed facility**
 - **Proof of liability insurance has been provided in the submittal package. (See attachment #1).**



- (f) **Description of financial surety that satisfies Section 9.30-13;**
- **The applicant requests that this item be included as a condition of approval. The decommissioning and removal of the equipment depicted on the Permit Site Plan may require revisions as we work through the permitting process. We request that prior to the issuance of a building permit, the applicant shall submit a decommissioning plan and receive approval from the Planning Board that satisfies this requirement. (See attachment #8)**
- (g) **Pre- and post-construction color photorealistic visualizations of the existing site and proposed large-scale ground-mounted solar photovoltaic installation from at least four perspectives (with a total of at least 180-degree separation) specified by the permitting authority, including from the nearest residential structure and of the area(s) that are most publicly visible, with technical explanation of how visualization was produced.**
- **Photorealistic visualizations have been prepared and included with the submittal package. (See attachment #11)**
- 9.30-5 The project proponent shall submit documentation of actual or prospective access and control of the project site sufficient to allow for construction and operation of the proposed solar photovoltaic installation.**
- **Proof of actual or prospective access and control of the project site sufficient to allow for construction and operation of the proposed solar photovoltaic installation has been included in the submittal package. (See attachment #2).**
- 9.30-6 The project proponent shall submit a plan for the operation and maintenance of the ground- mounted solar photovoltaic installation, which shall include measures for maintaining safe access to the installation, storm water controls, as well as general procedures for operational maintenance of the installation.**
- **An Operations and Maintenance Plan has been provided in the submittal package. (See attachment #6). See the stormwater report for a detailed Stormwater O&M**
- 9.30-7 No ground-mounted solar photovoltaic installation shall be constructed until evidence has been given to the Planning Board that the utility company that operates the electrical distribution system grid where the installation is to be located has been informed by the owner or operator of the proposed solar photovoltaic installation of their intent to install an interconnected customer-owned generator.**



- Evidence has been given to the Planning Board that the utility company operates the electrical distribution system grid where the installation is to be located and has been informed by the owner or operator of the proposed solar photovoltaic installation of their intent to install an interconnected customer-owned generator. (See attachment #3).

9.30-8 Dimension and Density Requirements

9.30-8.1 The setbacks for ground-mounted solar photovoltaic installations, including appurtenant structures and parking areas, shall be at least 50 feet from any property boundary. The setback areas shall not be included in the calculation of the size of the ground-mounted solar voltaic installation. The height of a ground-mounted solar photovoltaic installation or any appurtenant structure shall comply with the requirements of Sections 4.4 and 4.5 of the Williamsburg Zoning Bylaw.

- **Setback Height Requirements:** The proposed SPF project is setback more than fifty (50) feet from the property lines and the panels are less than forty (40) feet in height.

9.30-8.2 The lot coverage requirements of Section 9.3 of the Williamsburg Zoning Bylaw do not apply to ground-mounted solar photovoltaic installations.

- **Understood.**

9.30-8.3 All appurtenant structures to ground-mounted solar photovoltaic installations shall comply with the requirements of Section 9.2 Accessory Structures of the Williamsburg Zoning Bylaw. All such appurtenant structures include but are not limited to equipment shelters, storage facilities, transformers, and substations.

- **The proposed SPF project complies with the requirements for appurtenant structures.**

9.30-9 Design Standards

9.30-9.1 Lighting of solar photovoltaic installations shall be consistent with Section 9.12 of the Williamsburg Zoning Bylaw and all other applicable state and federal laws. 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 solar photovoltaic installation shall be directed downward and shall incorporate full cut-off fixtures to reduce light pollution.

- **The proposed SPF project does not include exterior lighting.**



9.30-9.2 Any signs on ground-mounted solar photovoltaic installations and property shall comply with Section 9.8 Sign Restrictions of this Zoning Bylaw. A sign shall be required to identify the owner and provide a 24-hour emergency contact phone number. Solar photovoltaic installations shall not be used for displaying any advertising except for reasonable identification of the manufacturer or operator of the solar photovoltaic installation.

➤ **The proposed SPF projects signage is in compliance with the Bylaw.**

9.30-9.3 Reasonable efforts, as determined during the site plan review, shall be made to place all utility connections from the solar photovoltaic installation underground, depending on appropriate soil conditions, shape, and topography of the site and any requirements of the utility provider. Electrical transformers for utility interconnections may be above ground if required by the utility provider.

➤ **The proposed SPF project depicts the proposed utilities to be located underground where possible.**

9.30-9.4 All land associated with the ground-mounted solar installation shall be covered and grown in natural vegetation. All ground surface areas beneath solar arrays and setback areas shall be pervious to maximize on-site infiltration of stormwater. Impervious paving of areas beneath solar arrays is prohibited. To the greatest extent possible, a diversity of plant species shall be used, with preference given to species that are native to New England. Use of plants identified by the most recent copy of the “Massachusetts Prohibited Plant List” maintained by the Massachusetts Department of Agricultural Resources is prohibited. Herbicides shall be applied only by properly licensed personnel in conformance with all applicable state regulations.

➤ **The proposed SPF project proposes ground surface areas beneath solar arrays and setback areas as pervious cover comprised of natural vegetation.**

9.30-9.5 Reasonable on-site parking is required for vehicles that will service the installation only. The requirements of Section 9.6 Off-street Parking of the Williamsburg Zoning Bylaw do not apply. The requirements of Section 10 Driveway Standards of the Williamsburg Zoning Bylaw do apply. The frontage requirements of Section 9.0 of the underlying district do apply.

➤ **There are no proposed parking or loading areas as a result of this project. Within the array area, adequate distance from the drive to the proposed fence was provided. The proposed project will only result in occasional vehicles for routine**



maintenance a few times per year accessed from the proposed entrances on Hatfield Street.

9.30-9.6 The plan for a ground-mounted solar photovoltaic installation shall be designed to maximize the preservation of on-site and abutting natural and developed features. In natural (undeveloped) areas, existing vegetation shall be retained to the greatest extent possible, especially where such vegetation provides a benefit to the natural environment. In developed areas, the design of the installation shall consider and incorporate human-designed landscape features to the greatest extent, including contextual landscaping and landscape amenities that complement the physical features of the site and abutting properties. Whenever reasonable, structures should be screened from view by vegetation and/or joined or clustered to avoid adverse visual impacts and be architecturally compatible with each other. Vegetation shall be of varieties native to New England. Vegetative screening shall reach a mature form to effectively screen the installation within five years of installation. The mature height of the vegetated screening shall be such that the installation's structures are not apparent to a person upon any public road and viewing the installation from a height of 10 feet. Planting of the vegetative screening shall be completed prior to final approval of the photovoltaic installation by the Building Inspector.

- **The proposed SPF project has been designed such that the installation's structures are not apparent to a person upon any public road and viewing the installation from a height of ten (10) feet. The site will have adequate remaining natural screening between the proposed array and abutting properties.**

9.30-10 Safety and Environmental Standards

9.30-10.1 The owner or operator of the ground-mounted solar photovoltaic installation shall provide a copy of the project summary, electrical schematic, and site plan to the Williamsburg Fire Chief. Upon request, the owner or operator shall cooperate with local emergency services in developing an emergency response plan. All means of disconnecting the solar photovoltaic installation shall be clearly marked. The owner or operator shall identify and provide contact information for a person who is responsible for responding to all public and emergency inquiries related to the installation. This information shall be updated as needed.

- **Access to the solar energy facility will be from land now or formerly Lee H. Lashaway utilizing a proposed eighteen (18) foot wide access drive to the solar arrays. The solar energy facilities will be secured from unauthorized access with a seven (7) foot tall perimeter chain link fence and gates. The twenty-four (24) foot wide control gate will be located at each array. A Knox box will be located at each gate and municipal emergency personnel will have key access to the boxes for**



entry to the facility as necessary. Signs will be placed at the gates, as well as around the perimeter fencing to make it clear that unauthorized access to the facility is prohibited. The applicant or operator shall provide a copy of the project summary, electrical schematic, and site plan to the Fire Chief and Police Chief, shall identify a responsible person for public inquiries throughout the life of the SPF, and all means of shutting down the SPF shall be clearly marked prior to the issuance of a Building Permit.

9.30-10.2 Clearing of natural vegetation shall be limited to that which is necessary for the construction, operation and maintenance of the ground-mounted solar photovoltaic installation or otherwise prescribed by applicable laws, regulations, and bylaws. Sufficient vegetation shall be maintained to minimize soil erosion. Ground-mounted solar photovoltaic installations shall be installed only upon water permeable surfaces as approved during site plan review.

- The proposed SPF project has been designed to be limited to clearing only that area which is necessary for the construction, operation, removal of shade and maintenance of the ground-mounted solar photovoltaic installation.

9.30-10.3 Ground-mounted solar photovoltaic installations shall be designed and constructed to preserve and maintain the health and root systems of significant trees on public property and within the jurisdiction of the Tree Warden that are age 75 years and older or at least three feet in diameter at a height of four feet above the ground. Any removal of trees on public property shall be consistent with MGL Chapter 87 Shade Trees, MGL Chapter 40 Section 15C Scenic Road Designations and all other applicable laws and regulations.

- No portion of the SPF project is located within public property, and as such, no mature trees located on public property will be impacted.

9.30-10.4 Ground-mounted solar photovoltaic installations shall be designed and constructed to minimize the impacts on and optimize the maintenance requirements of wildlife corridors.

- The proposed SPF project has been designed to minimize the impacts on and optimize the maintenance requirements of wildlife corridors. A wildlife habitat study will be undertaken by the applicant and presented to the Board.

9.30-10.5 Hazardous materials that are stored, used, or generated on site shall not exceed the amount for a Very Small Quantity Generator of Hazardous Waste as defined by Massachusetts Department of Environmental Protection regulations 310 CMR 30.000 and shall meet all applicable requirements, including storage of hazardous materials in a building with an impervious floor that is not adjacent to any floor drains to prevent discharge to the



outside environment. If hazardous materials are utilized within the solar electric equipment, then impervious containment areas capable of controlling any release to the environment and to prevent potential contamination of groundwater are required.

- **The proposed SPF project does not require the use or storage of any hazardous materials or chemicals.**

9.30-11 Monitoring and Maintenance

9.30-11.1 The owner or operator of the ground-mounted solar photovoltaic installation shall maintain the facility in good condition. Maintenance shall include, but not be limited to, painting, structural repairs, landscaping and integrity of security measures. Site access shall be maintained to a level acceptable to the Williamsburg Fire Chief, Building Inspector and Electrical Inspector. The owner or operator shall be responsible for the cost of maintaining the installation and any access road(s), unless accepted as a public way.

- **Refer to the previously stated Operations and Maintenance Plan.**

9.30-11.2 All material modifications to a solar photovoltaic installation made after issuance of the required building permit shall require approval by the Planning Board.

- **The owner / operator understands that modifications to a solar photovoltaic installation made after issuance of the required building permit shall require approval by the Planning Board.**

9.30-11.3 The owner or operator of the installation shall submit an Annual Report which certifies compliance with the requirements of this bylaw and the approved site plan. The Annual Report shall also provide information on the quantity of electricity generated, the percentage of generated electricity that was used off site, and maintenance completed during the course of the year. The Annual Report shall include a reasonable photo survey of the installation. The report shall be submitted to the Select Board and the Planning Board no later than June 30 of each year. The owner or operator shall allow and make arrangements for an authorized agent of the Town of Williamsburg to enter the property to verify the contents of the Annual Report following its submittal if requested.

- **The owner or operator of the installation will submit an Annual Report which certifies compliance with the requirements of the bylaw and the approved site**



plan. The Annual Report shall also provide information on the quantity of electricity generated, the percentage of generated electricity that was used off site, and maintenance completed during the course of the year. The Annual Report shall include a reasonable photo survey of the installation. The report will be submitted to the Select Board and the Planning Board no later than June 30 of each year. The owner or operator will allow and make arrangements for an authorized agent of the Town of Williamsburg to enter the property to verify the contents of the Annual Report following its submittal if requested.

9.30-12 Removal Requirements and Abandonment

9.30-12.1 Absent notice of a proposed date of decommissioning, the filing of an annual report as required in 9.30-11.3, or written notice to the Planning Board of extenuating circumstances, the solar photovoltaic installation shall be considered abandoned when it fails to operate for more than one year without a written waiver of 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 within 150 days of abandonment or the proposed date of decommissioning, the town or its agents may enter the property and physically remove the installation, the full cost of which shall be the responsibility of the owner or operator.

➤ **Understood**

9.30-12.2 Any ground-mounted solar photovoltaic installation which has reached the end of its useful life or has been abandoned consistent with Section 9.30-12.1 of this bylaw 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 ground-mounted solar photovoltaic installations, structures, equipment, security barriers and electrical lines from the site;**

➤ **Understood.**

- (b) Disposal of all solid and hazardous waste in accordance with local, state, and federal waste disposal regulations;**

➤ **Understood.**

- (c) Stabilization and 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 to minimize erosion and disruption to vegetation.

➤ **Understood.**

9.30-13 Financial Surety

The project proponent of ground-mounted solar photovoltaic projects shall provide a form of surety, either through escrow account, bond or otherwise, to cover the cost of removal in the event the town becomes responsible for removing the installation and remediating the landscape. The amount and form of the surety shall be determined to be reasonable by the permitting authority, but in no event should exceed more than 125 percent of the cost of removal and compliance with the additional requirements set forth herein, as determined by the project proponent. Such surety is not required for municipally-owned or state-owned facilities. 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.

➤ **A decommissioning letter outlining the cost of removal in the event the Town must remove the facility and restore the landscape has been attached. The decommissioning amount has included a mechanism for calculating increased removal costs due to inflation. The applicant will coordinate with the Town to set up a mutually agreed upon form of surety for the decommissioning of the system.**

9.30-14 Upon request of the Planning Board, the proponent shall pay for a licensed third-party Independent Engineer selected by the permitting authority to review submittals on their behalf.

➤ **Understood**

ATTACHMENT 1:
PROOF OF LIABILITY INSURANCE



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

09/20/2018

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 Securitas Insurance Partners, LLC 7 Great Valley Parkway Suite 100 Malvern PA 19355	CONTACT NAME: Michael Knight PHONE (A/C, No, Ext): (484) 324-2794 E-MAIL ADDRESS: mknight@securitasins.com FAX (A/C, No):																					
INSURED Pro-Tech Energy Solutions, LLC 215 Executive Drive Moorestown NJ 08057-4221	<table><tr><th colspan="2">INSURER(S) AFFORDING COVERAGE</th><th>NAIC #</th></tr><tr><td>INSURER A:</td><td>Continental Insurance Company</td><td>35289</td></tr><tr><td>INSURER B:</td><td>Valley Forge Insurance Company</td><td>20508</td></tr><tr><td>INSURER C:</td><td>Continental Casualty Company</td><td>20443</td></tr><tr><td>INSURER D:</td><td>Tokio Marine Specialty Insurance Company</td><td>23850</td></tr><tr><td>INSURER E:</td><td></td><td></td></tr><tr><td>INSURER F:</td><td></td><td></td></tr></table>	INSURER(S) AFFORDING COVERAGE		NAIC #	INSURER A:	Continental Insurance Company	35289	INSURER B:	Valley Forge Insurance Company	20508	INSURER C:	Continental Casualty Company	20443	INSURER D:	Tokio Marine Specialty Insurance Company	23850	INSURER E:			INSURER F:		
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INSURER D:	Tokio Marine Specialty Insurance Company	23850																				
INSURER E:																						
INSURER F:																						

COVERAGES**CERTIFICATE NUMBER:** CL1842700789**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	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC OTHER:			6046309637	04/30/2018	04/30/2019	EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 300,000 MED EXP (Any one person) \$ 15,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000 \$ \
B	<input checked="" type="checkbox"/> AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO <input type="checkbox"/> OWNED AUTOS ONLY <input type="checkbox"/> HIRED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> NON-OWNED AUTOS ONLY			6046392857	04/30/2018	04/30/2019	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$
A	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> EXCESS LIAB DED <input checked="" type="checkbox"/> RETENTION \$ 10,000			6024615518	04/30/2018	04/30/2019	EACH OCCURRENCE \$ 10,000,000 AGGREGATE \$ 10,000,000 \$
C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y / N <input type="checkbox"/>	N / A	6046392874	04/30/2018	04/30/2019	<input checked="" type="checkbox"/> PER STATUTE E.L. EACH ACCIDENT \$ 1,000,000 E.L. DISEASE - EA EMPLOYEE \$ 1,000,000 E.L. DISEASE - POLICY LIMIT \$ 1,000,000
D	Professional Liability & Pollution Liability			PPK1689555	07/30/2018	07/30/2019	\$8,000,000 Per Occurren \$8,000,000 Aggregate \$50,000 Deduc.

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

Evidence Only.

CERTIFICATE HOLDER**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

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ATTACHMENT 2:
SITE CONTROL



VIA CERTIFIED MAIL

September 25, 2018

Mr. Lawrence West
95 Main Street
Haydenville, MA 01039

Dear Larry,

In accordance with the terms of Section 3 of the Letter of Intent (the "LOI") dated August 8, 2017, between Lawrence West and Linda West and Zero Point Development, Inc. and its affiliates, we have extended the LOI for six months, to February 8, 2019, and you have received the first three months installment with a check for \$[REDACTED].

Enclosed please find a check in the amount of \$[REDACTED], representing a payment of \$[REDACTED] for the first three months of the extension.

All other terms of the LOI shall remain in full force and effect.

Sincerely,

Tony Pawlik

*Tony Pawlik
Sr Vice President
Pro-Tech Energy Solutions*

*6 Park Ave.
Worcester, MA 01605*

office: (856) 437-6220
fax: (856) 437-6501

215 Executive Drive
Moorestown, NJ 08057

protechenergysolutions.com

August 8, 2017

Lawrence West
95 Main St
Haydenville, MA 01039

Dear Mr. West,

This Letter of Intent (LOI) is intended to set for the basic terms under which Zero Point Development, Inc. and its affiliates as proposed Lessee (hereinafter referred to as "Lessee") will lease from Lawrence West and Linda West as proposed Lessor (hereinafter referred to as "Lessor") a portion of the properties known as 95 Main St, Haydenville, MA, on property map parcel ID# 340011K00000003A, LS Book 2086, Page 065 as referenced in Appendix A (the "Leased Areas"). Final location of the solar array will be mutually agreed to by both parties.

The Purpose of the lease is for the installation of a photovoltaic generating facility (the "Generating Facility") on the Leased Areas in order to generate electric power for sale and distribution. It is understood that upon execution by both parties the LOI they shall precede towards the preparation and finalization of a Lease Agreement ("Lease"). The Lease, among other items, will provide additional details regarding schedule of projected approval submission times, installation, and maintenance of the Generating Facility and Leased Areas. The Lease will incorporate the terms of the Letter of Intent and will contain additional terms reflecting the structure of the transaction as well as customary representations, warranties, covenants, and conditions.

The basic terms of the transaction are as follows:

1. **Property.** The Leased Areas to be leased and upon which the Generating Facilities will be installed and operated consists of approximately 10 -20 acres of that parcel at the Leased Areas as described above and shown in Appendix A attached.
2. **Lease Agreement.** In order to permit the installation and operation of the Generating Facility on the Leased Areas, the Owner will enter into a Lease which will provide that during the Lease term, the lessee will have the right to enter and occupy all of the portions of the Leased Areas that is needed to install, operate to its maximum efficiency, maintain, replace and have access to the Generating Facility. In addition to such normal and customary terms for commercial land leases, the Lease shall contain such terms and conditions, supplemental to the LOI as reasonably required by Lessee in order for the Lessee to engage in the Generating Facility Activities and to assure that its occupancy of the Leased Areas is not disturbed for the duration of the Lease Agreement by Lessor or anyone acting on Lessor's behalf. It will be necessary, as a condition under the Lease, for the Lessor to obtain consent of any holder of any mortgage or security interest in the Property or any improvement constructed or installed thereon to a subordination and non-disturbance agreement subordinating the priority of such mortgage or security interest to the interest of the Lessee in the Generating Facility so that (i) the generating Facility is considered the personal property of Lessee or its nominee, and shall survive any liens

existing and related to the property to which the facility has utilized (ii) the Lessee will be permitted access to the property to remove the Generating Facility, at its' option, if the Lease is terminated or if the Property is foreclosed upon or title to the Property is otherwise transferred on terms and conditions reasonably acceptable to Lessor and security interest holder.

3. **Termination of LOI/Extension Option.** This LOI shall automatically terminate in the event that the parties hereto do not execute the contemplated lease within 12 months of the date of this LOI. However, in the event the parties have not executed the contemplated lease within 12 months, then, at the election of the Lessee and upon written notice of such election to the Lessor, the Lessee may extend the terms of this Letter of Intent for up to an additional 6 months provided that the Lessee pays to the Lessor [REDACTED] for each month of such extension. In the event the Lessor intends to exercise this Extension Option, Lessor shall notify Lessee, in writing of its intent to exercise such option at least 7 days prior to the expiration of this LOI (or prior extension then in effect) and, with such written notice, payment of the option payment of [REDACTED] reflected above. All Extension Option shall be nonrefundable.
4. **Lease Term and Rent.** The initial term of the Lease shall begin upon execution of the Lease and terminate twenty-five (25) years from Commercial Operation Date (COD as determined by the utility company) of the generating Facility, with three (3) renewable options (upon mutual agreement of Lessee and Lessor) of five (5) years each. Assuming the Lease is initiated by Lessee, Lessee's obligation to pay rent shall commence upon COD of the generating Facility or four (4) months from the commencement of the lease, whichever occurs first. If the Lessee has not exercised the Lease to the Leased Areas prior the expiration of this LOI, this LOI shall be void and of no further force and effect. Owner shall not be responsible for paying any commissions, charges, or fee in connection with the negotiation and entry into this LOI, and Lessee shall indemnify and hold Owner harmless from any commissions, fees, or charges arising from any real estate agent or broker involved in the transaction by its representation, contractors or its agents.
5. **Termination of Lease.** The term of the Lease shall include a reasonable period, not to exceed sixty days, to allow removal of the Generating Facility and cleanup of the real property, during which period Lessee shall not be charged rent, but shall pay taxes, insurance premiums and any other holding costs related to the Leased Areas.
6. **LOI Consideration.** As consideration for the terms of this LOI Lessee shall pay Lessor, the nonrefundable sum of \$ [REDACTED] to bind the parties to the terms referenced herein.
7. **Lease Payment.** The Lessee shall pay Lessor, as lease payments, [REDACTED] per month during the construction and development phase (said timeframe not to exceed 4 months from the date the lease is executed) and, thereafter, no less than \$ [REDACTED] per MW AC installed (the "Lease Rate") per year, payable annually, on or before January 1 of each year (said rent to be prorated and paid in advance from the date of the COD through the end of the initial year of the lease term).

The intent is to install a 1MW AC / 2MW AC / 5MW AC solar array. All Payments shall be non-refundable except in the case of Lessor default under the Lease beyond any applicable cure period.

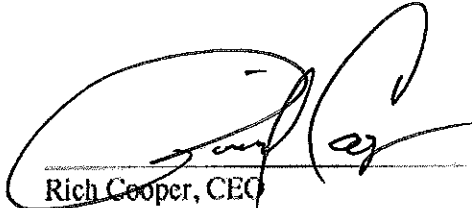
The parties agree to negotiate the annual lease amount upon DOER releasing the final program details for the new FIT solar incentives. It is understood by both parties that the new incentives could adjust the lease upward or downward based on the economic realities of the program.

The Lease Rate also contemplates a total combined interconnection payment, as determined by the Utility Company of less than [REDACTED] per MW, should the interconnection payment exceed [REDACTED] per MW, the Lease Rate shall be decreased by [REDACTED] per MW AC for every [REDACTED] the interconnection payment exceeds [REDACTED] per MW

8. **Operation and Maintenance.** Lessee and its affiliates, at its sole cost and expense, will be solely responsible for designing, constructing, installing, operating, maintaining, replacing and upgrading the Generating Facility and land area subject to the lease during the term of the Lease. They will also comply with all required laws, rules and regulations (Laws) regarding such designing, contracting, installing, operating, maintaining, replacing, and upgrading the Generating Facility, including but not limited to compliance with any and all environmental, wildlife, health, safety, and energy generation laws. At the end of the lease term, Lessee shall return the Leased Areas to the Lessor in a clean condition and in substantially the same state as at the commencement of the Lease, except if and to the extent Lessor notifies Lessee that any improvements made to the Property shall remain on the Leased Areas (excluding any trade fixtures, which Lessor shall not be able to require Lessee to leave on the Leased Areas).
9. **Taxes.** Lessor shall pay all real property taxes levied against the Leased Areas for land only. During the Lease Term, Lessee will be responsible for payment of any increase in real property taxes or assessments as well as for any personal property tax or assessments caused solely by the construction of the Generating Facility. Lessor agrees to cooperate with any petition submitted by Lessee pursuant to M.G.L. c.59, §38H (Acts of 1997 Chapter 164, Section 71(b), as amended) seeking a tax payment agreement with the Town of Haydenville.
10. **Maintenance of Leased Areas.** During the Option Term, Lessor will maintain the Property in its present undeveloped condition as it is as of the date of execution of this LOI and, in the event the Option is exercised and the Lease executed, in its condition as of the date of execution of the Lease. Lessor shall pay all real property taxes and assessments before any of the same becomes delinquent.


11. **Financing Approvals.** Lessee's obligation under the LOI and the lease will be expressly conditioned upon its ability to obtain all financing to construct the Generating Facility on the Leased Areas.
12. **Insurance and Indemnification.** Lessee or its agents shall, at its own expense, maintain a commercial general liability insurance policy in an amount not less than \$2,500,000.00 in combined single limit liability insurance coverage per occurrence, which coverage limit shall be reviewed and increased to correspond to market changes every five years during the lease term. Lessor shall be an insured under said policy. Lessee shall furnish the Lessor with a certificate of insurance prior to entry onto the Property. Lessee shall indemnify and hold harmless Lessor from any and all liabilities, claims, costs (including reasonable attorney's fees) expenses, actions, and penalties (collectively, Claims) arising from its actions and inactions or attributable to them at any time, in and around the Leased Areas, and for any Claims arising during the Lease term, except if and to the extent due to the gross negligence or intentional wrongdoing of Lessor. This indemnity obligation shall survive any termination of the LOI or Lease.
13. **Exclusivity.** Lessor hereby agrees that Lessor will not negotiate with any party regarding the sale or lease of the Property so long as Lessee is pursuing its rights hereunder in a timely manner and the LOI has not been terminated, recognizing that this LOI is binding upon Lessee and the Lessor.
14. **Confidentiality.** Both parties of this LOI acknowledge that they are bound by a confidentially agreement that protects the confidentiality of information provided by each other and the disclosure of the terms of the LOI.
15. **Negotiation of the Option and Lease.** Both parties to the LOI shall negotiate the Lease in good faith and may each terminate the LOI only, if exercising in good faith, they are not able to agree upon the terms of the Lease within 180 days of this date. A draft of the Lease Agreement shall be furnished to the Lessee within 30 days of the execution of this LOI by all parties.
16. **Limited Binding Effect.** Both parties agree that this LOI contains sufficient terms and conditions regarding the subject matter of this LOI to be considered a binding agreement between the parties, recognizing that the Lease will contain additional provisions and terms, and subject to the termination of this LOI as provided herein.

*[The remainder of this page has been intentionally left blank.
Signatures appear on next page]*


Rich Cooper, CEO
Pro-Tech Energy Solutions

Date: 10/11/17

Accepted by Lessor

Signature: 
Name: LAURENCE E. WEST
Title: LAND OWNER

Date: 8/11/17

Signature: _____
Name: _____
Title: _____

Date: _____

Appendix A – Proposed PV Location



Contract for Easement

This Contract for Easement Agreement (this “Agreement”) is by and between Lee H. Lashway of 94 Audubon Road, Leeds, Massachusetts (hereinafter “Grantor”), his/her successors and assigns, and ZPT Energy Solution II, LLC, a Massachusetts limited liability company with an address of 309 East County Road, Rutland, MA 01543 (hereinafter “Grantee”), its successors and/or assigns, for the grant of an easement over lands of the Grantor located off Kellogg Road, Haydenville, Massachusetts and more particularly described in a deed recorded at the Worcester District Registry of Deeds in Book 2659, Page 271 (“Premises”), said easement to be for a utility easement and access easement.

WHEREAS the Grantee has entered, or intends to enter, into a lease for all or a portion of the real estate located at and known as 95 Main Street, Haydenville, Massachusetts, 5 Hatfield Road, Haydenville, Massachusetts and such other nearby parcels of land as are necessary or convenient for the development of solar (“Solar Premises”) for the purpose of installing a solar array or solar facility (“Solar Facility”) which requires access to sunlight;

WHEREAS, the Grantor is the owner of the Premises which abuts the Solar Facility and as such, the construction, installation and maintenance of buildings, structures, improvements, trees, landscaping and other foliage on a portion of the Premises could potentially directly or indirectly impede, block or interfere with sunlight reaching the Solar Premises which would severally limit the Grantee’s ability to maintain and operate the Solar Facility;

WHEREAS, the Grantor and Grantee agree to enter into this contract to memorialize the parties agreement to enter into an Easement Agreement on the terms and conditions set forth herein;

NOW THEREFORE, in consideration of the mutual covenants and agreements herein contained and for and in consideration of the sum of Ten and 00/100 Dollars (\$10.00) and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. Easement. The parties (along with the landlord/owner of the Solar Premises; provided, however, that Grantee may elect, in its sole discretion, to waive the requirement that the landlord/owner of the Solar Premises be a party to the easement) shall enter into one or more Easement Agreements, with a duration equivalent to the period for which the Solar Premises will be leased, substantially in the form of the Easement Agreements attached hereto as Exhibit C within fifteen (15) days of written notice by the Grantee to the Grantor of the Grantee’s intention to proceed with the Easement Agreement, which notice shall include a copy of the Easement Agreement in final form. The access easement area shall be located approximately in the area set forth in the sketch attached hereto as Exhibit A. The utility easement area shall be located approximately in the area set forth in the sketch attached hereto as Exhibit B. The easements are collectively referred to herein as, the “Easement”.

2. Consideration. The total purchase price for the Easement shall be [REDACTED] Dollars ([REDACTED]), which shall be paid upon mutual execution and delivery of the Easement Agreements. Grantee may record the Easement Agreements in the registry of deeds for the municipality in which the Premises is located.

3. Access; Determination of Exact Location of Easement Area. The Grantor agrees that the Grantee, its agent, employees, contractors and representatives may enter onto the Grantor's land for purposes of determining the exact location of the easement area, including but not limited to conducting engineering, surveying and testing. Grantee shall ensure that all contractors, subcontractors or other parties engaged by Grantor in connection with or related to such activities maintain at all times customary and reasonable liability insurance. Grantor and Grantee shall mutually reasonably agree on the exact location of the easement area, and such area shall be identified in the final form of Easement Agreement. Grantor and Grantee further agree that the access easement area identified as "ACCESS EASEMENT 2" in Exhibit A may be moved by mutual agreement of Grantor and Grantee. Grantor and Grantee agree to work in good faith to determine the access easement area to replace such "ACCESS EASEMENT 2" that permits the construction of the Solar Facility.

4. Term. This Agreement shall have a term of two (2) years. If the Grantee has not notified the Grantor of its intent to proceed with the Easement Agreement within two (2) years from the date of this Agreement, then at any time thereafter (prior to Grantee sending such notice of intent to proceed) the Grantor may send written notice to Grantee terminating this Agreement, and, unless Grantee gives a notice to proceed within fifteen (15) days of receiving such notice, this Agreement shall be deemed terminated and of no further force or effect and no further payment shall be due to the Grantor.

5. Default. If the Grantor breaches this Agreement or shall fail to perform the obligations and conditions to be performed and satisfied by it hereunder, the Grantee shall be entitled to any and all remedies at law (which may include all of Grantees reasonable, out-of-pocket expenses incurred in connection with entering into this Agreement and conducting any due diligence investigations) or in equity, including but not limited to a suit for specific performance or other equitable relief in connection with the matters arising out of this Agreement and the transactions contemplated hereby.

6. Notices. All notices and other communications required or permitted to be given hereunder shall be in writing and shall be effective as of: (a) the date of delivery, if served in person or by facsimile or .pdf; (b) three (3) business days after the date of mailing, if served by certified or registered mail, postage prepaid and return receipt requested; or (c) the next succeeding business day after deposit with a responsible overnight delivery service such as UPS and/or Federal Express. Attorneys may give notice on behalf of their clients.

If to Grantor:

If to Grantee:

ZPT Energy Solution II, LLC
c/o Brendan Gove
309 East County Road
Rutland, MA 01543

7. Subordination. Grantor shall use best efforts to obtain and deliver to the Grantee an executed subordination (in form reasonably acceptable to Grantee) from each lender and lienholder of record as to the Easement Agreement. Grantee may require that such subordination be acquired (but not yet recorded in the registry of deeds) prior to the Easement Agreement being mutually executed and recorded (with the subordination being recorded simultaneously therewith).

8. Assignment. Grantee shall be entitled without Grantor's consent to assign all of its right, title and interest in and to this Agreement.

9. No Recording; Future Lenders, Buyers, Etc. Neither this Agreement nor any memorandum or notice thereof shall be recorded. Grantor shall not, for the period of time beginning on or after the date hereof, and lasting until either the Easement Agreement is recorded or this Agreement terminates pursuant to Section 4 hereof, grant or permit any lien to be placed on the Premises, nor sell or lease the Premises, or otherwise grant any property rights in the Premises, without delivering a true and complete, mutually executed copy of this Agreement to the prospective lender, lienholder, buyer, tenant, or other applicable party and obtaining said party's written agreement (a "Subordination Acknowledgment") that their property interest in the Premises will be subordinate to the Easement Agreement, and that, upon Grantee's written request, such party shall execute a recordable subordination agreement so sating, which Grantee may record in the applicable registry of deeds, together with the recording of the Easement Agreement. The Subordination Acknowledgment shall state that Grantee is a third party beneficiary thereof. A copy of the executed Subordination Acknowledgement shall be promptly delivered to Grantee.

10. Miscellaneous. This Agreement and the documents referred to herein contain the entire agreement between the parties hereto with respect to the transactions contemplated hereby, and no modification hereof shall be effective unless in writing and signed by the party against which it is sought to be enforced. This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which taken together shall constitute one and the same instrument. Fax and electronic mail (.pdf copy) signatures to this Agreement shall be binding. Should any provision or part of this Agreement be determined to be invalid, such determination shall not affect the validity of the remaining terms of this Agreement. If the end of any time period herein, or if any specified date, falls on a weekend or national or state (i.e., the state where the Premises is located) holiday, then the end of such time period, or such date, as the case may be, shall be extended to the next business day thereafter.

11. Binding Effect; Severability; Modification. This Agreement shall be binding on and shall inure to the benefit of the parties hereto and their successors and permitted assigns and may only be modified by written agreement of the parties. If any provision of this Agreement or

the application thereof to any person or circumstance shall, to any extent, be invalid or unenforceable, the remainder of this Agreement shall not be affected thereby and each provision of this Agreement shall be valid and enforceable to the fullest extent permitted by law. Except as set forth in paragraph 8, this Agreement may not be assigned, transferred or conveyed by any party without the prior written consent of the others, which consent may be granted in such each other party's sole and absolute discretion.

12. Governing Law. This Agreement shall be governed by the laws of the Commonwealth of Massachusetts.

13. Counterparts; Captions. This Agreement may be executed in counterparts or with counterpart signature pages, which upon execution by all parties shall constitute one integrated agreement. The captions set forth herein are for convenience only and are not a part of this Agreement.

[The remainder of the page intentionally left blank. Signatures follow on the next page.]

IN WITNESS WHEREOF, Grantor and Grantee have caused this Agreement to be executed as of the last date set forth below.

GRANTEE

ZPT Energy Solutions II, LLC

By:

Name:

Its:

Brendan Gove

Authorized Person

Date:

GRANTOR

Signature:

Name:

Lee H. Lashway

Date:

Exhibit A

Sketch Showing Approximate Access Easement Area

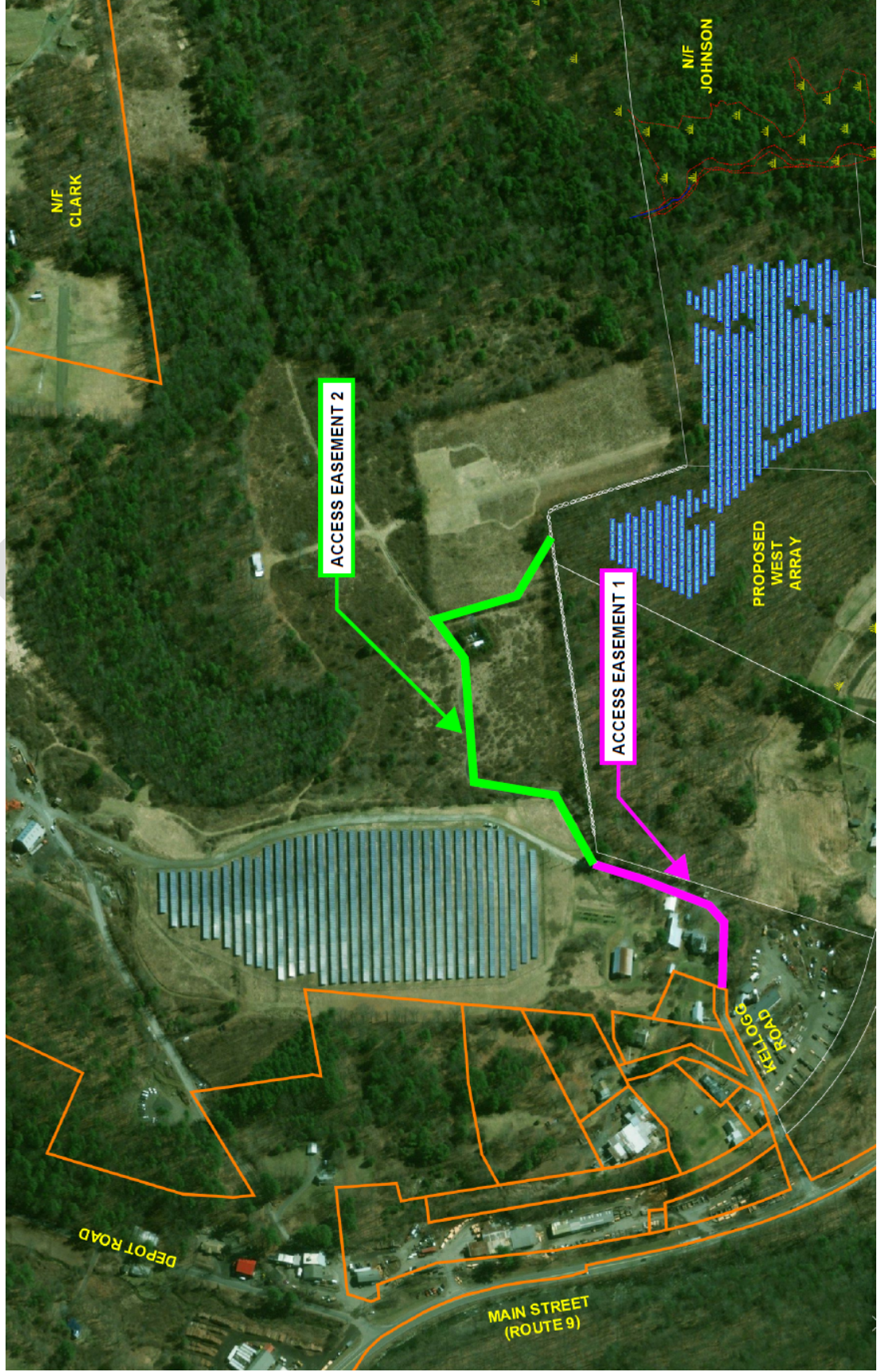


Exhibit B

Sketch Showing Approximate Utility Easement Area

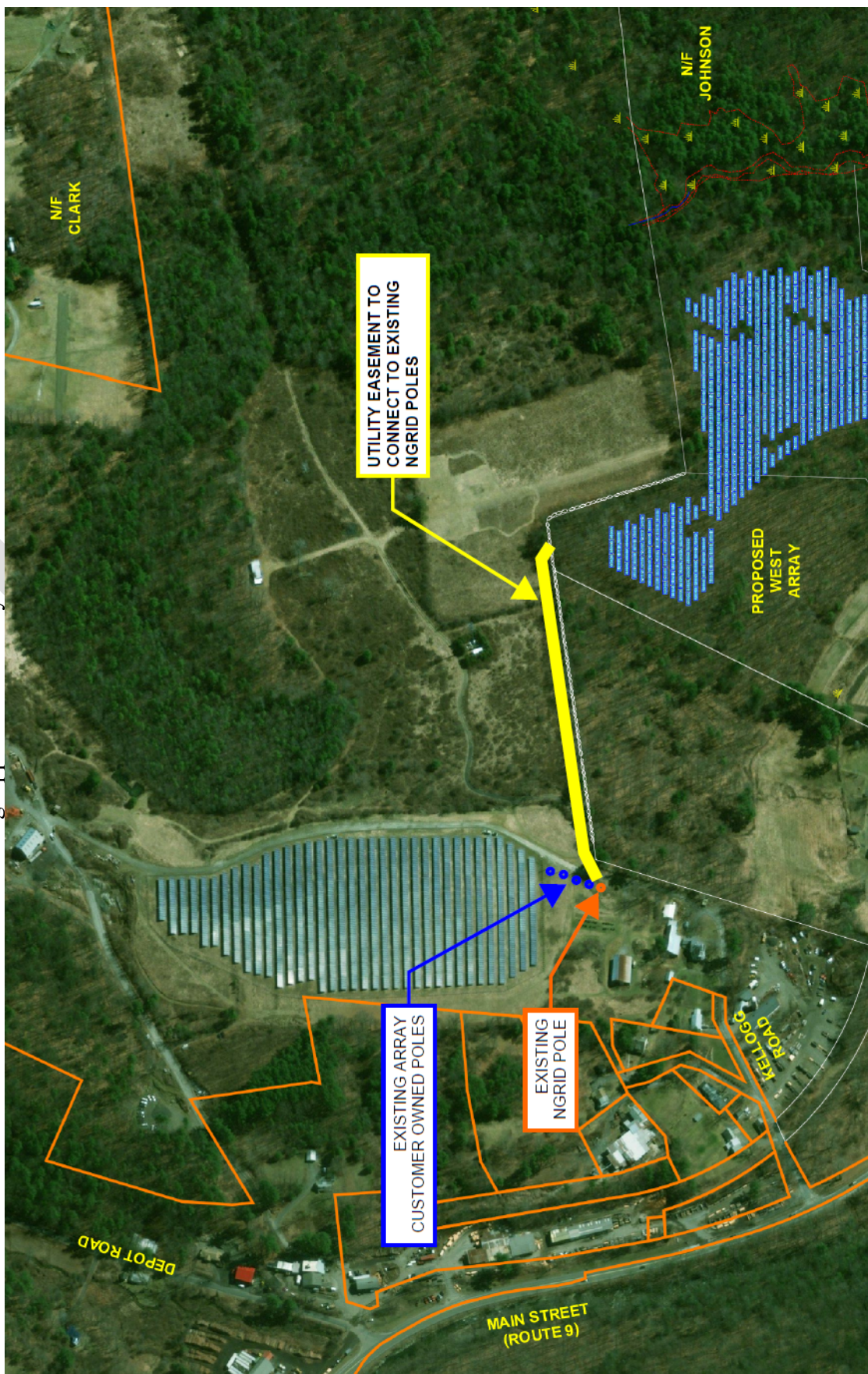


Exhibit C

Easement Agreement Form

[*Form Attached*]

DRAFT

RECORDING INFORMATION AREA

EASEMENT AGREEMENT

This Easement Agreement (this "Agreement") is made as of the ____ day of _____, 201__, by and among _____, a _____, with an address at _____ ("Grantor"), and [ZPT Energy Solution II, LLC], a Massachusetts limited liability company with an address of 309 East Country Road, Rutland, MA 01543 ("Grantee").

WHEREAS, Grantor is the owner of certain land located at _____, and legally described in Exhibit A attached hereto, and depicted on Exhibit C attached hereto ("Grantor's Property"); and

WHEREAS, _____ ("Solar Landlord") is the owner of certain land located at _____, and legally described in Exhibit B attached hereto and depicted on Exhibit C attached hereto ("Solar Landlord's Property"); and

WHEREAS, Solar Landlord and Solar Tenant have entered into a lease dated _____ that allows Solar Tenant to erect and operate a solar facility (the "Solar Facility") on a portion of the Solar Landlord's Property; specifically, on the portion of such property that is depicted on, and described in, Exhibit C attached hereto (the "Solar Premises"), which Solar Facility may be modified and/or replaced from time to time but shall continue to be the "Solar Facility" defined herein; and

WHEREAS, Grantee desires certain easements over Grantor's Property (in the areas more specifically defined below);

NOW THEREFORE, for Ten Dollars (\$10.00) and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. **Grant of Easement.** Grantor grants to Grantee the following exclusive easements, which are referred to, separately and collectively, as the "Easements". The Easements may be used not only Grantee, but also, by Grantee's employees, agents, contractors, sub-contractors, subtenants, licensees, utility providers, and invitees. Thus, references to "Grantee" using the Easements also includes the foregoing parties.

(a) Solar Access Easement. A Solar Access Easement (defined below) which shall burden the “Solar Easement Area” (being the area, on Grantor’s Property, so labeled and depicted on Exhibit C attached hereto). “Solar Access Easement” means an exclusive, perpetual easement for the unobstructed passage of sunlight over and through the Solar Easement Area, to the Solar Premises and the Solar Facility. Accordingly, no objects, buildings, equipment, fixtures, structures, trees or other foliage may be erected or maintained on the Solar Easement Area, and no use may be made of the Solar Easement Area, that would cast a shadow over the Solar Premises or otherwise obstruct the passage of sunlight to the Solar Premises and the Solar Facility. In furtherance of the foregoing, Grantor shall promptly remove any such objects, buildings, equipment, fixtures, structures, trees and/or other foliage and shall cease to use the Solar Easement Area in such a manner as to obstruct the passage of sunlight onto the Solar Premises and Solar Facility. Without limiting the foregoing, Grantor shall trim, thin, and/or (as the case may be) remove, trees, tree limbs, foliage and other vegetation on the Solar Easement Area, and take such other reasonable steps as may be necessary or advisable to prevent shade being cast on the Solar Premises and Solar Facility, and to prevent any other matter (including without limitation smoke) obstructing the passage of sunlight onto the Solar Premises and the Solar Facility. If Grantor defaults in its obligations to keep the Solar Easement Area clear of objects that might impede the passage of sunlight, then Grantee may, without waiving any other rights and remedies it may have, enter upon the Grantor’s Property and perform the applicable clearing/maintenance. In that event, Grantor shall reimburse Grantee for the reasonable, out of pocket, documented costs incurred by Grantee in performing such tasks, within thirty (30) days of Grantee presenting Grantor with an invoice therefor.

(b) Access and Egress Easement. An Access and Egress Easement (defined below) which shall burden the “Access and Egress Easement Area” (being the area, on Grantor’s Property, so labeled and depicted on Exhibit C attached hereto). “Access and Egress Easement” means an easement and right of way over, across and through the Access and Egress Easement Area in order for Grantee to access (and egress) by vehicle, foot or otherwise, the Solar Premises, for all purposes associated with the installation and operation (including without limitation maintenance, modification, replacement, and potential decommissioning and removal) of the Solar Facility. If a road or way sufficient for Grantee’s purposes does not presently exist in the Access and Egress Easement Area then Grantee shall have the right to construct such a road or way, to such reasonable specifications as Grantee may determine, and at Grantee’s sole cost and expense.

(c) Utility Easement. A Utility Easement (defined below) which shall burden the “Utility Easement Area” (being the area, on Grantor’s Property, so labeled and depicted on Exhibit C attached hereto). “Utility Easement” means an easement to build, maintain, upgrade, install and from time to time relocate (within the Utility Easement Area) above ground and/or below ground electrical lines and associated poles and other infrastructure (and, if so desired by Grantee, lines, pipes or other forms of conduit, and associated infrastructure, for other types of utilities necessary or desirable for the operation of the Solar Facility including without limitation communications of all types, and water) running to and from the Solar Premises and the Solar Facility, as well as related equipment and facilities servicing the Solar Facility including without limitation customer meters and transformers. To be clear, this easement is for the benefit not only of Grantee, but also, of the applicable utility providers. Without limiting the foregoing, if so

requested by Grantee in writing, Grantor shall grant such an easement directly to the applicable utility provider.

(d) Drainage Easement. A Drainage Easement (defined below) which shall burden the “Drainage Easement Area” (being the area, on Grantor’s Property, so labeled and depicted and described on Exhibit C attached hereto). “Drainage Easement” means an easement, including rights of ingress and egress, for the purposes of storm water and surface drainage over, upon, across, in and through the Drainage Easement Area. Storm water and surface drainage from the Solar Premises and the Landlord’s Solar Property shall be permitted to discharge and flow over, upon, across, through and under the Drainage Easement Area. Grantor shall maintain the Drainage Easement Area so that at all times it continues to function as intended. Grantor shall be prohibited from altering or placing anything in the Drainage Easement Area which shall obstruct or impede the flow of storm water or surface drainage from the Solar Premises and the Solar Landlord’s Property. Grantor agrees not to build or to convey to others permission to build any structures or improvements on, over, across, in through, or under the Drainage Easement Area, or to develop or allow the development of the Drainage Easement Area in any manner which obstructs the flow of storm water drainage. However, as part of a site plan that Grantor submits to Grantee and Grantee approves (such approval not to be unreasonably withheld, conditioned, or delayed), Grantor may construct and/or install surface improvements to the Grantor’s Property, including paved driveways, parking and/or walkways, landscaping, utilities and/or similar improvements, provided that the improvements do not adversely interfere with the flow of such storm water drainage over, upon, across, in and through the Drainage Easement Area.

(e) Construction Easement. A Construction Easement (defined below) which shall burden the “Construction Easement Area” (being the area, on Grantor’s Property, so labeled and depicted and described on Exhibit C attached hereto). “Construction Easement” means an easement to use the Construction Easement Area, during the period of time that any Construction Work (defined below) is being performed at the Solar Premises, for the purpose of facilitating such Construction Work, including without limitation for access and egress by foot, vehicle, and applicable machinery, to the areas where the Construction Work is being performed, and for the placement, storage and parking of equipment, materials and vehicles. “Construction Work” means construction, maintenance, repair (including replacement), and other physical work to the Solar Facility from time to time, including without limitation any decommissioning and removal of the Solar Facility.

2. Term. The Easements shall continue for [TERM]; provided, however, that Grantee shall issue to Grantor a written termination agreement, stating that the Easements are terminated and of no further force or effect, as of the date (if ever such date occurs) that the Solar Facility has been decommissioned, and permanently physically removed from the Solar Premises. To be clear, any temporary decommissioning, and/or physical removal, of the Solar Facility, in connection with modification or replacement of the Solar Facility, shall not cause the Easements to terminate. There shall be no termination of the Easements unless and until such termination agreement has been delivered by Grantee to Grantor, and Grantor has recorded same in the applicable registry of deeds (and/or division of the Land Court, as the case may be). At the end of the Term, Grantee shall remove all utility poles and equipment owned by Grantee, but Grantee assumes no obligation to remove poles and equipment owned by other persons, including, without limitation, the applicable utility company.

3. **Insurance and Indemnification.** Grantee shall carry commercial general liability insurance of at least One Million Dollars (\$1,000,000) combined single limit, naming Grantor as an additional insured. If at third party lawsuit is ever brought against Grantor based on personal injury (or death), or damage to personal property, proximately caused by the use of the Easements by Grantee, then Grantee shall indemnify Grantor for any liability incurred by Grantor in connection therewith, as well as Grantor's reasonable attorneys fees. If the use of the Easements by Grantee results in harm or damage to the Grantor's Property (excluding impacts to the Grantor's Property that are necessarily incident to, and of the nature of, the Easements) then Grantee shall promptly repair the damaged area to as near as practicable its prior condition.

4. **Further Cooperation.** Grantor and Grantee agree to execute such other documents and to perform such other acts as may be reasonably necessary or desirable to further the expressed and intent purpose of this Agreement.

5. **Easements Appurtenant to the Solar Premises and the Solar Landlord's Property.** The Easements are appurtenant to the Solar Premises. Given that the Solar Premises are a portion of the Solar Landlord's Property, the Easements are also appurtenant to the Solar Landlord's Property. To the extent, if any, that it might be necessary or desirable to the effectiveness of this Agreement for the Solar Landlord, as the owner of the Solar Landlord's Property, to join in this Agreement, the Solar Landlord does so join in this Agreement, as evidenced by its signature on the signature page below. Such joinder is solely for the foregoing purpose of ensuring the effectiveness of the Easements, and does not create any liability or responsibilities for Solar Landlord (or its heirs, successors or assigns) whatsoever.

6. **Title.** Grantor represents and warrants that as of the date hereof Landlord has good and marketable title to the Premises subject to no liens, easements, options or other encumbrances other than the existing encumbrances set forth in Exhibit D and that the Grantor shall use best efforts to obtain subordination agreements (in a form reasonably acceptable to Grantee) from the holders of any and all existing encumbrances set forth in Exhibit D and Grantor shall not hereafter create or permit any encumbrances which would interfere with the grant of the Easements.

7. **Counterparts.** This Agreement may be executed in counterparts, each of which shall be deemed an original instrument, but all of which together shall constitute one and the same instrument.

8. **Successor and Assigns.** The provisions of this Agreement shall run with the land and shall be binding upon and inure to the benefit of the parties hereto and their respective heirs, executors, administrators, successors and assigns. Without limiting the foregoing, if the Grantor conveys the fee interest in the entire Grantor's Property to another party, or if Grantee assigns the entire Solar Lease to another party, then from and after such conveyance or assignment, the undersigned Grantor or Grantee (whichever is applicable) shall be deemed released from its obligations hereunder on a going forward basis, and the applicable transferee shall be deemed automatically to have assumed and be bound by all such obligations.

9. **Notices.** All notices and other communications provided for or permitted hereunder shall be in writing and shall be delivered by hand, or mailed by certified mail, postage prepaid, return receipt requested, or delivered by a nationally recognized overnight courier service,

courier charges prepaid, addressed to the applicable party or parties at the address set forth on Page 1, above, or at such other address as may be set forth in a notice delivered or mailed as herein provided, or, if no such notice of a change in address is received upon the transfer of ownership of either the Solar Landlord's Property or the Grantor's Property, notices to the owner of the applicable property may thereafter be given to the address of such party as shown on the records of the municipal tax collector's office. Notice shall be deemed given when delivered by hand to the addressee, or, if so mailed or delivered by courier, when delivered or first tendered for delivery as shown on the records of the US Postal Service or such courier service.

10. **Amendments.** This Agreement may not be amended, modified, or terminated except by a written instrument duly executed by all of the parties hereto.

11. **Governing Law.** This Agreement shall be interpreted in accordance with and governed by the laws of the Commonwealth of Massachusetts, without regarding to its conflict of laws provisions.

{Signature pages and notary acknowledgments follow}

Executed as an instrument under seal as of the date first set forth above.

GRANTOR:

By: _____

Name: _____

Title: _____

GRANTEE:

By: _____

Name: _____

Title: _____

JOINDER BY
SOLAR LANDLORD:

By: _____

Name: _____

Title: _____

COMMONWEALTH OF MASSACHUSETTS
COUNTY OF _____, ss.

On this ____ day of _____, 201_, before me, the undersigned notary public, personally appeared _____, proved to me through satisfactory evidence of identification, which was a was ☐ photographic identification with signature issued by a federal or state governmental agency, ☐ oath or affirmation of a credible witness, ☐ personal knowledge of the undersigned, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose.

Notary Public
Printed Name: _____
My commission expires: _____

COMMONWEALTH OF MASSACHUSETTS
COUNTY OF _____, ss.

On this ____ day of _____, 201_, before me, the undersigned notary public, personally appeared _____, proved to me through satisfactory evidence of identification, which was a was ☐ photographic identification with signature issued by a federal or state governmental agency, ☐ oath or affirmation of a credible witness, ☐ personal knowledge of the undersigned, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose.

Notary Public
Printed Name: _____
My commission expires: _____

COMMONWEALTH OF MASSACHUSETTS
COUNTY OF _____, ss.

On this ____ day of _____, 201_, before me, the undersigned notary public, personally appeared _____, proved to me through satisfactory evidence of identification, which was a was ☐ photographic identification with signature issued by a federal or state governmental agency, ☐ oath or affirmation of a credible witness, ☐ personal knowledge of the undersigned, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purpose.

Notary Public
Printed Name: _____
My commission expires: _____

ATTACHMENT 3:
UTILITY NOTIFICATION

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application**Contact Information (TYPE or PRINT):**Date Prepared: 11.2.17Legal Name and Address of Interconnecting CustomerInterconnecting Customer: Zero Point Development, Inc. Contact Person: Greg HuntMailing Address: 309 East County RoadCity: Rutland State: MA Zip Code: 01543Telephone (Daytime): 774-234-9008 (Evening): SameFacsimile Number: _____ E-Mail Address: ghunt@zpeenergy.comOwnership Information (include % ownership by any electric utility): 100% Zero Point Development, Inc.Site Control: Does the Interconnecting Customer have site control? ☒ Yes ☐ NoConfidentiality Statement: "I agree to allow information regarding the processing of my application (without my name and address) to be reviewed by the Massachusetts DG Working Group that is exploring ways to further expedite future interconnections." ☒ Yes ☐ NoGroup Study Agreement: "I understand and agree if my project becomes part of a Group Study, the Company is authorized to share my contact information and project details with other parties that are also involved in the Group Study." ☒ Yes ☐ NoHost Retail Customer Contact Information (complete any that are different than Interconnecting Customer information above):

Retail Customer: _____ Contact Person: _____

E-Mail Address: _____ Telephone: _____

Landowner Name (if neither Interconnecting Customer nor Customer): Lawrence WestLandowner email: landwest3315@yahoo.com Landowner telephone: 413-336-2878Landowner Mailing Address: 95 Main StCity: Haydenville State: MA Zip Code: 01039Alternative Contact Information (e.g., system installation contractor or coordinating company, if appropriate):

Company Name: _____ Contact Person: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone (Daytime): _____ (Evening): _____

Facsimile Number: _____ E-Mail Address: _____

Electrical Contractor Contact Information (if appropriate):

Name: _____ E-mail Address: _____

Mailing Address: _____ Telephone: _____

City: _____ State: _____ Zip Code: _____

Interconnection Seminars: "I have attended one of the utility-hosted Interconnection Seminars." (Recommended) ☒ Yes ☐ NoInterconnection Tariff: "I have reviewed the entire MDPU 1248 Standards for Interconnection of DG." (Recommended) ☒ Yes ☐ No**Facility Information (TYPE or PRINT):***Please provide all Pre-Application Reports (either mandatory or optional as per MDPU 1248) as attachments.*Address of Facility: 95 Main StreetCity: Haydenville (Williamsburg) State: MA Zip Code: 01039Single Parcel: Will the Facility be constructed on a single parcel of land? ☒ Yes ☐ No

Authorized/Proposed generation capacity already exists (check all that apply):

☐ On Current Account ☐ On Same Legal Parcel of Land ☐ In Same Building/Structure

If any apply, include existing generation capacity on design diagrams, and provide Application Number(s): _____

Electric Service Company: National Grid Account Number: 30189-16010 Meter Number: _____Work Request Number (For Upgrades or New Service): 25266335 MTC ID: _____System Design Capacity: Nominal 3500 (kW_{AC}) 3500 (kVA) Maximum 3500 (kW_{AC}) 3500 (kVA)For Solar PV provide the DC-STC rating: 4914.36 (kW_{DC})

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application

Prime Mover: ☒ Photovoltaic ☐ Reciprocating Engine ☐ Fuel Cell ☐ Turbine ☐ Other: _____
 Energy Source: ☒ Solar ☐ Wind ☐ Hydro ☐ Diesel ☐ Natural Gas ☐ Fuel Oil ☐ Other: _____
 IEEE 1547.1 (UL 1741) Listed? ☐ Yes ☐ No

1) Generating Unit Type 1

Manufacturer: Solectria _____ Model Name and Number: SGI 750 XTM _____ Quantity: 2 _____

AC Rating:

Nominal: 750 (kW) 750 (kVA) 380 (AC Volts)
 Maximum: 750 (kW) 750 (kVA) 418 (AC Volts) ☐ Single or ☒ Three Phase

2) Generating Unit Type 2 (if applicable)

Manufacturer: Solectria _____ Model Name and Number: SGI 500XTM _____ Quantity: 4 _____

AC Rating:

Nominal: 500 (kW) 500 (kVA) 380 (AC Volts)
 Maximum: 500 (kW) 500 (kVA) 418 (AC Volts) ☐ Single or ☒ Three Phase

3) Generating Unit Type 3 (if applicable)

Manufacturer: _____ Model Name and Number: _____ Quantity: _____

AC Rating:

Nominal: _____ (kW) _____ (kVA) _____ (AC Volts)
 Maximum: _____ (kW) _____ (kVA) _____ (AC Volts) ☐ Single or ☐ Three Phase

Does this project need an air quality permit from the DEP? ☐ Yes ☒ No ☐ Not Sure

If "Yes", have you applied for it?

☐ Yes ☐ No

Planning to Export Power?

☒ Yes ☐ No

Is this a Cogeneration Facility?

☐ Yes ☒ No

Anticipated Export Power Purchaser: Housing Authority

Export Form? ☐ Qualifying Facility (QF) ☐ Net Metering ☒ Other (explain): SMART tariff

Estimated Install Date: 12/10/2017 Estimated. In-Service Date: 1/16/2018


Agreement Need By: 12/16/2017

If net metering, please refer to Schedule Z of the Standards for Interconnection of Distributed Generation. Please note that if under the public cap, all off-takers must be a Municipality or other Governmental Entity (as defined in 220 C.M.R. 18.02) and therefore be certified by the DPU.

Application Process**Interconnecting Customer Signature:**

"I am opting to forego the Expedited Process. Please review this application under the Standard Process." ☐ Yes ☒ No


I hereby certify that, to the best of my knowledge, all of the information provided in this application is true:

Signature:  Title: Chief Operating Officer _____ Date: 11/7/2017

Please attach any documentation provided by the inverter manufacturer describing the inverter's UL 1741 listing.

All Application Materials Received (For Company use only):

The information provided in this application is complete, all attachments and supplemental application materials have been received, and the application may proceed to the initial/screening review stage of the interconnection process:

Signature:  Title: Customer Energy Integration Date: 12/20/2017

Application ID number: 25410112

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application**Generating Facility Technical Detail**

Information on components of the generating facility that are currently Listed

	Equipment Type	Manufacturer	Model	National Standard
1.	Inverter	Solectria	SGI500XTM	UL1741
2.	Inverter	Solectria	SGI750XTM	UL1741
3.	Solar Panel	LG	LG365 N2W	UL1703
4.	MV Transformer	Cooper	Tamper proof Distribution type	ANSI C57.12, NEMA TR 1-1993 (R2000)
5.	Field Combiner	Solectria	ARCOMM	UL1741
6.	Protective relay	Cooper	iDP210	
7.	Vacuum Fault Interrupter	Cooper	KP00610L01S09M	

Total Number of Generating Units in Facility? _____

Generator Unit Power Factor Rating: >99%Max Adjustable Leading Power Factor? -.88 Max Adjustable Lagging Power Factor? +.88**Generator Characteristic Data (for all inverter-based machines)**Max Design Fault Contribution Current? 161.07/phase ☐ Instantaneous or ☒ RMSHarmonics Characteristics: <3%Start-up power requirements: <300W**Generator Characteristic Data (for all rotating machines)**

Rotating Frequency: _____ (rpm) Neutral Grounding Resistor (If Applicable): _____

Additional Information for Synchronous Generating Units

Synchronous Reactance, Xd: _____ (PU) Transient Reactance, X'd: _____ (PU)

Subtransient Reactance, X''d: _____ (PU) Neg Sequence Reactance, X2: _____ (PU)

Zero Sequence Reactance, Xo: _____ (PU) kVA Base: _____ (PU)

Field Voltage: _____ (Volts) Field Current: _____ (Amps)

Additional information for Induction Generating Units

Rotor Resistance, Rr: _____ Stator Resistance, Rs: _____

Rotor Reactance, Xr: _____ Stator Reactance, Xs: _____

Magnetizing Reactance, Xm: _____ Short Circuit Reactance, Xd'': _____

Exciting Current: _____ Temperature Rise: _____

Frame Size: _____

Total Rotating Inertia, H: _____ Per Unit on kVA Base: _____

Reactive Power Required In Vars (No Load): _____

Reactive Power Required In Vars (Full Load): _____

Additional information for Induction Generating Units that are started by motoring

Motoring Power: _____ (kW) Design Letter: _____

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application**Interconnection Equipment Technical Detail** Date: 11/2/2017

Will a transformer be used between the generator and the point of interconnection?

☒ Yes ☐ No

Will the transformer be provided by Interconnecting Customer?

☒ Yes ☐ NoTransformer Data (if applicable, for Interconnecting Customer-Owned Transformer):Nameplate Rating: 3500 (kVA)☐ Single or ☒ Three PhaseTransformer Impedance: 5 (%) on a3500 kVA Base

If Three Phase:

Transformer Secondary: 380 (Volts)☒ Delta ☐ Wye ☐ Wye-Grounded ☐ Other: _____Transformer Primary: 13.8k (Volts)☐ Delta ☐ Wye ☒ Wye-Grounded ☐ Other: _____Transformer Fuse Data (if applicable, for Interconnecting Customer-Owned Fuse):

(Attach copy of fuse manufacturer's Minimum Melt & Total Clearing Time-Current Curves)

Manufacturer: Cooper Power Systems Type: PRCLF = 3544125M71M and Bayonet = 4038108C14. Under oilSize: See DatasheetSpeed: See DatasheetInterconnecting Circuit Breaker (if applicable):Manufacturer: EATON Type: 100% Rated Vista Brkr Load Rating: 2000 (Amps)Interrupting Rating: 50kA Trip Speed: programmable (Cycles)Interconnection Protective Relays (if applicable):

If microprocessor-controlled, List of Functions and Adjustable Setpoints for the protective equipment or software:

	Setpoint Function	Minimum	Maximum
1.	<u>See Drawing and Datasheet</u>		
2.			
3.			
4.			
5.			
6.			

If discrete components (Enclose copy of any proposed Time-Overcurrent Coordination Curves):

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Current Transformer Data (if applicable):

(Enclose copy of Manufacturer's Excitation & Ratio Correction Curves)

Manufacturer: _____ Type: _____ Accuracy Class: _____ Proposed Ratio Connection: _____

Manufacturer: _____ Type: _____ Accuracy Class: _____ Proposed Ratio Connection: _____

Potential Transformer Data (if applicable):

Manufacturer: _____ Type: _____ Accuracy Class: _____ Proposed Ratio Connection: _____

Manufacturer: _____ Type: _____ Accuracy Class: _____ Proposed Ratio Connection: _____

Massachusetts: http://www.nationalgridus.com/masselectric/home/energyeff/distributed_generation.aspNantucket: http://www.nationalgridus.com/nantucket/home/energyeff/distributed_generation.asp

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application**General Technical Details**

Submit all of the customer's Interconnection Application materials and proposed design diagrams using the following process:

1. Email the following materials to National Grid at Distributed.Generation@nationalgrid.com:
 - a. ☒ P.E.-stamped One-Line Diagram (and ☐ Three-Line Diagram if applicable), including:
 - i. ☒ Schematics for all (internal & redundant) protection and control circuits, relay current circuits, relay potential circuits, and alarm/monitoring circuits (if applicable)
 - b. ☒ Site Plan, which indicates the precise physical location of the proposed:
 - i. ☒ Generating Facility
 - ii. ☒ AC Utility Disconnect Switch
 - iii. ☒ All meters (utility- and customer-owned)
 - iv. ☒ Related interconnection equipment
 - c. ☒ Technical Specifications (pdf files only)
 - d. ☒ Exhibit C (this form) – completed and signed (available on the website)
 - e. ☒ Legal Information Document – completed (available on the website)
 - f. ☒ Schedule Z (net metering only) – completed, initialed, and signed (available on the website)
 - g. ☐ Copy of electric bill (if applicable)
 - h. ☒ Copy of any Pre-Application Reports related to this application (if applicable)
 - i. ☒ Copy of Interconnection Application fee check
 - j. ☒ Any other information pertinent to this Interconnection Application (if applicable)
2. Mail the ☒ Interconnection Application fee check and the ☒ first two pages of the signed copy of this Interconnection Application form to:

National Grid
Attn: Distributed Generation
40 Sylvan Rd
Waltham, MA 02451

Note: The Schedule Z may be updated as needed at any point prior to the Authorization to Interconnect.

Refer to National Grid's Distributed Generation website for more detailed instructions:

Massachusetts:

Residential: http://www.nationalgridus.com/masselectric/home/energyeff/distributed_generation.asp

Commercial: http://www.nationalgridus.com/masselectric/business/energyeff/distributed_generation.asp

Nantucket:

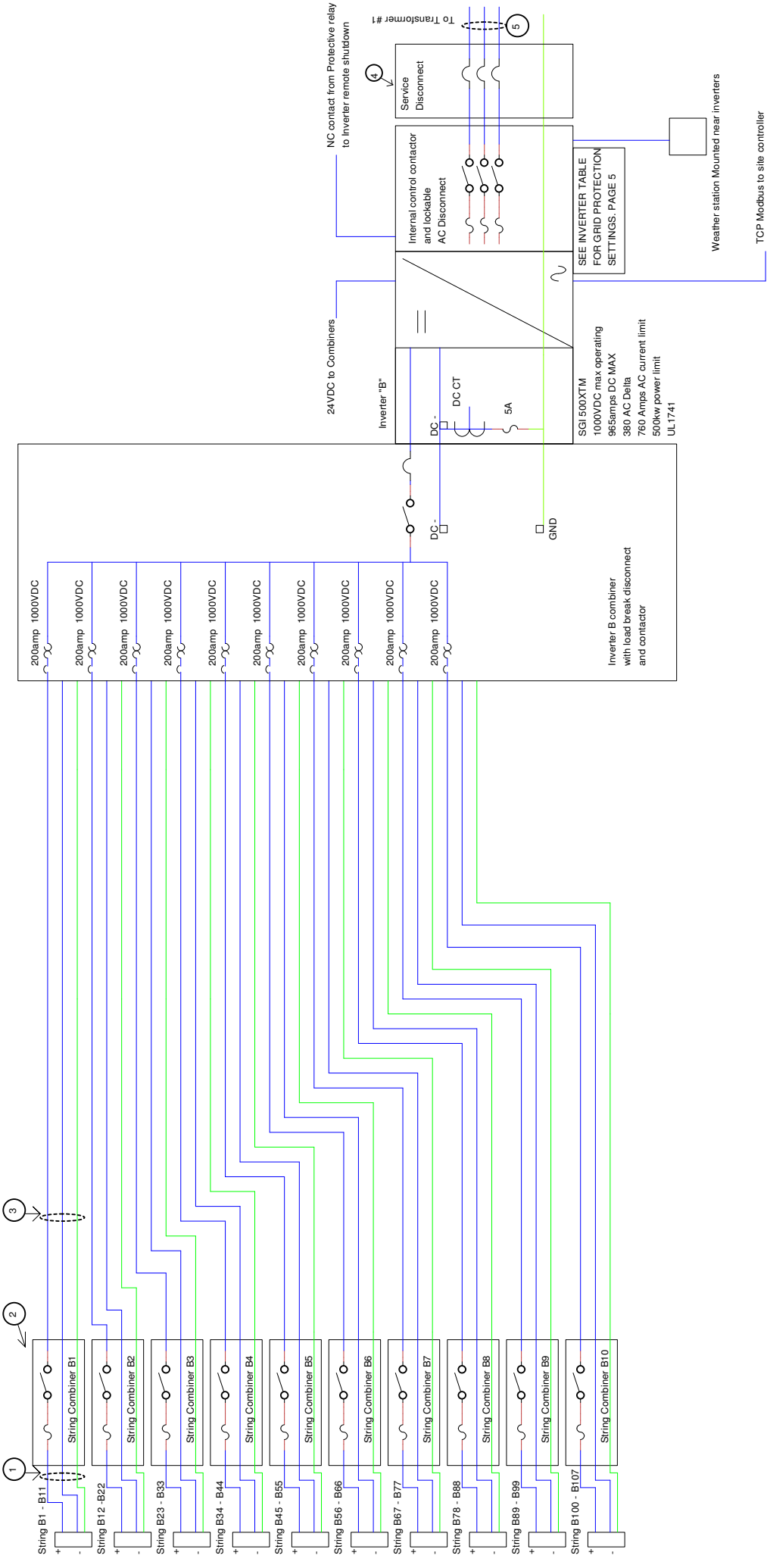
Residential: http://www.nationalgridus.com/nantucket/home/energyeff/distributed_generation.asp

Commercial: http://www.nationalgridus.com/nantucket/business/energyeff/distributed_generation.asp

Massachusetts: http://www.nationalgridus.com/masselectric/home/energyeff/distributed_generation.asp

Nantucket: http://www.nationalgridus.com/nantucket/home/energyeff/distributed_generation.asp

ATTACHMENT 4:
ELECTRICAL DIAGRAM



PROFESSIONAL STAMP

MARK C. YEAU
ELECTRICAL
NO. 47694
PROFESSIONAL

PRELIMINARY
NOT FOR CONSTRUCTION

Title

ZP-222, 95 Main St, Haydenville, MA 01039

Author

Zero Point Development for ZPT Energy Solutions II, LLC

Revision

1,2

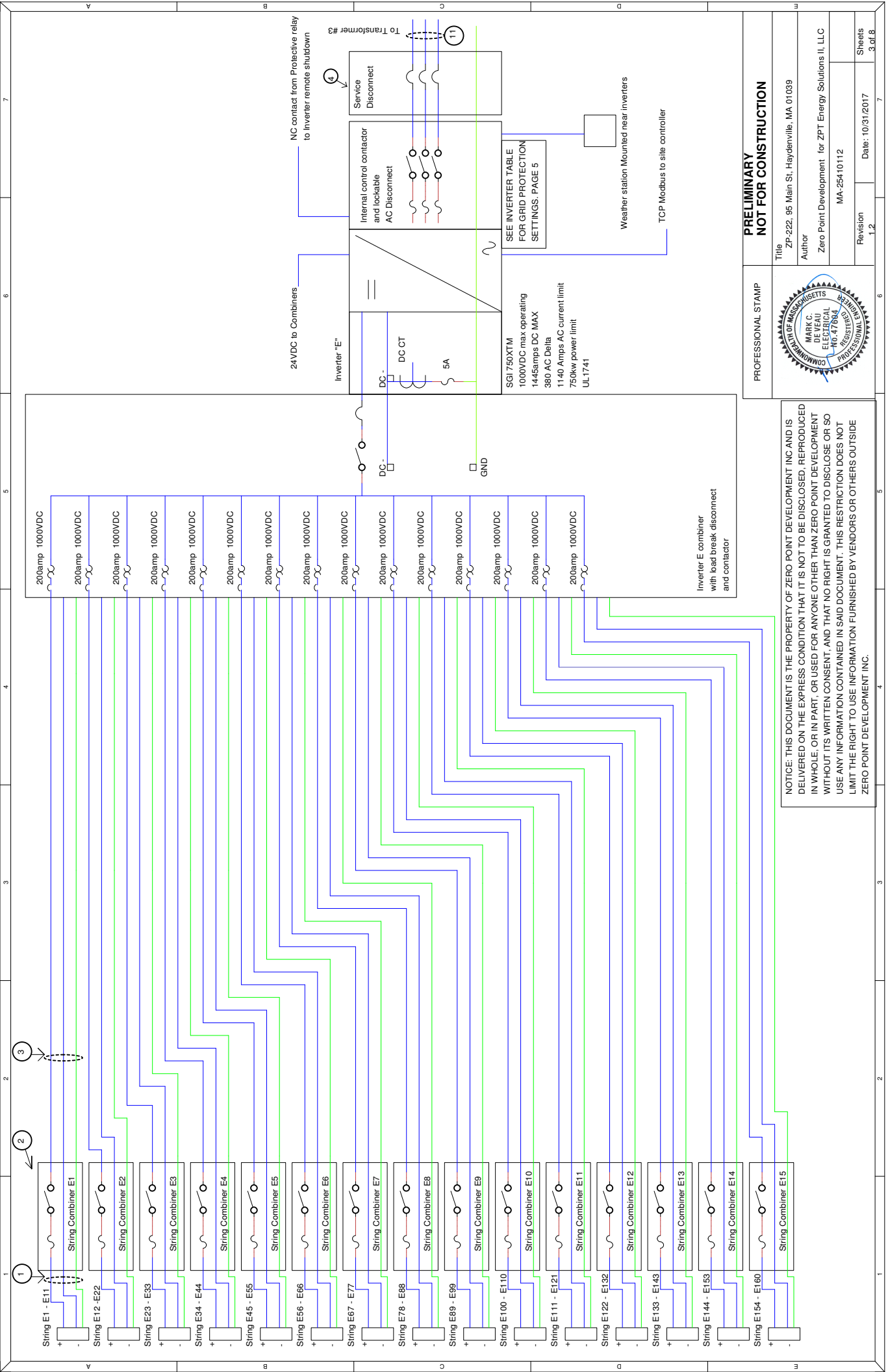
Date

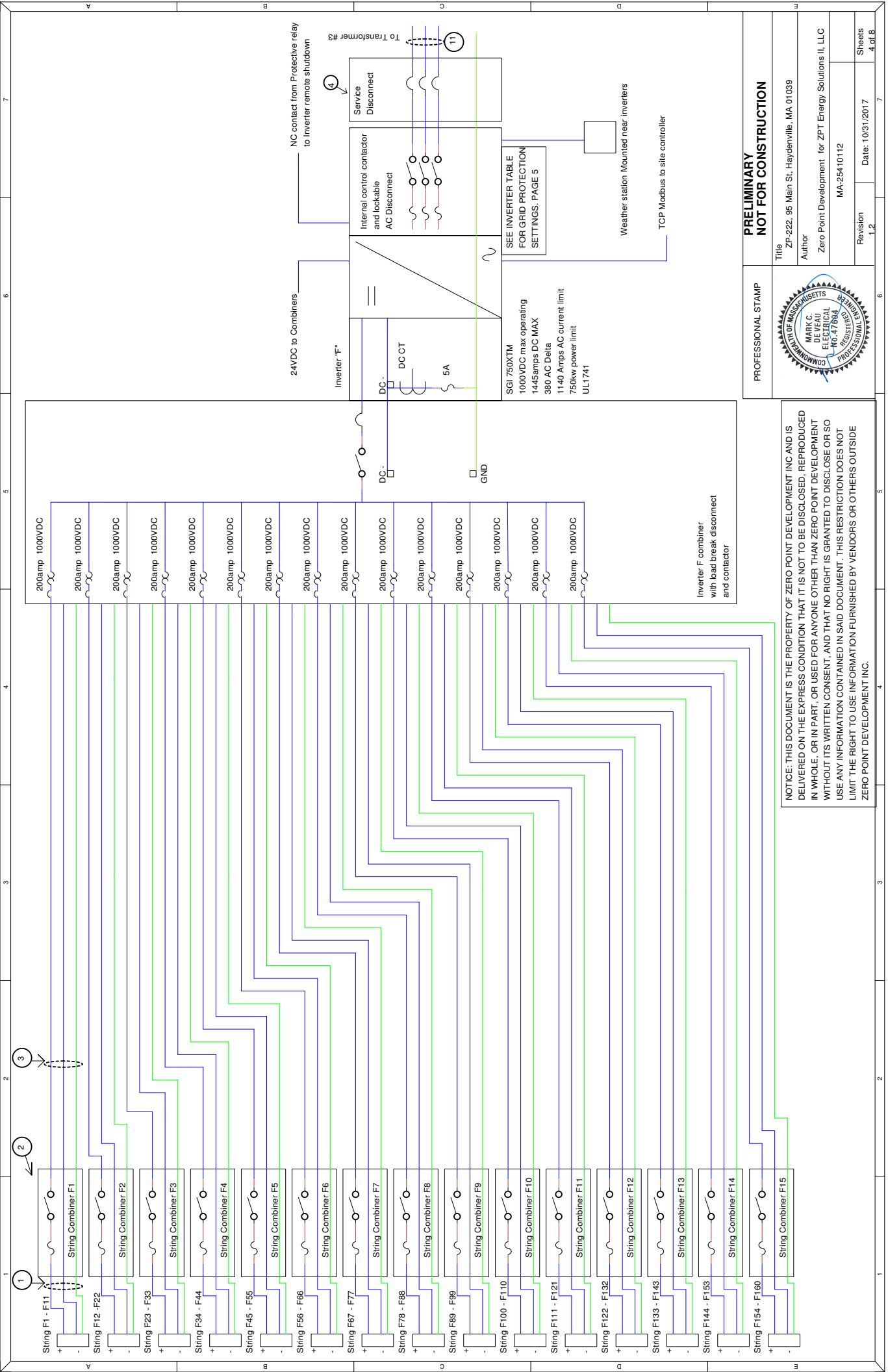
10/31/2017

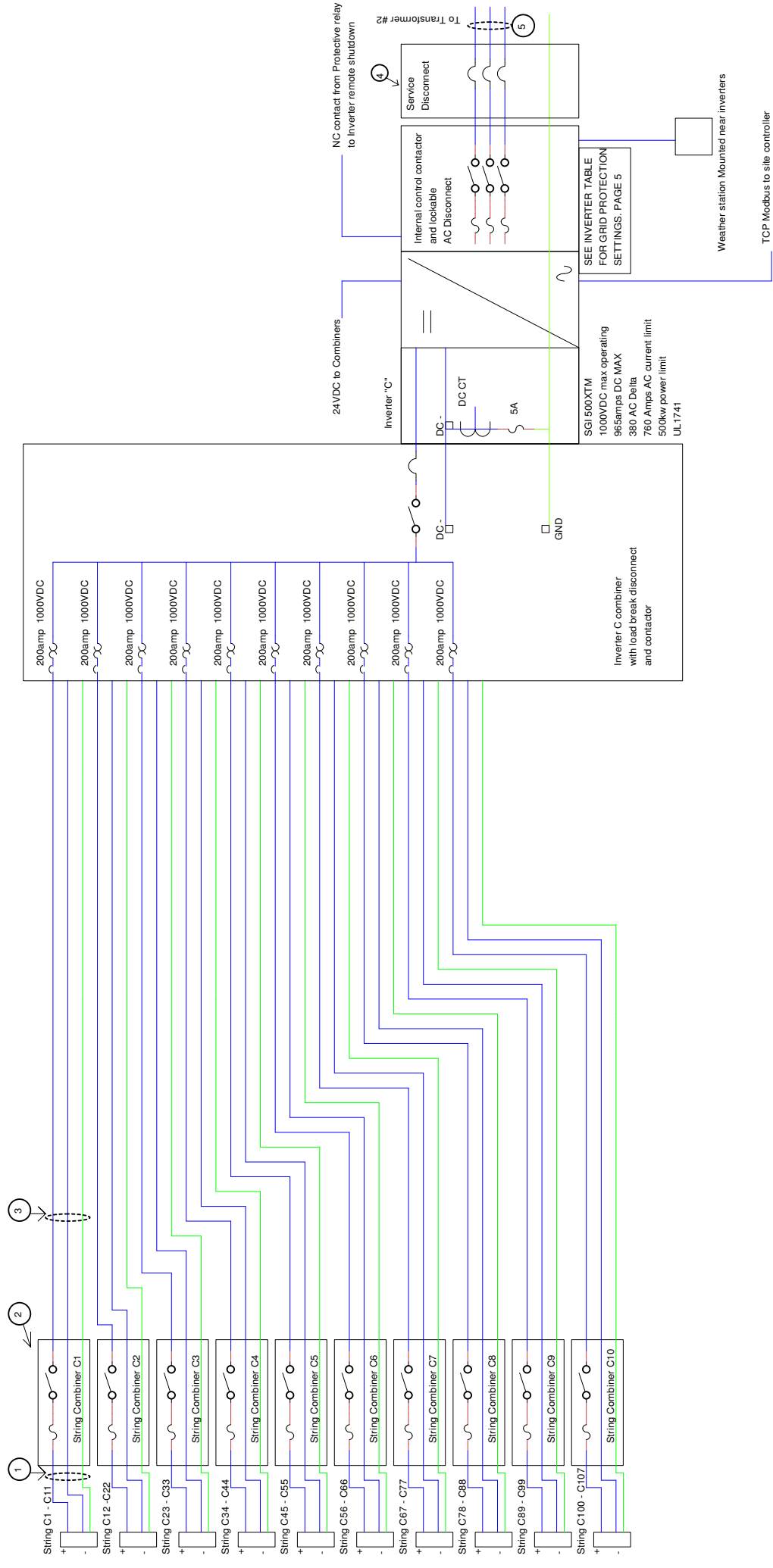
Sheets


2 of 8

NOTICE: THIS DOCUMENT IS THE PROPERTY OF ZERO POINT DEVELOPMENT INC AND IS DELIVERED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE DISCLOSED, REPRODUCED IN WHOLE OR IN PART, OR USED FOR ANYONE OTHER THAN ZERO POINT DEVELOPMENT WITHOUT ITS WRITTEN CONSENT, AND THAT NO RIGHT IS GRANTED TO DISCLOSE OR SO USE ANY INFORMATION CONTAINED IN SAID DOCUMENT. THIS RESTRICTION DOES NOT LIMIT THE RIGHT TO USE INFORMATION FURNISHED BY VENDORS OR OTHERS OUTSIDE ZERO POINT DEVELOPMENT INC.

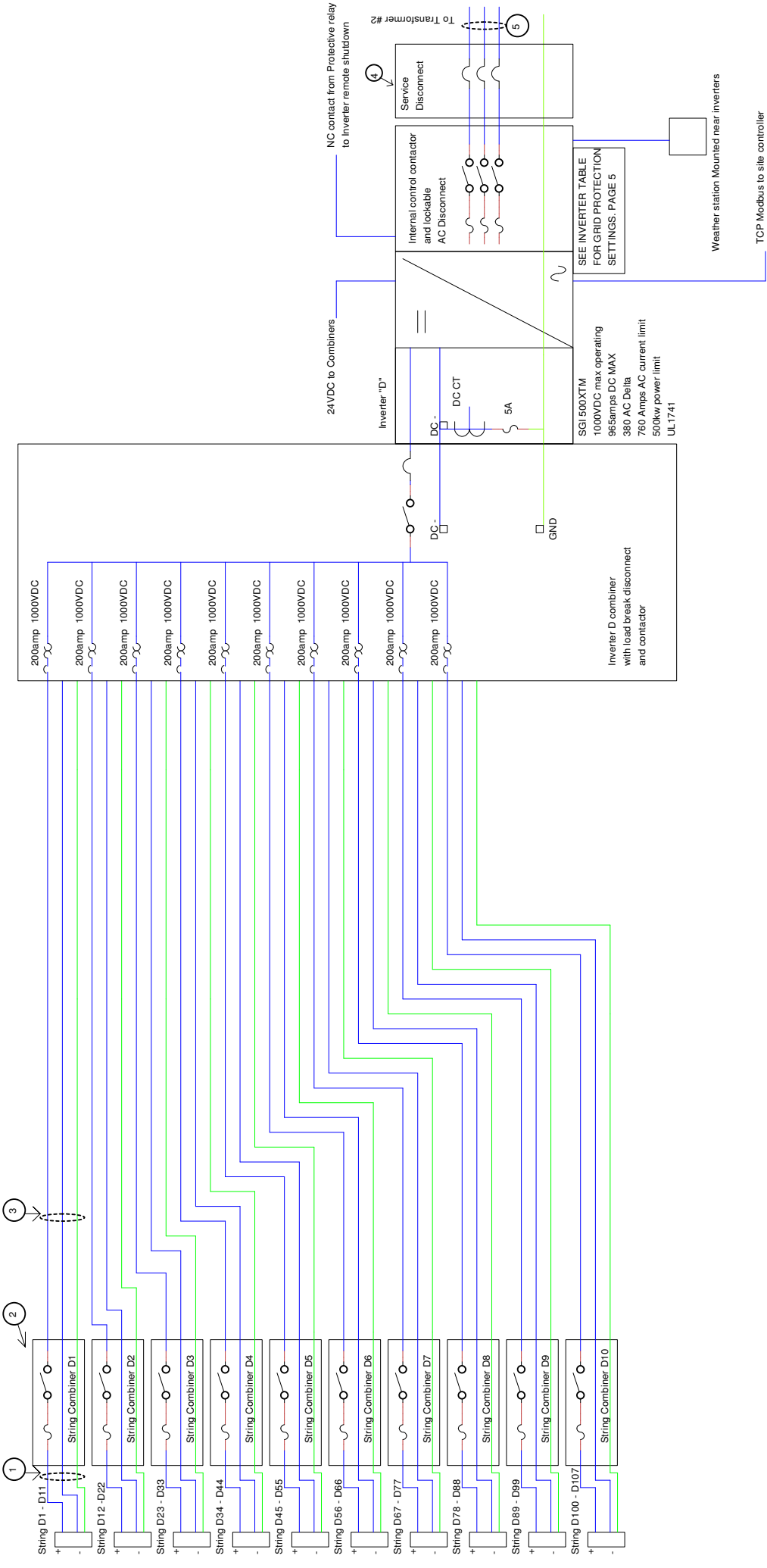






PROFESSIONAL STAMP		PRELIMINARY NOT FOR CONSTRUCTION	
		Title ZP-222 95 Main St, Haydenville, MA 01039	
		Author Zero Point Development for ZPT Energy Solutions II, LLC	
		Revision MA-25410112	
		Date: 10/31/2017	
		Sheets 5 of 8	

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PRELIMINARY
NOT FOR CONSTRUCTION

Title

ZP-222 95 Main St, Haydenville, MA 01039

Author

Zero Point Development for ZPT Energy Solutions II, LLC

Revision

1,2

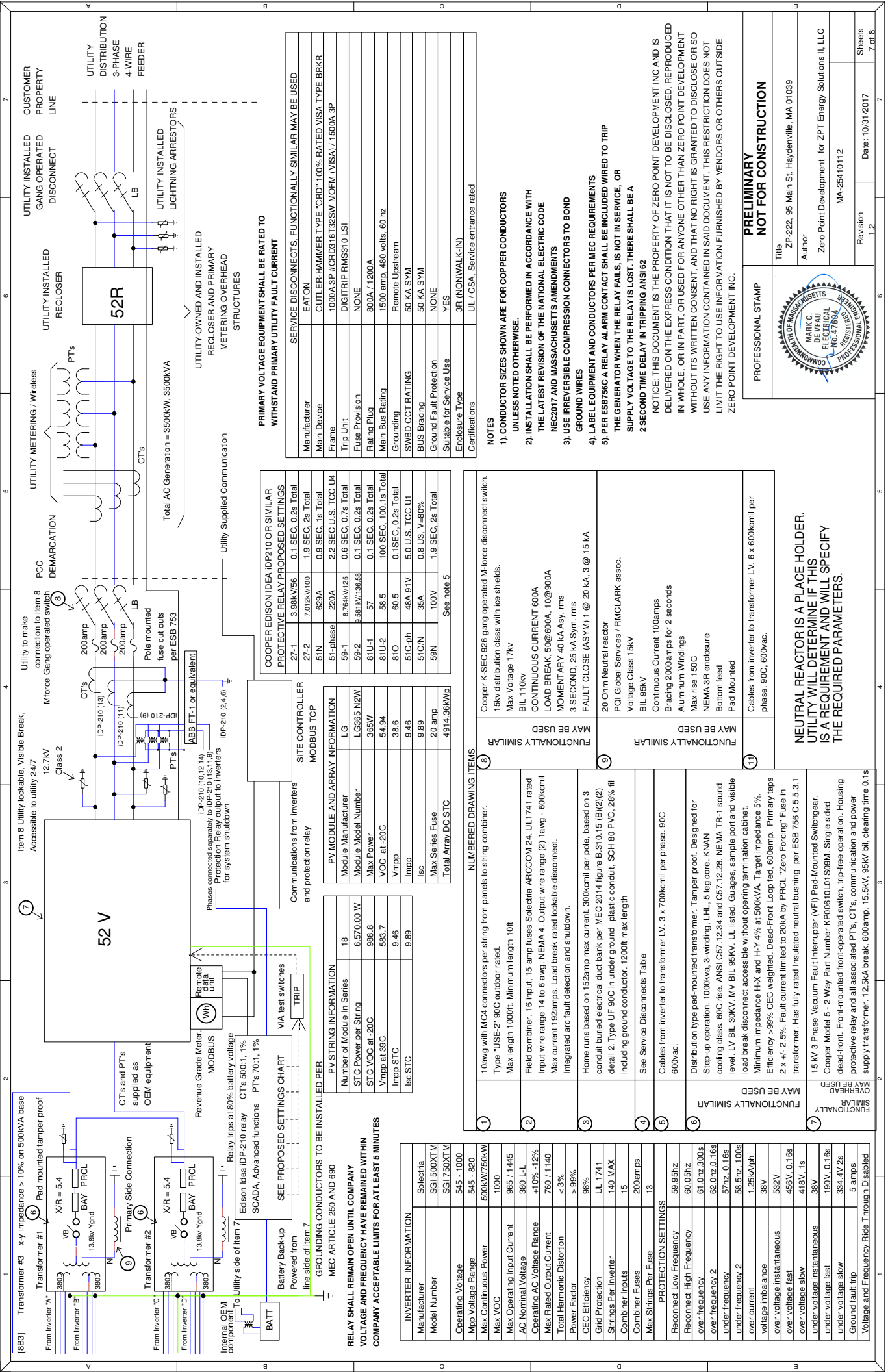
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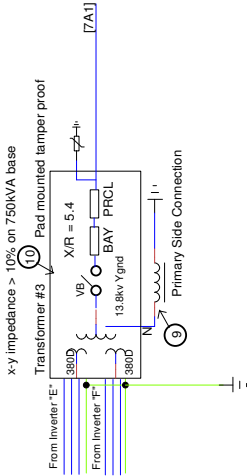
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FUNCTIONALLY SIMILAR
(10)

Distribution type pad-mounted transformer. Tamper proof. Designed for Step-up operation. 1500kva. 3-winding. LHL, 5 leg core. KNAN cooling class. 60C rise. ANSI C57.12.34 and C57.12.28. NEMA TR-1 sound level. LV BIL 30KV. MV BIL 95KV. UL listed. Guages, sample port and visible load break disconnect accessible without opening termination cabinet. 4% Minimum impedance H-X and H-Y 750kva. Target impedance 5%. Efficiency >99% CEC weighted. Dead-Front Loop fed, 600amp. Primary taps 2 x +/- 2.5%. Fault current limited to 20kA by PRCL. "Zero Forcing" Fuse in transformer. Has fully rated insulated neutral bushing per ESB 756 C 5.5.3.1

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	Author	Zero Point Development for ZPT Energy Solutions II, LLC	
	Revision	1,2	Date: 10/31/2017
Sheets		8 of 8	

ATTACHMENT 5:
PROJECT CONTACTS

Project Proponent:

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Worcester, Massachusetts 01605

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Vice President
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AChristie@ProtechEnergySolutions.com

Engineering Firm:

Meridian Associates, Inc.
500 Cummings Center
Beverly, MA 01915

Christopher A. Ryan
Project Manager
(978) 299-0447 x227
CRyan@MeridianAssoc.com

Property Owners:

Lawrence E. & Linda A. West
95 Main Street
Williamsburg, Massachusetts 01096

**ATTACHMENT 6:
MAJOR EQUIPMENT**

ARCCOM

FEATURES

- String level arc fault detection
- Remote shutdown
- Contactor disconnect
- Audible indication
- LED indicators
- Dry contact indication
- 16 or 24 fused positions
- Multiple fuse sizes
- Switch locking mechanism
- Lowest power consumption in the industry

OPTIONS

- Connection plates for field-crimped lugs
- Surge arrestor
- Internal power supply



ADVANCED STRING COMBINERS

Solectria Renewables' advanced string combiner (ARCCOM) offers the best quality, durability, ease-of-installation, mounting flexibility, safety and protection features. The ARCCOM is compliant with the latest NEC arc fault and rapid shut down requirements and offers contactor disconnect, lockable switch, string level arc fault protection, allowing the ARCCOM to detect and interrupt a series arc. It is designed and built for rugged conditions, wide temperature ranges and is HALT tested to extremes so all components are carefully vetted for highest reliability. ARCCOM also features standard oversized compression lugs that allow for long home run conductors. You may choose a 24VDC external power supply, a fire-panel auxiliary 24V output supply or optional integrated 120VAC power supply. Additional options include surge arrestor and stud connector plates for those installers that prefer crimped connectors.



ARCCOM SPECIFICATIONS		
PRODUCT	ARCCOM	
Number of Fused Inputs	16	24
Input Wire Range	14-6 AWG	
Ouput Wire Range	(2) 1 AWG - (2) 600 kcmil*	(2) 3/0 kcmil - (2) 600 kcmil*
Maximum Voltage	600 or 1000 VDC	
Maximum Continuous Current	192 A	288 A
Available String Fuses	4A, 6 A, 8A, 10A, 12A, 15A	
Operating Temperature	-40°F to +122°F (-40° C to +50°C)	
Mounting Locations	Indoor, Outdoor, Wall, Array, Rooftop - Vertical or Horizontal	
Certifications		
Safety Listings & Certifications	UL 1741, CSA C22.2#107.1, UL 1699B	
Certification Agency	ETL	
Warranty		
Standard	5 year	
Power Supply/Signals		
Standard Power Supply Input	24 VDC / 0.32 A (max)	
Optional Integrated Power Supply	100-277 VAC	
Dry Contact Arc Fault Detection	24V / 5 A rated	
Enclosure		
Dimensions (H x W x D)	20 in. x 24 in. x 7 in. (508 x 610 x 178 mm)	
Weight	41 lbs (18.5 kg)	
Enclosure Rating	Type 4	
Enclosure	Polyester powder coated steel	

*Inquire about option (code) for field-crimp lug plates for output terminals

EnvirotempTM FR3TM fluid Formulated for performance.



Envirotemp[™] FR3[™] fluid.
Trusted worldwide
a million times over.





With over one million installations across six continents and validated in over 250 tests, Cargill's Envirotemp™ FR3™ natural ester fluid is trusted by our customers to deliver cost-effective solutions that help improve transformer performance reliably and safely.

Our team of dielectric experts is active in the standards community globally and has extensive knowledge of not only dielectric fluid properties but also fluid performance in

application. And they have transformer design experience, too. This means our customers adopting FR3 natural ester technology have comprehensive dielectric fluids support from initial planning stages through best practices implementation and beyond.

Backed by Cargill's global supply chain network, our customers can rely on us to deliver the best solution for their application - when they need it, anywhere in the world.

With FR3 fluid, our customers can:

- Gain cost efficiencies either on initial cost or total cost of ownership without sacrificing reliability.
- Extend transformer insulation and asset life.
- Optimize load capacity.
- Significantly improve fire safety.
- Enhance their environmental footprint and sustainable supply chain initiatives.

Improve performance with life extension and loading flexibility.

Protect insulation life to extend asset life.

Insulation paper is one of the primary factors that determines the life of a transformer. FR3™ fluid's unique chemistry absorbs free water and essentially wicks it away from the insulation paper. FR3 fluid has 10 times the water saturation level of mineral oil. This results in extending the insulation life 5-8 times longer than mineral oil.



Insulation aging study comparing thermally upgraded paper using FR3 fluid vs. mineral oil.

- Save significantly on replacement costs by extending the asset life with FR3 fluid.
- Reduce the risk of failure to improve reliability of the transformer.
- Reduce processing maintenance costs, since FR3 fluid does not sludge like mineral oil.

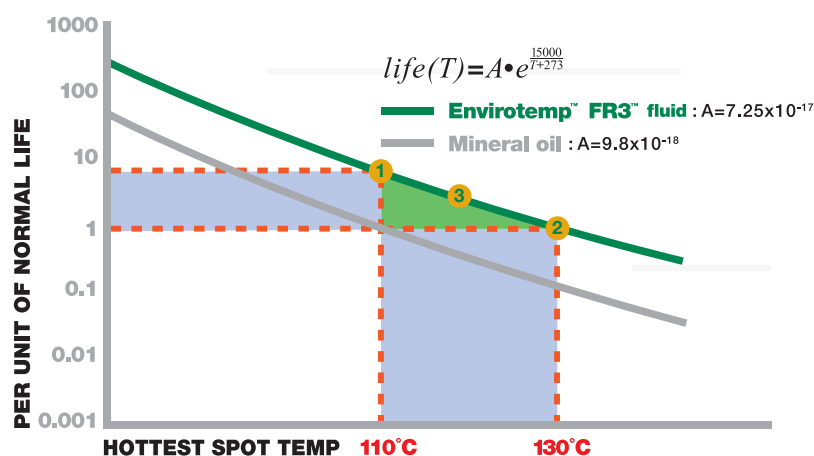
With FR3™ fluid's unique capabilities to extend insulation life and increase load capacity, organizations now have the flexibility to optimize their transformer fleet loading profiles in order to gain cost savings without sacrificing reliability.

Leverage higher thermal capability with FR3 fluid.

Historically, standards were written to accommodate a 95°C or 110°C hot spot for cellulose and Thermally Upgraded Kraft (TUK), respectively. However, published high temperature insulation system standards - IEC (60076-14) and IEEE (C157.154) – accommodate a 15°C or 20°C increase in hot spot without sacrificing the life or reliability of the transformer, when immersed in natural ester fluid.

Paper	Dielectric Fluid	Thermal Class	Hot spot	IEEE AWR	IEC AWR
TUK	Mineral Oil	120	110°C	65°C	75K
TUK	Natural Ester	140	130°C	85°C	95K

TUK life curves



OPTION 1: Extend asset life at current 110° hotspot.

OPTION 2: Increase load capability up to 20% with 130°C hotspot.

OPTION 3: Incrementally extend asset life and increase load capability with 120°C hotspot.

IEC 60076-14 Part 14: Liquid-immersed power transformers using high-temperature insulation materials. Edition 1.0 September 2013.

IEEE C57.154 Standard for the Design, Testing, and Application of Liquid-Immersed Distribution, Power, and Regulating Transformers Using High-Temperature Insulation Systems and Operating at Elevated Temperature. Published October 30, 2012.

Improve fire safety.

Add more sustainability to your sustainable supply chain.



Reduce costs while increasing fire safety.

FR3™ fluid has the highest fire point of any dielectric fluid (360°C compared to 160°C for mineral oil) making it the ideal choice for densely populated areas where transformers are positioned indoors, underground or in close proximity to buildings and other equipment. FR3 fluid is a K-class, less flammable fluid as certified by Underwriters Laboratory and approved by FM Global.

- Reduce clearance to buildings which saves precious real estate, particularly in space-constrained areas.
- Retrofill older transformers with FR3 fluid instead of replacing or moving them to help comply with current fire code regulations.
- For power transformers, potentially eliminate the need for expensive fire walls and deluge systems (and their ongoing maintenance costs).

“Being green” also benefits your bottom line.

FR3 fluid not only has best-in-class environmental properties, but with its enhanced thermal capabilities enabling smaller transformer designs, your supply chain just got a whole lot more sustainable.

- Smaller, more efficient transformer designs:
 1. Use less fluid and construction materials.
 2. Are typically lighter which could make installations easier for work crews and could reduce transportation costs.

Envirotemp™ FR3™ fluid properties: standard acceptance values and typical values

PROPERTY	Standard test methods		ASTM D6871	IEC 62770	Envirotemp FR3 fluid
	ASTM	ISO/IEC	As-received new fluid property requirements	Unused new fluid property requirements	TYPICAL
Physical					
Color	D1500	ISO 2211	≤1.0		0.5
Flash Point PMCC (°C)	D93	ISO 2719		≥250	255
Flash Point COC (°C)	D92	ISO 2592	≥275		320-330
Fire Point (°C)	D92	ISO 2592	≥300	>300	350-360
Pour Point (°C)	D97	ISO 3016	<-10	≤-10	-18 - -23
Density at 20°C (g/cm³)		ISO 3675		≤1.0	0.92
Relative Density (Specific Gravity) 15°C	D1298		≤0.96		0.92
Viscosity (mm²/sec)	D445	ISO 3104			
100 °C			≤15	≤15	7.7 - 8.3
40 °C			≤50	≤50	32 - 34
0 °C			≤500		190
Visual Examination	D1524	IEC 61099 9.2	bright and clear	clear, free from sediment and suspended matter	clear, light green
Biodegradation		OECD 301	readily biodegradable	readily biodegradable	ultimately biodegradable
Electrical					
Dielectric Breakdown (kV)	D877		≥30		47
Dielectric Breakdown (kV)					
1mm gap	D1816		≥20		28
2mm gap	D1816		≥35		48-75
2.5mm gap		IEC 60156		≥35	73
Gassing Tendency (mm/min)	D2300		≤0		-79
Dissipation Factor					
25°C (%)	D924		≤0.20		0.010 - 0.15
90°C (tan δ)		IEC 60247		≤0.05	0.02
100°C (%)	D924		≤4.0		0.41 - 3.85
Chemical					
Corrosive Sulfur	D1275	IEC 62697	non-corrosive	non-corrosive	non-corrosive
Water Content (mg/kg)	D1533	IEC 60814	≤200	≤200	4 - 50
Acid Number (mg KOH/g)	D974	IEC 62021.3	≤0.06	≤0.06	0.013 - 0.042
PCB Content (mg/kg)	D4059	IEC 61619	not detectable	free from PCBs	not detectable
Oxidation Stability (48 hrs, 120°C)		IEC 61125C			
Total Acidity (mg KOH/g)		IEC 62621.3		≤0.6	0.1
Viscosity at 40°C (mm²/sec)		ISO 3104		≤30% increase over initial	17.1% increase
Dissipation Factor at 90°C (tan δ)		IEC 60247		≤0.5	0.1

NOTE: Specifications should be written referencing only the defined ASTM or IEC industry standard acceptance values and test methods. The listed 'typical' values are average values summarized from a significant number of data points over many years; they are not to be identified as acceptance values.

ASTM D6871 Standard Specification for Natural (Vegetable Oil) Ester Fluids Used in Electrical Apparatus.

IEC 62770: Fluids for electrotechnical applications – Unused natural esters liquids for transformers and similar electrical equipment.

A transformer filled with FR3™ fluid complies with the transformer temperature operating range requirements defined in IEEE C57.12.00 and IEC 60076-1.

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- Made from a renewable source with global, reliable supply.
- Carbon neutral (according to BEES 4.0 lifecycle analysis).
- Non-toxic and non-hazardous in soil and water.
- Biodegrades in less than 28 days.
- Contains no petroleum, halogens, silicones or sulfurs.
- Recyclable.



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SGI 500XTM SGI 750XTM

FEATURES

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

OPTIONS

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

OPTIONS FOR UTILITIES

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



1000VDC UTILITY-SCALE INVERTERS

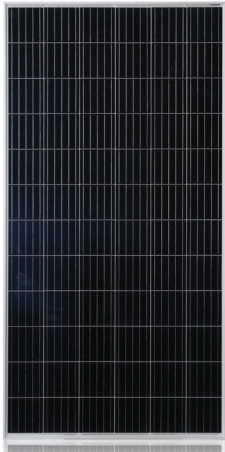
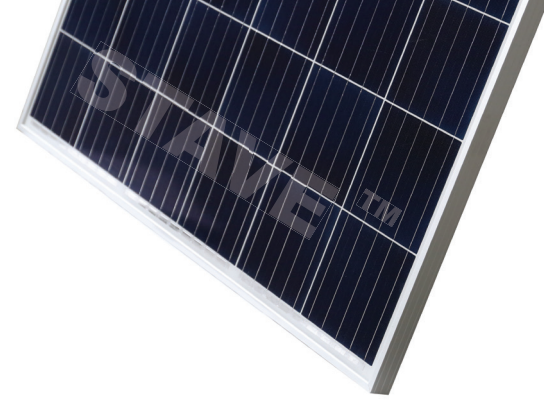
The only 1000VDC inverter available that is compliant with NEC 2014 690.11 & 690.12 arc fault and rapid shutdown requirements. Solectria's next generation of SMARTGRID series inverters are optimized for high efficiency, reliability, and economy. Available in two power classes, 500 kW and 750 kW, these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



Built for the real world

SPECIFICATIONS	SGI 500XTM		SGI 750XTM	
DC Input				
Absolute Maximum Input Voltage	1000 VDC			
Max Power Input Voltage Range (MPPT)*	545-820 VDC			
Operating Voltage Range	545-1000 VDC			
Maximum Operating Input Current	965 A		1445 A	
Strike Voltage	700 V			
AC Output				
Native Output Voltage	380 VAC, 3-Ph			
AC Voltage Range	-12/+10%			
Continuous Output Power	500 kW		750 kW	
Continuous Output Current	760 A		1140 A	
Maximum Backfeed Current	0 A			
Nominal Output Frequency	60 Hz			
Output Frequency Range	57-60.5 Hz			
Power Factor	Adjustable - 0.8 to +0.8, factory set at 1			
Total Harmonic Distortion (THD) @ Rated Load	< 3%			
Efficiency				
Peak Efficiency	98.3%			
CEC Efficiency	98.0%			
Tare Loss	89 W		123 W	
Subcombiner Options				
Fuses	4 to 16 positions, 100-400 A			
Breakers	4 to 15 positions, 125-350 A			
Temperature				
Ambient Temperature Range (full power)	-40°F to +122°F (-40°C to +50°C)			
Storage Temperature Range	-40°F to +122°F (-40°C to +50°C)			
Relative Humidity (non-condensing)	5-95%			
Data Monitoring				
Optional SolrenView Web-based Monitoring	Integrated			
Optional Revenue Grade Monitoring	800 A		1600 A	
Optional SolZone™ Sub-Array Monitoring (DC Current)	1 zone per protected input (up to 16 zones)			
Optional Cellular Communication	SolrenView AIR			
External Communication Interface	RS-485 SunSpec Modbus RTU			
Testing & Certifications				
Safety Listings & Certifications	UL 1741/IEEE 1547, CSA C22.2#107.1			
Testing Agency	ETL			
Warranty				
Standard	5 year			
Optional	10, 15, 20 year; extended service agreement; uptime guarantee			
Dedicated External Transformer				
Dedicated External Transformer	Required, provided by customer to Solectria's specification			
Transformer Type	Self cooled, step up, pad mount			
Output Voltage	Typical: 2.4-36.0 kV, 3-Ph			
Enclosure				
dBA (Decibel) Rating	< 67 dBA @ 10 m			
DC Disconnect (integrated)	Standard			
AC Disconnect/Breaker (integrated)	Optional disconnect, breaker or breaker with shunt trip			
Dimensions (H x W x D)	82 in. x 109 in. x 41 in. (2083 mm x 2769 mm x 1042 mm)			
Shading Set Back	137" (3480 mm) at 30° solar elevation			
Shipping Weight	3080 lbs (1398 kg)		3570 lbs (1620 kg)	
Enclosure Rating	Type 3R			
Enclosure Finish	Polyester powder coated steel; optional 316 stainless steel			

*At nominal AC voltage



STAVETM

Crystalline PV Module

CHSM6612P Series

CHSM6612P/HV Series

- ▶ With innovational 5-busbar cells
- ▶ Reducing cell series resistance
- ▶ Increasing cell efficiency
- ▶ More power output

CHSM6612P max system voltage 1000V standard, CHSM6612P/HV max system voltage 1500V standard

310 315 320 325 330

EN

ELECTRICAL SPECIFICATIONS

STC rated output (P_{mpp})*	310 Wp	315 Wp	320 Wp	325 Wp	330 Wp
PTC rated output (P_{mpp})**	282.5 Wp	287.2 Wp	291.9 Wp	296.6 Wp	301.3 Wp
Standard sorted output	0/+5 Wp				
Warranted power output STC ($P_{nominal}$)	310 Wp	315 Wp	320 Wp	325 Wp	330 Wp
Rated voltage (V_{mpp}) at STC	36.91 V	36.99 V	37.02 V	37.11 V	37.15 V
Rated current (I_{mpp}) at STC	8.40 A	8.53 A	8.65 A	8.77 A	8.89 A
Open circuit voltage (V_{oc}) at STC	45.15 V	45.30 V	45.45 V	45.67 V	45.86 V
Short circuit current (I_{sc}) at STC	8.92 A	9.04 A	9.25 A	9.48 A	9.52 A
Module efficiency	16.0%	16.3%	16.5%	16.8%	17.1%
Rated output (P_{mpp}) at NOCT	216.5 Wp	220.0 Wp	223.5 Wp	226.9 Wp	230.4 Wp
Rated voltage (V_{mpp}) at NOCT	33.71 V	33.74 V	33.80 V	33.86 V	33.92 V
Rated current (I_{mpp}) at NOCT	6.42 A	6.52 A	6.61 A	6.70 A	6.79 A
Open circuit voltage (V_{oc}) at NOCT	41.43 V	41.57 V	41.70 V	41.91 V	42.08 V
Short circuit current (I_{sc}) at NOCT	6.90 A	6.99 A	7.15 A	7.33 A	7.37 A
Temperature coefficient (P_{mpp})	- 0.408%/K				
Temperature coefficient (I_{sc})	+0.050%/K				
Temperature coefficient (I_{mpp})	- 0.003%/K				
Temperature coefficient (V_{mpp})	- 0.406%/K				
Temperature coefficient (V_{oc})	- 0.311%/K				
Normal operating cell temperature (NOCT)	46±2°C				
Maximum system voltage (IEC/UL)	1000V _{DC} / 1000V _{DC} or 1500V _{DC} / 1500V _{DC}				
Number of diodes	3				
Maximum series fuse rating	15 A				

* Measurement tolerance +/- 3%

** Estimated



RELATED PARAMETERS

Cell type	Polycrystalline
Number of cells / cell arrangement	72 / 6 x 12
Cells dimension	6"
Packing unit	27 modules
Weight of packing unit (for container)	646 kg / 1424 lbs

MECHANICAL SPECIFICATIONS

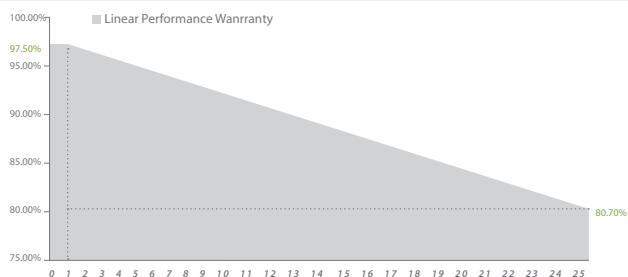
Outer dimensions (L x W x H)	1954 x 990 x 40 mm 76.93 x 38.98 x 1.57 in
Frame technology	Aluminum, silver anodized
Module composition	Glass / EVA / Backsheet (white)
Weight (module only)	21.8 kg / 48.1 lbs
Front glass thickness	3.2 mm / 0.13 in
Junction box IP rating	IP 67
① Cable length (UL/IEC)	1150 mm / 45.28 in
Cable diameter (UL/IEC)	12 AWG / 4 mm ²
② Maximum load capacity	5400 Pa
Fire performance (UL/IEC)	Type 1 (UL) or Class C (IEC)
Connector type (UL/IEC)	MC4 compatible

① Option: 900(+)/600(-) mm for defined projects in advance.

② Refer to Astronergy crystalline installation manual.

QUALIFICATION AND LINEAR WARRANTIES

Product standard	IEC 61215, 61730 / UL1703
Extended product warranty	10 years
Output decline 2.5%/year performance P _{mp} (STC)	1 st year
Output decline 0.7%/year performance P _{mp} (STC)	2 nd ~ 25 th years



ARTICLE NUMBER

Model	Article No. (IEC)	Article No. (UL)
(STAVE) CHSM6612P-310	200794	200777
(STAVE) CHSM6612P-315	200769	200778
(STAVE) CHSM6612P-320	200770	200779
(STAVE) CHSM6612P-325	200771	200780
(STAVE) CHSM6612P-330	200772	200781
(STAVE) CHSM6612P/HV-310	500169	500152
(STAVE) CHSM6612P/HV-315	500144	500153
(STAVE) CHSM6612P/HV-320	500145	500154
(STAVE) CHSM6612P/HV-325	500146	500155
(STAVE) CHSM6612P/HV-330	500147	500156

MODULE DIMENSION DETAILS

Front view	Side view	Rear view	Frame cross section

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Specifications and designs included in this datasheet are subject to change without notice.

TerraFarm Data Sheet



TerraFarm Ground Mount - Landscape

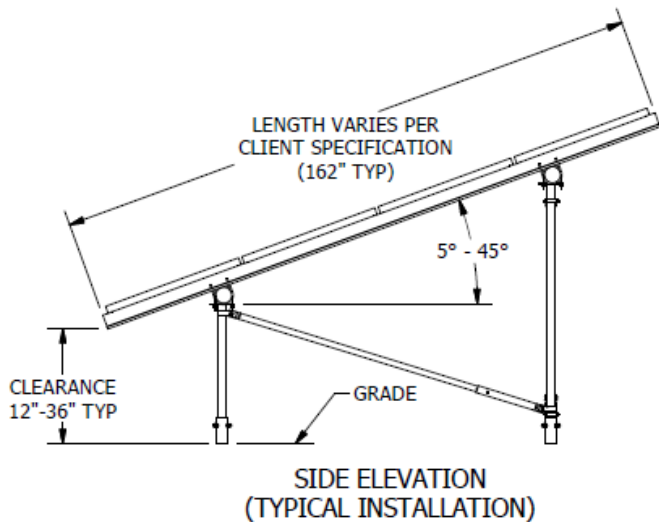
Application:	Commercial to Utility Scale
Grounding:	ETL listed, Electrically bonded system, verified Wiley
Panel Orientation:	Landscape
Array Configurations:	Up to 7 panels high and up to 12 panels long
Tilt Angle:	5 – 45 degrees
Lower Panel Clearance:	Up to 48 inches, standard
Loading Conditions:	Up to 160 mph wind speed, 80 psf snow load, Exposure C
Warranty:	20-year limited warranty
Engineering:	Professional Engineer Stamped Drawings Available in 50 States Custom Engineered to Exceed Applicable ASCE, IBC, and UL Standards.
Material:	Galvanized steel (G90 or Better)
East-West Slope:	20% maximum
North-South Slope:	60% maximum, limited by installation equipment
Max Fuse Rating:	30 Amp Fuse Rating



Max Capacity of PV modules:

12 High x 12 Wide (144 Panels):	Listed Frameless (Thin Film) PV Module (21"-26" x 47"-51")
7 High x 10 Wide (70 Panels):	54 Cell Listed Aluminum Framed PV Module (37"-41" x 56"-60")
7 High x 9 Wide (63 Panels):	60 Cell Listed Aluminum Framed Module (37"-41" x 63"-67")
7 High x 8 Wide (56 Panels):	72 Cell Listed Aluminum Framed Module (37"-41" x 75"x79")

Benefits



Minimal hardware to assemble

No in-field drilling, cutting, or welding

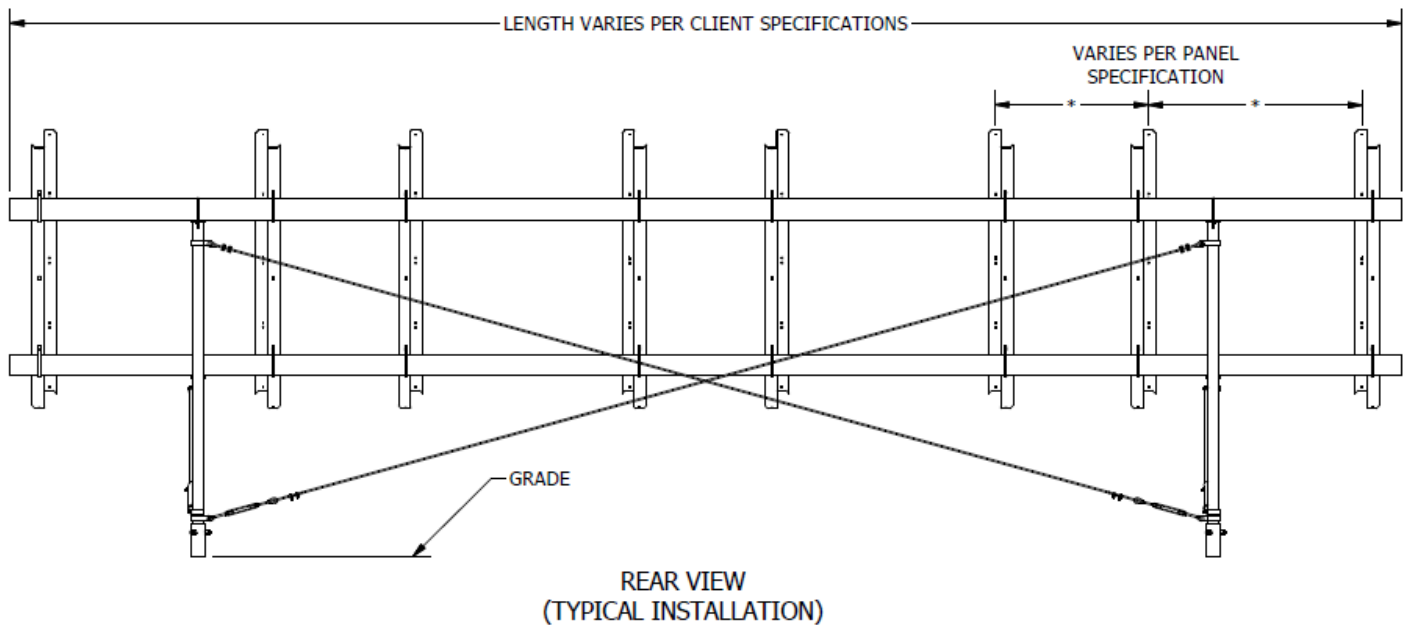
Significantly reduces installed labor costs

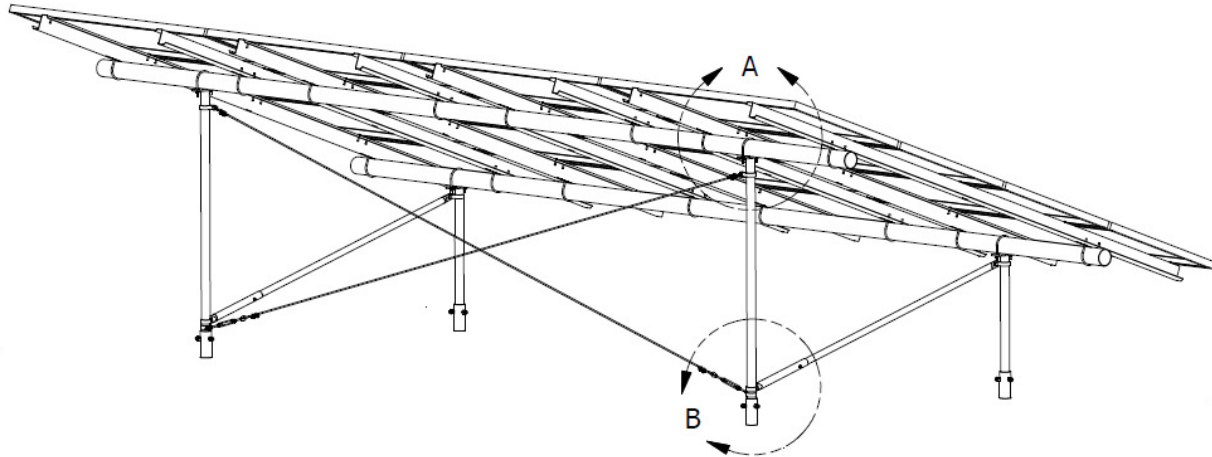
Integrated foundation solution

Turn-key installation service available, Foundation to Panels

Pre-assembly options available

Maximum adjustability for following grade





Z-PURLIN PV MODULE
SUPPORT RAIL

1/4"-20 x 1" FULLY THREADED SS HEX BOLT, EXTERNAL
TOOTH LOCK WASHER, FLAT WASHER, LOCK WASHER,
AND HEX NUT.

3/8"-16 X 6" U-BOLT, TWO FLAT WASHERS, TWO LOCK WASHERS,
TWO HEX NUTS, AND Z-PURLIN WASHER PLATE

2-3/8" TENSION BAND

3/16" GALVANIZED STEEL WIRE ROPE CROSS BRACE CABLE
AND TWO GALVANIZED WIRE ROPE CLIPS

3/8"-16 X 1-1/2" CARRIAGE BOLT, LOCK WASHER, AND HEX NUT

REAR LEG ASSEMBLY

PV MODULE - SUPPLIED BY OTHERS

3/8"-16 X 6" U-BOLT, TWO FLAT WASHERS, TWO LOCK WASHERS,
AND TWO HEX NUTS

LONGITUDINAL BEAM

DETAIL A

2-3/8" TENSION BAND

3/16" GALVANIZED STEEL WIRE ROPE CROSS BRACE CABLE
AND TWO GALVANIZED WIRE ROPE CLIPS

GALVANIZED STEEL TURNBUCKLE

3/8"-16 X 1-1/2" CARRIAGE BOLT, LOCK WASHER, AND HEX NUT

G 76X2100-M16X3 GROUND SCREW

REAR LEG ASSEMBLY

3/8"-16 X 2-1/2" HEX BOLT, LOCK WASHER, AND HEX NUT

TELESCOPING LATERAL BRACE

3/8"-16 X 1-1/2" CARRIAGE BOLT, LOCK WASHER, AND HEX NUT

2-3/8" TENSION BAND

THREE M16 SET SCREWS AND JAM NUTS

DETAIL B

Underground Distribution Switchgear

VFI Underground Distribution Switchgear

285-10

GENERAL

Cooper Power Systems VFI underground distribution switchgear provides superior overcurrent protection through the use of proven, reliable vacuum fault interrupters from Cooper Power Systems. The resettable vacuum fault interrupter allows immediate service restoration, eliminating the added expense and downtime associated with stocking and replacing fuses.

Deadfront construction provides a higher level of safety for operating personnel. With the addition of visible-break switches, circuits can be isolated and grounded without disconnecting or moving terminations.

A sealed insulation system offers the further advantage of low-maintenance, and permits construction of a compact, low-profile unit that is less obtrusive than a comparable air-insulated design. Insulation options include the environmentally-preferred high-fire-point E200™ fluid and Envirotemp™ FR3™ fluid, as well as mineral oil and Sulfur Hexafluoride (SF₆) gas.

VFI switchgear is used for commercial/industrial and utility applications, and can be easily coordinated in the field without a PC, using field-selectable settings to

meet distribution system protection requirements. Ratings of VFI switchgear are shown in Table 1.



Figure 1. VFI underground distribution switchgear offers a simplified approach to the protection of 15, 25, and 35 kV underground systems, and provides a wide choice of switching combinations to meet system requirements.

TABLE 1
Ratings for VFI Switchgear and Load-Break Switch*

Nominal Voltage		15 kV	15 kV	25 kV	35 kV
Maximum Design Voltage, kV		15.5	15.5	27.0	38.0
BIL, kV		95	95	125	150
1-minute Withstand Voltage (60 Hz), kV		35	35	60	70
Momentary Current, 10 cycles (sym.), kA		12.5	16.0	12.5	12.5
3-second Withstand Current (sym.), kA		12.5	16.0	12.5	12.5
Vacuum Fault Interrupter	Continuous Current, (max.), A	600**	600**	600**	600
	Interrupting Current (sym./asym.), kA	12.5/20.0	16/25.8	12.5/20.0	12.5/20.0
	Making Current (sym.), kA	12.5	16.0	12.5	12.5
	Cable Charging Interrupting Current, A	10.0	10.0	25.0	40.0
Load-Break Switch	Continuous Current, (max), A	600	600	600	600
	Load Switching, A	600	600	600	600
	3-Shot Make and Latch (asym.), kA	20.0	25.8	20.0	20.0

* Continuous and short-circuit currents may be limited by ratings of selected bushings.

** 900 A and 1200 A continuous-current ratings are also available.

FEATURES AND DETAILED DESCRIPTION

VFI Switchgear

Cooper Power Systems VFI underground distribution switchgear provides a simple, economical approach to protective requirements for 5, 15, 25, and 35 kV underground systems.

The deadfront construction of VFI switchgear improves safety for utility personnel and the general public. Inside, all terminations are covered with insulating rubber that is grounded. All internal parts are completely sealed in a steel tank to reduce maintenance and eliminate the problems of moisture, dirt, and wildlife.

This fluid-insulated, sealed design offers an added advantage: an unobtrusive, low-profile appearance.

VFI switchgear is versatile in its application. It is suited for commercial/industrial and utility requirements.



Figure 2. Compact single-sided units are available in vault and pad-mounted styles.

Single-sided compact style VFI switchgear units are ideal for areas where access is limited; such as next to a transformer, behind a building, against a wall, or in a vault. The VFI vault-style unit is suitable for indoor applications including commercial and industrial electrical equipment rooms. 5- and 6-way units are ideal for large retail complexes and campuses (military, university, industrial park) with multiple loads.

For sustained reliability, Cooper Power Systems VFI switchgear has 30 years of excellent field performance. The VFI switchgear's interrupting duty cycle is unmatched in the industry, providing a full 232 interruptions per IEEE Std C37.60™-2003 standard (see Table 2).



Figure 3. VFI switchgear 6-way unit.

Tri-Phase Control

The Tri-Phase electronic control provides a flexible solution for time-current-curve coordination. The Tri-Phase control offers over 100 minimum trip settings and an assortment of time-current curves. With standard instantaneous trip and optional ground trip and minimum response characteristics, the Tri-Phase control will satisfy system protection and coordination needs. A wide selection of TCCs and minimum trip settings make it easily adaptable to distribution systems.

Edison™ Idea™ Relays

Edison™ Idea™ relays allow enhanced functionality in protection and communication.

The IDEA Workbench™ embedded within the ProView™ software allow unsurpassed flexibility in customizing the relay protection and control functions through downloadable Custom Software Modules.

Depending on the relay selected, Edison Idea relays can provide protective functions such as overcurrent with or without ground detection, over/under voltages, reverse power, and negative sequence to name a few.

IMPORTANT: For applications requiring SF₆ insulated switchgear, contact your Cooper Power Systems representative when selecting a relay/controller that has metering and protective elements requiring potential transformers.

Advanced metering and analytics are also available which are critical to providing Distribution Automation capability.

Single- or Three-Phase Tripping

Most commercial loads consist of large three-phase transformers. Many transformers are protected with single-phase fuses. Typically, only one of the fuses will open during an overcurrent condition. This “single-phases” three-phase commercial loads, and may cause damage to three-phase motors and other equipment. VFI switchgear solves this problem by providing three-phase ganged tripping. An overcurrent on any phase automatically opens all three phases simultaneously.

VFI switchgear can also be specified with single-phase trip, to provide individual phase protection for single-phase residential applications.

VFI switchgear can also serve as a vacuum load-break switch. Tap switching has traditionally been accomplished by pulling load-break elbows. With VFI switchgear, the tap can be switched with a simple push-pull of the operating handle.

TABLE 2
Interrupting Duty Cycle

Minimum Full Life Fault Interrupting Duty Cycle per IEEE Std C37.60™-2003 standard (2 duty cycles)		Number of Operations
Percent of Interrupting Current Rating:	15-20%	
	45-55%	112
	90-100%	32
Total		232

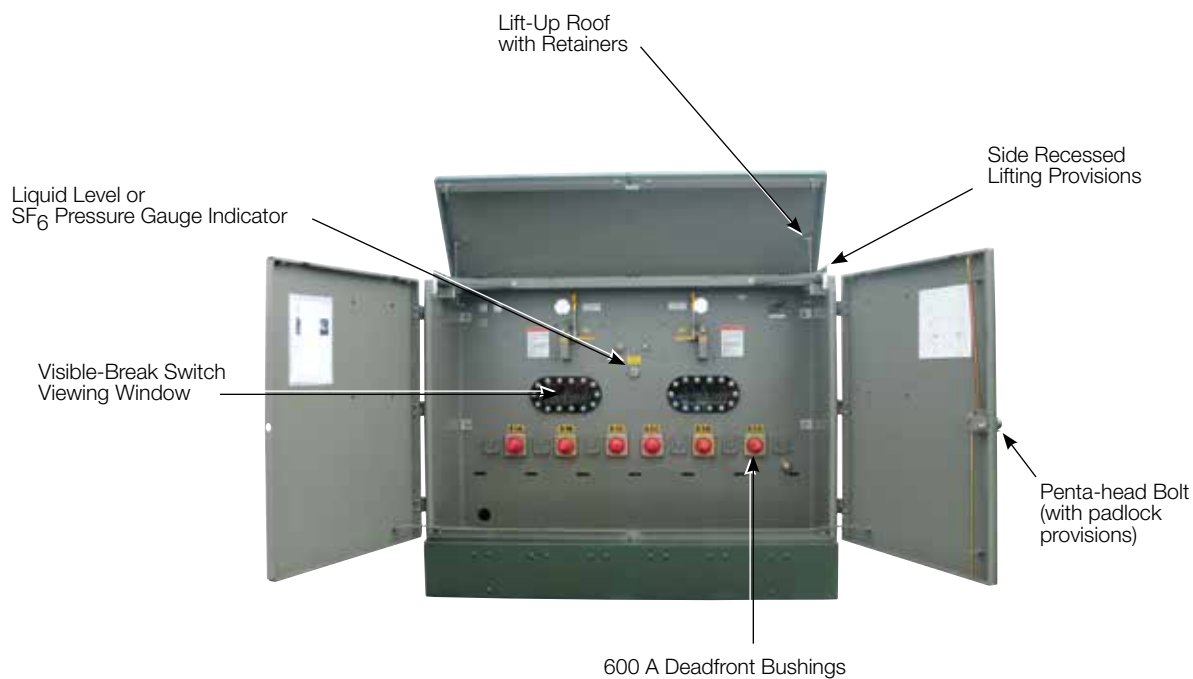


Figure 4.
VFI switchgear source-side switch components (some optional components shown).

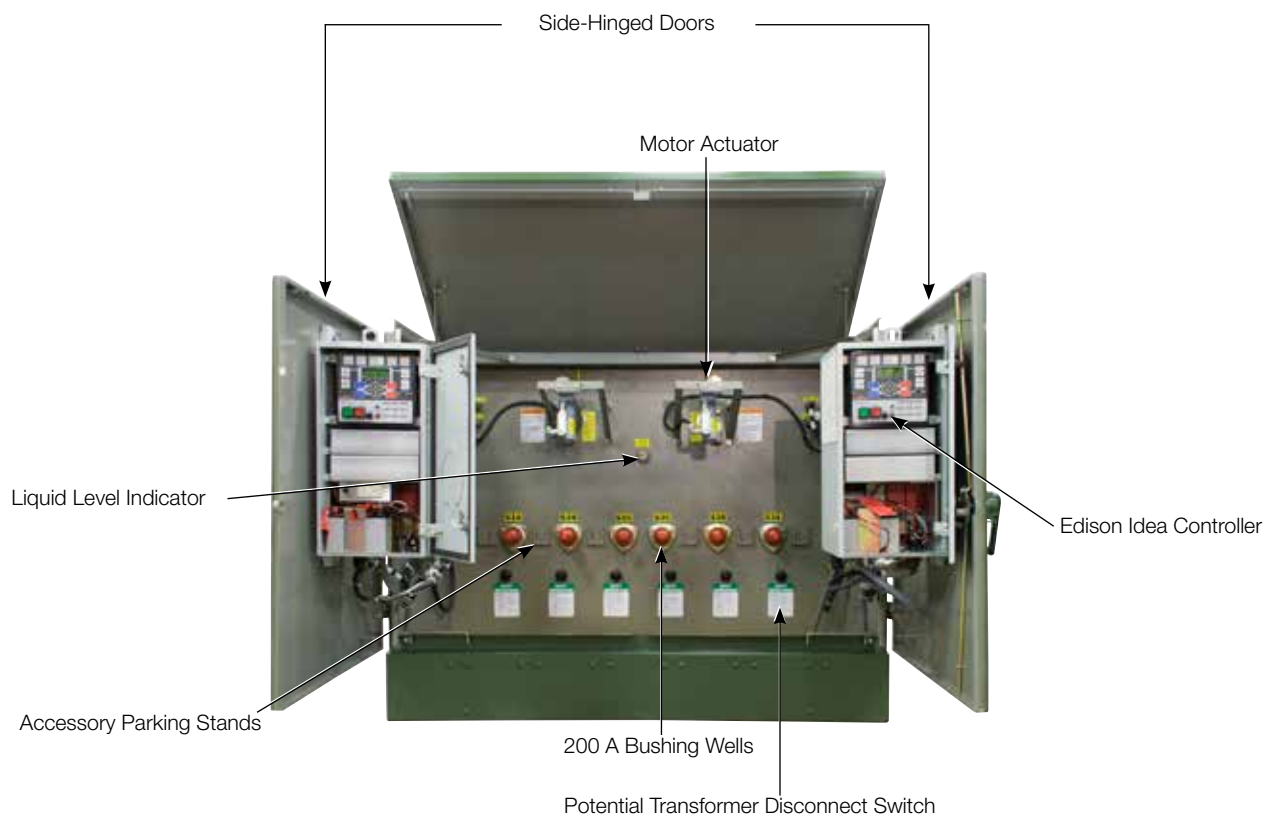


Figure 5.
VFI switchgear tap-side components (some optional components shown).

Vacuum Load-Break Switch

Source switching is accomplished by three-phase, vacuum load-break switches. The ratings for the vacuum switches are in Table 1.

Visible-Break Switch

Visible-break switches are available in two versions—a two-position switch (closed/open) and a three-position switch, (closed/open/ground). Visible-break is accomplished by a separate switch operated from the side of the unit—away from the high voltage compartment. This switch is mechanically interlocked such that the vacuum load-break switch or the vacuum fault interrupter mechanism first interrupts the current and then the visible-break switch may be operated. The visible-break switch is rated 600 A continuous current and has a making current rating up to 16 kA (sym). The ground position allows the cables to be grounded without disconnecting or moving the terminations. The switch contact positions are visible via a large viewing window above the associated bushings. Only VFI switchgear with liquid dielectric may be equipped with a visible-break feature.

Types of Insulation

Cooper Power Systems offers underground distribution switchgear with the widest availability of dielectric media in the industry. Fire-resistant E200 fluid and Envirotemp™ FR3™ fluid, as well as commonly used mineral oil and SF₆ gas, are offered as insulation media for VFI switchgear.

E200 Fluid

E200 fluid is fire-resistant biodegradable, polyol ester-based, non-toxic low viscosity fluid with excellent dielectric, thermal and physical properties. The low viscosity characteristic allows it to be used in VFI switchgear down to -30 °C. Its fire point is greater than 300 °C (572 °F), a requirement for less flammable fluids.

The performance of the switchgear equipment containing E200 fluid is further enhanced by the fluid’s other important properties:

- Excellent thermal properties
- High dielectric strength
- Oxidation stability
- Clear bright appearance

Envirotemp™ FR3™ Fluid

Envirotemp™ FR3™ fluid is formulated from edible vegetable oils and food grade performance enhancing additives. It does not contain any petroleum, halogens, silicones, or any other questionable material. It quickly and thoroughly biodegrades in both soil and aquatic environments. The fluid tested non-toxic in aquatic toxicity tests.

Mineral Oil

Mineral oil is a petroleum-based, time-proven insulation and has reliable electrical insulating properties.

SF₆

SF₆ is non-flammable, odorless, colorless gas that requires a gas-tight design and gas monitoring and handling systems.

TABLE 3
Available Dielectric Media -
Minimum Application Limits

E200 Fluid	-30 °C
Envirotemp™ FR3™ Fluid	0 °C
Mineral Oil	-30 °C
SF ₆ Gas	-30 °C

Low Profile Sealed Construction

VFI switchgear features a low-profile cabinet design, with sealed tank construction. This means that VFI switchgear can be used in locations where air-insulated switchgear cannot, such as flood areas or high-contaminant industrial sites. It is resistant to attacks from dust, ice, vegetation, and wildlife.

Stainless Steel

VFI switchgear may be specified in 100% stainless steel construction for the ultimate in corrosion protection. With VFI switchgear from Cooper Power Systems, the entire unit is designed in stainless steel, including the tank and cable compartments. All details and accessories are stainless steel as well. This construction meets the requirements of IEEE Std C57.12.29™-2005 standard, Standard for Pad-Mounted Equipment–Enclosure Integrity for Coastal Environments.

Trip-Free Operation

The vacuum fault interrupter mechanism can be quickly and easily reset manually by pulling the handle to the “reset” position and then moving it to the closed position. However, if a fault is present when the vacuum fault interrupter mechanism is closed, the trip-free feature will prevent the mechanism from being held in the closed position and it will clear the circuit fault.

Low Maintenance

Both load and fault interruption take place within the sealed vacuum fault interrupter with no arcing by-products to contaminate the insulating medium. Advanced technology vacuum fault interrupters are reliable, have long life and require no maintenance. Cooper Power Systems patented design reduces the arc energy—resulting in far less contact erosion and the longest life of any vacuum fault interrupter in the industry. Since there are no expulsion fuses or switching by-products to contaminate the insulation medium, maintenance intervals are greatly increased.

Edison™ Idea™ Relay and Tri-Phase Control

Cooper Power Systems Edison™ Idea™ relay and Tri-Phase control makes use of internally mounted 1000:1 current transformers (CT), one on each phase, to monitor line current. If the current in any phase exceeds the minimum trip level setting, the control begins a user selectable time-current-curve (TCC) delay sequence.

At the completion of the programmed TCC delay, a signal is issued to trip the vacuum fault interrupter mechanism.

CT Circuits

The Tri-Phase control is self-powered by the line current. It requires no external voltage supply or battery backup. Since the Tri-Phase control is powered by the sensing CT circuits, it is not affected by system voltage conditions.

Edison Idea relays require a 120 Vac power source to power their internal battery source. The standard battery



Figure 6.
TPG control with SCADA shown.

provided is an 13 Ah. 18 Ah batteries are an option.

Tri-Phase Control Settings

The minimum-trip setting for each phase is selectable. This permits convenient field configuration of the Tri-Phase control, to meet specific application requirements.

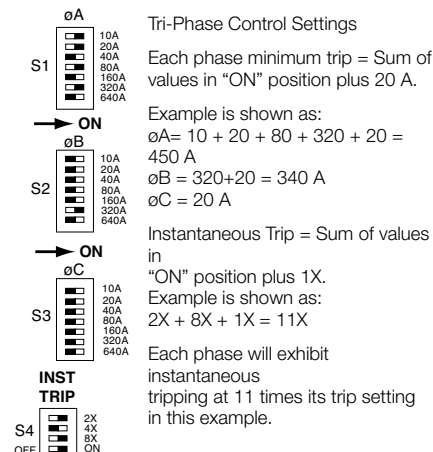


Figure 7.
Tri-Phase control settings.

The control features an assortment of field replaceable TCC modules, each provides a fixed time-current-curve characteristic. The variety of modules available provides coordination flexibility between the Tri-Phase control and other protective equipment.



Figure 8.
Typical Tri-Phase Control TCC module.

Tri-Phase Control Normal Load

At normal system current, the Tri-Phase control is effectively dormant. Load current is continuously being compared to the selected minimum-trip settings, but the TCC and trip circuits are not activated.

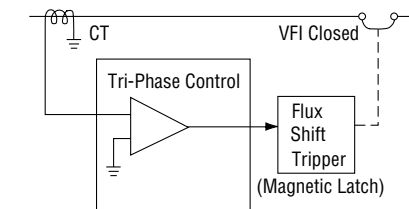


Figure 9.
Normal load diagram.

Tri-Phase Control Overcurrent Protection

The TCC circuit is activated when current above the pre-selected minimum trip value is sensed. Once activated, the TCC circuit uses the magnitude of the overcurrent to establish a time delay. At the completion of the delay, the trip circuit pulses the Flux Shift Tripper, which causes it to trip open the vacuum fault interrupter mechanism.

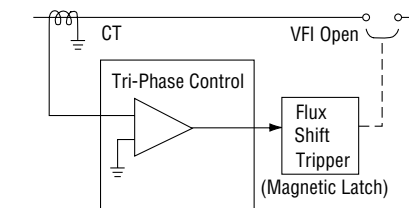


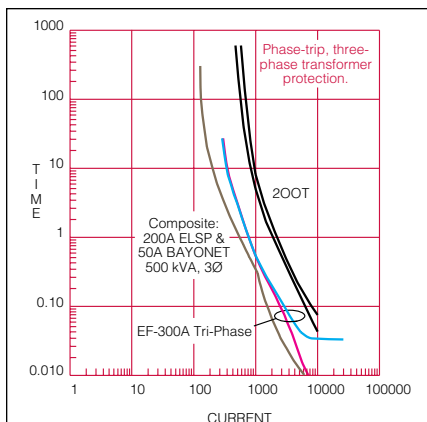
Figure 10.
Tri-Phase control overcurrent protection diagram.



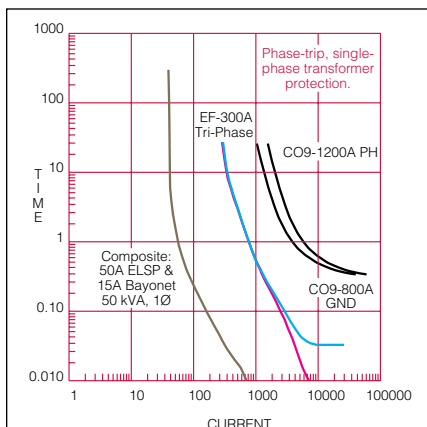
Figure 11.
Edison Idea iTAP-260 relays.

Tri-Phase Control Coordination Flexibility

The E time-current curve has long been an industry standard for underground distribution switchgear fusing. However, when several protective devices are present on the same line, it can become difficult to obtain proper system coordination. The Tri-Phase control, with the EF TCC installed, combines classic switchgear protection with state-of-the-art vacuum fault interrupter technology. The Tri-Phase control eliminates the problems normally associated with fuses, but preserves and extends the familiar E-shaped curve to higher currents.



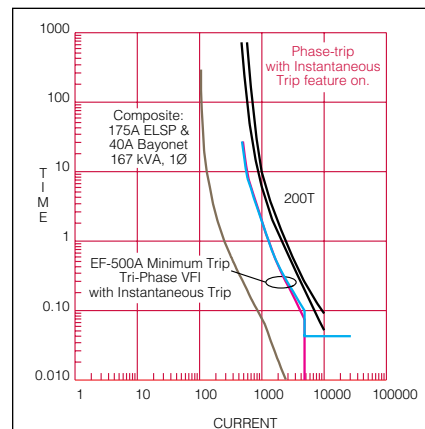
Coordination and application of the Tri-Phase control is identical to fuse application, but with the benefit of a greatly expanded offering of trip ratings and timing curves. In the following example, the EF TCC provides ideal coordination when protecting single-phase distribution transformer loop schemes. The cable can be protected to its rated load with sufficient margin between the EF and the substation breaker.



Tri-Phase Control Instantaneous Trip

Instantaneous trip, a standard feature of the Tri-Phase control, extends the range of coordination with upstream devices, at higher fault levels. A switch on the control circuit board enables the instantaneous trip feature and programs a multiplier that is applied to the standard minimum trip setting. When current above the predetermined fault level is sensed, the instantaneous trip feature causes the control to bypass the normal TCC delay and trip immediately; thus eliminating any intentional time delay. For faults below this actuation level, the control operates according to its normal settings.

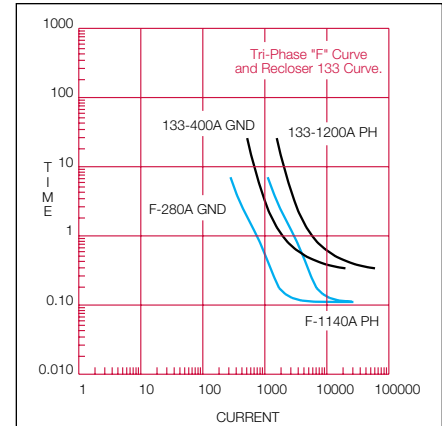
In the example, the EF curve coordinates well with the transformer fusing, although instantaneous trip is required to extend coordination with the upstream T-Link.



Optional Tri-Phase with Ground Trip (TPG)

The optional TPG control operates under the same algorithm as the standard Tri-Phase control for phase protection. In addition, the TPG control has a separate zero-sequence circuit and settings for ground protection. Settings for ground trip vary from 10 A to 640 A in 10 A increments, and are field selectable by the user.

In some applications, such as a switchgear tap that feeds both underground and overhead feeders, the TPG control is necessary. As shown below, the F curve achieves coordination with both the phase and ground settings of the upline recloser.

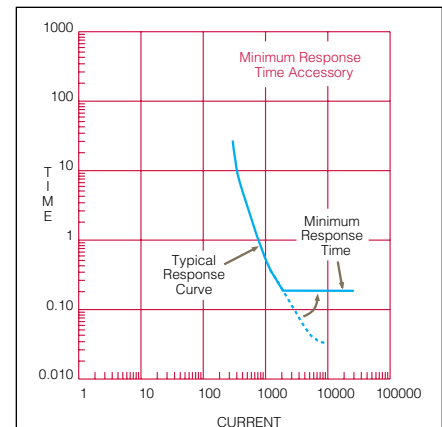


Tri-Phase Control Accessories

Minimum Response Time

The minimum response time accessory is used to achieve coordination between in-line protective interrupting devices, located where fault-level currents would normally cause simultaneous tripping.

The accessory inhibits tripping until a predetermined minimum time has elapsed; available minimum response times are adjustable at 0.050, 0.100, 0.145, 0.205, 0.260, 0.335, 0.405, 0.495, or 0.580 seconds. Refer to the example below.



Minimum Trip Multiplier

The minimum trip multiplier accessory allows the user to increase the programmed minimum trip setting, to a predetermined alternate setting, by operating a toggle switch. Typical applications for an alternate minimum trip settings include: preplanned or emergency load transfers, maintenance, or other routine switching conditions where line or feeder load temporarily exceeds the normally anticipated levels.

TPG Ground Trip

The TPG control includes phase and ground-fault protection for systems where increased sensitivity is required. If a ground-fault is detected, the control will begin a time-current curve delay sequence. At the completion of the programmed delay, a signal is issued to trip the vacuum fault interrupter mechanism.

Since the ground-fault curves are more sensitive than the phase curves, they can offer a distinct advantage in those special applications where increased sensitivity and speed in overcurrent protection are required. As a result, coordination with upstream devices (i.e., electronic reclosers) can be obtained where TCC coordination is difficult.

TPG SCADA Accessory

VFI switchgear, when ordered with the TPG control, may also be supplied with an optional SCADA accessory. The SCADA accessory provides the user with remote functionality, along with Status and Fault indicators, for each TPG-controlled vacuum fault interrupter mechanism. For additional information, refer to *Service Bulletin S285-75-1, Tri-Phase, TPG, and TPG with SCADA Electronic Control Installation and Operation Instructions*.

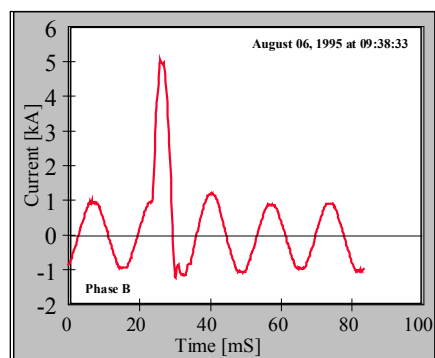


Figure 12.
Typical self-clearing fault detected by the iDP-210 relay ICSF algorithm.



Figure 13.
The iDP-210 is a member of Cooper Power Systems Edison Idea line of protective relays.

Edison Idea and IdeaPLUS™ Relays

IMPORTANT: For applications requiring SF₆ insulated switchgear, contact your Cooper Power Systems representative when selecting a relay/controller that has metering and protective elements requiring potential transformers.

Edison Idea and IdeaPLUS™ relays offer advanced protection and control options for the most demanding applications. Three different relays are available:

iDP-210 relay-provides multi-function protection elements for one source or tap. The iDP-210 relay is available in the Idea and IdeaPLUS™ platforms.

iTAP-265 relay-provides overcurrent protection for two three-phase taps. Available in IdeaPLUS platform only.

iTAP-260 relay-provides overcurrent protection for two three-phase taps with independent settings for each phase. Each phase can be independently tripped. Available in IdeaPLUS platform only.

Edison Idea and IdeaPLUS relays meet all applicable relay standards, including IEEE Std C37.90™-2005 and IEEE Std 1547™-2003 standards.

All relays include the following features and functions:

- Incipient Cable Splice Fault (ICSF) Detector
- Sequence of Event recorder with capacity to store the most recent 250 events in non-volatile memory

- Oscillography for fault analysis
- Programmable Data Profiler to record any combination of the available metering data
- Metering – instantaneous current, voltage, power factor, power, energy, demand, and harmonics
- Communications protocols shall include DNP3 via serial and TCP/IP, and Modbus via serial
- Graphical programming environment for custom logic and communication point maps
- Virtual Test Set™ for testing relay settings without the need for an external test set
- Integral breaker Interface panel, including illuminated Trip and Close pushbuttons, Close Inhibit switch, and close circuit disable link
- Twenty-five front panel LED targets to indicate relay status

iDP-210 Feeder Protection Relay

The iDP-210 is a full-featured relay suitable for a variety of protection applications, including source protection, feeder protection, and distributed generation inter-ties. Integral motor control logic for the VFI switchgear operator is included as standard. The protective elements in the iDP-210 relay are listed below.

- Phase instantaneous, definite time, and inverse time overcurrent (50/51)
- Ground instantaneous, definite time, and inverse time overcurrent (50N/51N)
- Negative Sequence instantaneous,

definite time, and inverse time overcurrent (50Q/51Q)

- Directional phase, ground, and negative sequence elements (67P, 67N, 67Q)
- Reverse Power (32)
- Voltage elements: Definite time undervoltage (27), Definite time overvoltage (59), Negative sequence, and zero sequence overvoltage (59N)
- Frequency elements: definite time underfrequency (81U) and definite time overfrequency (81O)
- Sync-check (25)
- Highly configurable ground fault recloser (79)
- Breaker failure (BF52)

iTAP-265 Dual Overcurrent Relay

The iTAP-265 relay provides overcurrent protection for two three-phase taps. Additional functionality can be programmed in the IDEA Workbench feature of ProView™ software.

- Phase instantaneous/definite time, and inverse time overcurrent (50/51) for each three-phase tap
- Ground instantaneous/definite time, and inverse time overcurrent (50N/51N) for each three-phase tap

iTAP-260 Dual Overcurrent Relay

The iTAP-260 relay provides overcurrent protection for two tap with independent settings for each phase. Additional functionality can be programmed in the IDEA Workbench feature of ProView software.

- Phase instantaneous/definite time, and inverse time overcurrent (50/51) for each phase. Six elements total
- Ground instantaneous/definite time, and inverse time overcurrent (50N/51N) for each phase. Two elements total.

Customize with the IDEA Workbench

Edison Idea and IdeaPLUS relays are fully functional relays, ready to use right out of the box. However, there are applications where custom control logic, or custom functions need to be added to the relay. The IDEA Workbench is a revolutionary graphical software programming environment which permits the user to customize the relays.

- Add new features or protective functions by means of IDEA Workbench Custom Modules. These operate in the same fashion as the plug-ins for popular internet browsers. your investment in the relay is protected as future needs and developments may be addressed through new Custom Modules.
- Create custom control and protection logic using over 400 programming signals and tools, all selectable from drag-off Toolboxes. Logic created using these tools can then be saved as Custom Modules to be reused or shared with associates.
- Monitor and control practically every aspect of the relay's operation
- Create custom metering and measurement quantities
- Create custom sequence of event records
- Configure communication protocols to match existing SCADA system mappings

The IDEA Workbench offers the user the ability to rapidly and accurately create customizations by working the way the engineer thinks, by using logic diagram and flowchart construction methods. No equation-based or command-based logic programming is required.

The IDEA Workbench also addresses some of the more difficult questions associated with custom relay programming, namely:

Clarity: Compared to that offered by equation and command based

programming techniques, graphical programming results in customizations whose operation is intuitive.

Testing: ProView provides a Virtual Test Set (VTS), which can be used to test the developed logic with realistic fault signals. During test, the logic diagrams become “live” showing the state of all variables, logic gates, contacts, counters, etc. To avoid any question of how the custom logic interacts with the relay itself, the VTS environment models the entire relay in addition to the custom programming. Unlike other programming environments, the IDEA Workbench does not require the user to have an actual relay or relay test set on hand to verify the proper operation of the programmed logic.

Documentation: Notes regarding how the custom logic operates may be embedded within the IDEA Workbench. This improves the ability of others to quickly understand how the logic is designed to work. Links to external files may also be embedded in the IDEA Workbench, providing fast access to larger documents stored on company's network servers.

Portability: If the original data files are lost, the entire IDEA Workbench may be uploaded from the relay, complete with logic diagrams, embedded notes and external reference links.

Event Records and Analysis Tools

The iDP-210 relay shares the same event records and analysis tools as all Edison Idea relays. The Edison Idea allows for the display of event

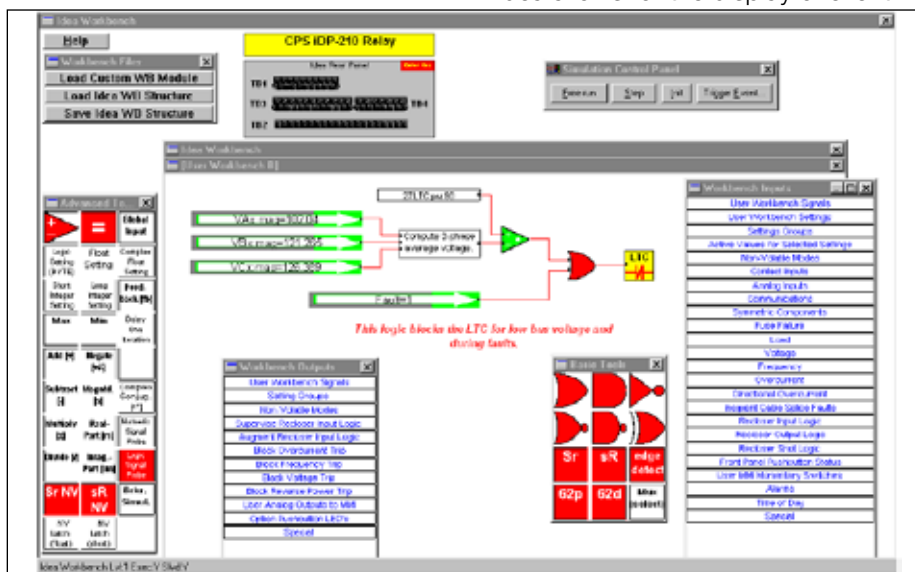


Figure 14.
The IDEA Workbench graphical customization environment.

records in a variety of formats including waveforms (oscillography), magnitude plots, phasor diagrams, symmetrical component diagrams and more. ProView, the software for the Edison Idea relay, also provides a unique Application Diagram View that provides a one-screen view of everything that is going on in the relay. Many of these event views are also available in On-Line View mode, where it is possible to monitor the status of the relay in real-time, including phasor diagrams, which is ideal for verifying CT phasing during commissioning. The iDP-210 relay also includes distance to fault indication.

Relay Replay™

To evaluate the effect different settings would have on the relay, the Relay Replay™ feature of the Edison Idea software allows the user to make any number of setting changes and replay an existing event using these new settings without the need for an actual relay or expensive test equipment. The operation of every aspect of the relay's performance, from which elements pick-up, the response time of those elements that do and the operation of any custom programming made via the IDEA Workbench can be observed. This tool provides unprecedented "what-if" analysis capabilities.

Virtual Test Set (VTS)

To evaluate settings against any arbitrary fault, the Edison Idea software permits the user to create a virtual event record through use of the software's VTS feature. The VTS allows complete control over:

- Pre-fault and post-fault voltage and current levels
- Selection of phase-ground, phase-phase, phase-phase-ground and three-phase fault types
- Fault duration
- Selection of system and fault impedances
- Selection of DC time constant
- Control over fault dynamics to verify reclosing sequences and sequence coordination
- Control of frequency change, rate of change, and acceleration during faults
- Control over simulated breaker open and close times
- Voltage and current parameters derived from a built-in power system model or entered manually.

Communications

Both Modbus RTU and DNP 3.0 communication protocols are included with the iDP-210 relay. A Communications Workbench™ provides the user the ability to customize communication maps, add or delete information, add control points, and even create new signals to be brought out through communications. The iDP-210 relay features two RS-232 auto-baud (57600 kbps max) communication ports and one port configurable for RS-485, serial fiber optic, and various Ethernet options (RJ-45, multi-mode fiber, single-mode fiber). Contact your Cooper Power Systems representative for availability of other communication protocols.

Incipient Cable Splice Fault Detector (ICSF)

One of the most common causes of buried cable failure is from moisture ingress to buried cable splices. When sufficient water accumulates in the splice, a line-to-ground fault briefly occurs. The fault is cleared as the water is suddenly converted in to steam. Over time, the insulation is damaged and the cable splice eventually fails. The iDP-210 relay contains an algorithm to recognize the unique waveform characteristics of these self-clearing faults. See Figure 12. By counting how often these events occur over a moving time window, the iDP-210 relays are able to give advance notice of pending cable splice failures. This permits cable maintenance to be scheduled rather than addressed on an emergency basis.

Overcurrent Protection

The iDP-210 relay offers inverse time, definite time (2 levels) and instantaneous elements for phase, residual and negative sequence overcurrent protection. An additional definite time ground overcurrent element is provided for a separate zero-sequence flux summing CT. This fourth current channel input may also be ordered in a sensitive earth fault version which may be set as low as 0.005 A secondary. Each overcurrent element may be independently selected to be non-directional, forward- or reverse-directional. Inverse time elements may be set for disk-like or instantaneous reset characteristics. Complete fuse-fail detection logic is also included to selectively non-directionalize or disable directional elements during loss of bus potential.

Motor Operators

VFI switchgear may be specified with motor operators and an associated control to allow for local or remote opening and closing of the switches and vacuum fault interrupters via SCADA command.

Motor control is available either via the Edison Idea relays or with a separate DC Motor Controller.

Edison Idea relays can control up to two (2) individual motors on the operating handles. With this option, the motor control is integral to the relay.

The stand alone DC Motor Controller may operate up to six (6) individual motors on the operating handles. Additional motor controllers can be supplied if more than six (6) motors are required.

Applicable Standards

IEEE Std C37.74™-2003 standard, Standard Requirements for Subsurface, Vault, and Pad-Mounted Load-Interrupter Switchgear and Fused Load-Interrupter Switchgear for Alternating Current Systems Up to 38 kV.

IEEE Std C37.60™-2003 standard, Standard Requirements for Overhead, Pad-Mounted, Dry Vault, and Submersible Automatic Circuit Reclosers and Fault Interrupters for Alternating Current Systems Up to 38 kV.

IEEE Std C57.12.28™-2005 standard, Standard for Pad-Mounted Equipment—Enclosure Integrity.

IEEE Std C57.12.29™-2005 standard, Standard for Pad-Mounted Equipment—Enclosure Integrity for Coastal Environments – applicable when stainless steel construction is specified.

IEEE Std 386™-2006 standard, Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V.

IEEE Std C37.90™-2005 standard, Standard for Relays and Relay Systems Associated with Electric Power Apparatus.

IEEE Std C37.90.2™-2004 standard, Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers.

See page 24 for a list of additional information that is available from Cooper Power Systems.

SPECIFIERS GUIDE

Standard Unit Configuration:

- Mild-Steel construction
- Side-hinged (for pad-mounted style) doors
- Visible-Break not included
- Motor operators/provisions not included
- Three-Phase trip
- Tri-Phase control with "EF" TCC curve for the vacuum fault interrupter tap ways
- Bell Green/Munsell 7GY paint
- Ground Connector in each high voltage compartment
- 600 A deadbreak bushings on 600 A ways, 200 A bushing wells on 200 A ways

Example:

To specify a VFI Unit use the following procedure:

1. Build the descriptor by completing the fields based on the Switchgear requirements:

For example, **KPDE-VF9-32** is the descriptor for the following standard unit:

- **Pad-Mounted, Double-Sided unit**
- **E200 Fluid insulation**
- **15 kV, 600 A deadbreak bushings on source ways, 200 A loadbreak bushing wells on tap ways**
- **Model 9 - Two switched source ways and Two vacuum fault interrupter protected Tap ways**
- **Mild-Steel construction**
- **Side-hinged doors**
- **Tri-phase control for the vacuum fault interrupter tap ways** (Tri-Phase control with "EF" TCC curve is the standard control that ships with the VFI unit. If a different control is required, select the appropriate control from Table 10 and the desired TCC curve from Table 11.)
- **Unit is of standard Bell Green/Munsell 7GY paint. If custom color is required, refer to Table 12.**

2. Identify the options or accessories for inclusion with the standard unit. Refer to Tables 7-21.

3. Submit the descriptor with a list of options and accessories to your Cooper Power Systems representative for a quotation.

TABLE 4
Constructing a VFI Switchgear Descriptor

Three-Phase* • 15, 25 and 35 kV Nominal
200 and 600** A Max Continuous • 12500‡ A Interrupting Rating
Pad-Mounted • Electronically Controlled • Vacuum Fault Interrupters
• Deadfront Construction

KP Unit Style

KP for Pad-Mounted style

KV for Vault-Mounted style (no cabinets)

D Unit configuration

D for Double-Sided configuration

S for Single-Sided configuration

E Insulating Medium

O for Mineral Oil insulation

F for Envirotemp™ FR3™ Fluid (consult factory)

E for E200 Fluid

S for SF₆ insulation

VF Type of unit

VF for VFI unit

RV for RVAC unit (model 13A & 10)

9 Model number of the unit

refer to column "model" in Table 4 for double-sided unit or for single-sided unit.

3 Unit Phase type

3 for Three-Phase unit

1 for Single-Phase unit

2 Bushing Configuration

Digit represents ampere rating of bushing and voltage rating of gear per Table 5, below.

KP D E - VF 9- 3 2 is the required descriptor†

TABLE 5
Bushing Configuration

Voltage Rating	Amperage Rating (Source/Tap)		
	600 A/600 A	600 A/200 A	200 A/200 A
15 kV	1	2	3
25 kV	4	5	6
35 kV	7	8	9

* Single-Phase units available. Consult Factory.

** For 900 A continuous rating. Consult Factory.

‡ For 16000 A interrupting rating. Consult Factory.

† The descriptor is not the catalog number, but a shorthand method of describing the unit.

TABLE 6
Basic Models

Model*	One-Line Diagram**	Nominal Voltage (kV)	DOUBLE-SIDED, FRONT & BACK ACCESS		
			OIL INSULATED	E200 INSULATED†	SF ₆ INSULATED
			Descriptor	Descriptor	Descriptor
5		15	KPDO-VF5-32	KPDE-VF5-32	KPDS-VF5-32
		25	KPDO-VF5-35	KPDE-VF5-35	KPDS-VF5-35
		35	KPDO-VF5-38	KPDE-VF5-38	KPDS-VF5-38
6		15	KPDO-VF6-32	KPDE-VF6-32	KPDS-VF6-32
		25	KPDO-VF6-35	KPDE-VF6-35	KPDS-VF6-35
		35	KPDO-VF6-38	KPDE-VF6-38	KPDS-VF6-38
7		15	KPDO-VF7-32	KPDF-VF7-32	KPDS-VF7-32
		25	KPDO-VF7-35	KPDE-VF7-35	KPDS-VF7-35
		35	KPDO-VF7-38	KPDE-VF7-38	KPDS-VF7-38
13A ‡		15	KPDO-RV13A-32	KPDE-RV13A-32	KPDS-RV13A-32
		25	KPDO-RV13A-35	KPDE-RV13A-35	KPDS-RV13A-35
		35	KPDO-RV13A-38	KPDE-RV13A-38	KPDS-RV13A-38
9		15	KPDO-VF9-32	KPDE-VF9-32	KPDS-VF9-32
		25	KPDO-VF9-35	KPDE-VF9-35	KPDS-VF9-35
		35	KPDO-VF9-38	KPDE-VF9-38	KPDS-VF9-38
9T		15	KPDO-VF9T-32	KPDE-VF9T-32	KPDS-VF9T-32
		25	KPDO-VF9T-35	KPDE-VF9T-35	KPDS-VF9T-35
		35	KPDO-VF9T-38	KPDE-VF9T-38	KPDS-VF9T-38
10 ‡		15	KPDO-RV10-32	KPDE-RV10-32	KPDS-RV10-32
		25	KPDO-RV10-35	KPDE-RV10-35	KPDS-RV10-35
		35	KPDO-RV10-38	KPDE-RV10-38	KPDS-RV10-38
11		15	KPDO-VF11-32	KPDE-VF11-32	KPDS-VF11-32
		25	KPDO-VF11-35	KPDE-VF11-35	KPDS-VF11-35
		35	KPDO-VF11-38	KPDE-VF11-38	KPDS-VF11-38
12		15	KPDO-VF12-32	KPDE-VF12-32	KPDS-VF12-32
		25	KPDO-VF12-35	KPDE-VF12-35	KPDS-VF12-35
		35	KPDO-VF12-38	KPDE-VF12-38	KPDS-VF12-38
14		15	KPDO-VF14-32	KPDE-VF14-32	KPDS-VF14-32
		25	KPDO-VF14-35	KPDE-VF14-35	KPDS-VF14-35
		35	KPDO-VF14-38	KPDE-VF14-38	KPDS-VF14-38
5W2		15	KPDO-VF5W2-32	KPDE-VF5W2-32	KPDS-VF5W2-32
		25	KPDO-VF5W2-35	KPDE-VF5W2-35	KPDS-VF5W2-35
		35	KPDO-VF5W2-38	KPDE-VF5W2-38	KPDS-VF5W2-38
6W2		15	KPDO-VF6W2-32	KPDE-VF6W2-32	KPDS-VF6W2-32
		25	KPDO-VF6W2-35	KPDE-VF6W2-35	KPDS-VF6W2-35
		35	KPDO-VF6W2-38	KPDE-VF6W2-38	KPDS-VF6W2-38
6W3		15	KPDO-VF6W3-32	KPDE-VF6W3-32	KPDS-VF6W3-32
		25	KPDO-VF6W3-35	KPDE-VF6W3-35	KPDS-VF6W3-35
		35	KPDO-VF6W3-38	KPDE-VF6W3-38	KPDS-VF6W3-38

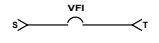
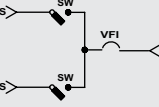
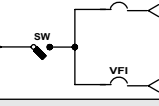
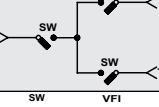
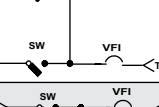
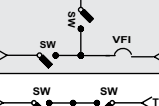
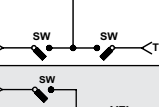
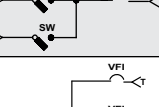
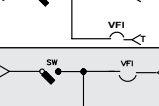
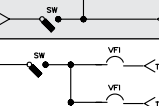
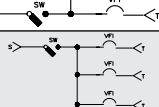
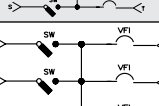
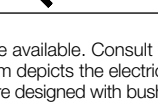
* Other models are available. Consult Factory.

** One-Line Diagram depicts the electrical connectivity, not the physical arrangement. Standard "source" and "tap" designation indicated by "S" and "T" on one-line diagrams.

‡ RVAC Models

† Envirotemp™ FR3™ fluid insulation is available. Consult Factory.

TABLE 6
Basic Models, continued

Model*	One-Line Diagram**	Nominal Voltage (kV)	SINGLE-SIDED, COMPACT [†] FRONT ACCESS		
			OIL INSULATED	E200 INSULATED†	SF ₆ INSULATED
			Descriptor	Descriptor	Descriptor
5		15	KPSO-VF5-32	KPSE-VF5-32	KPSS-VF5-32
		25	KPSO-VF5-35	KPSE-VF5-35	KPSS-VF5-35
		35	KPSO-VF5-38	KPSE-VF5-38	KPSS-VF5-38
6		15	KPSO-VF6-32	KPSE-VF6-32	KPSS-VF6-32
		25	KPSO-VF6-35	KPSE-VF6-35	KPSS-VF6-35
		35	KPSO-VF6-38	KPSE-VF6-38	KPSS-VF6-38
7		15	KPSO-VF7-32	KPSE-VF7-32	KPSS-VF7-32
		25	KPSO-VF7-35	KPSE-VF7-35	KPSS-VF7-35
		35	KPSO-VF7-38	KPSE-VF7-38	KPSS-VF7-38
13A ‡		15	KPSO-RV13A-32	KPSE-RV13A-32	KPSS-RV13A-32
		25	KPSO-RV13A-35	KPSE-RV13A-35	KPSS-RV13A-35
		35	KPSO-RV13A-38	KPSE-RV13A-38	KPSS-RV13A-38
9		15	KPSO-VF9-32	KPSE-VF9-32	KPSS-VF9-32
		25	KPSO-VF9-35	KPSE-VF9-35	KPSS-VF9-35
		35	KPSO-VF9-38	KPSE-VF9-38	KPSS-VF9-38
9T		15	KPSO-VF9T-32	KPSE-VF9T-32	KPSS-VF9T-32
		25	KPSO-VF9T-35	KPSE-VF9T-35	KPSS-VF9T-35
		35	KPSO-VF9T-38	KPSE-VF9T-38	KPSS-VF9T-38
10 ‡		15	KPSO-RV10-32	KPSE-RV10-32	KPSS-RV10-32
		25	KPSO-RV10-35	KPSE-RV10-35	KPSS-RV10-35
		35	KPSO-RV10-38	KPSE-RV10-38	KPSS-RV10-38
11		15	KPSO-VFT11-32	KPSE-VF11-32	KPSS-VF11-32
		25	KPSO-VFT11-35	KPSE-VF11-35	KPSS-VF11-35
		35	KPSO-VFT11-38	KPSE-VF11-38	KPSS-VF11-38
12		15	KPSO-VF12-32	KPSE-VF12-32	KPSS-VF12-32
		25	KPSO-VF12-35	KPSE-VF12-35	KPSS-VF12-35
		35	KPSO-VF12-38	KPSE-VF12-38	KPSS-VF12-38
14		15	KPSO-VF14-32	KPSE-VF14-32	KPSS-VF14-32
		25	KPSO-VF14-35	KPSE-VF14-35	KPSS-VF14-35
		35	KPSO-VF14-38	KPSE-VF14-38	KPSS-VF14-38
5W2		15	KPSO-VF5W2-32	KPSE-VF5W2-32	KPSS-VF5W2-32
		25	KPSO-VF5W2-35	KPSE-VF5W2-35	KPSS-VF5W2-35
		35	KPSO-VF5W2-38	KPSE-VF5W2-38	KPSS-VF5W2-38
6W2		15	KPSO-VF6W2-32	KPSE-VF6W2-32	KPSS-VF6W2-32
		25	KPSO-VF6W2-35	KPSE-VF6W2-35	KPSS-VF6W2-35
		35	KPSO-VF6W2-38	KPSE-VF6W2-38	KPSS-VF6W2-38
6W3		15	KPSO-VF6W3-32	KPSE-VF6W3-32	KPSS-VF6W3-32
		25	KPSO-VF6W3-35	KPSE-VF6W3-35	KPSS-VF6W3-35
		35	KPSO-VF6W3-38	KPSE-VF6W3-38	KPSS-VF6W3-38

* Other models are available. Consult Factory.

** One-Line Diagram depicts the electrical connectivity, not the physical arrangement. Standard "source" and "tap" designation indicated by "S" and "T" on one-line diagrams.

[†] Compact units are designed with bushings in a diagonal fashion. Models 5, 6, 7, 13A, 9, 10, 11, 12, and 14 can be designed single-sided with in-line bushings. Consult Factory.

‡ RVAC Models

† Envirotemp™ FR3™ fluid insulation is available. Consult Factory.

OPTIONAL FEATURES

TABLE 7

Vacuum Fault Interrupter Operation

Type	Description	Location
Vacuum Fault Interrupter Type (select One)	Three-Phase Ganged Trip (STANDARD)	All Fault Interrupters
	Single-Phase Trip	All Fault Interrupters
	Mixture of Single-Phase and Three-Phase Trip	Specify location for each type

TABLE 8

Visible-Break Switch* Options

Description	Visible-Break Positions
No Visible-Break (STANDARD)	N/A
Two-position Visible-Break—close-open	All Source ways
	All Source & Tap ways
Three-position Visible-Break—close-open-ground	All Source ways
	All Source & Tap ways

* Visible-Break Switch available only for double-sided, fluid-filled switchgear.

TABLE 9

Bushing Options

Current Rating	Description
200 A Ways (select only one)	Bushing wells (STANDARD)
	Bushing wells with loadbreak inserts**
	Single-piece large interface, integral, loadbreak bushings*
600 A Ways (select only one)	600 A deadbreak bushings (STANDARD)
	PUSH-OP™ bushings
	U-OP™ systems with aluminum Visible-Break Junctions & U-connectors**
	U-OP provisions**
600 A & 200 A	Externally Replaceable Bushing/Wells (on all ways)†

Note: Aluminum is standard for bushing material.

* Only for 35 kV units, Cooper Power Systems large interface design.

** Only for 15, 25 kV units

† All SF6 units include this feature at no-charge.

TABLE 10

Controls*‡

Control Type	Overcurrent	Ground	Metering	SCADA	Comms	Advanced Functions
Tri-Phase control (STANDARD)	X					
TPG control (Tri-Phase control with ground)	X	X				
TPG with SCADA	X	X		X		
Edison Idea iTAP-265 relay (Three-Phase Trip)	X	X	X**	X	X	
Edison Idea iTAP-260 relay (Single-Phase Trip)	X	X	X**	X	X	
Edison Idea iDP-210 relay	X	X	X**	X	X	X**

* Consult factory for automation options using advanced controllers and communications.

** For metering and advanced functions requiring potential transformers in SF₆ insulated switchgear, contact your Cooper Power Systems representative.

‡ Select the TCC curve and the optional Minimum Response Time curve from Table 11.

TABLE 11
Tri-Phase/TPG Control Options

Time-Current Curve Card (TCC) (select only one)	EF Curve (STANDARD)
	KF Curve
	TF Curve
	H Curve
	F Curve
Minimum Response Timing Accessory (select only one)	EFR Curve (STANDARD)
	KFR Curve
	TFR Curve
	HR Curve
	FR Curve
Ground Trip Block Switch	for TPG only
CT Shorting Switch	for TPG only

TABLE 12
Construction

Tank Style	Material	Construction
Vault-Mounted Style*	Tank Material	Mild Steel construction with non-corrosive hardware (STANDARD)
		304L Stainless steel construction
Pad-Mounted Style	Tank/Cabinet Material	Mild Steel construction with non-corrosive hardware (STANDARD)
		304L Stainless steel construction
Paint color	Bell Green/Munsell 7GY (STANDARD)	
	Other paint color, top coat on external surfaces only (specify the Federal Spec Paint number)	

* Change first two digits of descriptor from Table 4 from "KP" to "KV" as shown on page 8.

TABLE 13
Distribution Automation*

Description	Motor Operator Positions
No motor operators/provisions (STANDARD)	N/A
Motor operator provisions	Specify the ways: Source, Tap, or All
Motor operators**	

* Advanced automation and control options are available. Consult Factory.

** Motor operators require semaphores.

TABLE 14
Auxiliary Switch

Type	Position
Two-Stage Auxiliary Switch	Specify the ways: Source, Tap, or All

TABLE 15
Indicators

Description	Indicator Positions
Operation counter	Specify the ways: Source, Tap, or All
Semaphore*	Specify the ways: Source, Tap, or All

*Position indicator linked directly to operating mechanism and viewable through tank window.

TABLE 16
Grounding Options (select only one)

Ground Stud (STANDARD)
1/2" Round copper ground-bus
3" stand-off bracket for 1/2" round bus
NEMA® Ground Pad (welded to tank)
Flat copper ground-bus

TABLE 17
Fault Indicator Provisions (select only one)

No Fault Indicator provisions
Provisions for Fault Circuit Indicators (FCI) (1.06" dia. hole with removable SS backing plate)*
Provisions for S.T.A.R.™ FCI with large FISHEYE™
Provisions for S.T.A.R. FCI with small remote
Provisions for LED Display Indicator

* Accommodates future installation of S.T.A.R. FCI type indicators

TABLE 18
Service Items

Description	
1" drain plug with 3/8" sampler (STANDARD)*	Select only one
1" drain valve with 3/8" sampler*	
Penta-head door bolt (STANDARD)	Select only one
Hex-head door bolt	

* Not applicable to SF₆ units

TABLE 19
Service Items-Accessories

Description	
SF ₆ refill kit; hoses, valves, regulator	Select only one
SF ₆ refill kit; hoses and valves (without regulator)	
Bracket to convert single-phase trip unit into three-phase trip unit	Select only one (only for units with single-phase trip ways)
Hotstick tool for three-phase manual operation of single-phase trip unit	

* Prices listed are for all Models

TABLE 20
Key Interlocks

Description
Provisions for key interlocks
Key interlocks to prevent paralleling of source 1 and source 2 *

* Furnish name of ultimate user at time of ordering

TABLE 21
Decals

Danger High Voltage	Specify Location
Internal Mr. Ouch, bilingual	
External Mr. Ouch, bilingual	
Non PCB	

TABLE 22
Double-Sided VFI Switchgear (Without Visible-Break Switch)
 (All dimensions shown in inches).

kV Class	Source/ Tap Current Ratings													Model
	Dimension	600 A Segment 1, 600 A Segment 2				600 A Segment 1, 200 A Segment 2				200 A Segment 1, 200 A Segment 2				
		5	6	9T	12	5	6	9T	12	5	6	9T	12	
			7	10T*			7	10T*			7	10T*		
		9				9				9				
		10*				10*				10*				
		11				11				11				
		13 A*				13 A*				13 A*				
15 kV	A	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	
	B	68.40	76.40	79.40	81.40	68.40	76.40	79.40	81.40	68.40	76.40	79.40	81.40	
	C	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	
	D	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	
	E	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	24.00	32.00	35.00	37.00	24.00	32.00	35.00	37.00	24.00	32.00	35.00	37.00	
	G	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	6.80	6.80	6.80	6.80	
	J	5.20	5.20	5.20	5.20	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	
25 kV	A	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	
	B	68.40	76.40	79.40	81.40	68.40	76.40	79.40	81.40	68.40	76.40	79.40	81.40	
	C	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	
	D	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	
	E	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	24.00	32.00	35.00	37.00	24.00	32.00	35.00	37.00	24.00	32.00	35.00	37.00	
	G	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	8.00	8.00	8.00	8.00	
	J	5.20	5.20	5.20	5.20	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	
35 kV	A	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	
	B	80.40	87.40	89.40	95.40	76.40	83.40	85.40	91.40	72.40	81.40	83.40	87.40	
	C	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	
	D	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	
	E	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	35.00	37.00	39.00	28.00	35.00	37.00	43.00	28.00	37.00	39.00	43.00	
	G	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	
	H	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20	8.75	8.75	8.75	8.75	
	J	6.20	6.20	6.20	6.20	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	

* RVAC models. 'RVAC' is the nameplate designation for models with only load-break switches (no fault interrupters).
 For dimensions of models not listed, consult factory.

Note: This table provides standard product dimensional information only. Dimensions are NOT for construction purposes. Foundation construction should comply with local building or construction codes as required. If needed, request engineering drawings for approval or drawings for record purposes with your order.

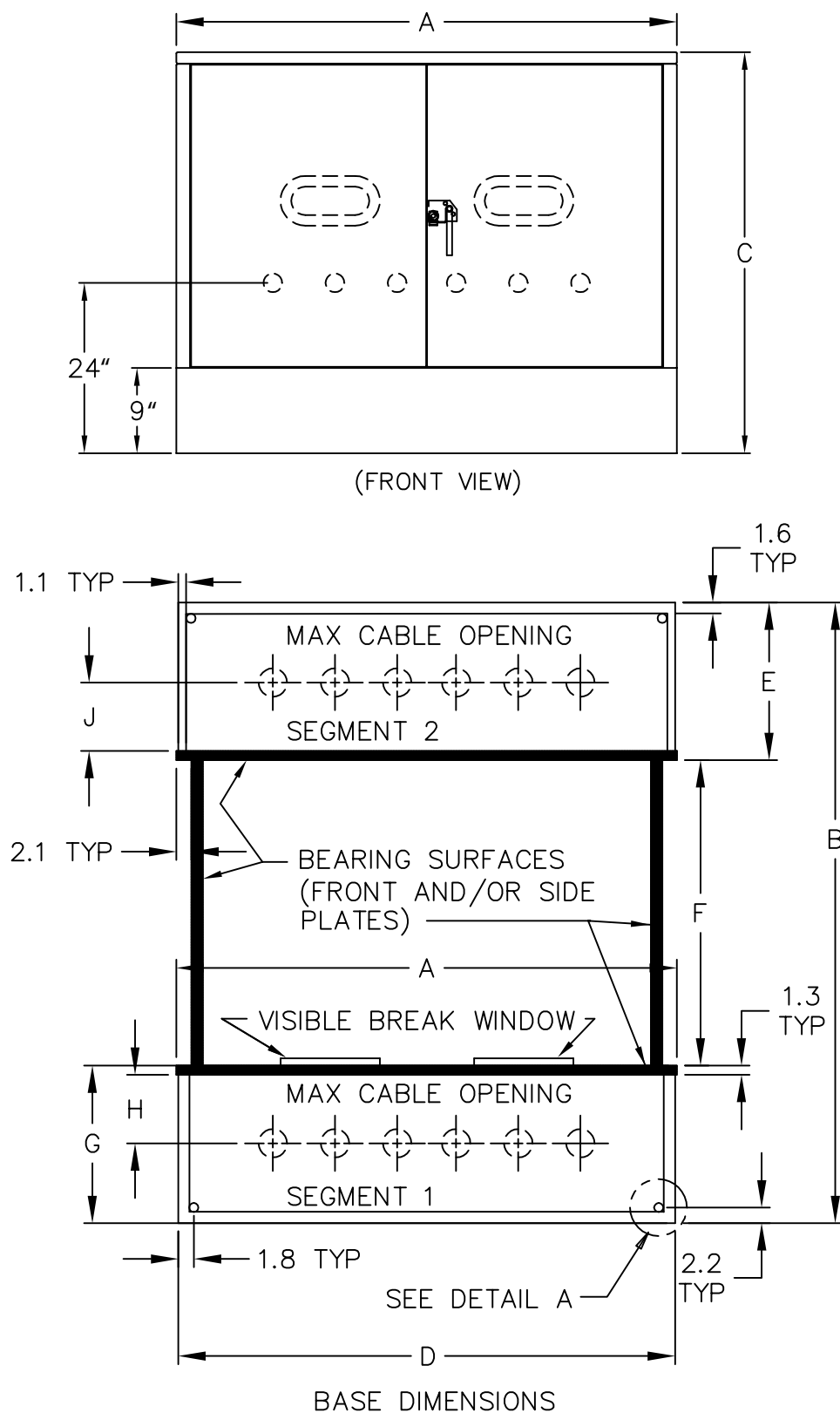


Figure 16.
Double-Sided VFI Switchgear (With Visible-Break Switch on Sources Only).

TABLE 23
Double-Sided VFI Switchgear (With Visible Break Switch on Sources Only)
 (All dimensions shown in inches).

kV Class	Dimension	Source/ Tap Current Ratings															Model
		600 A Segment 1, 600 A Segment 2					600 A Segment 1, 200 A Segment 2					200 A Segment 1, 200 A Segment 2					
		5	6 7 9 10* 13A*	9T 10T*	11	12	5	6 7 9 10* 13A*	9T 10T*	11	12	5	6 7 9 10* 13A*	9T 10T*	11	12	
15 kV	A	40.50	70.50	84.50	70.50	70.50	40.50	70.50	84.50	70.50	70.50	40.50	70.50	84.50	70.50	70.50	
	B	72.40	87.40	90.40	87.40	90.40	72.40	87.40	90.40	87.40	90.40	72.40	87.40	90.40	87.40	90.40	
	C	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	
	D	40.00	70.00	84.00	70.00	70.00	40.00	70.00	84.00	70.00	70.00	40.00	70.00	84.00	70.00	70.00	
	E	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	37.00	43.00	43.00	43.00	28.00	37.00	43.00	43.00	43.00	28.00	37.00	43.00	43.00	43.00	
	G	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	6.80	6.80	6.80	6.80	6.80	
	J	5.20	5.20	5.20	5.20	5.20	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	
25 kV	A	40.50	70.50	84.50	70.50	70.50	40.50	70.50	84.50	70.50	70.50	40.50	70.50	84.50	70.50	70.50	
	B	72.40	87.40	90.40	87.40	90.40	72.40	87.40	90.40	87.40	90.40	72.40	87.40	90.40	87.40	90.40	
	C	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	
	D	40.00	70.00	84.00	70.00	70.00	40.00	70.00	84.00	70.00	70.00	40.00	70.00	84.00	70.00	70.00	
	E	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	37.00	43.00	43.00	43.00	28.00	37.00	43.00	43.00	43.00	28.00	37.00	43.00	43.00	43.00	
	G	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	8.00	8.00	8.00	8.00	8.00	
	J	5.20	5.20	5.20	5.20	5.20	8.00	8.00	6.80	8.00	6.80	8.00	8.00	8.00	8.00	8.00	
35 kV	A	40.50	70.50	84.50	70.50	70.50	40.50	70.50	84.50	70.50	70.50	40.50	70.50	84.50	70.50	70.50	
	B	80.40	95.40	98.40	95.40	98.40	76.40	91.40	94.40	91.40	94.40	72.40	87.40	90.40	87.40	90.40	
	C	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	
	D	40.00	70.00	84.00	70.00	70.00	40.00	70.00	84.00	70.00	70.00	40.00	70.00	84.00	70.00	70.00	
	E	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	37.00	43.00	43.00	43.00	28.00	37.00	43.00	43.00	43.00	28.00	37.00	43.00	43.00	43.00	
	G	26.00	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20	8.75	8.75	8.75	8.75	8.75	
	J	6.20	6.20	6.20	6.20	6.20	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	

* RVAC models. 'RVAC' is the nameplate designation for models with only load-break switches (no fault interrupters).
 For dimensions of models not listed, consult factory.

Note: This table provides standard product dimensional information only. Dimensions are NOT for construction purposes. Foundation construction should comply with local building or construction codes as required. If needed, request engineering drawings for approval or drawings for record purposes with your order.

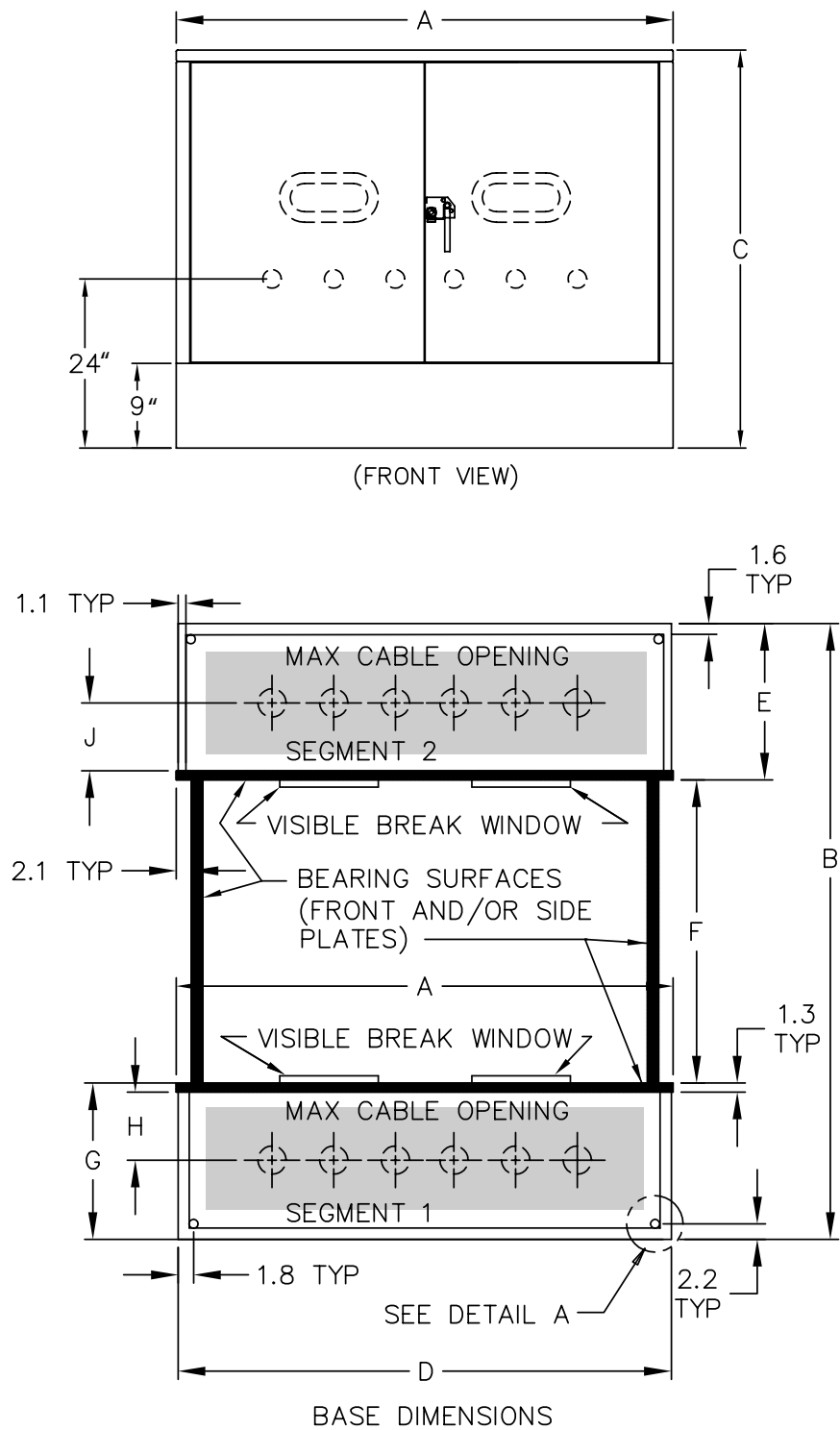


Figure 17.
Double-Sided VFI Switchgear (With Visible-Break Switches on all ways).

TABLE 24
Double-Sided VFI Switchgear (With Visible-Break Switches on all ways)
(All dimensions in inches).

kV Class	Dimension	Source/ Tap Current Ratings												Model
		600 A Segment 1, 600 A Segment 2				600 A Segment 1, 200 A Segment 2				200 A Segment 1, 200 A Segment 2				
		5	6 7 9 10* 11 13 A*	9T 10T*	12	5	6 7 9 10* 11 13 A*	9T 10T*	12	5	6 7 9 10* 11 13 A*	9T 10T*	12	
15 kV	A	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	
	B	72.40	87.40	90.40	90.40	72.40	87.40	90.40	90.40	72.40	87.40	90.40	90.40	
	C	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	
	D	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	
	E	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	43.00	46.00	46.00	28.00	43.00	46.00	46.00	28.00	43.00	46.00	46.00	
	G	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	6.80	6.80	6.80	6.80	
	J	5.20	5.20	5.20	5.20	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	
25 kV	A	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	
	B	72.40	87.40	90.40	90.40	72.40	87.40	90.40	90.40	72.40	87.40	90.40	90.40	
	C	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	
	D	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	
	E	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	43.00	46.00	46.00	28.00	43.00	46.00	46.00	28.00	43.00	46.00	46.00	
	G	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	8.00	8.00	8.00	8.00	
	J	5.20	5.20	5.20	5.20	8.00	8.00	6.80	6.80	8.00	8.00	8.00	8.00	
35 kV	A	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	
	B	80.40	95.40	98.40	98.40	76.40	91.40	94.40	94.40	72.40	87.40	90.40	90.40	
	C	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	
	D	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	
	E	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	43.00	46.00	46.00	28.00	43.00	46.00	46.00	28.00	43.00	46.00	46.00	
	G	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	
	H	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20	8.75	8.75	8.75	8.75	
	J	6.20	6.20	6.20	6.20	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	

* RVAC models. 'RVAC' is the nameplate designation for models with only load-break switches (no fault interrupters).
 For dimensions of models not listed, consult factory.

Note: This table provides standard product dimensional information only. Dimensions are NOT for construction purposes. Foundation construction should comply with local building or construction codes as required. If needed, request engineering drawings for approval or drawings for record purposes with your order.

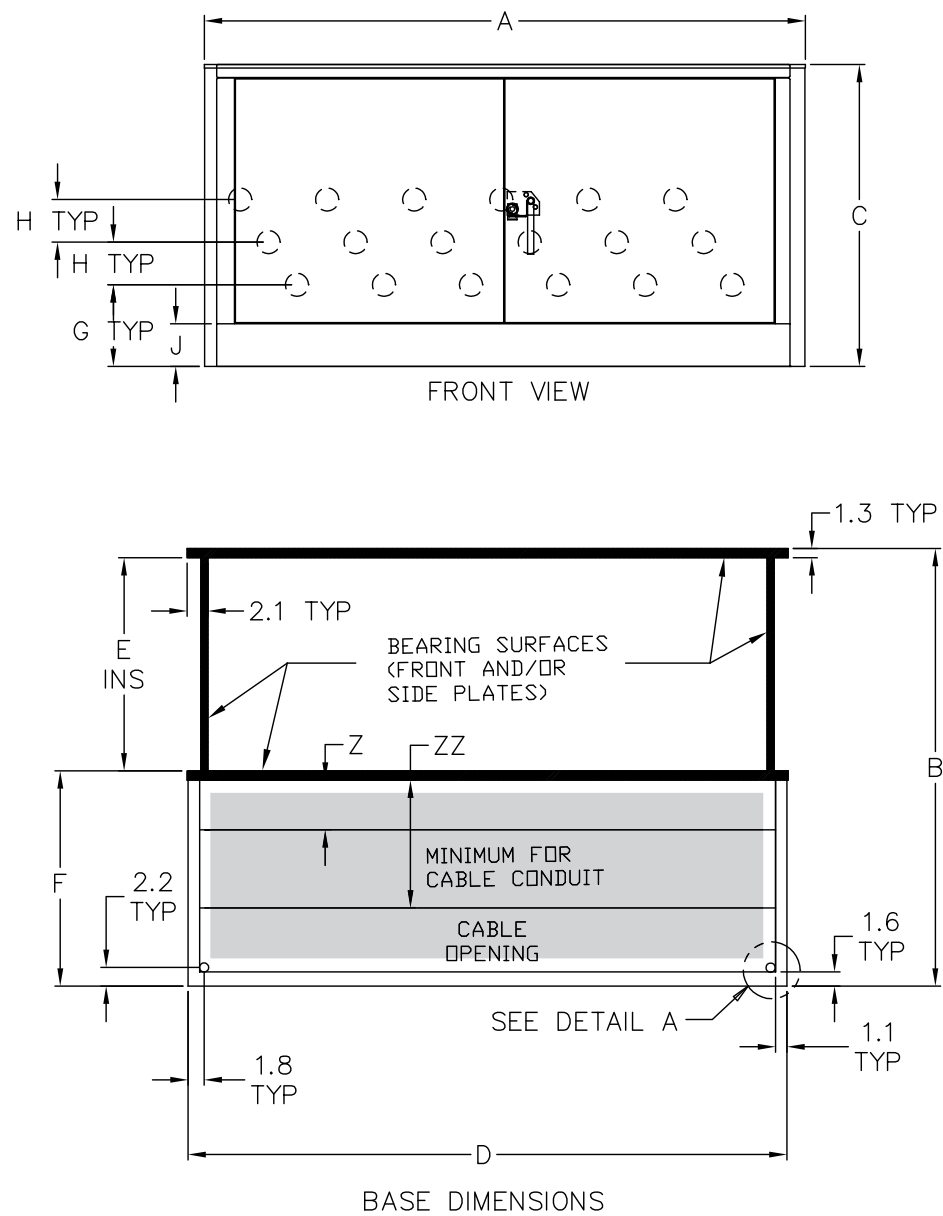


Figure 18.
Single-Sided Compact VFI Switchgear.

TABLE 25
Single-Sided Compact VFI Switchgear
(All dimensions shown in inches).

kV Class	Dimension	Source/ Tap Current Ratings				Model
		600 A		200 A		
		6 7 10* 13 A*	9 11 12	6 7 10* 13 A*	9 11 12	
15 kV	A	62.50	62.50	62.50	62.50	
	B	53.60	53.60	53.60	53.60	
	C	43.50	43.50	43.50	43.50	
	D	62.30	62.30	62.30	62.30	
	E	30.00	30.00	30.00	30.00	
	F	22.00	22.00	22.00	22.00	
	G	11.50	11.50	11.50	11.50	
	H	6.00	6.00	6.00	6.00	
	J	6.00	6.00	6.00	6.00	
	Z	3.00	3.00	5.00	5.00	
	ZZ	7.00	7.00	9.00	9.00	
25 kV	A	62.50	62.50	62.50	62.50	
	B	53.60	53.60	53.60	53.60	
	C	43.50	43.50	43.50	43.50	
	D	62.30	62.30	62.30	62.30	
	E	30.00	30.00	30.00	30.00	
	F	22.00	22.00	22.00	22.00	
	G	11.50	11.50	11.50	11.50	
	H	6.00	6.00	6.00	6.00	
	J	6.00	6.00	6.00	6.00	
	Z	3.00	3.00	6.00	6.00	
	ZZ	7.00	7.00	10.00	10.00	
35 kV	A	62.50	62.50	62.50	62.50	
	B	65.60	65.60	65.60	65.60	
	C	43.50	43.50	43.50	43.50	
	D	62.30	62.30	62.30	62.30	
	E	30.00	30.00	30.00	30.00	
	F	34.00	34.00	34.00	34.00	
	G	11.50	11.50	11.50	11.50	
	H	6.00	6.00	6.00	6.00	
	J	6.00	6.00	6.00	6.00	
	Z	4.00	4.00	6.75	6.75	
	ZZ	8.00	8.00	10.75	10.75	

* RVAC models. 'RVAC' is the nameplate designation for models with only load-break switches (no fault interrupters).
 For dimensions of models not listed, consult factory.

Note: This table provides standard product dimensional information only. Dimensions are NOT for construction purposes. Foundation construction should comply with local building or construction codes as required. If needed, request engineering drawings for approval or drawings for record purposes with your order.

Additional Information

165-210, iDP-210 Feeder Protection Relay

165-260, iTAP-260 Dual Overcurrent Relay

165-265, iTAP-265 Dual Overcurrent Relay

S285-10-1, VFI Oil-Insulated Installation Instructions

S285-10-2, VFI SF₆-Insulated, Vacuum Fault Interrupter; installation, Operation and Maintenance Instructions

S285-10-3, SF₆ Gas Top-Off Kit Operation Instructions

S285-10-4, Visible Break Switch Accessory Operation Instructions

S285-10-5, VFI Fault Interrupter w/ Tri-Phase Control Single-Phase Trip to Three-Phase Trip Conversion Kit Instructions

S285-10-7, VFI Tester Operation Instructions

S285-75-1, Kyle Tri-Phase, TPG, and TPG with SCADA Electronic Control Installation and Operation Instructions

B165-06047, iDP-210 Feeder Protection Relay Bulletin

B285-01041, VFI Underground Distribution Switchgear - Environmentally Preferred Switchgear

B285-09042, VFI Underground Distribution Switchgear Frequently Asked Questions

R285-10-1, Guide for Atmospheric Retrofilling of 38 kV (or lower) Fluid-filled Switchgear

B285-13011, Smart VFI for Solar Applications

B285-13012, Smart VFI Underground Distribution Switchgear

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2300 Badger Drive
Waukesha, WI 53188 USA

**ATTACHMENT 7:
FINANCIAL SURETY/
DECOMMISSIONING PLAN**

DECOMMISSIONING PLAN

Ground-Mounted Solar Project

at

95 Main Street

Williamsburg, Massachusetts

ZPT ENERGY SOLUTIONS II, LLC

1.1 INTRODUCTION

ZPT Energy Solutions II, LLC is committed to improving the environment around us and reducing our impact during and after our projects are constructed. For these reasons, the following decommissioning actions and activities are provided for future reference and planning.

1.2 SOLAR ENERGY PROJECT DECOMMISSIONING

Decommissioning and site activities that need to be considered to minimize environmental impacts include facility removal, land recontouring, and revegetation. Typical activities during the solar energy facility decommissioning and site reclamation phase include facility removal, breaking up of concrete pads and foundations, removal of access roads that are not maintained for other uses, recontouring the surface, and revegetation.

1.3 PROCESS

The following process is what ZPT Energy Solutions II, LLC would implement in order to decommission an active Photovoltaic system:

1. Contact local AHJ (authority having jurisdiction) and obtain a demolition permit.
2. Contact local power authority and schedule all exterior transformer interconnections to be disconnected and terminated.
3. Contact local power authority to remove the Photovoltaic production meter.
4. Place a temporary storage container at site to store all re-usable equipment and small tools.
5. Set main disconnect at panel integration to off position.
6. Set main inverter switch to off position.
7. Switch main DC disconnect to off position.
8. Disconnect all module strings at combiner boxes.
9. Disconnect all DC wiring at modules.
10. Remove and recycle all galvanized rigid conduit between building service and inverter.
11. Remove and recycle existing inverter.
12. Remove and recycle all AC copper wiring.
13. Remove and recycle all DC wiring between inverters and combiner boxes.
14. Remove existing end-of-life modules from system
 - a. Contact local PV recycling company to stage a storage container to accept and process end-of-life modules (see Section 1.4 below).
 - b. PV recycling firm will separate extruded aluminum frame from the semiconductor material and glass.
 - c. The extruded aluminum will be recycled.
 - d. The semiconductor material and glass will be crushed with a hammer mill to pieces smaller than 5mm.
 - e. Semiconductor films are removed in a slow rating leach drum in a process taking 4–6 hours. Weak sulfuric acid and hydrogen peroxide is added to the glass to achieve an optimal solid-liquid ratio. The films are etched from the glass during the leach cycle.
 - f. All glass material will be separated from the liquids in a classifier.
 - g. The material is then moved to a vibrating screen separating the glass from the larger ethylene vinyl acetate (EVA) pieces. The EVA is deposited into another

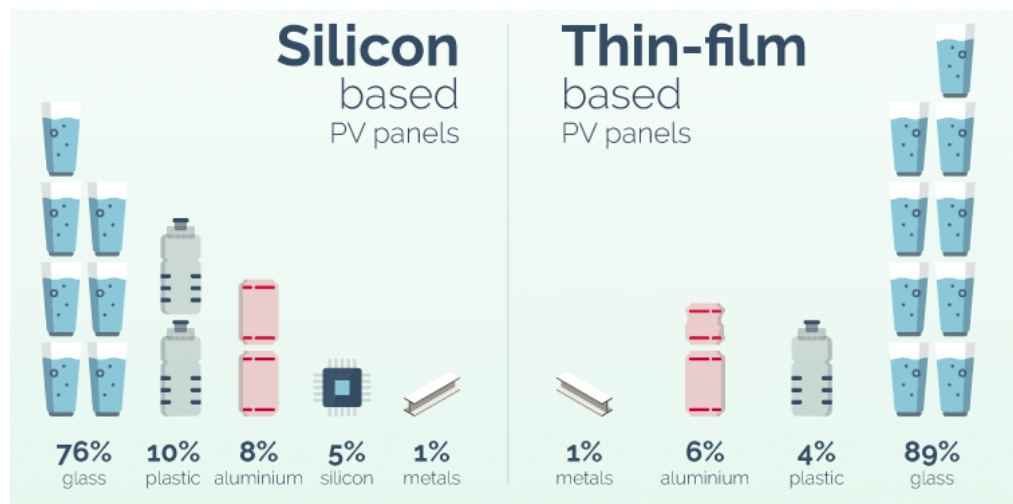
- conveyor and collected, whereas the glass falls through the screen to a chute where it is taken to the rinsing step.
- h. After being cleaned, the glass is deposited into containers for recycling and the rinse waters are pumped to a precipitation system for metal recovery.
 - i. The metal compounds are precipitated in three stages at increasing pH using sodium hydroxide. When the solids have settled and been made into a metal rich filter cake, it is sent off for processing by a third party where they can be processed to semiconductor grade raw materials for use in new solar modules.
15. Remove and recycle all gates and fencing.
 16. Begin disassembling racking system.
 17. Extract and remove screws/posts from below grade and recycle steel.
 18. Have a local recycler provide 30 yard roll off to place all discarded structural steel.
 19. Re-grade areas and fill open trenches and excavations with common borrow, as necessary.
 20. Loam and seed all disturbed areas.
 21. Substantially stabilize the site.

1.4 PHOTOVOLTAIC MODULE RECYCLING

Silicon solar modules are primarily composed of glass, plastic, and aluminum: three materials that are recycled in mass quantities.

Despite the recyclability of the modules, the process in which materials are separated can be tedious and requires advanced machinery. Here are the main steps involved in successfully recycling a silicon module:

1. Removing the aluminum frame (100% reusable)
2. Separating the glass along a conveyor belt (95% reusable)
3. Thermal processing at 500 degrees Celsius
 - o This allows for the evaporation of small plastic components and allows the cells to be easier separated.
4. Etching away silicon wafers and smelting them into reusable slabs (85% reusable)



Decommissioning Estimate
ZP-222 - West Haydenville - 4.2MW DC / 3.0MW AC

	Unit	Est. Qty.	Material/ Labor Cost	Salvage Labor	Material Recycle Val.	Net Salvage	Net Cost	Notes
Contractor Fees								
Mobilization	LS	1	-	-	-	-	-	
Supervisory/Management	LS	1	14,375	-	-	-	14,375	115 man hours @ \$125/hour
Electrical Disconnection	EA	1	2,240	-	-	-	2,240	28 hours of electrical labor @ \$80/hour to de-energize
Silt Fence	LF	4,302	10,755	-	-	-	10,755	\$2.50/LF
Permitting Fees	LS	1	-	-	-	-	-	No permit assumed
Subtotal			27,370	-	-	-	27,370	
Sitework								
Access Roads	SF		10,000	-	-	-	10,000	
Restoration Seeding	AC	24.8	30,938	-	-	-	30,938	Damaged areas only at \$1,250/AC
Fence Removal and Recycling	LF	4,713	2,521	-	-	-	2,521	100 LF/hr @ \$53.5/hr
Site Cleanup	LS	1	12,075	-	-	-	12,075	Labor and dumpster
Subtotal			55,534	-	-	-	55,534	
Racking Removed								
Remove and recycle piles	LB	1,805	1,609	-	-	-	1,609	60 piles per hour per crewmember @ \$53.5/hr
Remove and recycle racking tables	EA	451	2,011	-	(40,838)	(40,838)	(38,827)	12 tables per hour per crewmember @ \$53.5/hr
Subtotal			3,620	-	(40,838)	(40,838)	(37,217)	
Solar Modules Removed								
Remove modules	EA	10,764	9,598	-	-	-	9,598	Assume 60 modules per hour per crewmember @ \$53.5/hour
Subtotal			9,598	-	-	-	9,598	
AC & DC Wire Renewal								
DC/AC direct burial wire removal	LF	13,910	1,855	-	(2,782)	(2,782)	(927)	LF - Assume 600'/hour removed/crewmember @ \$80/hr
AC overhead wire removal	EA	200	21	480	(40)	440	461	LF - Assume 100'/hour removed/crewmember @ \$80/hr 3 phase
DC wire removal	LF	224,502	11,973	-	(22,450)	(22,450)	(10,477)	Assume 1500'/hour removed @ \$80/hour
Interconnection pole removal	EA	4	107	-	-	-	107	Assume 3 hours per pole @ \$80/hour
Central inverter removal	EA	2	1,280	-	-	-	1,280	Crew of 4 removes 4/day @ \$80/hour
Transformer removal	EA	1	853	-	-	-	853	Crew of 4 removes 3/day @ \$80/hour
Subtotal			16,089	480	(25,272)	(24,792)	(8,703)	
Equipment Pad Removal								
Remove equipment pads	EA	4	12,000	-	-	-	12,000	\$3,000/pad
Subtotal			12,000	-	-	-	12,000	
Decommissioning subtotal								
			124,212	480	(66,110)	(65,630)	58,582	
Subcontractor markup								
10%			12,421	-	(6,611)	-	5,810	
Total Decommissioning								
			136,633	480	(72,721)	(65,630)	64,392	
							\$	25.76
Cost/kW AC			\$	54.65				

ATTACHMENT 8:
EMERGENCY RESPONSE PLAN

EMERGENCY RESPONSE PLAN

Ground-Mounted Solar Project

at

95 Main Street

Williamsburg, Massachusetts

ZPT ENERGY SOLUTIONS II, LLC

1.1 EMERGENCY RESPONSE PLAN

In the event of an emergency, all local emergency response personnel will have full access to the proposed facility. Prior to the facility becoming operational, local fire departments and police stations will be provided keys to the utility locks which secure the site.

There will be clearly marked emergency shut-off switches on each inverter as well as a general shut-off switch to cut the utility connection to the entire array. Each string of the array will be laid-out in compliance with the approved spacing arrangement, allowing for the safe access of emergency personnel throughout the facility.

1.2 EMERGENCY SHUTDOWN PROCEDURE

1.2.1 EMERGENCY SHUTDOWN – INITIAL STEP

In an emergency, each inverter should be manually turned to the off position (this will require a key). Doing this will immediately open, or disconnect, the internal AC and DC contactors (if present) inside the inverter.

1.2.2 ISOLATION PROCEDURE – INVERTER PAD EQUIPMENT

TO ISOLATE THE INVERTER PAD SAFELY:

1. Shut the inverters off through a controlled shutdown.
2. Turn off all AC and DC disconnects that feed the pad. Follow the procedure in the LOTO section for opening electrical disconnects.
3. Use LOTO procedures to ensure the system remains off.
4. Always wear proper PPE and test for voltages with a properly rated meter to confirm the system is completely isolated.

1.2.3 ISOLATION PROCEDURE – FIELD COMBINER BOX

TO ISOLATE THE FIELD COMBINER BOXES SAFELY:

1. Turn off the inverters as described above.
2. Operate the switch of the combiner (if applicable) by turning the handle to the off position.
3. Use a DC clamp-on meter to confirm there is no current passing through the ungrounded conductors in the combiner box, and then open all of the fuses.
4. If further isolation of the box is needed, use the string diagrams to locate the homeruns (end connectors of the PV strings).
5. Use a DC clamp-on meter to confirm that the homerun does not have any current passing through it. Then, disconnect the string by opening the homerun positive and negative connectors and putting caps on the source circuit connectors.
6. Go back to the combiner box and use a voltmeter to confirm that each string has been successfully disconnected.

1.2.4 ISOLATION PROCEDURE – MODULES AND STRING WIRING

TO ISOLATE THE INDIVIDUAL MODULES SAFELY:

1. After turning off the inverter, switches, and combiner boxes and isolating the combiner boxes from the array, disconnect individual modules from the string.
2. Before disconnecting any string, use a DC clamp-on meter to confirm there is no current passing through the string.
3. Use the appropriate connector unlocking tool to disengage the module connector.
4. Repeat for each module to be isolated from the system.
5. If modules are removed from a string, even temporarily, technicians must ensure that the equipment grounding system remains intact for the remaining modules.

**ATTACHMENT 9:
HAZARDOUS MATERIALS AND SPILL
PREVENTION PLAN**

HAZARDOUS MATERIAL & SPILL PREVENTION PLAN

Ground-Mounted Solar Project

at

95 Main Street

Williamsburg, Massachusetts

ZPT ENERGY SOLUTIONS II, LLC

1.1 HAZARDOUS MATERIALS

No hazardous materials will be permanently introduced or stored on-site as part of the solar array installation. The solar panels do not contain any hazardous materials and they will be mounted on stationary racking systems with no movable parts. The solar installation requires no lubricants, fuel or water for operation, and generates no wastewater requiring disposal.

The proposed transformers for the solar facility will contain a non-toxic, vegetable oil-based fluid (Envirotemp FR3 fluid) as a coolant. Envirotemp FR3 fluid is formulated from seed oils (>98.5% vegetable oil) and performance enhancing additives and colorant.

During construction, hazardous materials in the form of limited quantities of fuel (gasoline or diesel), lubricating and hydraulic oil, and coolants, will be temporary introduced on the site within the construction vehicles and equipment. Refueling protocols and spill preventive measures will be further detailed within the SWPPP to be provided prior to the start work.

1.2 SPILL PREVENTION PLAN

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.

1.2.1 GOOD HOUSEKEEPING:

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

- An effort will be made to store only enough product required to do the job.
- All materials stored onsite will be stored in a neat, 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.
- Manufacturer, local, and State recommendations for proper use and disposal shall be followed.
- 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.
- The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.

SPILL PREVENTION AND RESPONSE PLANS:

- Spill Control Practices shall be in conformance with the guidelines set forth in the National Pollutant Discharge Elimination System (NPDES) Stormwater Pollution Prevention Plan (SWPPP)

PROVISIONS FOR MAINTENANCE OF LAWNS, GARDENS, AND OTHER LANDSCAPED AREAS:

- Grass shall not be cut shorter than 2 to 3 inches and mulch clipping should be left on lawn as a natural fertilizer.
- The use of mulch shall be utilized where possible. Mulch helps retain water and prevents erosion.

REQUIREMENTS FOR STORAGE AND USE OF 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 storm water. 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.
- Do not fertilize before a rainstorm.
- Consider using organic fertilizers. They release nutrients more slowly.

SNOW DISPOSAL AND PLOWING PLANS RELATIVE TO RESOURCE AREAS:

- Snow shall be plowed and stored on gravel, grass, or other permeable surfaces to allow filtration to occur.
- Once snow melts all sand salt and debris shall be extracted from surface and properly disposed of.
- Snow shall not be disposed of in any resource area or waterbody.
- Avoid disposing snow on top of storm drain catch basins or stormwater drainage swale.

1.2.2 HAZARDOUS PRODUCTS:

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

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

1.2.3 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 product will be stored in tightly sealed containers which are clearly labeled.

Concrete Products

Concrete contractors should be encouraged, where possible, to use the washout facilities at their own plants or dispatch facilities.

If concrete washout or discharge of surplus concrete or drum wash water on the site is needed for emergency purposes only, then the following must comply:

- a) Do not wash out concrete trucks or equipment into storm drains, streets, gutters, uncontained areas, or streams.
- b) Washout area shall be located within the designated construction laydown area per the approved permit plans only and advertise the location with signs.
- c) Direct all washwater into a leak-proof container or leak-proof pit. The container or pit must be designed so that no overflows can occur due to inadequate sizing or precipitation. Provide adequate containment for the amount of wash water that will be used
- d) Inspect washout structures daily to detect leaks or tears and to identify when materials need to be removed.
- e) Dispose of materials properly. The preferred method is to allow the water to evaporate and to recycle the hardened concrete. Full service companies may provide dewatering services and should dispose of wastewater properly. Concrete wash water can be highly polluted. It should not be discharged to any surface water, storm sewer system, or allowed to infiltrate into the ground. It should not be discharged to a sanitary sewer system without first receiving written permission from the system operator.

1.2.4 SPILL CONTROL PRACTICES:

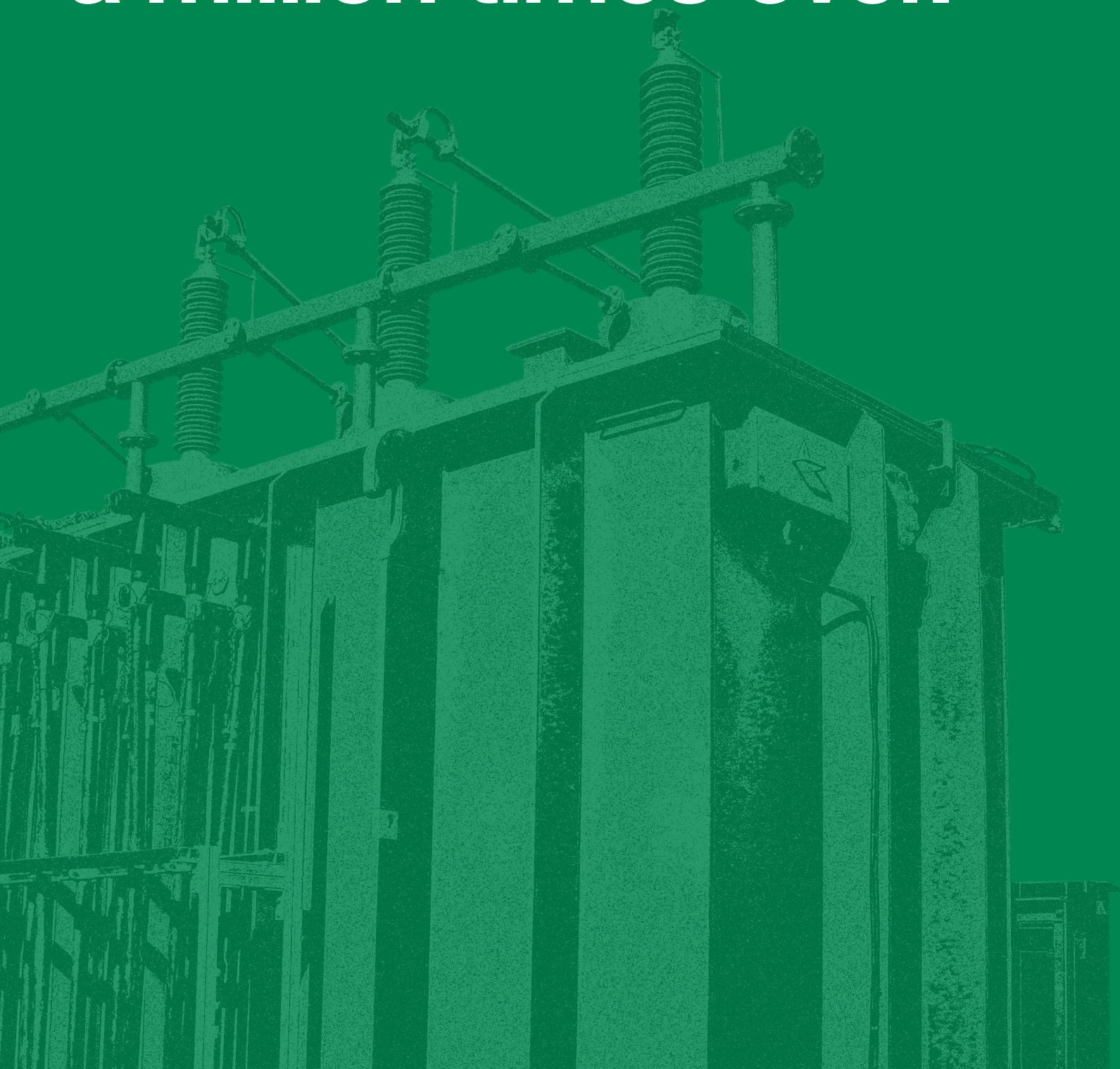
In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturer's 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, dust pans, 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 after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of the size.
- The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.
- The site superintendent responsible for the day-to-day site operations, will be the spill prevention and cleanup coordinator. He will designate at least three other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the office trailer onsite.

EnvirotempTM FR3TM fluid Formulated for performance.



Envirotemp[™] FR3[™] fluid.
Trusted worldwide
a million times over.





With over one million installations across six continents and validated in over 250 tests, Cargill's Envirottemp™ FR3™ natural ester fluid is trusted by our customers to deliver cost-effective solutions that help improve transformer performance reliably and safely.

Our team of dielectric experts is active in the standards community globally and has extensive knowledge of not only dielectric fluid properties but also fluid performance in

application. And they have transformer design experience, too. This means our customers adopting FR3 natural ester technology have comprehensive dielectric fluids support from initial planning stages through best practices implementation and beyond.

Backed by Cargill's global supply chain network, our customers can rely on us to deliver the best solution for their application - when they need it, anywhere in the world.

With FR3 fluid, our customers can:

- Gain cost efficiencies either on initial cost or total cost of ownership without sacrificing reliability.
- Extend transformer insulation and asset life.
- Optimize load capacity.
- Significantly improve fire safety.
- Enhance their environmental footprint and sustainable supply chain initiatives.

Improve performance with life extension and loading flexibility.

Protect insulation life to extend asset life.

Insulation paper is one of the primary factors that determines the life of a transformer. FR3™ fluid's unique chemistry absorbs free water and essentially wicks it away from the insulation paper. FR3 fluid has 10 times the water saturation level of mineral oil. This results in extending the insulation life 5-8 times longer than mineral oil.



Insulation aging study comparing thermally upgraded paper using FR3 fluid vs. mineral oil.

- Save significantly on replacement costs by extending the asset life with FR3 fluid.
- Reduce the risk of failure to improve reliability of the transformer.
- Reduce processing maintenance costs, since FR3 fluid does not sludge like mineral oil.

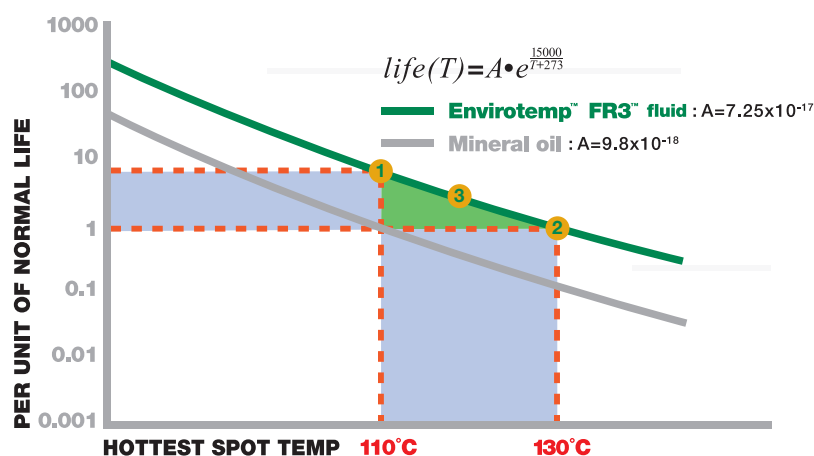
With FR3™ fluid's unique capabilities to extend insulation life and increase load capacity, organizations now have the flexibility to optimize their transformer fleet loading profiles in order to gain cost savings without sacrificing reliability.

Leverage higher thermal capability with FR3 fluid.

Historically, standards were written to accommodate a 95°C or 110°C hot spot for cellulose and Thermally Upgraded Kraft (TUK), respectively. However, published high temperature insulation system standards - IEC (60076-14) and IEEE (C157.154) – accommodate a 15°C or 20°C increase in hot spot without sacrificing the life or reliability of the transformer, when immersed in natural ester fluid.

Paper	Dielectric Fluid	Thermal Class	Hot spot	IEEE AWR	IEC AWR
TUK	Mineral Oil	120	110°C	65°C	75K
TUK	Natural Ester	140	130°C	85°C	95K

TUK life curves



OPTION 1: Extend asset life at current 110° hotspot.

OPTION 2: Increase load capability up to 20% with 130°C hotspot.

OPTION 3: Incrementally extend asset life and increase load capability with 120°C hotspot.

IEC 60076-14 Part 14: Liquid-immersed power transformers using high-temperature insulation materials. Edition 1.0 September 2013.

IEEE C57.154 Standard for the Design, Testing, and Application of Liquid-Immersed Distribution, Power, and Regulating Transformers Using High-Temperature Insulation Systems and Operating at Elevated Temperature. Published October 30, 2012.

Improve fire safety.

Add more sustainability to your sustainable supply chain.



Reduce costs while increasing fire safety.

FR3™ fluid has the highest fire point of any dielectric fluid (360°C compared to 160°C for mineral oil) making it the ideal choice for densely populated areas where transformers are positioned indoors, underground or in close proximity to buildings and other equipment. FR3 fluid is a K-class, less flammable fluid as certified by Underwriters Laboratory and approved by FM Global.

- Reduce clearance to buildings which saves precious real estate, particularly in space-constrained areas.
- Retrofill older transformers with FR3 fluid instead of replacing or moving them to help comply with current fire code regulations.
- For power transformers, potentially eliminate the need for expensive fire walls and deluge systems (and their ongoing maintenance costs).

“Being green” also benefits your bottom line.

FR3 fluid not only has best-in-class environmental properties, but with its enhanced thermal capabilities enabling smaller transformer designs, your supply chain just got a whole lot more sustainable.

- Smaller, more efficient transformer designs:
 1. Use less fluid and construction materials.
 2. Are typically lighter which could make installations easier for work crews and could reduce transportation costs.

Envirotemp™ FR3™ fluid properties: standard acceptance values and typical values

PROPERTY	Standard test methods		ASTM D6871	IEC 62770	Envirotemp FR3 fluid
	ASTM	ISO/IEC	As-received new fluid property requirements	Unused new fluid property requirements	TYPICAL
Physical					
Color	D1500	ISO 2211	≤1.0		0.5
Flash Point PMCC (°C)	D93	ISO 2719		≥250	255
Flash Point COC (°C)	D92	ISO 2592	≥275		320-330
Fire Point (°C)	D92	ISO 2592	≥300	>300	350-360
Pour Point (°C)	D97	ISO 3016	<-10	≤-10	-18 - -23
Density at 20°C (g/cm³)		ISO 3675		≤1.0	0.92
Relative Density (Specific Gravity) 15°C	D1298		≤0.96		0.92
Viscosity (mm²/sec)	D445	ISO 3104			
100 °C			≤15	≤15	7.7 - 8.3
40 °C			≤50	≤50	32 - 34
0 °C			≤500		190
Visual Examination	D1524	IEC 61099 9.2	bright and clear	clear, free from sediment and suspended matter	clear, light green
Biodegradation		OECD 301	readily biodegradable	readily biodegradable	ultimately biodegradable
Electrical					
Dielectric Breakdown (kV)	D877		≥30		47
Dielectric Breakdown (kV)					
1mm gap	D1816		≥20		28
2mm gap	D1816		≥35		48-75
2.5mm gap		IEC 60156		≥35	73
Gassing Tendency (mm/min)	D2300		≤0		-79
Dissipation Factor					
25°C (%)	D924		≤0.20		0.010 - 0.15
90°C (tan δ)		IEC 60247		≤0.05	0.02
100°C (%)	D924		≤4.0		0.41 - 3.85
Chemical					
Corrosive Sulfur	D1275	IEC 62697	non-corrosive	non-corrosive	non-corrosive
Water Content (mg/kg)	D1533	IEC 60814	≤200	≤200	4 - 50
Acid Number (mg KOH/g)	D974	IEC 62021.3	≤0.06	≤0.06	0.013 - 0.042
PCB Content (mg/kg)	D4059	IEC 61619	not detectable	free from PCBs	not detectable
Oxidation Stability (48 hrs, 120°C)		IEC 61125C			
Total Acidity (mg KOH/g)		IEC 62621.3		≤0.6	0.1
Viscosity at 40°C (mm²/sec)		ISO 3104		≤30% increase over initial	17.1% increase
Dissipation Factor at 90°C (tan δ)		IEC 60247		≤0.5	0.1

NOTE: Specifications should be written referencing only the defined ASTM or IEC industry standard acceptance values and test methods. The listed 'typical' values are average values summarized from a significant number of data points over many years; they are not to be identified as acceptance values.

ASTM D6871 Standard Specification for Natural (Vegetable Oil) Ester Fluids Used in Electrical Apparatus.

IEC 62770: Fluids for electrotechnical applications – Unused natural esters liquids for transformers and similar electrical equipment.

A transformer filled with FR3™ fluid complies with the transformer temperature operating range requirements defined in IEEE C57.12.00 and IEC 60076-1.

The information presented herein is believed to be true and accurate. However, all statements, recommendations and suggestions are made without guarantee, express or implied, and are subject to change without notice. WE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE and FREEDOM FROM INFRINGEMENT and disclaim all liability in connection with the use of the products or information contained herein. All such risks are assumed by the equipment manufacturer/user and the final determination of suitability of each use application is the responsibility of the equipment manufacturer/user. Products may present unknown hazards and should be used with caution. Although certain hazards are described herein, we do not guarantee that these are the only hazards that exist.

- Made from a renewable source with global, reliable supply.
- Carbon neutral (according to BEES 4.0 lifecycle analysis).
- Non-toxic and non-hazardous in soil and water.
- Biodegrades in less than 28 days.
- Contains no petroleum, halogens, silicones or sulfurs.
- Recyclable.



contact us - envirotempfluids.com

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ATTACHMENT 10:
PLANNING BOARD COMMENT RESPONSE
LETTER



VIA EMAIL: rbarker@att.net

January 4, 2019

January 17, 2019

January 25, 2019

Town of Williamsburg Planning Board
141 Main Street, P.O. Box 447
Haydenville, MA 01039-0447

**Re: 95 Main Street, Haydenville, MA
Proposed Solar Array – Larry West Property**

Dear Members of the Board:

We have received the email summary of your comments and concerns as a result of the site walk conducted on November 17, 2018. Below is the list of comments with responses from the Applicant, ZPT Energy Solutions II, LLC (ZPT) and Meridian Associates, Inc. (MAI):

1: We appear to now have Attachment 11. However, the views of the installation are mostly from above, looking down. They do not present any view from Highway 9 looking toward the installation. Though the site visit appeared to indicate that the installation would not be visible from Highway 9, we still need a post-development photorealistic visualization that shows the view of the site from Highway 9, and a statement that it will not be visible from Highway 9.

Response: We have included images from the views requested that have been generated from our LiDAR survey data. These images depict the existing topography and trees with an actual depiction of the solar array. In addition to the provided images, we will have a live demonstration at the public hearing which will allow viewing from any angle/perspective that the Board members request.

2: We are concerned about the fact that there is no defined surety. We have in the past allowed the surety to be posted prior to the issuance of a building permit, but we do need to know the form of the surety, or at least the various options.

Response: A decommissioning plan and estimate were provided with the original submission. The initial estimate was calculated to a total of \$64,392. Upon final negotiation of the decommissioning plan and estimate with the Town, ZPT Energy Solutions will post a surety



bond based on the final amount. This bond shall be issued by an A.M. Best Rated Insurance Company.

3: We request that you prepare sections across any significant changes in topography, such as portions of the access road, showing original versus final slopes.

Response: Cross sections have been included with the LiDAR imagery described above.

4: Sheet 1 is not readable. We understand that you will correct this matter.

Response: Sheet 1 has been revised with improved imagery to facilitate easier reading of the plan.

5: On Sheet 3, and Sheet 10, please show the proposed, changed alignment of the access road.

Response: The proposed gravel road has had the alignment changed in the area requested to pull any proposed grading and fence away from the existing stone wall so as not to disturb it during construction. The road grading and adjacent swale were able to be shifted without any increase in grade for vehicular traffic.

6: Please provide a plan to manage issues related to invasive species, preferably an IPM (Integrated Pest Management) plan, which also minimizes usage of pesticides.

Response: Please refer to the attached "Invasive Species Management Plan" letter prepared by the Applicant for your reference.

1/25/19: This document is now included in the Appendix of the Stormwater report.

7: Please provide a letter explaining the relationships between the various business entities involved in the development and management of this project.

Response: Please refer to the attached "Development Team" letter prepared by the applicant for your reference.

8: There should be a statement that logging is not permitted in a buffer zone around the site, particularly in the area of tree growth that will prevent project visibility from Highway 9. Please show this on one of the plans. Perhaps this should be included in the lease, or in an addendum to the lease, with the property owner?

Response: A buffer zone showing a 200' setback from the limit of clearing has been depicted on the site plan set (see Sheet #4-Layout Plan). The applicant is currently negotiating the language of the Lease with the land owner. The same 200' offset has been presented to the Land Owner for inclusion in the Lease. Proof of the final executed Memorandum of Lease



acknowledging the limitation shall be submitted to the Planning Board prior to the issuance of a Building Permit. The final Ground Lease and Memorandum of Lease shall be drafted and executed after the conclusion of local permitting. Applicant would be amenable to this being a condition of approval.

9: Though at this stage of development, we do not believe that a more detailed management plan for larger wildlife is required, this will become an issue of more concern as additional development is pursued nearby or in the immediate area.

Response: Understood. This was discussed previously, and the Applicant will provide any information the Board may require in the future.

1/25/19: This document is now included in the project Application package.

10: The Planning Board will likely recommend that the developer allow regular visits from the Zoning Board of Appeals and the Conservation Commission during construction. You may prefer to take the lead in defining that in a letter or in the final draft of your application.

Response: We have been before the Conservation Commission and received a Negative Determination through a Request for Determination of Applicability application. This Determination included Conditions prepared by the Commission. Condition #6 stated that “the Williamsburg Conservation Commission reserves the right to visit the site throughout the duration of the project.” A pre-construction walkthrough after the installation of the erosion controls was also included as Condition #5. Please see the attached Negative Determination with Conditions from the Commission for your reference.

Regarding site access for other Boards in Town, the applicant is amenable to periodic visits to the site. The Site Contractor, (Pro-Tech Energy Solutions) respectfully requests that all visitors to the site sign in and undergo their safety training prior to accessing the Construction Site. A record of Town Representatives, and others, that undergo training will be kept on file in the Construction trailer. As this is an active Construction Site with potential hazards, OSHA approved Personal Protective Equipment (PPE) shall be worn at all times. Pro-Tech respectfully requests that proper notice be provided prior to arrival. Proper notice of arrival will ensure that onsite construction personnel will be present to authorize access to the site.

1/25/19: A copy of the RDA Negative Determination is now included in the Application package.



We look forward to discussing these outstanding issues at the public hearing on December 17th.
If you have any other comments or concerns, please do not hesitate to contact us.

Sincerely,

MERIDIAN ASSOCIATES, INC.

A handwritten signature in black ink, appearing to read "Christopher Ryan". The signature is fluid and cursive, with a prominent initial "C" and a long, sweeping tail.

Christopher Ryan
Project Manager

P:\6091_ZPII-Haydenville\ADMIN\Letters_Memos\6091-Planning_comment_response 2019-01-25.doc

ATTACHMENT 11:
DEVELOPMENT TEAM

DEVELOPMENT TEAM

Ground-Mounted Solar Project

at

95 Main Street

Williamsburg, Massachusetts

ZPT ENERGY SOLUTIONS II, LLC

Developer: ZPT Energy Solutions

Interconnection: Zero-Point Development, Inc.

Engineering, Procurement, and Construction: Pro-Tech Energy Solutions, LLC

Long Term Maintenance and Operation: Pro-Tech Energy Solutions, LLC

ZPT Energy Solutions “ZPT” is a joint venture between Zero-Point Development “Zero Point”, a leading solar project developer based in Worcester, MA, and Pro-Tech Energy Solutions “Pro Tech”, a leading energy services company headquartered in Moorestown, New Jersey with a local office in Worcester, MA. Zero-Point and Pro-Tech saw an opportunity to combine their skills and transform their smaller local companies to a large, nationally recognized, full service renewable energy provider.

As one team, they are capable of financing, developing, engineering, procuring, and constructing large solar energy projects including ground mount, roof mount, and canopy solar arrays.

Collectively, ZPT Energy Solutions currently has over 500 MWs (DC) of projects installed and in-development.

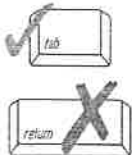
ATTACHMENT 12:
MASSDEP WPA FORM 2 – NEGATIVE
DETERMINATION



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 2 – Determination of Applicability
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. General Information

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



From:

Williamsburg
Conservation Commission

To: Applicant

Property Owner (if different from applicant):

ZPT Energy Solutions II, LLC
Name

Lawrence West
Name

6 Park Avenue, Suite 100
Mailing Address

95 Main St
Mailing Address

Worcester
City/Town

MA
State

01605
Zip Code

Wmsbg
City/Town

MA
State

01096
Zip Code

1. Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:

Stormwater Analysis & Calculations
Title

Oct. 3, 2018
Date

ZPT II - 222 Solar Array - Williamsburg MA
Title

Oct. 3, 2018
Date

Maps & BVW Delineation Field Data Form
Title

Oct. 4, 2018
Date

2. Date Request Filed:

Oct 3, 2018

B. Determination

Pursuant to the authority of M.G.L. c. 131, § 40, the Conservation Commission considered your Request for Determination of Applicability, with its supporting documentation, and made the following Determination.

Project Description (if applicable):

- Installation of two p.v. solar arrays within
- ~~Ident~~ forested uplands on a 36 ± acre site located north and east of Main St, South of Kellogg Road

Project Location:

95 Main St
Street Address

R
Assessors Map/Plat Number

Williamsburg, MA
City/Town

76
Parcel/Lot Number



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Determination (cont.)

The following Determination(s) is/are applicable to the proposed site and/or project relative to the Wetlands Protection Act and regulations:

Positive Determination

Note: No work within the jurisdiction of the Wetlands Protection Act may proceed until a final Order of Conditions (issued following submittal of a Notice of Intent or Abbreviated Notice of Intent) or Order of Resource Area Delineation (issued following submittal of Simplified Review ANRAD) has been received from the issuing authority (i.e., Conservation Commission or the Department of Environmental Protection).

☐ 1. The area described on the referenced plan(s) is an area subject to protection under the Act. Removing, filling, dredging, or altering of the area requires the filing of a Notice of Intent.

☐ 2a. The boundary delineations of the following resource areas described on the referenced plan(s) are confirmed as accurate. Therefore, the resource area boundaries confirmed in this Determination are binding as to all decisions rendered pursuant to the Wetlands Protection Act and its regulations regarding such boundaries for as long as this Determination is valid.

☐ 2b. The boundaries of resource areas listed below are not confirmed by this Determination, regardless of whether such boundaries are contained on the plans attached to this Determination or to the Request for Determination.

☐ 3. The work described on referenced plan(s) and document(s) is within an area subject to protection under the Act and will remove, fill, dredge, or alter that area. Therefore, said work requires the filing of a Notice of Intent.

☐ 4. The work described on referenced plan(s) and document(s) is within the Buffer Zone and will alter an Area subject to protection under the Act. Therefore, said work requires the filing of a Notice of Intent or ANRAD Simplified Review (if work is limited to the Buffer Zone).

☐ 5. The area and/or work described on referenced plan(s) and document(s) is subject to review and approval by:

Name of Municipality

Pursuant to the following municipal wetland ordinance or bylaw:

Name

Ordinance or Bylaw Citation



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Determination (cont.)

- ☐ 6. The following area and/or work, if any, is subject to a municipal ordinance or bylaw but not subject to the Massachusetts Wetlands Protection Act:

- ☐ 7. If a Notice of Intent is filed for the work in the Riverfront Area described on referenced plan(s) and document(s), which includes all or part of the work described in the Request, the applicant must consider the following alternatives. (Refer to the wetland regulations at 10.58(4)c. for more information about the scope of alternatives requirements):

- ☐ Alternatives limited to the lot on which the project is located.
- ☐ Alternatives limited to the lot on which the project is located, the subdivided lots, and any adjacent lots formerly or presently owned by the same owner.
- ☐ Alternatives limited to the original parcel on which the project is located, the subdivided parcels, any adjacent parcels, and any other land which can reasonably be obtained within the municipality.
- ☐ Alternatives extend to any sites which can reasonably be obtained within the appropriate region of the state.

Negative Determination

Note: No further action under the Wetlands Protection Act is required by the applicant. However, if the Department is requested to issue a Superseding Determination of Applicability, work may not proceed on this project unless the Department fails to act on such request within 35 days of the date the request is post-marked for certified mail or hand delivered to the Department. Work may then proceed at the owner's risk only upon notice to the Department and to the Conservation Commission. Requirements for requests for Superseding Determinations are listed at the end of this document.

- ☐ 1. The area described in the Request is not an area subject to protection under the Act or the Buffer Zone.
- ☐ 2. The work described in the Request is within an area subject to protection under the Act, but will not remove, fill, dredge, or alter that area. Therefore, said work does not require the filing of a Notice of Intent.
- ☒ 3. The work described in the Request is within the Buffer Zone, as defined in the regulations, but will not alter an Area subject to protection under the Act. Therefore, said work does not require the filing of a Notice of Intent, subject to the following conditions (if any).

see attached

- ☐ 4. The work described in the Request is not within an Area subject to protection under the Act (including the Buffer Zone). Therefore, said work does not require the filing of a Notice of Intent, unless and until said work alters an Area subject to protection under the Act.



WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Determination (cont.)

- ☐ 5. The area described in the Request is subject to protection under the Act. Since the work described therein meets the requirements for the following exemption, as specified in the Act and the regulations, no Notice of Intent is required:

Exempt Activity (site applicable statutory/regulatory provisions)

- ☐ 6. The area and/or work described in the Request is not subject to review and approval by:

Name of Municipality

Pursuant to a municipal wetlands ordinance or bylaw.

Name

Ordinance or Bylaw Citation

C. Authorization

This Determination is issued to the applicant and delivered as follows:

☐ by hand delivery on

☐ by certified mail, return receipt requested on

Date

10-26-18
Date

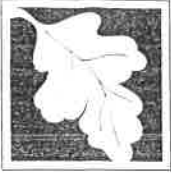
This Determination is valid for **three years** from the date of issuance (except Determinations for Vegetation Management Plans which are valid for the duration of the Plan). This Determination does not relieve the applicant from complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.

This Determination must be signed by a majority of the Conservation Commission. A copy must be sent to the appropriate DEP Regional Office (see <http://www.mass.gov/eea/agencies/massdep/about/contacts/>) and the property owner (if different from the applicant).

Signatures:

[Handwritten signatures of three Conservation Commission members]

10-25-18
Date



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

D. Appeals

The applicant, owner, any person aggrieved by this Determination, any owner of land abutting the land upon which the proposed work is to be done, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate Department of Environmental Protection Regional Office (see <http://www.mass.gov/eea/agencies/massdep/about/contacts/>) to issue a Superseding Determination of Applicability. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and Fee Transmittal Form (see Request for Departmental Action Fee Transmittal Form) as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Determination. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant if he/she is not the appellant. The request shall state clearly and concisely the objections to the Determination which is being appealed. To the extent that the Determination is based on a municipal ordinance or bylaw and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.



Williamsburg Conservation Commission
147 Main Street, P.O. Box 447
Haydenville, Massachusetts 01039-0447
Phone: 413-268-8416 Fax: 413-268-8409
conservation@burgy.org

Conditions

ZPT Energy Solutions II, LLC solar array project - Main Street

1. Erosion and sedimentation control measures shall use straw bales.
2. Erosion and sedimentation control measures at the east side of the array near the top of the slope above the brook shall include a double row of straw bales.
3. Fencing shall be placed on the outside perimeter of the detention ponds.
4. The applicant shall notify the Williamsburg Conservation Commission regarding the stormwater pollution prevention plan (SWPPP).
5. The applicant shall notify the Williamsburg Conservation Commission when erosion controls are installed for a pre-construction walk-through.
6. The Williamsburg Conservation Commission reserves the right to visit the site throughout the duration of the project.

October 25, 2018

ATTACHMENT 13:
LEC WILDLIFE MEMORANDUM

M E M O R A N D U M

DATE: January 17, 2019

TO: Adam Christie, ZPT Energy Solutions II, LLC

FROM: LEC Environmental Consultants, Inc.

RE: Proposed Ground-mounted Solar Photovoltaic Installation
75 Main Street (Assessor's Map G, Lot 76)
Williamsburg, Massachusetts

LEC PROJECT #: ZPE\17-431.04

LEC Environmental Consultants, Inc., is providing this Memorandum to address habitat impacts/wildlife corridors per Section 9.30 of the Town of Williamsburg *Zoning Bylaw* for the proposed ground-mounted solar photovoltaic installation at the above-referenced project site, as depicted on the site plans entitled *ZPII-222 Solar Array located in Williamsburg, Massachusetts* (13 sheets), prepared by Meridian Associates, Inc., dated October 3, 2018. Specifically,

Section **9.30-10.2 Land Clearing, Soil Erosion and Habitat Impacts** states that *clearing of natural vegetation shall be limited to that which is necessary for the construction, operation and maintenance of the ground-mounted solar photovoltaic installation or otherwise prescribed by applicable laws, regulations, and bylaws. Sufficient vegetation shall be maintained to minimize soil erosion.*

Section **9.30-10.4 Wildlife Corridors** states that *ground-mounted solar photovoltaic installations shall be designed and constructed to minimize the impacts on and optimize the maintenance requirements of wildlife corridors.*

Based on existing conditions, review of pertinent resource maps, and project details, wildlife habitat and potential migratory corridors are not anticipated to be adversely affected by the proposed ground-mounted solar photovoltaic installation, as further detailed below.

Existing Conditions

The 36± acre site is located north and east of residential/commercial/agricultural development along Main Street. Existing agricultural and undeveloped forested lands exist to the north. An unnamed perennial stream occurs to the east along with undeveloped forested upland associated with Shingle Hill. The Mill River extends parallel to and across Main Street.

The majority of the site is occupied by forested upland dominated by mixed canopy of northern red oak (*Quercus rubra*) and eastern hemlock (*Tsuga canadensis*), in addition to individual stands of black birch (*Betula lenta*), poplar (*Poplar* sp.), and individuals of paper birch (*Betula papyrifera*), American beech (*Fagus grandifolia*), red maple (*Acer rubrum*), eastern white pine (*Pinus strobus*), white oak (*Quercus alba*), hickory (*Carya* sp.), and black locust (*Robinia pseudoacacia*). Bordering Vegetated Wetlands (BVW) are located within the agricultural field within the southwestern portion of the site, and along the perennial stream located within the northeastern portion of the site. Site topography generally descends southerly with an elevation gradient of 200± feet, and southeasterly with an elevation gradient of 100± feet, descending towards the easterly perennial stream.

No work activities occur within 100 feet of jurisdictional wetlands or within 200 feet of the easterly perennial stream (Riverfront Area).

Resource Habitat Maps

In order to address potential habitat impacts/wildlife corridors, several pertinent reference materials were consulted as detailed below.

NHESP Designation

According to the 14th edition of the *Massachusetts Natural Heritage Atlas* (effective August 1, 2018), the project site does not occur within a Priority Habitat of Rare Species or an Estimated Habitat of Rare Wildlife. The closest mapped Priority/Estimated Habitat is associated with Mill River, approximately 700± feet away. No Certified or Potential Vernal Pools occur within the vicinity of the project site according to MassGIS data layers. The closest Potential Vernal Pool occurs greater than 700 feet to the north.

BioMap2

BioMap2, developed by NHESP and The Nature Conservancy's Massachusetts Program to protect the state's biodiversity, identifies two complementary spatial layers related to plant and wildlife habitat. "Core Habitat" *identifies key areas that are critical for the long-term persistence of rare species and other Species of Special Concern, as well as a wide diversity of natural communities and intact ecosystems across the Commonwealth.* "Critical Natural Landscape" *identifies larger natural Landscape Blocks that are minimally impacted by development. If protected, these areas will provide habitat for wide-ranging native species, maintain connectivity among habitats, and enhance ecological resilience to natural and anthropogenic disturbances in a rapidly changing world. Areas delineated as Critical Natural Landscape also include buffering upland around wetland, coastal, and aquatic Core Habitats to help ensure their long-term integrity.*

According to Williamsburg's *BioMap2* (2012), proposed work activities are not located within a "Core Habitat" and/or "Critical Natural Landscape." Core Habitat is associated with the Mill River and extends minimally across Main Street onto the southerly tip of the subject parcel.

"Habitat of Potential Regional or Statewide Importance"

According to the "Habitat of Potential Regional or Statewide Importance" map for Williamsburg, the project footprint is not mapped within an "Important Wildlife Habitat" by the MA DEP Conservation Assessment and Prioritization Systems (CAP) program, an ecosystem-based approach for assessing the ecological integrity of lands and waters and subsequently identifying and prioritizing land for habitat and biodiversity conservation. Portions of the Mill River and easterly perennial stream are mapped as "Important Wildlife Habitat."

Interior Forest

According to the most current MassGIS data layer, the subject parcel is not located within a mapped Interior Forest. While this data layer has no regulatory associations, it identifies extensively forested portions of the Massachusetts landscape where forest cover is relatively unfragmented by human development.

Wildlife Habitat/Migratory Corridor Impact Analysis

The fenced-in solar array, including the panels, access drives, rip rap slopes, and stormwater management features, comprises 20± acres of the 36± acre site. The project footprint has been sited to maximize setbacks to the easterly perennial stream and wetlands located within the southwesterly portion of the site. As stated above, no work activities occur within 100 feet of jurisdictional wetlands or within 200 feet of the easterly perennial stream (Riverfront Area). A Request for Determination of Applicability (RDA) has been filed with the Williamsburg Conservation Commission, and the Commission voted to issue a Negative Determination of Applicability approving the project at their Public Hearing on Thursday, October 25, 2018.

In accordance with Section **9.30-10.2**, proposed vegetative clearing has been minimized to the greatest extent feasible. To avoid excess clearing and grading, rip rap is proposed in select locations to minimize the alteration footprint. An Erosion Control Plan, including the installation of double-staked hay bales, silt fencing, and Filtermitt™, is proposed to manage erosion and sedimentation during construction.

The proposed ground-mounted solar photovoltaic installation will result in the conversion of approximately 13.8± acres of red oak-dominated forested upland to a native meadow containing the panels, etc. Following installation, the footprint of the array and all disturbed areas will be seeded with the New England Conservation/Wildlife Mix provided by New England Wetland Plants, Inc. This native seed mix provides a permanent cover of native grasses, wildflowers, and legumes to provide both good erosion control and wildlife habitat value. The perimeter security fence has been designed to allow for a

minimum of 6 inches of clearance from the final grade to allow for movement/migration of small mammals, reptiles, and amphibians.

Valuable edge habitat (early to mid-successional habitat) will be created and maintained south of the solar footprint. Existing shrub and groundcover will be maintained through the selective cutting (no grubbing) of trees. While vegetation maintenance outside the array is anticipated to be infrequent in future years considering the descending slopes and minimal shading concerns, future management should occur during November-March of any year.

Wildlife movement for larger mammals, such as white-tailed deer (*Odocoileus virginianus*), eastern coyote (*Canis latrans*), foxes (*Vulpes* spp.), black bear (*Ursus americanus*), moose (*Alces alces*), and/or bobcat (*Lynx rufus*), may be minimally directed around the fenced-in solar array. However, the solar footprint is not anticipated to result in a significant disruption to existing migratory corridors with the moderately dense residential homes and businesses occurring south and west of the project footprint along Main Street. The presence of these homes and businesses off a busy roadway already creates a potential for human:wildlife interactions that has been long standing on the landscape. Nevertheless, a 130-200+ linear foot wide, undisturbed forested buffer is provided within the southeastern portion of the site, between the southern limits of the array and existing meadow comprising the southwestern portion of the site. A 200+ foot buffer is also provided east of the solar footprint, along the perennial stream.

In summary, any potential migratory redirection or habitat conversion associated with the proposed ground-mounted solar photovoltaic installation is not expected to significantly affect wildlife populations or corridors since surrounding habitats both on and off-site are similar in structure and offer many of the same features and functions currently present within the proposed Limit of Work.

**ATTACHMENT 14:
STORMWATER ANALYSIS &
CALCULATIONS REPORT**

STORMWATER ANALYSIS & CALCULATIONS REPORT

for

**95 MAIN STREET
WILLIAMSBURG, MASSACHUSETTS**

Prepared for:

ZPT Energy Solutions II, LLC
6 Park Avenue, Suite 100
Worcester, MA 01605

Prepared by:

Meridian Associates, Inc.
500 Cummings Center, Suite 5950
Beverly, Massachusetts 01915
(978) 299-0447

Date: October 3, 2018
Revised: January 4, 2019
Revised: January 17, 2019
Revised: January 25, 2019



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- TR 20 SCS Unit Hydrograph Procedure
- Runoff Curve Numbers
- Time of Concentration by TR55 Methodology
- Reach and Pond Rating by the Storage-Indication Method
- Manning Equation

SOURCE OF DATA

- Technical Report No. 20
- Technical Report No. 55
- National Oceanic and Atmospheric Administration Atlas 14
- Field Survey by Meridian Associates, Inc.
- Massachusetts Stormwater Handbook February 2008

REPORT SUMMARY:

Calculation Objective

The purpose of this drainage analysis is to design a stormwater management system that will not increase peak rates or volume of stormwater runoff that will flow offsite from pre to post development conditions. Three Design Points have been chosen around the perimeter of the site for measurement during the 2, 10, and 100-year design storm events, and these are represented in the calculations included in this report.

The following analysis is separated into existing conditions and proposed conditions for ease of comparison. Drainage maps have been incorporated into this report to depict existing and proposed watershed areas and subcatchments for the site.

This stormwater management hydrological study has been prepared in accordance with the Performance Standards set forth in the Massachusetts Department of Environmental Protection (DEP) Stormwater Handbook.

Classification of Soils:

Existing soil conditions within the limits of the watershed analyzed for this study have been categorized as:

- Paxton Fine Sandy Loam, Hydrological Soil Group C
- Ridgebury Fine Sandy Loam, Hydrological Soil Group D
- Sudbury Fine Sandy Loam, Hydrological Soil Group B
- Windsor Loamy Sand, Hydrological Soil Group A

These classifications are based upon the Natural Resource Conservation Service Maps obtained through its web soil survey website on July 31, 2018. A copy of this soil map is contained in the Appendix of this report. In addition, onsite soil testing was conducted by Meridian Associates Inc. (MAI) on August 14, 2018 in the areas depicted on the attached plans. This testing revealed a sandy loam parent material, and the soil test logs can be found in the design plan set.

Selection of Storm Events

The storm event rainfall frequencies used for this analysis have been selected based upon the National Oceanic and Atmospheric Administration Atlas 14, and the data was obtained from their website in July, 2018 and updated on September 28, 2018. Rainfall frequency data obtained is as follows for Williamsburg, MA:

<u>Frequency (Years)</u>	<u>NOAA Precipitation [24 hour event (inches)]</u>
2	3.12
10	4.93
100	7.81

Existing Site Overview

The project consists of a lot (95 Main Street) encompassing 35.74± acres of land in Williamsburg, Massachusetts. Some tree clearing work will also be conducted on a neighboring lot (5R Hatfield Road) encompassing 6.84± acres. The entire project area is currently undeveloped woodland, portions of which are in the process of being cleared for logging purposes. The project area is bordered by land now or formerly Susan E. Stebbins to the west, land now or formerly Lee. H. Lashaway to the north, land now or formerly Penelope Johnson to the East, and land now or formerly: Penelope Johnson, Poverty Mountain Partners LLC, or Lawrence E. & Linda A. West to the south. The area included within the drainage analysis currently drains towards either bordering vegetated wetlands to the southwest, abutters to the south, or bordering vegetated wetlands to the east. The stormwater runoff patterns established within the pre-development conditions are based on existing topography indicating that the runoff flows in general to three (3) design point areas which are listed below:

- **Design Point #1 (DP1)** is the southwestern bordering vegetated wetlands.
- **Design Point #2 (DP2)** is the eastern bordering vegetated wetlands.
- **Design Point #3 (DP3)** is the southern abutters.

The existing site has been broken into three (3) subcatchment as depicted on the Pre-Development Drainage Plan. The following summarizes the hydraulic condition and area comprising the pre-hydrologic model:

- **Subcatchment SC1.0** – This is denoted as SC1.0 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists entirely of wooded land. Stormwater runoff generated in this subcatchment flows southwesterly towards bordering vegetated wetlands. **(DP1)**
- **Subcatchment SC2.0** – This is denoted as SC2.0 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists of wooded land and a grassed field on land now or formerly Lee H. Lashaway. Stormwater runoff generated in this subcatchment flows southeasterly towards bordering vegetated wetlands. **(DP2)**
- **Subcatchment SC3.0** – This is denoted as SC3.0 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists entirely of wooded land.

Stormwater runoff generated in this subcatchment flows southerly towards abutting land. **(DP3)**

It should be noted that even though the property has been, and is also currently, in the process of being deforested for logging purposes, the comparison of conditions included in this drainage analysis assume a pre-development condition of a completely forested site in order to take a conservative approach to the stormwater design.

Proposed Site Overview

The proposed project entails the development of the existing wooded land into a solar energy generating facility, the improvement and extension of an existing gravel access drive, infiltration basins, a grassed drainage swale, stone trenches, concrete equipment pads, battery storage, electrical and interconnection equipment, electrical conduit, new utility poles and risers, fencing, gates, and associated seeding and soil stabilization. The existing general runoff patterns will be largely maintained, with selective grading. The proposed solar facility racking will be installed using a screw and/or driven post system which minimizes impact on the existing topography and reduces the need for excess earthwork.

The proposed site has been broken into subcatchments as depicted on the Post-Development Drainage Plan. The following summarizes the various hydraulic conditions and areas comprising the post-hydrologic model.

Subcatchment SC100 – This is denoted as SC100 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists of wooded land, proposed gravel, and proposed meadow seeded with Conservation Wildlife Mix and a proposed concrete pad. Stormwater runoff generated in this subcatchment flows southwesterly towards bordering vegetated wetlands. **(DP1)**

Subcatchment SC200 – This is denoted as SC200 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists of wooded land, proposed gravel and proposed meadow seeded with Conservation Wildlife Mix. Stormwater runoff generated in this subcatchment flows southwesterly to an intermittent stream that leads to the stream confluence. **(DP2)**

Subcatchment SC210 – This is denoted as SC210 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists of wooded land, proposed meadow seeded with Conservation Wildlife Mix, and a proposed concrete pad. Stormwater runoff generated in this subcatchment flows southwesterly to an infiltration basin (P210) then to an intermittent stream that leads to the stream confluence. **(DP2)**

Subcatchment SC300 – This is denoted as SC300 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists of wooded land, proposed meadow seeded with Conservation Wildlife Mix, Stormwater runoff generated in this

subcatchment flows southerly to abutting land [now or formerly owned by Lisa A. Deitz, Statia Skwira and Poverty Mountain Partners LLC. \(DP3\)](#)

Subcatchment SC310 – This is denoted as SC301 on the accompanying Pre-Development Drainage Plan. The subcatchment area consists entirely proposed meadow seeded with Conservation Wildlife Mix. Stormwater runoff generated in this subcatchment flows southerly to an infiltration basin (P310) then towards abutting land to the south.

Stormwater Management Standards

Standard 1: No new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

This project does not direct any untreated stormwater towards neighboring resource areas. All runoff from the project will either be treated in one of two (2) surface basin BMP's before reaching an outlet with a large riprap apron or level spreader, or will run overland across large areas of vegetated land before reaching any resource area.

Standard 2: Peak Rate Attenuation - 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.

For the purpose of analyzing pre and post development stormwater peak rates of runoff, design points have been selected based on existing topographic conditions and were used for both the pre- and the post-development calculations. Comparison values for pre and post-development stormwater peak rates are given for the design points only.

The storm events used to calculate peak runoff rates for pre and post construction conditions, as previously mentioned, have been selected based upon the National Oceanic and Atmospheric Administration Atlas 14 and taken directly from the NOAA website. Full detail of peak rate attenuation along with supplemental stormwater calculations utilizing HydroCAD software as well as pre and post-construction drainage site plans can be found in the Appendix of this Stormwater Analysis report. The details of this report show that the peak rates of runoff for the 2-year, 10-year and 100-year events have been matched or reduced from pre to post conditions, and that overall stormwater volume leaving the site is also reduced.

The hydrologic calculations from HydroCAD model's Design Points have been included in the "Stormwater Analysis & Calculations Report".

Summary of Flows at Design Point 1

<u>Storm Event</u>	Existing Conditions (Pre)		Proposed Conditions (Post)	
	<u>Peak Flow</u> <u>(CFS)</u>	<u>Volume</u> <u>(AF)</u>	<u>Peak Flow</u> <u>(CFS)</u>	<u>Volume</u> <u>(AF)</u>
2-Year	11.3	1.13	9.8	0.94
10-Year	32.0	2.87	26.8	2.34
100-Year	71.1	6.22	58.5	5.00

Summary of Flows at Design Point 2

<u>Storm Event</u>	Existing Conditions (Pre)		Proposed Conditions (Post)	
	<u>Peak Flow</u> <u>(CFS)</u>	<u>Volume</u> <u>(AF)</u>	<u>Peak Flow</u> <u>(CFS)</u>	<u>Volume</u> <u>(AF)</u>
2-Year	7.5	1.08	6.1	0.83
10-Year	21.1	2.74	17.7	2.41
100-Year	46.6	5.93	39.9	5.55

Summary of Flows at Design Point 3

<u>Storm Event</u>	Existing Conditions (Pre)		Proposed Conditions (Post)	
	<u>Peak Flow</u> <u>(CFS)</u>	<u>Volume</u> <u>(AF)</u>	<u>Peak Flow</u> <u>(CFS)</u>	<u>Volume</u> <u>(AF)</u>
2-Year	0.4	0.10	0.1	0.04
10-Year	3.4	0.40	1.9	0.22
100-Year	11.6	1.13	9.3	1.17

Standard 3: Recharge - Loss of annual recharge to groundwater shall be eliminated or minimized...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 in accordance with the Mass Stormwater Handbook.

The project proposes a small amount of impervious area (approx. 2,500 s.f.) for the concrete equipment pads that will not have their runoff directed into a stormwater basin. In relation to the overall project area being developed, it is our opinion that this is a de minimus amount of impervious area that will have no impact in the overall design. These concrete pads will be surrounded by a crushed stone trench to allow for a measure of infiltration to treat any runoff coming directly off the concrete. Any runoff from the pads not entering the stone trench would flow overland where it can be infiltrated into the soils along the route towards the neighboring wetlands. Given this, as well as the recharge being provided by the proposed infiltration basins on site, we feel that the annual recharge from the proposed site approximates the annual recharge from pre-development conditions.

72-HOUR BASIN DRAW DOWN CALCULATIONS

$$\text{Time} = \frac{R_v}{(K)(\text{BottomArea})}$$

R_v = Storage Volume

K = Saturated Hydraulic Conductivity for Sandy Loam= 1.02 in/hour

Bottom Area = Bottom Area of Recharge Structure

Pond 210

R_v = 3,580 cf

Bottom Area = 11,716 sf

Time = $2,974 / (1.02(1/12)(11,716)) = 2.98$ hours

2.98 hours < 72 hours

Pond 310

R_v = 24,200 cf

Bottom Area = 10,395 sf

Time = $24,200 / (1.02(1/12)(10,395)) = 27.4$ hours

27.4 hours < 72 hours

Standard 4: Water Quality – Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). The standard is met with pollution prevention plans, stormwater BMP's sized to capture required water quality volume, and pretreatment measures.

The project proposes a de-minimus amount of impervious area (approx. 2,500 s.f.) for the concrete equipment pads. These equipment pads will be surrounded by crushed stone infiltration trenches to treat the small amount of TSS generated. In addition, any excess runoff will travel overland before encountering any resource areas. Any TSS generated from impervious areas will receive treatment. As shown below, a very small water quality volume of 104 cf will be generated on site.

General Equation from Stormwater Management Handbook

$$V_{wq} = (D_{wq})(A)$$

V_{wq} = required water quality volume

D_{wq} = water quality depth (1" for critical areas, 0.5" for non-critical areas)

A = impervious area

The following calculation is based on 0.5" for non-critical areas:

$$V_{wq} = (2,500)(0.5"/12) = 104\pm \text{ cf}$$

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs) – Source control and pollution prevention shall be implemented in accordance with the Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

Stormwater Standard 5 is not applicable to this project. The proposed development will not subject the site to higher potential pollutant loads as defined in the Massachusetts Department of Environmental Protection Wetlands and Water Quality Regulations.

LUHPPLs are identified in 310 CMR 22.20B(2) and C(2)(a)-(k) and (m) and CMR 22.21(2)(a)(1)-(8) and (b)(1)-(6), areas within a site that are the location of activities that are subject to an individual National Pollutant Discharge Elimination System (NPDES) permit or the NPDES Multi-sector General Permit; auto fueling facilities, exterior fleet storage areas, exterior vehicle service and equipment cleaning areas; marinas and boatyards; parking lots with high-intensity-use; confined disposal facilities and disposal sites.

Standard 6: Critical Areas – Stormwater discharges to critical areas require the use of specific source control and pollution prevention measures and specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas.

Stormwater Standard 6 is not applicable to this project given that proposed stormwater does not discharge to a critical area. Critical areas being Outstanding Resource Waters and Special Resource Waters as designated in 314 CMR 4.0, recharge areas for public water supplies as defined in 310 CMR 22.02, bathing beaches as defined in 105 CMR 445.000, cold-water fisheries and shellfish growing areas as defined in 314 CMR 9.02

and 310 CMR 10.04. The existing wetlands and streams are not considered critical areas therefore Standard #6 does not apply to this project.

Standard 7: Redevelopments – A redevelopment project is required to meet Standards 1-6 only to the maximum extent practicable. Remaining standards shall be met as well as the project shall improve the existing conditions.

Stormwater Standard 7 is not applicable to this project. Within the Stormwater Management Handbook (volume 1 chapter 1 page 20), the definition of a redevelopment project includes, “development, rehabilitation, expansion and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area”.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan shall be implemented.

An Operation and Maintenance Program is included with this report. The program details the construction period operation and maintenance plan and sequencing for pollution prevention measures and erosion and sedimentation controls. Locations of erosion control measures for the project are depicted on the design plan set accompanying this report.

Standard 9: A long term Operation and Maintenance Plan shall be implemented.

An Operation and Maintenance Program for a Proposed Stormwater Management System is included with this report. The long term operation and maintenance section of the program provides details and the schedule for routine and non-routine maintenance tasks to be implemented at the completion of the project.

Standard 10: Prohibition of Illicit Discharges – Illicit discharges to the stormwater management system are prohibited.

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Discharges to the stormwater management system from the following activities or facilities are permissible: Firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents. All other illicit discharges are prohibited.

There are no known illicit discharges anticipated through the completion of this project. During construction and post construction procedures are provided to dissipate the potential for illicit discharges to the drainage system. Post construction preventions of

illicit discharges are described in the Operation and Maintenance Program under the Good Housekeeping Practices section of the report.

Conclusion

The calculations demonstrate that the proposed development will not result in an increase in the peak rate or overall volume of stormwater runoff leaving the project site in the 2-year, 10-year, or 100-year 24-hour storm events.

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POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

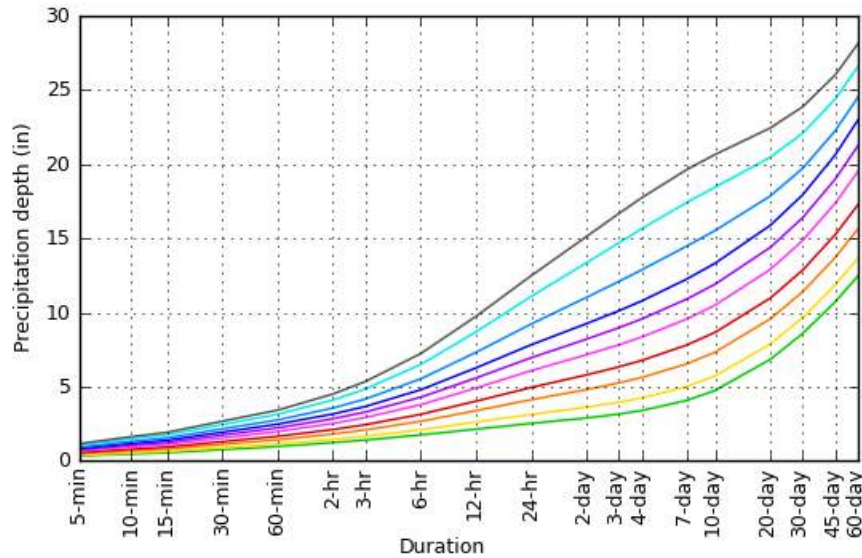
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.324 (0.250-0.417)	0.382 (0.295-0.491)	0.476 (0.366-0.615)	0.555 (0.424-0.720)	0.662 (0.491-0.895)	0.745 (0.541-1.03)	0.828 (0.584-1.18)	0.924 (0.621-1.36)	1.05 (0.681-1.60)	1.15 (0.726-1.78)
10-min	0.459 (0.355-0.590)	0.541 (0.417-0.696)	0.675 (0.519-0.871)	0.786 (0.601-1.02)	0.938 (0.695-1.27)	1.06 (0.766-1.46)	1.17 (0.827-1.68)	1.31 (0.880-1.92)	1.49 (0.965-2.26)	1.63 (1.03-2.52)
15-min	0.541 (0.417-0.694)	0.637 (0.491-0.819)	0.794 (0.610-1.02)	0.924 (0.707-1.20)	1.10 (0.818-1.49)	1.24 (0.902-1.71)	1.38 (0.973-1.97)	1.54 (1.04-2.26)	1.75 (1.14-2.66)	1.91 (1.21-2.96)
30-min	0.751 (0.580-0.965)	0.885 (0.683-1.14)	1.11 (0.849-1.43)	1.29 (0.984-1.67)	1.54 (1.14-2.08)	1.73 (1.26-2.39)	1.92 (1.36-2.74)	2.15 (1.44-3.15)	2.44 (1.58-3.71)	2.66 (1.69-4.13)
60-min	0.962 (0.743-1.24)	1.13 (0.875-1.46)	1.42 (1.09-1.83)	1.65 (1.26-2.14)	1.97 (1.46-2.66)	2.22 (1.61-3.06)	2.47 (1.74-3.52)	2.75 (1.85-4.04)	3.13 (2.03-4.75)	3.41 (2.16-5.29)
2-hr	1.22 (0.951-1.56)	1.44 (1.12-1.85)	1.80 (1.40-2.31)	2.10 (1.62-2.71)	2.52 (1.88-3.39)	2.83 (2.07-3.90)	3.15 (2.24-4.50)	3.56 (2.40-5.19)	4.09 (2.66-6.19)	4.50 (2.86-6.94)
3-hr	1.40 (1.09-1.78)	1.66 (1.29-2.11)	2.08 (1.62-2.66)	2.43 (1.88-3.12)	2.91 (2.18-3.92)	3.29 (2.42-4.52)	3.66 (2.62-5.23)	4.16 (2.81-6.06)	4.83 (3.14-7.28)	5.34 (3.39-8.21)
6-hr	1.74 (1.37-2.20)	2.09 (1.64-2.64)	2.66 (2.08-3.37)	3.13 (2.43-3.99)	3.78 (2.86-5.07)	4.28 (3.18-5.88)	4.78 (3.46-6.85)	5.52 (3.74-8.00)	6.49 (4.24-9.74)	7.23 (4.61-11.1)
12-hr	2.13 (1.69-2.67)	2.60 (2.06-3.27)	3.38 (2.66-4.25)	4.02 (3.14-5.09)	4.90 (3.73-6.54)	5.58 (4.17-7.64)	6.26 (4.57-8.96)	7.31 (4.97-10.5)	8.69 (5.69-13.0)	9.73 (6.23-14.8)
24-hr	2.52 (2.00-3.14)	3.13 (2.48-3.90)	4.12 (3.26-5.15)	4.94 (3.89-6.22)	6.08 (4.65-8.08)	6.95 (5.23-9.48)	7.82 (5.76-11.2)	9.23 (6.30-13.2)	11.1 (7.27-16.5)	12.5 (8.01-18.9)
2-day	2.88 (2.31-3.56)	3.61 (2.89-4.47)	4.80 (3.83-5.97)	5.79 (4.59-7.24)	7.15 (5.52-9.47)	8.20 (6.22-11.2)	9.25 (6.87-13.2)	11.0 (7.55-15.7)	13.4 (8.79-19.8)	15.1 (9.74-22.8)
3-day	3.15 (2.53-3.88)	3.95 (3.17-4.87)	5.25 (4.20-6.50)	6.33 (5.04-7.88)	7.82 (6.06-10.3)	8.97 (6.83-12.2)	10.1 (7.55-14.4)	12.1 (8.30-17.2)	14.7 (9.70-21.7)	16.7 (10.8-25.1)
4-day	3.39 (2.73-4.16)	4.24 (3.41-5.21)	5.62 (4.51-6.93)	6.77 (5.40-8.40)	8.35 (6.48-11.0)	9.57 (7.30-12.9)	10.8 (8.06-15.4)	12.9 (8.86-18.3)	15.6 (10.3-23.0)	17.7 (11.5-26.6)
7-day	4.06 (3.29-4.96)	5.00 (4.05-6.11)	6.53 (5.27-8.01)	7.80 (6.25-9.63)	9.55 (7.44-12.5)	10.9 (8.34-14.6)	12.2 (9.15-17.3)	14.5 (9.99-20.4)	17.4 (11.5-25.5)	19.6 (12.7-29.3)
10-day	4.74 (3.86-5.77)	5.72 (4.65-6.97)	7.33 (5.93-8.96)	8.66 (6.96-10.6)	10.5 (8.18-13.6)	11.9 (9.11-15.9)	13.3 (9.93-18.6)	15.5 (10.7-21.9)	18.4 (12.3-26.9)	20.7 (13.4-30.8)
20-day	6.85 (5.61-8.27)	7.88 (6.45-9.53)	9.57 (7.80-11.6)	11.0 (8.89-13.4)	12.9 (10.1-16.5)	14.4 (11.0-18.9)	15.9 (11.8-21.7)	17.9 (12.4-24.9)	20.5 (13.7-29.7)	22.4 (14.6-33.3)
30-day	8.59 (7.06-10.3)	9.66 (7.93-11.6)	11.4 (9.33-13.8)	12.9 (10.5-15.6)	14.9 (11.6-18.9)	16.4 (12.5-21.3)	17.9 (13.2-24.2)	19.7 (13.8-27.4)	22.1 (14.8-31.9)	23.9 (15.6-35.3)
45-day	10.7 (8.85-12.8)	11.8 (9.77-14.2)	13.7 (11.3-16.5)	15.2 (12.4-18.5)	17.4 (13.6-21.9)	19.0 (14.5-24.4)	20.6 (15.2-27.4)	22.2 (15.6-30.8)	24.4 (16.4-35.1)	26.0 (17.0-38.3)
60-day	12.5 (10.3-14.9)	13.7 (11.3-16.3)	15.6 (12.9-18.8)	17.3 (14.1-20.9)	19.5 (15.4-24.5)	21.3 (16.3-27.2)	23.0 (16.9-30.4)	24.5 (17.3-33.9)	26.6 (17.9-38.1)	28.1 (18.4-41.4)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
Please refer to NOAA Atlas 14 document for more information.

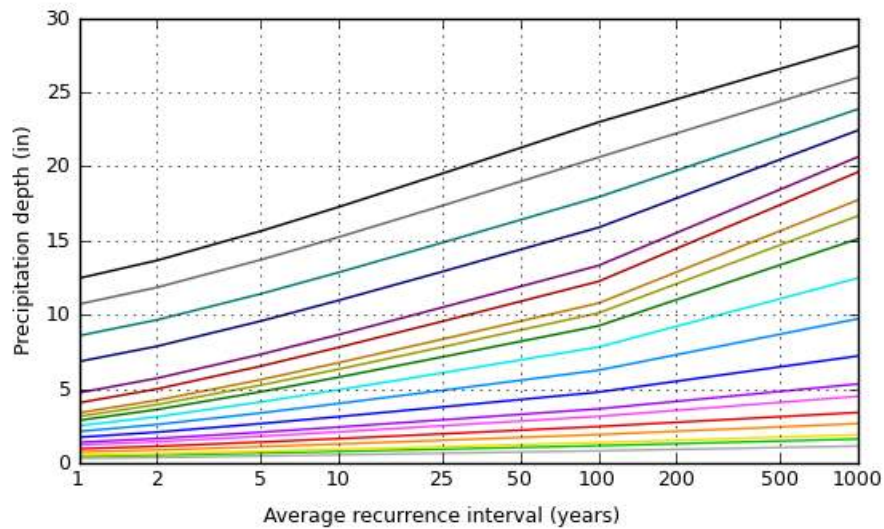
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PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.3780°, Longitude: -72.7049°



Average recurrence interval (years)	
1	2
5	10
25	50
100	200
500	1000

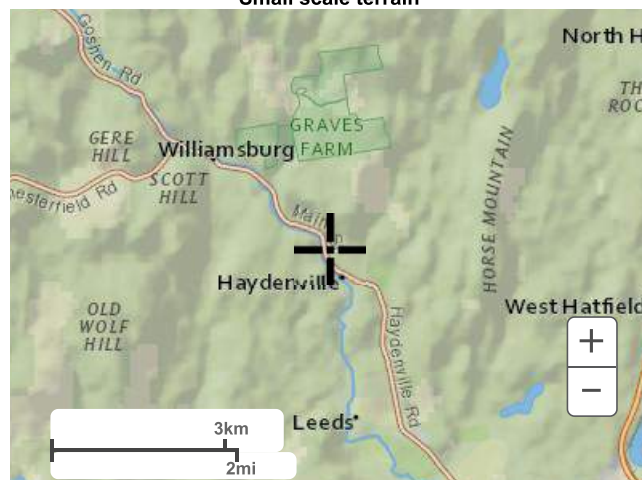


Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

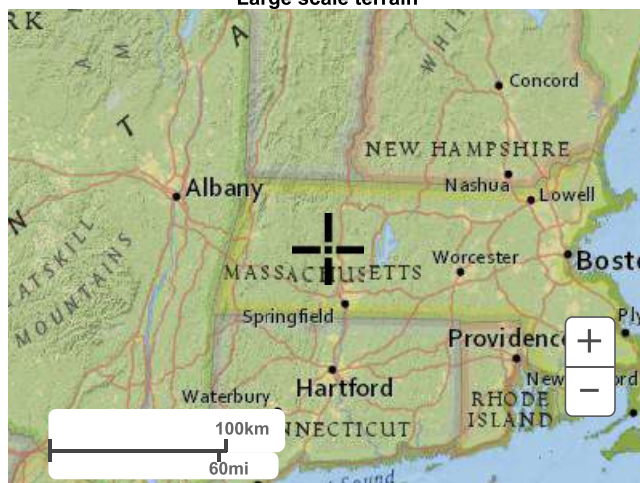
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Maps & aerals

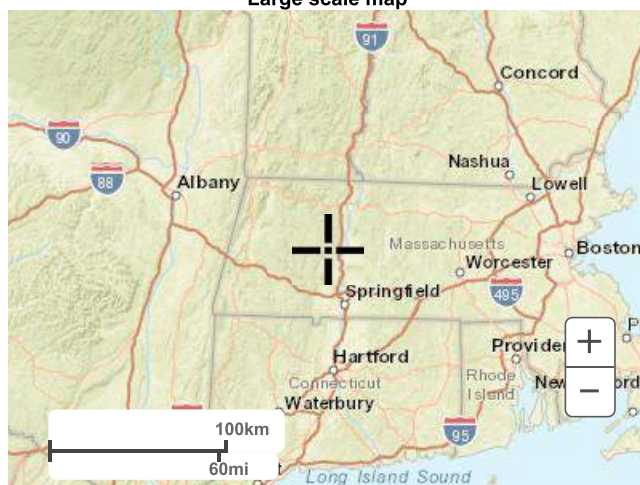
Small scale terrain



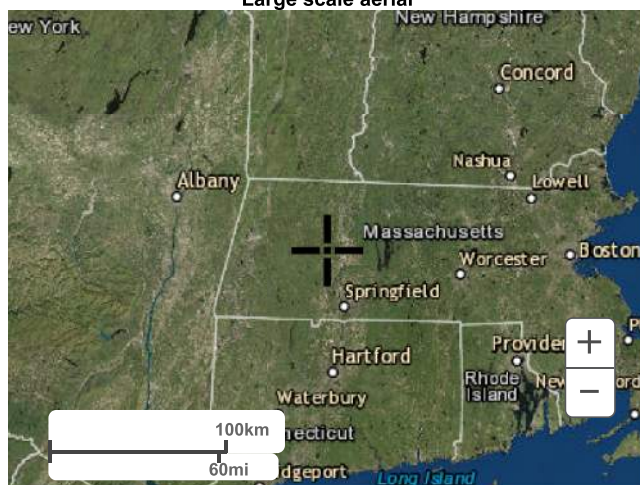
Large scale terrain



Large scale map

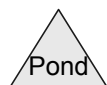
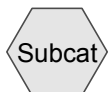
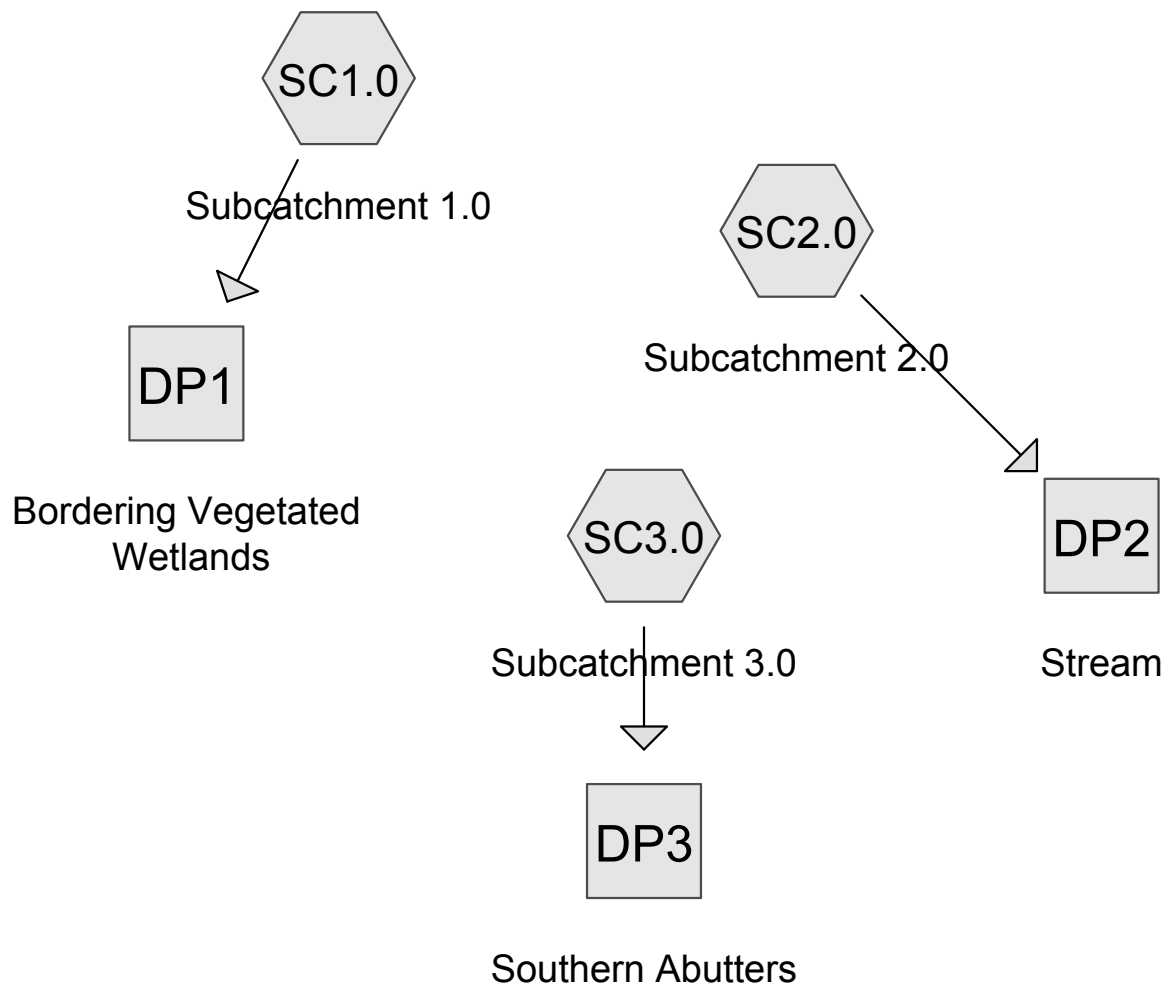


Large scale aerial



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**EXISTING CONDITIONS
WATERSHED ROUTING DIAGRAM**



Summary for Subcatchment SC1.0: Subcatchment 1.0

Runoff = 11.3 cfs @ 12.19 hrs, Volume= 1.13 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
10,167	55	Woods, Good, HSG B
735,536	70	Woods, Good, HSG C
9,697	74	>75% Grass cover, Good, HSG C
755,400	70	Weighted Average
755,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.1		Sheet Flow, Sheet Flow
					Woods: Light underbrush n= 0.400 P2= 3.12"
4.7	710	0.2500	2.5		Shallow Concentrated Flow, Shallow Concentrated Flow (A)
					Woodland Kv= 5.0 fps
1.6	110	0.0500	1.1		Shallow Concentrated Flow, Shallow Concentrated Flow (B)
					Woodland Kv= 5.0 fps
12.4	870	Total			

Summary for Subcatchment SC2.0: Subcatchment 2.0

Runoff = 7.5 cfs @ 12.49 hrs, Volume= 1.08 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
14,443	30	Woods, Good, HSG A
634,568	70	Woods, Good, HSG C
23,378	77	Woods, Good, HSG D
48,590	74	>75% Grass cover, Good, HSG C
720,979	70	Weighted Average
720,979		100.00% Pervious Area

6091_PRE PH1

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Type III 24-hr 2-Year Rainfall=3.12"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.1		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.12"
8.0	475	0.0200	1.0		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
0.5	50	0.0600	1.7		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Short Grass Pasture Kv= 7.0 fps
6.5	680	0.1200	1.7		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
6.4	505	0.0700	1.3		Shallow Concentrated Flow, Shallow Concentrated Flow (D) Woodland Kv= 5.0 fps
1.4	150	0.1300	1.8		Shallow Concentrated Flow, Shallow Concentrated Flow (E) Woodland Kv= 5.0 fps
2.2	175	0.0700	1.3		Shallow Concentrated Flow, Shallow Concentrated Flow (F) Woodland Kv= 5.0 fps
30.7	2,085	Total			

Summary for Subcatchment SC3.0: Subcatchment 3.0

Runoff = 0.4 cfs @ 12.48 hrs, Volume= 0.10 af, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
72,320	30	Woods, Good, HSG A
35,738	55	Woods, Good, HSG B
114,015	70	Woods, Good, HSG C
222,073	55	Weighted Average
222,073		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.1		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 3.12"
1.2	125	0.1200	1.7		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Woodland Kv= 5.0 fps
2.5	400	0.2800	2.6		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Woodland Kv= 5.0 fps
4.8	145	0.0100	0.5		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
14.2	720	Total			

Summary for Reach DP1: Bordering Vegetated Wetlands

Inflow Area = 17.342 ac, 0.00% Impervious, Inflow Depth = 0.78" for 2-Year event
 Inflow = 11.3 cfs @ 12.19 hrs, Volume= 1.13 af
 Outflow = 11.3 cfs @ 12.19 hrs, Volume= 1.13 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Stream

Inflow Area = 16.551 ac, 0.00% Impervious, Inflow Depth = 0.78" for 2-Year event
Inflow = 7.5 cfs @ 12.49 hrs, Volume= 1.08 af
Outflow = 7.5 cfs @ 12.49 hrs, Volume= 1.08 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP3: Southern Abutters

Inflow Area = 5.098 ac, 0.00% Impervious, Inflow Depth = 0.23" for 2-Year event
Inflow = 0.4 cfs @ 12.48 hrs, Volume= 0.10 af
Outflow = 0.4 cfs @ 12.48 hrs, Volume= 0.10 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Subcatchment SC1.0: Subcatchment 1.0

Runoff = 32.0 cfs @ 12.18 hrs, Volume= 2.87 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

Area (sf)	CN	Description
10,167	55	Woods, Good, HSG B
735,536	70	Woods, Good, HSG C
9,697	74	>75% Grass cover, Good, HSG C
755,400	70	Weighted Average
755,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.1		Sheet Flow, Sheet Flow
					Woods: Light underbrush n= 0.400 P2= 3.12"
4.7	710	0.2500	2.5		Shallow Concentrated Flow, Shallow Concentrated Flow (A)
					Woodland Kv= 5.0 fps
1.6	110	0.0500	1.1		Shallow Concentrated Flow, Shallow Concentrated Flow (B)
					Woodland Kv= 5.0 fps
12.4	870	Total			

Summary for Subcatchment SC2.0: Subcatchment 2.0

Runoff = 21.1 cfs @ 12.45 hrs, Volume= 2.74 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

Area (sf)	CN	Description
14,443	30	Woods, Good, HSG A
634,568	70	Woods, Good, HSG C
23,378	77	Woods, Good, HSG D
48,590	74	>75% Grass cover, Good, HSG C
720,979	70	Weighted Average
720,979		100.00% Pervious Area

6091_PRE PH1

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Type III 24-hr 10-Year Rainfall=4.93"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.1		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.12"
8.0	475	0.0200	1.0		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
0.5	50	0.0600	1.7		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Short Grass Pasture Kv= 7.0 fps
6.5	680	0.1200	1.7		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
6.4	505	0.0700	1.3		Shallow Concentrated Flow, Shallow Concentrated Flow (D) Woodland Kv= 5.0 fps
1.4	150	0.1300	1.8		Shallow Concentrated Flow, Shallow Concentrated Flow (E) Woodland Kv= 5.0 fps
2.2	175	0.0700	1.3		Shallow Concentrated Flow, Shallow Concentrated Flow (F) Woodland Kv= 5.0 fps
30.7	2,085	Total			

Summary for Subcatchment SC3.0: Subcatchment 3.0

Runoff = 3.4 cfs @ 12.23 hrs, Volume= 0.40 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

Area (sf)	CN	Description
72,320	30	Woods, Good, HSG A
35,738	55	Woods, Good, HSG B
114,015	70	Woods, Good, HSG C
222,073	55	Weighted Average
222,073		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.1		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 3.12"
1.2	125	0.1200	1.7		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Woodland Kv= 5.0 fps
2.5	400	0.2800	2.6		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Woodland Kv= 5.0 fps
4.8	145	0.0100	0.5		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
14.2	720	Total			

Summary for Reach DP1: Bordering Vegetated Wetlands

Inflow Area = 17.342 ac, 0.00% Impervious, Inflow Depth = 1.98" for 10-Year event

Inflow = 32.0 cfs @ 12.18 hrs, Volume= 2.87 af

Outflow = 32.0 cfs @ 12.18 hrs, Volume= 2.87 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Stream

Inflow Area = 16.551 ac, 0.00% Impervious, Inflow Depth = 1.98" for 10-Year event
Inflow = 21.1 cfs @ 12.45 hrs, Volume= 2.74 af
Outflow = 21.1 cfs @ 12.45 hrs, Volume= 2.74 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP3: Southern Abutters

Inflow Area = 5.098 ac, 0.00% Impervious, Inflow Depth = 0.95" for 10-Year event
Inflow = 3.4 cfs @ 12.23 hrs, Volume= 0.40 af
Outflow = 3.4 cfs @ 12.23 hrs, Volume= 0.40 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Subcatchment SC1.0: Subcatchment 1.0

Runoff = 71.1 cfs @ 12.17 hrs, Volume= 6.22 af, Depth= 4.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (sf)	CN	Description
10,167	55	Woods, Good, HSG B
735,536	70	Woods, Good, HSG C
9,697	74	>75% Grass cover, Good, HSG C
755,400	70	Weighted Average
755,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.1		Sheet Flow, Sheet Flow
					Woods: Light underbrush n= 0.400 P2= 3.12"
4.7	710	0.2500	2.5		Shallow Concentrated Flow, Shallow Concentrated Flow (A)
					Woodland Kv= 5.0 fps
1.6	110	0.0500	1.1		Shallow Concentrated Flow, Shallow Concentrated Flow (B)
					Woodland Kv= 5.0 fps
12.4	870	Total			

Summary for Subcatchment SC2.0: Subcatchment 2.0

Runoff = 46.6 cfs @ 12.44 hrs, Volume= 5.93 af, Depth= 4.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (sf)	CN	Description
14,443	30	Woods, Good, HSG A
634,568	70	Woods, Good, HSG C
23,378	77	Woods, Good, HSG D
48,590	74	>75% Grass cover, Good, HSG C
720,979	70	Weighted Average
720,979		100.00% Pervious Area

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Prepared by Microsoft

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Type III 24-hr 100-Year Rainfall=7.81"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.1		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.12"
8.0	475	0.0200	1.0		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
0.5	50	0.0600	1.7		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Short Grass Pasture Kv= 7.0 fps
6.5	680	0.1200	1.7		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
6.4	505	0.0700	1.3		Shallow Concentrated Flow, Shallow Concentrated Flow (D) Woodland Kv= 5.0 fps
1.4	150	0.1300	1.8		Shallow Concentrated Flow, Shallow Concentrated Flow (E) Woodland Kv= 5.0 fps
2.2	175	0.0700	1.3		Shallow Concentrated Flow, Shallow Concentrated Flow (F) Woodland Kv= 5.0 fps
30.7	2,085	Total			

Summary for Subcatchment SC3.0: Subcatchment 3.0

Runoff = 11.6 cfs @ 12.20 hrs, Volume= 1.13 af, Depth= 2.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (sf)	CN	Description
72,320	30	Woods, Good, HSG A
35,738	55	Woods, Good, HSG B
114,015	70	Woods, Good, HSG C
222,073	55	Weighted Average
222,073		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.1		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 3.12"
1.2	125	0.1200	1.7		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Woodland Kv= 5.0 fps
2.5	400	0.2800	2.6		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Woodland Kv= 5.0 fps
4.8	145	0.0100	0.5		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
14.2	720	Total			

Summary for Reach DP1: Bordering Vegetated Wetlands

Inflow Area = 17.342 ac, 0.00% Impervious, Inflow Depth = 4.30" for 100-Year event
Inflow = 71.1 cfs @ 12.17 hrs, Volume= 6.22 af
Outflow = 71.1 cfs @ 12.17 hrs, Volume= 6.22 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP2: Stream

Inflow Area = 16.551 ac, 0.00% Impervious, Inflow Depth = 4.30" for 100-Year event
Inflow = 46.6 cfs @ 12.44 hrs, Volume= 5.93 af
Outflow = 46.6 cfs @ 12.44 hrs, Volume= 5.93 af, Atten= 0%, Lag= 0.0 min

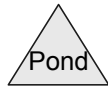
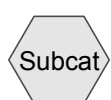
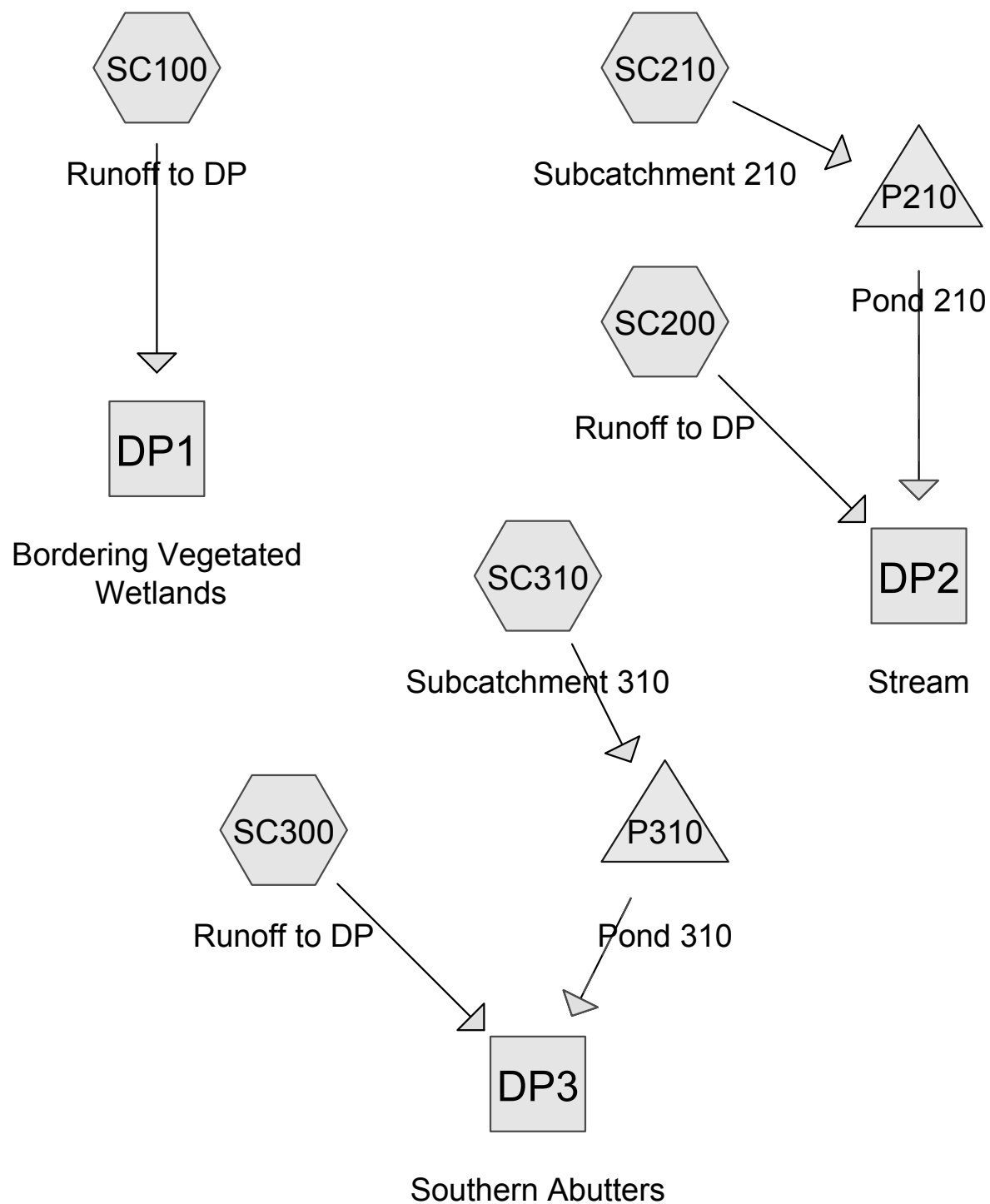
Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP3: Southern Abutters

Inflow Area = 5.098 ac, 0.00% Impervious, Inflow Depth = 2.66" for 100-Year event
Inflow = 11.6 cfs @ 12.20 hrs, Volume= 1.13 af
Outflow = 11.6 cfs @ 12.20 hrs, Volume= 1.13 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

**PROPOSED CONDITIONS
WATERSHED ROUTING DIAGRAM**



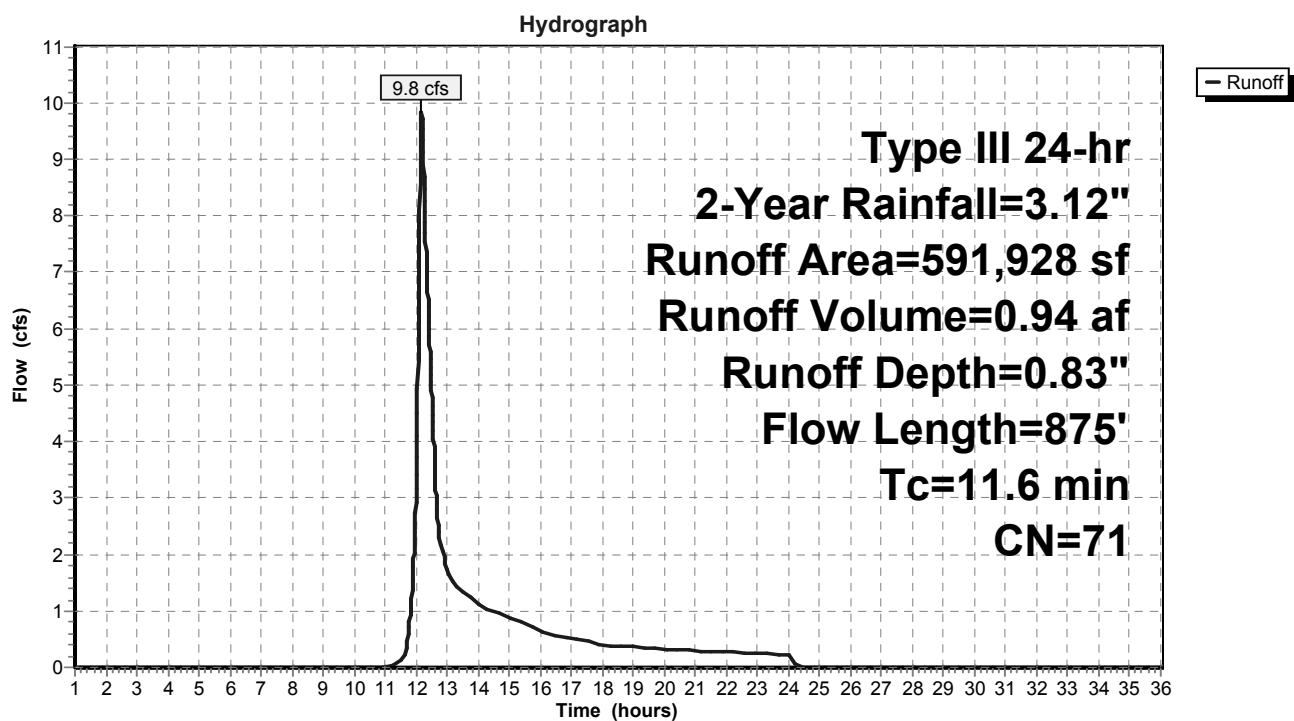
Summary for Subcatchment SC100: Runoff to DP

Runoff = 9.8 cfs @ 12.18 hrs, Volume= 0.94 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
10,167	55	Woods, Good, HSG B
274,355	70	Woods, Good, HSG C
* 297,729	71	Proposed Meadow, non-grazed, HSG C
* 7,085	89	Proposed Gravel roads, HSG C
* 2,592	98	Proposed Conc. Pad
591,928	71	Weighted Average
589,336		99.56% Pervious Area
2,592		0.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.1200	0.1		Sheet Flow, Sheet Flow Grass: Bermuda n= 0.410 P2= 3.12"
2.2	470	0.2500	3.5		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
1.6	245	0.2500	2.5		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Woodland Kv= 5.0 fps
1.6	110	0.0500	1.1		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
11.6	875	Total			

Subcatchment SC100: Runoff to DP

Summary for Subcatchment SC200: Runoff to DP

Runoff = 6.1 cfs @ 12.34 hrs, Volume= 0.76 af, Depth= 0.78"

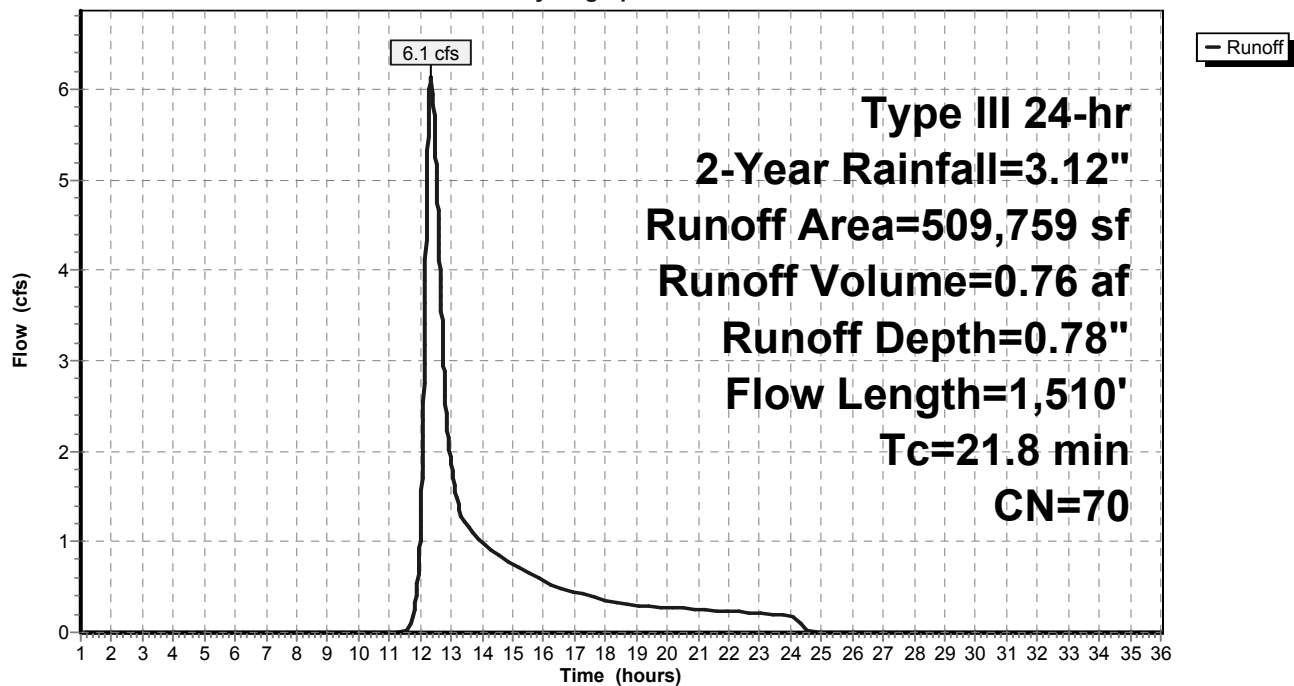
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
14,443	30	Woods, Good, HSG A
258,670	70	Woods, Good, HSG C
23,378	77	Woods, Good, HSG D
* 209,613	71	Proposed Meadow, non-grazed, HSG C
* 3,655	89	Proposed Gravel roads, HSG C
509,759	70	Weighted Average
509,759		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0600	0.1		Sheet Flow, Sheet Flow Grass: Bermuda n= 0.410 P2= 3.12"
4.3	630	0.1200	2.4		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
1.7	190	0.0700	1.9		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Short Grass Pasture Kv= 7.0 fps
4.0	315	0.0700	1.3		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
1.4	150	0.1300	1.8		Shallow Concentrated Flow, Shallow Concentrated Flow (D) Woodland Kv= 5.0 fps
2.2	175	0.0700	1.3		Shallow Concentrated Flow, Shallow Concentrated Flow (E) Woodland Kv= 5.0 fps
21.8	1,510	Total			

Subcatchment SC200: Runoff to DP

Hydrograph



Summary for Subcatchment SC210: Subcatchment 210

Runoff = 3.1 cfs @ 12.32 hrs, Volume= 0.37 af, Depth= 0.88"

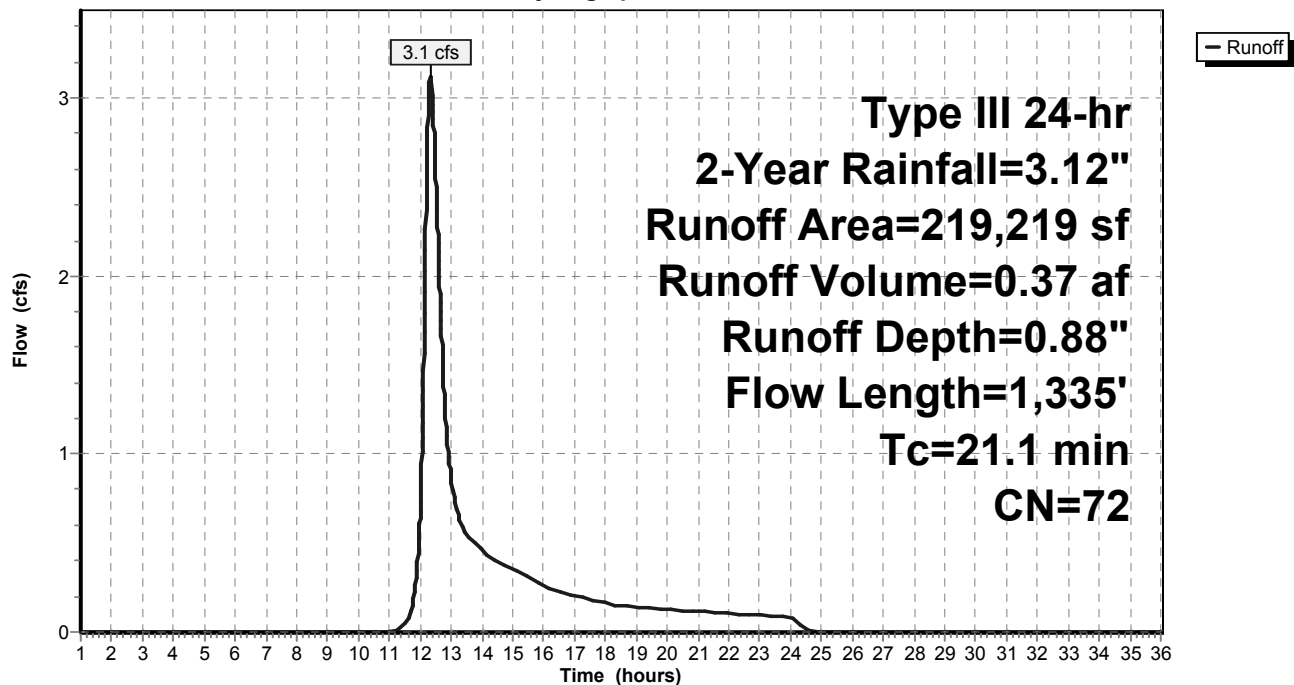
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
8,406	70	Woods, Good, HSG C
48,590	74	>75% Grass cover, Good, HSG C
* 152,258	71	Proposed Meadow, non-grazed, HSG C
* 9,965	89	Proposed Gravel roads, HSG C
219,219	72	Weighted Average
219,219		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.1		Sheet Flow, Sheet Flow
					Grass: Short n= 0.150 P2= 3.12"
9.3	555	0.0200	1.0		Shallow Concentrated Flow, Shallow Concentrated Flow (A)
					Short Grass Pasture Kv= 7.0 fps
0.5	20	0.0200	0.7		Shallow Concentrated Flow, Shallow Concentrated Flow (B)
					Woodland Kv= 5.0 fps
5.6	710	0.0900	2.1		Shallow Concentrated Flow, Shallow Concentrated Flow (C)
					Short Grass Pasture Kv= 7.0 fps
21.1	1,335	Total			

Subcatchment SC210: Subcatchment 210

Hydrograph



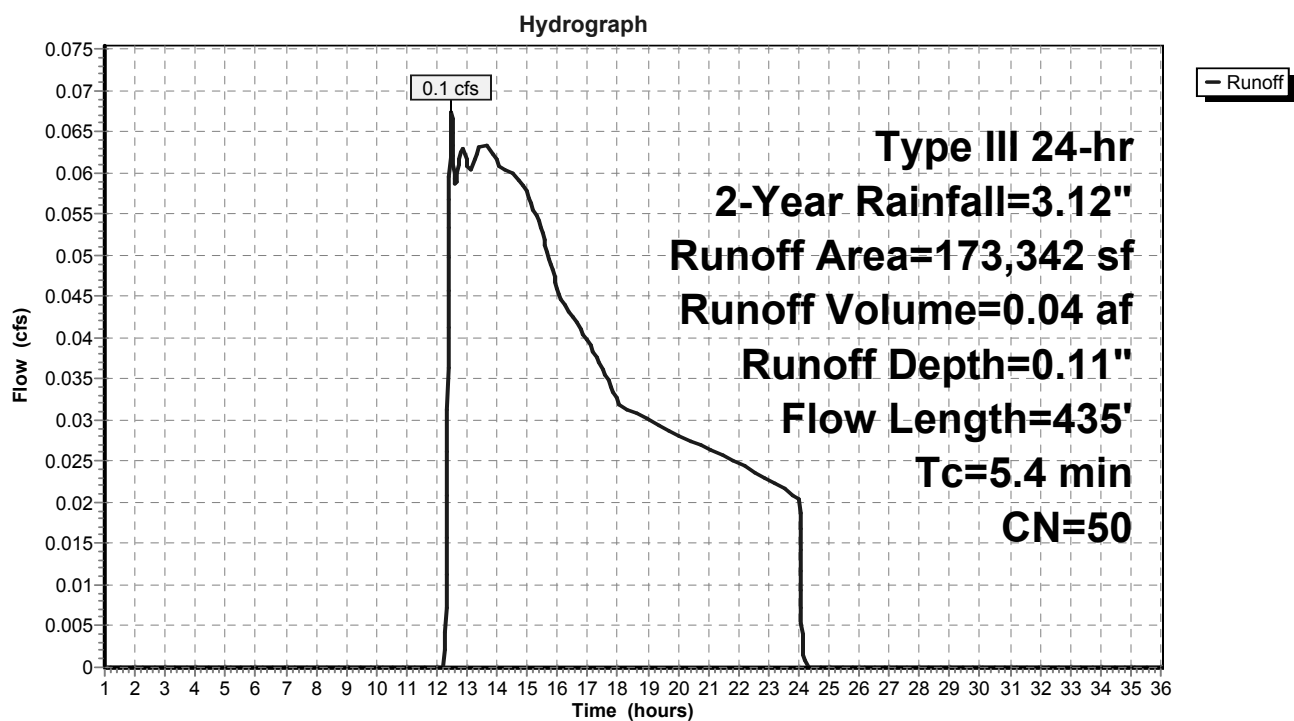
Summary for Subcatchment SC300: Runoff to DP

Runoff = 0.1 cfs @ 12.49 hrs, Volume= 0.04 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
69,181	30	Woods, Good, HSG A
35,738	55	Woods, Good, HSG B
32,088	70	Woods, Good, HSG C
* 3,139	30	Proposed Meadow, non-grazed, HSG A
* 33,196	71	Proposed Meadow, non-grazed, HSG c
173,342	50	Weighted Average
173,342		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1190	0.3		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.12"
0.6	85	0.1090	2.3		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
1.5	200	0.2000	2.2		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Woodland Kv= 5.0 fps
0.5	100	0.4450	3.3		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
5.4	435	Total			

Subcatchment SC300: Runoff to DP

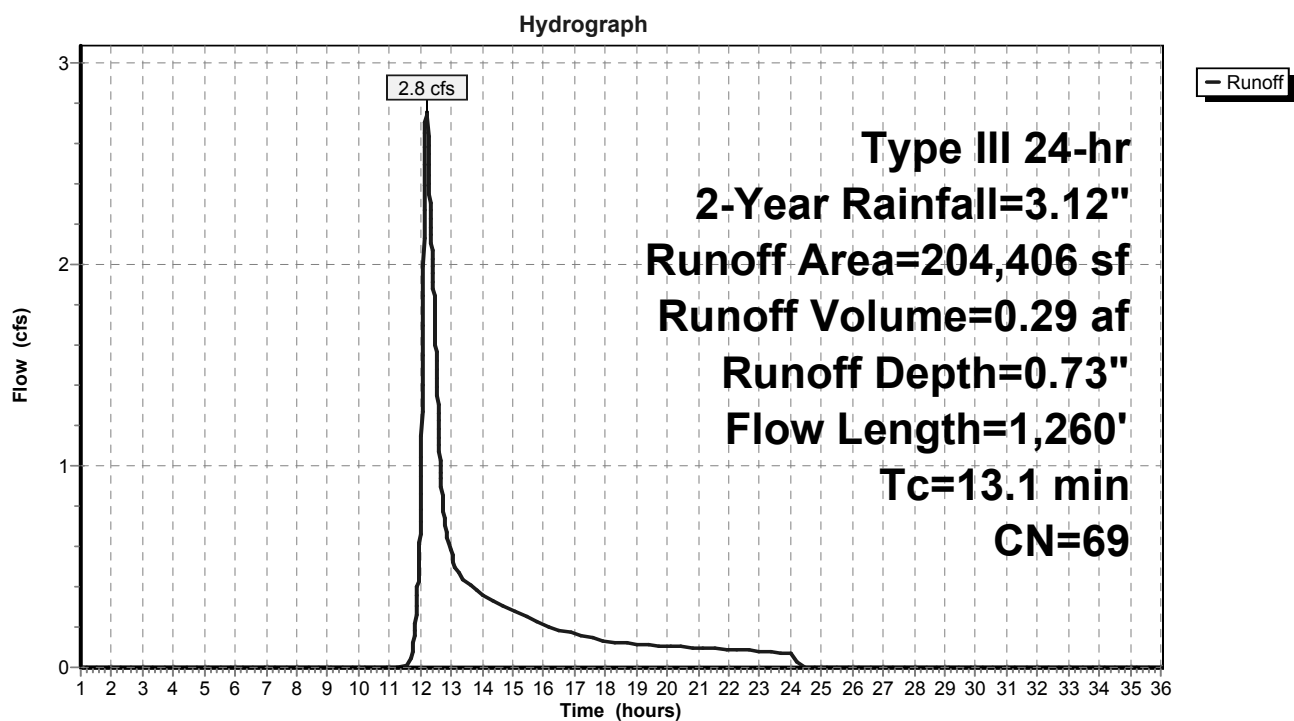
Summary for Subcatchment SC310: Subcatchment 310

Runoff = 2.8 cfs @ 12.21 hrs, Volume= 0.29 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.12"

Area (sf)	CN	Description
2,723	70	Woods, Good, HSG C
* 9,697	30	Proposed Meadow, non-grazed, HSG A
* 191,986	71	Proposed Meadow, non-grazed, HSG c
204,406	69	Weighted Average
204,406		100.00% Pervious Area

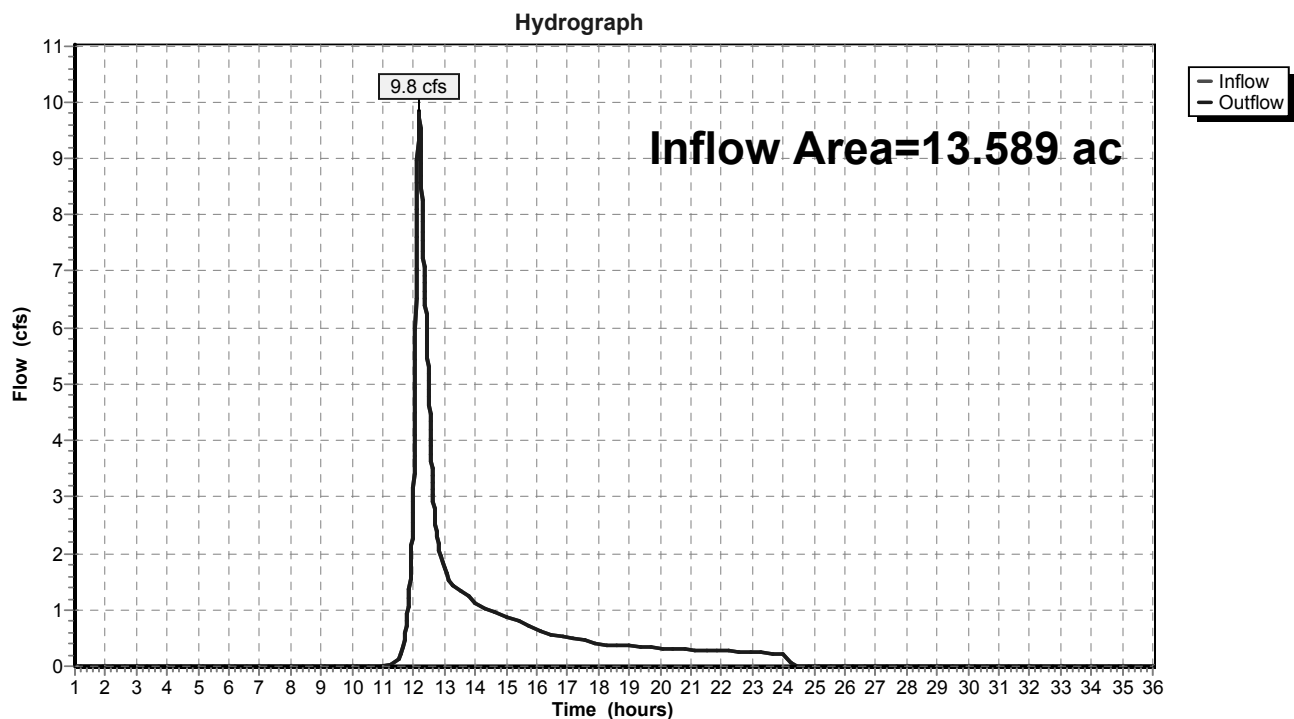
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0443	0.2		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.12"
1.1	130	0.0756	1.9		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0560	1.2		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Woodland Kv= 5.0 fps
0.5	90	0.0400	3.2		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Unpaved Kv= 16.1 fps
1.6	275	0.1730	2.9		Shallow Concentrated Flow, Shallow Concentrated Flow (D) Short Grass Pasture Kv= 7.0 fps
5.6	700	0.0900	2.1		Shallow Concentrated Flow, Shallow Concentrated Flow (E) Short Grass Pasture Kv= 7.0 fps
13.1	1,260	Total			

Subcatchment SC310: Subcatchment 310

Summary for Reach DP1: Bordering Vegetated Wetlands

Inflow Area = 13.589 ac, 0.44% Impervious, Inflow Depth = 0.83" for 2-Year event
Inflow = 9.8 cfs @ 12.18 hrs, Volume= 0.94 af
Outflow = 9.8 cfs @ 12.18 hrs, Volume= 0.94 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP1: Bordering Vegetated Wetlands

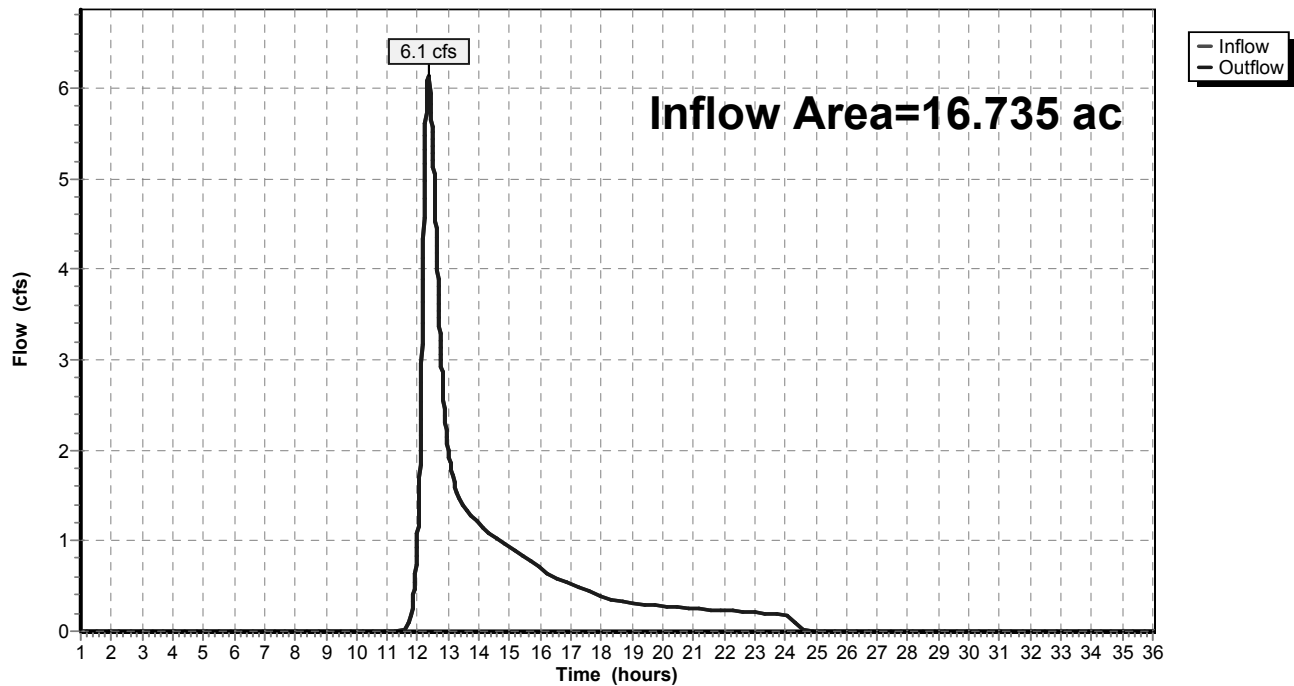
Summary for Reach DP2: Stream

Inflow Area = 16.735 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-Year event
Inflow = 6.1 cfs @ 12.34 hrs, Volume= 0.83 af
Outflow = 6.1 cfs @ 12.34 hrs, Volume= 0.83 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP2: Stream

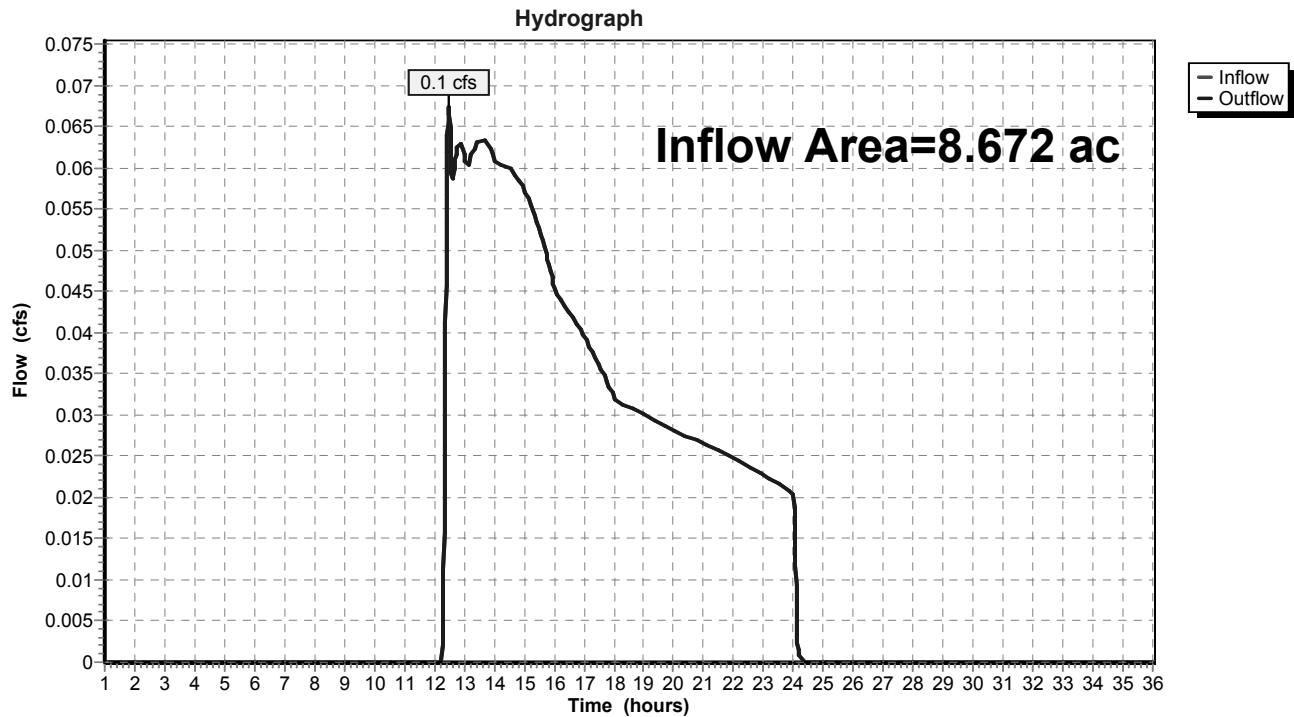
Hydrograph



Summary for Reach DP3: Southern Abutters

Inflow Area = 8.672 ac, 0.00% Impervious, Inflow Depth = 0.05" for 2-Year event
Inflow = 0.1 cfs @ 12.49 hrs, Volume= 0.04 af
Outflow = 0.1 cfs @ 12.49 hrs, Volume= 0.04 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP3: Southern Abutters

Summary for Pond P210: Pond 210

Inflow Area = 5.033 ac, 0.00% Impervious, Inflow Depth = 0.88" for 2-Year event
 Inflow = 3.1 cfs @ 12.32 hrs, Volume= 0.37 af
 Outflow = 0.5 cfs @ 13.81 hrs, Volume= 0.37 af, Atten= 84%, Lag= 89.5 min
 Discarded = 0.3 cfs @ 13.81 hrs, Volume= 0.31 af
 Primary = 0.2 cfs @ 13.81 hrs, Volume= 0.06 af
 Secondary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 594.53' @ 13.81 hrs Surf.Area= 12,485 sf Storage= 6,367 cf

Plug-Flow detention time= 178.0 min calculated for 0.37 af (100% of inflow)
 Center-of-Mass det. time= 177.9 min (1,062.4 - 884.5)

Volume	Invert	Avail.Storage	Storage Description
#1	594.00'	60,819 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
594.00	11,716	490.0	0	0	11,716
596.00	14,767	527.0	26,424	26,424	14,878
598.10	18,045	564.0	34,395	60,819	18,289

Device	Routing	Invert	Outlet Devices
#1	Discarded	594.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	589.00'	12.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 580.00' S= 0.1125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	594.25'	6.0" Vert. Orifice C= 0.600
#4	Device 2	595.00'	6.0" Vert. Orifice C= 0.600
#5	Device 2	597.00'	12.0" Horiz. Grate C= 0.600 Limited to weir flow at low heads
#6	Secondary	597.10'	20.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

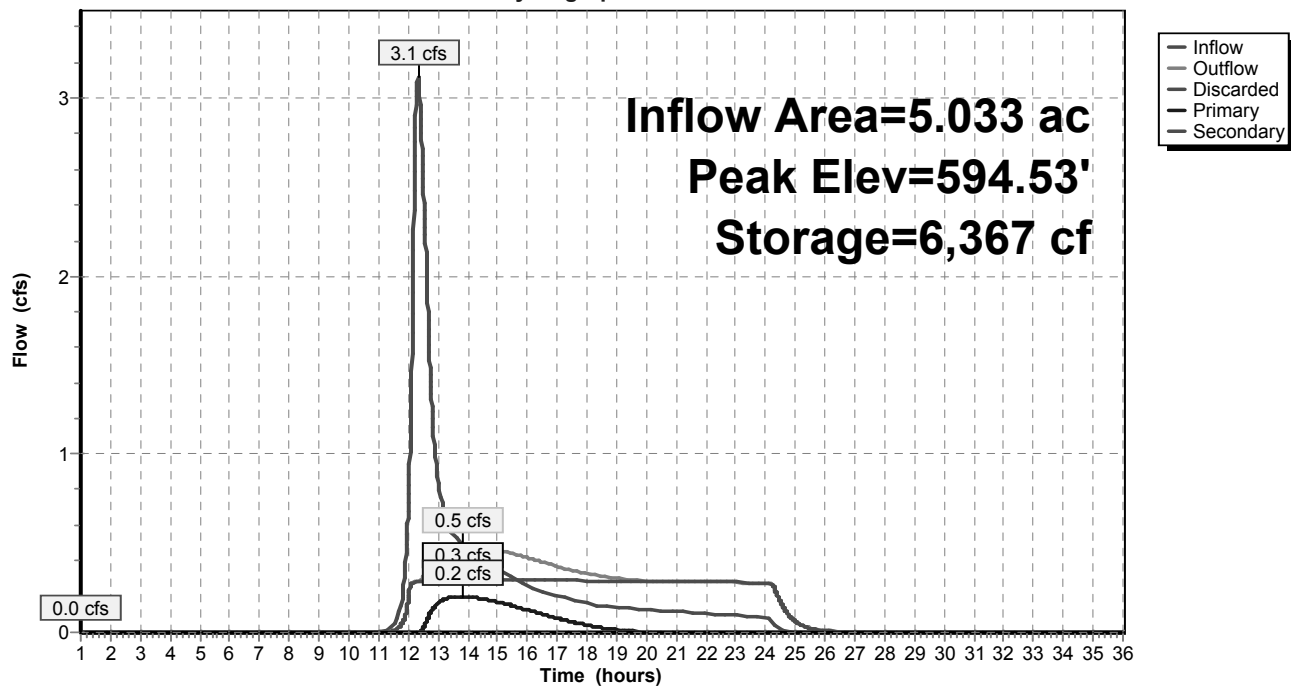
Discarded OutFlow Max=0.3 cfs @ 13.81 hrs HW=594.53' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.2 cfs @ 13.81 hrs HW=594.53' (Free Discharge)
 ↑ **2=Culvert** (Passes 0.2 cfs of 8.5 cfs potential flow)
 ↑ **3=Orifice** (Orifice Controls 0.2 cfs @ 1.8 fps)
 ↑ **4=Orifice** (Controls 0.0 cfs)
 ↑ **5=Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 1.00 hrs HW=594.00' (Free Discharge)
 ↑ **6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P210: Pond 210

Hydrograph



Summary for Pond P310: Pond 310

Inflow Area = 4.693 ac, 0.00% Impervious, Inflow Depth = 0.73" for 2-Year event
 Inflow = 2.8 cfs @ 12.21 hrs, Volume= 0.29 af
 Outflow = 0.3 cfs @ 14.90 hrs, Volume= 0.29 af, Atten= 90%, Lag= 161.8 min
 Discarded = 0.3 cfs @ 14.90 hrs, Volume= 0.29 af
 Primary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af
 Secondary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 564.48' @ 14.90 hrs Surf.Area= 11,191 sf Storage= 5,202 cf

Plug-Flow detention time= 202.7 min calculated for 0.29 af (100% of inflow)
 Center-of-Mass det. time= 202.7 min (1,090.6 - 888.0)

Volume	Invert	Avail.Storage	Storage Description		
#1	564.00'	56,980 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
564.00	10,395	482.0	0	0	10,395
566.00	13,889	579.0	24,200	24,200	18,653
568.00	19,026	748.0	32,781	56,980	36,549

Device	Routing	Invert	Outlet Devices
#1	Discarded	564.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	559.00'	12.0" Round Culvert L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 559.00' / 548.00' S= 0.1375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	566.00'	6.0" Vert. Orifice C= 0.600
#4	Device 2	566.90'	12.0" Horiz. Grate C= 0.600 Limited to weir flow at low heads
#5	Secondary	567.00'	20.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.3 cfs @ 14.90 hrs HW=564.48' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.0 cfs @ 1.00 hrs HW=564.00' (Free Discharge)

↑ **2=Culvert** (Passes 0.0 cfs of 6.3 cfs potential flow)

↑ **3=Orifice** (Controls 0.0 cfs)

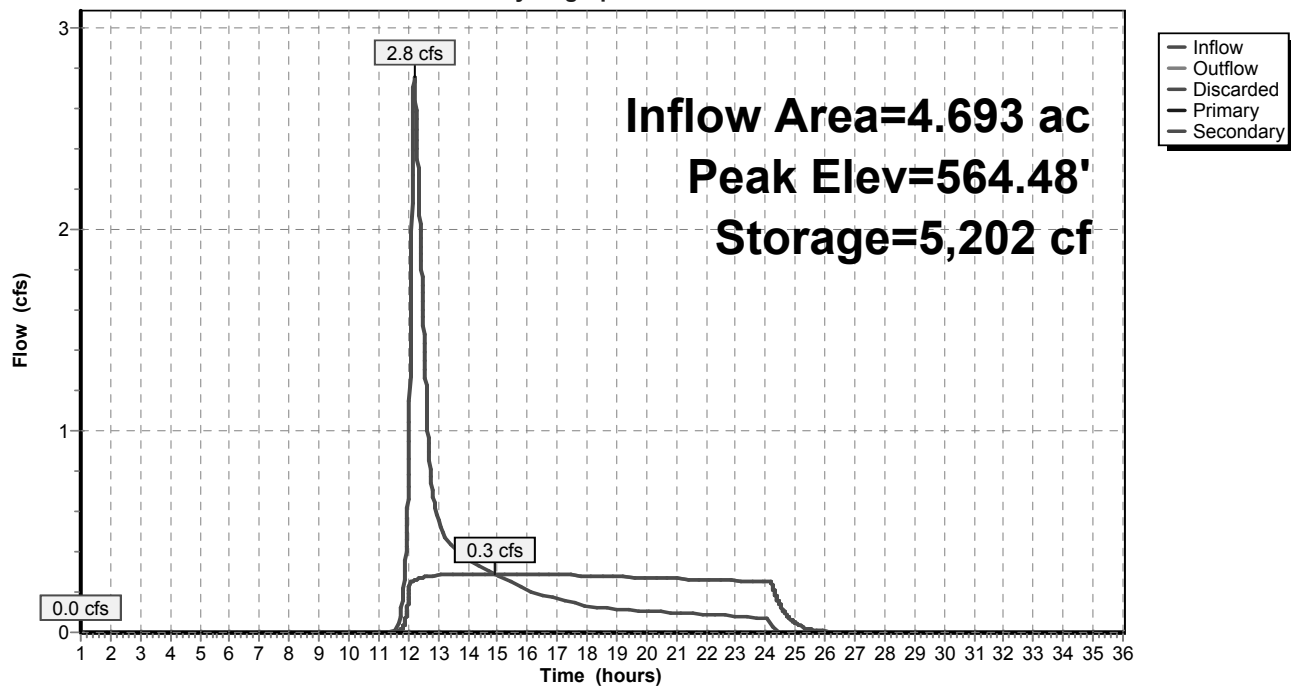
↑ **4=Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 1.00 hrs HW=564.00' (Free Discharge)

↑ **5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P310: Pond 310

Hydrograph



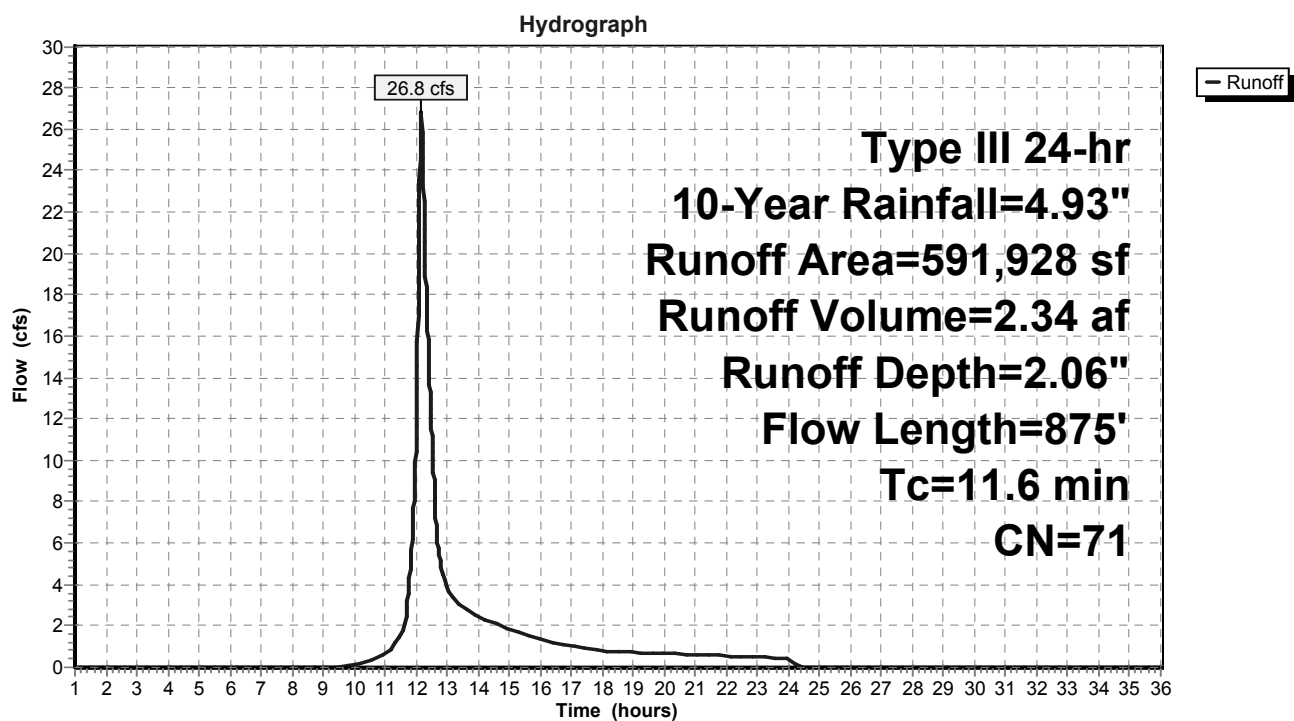
Summary for Subcatchment SC100: Runoff to DP

Runoff = 26.8 cfs @ 12.17 hrs, Volume= 2.34 af, Depth= 2.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

Area (sf)	CN	Description
10,167	55	Woods, Good, HSG B
274,355	70	Woods, Good, HSG C
* 297,729	71	Proposed Meadow, non-grazed, HSG C
* 7,085	89	Proposed Gravel roads, HSG C
* 2,592	98	Proposed Conc. Pad
591,928	71	Weighted Average
589,336		99.56% Pervious Area
2,592		0.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.1200	0.1		Sheet Flow, Sheet Flow Grass: Bermuda n= 0.410 P2= 3.12"
2.2	470	0.2500	3.5		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
1.6	245	0.2500	2.5		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Woodland Kv= 5.0 fps
1.6	110	0.0500	1.1		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
11.6	875	Total			

Subcatchment SC100: Runoff to DP

Summary for Subcatchment SC200: Runoff to DP

Runoff = 17.3 cfs @ 12.32 hrs, Volume= 1.94 af, Depth= 1.98"

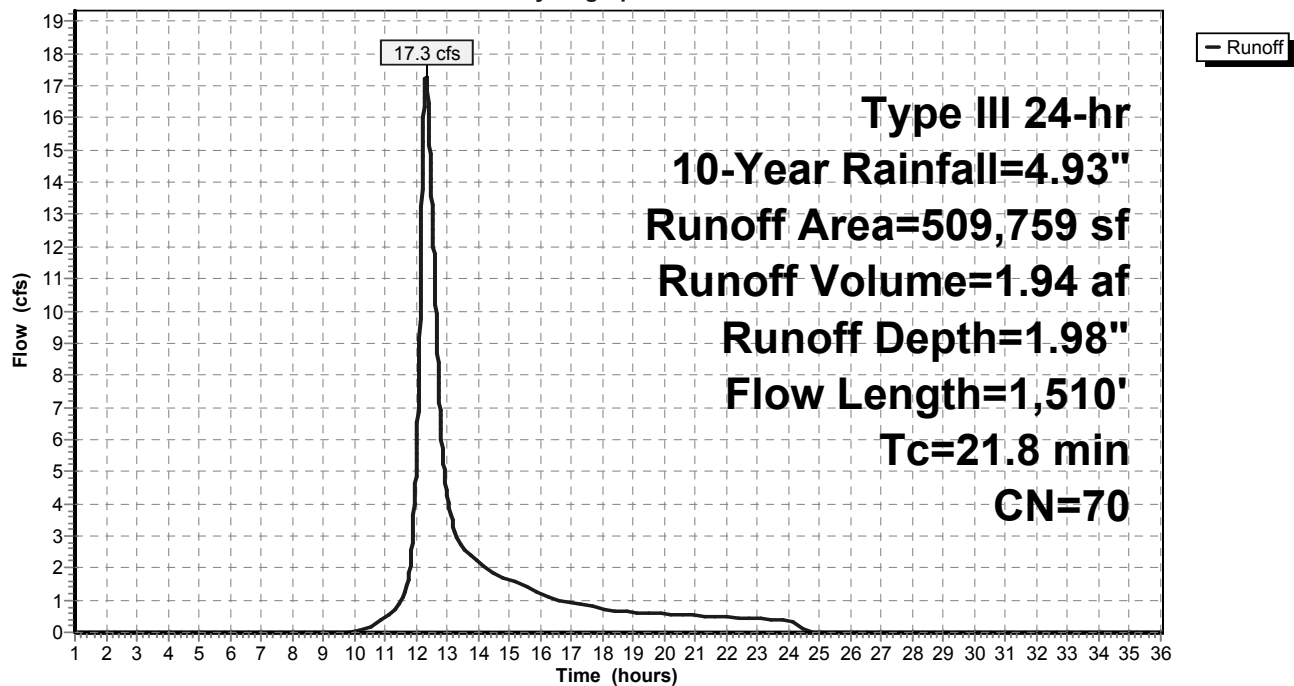
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

Area (sf)	CN	Description
14,443	30	Woods, Good, HSG A
258,670	70	Woods, Good, HSG C
23,378	77	Woods, Good, HSG D
* 209,613	71	Proposed Meadow, non-grazed, HSG C
* 3,655	89	Proposed Gravel roads, HSG C
509,759	70	Weighted Average
509,759		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0600	0.1		Sheet Flow, Sheet Flow Grass: Bermuda n= 0.410 P2= 3.12"
4.3	630	0.1200	2.4		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
1.7	190	0.0700	1.9		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Short Grass Pasture Kv= 7.0 fps
4.0	315	0.0700	1.3		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
1.4	150	0.1300	1.8		Shallow Concentrated Flow, Shallow Concentrated Flow (D) Woodland Kv= 5.0 fps
2.2	175	0.0700	1.3		Shallow Concentrated Flow, Shallow Concentrated Flow (E) Woodland Kv= 5.0 fps
21.8	1,510	Total			

Subcatchment SC200: Runoff to DP

Hydrograph



Summary for Subcatchment SC210: Subcatchment 210

Runoff = 8.2 cfs @ 12.31 hrs, Volume= 0.90 af, Depth= 2.14"

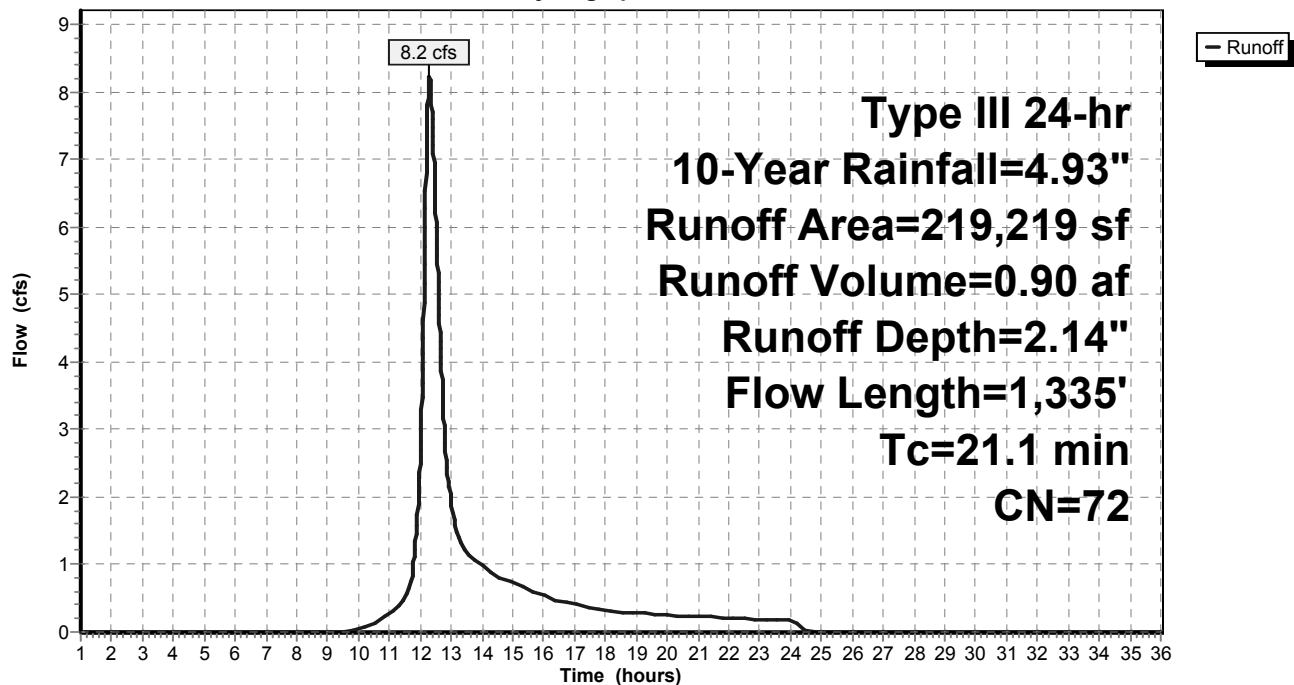
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

Area (sf)	CN	Description
8,406	70	Woods, Good, HSG C
48,590	74	>75% Grass cover, Good, HSG C
* 152,258	71	Proposed Meadow, non-grazed, HSG C
* 9,965	89	Proposed Gravel roads, HSG C
219,219	72	Weighted Average
219,219		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.1		Sheet Flow, Sheet Flow
					Grass: Short n= 0.150 P2= 3.12"
9.3	555	0.0200	1.0		Shallow Concentrated Flow, Shallow Concentrated Flow (A)
					Short Grass Pasture Kv= 7.0 fps
0.5	20	0.0200	0.7		Shallow Concentrated Flow, Shallow Concentrated Flow (B)
					Woodland Kv= 5.0 fps
5.6	710	0.0900	2.1		Shallow Concentrated Flow, Shallow Concentrated Flow (C)
					Short Grass Pasture Kv= 7.0 fps
21.1	1,335	Total			

Subcatchment SC210: Subcatchment 210

Hydrograph



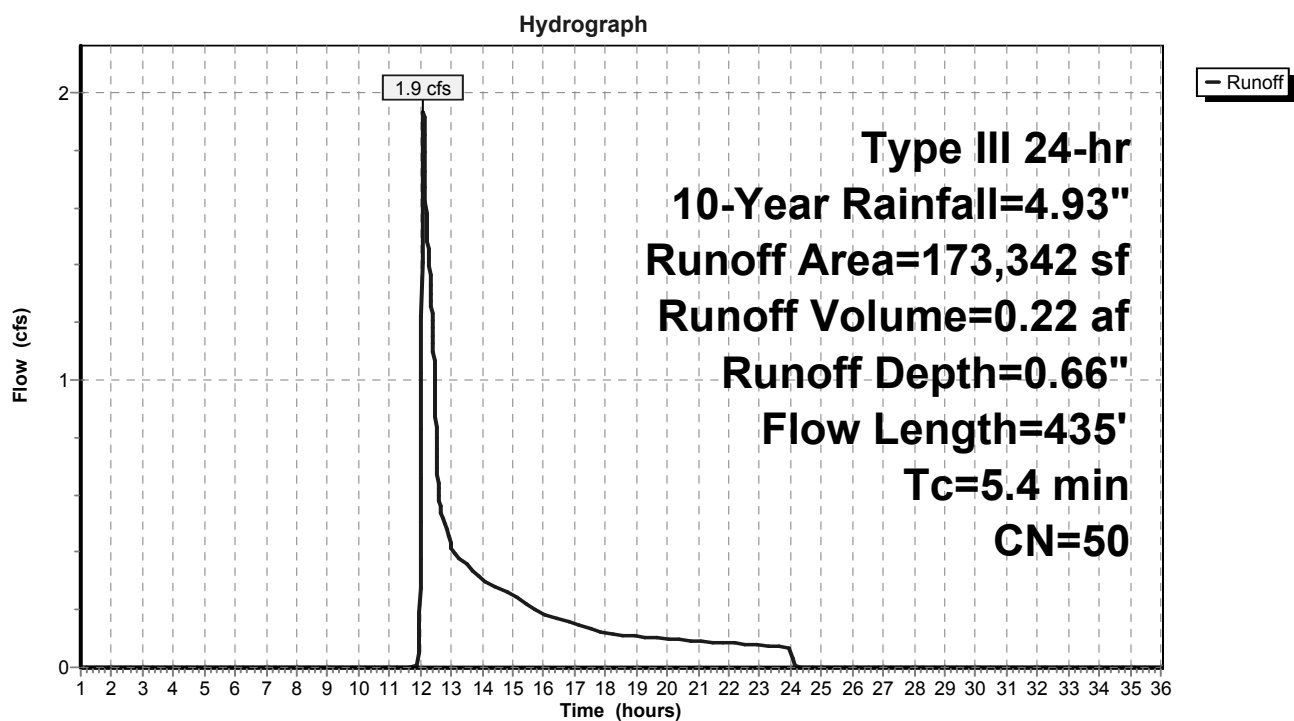
Summary for Subcatchment SC300: Runoff to DP

Runoff = 1.9 cfs @ 12.11 hrs, Volume= 0.22 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

Area (sf)	CN	Description
69,181	30	Woods, Good, HSG A
35,738	55	Woods, Good, HSG B
32,088	70	Woods, Good, HSG C
* 3,139	30	Proposed Meadow, non-grazed, HSG A
* 33,196	71	Proposed Meadow, non-grazed, HSG c
173,342	50	Weighted Average
173,342		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1190	0.3		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.12"
0.6	85	0.1090	2.3		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
1.5	200	0.2000	2.2		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Woodland Kv= 5.0 fps
0.5	100	0.4450	3.3		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
5.4	435	Total			

Subcatchment SC300: Runoff to DP

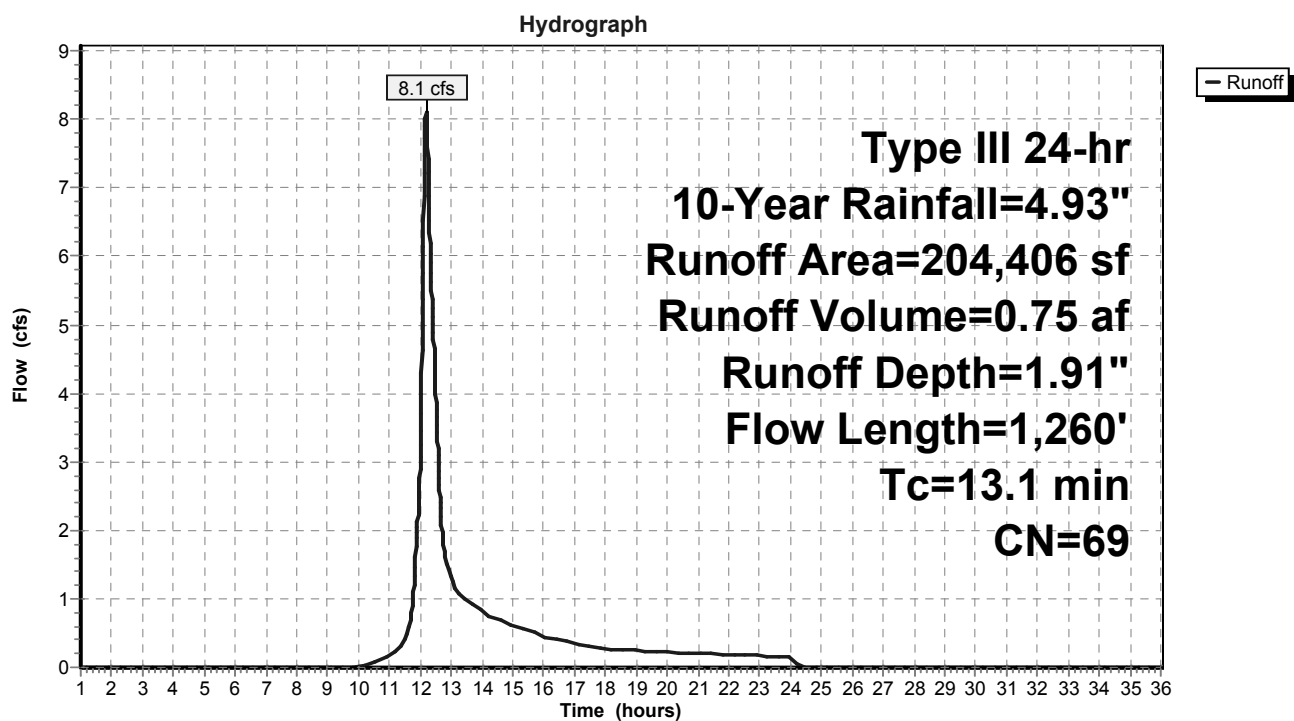
Summary for Subcatchment SC310: Subcatchment 310

Runoff = 8.1 cfs @ 12.19 hrs, Volume= 0.75 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.93"

Area (sf)	CN	Description
2,723	70	Woods, Good, HSG C
* 9,697	30	Proposed Meadow, non-grazed, HSG A
* 191,986	71	Proposed Meadow, non-grazed, HSG c
204,406	69	Weighted Average
204,406		100.00% Pervious Area

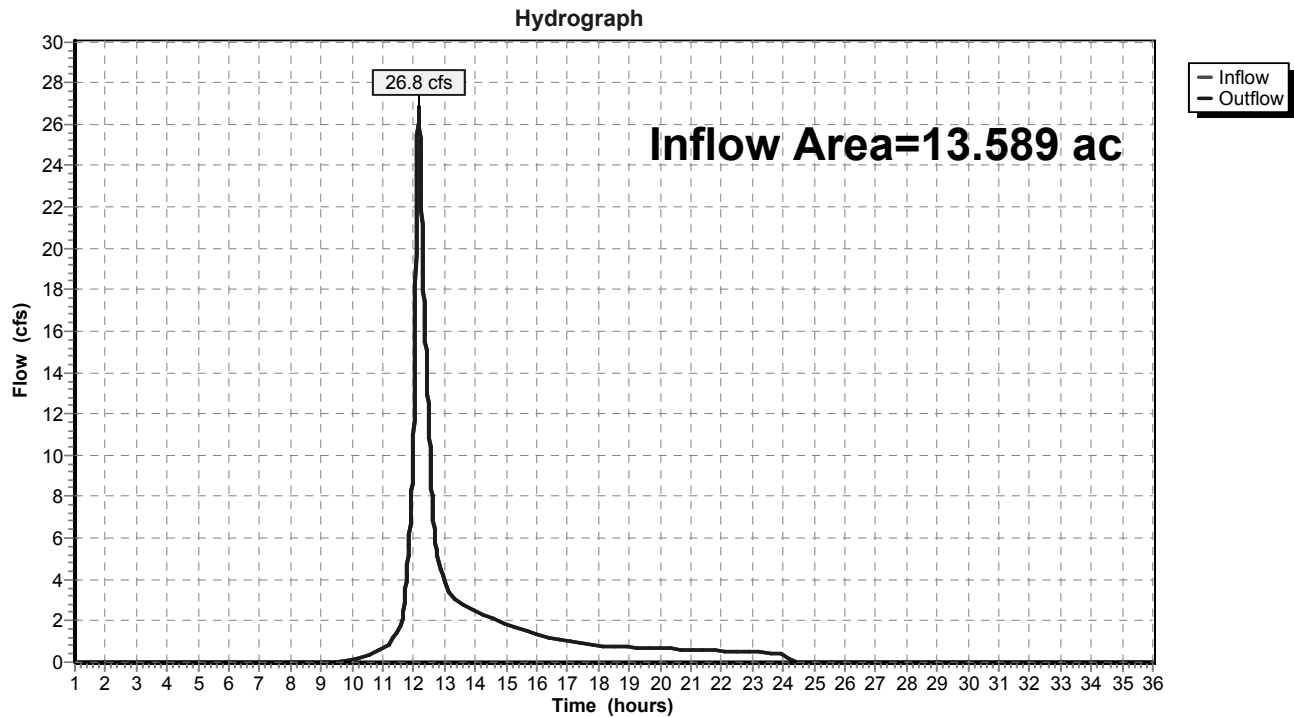
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0443	0.2		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.12"
1.1	130	0.0756	1.9		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0560	1.2		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Woodland Kv= 5.0 fps
0.5	90	0.0400	3.2		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Unpaved Kv= 16.1 fps
1.6	275	0.1730	2.9		Shallow Concentrated Flow, Shallow Concentrated Flow (D) Short Grass Pasture Kv= 7.0 fps
5.6	700	0.0900	2.1		Shallow Concentrated Flow, Shallow Concentrated Flow (E) Short Grass Pasture Kv= 7.0 fps
13.1	1,260	Total			

Subcatchment SC310: Subcatchment 310

Summary for Reach DP1: Bordering Vegetated Wetlands

Inflow Area = 13.589 ac, 0.44% Impervious, Inflow Depth = 2.06" for 10-Year event
Inflow = 26.8 cfs @ 12.17 hrs, Volume= 2.34 af
Outflow = 26.8 cfs @ 12.17 hrs, Volume= 2.34 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP1: Bordering Vegetated Wetlands

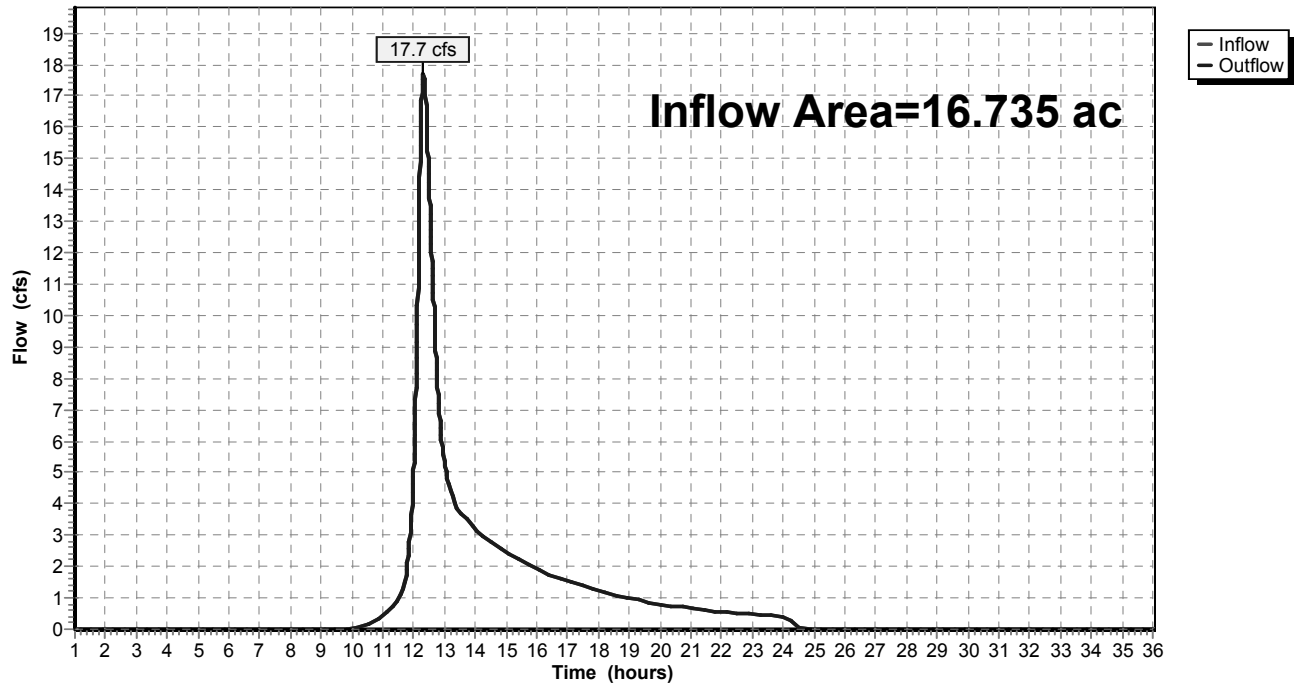
Summary for Reach DP2: Stream

Inflow Area = 16.735 ac, 0.00% Impervious, Inflow Depth = 1.73" for 10-Year event
Inflow = 17.7 cfs @ 12.33 hrs, Volume= 2.41 af
Outflow = 17.7 cfs @ 12.33 hrs, Volume= 2.41 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP2: Stream

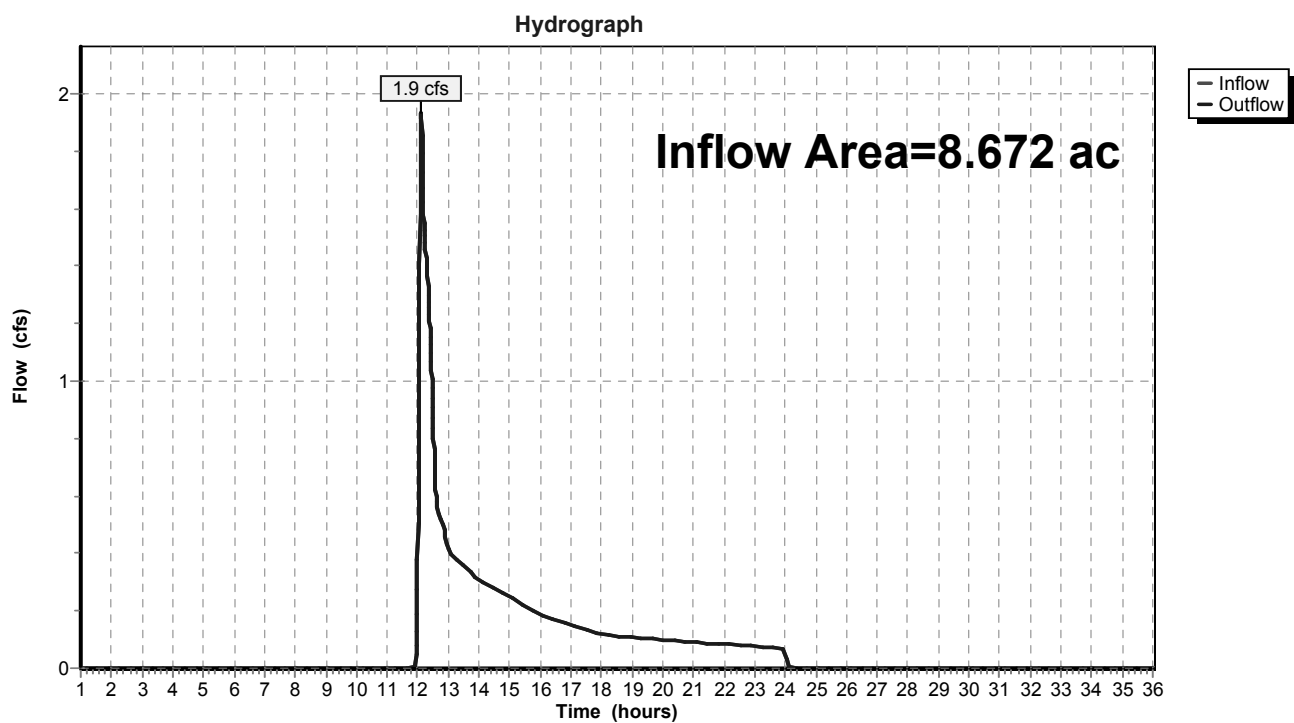
Hydrograph



Summary for Reach DP3: Southern Abutters

Inflow Area = 8.672 ac, 0.00% Impervious, Inflow Depth = 0.30" for 10-Year event
Inflow = 1.9 cfs @ 12.11 hrs, Volume= 0.22 af
Outflow = 1.9 cfs @ 12.11 hrs, Volume= 0.22 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP3: Southern Abutters

Summary for Pond P210: Pond 210

Inflow Area = 5.033 ac, 0.00% Impervious, Inflow Depth = 2.14" for 10-Year event
 Inflow = 8.2 cfs @ 12.31 hrs, Volume= 0.90 af
 Outflow = 1.4 cfs @ 13.22 hrs, Volume= 0.90 af, Atten= 83%, Lag= 54.8 min
 Discarded = 0.3 cfs @ 13.22 hrs, Volume= 0.43 af
 Primary = 1.1 cfs @ 13.22 hrs, Volume= 0.47 af
 Secondary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 595.32' @ 13.22 hrs Surf.Area= 13,691 sf Storage= 16,758 cf

Plug-Flow detention time= 192.2 min calculated for 0.90 af (100% of inflow)
 Center-of-Mass det. time= 192.2 min (1,049.5 - 857.3)

Volume	Invert	Avail.Storage	Storage Description
#1	594.00'	60,819 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
594.00	11,716	490.0	0	0	11,716
596.00	14,767	527.0	26,424	26,424	14,878
598.10	18,045	564.0	34,395	60,819	18,289

Device	Routing	Invert	Outlet Devices
#1	Discarded	594.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	589.00'	12.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 580.00' S= 0.1125 ' / Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	594.25'	6.0" Vert. Orifice C= 0.600
#4	Device 2	595.00'	6.0" Vert. Orifice C= 0.600
#5	Device 2	597.00'	12.0" Horiz. Grate C= 0.600 Limited to weir flow at low heads
#6	Secondary	597.10'	20.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

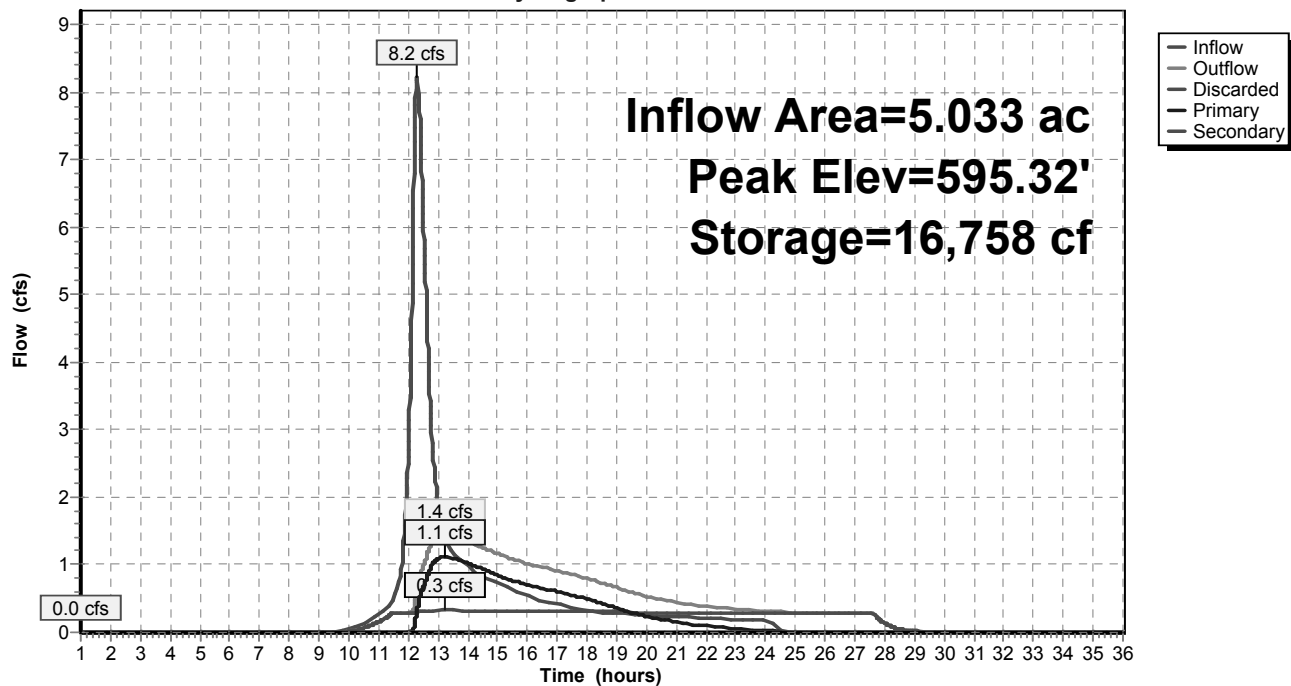
Discarded OutFlow Max=0.3 cfs @ 13.22 hrs HW=595.32' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=1.1 cfs @ 13.22 hrs HW=595.32' (Free Discharge)
 ↑ **2=Culvert** (Passes 1.1 cfs of 9.1 cfs potential flow)
 ↑ **3=Orifice** (Orifice Controls 0.9 cfs @ 4.4 fps)
 ↑ **4=Orifice** (Orifice Controls 0.3 cfs @ 1.9 fps)
 ↑ **5=Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 1.00 hrs HW=594.00' (Free Discharge)
 ↑ **6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P210: Pond 210

Hydrograph



Summary for Pond P310: Pond 310

Inflow Area = 4.693 ac, 0.00% Impervious, Inflow Depth = 1.91" for 10-Year event
 Inflow = 8.1 cfs @ 12.19 hrs, Volume= 0.75 af
 Outflow = 0.4 cfs @ 16.37 hrs, Volume= 0.71 af, Atten= 95%, Lag= 250.8 min
 Discarded = 0.4 cfs @ 16.37 hrs, Volume= 0.71 af
 Primary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af
 Secondary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 565.63' @ 16.37 hrs Surf.Area= 13,207 sf Storage= 19,205 cf

Plug-Flow detention time= 543.1 min calculated for 0.71 af (95% of inflow)
 Center-of-Mass det. time= 516.9 min (1,374.5 - 857.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	564.00'	56,980 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
564.00	10,395	482.0	0	0	10,395
566.00	13,889	579.0	24,200	24,200	18,653
568.00	19,026	748.0	32,781	56,980	36,549

Device	Routing	Invert	Outlet Devices
#1	Discarded	564.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	559.00'	12.0" Round Culvert L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 559.00' / 548.00' S= 0.1375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	566.00'	6.0" Vert. Orifice C= 0.600
#4	Device 2	566.90'	12.0" Horiz. Grate C= 0.600 Limited to weir flow at low heads
#5	Secondary	567.00'	20.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.4 cfs @ 16.37 hrs HW=565.63' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=0.0 cfs @ 1.00 hrs HW=564.00' (Free Discharge)

↑ **2=Culvert** (Passes 0.0 cfs of 6.3 cfs potential flow)

↑ **3=Orifice** (Controls 0.0 cfs)

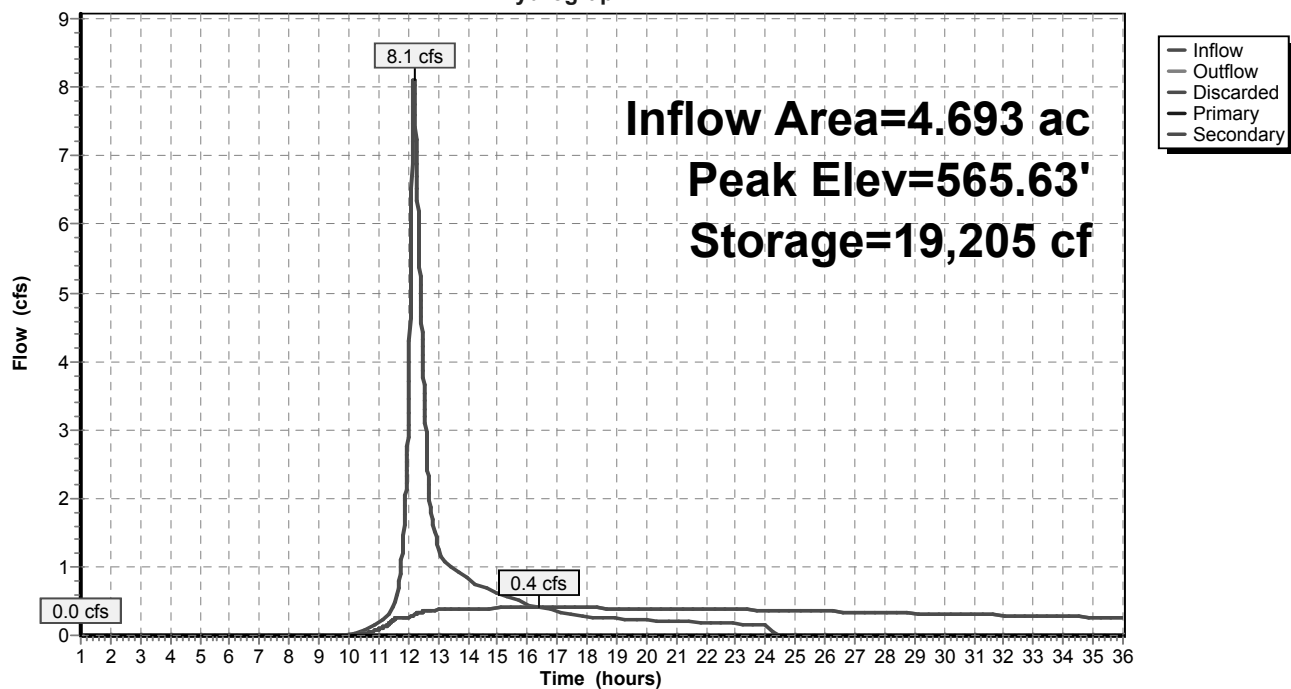
↑ **4=Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 1.00 hrs HW=564.00' (Free Discharge)

↑ **5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P310: Pond 310

Hydrograph



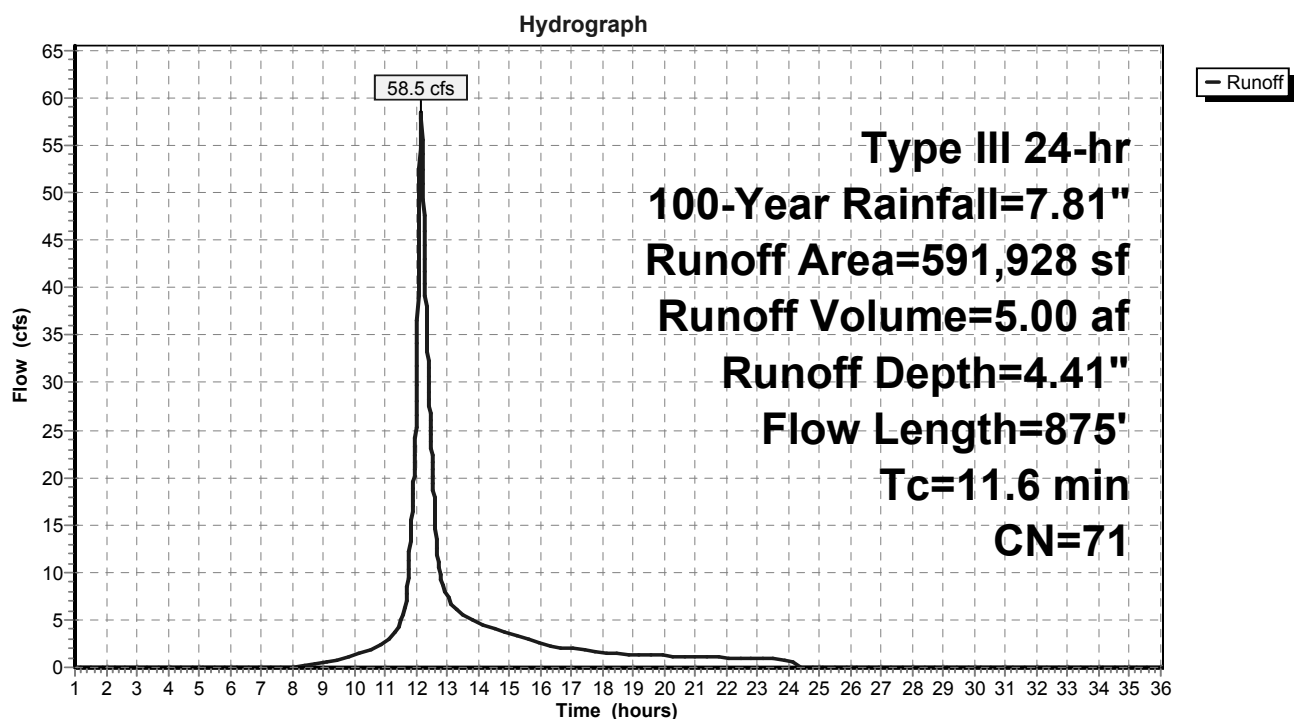
Summary for Subcatchment SC100: Runoff to DP

Runoff = 58.5 cfs @ 12.16 hrs, Volume= 5.00 af, Depth= 4.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (sf)	CN	Description
10,167	55	Woods, Good, HSG B
274,355	70	Woods, Good, HSG C
* 297,729	71	Proposed Meadow, non-grazed, HSG C
* 7,085	89	Proposed Gravel roads, HSG C
* 2,592	98	Proposed Conc. Pad
591,928	71	Weighted Average
589,336		99.56% Pervious Area
2,592		0.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.1200	0.1		Sheet Flow, Sheet Flow Grass: Bermuda n= 0.410 P2= 3.12"
2.2	470	0.2500	3.5		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
1.6	245	0.2500	2.5		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Woodland Kv= 5.0 fps
1.6	110	0.0500	1.1		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
11.6	875	Total			

Subcatchment SC100: Runoff to DP

Summary for Subcatchment SC200: Runoff to DP

Runoff = 38.3 cfs @ 12.30 hrs, Volume= 4.19 af, Depth= 4.30"

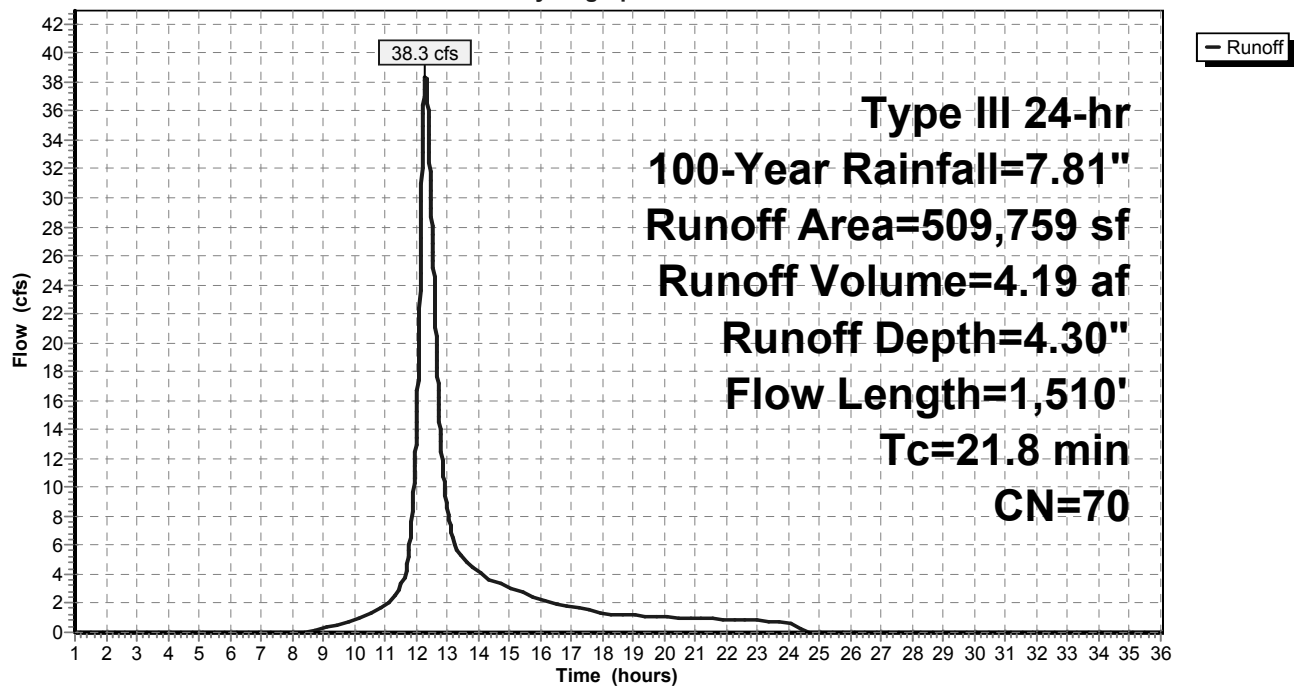
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (sf)	CN	Description
14,443	30	Woods, Good, HSG A
258,670	70	Woods, Good, HSG C
23,378	77	Woods, Good, HSG D
* 209,613	71	Proposed Meadow, non-grazed, HSG C
* 3,655	89	Proposed Gravel roads, HSG C
509,759	70	Weighted Average
509,759		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0600	0.1		Sheet Flow, Sheet Flow Grass: Bermuda n= 0.410 P2= 3.12"
4.3	630	0.1200	2.4		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
1.7	190	0.0700	1.9		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Short Grass Pasture Kv= 7.0 fps
4.0	315	0.0700	1.3		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
1.4	150	0.1300	1.8		Shallow Concentrated Flow, Shallow Concentrated Flow (D) Woodland Kv= 5.0 fps
2.2	175	0.0700	1.3		Shallow Concentrated Flow, Shallow Concentrated Flow (E) Woodland Kv= 5.0 fps
21.8	1,510	Total			

Subcatchment SC200: Runoff to DP

Hydrograph



Summary for Subcatchment SC210: Subcatchment 210

Runoff = 17.6 cfs @ 12.29 hrs, Volume= 1.90 af, Depth= 4.53"

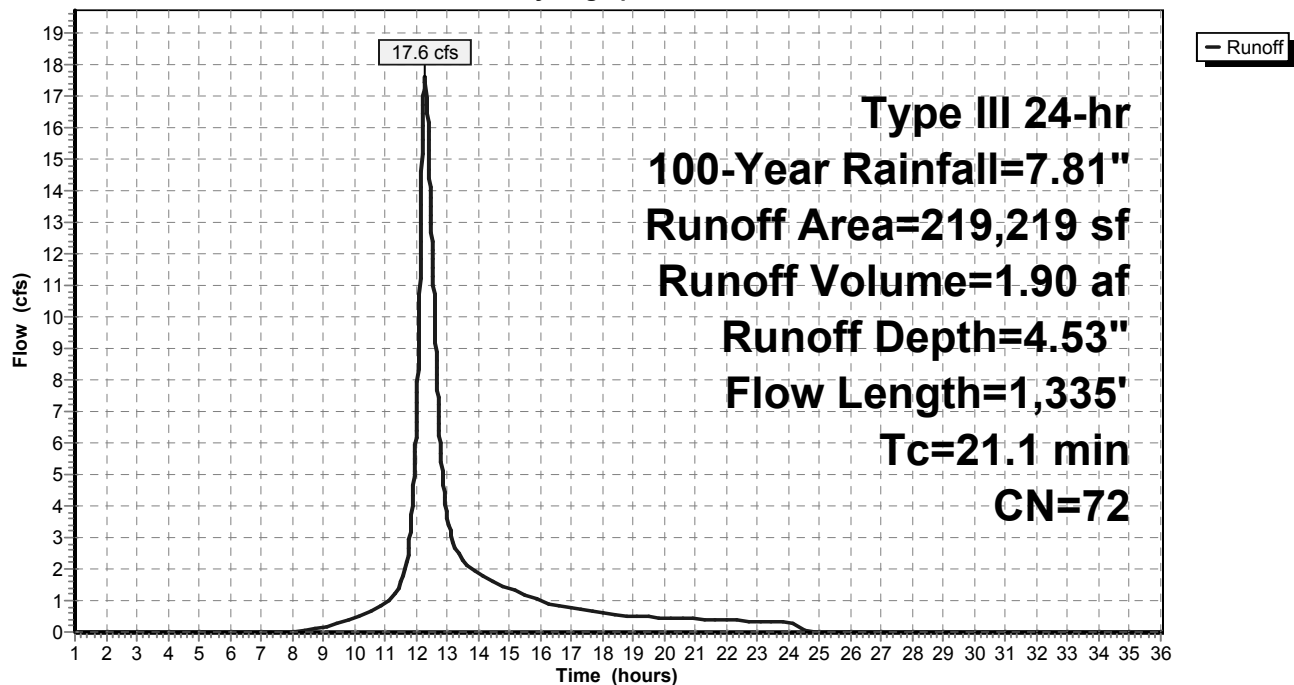
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (sf)	CN	Description
8,406	70	Woods, Good, HSG C
48,590	74	>75% Grass cover, Good, HSG C
* 152,258	71	Proposed Meadow, non-grazed, HSG C
* 9,965	89	Proposed Gravel roads, HSG C
219,219	72	Weighted Average
219,219		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.1		Sheet Flow, Sheet Flow
					Grass: Short n= 0.150 P2= 3.12"
9.3	555	0.0200	1.0		Shallow Concentrated Flow, Shallow Concentrated Flow (A)
					Short Grass Pasture Kv= 7.0 fps
0.5	20	0.0200	0.7		Shallow Concentrated Flow, Shallow Concentrated Flow (B)
					Woodland Kv= 5.0 fps
5.6	710	0.0900	2.1		Shallow Concentrated Flow, Shallow Concentrated Flow (C)
					Short Grass Pasture Kv= 7.0 fps
21.1	1,335	Total			

Subcatchment SC210: Subcatchment 210

Hydrograph



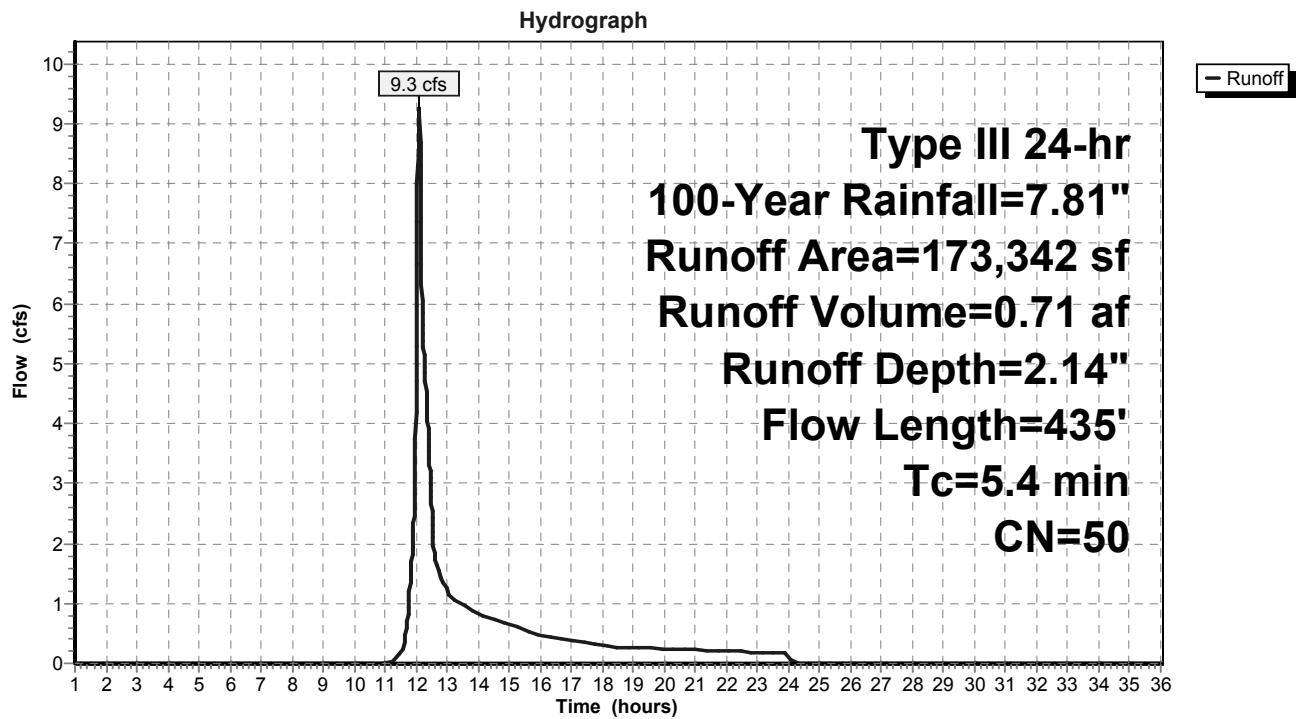
Summary for Subcatchment SC300: Runoff to DP

Runoff = 9.3 cfs @ 12.09 hrs, Volume= 0.71 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (sf)	CN	Description
69,181	30	Woods, Good, HSG A
35,738	55	Woods, Good, HSG B
32,088	70	Woods, Good, HSG C
* 3,139	30	Proposed Meadow, non-grazed, HSG A
* 33,196	71	Proposed Meadow, non-grazed, HSG c
173,342	50	Weighted Average
173,342		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1190	0.3		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.12"
0.6	85	0.1090	2.3		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
1.5	200	0.2000	2.2		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Woodland Kv= 5.0 fps
0.5	100	0.4450	3.3		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Woodland Kv= 5.0 fps
5.4	435	Total			

Subcatchment SC300: Runoff to DP

Summary for Subcatchment SC310: Subcatchment 310

Runoff = 18.4 cfs @ 12.18 hrs, Volume= 1.64 af, Depth= 4.19"

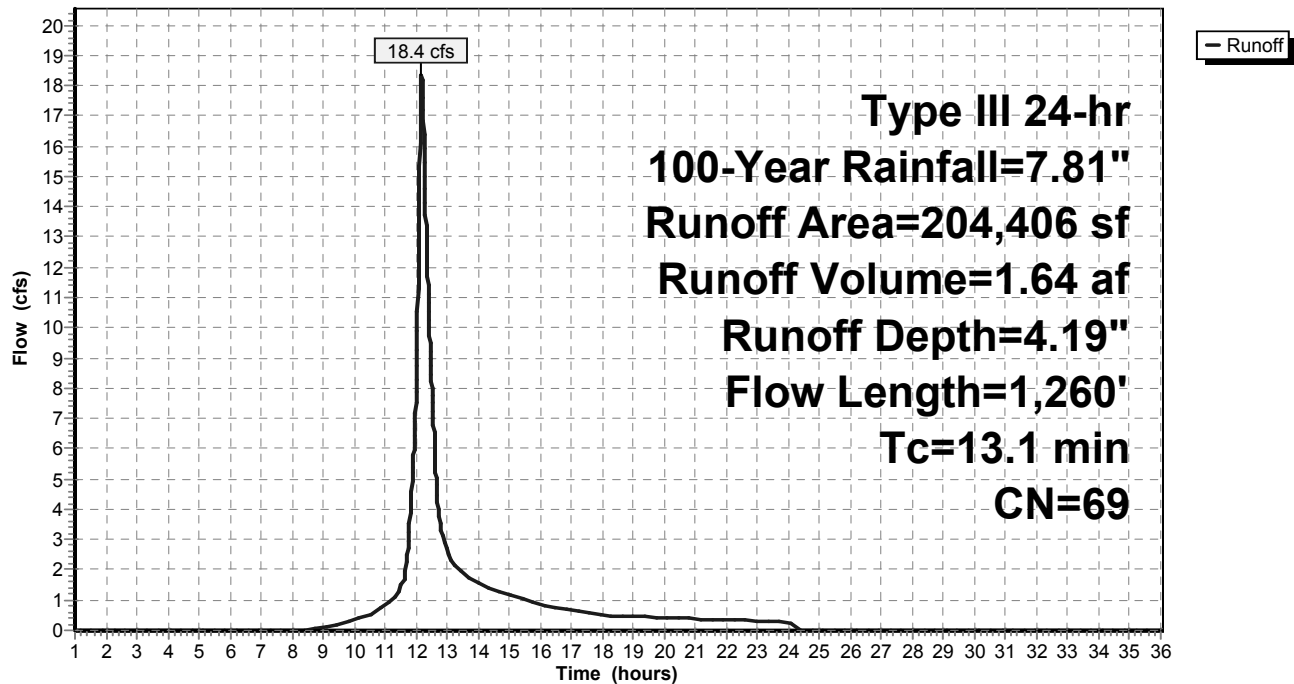
Runoff by SCS TR-20 method, UH=SCS, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.81"

Area (sf)	CN	Description
2,723	70	Woods, Good, HSG C
* 9,697	30	Proposed Meadow, non-grazed, HSG A
* 191,986	71	Proposed Meadow, non-grazed, HSG c
204,406	69	Weighted Average
204,406		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0443	0.2		Sheet Flow, Sheet Flow Grass: Short n= 0.150 P2= 3.12"
1.1	130	0.0756	1.9		Shallow Concentrated Flow, Shallow Concentrated Flow (A) Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0560	1.2		Shallow Concentrated Flow, Shallow Concentrated Flow (B) Woodland Kv= 5.0 fps
0.5	90	0.0400	3.2		Shallow Concentrated Flow, Shallow Concentrated Flow (C) Unpaved Kv= 16.1 fps
1.6	275	0.1730	2.9		Shallow Concentrated Flow, Shallow Concentrated Flow (D) Short Grass Pasture Kv= 7.0 fps
5.6	700	0.0900	2.1		Shallow Concentrated Flow, Shallow Concentrated Flow (E) Short Grass Pasture Kv= 7.0 fps
13.1	1,260	Total			

Subcatchment SC310: Subcatchment 310

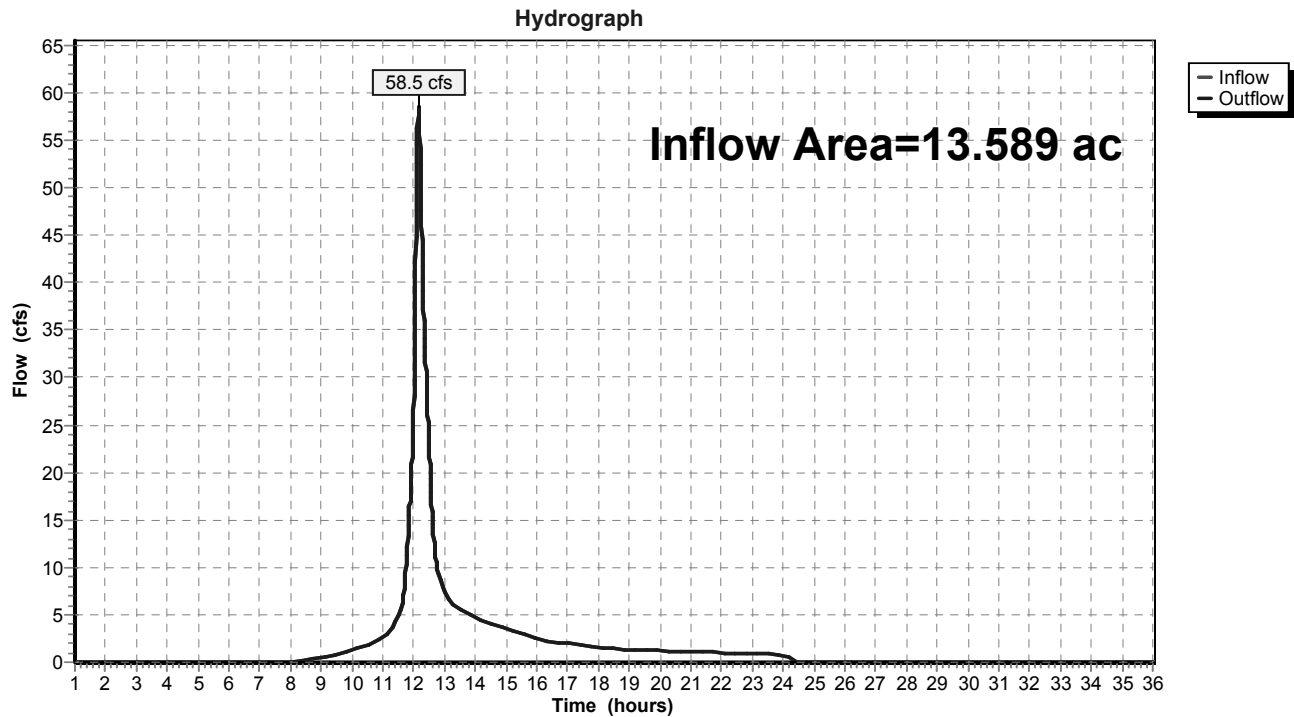
Hydrograph



Summary for Reach DP1: Bordering Vegetated Wetlands

Inflow Area = 13.589 ac, 0.44% Impervious, Inflow Depth = 4.41" for 100-Year event
Inflow = 58.5 cfs @ 12.16 hrs, Volume= 5.00 af
Outflow = 58.5 cfs @ 12.16 hrs, Volume= 5.00 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP1: Bordering Vegetated Wetlands

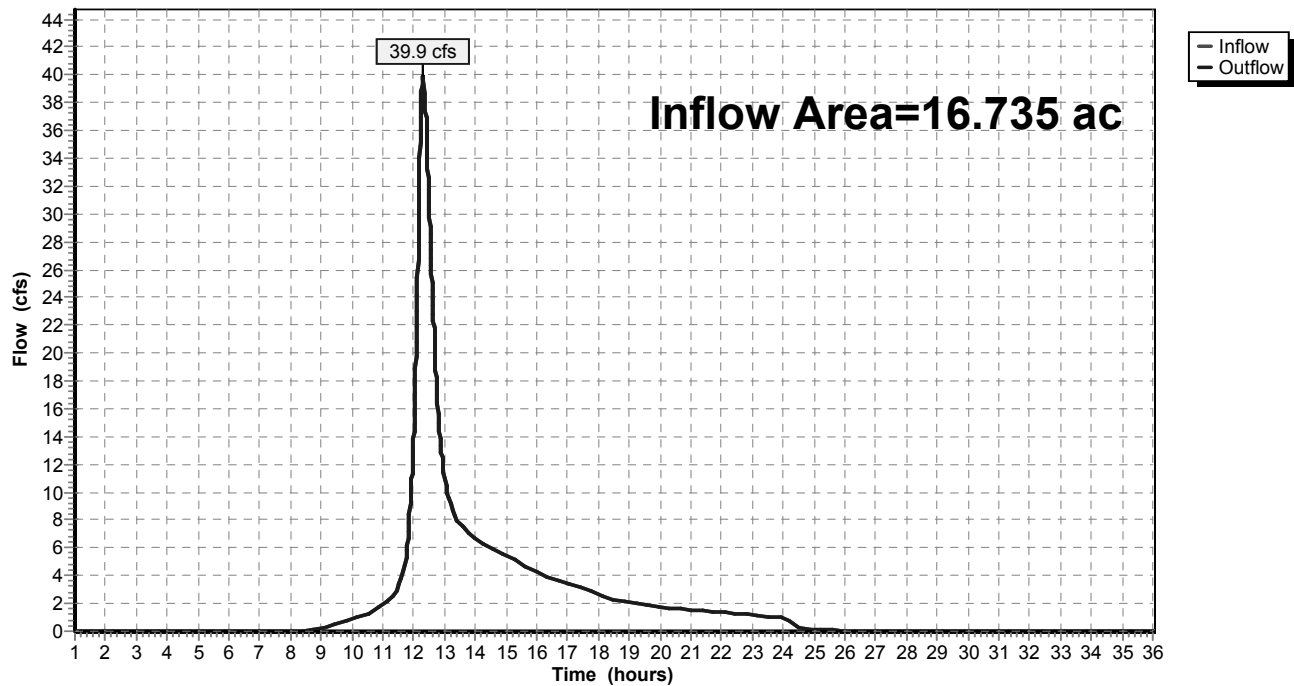
Summary for Reach DP2: Stream

Inflow Area = 16.735 ac, 0.00% Impervious, Inflow Depth = 3.98" for 100-Year event
Inflow = 39.9 cfs @ 12.31 hrs, Volume= 5.55 af
Outflow = 39.9 cfs @ 12.31 hrs, Volume= 5.55 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP2: Stream

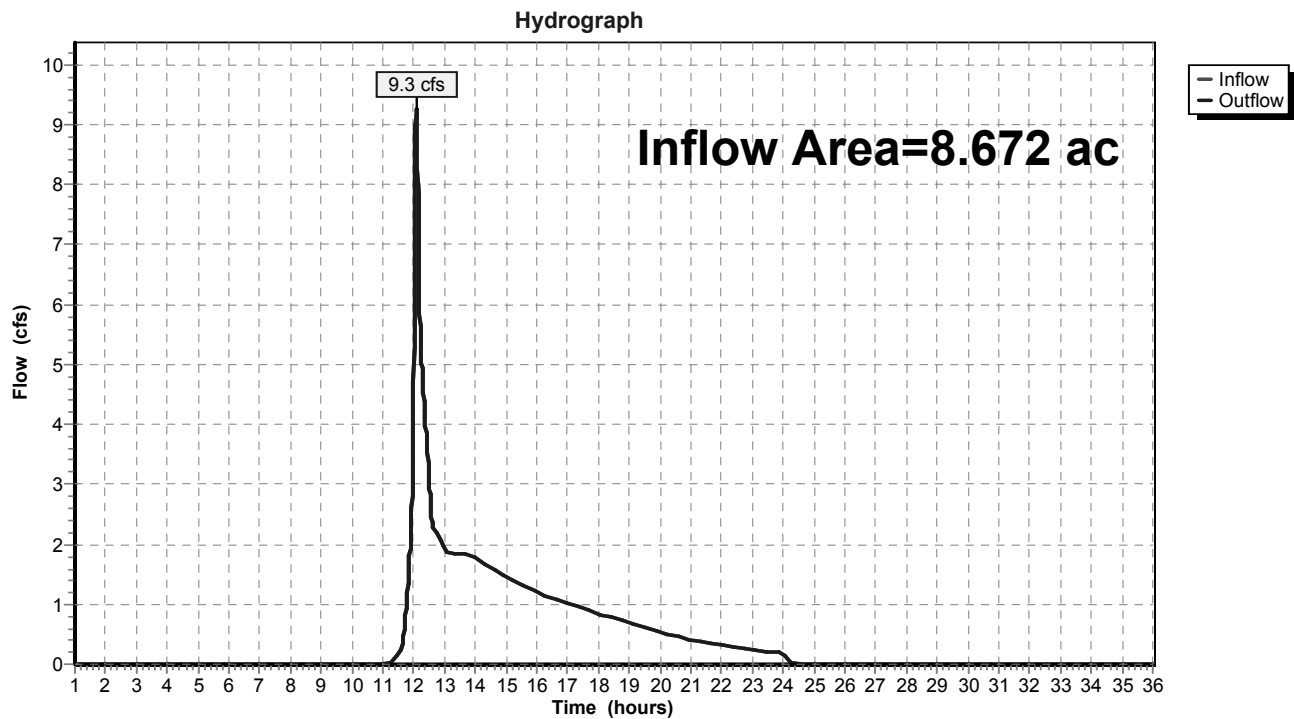
Hydrograph



Summary for Reach DP3: Southern Abutters

Inflow Area = 8.672 ac, 0.00% Impervious, Inflow Depth = 1.62" for 100-Year event
Inflow = 9.3 cfs @ 12.09 hrs, Volume= 1.17 af
Outflow = 9.3 cfs @ 12.09 hrs, Volume= 1.17 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Reach DP3: Southern Abutters

Summary for Pond P210: Pond 210

Inflow Area = 5.033 ac, 0.00% Impervious, Inflow Depth = 4.53" for 100-Year event
 Inflow = 17.6 cfs @ 12.29 hrs, Volume= 1.90 af
 Outflow = 3.0 cfs @ 13.16 hrs, Volume= 1.90 af, Atten= 83%, Lag= 52.1 min
 Discarded = 0.4 cfs @ 13.16 hrs, Volume= 0.54 af
 Primary = 2.6 cfs @ 13.16 hrs, Volume= 1.36 af
 Secondary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 596.76' @ 13.16 hrs Surf.Area= 15,914 sf Storage= 38,062 cf

Plug-Flow detention time= 193.0 min calculated for 1.90 af (100% of inflow)
 Center-of-Mass det. time= 193.1 min (1,028.7 - 835.6)

Volume	Invert	Avail.Storage	Storage Description
#1	594.00'	60,819 cf	Custom Stage Data (Irregular) Listed below (Recalc)

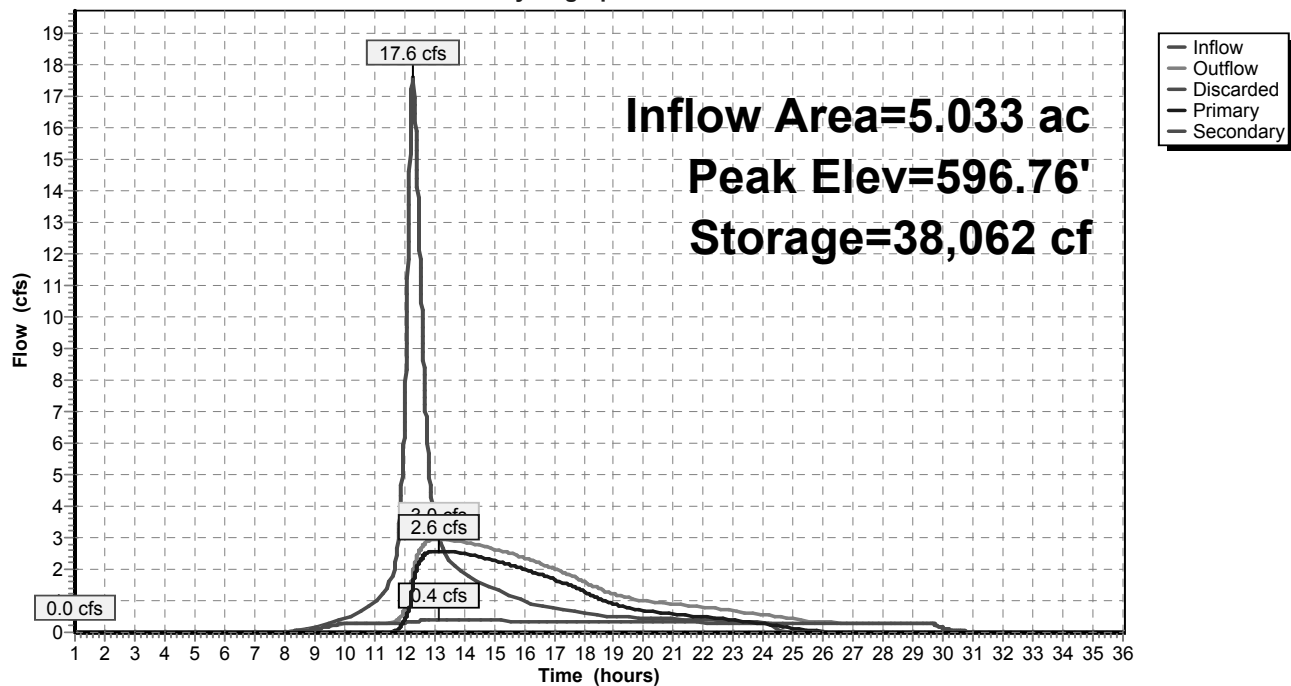
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
594.00	11,716	490.0	0	0	11,716
596.00	14,767	527.0	26,424	26,424	14,878
598.10	18,045	564.0	34,395	60,819	18,289

Device	Routing	Invert	Outlet Devices
#1	Discarded	594.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	589.00'	12.0" Round Culvert L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 589.00' / 580.00' S= 0.1125 ' / Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	594.25'	6.0" Vert. Orifice C= 0.600
#4	Device 2	595.00'	6.0" Vert. Orifice C= 0.600
#5	Device 2	597.00'	12.0" Horiz. Grate C= 0.600 Limited to weir flow at low heads
#6	Secondary	597.10'	20.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.4 cfs @ 13.16 hrs HW=596.76' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=2.6 cfs @ 13.16 hrs HW=596.76' (Free Discharge)
 ↑ **2=Culvert** (Passes 2.6 cfs of 10.2 cfs potential flow)
 ↑ **3=Orifice** (Orifice Controls 1.4 cfs @ 7.2 fps)
 ↑ **4=Orifice** (Orifice Controls 1.2 cfs @ 5.9 fps)
 ↑ **5=Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 1.00 hrs HW=594.00' (Free Discharge)
 ↑ **6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P210: Pond 210**Hydrograph**

Summary for Pond P310: Pond 310

Inflow Area = 4.693 ac, 0.00% Impervious, Inflow Depth = 4.19" for 100-Year event
 Inflow = 18.4 cfs @ 12.18 hrs, Volume= 1.64 af
 Outflow = 1.6 cfs @ 13.98 hrs, Volume= 1.43 af, Atten= 91%, Lag= 108.1 min
 Discarded = 0.6 cfs @ 13.98 hrs, Volume= 0.97 af
 Primary = 1.0 cfs @ 13.98 hrs, Volume= 0.46 af
 Secondary = 0.0 cfs @ 1.00 hrs, Volume= 0.00 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
 Peak Elev= 566.96' @ 13.98 hrs Surf.Area= 16,259 sf Storage= 38,685 cf

Plug-Flow detention time= 431.9 min calculated for 1.43 af (87% of inflow)
 Center-of-Mass det. time= 374.3 min (1,208.8 - 834.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	564.00'	56,980 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
564.00	10,395	482.0	0	0	10,395
566.00	13,889	579.0	24,200	24,200	18,653
568.00	19,026	748.0	32,781	56,980	36,549

Device	Routing	Invert	Outlet Devices
#1	Discarded	564.00'	1.020 in/hr Exfiltration over Wetted area
#2	Primary	559.00'	12.0" Round Culvert L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 559.00' / 548.00' S= 0.1375 ' S= 0.1375 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	566.00'	6.0" Vert. Orifice C= 0.600
#4	Device 2	566.90'	12.0" Horiz. Grate C= 0.600 Limited to weir flow at low heads
#5	Secondary	567.00'	20.0' long x 12.0' 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) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.6 cfs @ 13.98 hrs HW=566.96' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.6 cfs)

Primary OutFlow Max=1.0 cfs @ 13.98 hrs HW=566.96' (Free Discharge)

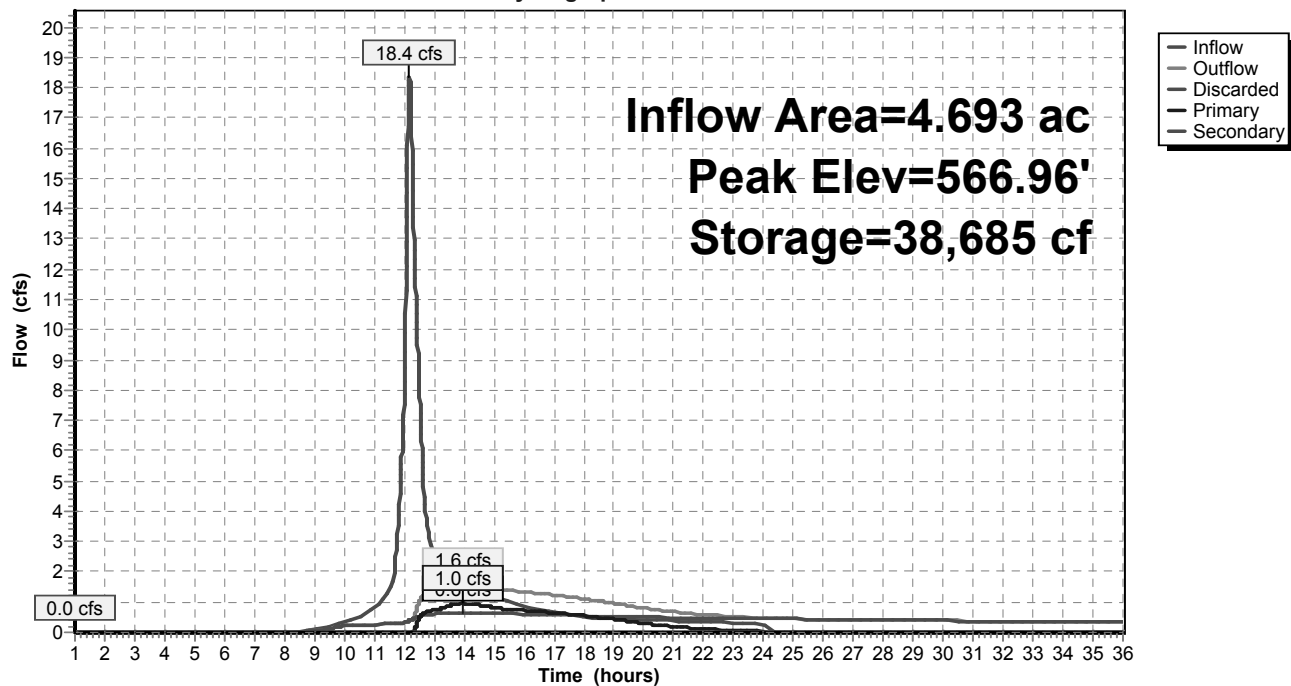
↑ **2=Culvert** (Passes 1.0 cfs of 8.2 cfs potential flow)

↑ **3=Orifice** (Orifice Controls 0.8 cfs @ 4.1 fps)

↑ **4=Grate** (Weir Controls 0.2 cfs @ 0.8 fps)

Secondary OutFlow Max=0.0 cfs @ 1.00 hrs HW=564.00' (Free Discharge)

↑ **5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P310: Pond 310**Hydrograph**

APPENDIX

**OPERATION & MAINTENANCE
PROGRAM FOR A PROPOSED
STORMWATER MANAGEMENT SYSTEM**

**OPERATION AND MAINTENANCE PROGRAM
for
A PROPOSED STORMWATER MANAGEMENT SYSTEM
located at
95 MAIN STREET
WILLIAMSBURG, MASSACHUSETTS**



Applicant:

ZPT Energy Solutions II, LLC
6 Park Avenue, Suite 100
Worcester, MA 01605

Prepared by:

Meridian Associates, Inc.
500 Cummings Center, Suite 5950
Beverly, Massachusetts 01915
(978) 299-0447

**October 28, 2018
Revised January 4, 2019
Revised January 19, 2019**

Project Name: ZPTII-222 SOLAR ARRAY
95 Main Street
Williamsburg, Massachusetts 01039

Owner Name: 95 Main Street:
Lawrence E. & Linda A. West
18 South Street
Williamsburg, Massachusetts

Party Responsible for Maintenance

During and After Construction: ZPT Energy Solutions II, LLC
6 Park Avenue, Suite 100
Worcester, MA 01605

Erosion and Sedimentation Control Measures during Construction Activities

Haybales/ Silt Fence/Silt Sock erosion control barriers

Staked haybales and silt fencing will be installed upgradient of the resource areas as depicted on the Erosion & Sediment Control Plan. The haybales and silt fence shall be installed prior to the commencement of any work on-site and in accordance with the design plans. An additional supply of haybales and silt fence shall be on-site to replace and/or repair any haybales or silt fence that have been disturbed or are in poor condition. The line of haybales and silt fence shall be inspected and maintained on a weekly basis and after every major storm event (0.5 inches of rain or greater) during construction. No construction activities are to occur beyond the haybale line at any time. Deposited sediments shall be removed when the volume of the deposition reaches approximately one-half the height of the hay bale.

Silt sock barrier locations are shown on the design plans and shall be installed at the intervals and locations along the slope as dimensioned on those plans. If, during construction, a barrier needs to be temporarily moved in order to allow construction in a specific area, the barrier shall be returned to its original location or as close to its original location as possible after the work is complete. These barriers shall be inspected at the same time intervals as the haybale barriers, and accumulated sediment shall be removed as needed to maintain proper functioning of the barrier. The means of creating new lengths of silt sock barrier shall be maintained on site during construction in order to replace damaged sections quickly as necessary.

Invasive Species Management

Invasive Species Management within the array footprint:

This area will be seeded with the New England Conservation/Wildlife seed mix available from New England Wetland Plants, Inc., a native seed mixture containing grasses and other herbaceous plants intended to provide soil stabilization and wildlife habitat. The resulting meadow will be mowed annually to control the height of the plants, as well as to keep out woody plant stock, including those woody plants that may be invasive, such as tartarian honeysuckle (*Lonicera tartarica*), multiflora rose (*Rosa multiflora*), Japanese barberry (*Berberis thunbergii*), common buckthorn (*Rhamnus cathartica*), and/or European buckthorn (*Frangula alnus*), etc. No herbicides or pesticides are proposed for the site.

Invasive Species Management for the area between the array and the limit of clearing:

By opening the canopy, this will change the conditions of the understory, and plants that prefer more sun will likely colonize this zone. In order to manage invasive species for this type of site condition, the applicant would pro-actively remove invasive shrubs and saplings (and groundcover plants, if present).

The applicant proposes the following Invasive Species Management Plan:

- a) The applicant's Environmental Consultant, LEC Environmental Consultants, Inc., will perform an onsite inspection of this area after the limit of erosion control and clearing are staked in the field by the project surveyor.
- b) An inventory of Invasive Species will be identified and delineated in the field.
- c) A Removal and Maintenance Plan for each Invasive Species identified will be developed and implemented immediately. This will likely consist of removal, by hand, using a weed wrench and/or shovels, etc. A small machine may be required to remove larger specimens.
- d) After land clearing activity, and prior to grubbing operations within the array footprint, LEC shall coordinate and inspect the removal of any Invasive Species identified. Invasive plants will be removed by the Applicant's landscape contractor. **See Invasive Species Management Plan" letter prepared by ZPT for further disposal information.**
- e) Once the Invasive Species removal effort has been implemented, LEC shall perform bi-monthly (once every 2 months) inspections during the growing season, for the duration of construction, to identify any significant return or germination of invasive plants, and coordinate with the Applicant and landscape contractor for removal and disposal.
- f) Inspection reports and proposed treatments and maintenance action items shall be prepared and submitted after each inspection and provided to the Williamsburg Planning Board.

Infiltration/Stormwater Basins

The Stormwater/Infiltration surface basins shall be checked weekly and after major storm events during construction for rilling, erosion, and debris removal. Avoid compaction of the parent material by working from the edge of the areas proposed as the locations of the Sedimentation Basins. Any uphill erosion control barriers shall be maintained so that runoff and sediment does not accumulate inside the basins, and allows vegetative cover to take hold. Care should be taken during regular inspections to remove any plants other than the recommended seed mix to avoid possible compromise of the interior side slopes. Any accumulated sediment shall be promptly removed.

Gravel Access Drive

During construction the gravel access drive and shall be inspected daily. The access drive shall be inspected for ruts, channelized drainage, gullying and sedimentation. Repairs to the drive shall be made with new clean stone, and shall be compacted into place. Large ruts may be filled with larger stone and set in place with dense grade material, then overlain by new crushed stone.

Stockpiles

All unused debris, soil, and other material shall be stockpiled in locations of relatively flat grades upgradient of the haybales. Stockpile side slopes shall not be greater than 2:1. All stockpiles shall be surrounded by a row of haybales. Surrounding haybales shall be inspected and maintained on a daily basis.

Surface Stabilization

The surface of all disturbed areas shall be stabilized during and after construction. Temporary measures shall be taken during construction to prevent erosion and siltation. All disturbed slopes will be stabilized with a permanent vegetative cover. Once the forested areas have been cleared and grubbed, the entire area will be tilled following the installation of the array; areas of exposed soils will be seeded with the "*New England Conservation/Wildlife Mix*" provided by New England Wetland Plants, Inc. This seed mix contains a variety of low-growing, low-maintenance fescues that will stabilize the ground surface.

Construction Tracking Pad

The construction tracking pad shall be installed at the designated entrance/exit north of the site as shown on the Erosion & Sediment Control plans to reduce the amount of sediment transported off site. The construction tracking pads shall be inspected weekly.

Removal of Sediment and Erosion Controls

At the completion of construction activities, when a permanent vegetative cover has been established on the site, and only after receiving approval from the Town of Williamsburg Conservation Commission, all physical sediment and erosion controls shall be removed from the site. The areas where the controls have been removed shall be seeded and stabilized immediately upon removal.

Long-Term Inspection and Maintenance Measures after Construction

Infiltration/Stormwater Basins

These basins should be inspected after the first several rainfall events or first few months after construction is complete, after all major storms (0.5 inches of rain or greater), and on regular bi-annual scheduled dates. Ponded water in the basin after several days often indicates that the bottom of the pond is clogged. At this point, material at the bottom of the pond shall be excavated to a minimum depth of 8 inches and replaced with sandy material to ensure infiltration. The area shall be re-seeded and monitored weekly until a new, permanent vegetative cover is established.

Erosion Control

Eroded sediments can adversely affect the performance of the stormwater management system. Any eroding or barren areas should be immediately re-compacted and re-vegetated.

Gravel Access Drive

The gravel access drive shall be inspected bi-annually and after every major storm event for ruts, channelized drainage, gulying and sedimentation. Repairs to the drive shall be made with new clean stone, and shall be compacted into place. Large ruts may be filled with larger stone and set in place with dense grade material, then overlain by new crushed stone. This access drive must be maintained in order to facilitate emergency vehicles moving through the site.

Debris and Litter Removal

Trash may collect in the BMP's, potentially causing clogging of the facilities. All debris and litter shall be removed when necessary, and after each storm event. Sediment and debris collected from vacuuming and/or sweeping should be disposed of at a permitted waste disposal facility. Avoid disposing of this material on site.

Grass Mowing

Grass shall be inspected annually and maintenance mowing shall occur as needed. All lawn mowing to take place will be done with a mulch mower so grass clippings will not be an

issue. Any grassed access paths and driveways shall be mowed and maintained as necessary to allow movement of vehicles throughout the site.

Good Housekeeping Practices (in accordance with Standard 10 of the Stormwater Management Handbook to prevent illicit discharges)

Provisions for storing paints, cleaners, automotive waste and other potentially hazardous household waste products inside or under cover

- All materials on site will be stored inside in a neat, orderly, manner in their appropriate containers with the original manufacturer's label.
- Only store enough material necessary. Whenever possible, all of a product shall be used up before disposing of container.
- Manufacturer, local, and State recommendations for proper use and disposal shall be followed.

Vehicle washing controls

- A commercial car wash shall be used when possible. Car washes treat and/or recycle water.
- Cars shall be washed on gravel, grass, or other permeable surfaces to allow filtration to occur.
- Use biodegradable soaps.
- A water hose with a nozzle that automatically turns off when left unattended.

Requirements for routine inspection and maintenance of stormwater BMPs

See Inspection and Maintenance Measures after Construction.

Spill prevention and response plans

Spill Control Practices shall be in conformance with the guidelines set forth in the National Pollutant Discharge Elimination System (NPDES) Stormwater Pollution Prevention Plan (SWPPP)

Provisions for maintenance of lawns, gardens, and other landscaped areas

- Grass shall not be cut shorter than 2 to 3 inches and mulch clipping should be left on lawn as a natural fertilizer.
- Use low volume water approaches such as drip-type or sprinkler systems. Water plants only when needed to enhance root growth and avoid runoff problems.
- The use of mulch shall be utilized where possible. Mulch helps retain water and prevents erosion.

Requirements for storage and use of fertilizers, herbicides and pesticides

- Fertilizers to be 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

storm water. 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.

- Do not fertilize before a rainstorm.
- Consider using organic fertilizers. They release nutrients more slowly.
- Pesticides shall be applied on lawns and gardens only when necessary and applied only in the minimum amounts recommended by the manufacturer.

Pet waste management

- Scoop up and seal pet wastes in a plastic bag. Dispose of properly, in the garbage.

Provisions for operation and management of septic systems

Not Applicable

Provisions for solid waste management

- All solid waste shall be disposed of or recycled in accordance with local town regulations.

Snow disposal and plowing plans relative to Resource Area

- Snow shall be plowed and stored on gravel, grass, or other permeable surfaces to allow filtration to occur.
- Once snow melts all sand salt and debris shall be extracted from surface and properly disposed of.
- Snow shall not be disposed of in any resource area or waterbody.
- Avoid disposing snow on top of storm drain catch basins or stormwater drainage swale.

Winter Road Salt and/or Sand use and storage restrictions

- Salt storage piles should be located outside the 100-year buffer zone and shall be covered at all times.
- The amount of road salt applied should be regulated to prevent over salting of roadways and increasing runoff concentrations. Alternative materials, such as sand or gravel, should be used in especially sensitive areas.

Roadway and Parking Lot sweeping schedule

- Pavement sweeping shall be conducted at a frequency of not less than once per year.
- Removal of any accumulated sand, grit, and debris from driveway after the snow melts shall be completed shortly after snow melts for the season.

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

Not Applicable

Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan

To be determined by the owner.

List of Emergency contacts for implementing Long-Term Pollution Prevention Plan

To be determined by the owner.

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STORMWATER MANAGEMENT
CONSTRUCTION PHASE

INSPECTION SCHEDULE AND EVALUATION CHECKLIST

PROJECT LOCATION: 5 Hatfield Road, Williamsburg, Massachusetts **WEATHER:** _____

<i>Inspection Date</i>	<i>Inspector</i>	<i>Area Inspected</i>	<i>Required Inspection Frequency if BMP</i>	<i>Comments</i>	<i>Recommendation</i>	<i>Follow-up Inspection Required (yes/no)</i>
		<i>Erosion Barriers</i>	<i>Weekly and After Major Storm Events</i>			
		<i>Construction Tracking Pads</i>	<i>Weekly and After Major Storm Events</i>			
		<i>Gravel Access Drive</i>	<i>Weekly and After Major Storm Events</i>			
		<i>Stormwater Basins and Outlets</i>	<i>Weekly and After Major Storm Events</i>			
		<i>Grassed Swales</i>	<i>Weekly and After Major Storm Events</i>			
		<i>Riprap Areas</i>	<i>Weekly and After Major Storm Events</i>			

-
- (1) Refer to the Massachusetts Stormwater Handbook, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.
- (2) Inspections to be conducted by a qualified professional such as an environmental scientist or civil engineer.
- Limited or no use of sodium chloride salts, fertilizers or pesticides recommended.
- Other notes: (Include deviations from: Con. Comm. Order of Conditions, PB Approval, Construction Sequence and Approved Plan)
- Stormwater Control Manager: _____

STORMWATER MANAGEMENT
POST-CONSTRUCTION

INSPECTION SCHEDULE AND EVALUATION CHECKLIST

PROJECT LOCATION: 5 Hatfield Road, Williamsburg, Massachusetts **WEATHER:** _____

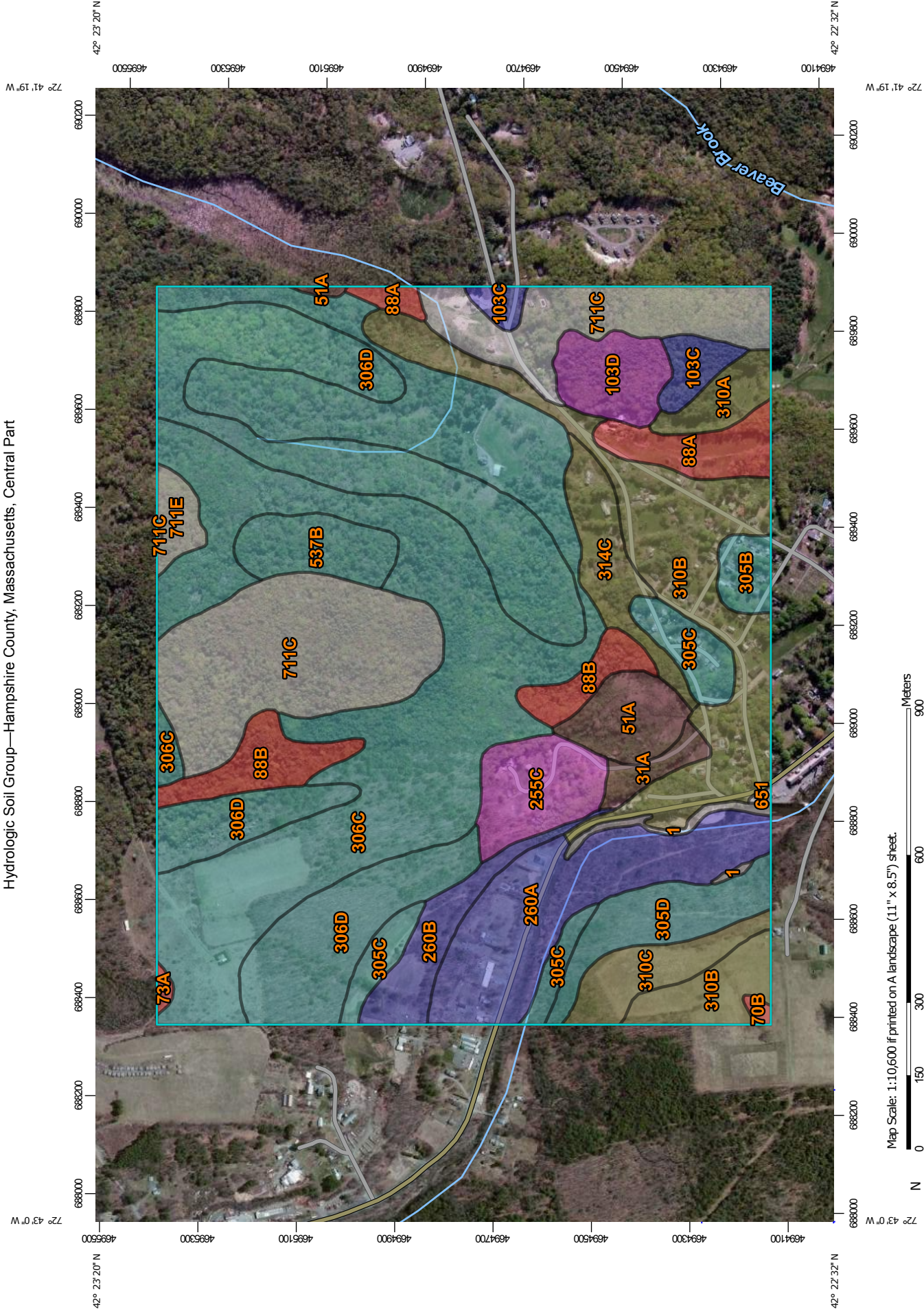
<i>Inspection Date</i>	<i>Inspector</i>	<i>Area Inspected</i>	<i>Required Inspection Frequency if BMP</i>	<i>Comments</i>	<i>Recommendation</i>	<i>Follow-up Inspection Required (yes/no)</i>
		<i>Gravel Access Drive</i>	<i>Bi-annually and After Major Storm Event</i>			
		<i>Sedimentation Basins and Outlets</i>	<i>Bi-annually and After Major Storm Event</i>			
		<i>Grassed Swales</i>	<i>Bi-annually and After Major Storm Event</i>			
		<i>Riprap Areas</i>	<i>Bi-annually and After Major Storm Event</i>			

-
- (1) Refer to the Massachusetts Stormwater Handbook, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.
- (2) Inspections to be conducted by a qualified professional such as an environmental scientist or civil engineer.
- Limited or no use of sodium chloride salts, fertilizers or pesticides recommended.
- Other notes: (Include deviations from: Con. Comm. Order of Conditions, PB Approval, Construction Sequence and Approved Plan)
- Stormwater Control Manager: _____

**USDA NATURAL RESOURCE
CONSERVATION SERVICE**

NATIONAL COOPERATIVE SOIL SURVEY

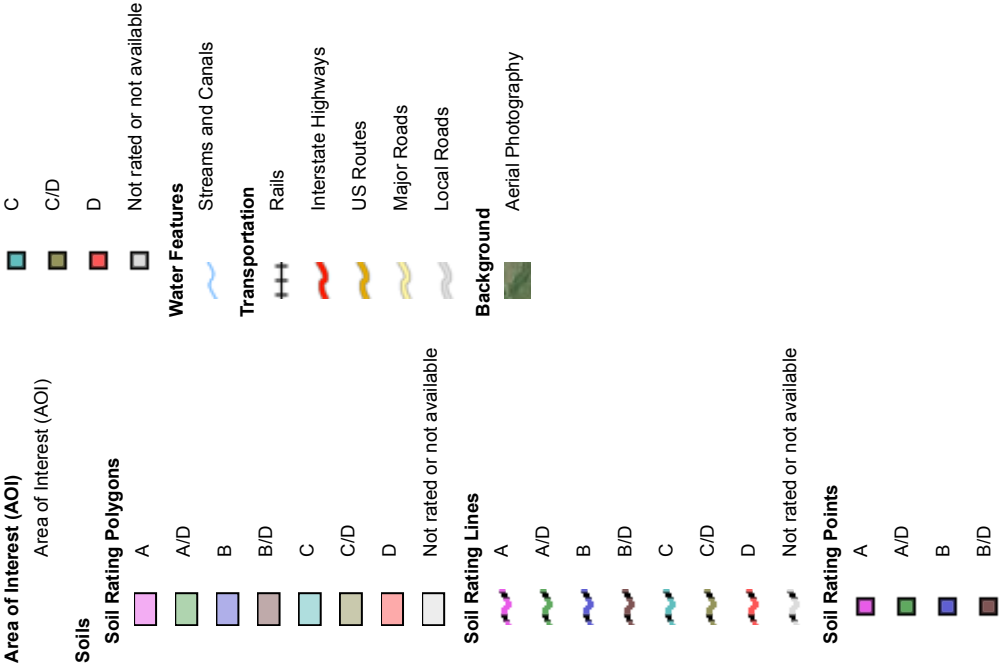
Hydrologic Soil Group—Hampshire County, Massachusetts, Central Part



Map Scale: 1:10,600 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Hampshire County, Massachusetts, Central Part
Survey Area Data: Version 12, 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: Mar 28, 2011—Mar 27, 2012

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		2.1	0.5%
31A	Walpole sandy loam, 0 to 3 percent slopes	B/D	3.4	0.7%
51A	Swansea muck, 0 to 1 percent slopes	B/D	8.9	1.9%
70B	Ridgebury fine sandy loam, 3 to 8 percent slopes	D	0.6	0.1%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	0.6	0.1%
88A	Ridgebury fine sandy loam, 0 to 3 percent slopes, very stony	D	9.6	2.1%
88B	Ridgebury fine sandy loam, 3 to 8 percent slopes, very stony	D	13.0	2.8%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	B	5.8	1.2%
103D	Charlton-Hollis- Rock outcrop complex, 15 to 25 percent slopes	A	9.1	2.0%
255C	Windsor loamy sand, 8 to 15 percent slopes	A	11.7	2.5%
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	B	29.3	6.3%
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	B	9.1	1.9%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	4.0	0.9%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	C	12.1	2.6%
305D	Paxton fine sandy loam, 15 to 25 percent slopes	C	12.0	2.6%
306C	Paxton fine sandy loam, 8 to 15 percent slopes, very stony	C	124.4	26.7%
306D	Paxton fine sandy loam, 15 to 25 percent slopes, very stony	C	68.4	14.7%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
310A	Woodbridge fine sandy loam, 0 to 3 percent slopes	C/D	5.4	1.2%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	47.0	10.1%
310C	Woodbridge fine sandy loam, 8 to 15 percent slopes	C/D	8.7	1.9%
314C	Woodbridge fine sandy loam, 8 to 15 percent slopes, stony	C/D	10.0	2.2%
537B	Paxton fine sandy loam, 3 to 8 percent slopes, stony	C	9.4	2.0%
651	Udorthents, smoothed		0.2	0.1%
711C	Charlton-Rock outcrop-Hollis complex, sloping		57.6	12.4%
711E	Charlton-Rock outcrop-Hollis complex, steep		3.7	0.8%
Totals for Area of Interest			466.4	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

**FEDERAL EMERGENCY
MANAGEMENT AGENCY**

FLOOD INSURANCE RATE MAP

INVASIVE SPECIES MANAGEMENT PLAN

INVASIVE SPECIES MANAGEMENT PLAN

Ground-Mounted Solar Project

at

95 Main Street

Williamsburg, Massachusetts

ZPT ENERGY SOLUTIONS II, LLC

Invasive Species Management within the array footprint:

This area will be seeded with the New England Conservation/Wildlife seed mix available from New England Wetland Plants, Inc., a native seed mixture containing grasses and other herbaceous plants intended to provide soil stabilization and wildlife habitat. The resulting meadow will be mowed annually to control the height of the plants, as well as to keep out woody plant stock, including those woody plants that may be invasive, such as tartarian honeysuckle (*Lonicera tartarica*), multiflora rose (*Rosa multiflora*), Japanese barberry (*Berberis thunbergii*), common buckthorn (*Rhamnus cathartica*), and/or European buckthorn (*Frangula alnus*), etc. No herbicides or pesticides are proposed for the site.

Invasive Species Management for the area between the array and the limit of clearing:

By opening the canopy, this will change the conditions of the understory, and plants that prefer more sun will likely colonize this zone. In order to manage invasive species for this type of site condition, the applicant would pro-actively remove invasive shrubs and saplings (and groundcover plants, if present).

LEC Environmental Consultants, Inc. (LEC), ZPT Energy Solutions environmental consultant that prepared the Request for Determination of Applicability application for Conservation, performed site reconnaissance during their wetland delineation field work. During their reconnaissance, they observed the following non-native invasive species plants in the upland areas of the proposed development:

- Japanese barberry (*Berberis thunbergii*)
- Winged euonymus/burning bush (*Euonymus alatus*)
- Oriental bittersweet (*Celastrus orbiculatus*)
- Multiflora rose (*Rosa multiflora*) - was observed in wetland areas

The applicant proposes the following Invasive Species Management Plan:

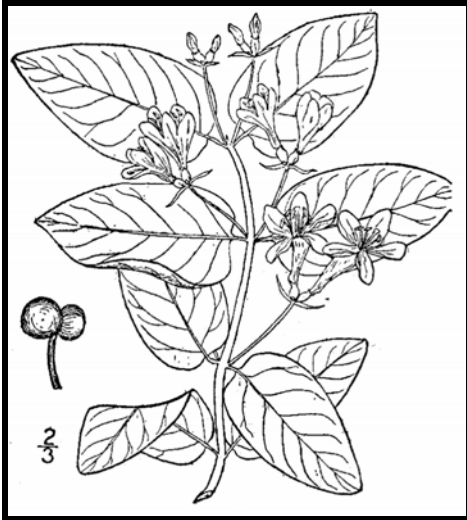
- a) LEC will perform an onsite inspection of this area after the limit of erosion control and clearing are staked in the field by the project surveyor.
- b) An inventory of Invasive Species will be identified and delineated in the field.
- c) A Removal and Maintenance Plan for each Invasive Species identified will be developed and implemented pending Town approval. This will likely consist of removal, by hand, using a weed wrench and/or shovels, etc. A small machine may be required to remove larger specimens.
 1. Upon completion of inspections, the quantity and size of plants identified shall inform the Disposal Method by utilizing the “*Methods for Disposing Non-Native Invasive Plants*” guidelines prepared by the University of New Hampshire Cooperative Extension (refer to document at the end of this Plan) and referenced

by the Massachusetts Department of Environmental Protection and
Massachusetts Association of Conservation Commissions for Disposal Methods.

2. Inspection Reports prepared by LEC detailing identified Invasive Species and proposed Methods of Disposal shall be issued to the Town of Williamsburg Planning Board for approval prior to Disposal.
 - d) After land clearing activity, and prior to grubbing operations within the array footprint, LEC shall coordinate and inspect the removal of any Invasive Species identified. Invasive plants will be removed by the Applicant's landscape contractor per the means and methods described in the "*Methods for Disposing Non-Native Invasive Plants*" and as directed by LEC per Item C above.
 - e) Once the Invasive Species removal effort has been implemented, LEC shall perform bi-monthly (once every 2 months) inspections during the growing season, for the duration of construction, to identify any significant return or germination of invasive plants, and coordinate with the Applicant and landscape contractor for removal and disposal.

Methods for Disposing Non-Native Invasive Plants

Prepared by the Invasives Species Outreach Group, volunteers interested in helping people control invasive plants. Assistance provided by the Piscataquog Land Conservancy and the NH Invasives Species Committee. Edited by Karen Bennett, Extension Forestry Professor and Specialist.



Tatarian honeysuckle

Lonicera tatarica

USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 3: 282.

Non-native invasive plants crowd out natives in natural and managed landscapes. They cost taxpayers billions of dollars each year from lost agricultural and forest crops, decreased biodiversity, impacts to natural resources and the environment, and the cost to control and eradicate them.

Invasive plants grow well even in less than desirable conditions such as sandy soils along roadsides, shaded wooded areas, and in wetlands. In ideal conditions, they grow and spread even faster. There are many ways to remove these non-native invasives, but once removed, care is needed to dispose the removed plant material so the plants don't grow where disposed.

Knowing how a particular plant reproduces indicates its method of spread and helps determine the appropriate disposal method. Most are spread by seed and are dispersed by wind, water, animals, or people. Some reproduce by vegetative means from pieces of stems or roots forming new plants. Others spread through both seed and vegetative means.

Because movement and disposal of viable plant parts is restricted (see NH Regulations), viable invasive parts can't be brought to most transfer stations in the state. Check with your transfer station to see if there is an approved, designated area for invasives disposal. This fact sheet gives recommendations for rendering plant parts non-viable.

Control of invasives is beyond the scope of this fact sheet. For information about control visit www.nhinvasives.org or contact your UNH Cooperative Extension office.

New Hampshire Regulations

Prohibited invasive species shall only be disposed of in a manner that renders them nonliving and nonviable. (Agr. 3802.04)

No person shall collect, transport, import, export, move, buy, sell, distribute, propagate or transplant any living and viable portion of any plant species, which includes all of their cultivars and varieties, listed in Table 3800.1 of the New Hampshire prohibited invasive species list. (Agr 3802.01)

How and When to Dispose of Invasives?

To prevent seed from spreading remove invasive plants before seeds are set (produced). Some plants continue to grow, flower and set seed even after pulling or cutting. Seeds can remain viable in the ground for many years. If the plant has flowers or seeds, place the flowers and seeds in a heavy plastic bag “head first” at the weeding site and transport to the disposal site. The following are general descriptions of disposal methods. See the chart for recommendations by species.

Burning: Large woody branches and trunks can be used as firewood or burned in piles. For outside burning, a written fire permit from the local forest fire warden is required unless the ground is covered in snow. Brush larger than 5 inches in diameter can’t be burned. Invasive plants with easily airborne seeds like black swallow-wort with mature seed pods (indicated by their brown color) shouldn’t be burned as the seeds may disperse by the hot air created by the fire.

Bagging (solarization): Use this technique with softer-tissue plants. Use heavy black or clear plastic bags (contractor grade), making sure that no parts of the plants poke through. Allow the bags to sit in the sun for several weeks and on dark pavement for the best effect.

Tarping and Drying: Pile material on a sheet of plastic and cover with a tarp, fastening the tarp to the ground and monitoring it for escapes. Let the material dry for several weeks, or until it is clearly nonviable.

Chipping: Use this method for woody plants that don’t reproduce vegetatively.

Burying: This is risky, but can be done with watchful diligence. Lay thick plastic in a deep pit before placing the cut up plant material in the hole. Place the material away from the edge of the plastic before covering it with more heavy plastic. Eliminate as much air as possible and toss in soil to weight down the material in the pit. Note that the top of the buried material should be at least three feet underground. Japanese knotweed should be at least 5 feet underground!

Drowning: Fill a large barrel with water and place soft-tissue plants in the water. Check after a few weeks and look for rotted plant material (roots, stems, leaves, flowers). Well-rotted plant material may be composted. A word of caution- seeds may still be viable after using this method. Do this before seeds are set. This method isn’t used often. Be prepared for an awful stink!

Composting: Invasive plants can take root in compost. Don’t compost any invasives unless you know there is no viable (living) plant material left. Use one of the above techniques (bagging, tarping, drying, chipping, or drowning) to render the plants nonviable before composting. Closely examine the plant before composting and avoid composting seeds.






Japanese knotweed
Polygonum cuspidatum
USDA-NRCS PLANTS Database /
Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 1: 676.

Be diligent looking for seedlings for years in areas where removal and disposal took place.

Suggested Disposal Methods for Non-Native Invasive Plants

This table provides information concerning the disposal of removed invasive plant material. If the infestation is treated with herbicide and left in place, these guidelines don't apply. Don't bring invasives to a local transfer station, unless there is a designated area for their disposal, or they have been rendered non-viable. This listing includes wetland and upland plants from the New Hampshire Prohibited Invasive Species List. The disposal of aquatic plants isn't addressed.

Woody Plants	Method of Reproducing	Methods of Disposal
Norway maple <i>(Acer platanoides)</i> European barberry <i>(Berberis vulgaris)</i> Japanese barberry <i>(Berberis thunbergii)</i> autumn olive <i>(Elaeagnus umbellata)</i> burning bush <i>(Euonymus alatus)</i> Morrow's honeysuckle <i>(Lonicera morrowii)</i> Tatarian honeysuckle <i>(Lonicera tatarica)</i> showy bush honeysuckle <i>(Lonicera x bella)</i> common buckthorn <i>(Rhamnus cathartica)</i> glossy buckthorn <i>(Frangula alnus)</i>	Fruit and Seeds 	<div> Prior to fruit/seed ripening Seedlings and small plants <ul style="list-style-type: none"> ▪ Pull or cut and leave on site with roots exposed. No special care needed. Larger plants <ul style="list-style-type: none"> ▪ Use as firewood. ▪ Make a brush pile. ▪ Chip. ▪ Burn. </div> <div> After fruit/seed is ripe Don't remove from site. <ul style="list-style-type: none"> ▪ Burn. ▪ Make a covered brush pile. ▪ Chip once all fruit has dropped from branches. ▪ Leave resulting chips on site and monitor. </div>
oriental bittersweet <i>(Celastrus orbiculatus)</i> multiflora rose <i>(Rosa multiflora)</i>	Fruits, Seeds, Plant Fragments 	<div> Prior to fruit/seed ripening Seedlings and small plants <ul style="list-style-type: none"> ▪ Pull or cut and leave on site with roots exposed. No special care needed. Larger plants <ul style="list-style-type: none"> ▪ Make a brush pile. ▪ Burn. </div> <div> After fruit/seed is ripe Don't remove from site. <ul style="list-style-type: none"> ▪ Burn. ▪ Make a covered brush pile. ▪ Chip – only after material has fully dried (1 year) and all fruit has dropped from branches. Leave resulting chips on site and monitor. </div>

Non-Woody Plants	Method of Reproducing	Methods of Disposal
<p>garlic mustard (<i>Alliaria petiolata</i>)</p> <p>spotted knapweed (<i>Centaurea maculosa</i>)</p> <ul style="list-style-type: none"> ▪ Sap of related knapweed can cause skin irritation and tumors. Wear gloves when handling. <p>black swallow-wort (<i>Cynanchum nigrum</i>)</p> <ul style="list-style-type: none"> ▪ May cause skin rash. Wear gloves and long sleeves when handling. <p>pale swallow-wort (<i>Cynanchum rossicum</i>)</p> <p>giant hogweed (<i>Heracleum mantegazzianum</i>)</p> <ul style="list-style-type: none"> ▪ Can cause major skin rash. Wear gloves and long sleeves when handling. <p>dame's rocket (<i>Hesperis matronalis</i>)</p> <p>perennial pepperweed (<i>Lepidium latifolium</i>)</p> <p>purple loosestrife (<i>Lythrum salicaria</i>)</p> <p>Japanese stilt grass (<i>Microstegium vimineum</i>)</p> <p>mile-a-minute weed (<i>Polygonum perfoliatum</i>)</p>	<p>Fruits and Seeds</p> 	<p>Prior to flowering</p> <p>Depends on scale of infestation</p> <p>Small infestation</p> <ul style="list-style-type: none"> ▪ Pull or cut plant and leave on site with roots exposed. <p>Large infestation</p> <ul style="list-style-type: none"> ▪ Pull or cut plant and pile. (You can pile onto or cover with plastic sheeting). ▪ Monitor. Remove any re-sprouting material. <hr/> <p>During and following flowering</p> <p>Do nothing until the following year or remove flowering heads and bag and let rot.</p> <p>Small infestation</p> <ul style="list-style-type: none"> ▪ Pull or cut plant and leave on site with roots exposed. <p>Large infestation</p> <ul style="list-style-type: none"> ▪ Pull or cut plant and pile remaining material. (You can pile onto plastic or cover with plastic sheeting). ▪ Monitor. Remove any re-sprouting material.
<p>common reed (<i>Phragmites australis</i>)</p> <p>Japanese knotweed (<i>Polygonum cuspidatum</i>)</p> <p>Bohemian knotweed (<i>Polygonum x bohemicum</i>)</p>	<p>Fruits, Seeds, Plant Fragments</p> <p>Primary means of spread in these species is by plant parts. Although all care should be given to preventing the dispersal of seed during control activities, the presence of seed doesn't materially influence disposal activities.</p>	<p>Small infestation</p> <ul style="list-style-type: none"> ▪ Bag all plant material and let rot. ▪ Never pile and use resulting material as compost. ▪ Burn. <p>Large infestation</p> <ul style="list-style-type: none"> ▪ Remove material to unsuitable habitat (dry, hot and sunny or dry and shaded location) and scatter or pile. ▪ Monitor and remove any sprouting material. ▪ Pile, let dry, and burn.

January 2010

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**OPERATION & MAINTENANCE
PLAN FOR THE GROUND-MOUNTED SOLAR
PROJECT**

OPERATIONS & MAINTENANCE PLAN

Ground-Mounted Solar Project

at

95 Main Street

Williamsburg, Massachusetts

ZPT ENERGY SOLUTIONS II, LLC

1.1 OPERATION & MAINTENANCE ANNUAL SCHEDULE

Task	Schedule
Full Site Visual Inspection & Report	Quarterly
Production Performance Report	Quarterly
Inverter Preventative Maintenance	Annually
Medium Voltage Gear Maintenance	Annually
String Voc/Imp	100%, Annually
IV Curve Tracing	100%, Annually
Thermal Imaging Combiners, Inverters, Disconnects	100%, Annually
Warranty Enforcement	4
Issue Tracking of Unscheduled Service Dispatches	4
24/7 Monitoring	4
Dispatch Commitment	48 hrs.
Three (3) Corrective Maintenance Troubleshooting Dispatches (total of 24 hrs.)	Annually
Vegetation Management	As needed

1.2 EXHIBIT A – SYSTEM SERVICES

1.2.1 SYSTEM SERVICES FOR YEARS 1 – 10

PREVENTIVE MAINTENANCE SITE VISITS

One time, annually, additional at request and expense of Project Owner for:

- System testing (voltage/ampereage)
- System visual inspection and necessary corrections, excluding cost of replacement components:
- Inspect for stolen, broken or damaged PV modules, record damage and location. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner
- Inspect PV wiring for loose connections and wire condition. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect for wires in contact with the structure or hanging loose from racking. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract

or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.

- Check mechanical attachment of the PV modules to the racking. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check attachment of racking components to each other and the structure. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Verify proper system grounding is in place from panels to the inverter. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check conduits and raceways for proper anchorage to structures. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect all metallic parts for corrosion. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check combiner boxes for proper fuse size and continuity. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect all wiring connection for signs of poor contact at terminals (burning, discoloration, etc.). Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect disconnection for proper operation. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Survey entire jobsite for debris or obstructions. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project

- Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect fasteners for proper torque and corrosion. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect inverter pad for cracking or settling. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect electrical hardware for proper warning and rating labeling. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Review as built documentation as needed and update as built documentation as changes are required.
 - Inspect alignment of arrays and racking to identify settling foundation or loose attachments. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect operation of tracking hinges, pivots, motors and actuators if present. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Check proper operation and reporting of monitoring hardware. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect sealed electrical components for condensation buildup. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect wiring and hardware for signs of damage from vandalism or animal damage. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.

- Routine system maintenance to include correction of loose electrical connections, ground connections, replacement of defective modules found during testing, other minor maintenance repair work. Tree trimming, and plant trimming work not included.
- Routine DAS maintenance to include sensor calibration and data integrity check.

TROUBLESHOOTING, INSPECTION AND ADDITIONAL REPAIRS

- Dispatch of field services resources within two business days for repairs up to three times per year or as deemed necessary by Operator.
- Major system repairs, not to include mid-voltage switchgear or transformers.

CUSTOMER SERVICE SUPPORT

Support line is available to Project Owner staff to answer questions or report issues.

MAJOR COMPONENTS

Operator will represent Project Owner on all major component issues.

REPORTING

- Monthly Production report will be available online to the Project Owner personnel.
- Annual Performance report will be sent electronically to the Project Owner personnel.
- O&M Manual updates. Complete versions of new editions to be delivered electronically to the Project Owner staff as they become available.
- As Built drawing updates, as necessary.

OTHER SYSTEM SERVICES

Facility staff training, one time per site which will include the follow basic training items:

- General Inspection: A full visual and physical inspection of all systems components and their immediate surroundings carried out in accordance with inspection checklists.
- Safety: Operator will train Project Owner staff on how to safely shut down the system.
- Tree Trimming/Plant Trimming: Operator will train Project Owner staff on what vegetation near structures that need to be trimmed as required by local site conditions.
- Structure Maintenance: Necessary preventive maintenance may be performed on system structural components to ensure continued safe and effective operation.
- The basics of performing a visual inspection: Checklist review with Operator.
- Performance characterization, as determined by Operator.
- O&M Manuals – additional copies, as needed. Updated editions of O&M manuals will be sent electronically to the Project Owner as they become available.
- Management of long-term service and warranty agreements, ongoing. Operator shall provide Project Owner local DFD/AFSD with updates as required.

INVERTER REPAIR

Component replacement and refurbishment as required, in the event of a failure.

INVERTER INSPECTION AND REGULAR SERVICING

As required under inverter manufacturer's warranty specifications. Include but are not limited to the following, one time annually:

- Check appearance/cleanliness of the cabinet, ventilation system and all exposed surfaces.
- Inspect, clean/replace air filter elements.
- Check for corrosion on all terminals, cables and enclosure.
- Check all fuses.
- Perform a complete visual inspection of all internally mounted equipment including subassemblies, wiring harness, contractors, power supplies and all major components.
- Check condition of all the AC and DC surge suppressors.
- Torque terminals and all fasteners in electrical power connections.
- Check the operation of all safety devices (E-stop, door switches)
- Record all operating voltages and current readings via the front display panel.
- Record all inspections completed.
- Inform Manufacturer of all deficiencies identified.
- Manufacturer will be responsible for the In-Warranty replacement of failed inverter components, parts and labor.

SERVICES UNDER THE FOLLOWING WARRANTIES

- 20-year warranty for inverters as set forth in Exhibit F of the EPC Contract.
- 25-year warranty for PV Modules as set forth in Exhibit F of the EPC Contract.

EDUCATION PROGRAM

Operator will work with the Project Owner to provide the following education program one time annually, per site:

- Assistance with development of solar class lesson plans.
- Assistance developing multimedia, social networking tools, and videos.
- Classroom and assembly presentations. Assistance with public education campaigns, activities and workshops surrounding Earth Day and Earth Month community events, outreach, and initiatives.

1.2.2 SYSTEM SERVICES FOR YEARS 11 – 20

PREVENTIVE MAINTENANCE SITE VISITS

One time, annually, additional at request and expense of Project Owner for:

- System testing (voltage/amperage)
- System visual inspection and necessary corrections, excluding cost of replacement components:
- Inspect for stolen, broken or damaged PV modules, record damage and location. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner
- Inspect PV wiring for loose connections and wire condition. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.

- Inspect for wires in contact with the structure or hanging loose from racking. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check mechanical attachment of the PV modules to the racking. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check attachment of racking components to each other and the structure. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Verify proper system grounding is in place from panels to the inverter. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check conduits and raceways for proper anchorage to structures. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect all metallic parts for corrosion. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check combiner boxes for proper fuse size and continuity. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect all wiring connection for signs of poor contact at terminals (burning, discoloration, etc.). Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect disconnection for proper operation. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.

- Survey entire jobsite for debris or obstructions. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect fasteners for proper torque and corrosion. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect inverter pad for cracking or settling. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect electrical hardware for proper warning and rating labeling. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Review as built documentation as needed and update as built documentation as changes are required.
- Inspect alignment of arrays and racking to identify settling foundation or loose attachments. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect operation of tracking hinges, pivots, motors and actuators if present. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check proper operation and reporting of monitoring hardware. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect sealed electrical components for condensation buildup. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect wiring and hardware for signs of damage from vandalism or animal damage. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project

Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.

- Routine system maintenance to include correction of loose electrical connections, ground connections, replacement of defective modules found during testing, other minor maintenance repair work. Tree trimming, and plant trimming work not included.
- Routine DAS maintenance to include sensor calibration and data integrity check.

TROUBLESHOOTING, INSPECTION AND ADDITIONAL REPAIRS

- Dispatch of field services resources within two business days for repairs up to three times per year or as deemed necessary by Operator.
- Major system repairs, not to include mid-voltage switchgear or transformers.

CUSTOMER SERVICE SUPPORT

- *Support line is available to Project Owner staff to answer questions or report issues.*

MAJOR COMPONENTS

- *Operator will represent Project Owner on all major component issues.*

REPORTING

- Monthly Production report will be available online to the Project Owner personnel.
- Annual Performance report will be sent electronically to the Project Owner personnel.
- O&M Manual updates. Complete versions of new editions to be delivered electronically to the Project Owner staff as they become available.
- As Built drawings update as necessary.

OTHER SYSTEM SERVICES

Facility staff training, one time per site which will include the follow basic training items:

- General Inspection: A full visual and physical inspection of all systems components and their immediate surroundings carried out in accordance with inspection checklists.
- Safety: Operator will train Project Owner staff on how to safely shut down the system.
- Tree Trimming/Plant Trimming: Operator will train Project Owner staff on what vegetation near structures that need to be trimmed as required by local site conditions.
- Structure Maintenance: Necessary preventive maintenance may be performed on system structural components to ensure continued safe and effective operation.
- The basics of performing a visual inspection: Checklist review with Operator.
- Performance characterization, as determined by Operator.
- O&M Manuals – additional copies, as needed. Updated editions of O&M manuals will be sent electronically to the Project Owner as they become available.
- Management of long-term service and warranty agreements, ongoing. Operator shall provide Project Owner local DFD/AFSD with updates as required.

INVERTER REPAIR

Component replacement and refurbishment as required in the event of inverter failure.

INVERTER INSPECTION AND REGULAR SERVICING AS REQUIRED UNDER INVERTER MANUFACTURER'S WARRANTY

SPECIFICATIONS

Those include but are not limited to the following one time annually:

- Check appearance/cleanliness of the cabinet, ventilation system and all exposed surfaces.
- Inspect, clean/replace air filter elements.
- Check for corrosion on all terminals, cables and enclosure.
- Check all fuses.
- Perform a complete visual inspection of all internally mounted equipment including subassemblies, wiring harness, contractors, power supplies and all major components.
- Check condition of all the AC and DC surge suppressors.
- Torque terminals and all fasteners in electrical power connections.
- Check the operation of all safety devices (E-stop, door switches)
- Record all operating voltages and current readings via the front display panel.
- Record all inspections completed.
- Inform Manufacturer of all deficiencies identified.
- Manufacturer will be responsible for the In-Warranty replacement of failed inverter components, parts and labor.

SERVICES UNDER THE FOLLOWING WARRANTIES

- 20-year warranty for inverters as set forth in Exhibit F of the EPC Contract.
- 25-year warranty for PV Modules as set forth in Exhibit F of the EPC Contract.

1.3 EXHIBIT B – ADDITIONAL SYSTEM SERVICES

1.3.1 ADDITIONAL SERVICES FOR YEARS 1 – 10

- Additional system and component training.
- Operations, and Maintenance training in addition to what is already included in Exhibit A above.
- System performance evaluation will be covered under out 10-year Performance Guarantee for the first 10 years but is not included in this O&M agreement
- Vegetation management.
- Module Cleaning. Operator may at its option and at no cost to the Project Owner clean the modules to ensure peak performance of the Solar System. Such cleaning is subject to Project Owner approval. If the Project Owner requests module cleaning, Operator shall provide the Project Owner with a competitive quote based on current market prices.
- Security services.
- Response and Repairs due to accidental damages upon request.

- Additional Maintenance, Inspection and Repair available upon request.
- Data Line: Project Owner shall provide Operator a high-speed internet data line for each site during the Term to enable the Operator to record the electric energy generated by the System.

1.3.2 ADDITIONAL SERVICES FOR YEARS 11 – 20

- Additional system and component training
- Operations, and Maintenance training in additional to what is already included in Exhibit A above.
- System performance evaluation will be provided to the Project Owner one time annual in our annual performance report.
- Vegetation management.
- Module Cleaning. Operator may at its option and at no cost to the Project Owner clean the modules to ensure peak performance of the Solar System. Such cleaning is subject to Project Owner approval. If the Project Owner requests module cleaning, Operator shall provide the Project Owner with a competitive quote based on current market prices.
- Security services.
- Response and Repairs due to accidental damages upon request.
- Additional Maintenance, Inspection and Repair available upon request.
- Data Line: Project Owner shall provide Operator a high-speed internet data line for each site during the Term to enable the Operator to record the electric energy generated by the System.

