From: Bachman, Melanie <Melanie.Bachman@ct.gov>
Sent: Wednesday, June 17, 2020 10:12 AM
To: Emily Gianquinto <emily@eaglawllc.com>; CSC-DL Siting Council <Siting.Council@ct.gov>; apiersall@waterfordct.org; Deborah Moshier-Dunn <debm0727@sbcglobal.net>; jean-paul.lamarche@cleanfocus.us; rbrule@waterfordct.org; Hoffman, Lee D. <LHoffman@PULLCOM.COM>
Subject: RE: Petition #1347A

Good morning.

In response to Attorney Gianquinto's below requests, attached please find a copy of Dr. Klemens' resignation letter and the Siting Council's comments on the CEQ's Draft Diggin' Connecticut Report.

Thanks.

Melanie A. Bachman, Esq.

Executive Director/Staff Attorney

Connecticut Siting Council

10 Franklin Square

New Britain, CT 06051

860-827-2951

CSC
CONNECTICUT SITING COUNCIL

From: Emily Gianquinto <emily@eaglawllc.com>
Sent: Wednesday, June 17, 2020 12:56 AM

To: CSC-DL Siting Council <Siting.Council@ct.gov>; Bachman, Melanie <Melanie.Bachman@ct.gov>
Subject: Re: Petition #1347A

Please also provide a copy of item #89, the Council's comments on CEQ's "Digging Connecticut" draft. Thank you.

EAG | LAW LLC

Emily A. Gianquinto, Esq.
emily@eaglawllc.com
P: 860.785.0545 21 Oak Street, Suite 601
F: 860.838.9027 Hartford, CT 06106

On Tue, Jun 16, 2020 at 9:36 PM Emily Gianquinto <emily@eaglawllc.com> wrote:

The Council has listed on its administrative notice list Dr. Klemens' resignation letter from 2019. I do not see that anywhere on the Council's site. Please provide a copy. Thank you.

EAG | LAW LLC

Emily A. Gianquinto, Esq.
emily@eaglawllc.com
P: 860.785.0545 21 Oak Street, Suite 601
F: 860.838.9027 Hartford, CT 06106

From: fenbois@aol.com [mailto:fenbois@aol.com]
Sent: Thursday, May 16, 2019 8:48 PM
To: Fontaine, Lisa
Subject: My resignation

Good Evening Lisa:

I resigned from the CSC on May 15th. I am returning my ID, swipe pass, and parking pass to you via mail. Please let me know that your received them. Best wishes,
Michael

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

January 27, 2016

Connecticut Council on Environmental Quality
Karl J. Wagener, Executive Director
79 Elm Street
Hartford, CT 06106

RE: Digging Connecticut While Protecting its Waters and History: Recommendations for Reducing Impacts of Earth Moving – Special Report, December 4, 2015 Discussion Draft

Dear Mr. Wagener and Members of the Council on Environmental Quality:

Thank you for the opportunity to comment on CEQ's Special Report regarding recommendations to reduce the impacts of earthmoving in the state.

With regard to the case of the East Lyme solar facility, we offer the following comments:

1. **Operation and Maintenance Plan Reports**

   On page 6 of the CEQ Report, it describes a DEEP recommendation pertaining to the Operation and Maintenance (O&M) Plan in the Petition for a Declaratory Ruling for the East Lyme solar project. The O&M Plan is part of the Storm Water Management Plan for the project. This plan was submitted to DEEP as part of a *General Permit for the Discharge of Storm Water and Dewatering Wastewaters from Construction Activities* application. The O&M inspections relate only to post construction inspections and, as part of the General Permit reporting and recordkeeping provisions, are required to be retained for a period of five years. Submission of these reports to the Siting Council would be duplicative for information purposes only and furthermore, submission of these post-construction reports would not have prevented the storm water controls from being overwhelmed during the March 30, 2014 rainstorm that occurred while the solar project was in the midst of construction. Additionally, the General Permit has provisions in place for construction related inspections and reporting. Although the Siting Council staff inspections occurred while the project was under construction, these inspections do not replace any inspection and reporting requirements of the General Permit.

2. **March 30, 2014 Rainstorm**

   Page 5 of the CEQ Report indicates the subject rainstorm that occurred in East Lyme on March 30, 2014 was "far from unprecedented." However, the Report fails to recognize or even acknowledge the duration over which the four inches of rain fell that day. According to news reports, attached hereto for convenience, the March 30, 2014 rainstorm was significant enough to cause the National Weather Service to issue a Flood Warning for most of Connecticut. In southeast Connecticut, where the site is located, two of the four inches of rain that was reported fell within three hours. The storm event was atypical enough to cause street flooding, home evacuations and road washouts.

   The project Storm Water Management Plan used design standards and calculations in accordance with the General Permit and the 2004 Connecticut Storm Water Quality Manual. As specified in these documents, the Storm Water Management Plan utilized record rainfall depths of New London County and for areas located within FEMA FIRM Zone X, which is delineated as "areas determined to be outside the 0.2% annual chance floodplain." Attached please find photographs of the erosion and sedimentation controls employed at the site from an October 11, 2013 site inspection. Construction on the site was phased in accordance with the provisions of the General Permit.

The Storm Water Management Plan also evidenced that peak discharge rates would be less from the pre-developed to post-developed site conditions using design parameters that met the technical drainage requirements set forth by the Town of East Lyme and the State of Connecticut. This is consistent with the goals of the cited Maryland and Pennsylvania guidelines for managing storm water at solar farms – to try and replicate the predevelopment condition after the construction is finished. Furthermore, in a publication entitled, "Hydrologic Response of Solar Farms," a copy of which is attached, from the Journal of Hydrologic Engineering, May 2013 at page 540 under the heading, "Design Suggestions," it states, "With well-maintained grass underneath the panels, the solar panels themselves do not have much effect on total volumes of the runoff or peak discharge rates… If the grass cover of a solar farm is not maintained… the runoff characteristics can change significantly with both runoff rates and volumes increasing by significant amounts." The subject rainstorm occurred *during construction* at a time when there was no grass cover underneath the panels.

3. Joint Efforts between the Siting Council and Town of East Lyme

The Siting Council's jurisdiction extends over the boundaries of the site property and the access road only. Jurisdiction does not extend to off-site properties. There is no mention in the CEQ Report that the Siting Council and Town of East Lyme worked together to address the project's storm water management system during construction. After the March 30, 2014 rainstorm, the Siting Council and the Town of East Lyme met at the site to assess and address on-site and off-site impacts. The resources deployed to the site in response to an unusual event was a necessary undertaking to ensure the site was being remediated and erosion controls reestablished to prevent further sediment release to the surrounding area.

In response to a letter to the Siting Council from the Town of East Lyme dated June 10, 2014 respectfully requesting the Siting Council to order Greenskies to make changes to their Development and Management Plan as directed by the conditions in the Town Inland Wetlands Agency Order, during a meeting held on June 12, 2014, the Siting Council considered and approved implementation of the corrective actions for erosion and sedimentation issues at the site within the Council's jurisdiction and recommended the project developer work with the Town of East Lyme on remediation measures within the town's jurisdiction. A copy of the Siting Council's decision letter and the Town's June 10, 2014 correspondence is attached for convenience.

4. Ongoing Statewide Efforts in Response to Climate Change and Storm Intensity

The state of Connecticut has been proactively addressing issues related to the prevention, planning and mitigation of impacts associated with storms and climate change for several years. On January 9, 2012, the Two Storm Panel, a state team organized by Governor Malloy in response to the statewide impacts from Tropical Storm Irene and the October Nor'easter, issued a report that contained 82 recommendations, including, but not limited to, revisions to state engineering standards to accommodate predicted increases in storm surge. The Two Storm Panel Report found that Connecticut engineering drainage standards currently use rainfall data based on the National Weather Service from the 1960's and data from the Northeast Regional Climate Center indicates a major increase in precipitation over the last 40 years. The Report recommended the Department of

Construction Services, in collaboration with the Department of Transportation (DOT) and DEEP, develop new engineering standards that will better protect the built environment from the effects of extreme weather and that the standards be incorporated into the State Building Code within six months of development to reflect such new standards. Furthermore, through continued efforts the state developed a Comprehensive Energy Strategy, revised Plan of Conservation and Development and Climate Preparedness Plan.

Storm Water General Permits have resulted in environmental improvements. The General Permit requirement is a regulatory mechanism that provides parcel-specific guidance for construction projects relative to design standards and calculations. The provisions of the General Permit, Guidelines for Erosion and Sediment Control and Storm Water Quality Manual are designed to be protective of the environment.

Lastly, the recommendation for DEEP to adopt a new general permit or adopt special guidelines for solar projects under existing permits begs the question as to whether DEEP should adopt a new general permit or adopt special guidelines for all other types of projects that are subject to the permit requirement. There is no indication in the CEQ Report as to what these new permits or guidelines would entail.

Thank you for the opportunity to comment on the CEQ Report.

Should you have any questions regarding the comments, please feel free to contact our office.

Sincerely,

Melanie A. Bachman
Acting Executive Director/Staff Attorney

Enclosures – News8 wtnh.com, National Weather Service warns of flash floods
NBC Connecticut, Heavy Rains Lead to Flooding Around State
Floodlist.com, Storms Bring Floods to North East USA
Construction Site Visit Memo
Hydrologic Response of Solar Farms
Correspondence between Greenskies, East Lyme and Connecticut Siting Council

NEWS8
wtnh.com

National Weather Service warns of flash floods

Associated Press
Published: March 30, 2014, 11:41 am

HARTFORD, Conn. (AP) — The National Weather Service has issued a flash flood warning for most of Connecticut as a days-long rain storm soaks the state.

Flooding closed several roads in Norwich on Sunday as the National Weather Service reports some areas in southeastern Connecticut received 2 inches of rain in three hours.

One road washed away and another road was closed.

Emergency management director Gene Arters says Route 12 and a local street were flooded with as much as 2 feet of water. He says an emergency shelter has opened at Kelly Middle School for residents who need to leave their homes.

Heavy Rains Lead to Flooding Around State

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Heavy Rains Caused March Flooding

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1 VIDEO Pregnant Teen Dies After Shoveling Snow

2 Missouri Mom Admits to Poisoning Family with Antifreeze

3 VIDEO 1-Year-Old, Mom Killed by Carbon Monoxide as Dad Clears Snow

4 Man Sought in $50,000 Westfarms Shoplifting

5 Niagara Falls Could Turn Into Temporary Trickle

Flood warnings and watches have been issued after heavy rain swept the state Sunday morning.

Flood warnings remain in effect for Fairfield, Litchfield, New Haven and New London counties. Flood watches have been posted statewide.

A winter weather advisory has also been issued for Litchfield County overnight Sunday into Monday, as dropping temperatures could bring sleet and ice.

Steady rain falling this morning has lightened up and is expected to turn to showers in the afternoon.

- **TRACK THE STORM HERE**

WEATHER FORECAST
Hartford, CT
38° Clear
Feels Like 33°

Several homes and streets have flooded in Norwich, according to Director of Emergency Management Gene Arters. Boswell Avenue was washed out and has been closed throughout the morning but one lane is now passable.

Kelly Middle School will open at noon to serve as a shelter for those affected by the flooding.

A number of small rivers around the state have jumped their banks. Moderate flooding has been reported at the Yantic River in Norwich, which crested at just over 10 feet, the highest since March 2010.

The Mount Hope River in Ashford, Willimantic River in Coventry and Housatonic River in New Milford and below the Stevenson Dam have seen minor flooding.

A flood warning has also been issued for the Pawcatuck River in Stonington, which is still rising. Minor flooding is expected and will mostly affect the Rhode Island side of the river.

- **VIDEO: Flooding in Clinton, Conn.**

Downpours will resume around dinnertime and could be accompanied by thunder, lightning and even some small hail.

Some parts of the state, including Norwich, North Stonington and Westbrook, have received more than 4 inches of rain since the start of the storm. Check for updated rain totals here.

Along with all the precipitation comes much cooler temperatures. The colder air will filter in later tonight, changing some of the rain to sleet and possibly even some wet snow in the hills.

- **CHECK THE FULL FORECAST**

Expect to wake up Monday morning to chilly temperatures, sleet and some wet snow flakes.

Relief is coming, as the temperatures should be in the 50s once April rolls around on Tuesday.

Send your weather photos to shareit@nbcconnecticut.com.

All bright green indicating flood advisories/flood warnings #Housatonic #Yantic #Park #Hartford #FirstAlertCT pic.twitter.com/OrNlp7B0DI

— Darren Sweeney NBCCT (@DarrenSweeney) March 30, 2014

Published at 6:59 AM EDT on Mar 30, 2014

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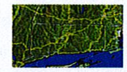
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Storms Bring Floods to North East USA

31 MARCH, 2014 BY RICHARD DAVIES IN USA

A storm system across the north east of the USA resulted in flooding in several states, including New York, Massachusetts, Rhode Island and Connecticut over the weekend. New Jersey and New Hampshire also saw some heavy rainfall.

Massachusetts

Several roads in Boston were closed over the weekend as a result of the flooding. Flooding also closed roads in New Bedford, Freetown, Westwood and Chelmsford. The heavy rain and storm also left a huge sinkhole in Boston Road, Chelmsford. Roads in the area will remain closed for at least the next 3 days.

The Prudential Tunnel off the eastbound Massachusetts Turnpike was flooded on Sunday 30 March 2014 and closed for several hours. It reopened around 5pm the same day.

Acushnet in Bristol County saw 5.07 inches in a 24 hour period up to early Sunday afternoon.

> *Over 3.5" of rain in Acushnet today.* pic.twitter.com/tQM6mw5GQh
>
> *— Ed Caron (@sher242)* March 31, 2014

Taunton, also in Bristol County, saw flood water as high as a foot and a half on some roads. Taunton River levels are also very high.

Rhode Island

A woman had to be rescued after her vehicle became trapped in flood water in Cranston, Rhode Island, on Sunday 23 March 2014.

> *Picture: Significant #flooding from excessive rainfall in the Cranston, #RhodeIsland area this morning via @wpri12 pic.twitter.com/hRqRqnnOug*
>
> *— Johnny Kelly (@stormchaser4850)* March 30, 2014

There is currently concern over the high levels of the Pawtuxet River, which could cause flooding for residents living close to the river. The river bursts its banks in 2010 causing severe damage to local houses.

FLOODLIST DIRECTORY

- Damage Restoration
- Elevation Certificates
- Flood Risk Assessment
- Pumps and Pumping
- Sandbags and Alternatives
- More...

RELATED NEWS

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- Insured Losses from December Storms and Floods in US and UK to Exceed $4.2 Billion

COPERNICUS

Copernicus Europe's eyes on Earth

FloodList is funded by Copernicus, the European system for Earth monitoring.

New Bedford floods. Photo: sdepina11 @ twitter

Kingston, Rhode Island, recorded 5.53 inches of rain in a 24 hour period up to early Sunday afternoon

Connecticut

In a similar story, the heavy rain in Sunday left as much as 2 feet of flood water on some roads in the Norwich area, Connecticut. Around 2 inches of rain fell in just 3 hours. The flooding was so bad parts of some roads were washed away. Around 10 people had to be rescued from their flooded homes and evacuated to safer accommodation.

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- Look for the page with your search engine.
- Refresh the page in a few minutes.

New York

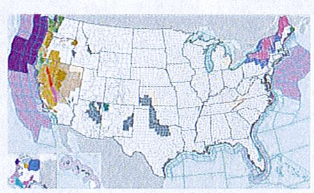
Westchester County, New York, also saw some heavy rainfall and flooding on some local roads during Sunday 30 March 2014. Briarcliff Manor saw 3.05 inches of rain, Irvington, 2.55 inches, and Westchester Airport, 2.44 inches.

Sources: ABC6; Daily Voice; Norwich Bulletin; My Fox Boston; Boston News; Tauton Gazette

Related

Coastal Flooding in Massachusetts after Winter Storm Juno Hits

Dramatic Flooding in Eastern USA after Unprecedented Rainfall



East and West Coast Storms - Flooding in Tri-State Area, Flood Warnings for Northern California

Connecticut Massachusetts New York Rhode Island

Petition 1056 – Construction Site Visit

October 11, 2013

Staff member Robert Mercier visited the GRE site on October 11, 2013 to observe site conditions.

At site, I met Ryan McNamara of Centerplan construction. We discussed current project status and past issues with the project. Discussed items included

- Wingardner well- Centerplan believes excavation caused vibrations to well, releasing accumulated material around casing that got into their water supply. Centerplan discussed issue with them, no further complaints to date.

- Public hearing – a town hearing was held on Oct. 3- about 40 people attended, mostly abutters. Concerns include, safety, fire, noise. Centerplan handed out information packet. Noise from inverters would be minimal.

- Fire marshal expressed support at meeting. Centerplan did meet fire marshal to discuss site safety numerous times.

-outlet to drainage basin on south side will be altered to have water flow to east rather than west. Town requested change to prevent ongoing flooding concerns on abutting properties. Alteration to DEEP permit is considered a field change. Centerplan to submit revised drawing to Council

- Hudyma boulders back in place, gate propped up- new gate is planned.

<u>Site conditions</u>

Site was still under construction. Site has been divided into two phases for construction purposes- Phase 1 is the north side, Phase 2 is the south side.

Phase 1, final site grading is occurring. Detention basins are under construction, geotex fabric being installed within the basins and the leaky berm on the east edge of site. Drainage features 90% complete. Solar panel racks have been delivered and are stored on north edge. Electrical ditches to be installed starting within two weeks then followed by racking system . Soil stockpile in phase 1 to be exported to Phase 2 for grading.

Phase 2- rough clearing and grading has occurred. No other work.

Tinker parcel- clearing and grading to accommodate utility install.

Walked perimeter of site. E&S controls in place, using silt soxx and silt fence. Danger signs at points of easy site access from abutters. Berm of unsuitable fill material in Phase 1 area now covered in grass. No outwash visible in any downgradient location. North side also hade sediment check dams within solar field area to deal with channelized drainage pattern.

No issues observed.

I also examined the area near the Dombrowski property- requested plantings. The property line area is well vegetated, could not see the house clearly.

Clearing along Wingardner property line- south side of house. Area of excessive clearing.

Rough clearing on west property line- Ader parcel – Phase 2. Bennet property to left.

View west onto tinker parcel. Clearing for utility line.

Vegetated berm. Leaky berm with geotex fabric. To upper left. Phase 1.

Sediment check dams. Phase 1. Racking system stored on-site beyond excavator.

View north across Phase 2 area. Rough graded. House (not shown) still in place. Debris in foreground from shed.

Hydrologic Response of Solar Farms

Lauren M. Cook, S.M.ASCE[1]; and Richard H. McCuen, M.ASCE[2]

Abstract: Because of the benefits of solar energy, the number of solar farms is increasing; however, their hydrologic impacts have not been studied. The goal of this study was to determine the hydrologic effects of solar farms and examine whether or not storm-water management is needed to control runoff volumes and rates. A model of a solar farm was used to simulate runoff for two conditions: the pre- and postpaneled conditions. Using sensitivity analyses, modeling showed that the solar panels themselves did not have a significant effect on the runoff volumes, peaks, or times to peak. However, if the ground cover under the panels is gravel or bare ground, owing to design decisions or lack of maintenance, the peak discharge may increase significantly with storm-water management needed. In addition, the kinetic energy of the flow that drains from the panels was found to be greater than that of the rainfall, which could cause erosion at the base of the panels. Thus, it is recommended that the grass beneath the panels be well maintained or that a buffer strip be placed after the most downgradient row of panels. This study, along with design recommendations, can be used as a guide for the future design of solar farms. **DOI: 10.1061/(ASCE)HE.1943-5584.0000530.** *© 2013 American Society of Civil Engineers.*

CE Database subject headings: Hydrology; Land use; Solar power; Floods; Surface water; Runoff; Stormwater management.

Author keywords: Hydrology; Land use change; Solar energy; Flooding; Surface water runoff; Storm-water management.

Introduction

Storm-water management practices are generally implemented to reverse the effects of land-cover changes that cause increases in volumes and rates of runoff. This is a concern posed for new types of land-cover change such as the solar farm. Solar energy is a renewable energy source that is expected to increase in importance in the near future. Because solar farms require considerable land, it is necessary to understand the design of solar farms and their potential effect on erosion rates and storm runoff, especially the impact on offsite properties and receiving streams. These farms can vary in size from 8 ha (20 acres) in residential areas to 250 ha (600 acres) in areas where land is abundant.

The solar panels are impervious to rain water; however, they are mounted on metal rods and placed over pervious land. In some cases, the area below the panel is paved or covered with gravel. Service roads are generally located between rows of panels. Altlhough some panels are stationary, others are designed to move so that the angle of the panel varies with the angle of the sun. The angle can range, depending on the latitude, from 22° during the summer months to 74° during the winter months. In addition, the angle and direction can also change throughout the day. The issue posed is whether or not these rows of impervious panels will change the runoff characteristics of the site, specifically increase runoff volumes or peak discharge rates. If the increases are hydrologically significant, storm-water management facilities may be needed. Additionally, it is possible that the velocity of water draining from the edge of the panels is sufficient to cause erosion of the soil below the panels, especially where the maintenance roadways are bare ground.

The outcome of this study provides guidance for assessing the hydrologic effects of solar farms, which is important to those who plan, design, and install arrays of solar panels. Those who design solar farms may need to provide for storm-water management. This study investigated the hydrologic effects of solar farms, assessed whether or not storm-water management might be needed, and if the velocity of the runoff from the panels could be sufficient to cause erosion of the soil below the panels.

Model Development

Solar farms are generally designed to maximize the amount of energy produced per unit of land area, while still allowing space for maintenance. The hydrologic response of solar farms is not usually considered in design. Typically, the panels will be arrayed in long rows with separations between the rows to allow for maintenance vehicles. To model a typical layout, a unit width of one panel was assumed, with the length of the downgradient strip depending on the size of the farm. For example, a solar farm with 30 rows of 200 panels each could be modeled as a strip of 30 panels with space between the panels for maintenance vehicles. Rainwater that drains from the upper panel onto the ground will flow over the land under the 29 panels on the downgradient strip. Depending on the land cover, infiltration losses would be expected as the runoff flows to the bottom of the slope.

To determine the effects that the solar panels have on runoff characteristics, a model of a solar farm was developed. Runoff in the form of sheet flow without the addition of the solar panels served as the prepaneled condition. The paneled condition assumed a downgradient series of cells with one solar panel per ground cell. Each cell was separated into three sections: wet, dry, and spacer.

The dry section is that portion directly underneath the solar panel, unexposed directly to the rainfall. As the angle of the panel from the horizontal increases, more of the rain will fall directly onto

[1]Research Assistant, Dept. of Civil and Environmental Engineering, Univ. of Maryland, College Park, MD 20742-3021.

[2]The Ben Dyer Professor, Dept. of Civil and Environmental Engineering, Univ. of Maryland, College Park, MD 20742-3021 (corresponding author). E-mail: rhmccuen@eng.umd.edu

Note. This manuscript was submitted on August 12, 2010; approved on October 20, 2011; published online on October 24, 2011. Discussion period open until October 1, 2013; separate discussions must be submitted for individual papers. This paper is part of the ***Journal of Hydrologic Engineering***, Vol. 18, No. 5, May 1, 2013. © ASCE, ISSN 1084-0699/2013/5-536-541/$25.00.

J. Hydrol. Eng., 2013, 18(5): 536-541

the ground; this section of the cell is referred to as the wet section. The spacer section is the area between the rows of panels used by maintenance vehicles. Fig. 1 is an image of two solar panels and the spacer section allotted for maintenance vehicles. Fig. 2 is a schematic of the wet, dry, and spacer sections with their respective dimensions. In Fig. 1, tracks from the vehicles are visible on what is modeled within as the spacer section. When the solar panel is horizontal, then the length longitudinal to the direction that runoff will occur is the length of the dry and wet sections combined. Runoff from a dry section drains onto the downgradient spacer section. Runoff from the spacer section flows to the wet section of the next downgradient cell. Water that drains from a solar panel falls directly onto the spacer section of that cell.

The length of the spacer section is constant. During a storm event, the loss rate was assumed constant for the 24-h storm because a wet antecedent condition was assumed. The lengths of the wet and dry sections changed depending on the angle of the solar panel. The total length of the wet and dry sections was set

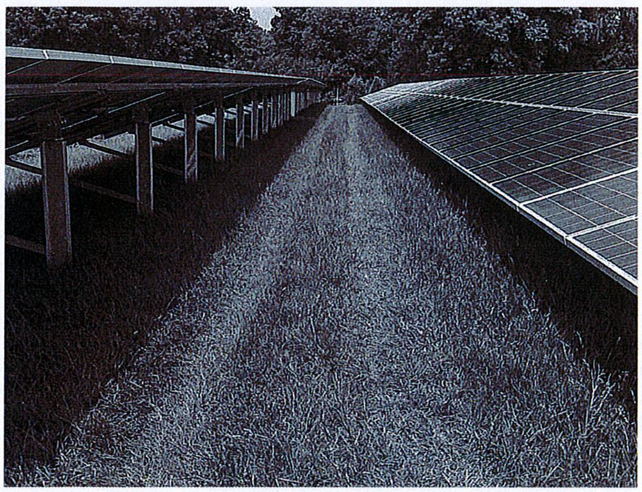


Fig. 1. Maintenance or "spacer" section between two rows of solar panels (photo by John E. Showler, reprinted with permission)

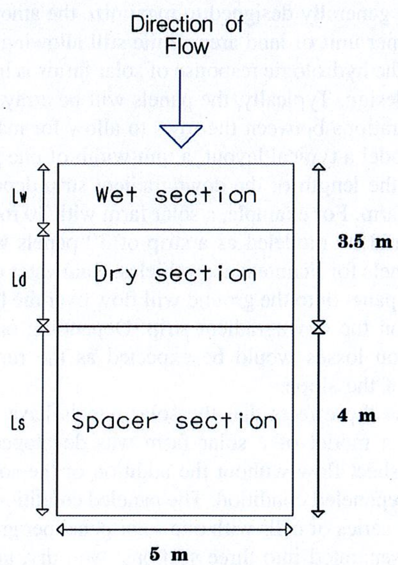


Fig. 2. Wet, dry, and spacer sections of a single cell with lengths *Lw*, *Ls*, and *Ld* with the solar panel covering the dry section

equal to the length of one horizontal solar panel, which was assumed to be 3.5 m. When a solar panel is horizontal, the dry section length would equal 3.5 m and the wet section length would be zero. In the paneled condition, the dry section does not receive direct rainfall because the rain first falls onto the solar panel then drains onto the spacer section. However, the dry section does infiltrate some of the runoff that comes from the upgradient wet section. The wet section was modeled similar to the spacer section with rain falling directly onto the section and assuming a constant loss rate.

For the presolar panel condition, the spacer and wet sections are modeled the same as in the paneled condition; however, the cell does not include a dry section. In the prepaneled condition, rain falls directly onto the entire cell. When modeling the prepaneled condition, all cells receive rainfall at the same rate and are subject to losses. All other conditions were assumed to remain the same such that the prepaneled and paneled conditions can be compared.

Rainfall was modeled after an natural resources conservation service (NRCS) Type II Storm (McCuen 2005) because it is an accurate representation of actual storms of varying characteristics that are imbedded in intensity-duration-frequency (IDF) curves. For each duration of interest, a dimensionless hyetograph was developed using a time increment of 12 s over the duration of the storm (see Fig. 3). The depth of rainfall that corresponds to each storm magnitude was then multiplied by the dimensionless hyetograph. For a 2-h storm duration, depths of 40.6, 76.2, and 101.6 mm were used for the 2-, 25-, and 100-year events. The 2- and 6-h duration hyetographs were developed using the center portion of the 24-h storm, with the rainfall depths established with the Baltimore IDF curve. The corresponding depths for a 6-h duration were 53.3, 106.7, and 132.1 mm, respectively. These magnitudes were chosen to give a range of storm conditions.

During each time increment, the depth of rain is multiplied by the cell area to determine the volume of rain added to each section of each cell. This volume becomes the storage in each cell. Depending on the soil group, a constant volume of losses was subtracted from the storage. The runoff velocity from a solar panel was calculated using Manning's equation, with the hydraulic radius for sheet flow assumed to equal the depth of the storage on the panel (Bedient and Huber 2002). Similar assumptions were made to compute the velocities in each section of the surface sections.

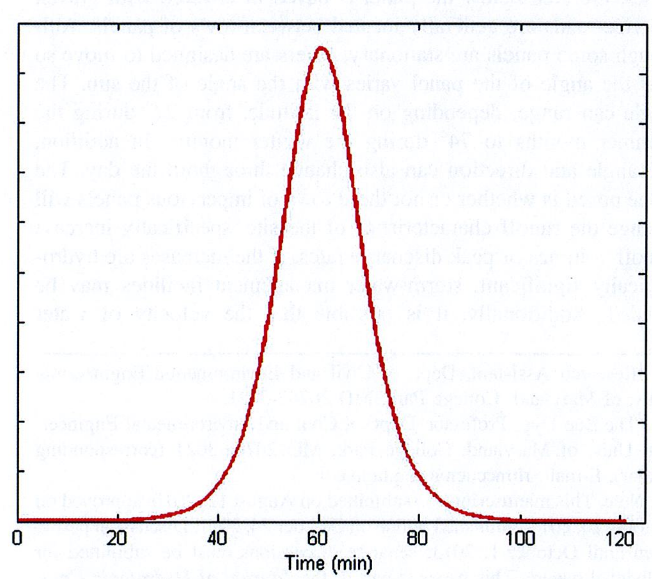


Fig. 3. Dimensionless hyetograph of 2-h Type II storm

J. Hydrol. Eng., 2013, 18(5): 536-541

Runoff from one section to the next and then to the next downgradient cell was routed using the continuity of mass. The routing coefficient depended on the depth of flow in storage and the velocity of runoff. Flow was routed from the wet section to the dry section to the spacer section, with flow from the spacer section draining to the wet section of the next cell. Flow from the most downgradient cell was assumed to be the outflow. Discharge rates and volumes from the most downgradient cell were used for comparisons between the prepaneled and paneled conditions.

Alternative Model Scenarios

To assess the effects of the different variables, a section of 30 cells, each with a solar panel, was assumed for the base model. Each cell was separated individually into wet, dry, and spacer sections. The area had a total ground length of 225 m with a ground slope of 1% and width of 5 m, which was the width of an average solar panel. The roughness coefficient (Engman 1986) for the silicon solar panel was assumed to be that of glass, 0.01. Roughness coefficients of 0.15 for grass and 0.02 for bare ground were also assumed. Loss rates of 0.5715 cm/h (0.225 in./h) and 0.254 cm/h (0.1 in./h) for B and C soils, respectively, were assumed.

The prepaneled condition using the 2-h, 25-year rainfall was assumed for the base condition, with each cell assumed to have a good grass cover condition. All other analyses were made assuming a paneled condition. For most scenarios, the runoff volumes and peak discharge rates from the paneled model were not significantly greater than those for the prepaneled condition. Over a total length of 225 m with 30 solar panels, the runoff increased by 0.26 m^3, which was a difference of only 0.35%. The slight increase in runoff volume reflects the slightly higher velocities for the paneled condition. The peak discharge increased by 0.0013 m^3, a change of only 0.31%. The time to peak was delayed by one time increment, i.e., 12 s. Inclusion of the panels did not have a significant hydrologic impact.

Storm Magnitude

The effect of storm magnitude was investigated by changing the magnitude from a 25-year storm to a 2-year storm. For the 2-year storm, the rainfall and runoff volumes decreased by approximately 50%. However, the runoff from the paneled watershed condition increased compared to the prepaneled condition by approximately the same volume as for the 25-year analysis, 0.26 m^3. This increase represents only a 0.78% increase in volume. The peak discharge and the time to peak did not change significantly. These results reflect runoff from a good grass cover condition and indicated that the general conclusion of very minimal impacts was the same for different storm magnitudes.

Ground Slope

The effect of the downgradient ground slope of the solar farm was also examined. The angle of the solar panels would influence the velocity of flows from the panels. As the ground slope was increased, the velocity of flow over the ground surface would be closer to that on the panels. This could cause an overall increase in discharge rates. The ground slope was changed from 1 to 5%, with all other conditions remaining the same as the base conditions.

With the steeper incline, the volume of losses decreased from that for the 1% slope, which is to be expected because the faster velocity of the runoff would provide less opportunity for infiltration. However, between the prepaneled and paneled conditions, the increase in runoff volume was less than 1%. The peak discharge and the time to peak did not change. Therefore, the greater ground slope did not significantly influence the response of the solar farm.

Soil Type

The effect of soil type on the runoff was also examined. The soil group was changed from B soil to C soil by varying the loss rate. As expected, owing to the higher loss rate for the C soil, the depths of runoff increased by approximately 7.5% with the C soil when compared with the volume for B soils. However, the runoff volume for the C soil condition only increased by 0.17% from the prepaneled condition to the paneled condition. In comparison with the B soil, a difference of 0.35% in volume resulted between the two conditions. Therefore, the soil group influenced the actual volumes and rates, but not the relative effect of the paneled condition when compared to the prepaneled condition.

Panel Angle

Because runoff velocities increase with slope, the effect of the angle of the solar panel on the hydrologic response was examined. Analyses were made for angles of 30° and 70° to test an average range from winter to summer. The hydrologic response for these angles was compared to that of the base condition angle of 45°. The other site conditions remained the same. The analyses showed that the angle of the panel had only a slight effect on runoff volumes and discharge rates. The lower angle of 30° was associated with an increased runoff volume, whereas the runoff volume decreased for the steeper angle of 70° when compared with the base condition of 45°. However, the differences (~0.5%) were very slight. Nevertheless, these results indicate that, when the solar panel was closer to horizontal, i.e., at a lower angle, a larger difference in runoff volume occurred between the prepaneled and paneled conditions. These differences in the response result are from differences in loss rates.

The peak discharge was also lower at the lower angle. At an angle of 30°, the peak discharge was slightly lower than at the higher angle of 70°. For the 2-h storm duration, the time to peak of the 30° angle was 2 min delayed from the time to peak of when the panel was positioned at a 70° angle, which reflects the longer travel times across the solar panels.

Storm Duration

To assess the effect of storm duration, analyses were made for 6-h storms, testing magnitudes for 2-, 25-, and 100-year return periods, with the results compared with those for the 2-h rainfall events. The longer storm duration was tested to determine whether a longer duration storm would produce a different ratio of increase in runoff between the prepaneled and paneled conditions. When compared to runoff volumes from the 2-h storm, those for the 6-h storm were 34% greater in both the paneled and prepaneled cases. However, when comparing the prepaneled to the paneled condition, the increase in the runoff volume with the 6-h storm was less than 1% regardless of the return period. The peak discharge and the time-to-peak did not differ significantly between the two conditions. The trends in the hydrologic response of the solar farm did not vary with storm duration.

Ground Cover

The ground cover under the panels was assumed to be a native grass that received little maintenance. For some solar farms, the area beneath the panel is covered in gravel or partially paved because the panels prevent the grass from receiving sunlight. Depending on the

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volume of traffic, the spacer cell could be grass, patches of grass, or bare ground. Thus, it was necessary to determine whether or not these alternative ground-cover conditions would affect the runoff characteristics. This was accomplished by changing the Manning's n for the ground beneath the panels. The value of n under the panels, i.e., the dry section, was set to 0.015 for gravel, with the value for the spacer or maintenance section set to 0.02, i.e., bare ground. These can be compared to the base condition of a native grass ($n = 0.15$). A good cover should promote losses and delay the runoff.

For the smoother surfaces, the velocity of the runoff increased and the losses decreased, which resulted in increasing runoff volumes. This occurred both when the ground cover under the panels was changed to gravel and when the cover in the spacer section was changed to bare ground. Owing to the higher velocities of the flow, runoff rates from the cells increased significantly such that it was necessary to reduce the computational time increment. Fig. 4(a) shows the hydrograph from a 30-panel area with a time increment of 12 s. With a time increment of 12 s, the water in each cell is discharged at the end of every time increment, which results in no attenuation of the flow; thus, the undulations shown in Fig. 4(a) result. The time increment was reduced to 3 s for the 2-h storm, which resulted in watershed smoothing and a rational hydrograph shape [Fig. 4(b)]. The results showed that the storm runoff

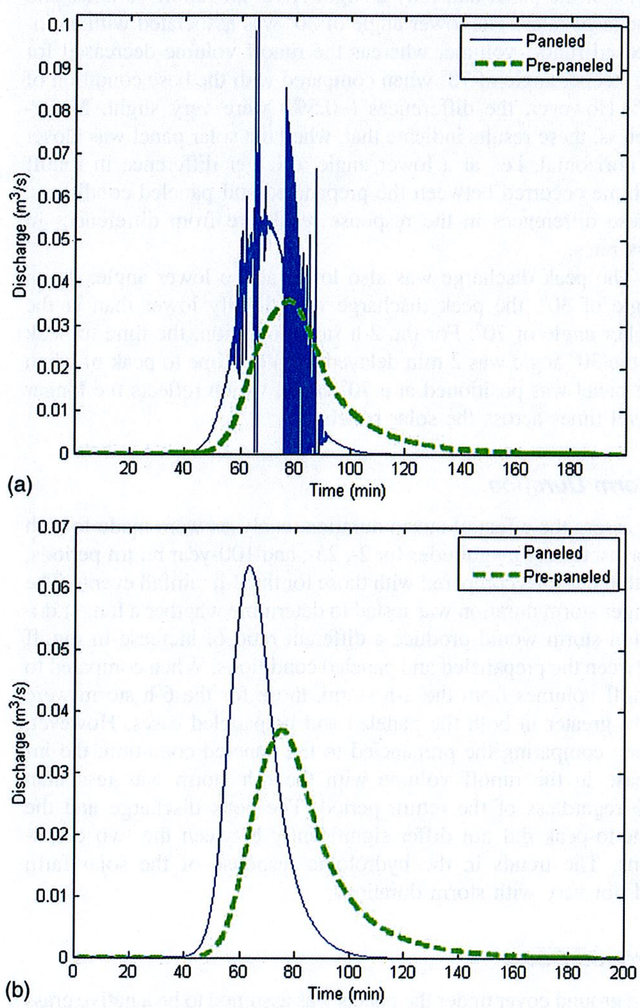

Fig. 4. Hydrograph with time increment of (a) 12 s; (b) 3 s with Manning's n for bare ground

increased by 7% from the grass-covered scenario to the scenario with gravel under the panel. The peak discharge increased by 73% for the gravel ground cover when compared with the grass cover without the panels. The time to peak was 10 min less with the gravel than with the grass, which reflects the effect of differences in surface roughness and the resulting velocities.

If maintenance vehicles used the spacer section regularly and the grass cover was not adequately maintained, the soil in the spacer section would be compacted and potentially the runoff volumes and rates would increase. Grass that is not maintained has the potential to become patchy and turn to bare ground. The grass under the panel may not get enough sunlight and die. Fig. 1 shows the result of the maintenance trucks frequently driving in the spacer section, which diminished the grass cover.

The effect of the lack of solar farm maintenance on runoff characteristics was modeled by changing the Manning's n to a value of 0.02 for bare ground. In this scenario, the roughness coefficient for the ground under the panels, i.e., the dry section, as well as in the spacer cell was changed from grass covered to bare ground ($n = 0.02$).The effects were nearly identical to that of the gravel. The runoff volume increased by 7% from the grass-covered to the bare-ground condition. The peak discharge increased by 72% when compared with the grass-covered condition. The runoff for the bare-ground condition also resulted in an earlier time to peak by approximately 10 min. Two other conditions were also modeled, showing similar results. In the first scenario, gravel was placed directly under the panel, and healthy grass was placed in the spacer section, which mimics a possible design decision. Under these conditions, the peak discharge increased by 42%, and the volume of runoff increased by 4%, which suggests that storm-water management would be necessary if gravel is placed anywhere.

Fig. 5 shows two solar panels from a solar farm in New Jersey. The bare ground between the panels can cause increased runoff rates and reductions in time of concentration, both of which could necessitate storm-water management. The final condition modeled involved the assumption of healthy grass beneath the panels and bare ground in the spacer section, which would simulate the condition of unmaintained grass resulting from vehicles that drive over the spacer section. Because the spacer section is 53% of the cell, the change in land cover to bare ground would reduce losses and decrease runoff travel times, which would cause runoff to amass as it

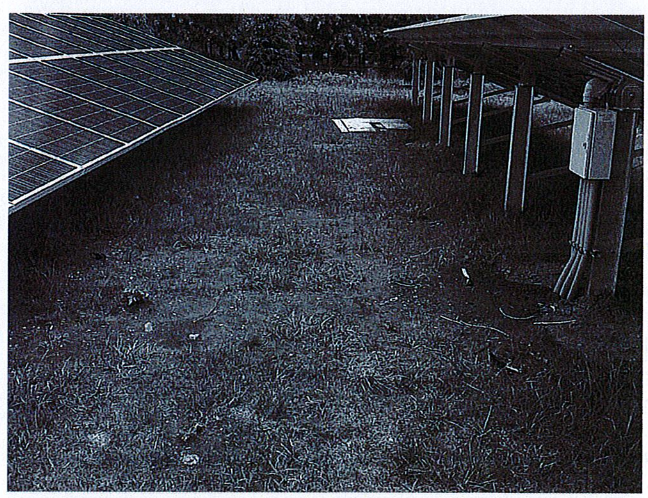

Fig. 5. Site showing the initiation of bare ground below the panels, which increases the potential for erosion (photo by John Showler, reprinted with permission)

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moves downgradient. With the spacer section as bare ground, the peak discharge increased by 100%, which reflected the increases in volume and decrease in timing. These results illustrate the need for maintenance of the grass below and between the panels.

Design Suggestions

With well-maintained grass underneath the panels, the solar panels themselves do not have much effect on total volumes of the runoff or peak discharge rates. Although the panels are impervious, the rainwater that drains from the panels appears as runoff over the downgradient cells. Some of the runoff infiltrates. If the grass cover of a solar farm is not maintained, it can deteriorate either because of a lack of sunlight or maintenance vehicle traffic. In this case, the runoff characteristics can change significantly with both runoff rates and volumes increasing by significant amounts. In addition, if gravel or pavement is placed underneath the panels, this can also contribute to a significant increase in the hydrologic response.

If bare ground is foreseen to be a problem or gravel is to be placed under the panels to prevent erosion, it is necessary to counteract the excess runoff using some form of storm-water management. A simple practice that can be implemented is a buffer strip (Dabney et al. 2006) at the downgradient end of the solar farm. The buffer strip length must be sufficient to return the runoff characteristics with the panels to those of runoff experienced before the gravel and panels were installed. Alternatively, a detention basin can be installed.

A buffer strip was modeled along with the panels. For approximately every 200 m of panels, or 29 cells, the buffer must be 5 cells long (or 35 m) to reduce the runoff volume to that which occurred before the panels were added. Even if a gravel base is not placed under the panels, the inclusion of a buffer strip may be a good practice when grass maintenance is not a top funding priority. Fig. 6 shows the peak discharge from the graveled surface versus the length of the buffer needed to keep the discharge to prepaneled peak rate.

Water draining from a solar panel can increase the potential for erosion of the spacer section. If the spacer section is bare ground, the high kinetic energy of water draining from the panel can cause soil detachment and transport (Garde and Raju 1977; Beuselinck et al. 2002). The amount and risk of erosion was modeled using the velocity of water coming off a solar panel compared with the velocity and intensity of the rainwater. The velocity of panel runoff was calculated using Manning's equation, and the velocity of falling rainwater was calculated using the following:

$$V_t = 120\, d_r^{0.35} \quad (1)$$

where d_r = diameter of a raindrop, assumed to be 1 mm. The relationship between kinetic energy and rainfall intensity is

$$K_e = 916 + 330 \log_{10} i \quad (2)$$

where i = rainfall intensity (in./h) and K_e = kinetic energy (ft-tons per ac-in. of rain) of rain falling onto the wet section and the panel, as well as the water flowing off of the end of the panel (Wischmeier and Smith 1978). The kinetic energy (Salles et al. 2002) of the rainfall was greater than that coming off the panel, but the area under the panel (i.e., the product of the length, width, and cosine of the panel angle) is greater than the area under the edge of the panel where the water drains from the panel onto the ground. Thus, dividing the kinetic energy by the respective areas gives a more accurate representation of the kinetic energy experienced by the soil. The energy of the water draining from the panel onto the ground can be nearly 10 times greater than the rain itself falling onto the ground area. If the solar panel runoff falls onto an unsealed soil, considerable detachment can result (Motha et al. 2004). Thus, because of the increased kinetic energy, it is possible that the soil is much more prone to erosion with the panels than without. Where panels are installed, methods of erosion control should be included in the design.

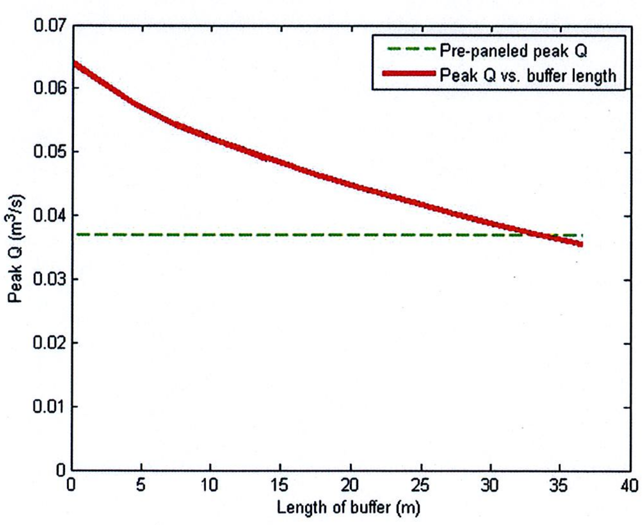

Fig. 6. Peak discharge over gravel compared with buffer length

Conclusions

Solar farms are the energy generators of the future; thus, it is important to determine the environmental and hydrologic effects of these farms, both existing and proposed. A model was created to simulate storm-water runoff over a land surface without panels and then with solar panels added. Various sensitivity analyses were conducted including changing the storm duration and volume, soil type, ground slope, panel angle, and ground cover to determine the effect that each of these factors would have on the volumes and peak discharge rates of the runoff.

The addition of solar panels over a grassy field does not have much of an effect on the volume of runoff, the peak discharge, nor the time to peak. With each analysis, the runoff volume increased slightly but not enough to require storm-water management facilities. However, when the land-cover type was changed under the panels, the hydrologic response changed significantly. When gravel or pavement was placed under the panels, with the spacer section left as patchy grass or bare ground, the volume of the runoff increased significantly and the peak discharge increased by approximately 100%. This was also the result when the entire cell was assumed to be bare ground.

The potential for erosion of the soil at the base of the solar panels was also studied. It was determined that the kinetic energy of the water draining from the solar panel could be as much as 10 times greater than that of rainfall. Thus, because the energy of the water draining from the panels is much higher, it is very possible that soil below the base of the solar panel could erode owing to the concentrated flow of water off the panel, especially if there is bare ground in the spacer section of the cell. If necessary, erosion control methods should be used.

Bare ground beneath the panels and in the spacer section is a realistic possibility (see Figs. 1 and 5). Thus, a good, well-maintained grass cover beneath the panels and in the spacer section is highly recommended. If gravel, pavement, or bare ground is

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deemed unavoidable below the panels or in the spacer section, it may necessary to add a buffer section to control the excess runoff volume and ensure adequate losses. If these simple measures are taken, solar farms will not have an adverse hydrologic impact from excess runoff or contribute eroded soil particles to receiving streams and waterways.

Acknowledgments

The authors appreciate the photographs (Figs. 1 and 5) of Ortho Clinical Diagnostics, 1001 Route 202, North Raritan, New Jersey, 08869, provided by John E. Showler, Environmental Scientist, New Jersey Department of Agriculture. The extensive comments of reviewers resulted in an improved paper.

References

Bedient, P. B., and Huber, W. C. (2002). *Hydrology and floodplain analysis*, Prentice-Hall, Upper Saddle River, NJ.

Beuselinck, L., Govers, G., Hairsince, P. B., Sander, G. C., and Breynaert, M. (2002). "The influence of rainfall on sediment transport by overland flow over areas of net deposition." *J. Hydrol.*, 257(1–4), 145–163.

Dabney, S. M., Moore, M. T., and Locke, M. A. (2006). "Integrated management of in-field, edge-of-field, and after-field buffers." *J. Amer. Water Resour. Assoc.*, 42(1), 15–24.

Engman, E. T. (1986). "Roughness coefficients for routing surface runoff." *J. Irrig. Drain. Eng.*, 112(1), 39–53.

Garde, R. J., and Raju, K. G. (1977). *Mechanics of sediment transportation and alluvial stream problems*, Wiley, New York.

McCuen, R. H. (2005). *Hydrologic analysis and design*, 3rd Ed., Pearson/ Prentice-Hall, Upper Saddle River, NJ.

Motha, J. A., Wallbrink, P. J., Hairsine, P. B., and Grayson, R. B. (2004). "Unsealed roads as suspended sediment sources in agricultural catchment in south-eastern Australia." *J. Hydrol.*, 286(1–4), 1–18.

Salles, C., Poesen, J., and Sempere-Torres, D. (2002). "Kinetic energy of rain and its functional relationship with intensity." *J. Hydrol.*, 257(1–4), 256–270.

Wischmeier, W. H., and Smith, D. D. (1978). *Predicting rainfall erosion losses: A guide to conservation planning, USDA Handbook 537*, U.S. Government Printing Office, Washington, DC.

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STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

June 16, 2014

Lee Hoffman, Esq.
Pullman & Comley, LLC
90 State House Square
Hartford, CT 06103-3702

RE: **PETITION NO. 1056** - GRE 314 East Lyme, LLC declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required for the proposed construction and operation of a 5.0 MW Solar Photovoltaic Renewable Energy Generating Project located on Grassy Hill Road and Walnut Hill Road, East Lyme, Connecticut. **Revisions to D&M Plan.**

Dear Attorney Hoffman:

At a public meeting of the Connecticut Siting Council (Council) held on June 12, 2014, the Council considered and approved implementation of the corrective actions for erosion and sedimentation issues at the site within the Council's jurisdiction, as set forth in the Town of East Lyme's letter of June 10, 2014; recommended that the project developer work with the Town of East Lyme on remediation measures within the town's jurisdiction; and suggested that this remediation include restoration of the vernal pool as described on page one of the Environmental Planning Services, LLC letter of April 30, 2014.

Approval of these Development & Management Plan (D&M Plan) changes, in accordance with RCSA §16-50j-61(e), applies only to the corrective actions referenced in the letter submitted by the Town of East Lyme dated June 10, 2014. Requests for any changes to the D&M Plan shall be approved by Council staff in accordance RCSA §16-50j-62(b). Furthermore, the project developer is responsible for reporting requirements pursuant to Regulations of Connecticut State Agencies Section 16-50j-62.

Please be advised that changes and deviations from this plan are enforceable under the provisions of the Connecticut General Statutes § 16-50u.

Thank you for your attention and cooperation.

Very truly yours,

Robert Stein MAB

Robert Stein
Chairman

RS/RDM/cm

c: Parties and Intervenors
The Honorable Paul M. Formica, First Selectman, Town of East Lyme
Gary A. Goeschel II, Director of Planning/Inland Wetlands Agent, Town of East Lyme

Town of East Lyme

P.O. Drawer 519
Department of Planning & Inland Wetlands
Gary A. Goeschel II, Director of Planning / Inland Wetlands Agent

108 Pennsylvania Ave
Niantic, Connecticut 06357
Phone: (860) 691-4114
Fax: (860) 860-691-0351

June 10, 2014

Melanie A. Bachman
Staff Attorney/Acting Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

RE: Antares Solar Field- CEASE AND CORRECT T ORDER – 20 Farm Meadow Road, Tax Assessor's Map# 52.0, Lot# 126, East Lyme, Connecticut

Dear Ms. Bachman,

The East Lyme Inland Wetlands Agency at their meeting of June 9, 2014, at the East Lyme Town Hall, 108 Pennsylvania Avenue, Niantic, Connecticut, voted to re-issue the Cease, Desist and Restore Order for the above referenced project with additional directives and directed me to forward these directives to the Connecticut Siting Council. As such, on behalf of the Town of East Lyme's Inland Wetlands Agency, I respectfully request the Siting Council order Greenskies to make the changes to their Development and Management Plan as directed by the conditions in the Inland Wetlands Agency's Cease, Desist, and Restore Order (attached).

If you have any questions regarding this letter or the re-issuance of the Cease, Desist, and Restore Order please do not hesitate to contact me at (860) 691-4105.

Sincerely,

Gary A. Goeschel II
Director of Planning /
Inland Wetlands Agent

cc: Cheryl Lozanov, Chairwomen, Inland Wetlands Agency
Paul M. Formica, First Selectman
Ed O'Connell, Esq.
Robert Landino, Chief Executive Officer, Centerplan Companies
Ryan McNamara, Project Manager, Centerplan Companies
Ted Harris, Esq.
Bill Mulholland, Zoning Official
Joseph Smith, Building Official

O:\Inland Wetlands Agency\Inland Wetlands Agency 2014\Enforcement\20 Farm Meadow Road\CoverSitingCouncil-20 FarmMeadowRd_Cease&Correct_6-10-14.doc

CEASE, DESIST AND RESTORE ORDER

EAST LYME
INLAND WETLANDS AGENCY

Owner (Respondent):	**Property:**
GRE 314 East Lyme, LLC 10 Main Street Suite E Middletown, CT 06457 Ryan C. McNamara, Project Manager Centerplan Construction Company 10 Main Street, Suite D Middletown, CT 06457	20 Farm Meadow Road East Lyme, CT 06333 Assessor's Map# 52.0, Lot# 126

RESPONDENT IS HEREBY ORDERED TO CEASE & CORRECT THE VIOLATION OF THE EAST LYME INLAND WETLANDS AND WATERCOURSE REGULATIONS ON THE ABOVE REFERENCED PROPERTY.

AUTHORITY: The East Lyme Inland Wetlands Agency is duly authorized to carry out and effectuate the purposes and policies of Sections 22a-36 TO 22A-45a, inclusive and has adopted regulations pursuant to 22a-42a of the CT General Statutes.

COMPLAINT: The pollution of an onsite inland wetlands and watercourse. More specifically, the deposition of sedimentation within an onsite wetlands and watercourse as a result of stormwater management system failures and failures of erosion and sedimentation controls associated with the construction of a solar field/array on property located at the above referenced address.

Said activity is hereby determined to be a regulated activity as defined by Section 2.1 of the Town of East Lyme Inland Wetland and Watercourses Regulations under the jurisdiction of the East Lyme Inland Wetlands Agency.

VIOLATION: In accordance with Sect. 6.1 of the Inland Wetland and Watercourse Regulations of the Town *of East Lyme "No person shall conduct or maintain a regulated activity without first obtaining a permit for such activity from the East Lyme Inland Wetlands Agency of the Town of East Lyme. Any person found to be conducting or maintaining a regulated activity without the prior authorization of the Agency, or violating any other provision of these regulations, shall be subject to the enforcement proceedings and penalties prescribed in section 14 of these regulations and any other remedies as provided by law.*" Respondent did not obtain any permit under the East Lyme Inland Wetlands and Watercourses Regulations authorizing the regulated activities.

CORRECTIVE ACTION: As initially ordered the Respondent shall restore wetlands and upland review area to original condition or better following schedule A Corrective Action Procedure in the Cease, Desist, and Restore Order of April 7, 2014, and further, is directed to:

1. Stabilize all bare and exposed soils with a mat of hydro-seed at, around, and between the rows of panels including the slopes of the detention basins once repaired/reshaped and have additional erosion control measures available and ready to install if high intensity rainfall events are predicted (e.g. hay bales, silt fence, geotextiles and turf reinforcement mats). Allow the use of flocculent logs or crystals in a temporary condition as approved by the Inland Wetlands Agent.

2. Return to the Commission with further information about the need for installing erosion control below the drip edges of solar panel (i.e., crushed stone, turf reinforcement mat, etc.) to reduce erosion and slow channelized flow down-gradient perpendicular to the panels as recommended by Freeman Companies. Further, the developer shall return to the Commission with recommendations for quantitative survival rates for landscaping installed as part of the project.

3. Install check dams along drip edge erosion control, and temporary sediment traps at the end of each drip edge erosion control, prior to discharge to the detention basins. Traps and basins should be cleaned regularly.

4. As noted in the remediation plan, the stabilization of existing sediment now present within the wetland is critical in order to prevent additional downstream sediment migration. These measures which were installed to control the migration of these sediments must be re-inspected and repaired and or improved to accommodate rain events until the sediment removal is complete and adequate vegetation has been established.

5. Follow the sediment removal and the restoration of vegetation plan as proposed by Michael S. Klein in his letter dated April 30, 2014, to Ryan C. McNamara and reiterated June 3, 2014. Such work shall be supervised in the field by a wetland scientist with special consideration in accessing any of the areas with machinery so as not to create greater disturbance and unnecessary impact. In July 2014, following sediment removal Michael S. Klein will do a site walk to determine areas that need to be re-vegetated.

6. Included in the remediation plan the area identified along the woods road to the south of the site. Additional check dams, water bars, or other appropriate measure shall be installed along this woods road to slow the velocity of water down the driveway to help prevent gulling.

7. Remediation and re-vegetation shall be completed by September 30, 2014.

Signed: Cheryl Lozanov /gg   Date: 6/10/14

Cheryl Lozanov, Chairwomen
Inland Wetlands Agency