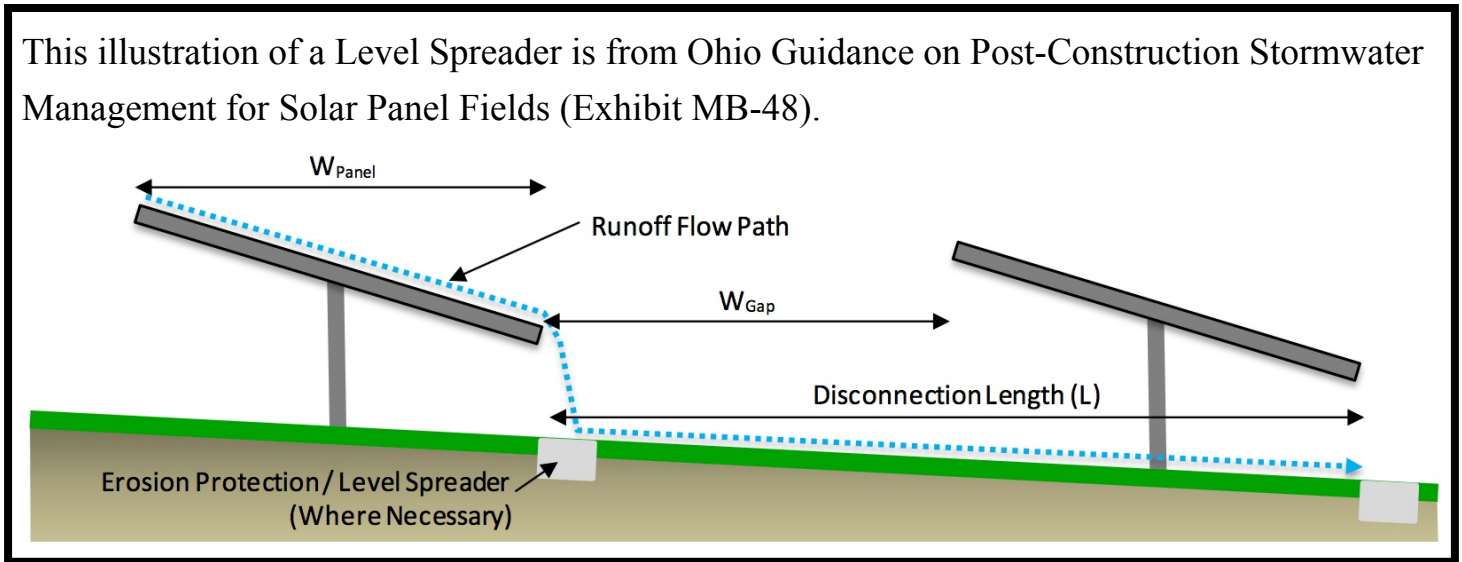


At the January 2022 Randolph Selectboard Meeting Brendan Malley, speaking for the Petitioner, told the Selectboard: (Exhibit MB-22 at 1:37:59 submitted May 6, 2022 with my prefiled testimony) [the state permitting process] “will govern things like runoff areas, whether you need level spreaders, or whether you need any number of other storm water management approaches implemented on the site.”

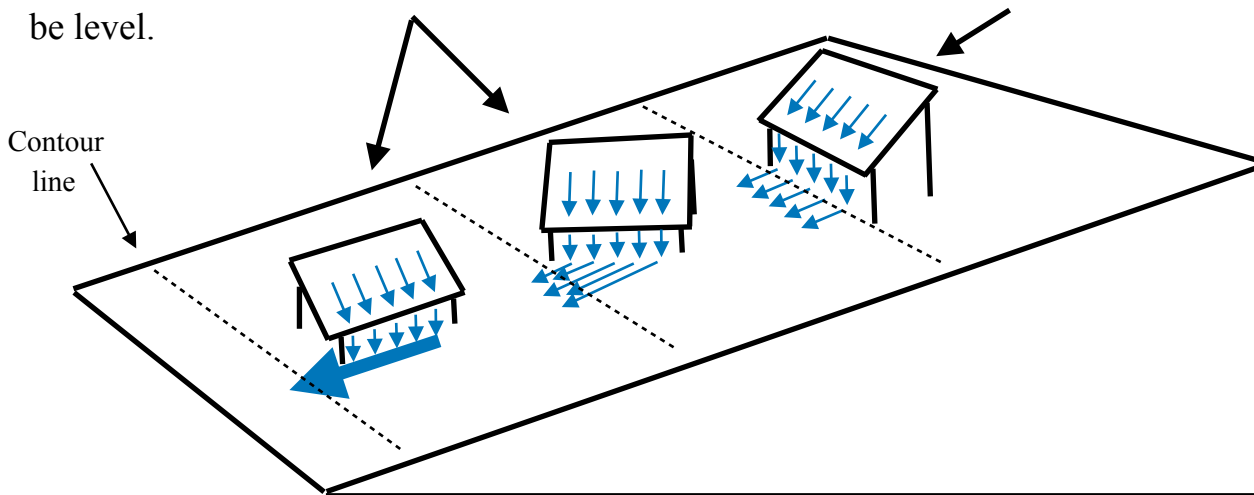
The purpose of Level Spreaders is to promote sheet flow of water. When a Level Spreader is located at the drip line, it may also help to prevent erosion (scouring) at the drip line.

This illustration of a Level Spreader is from Ohio Guidance on Post-Construction Stormwater Management for Solar Panel Fields (Exhibit MB-48).

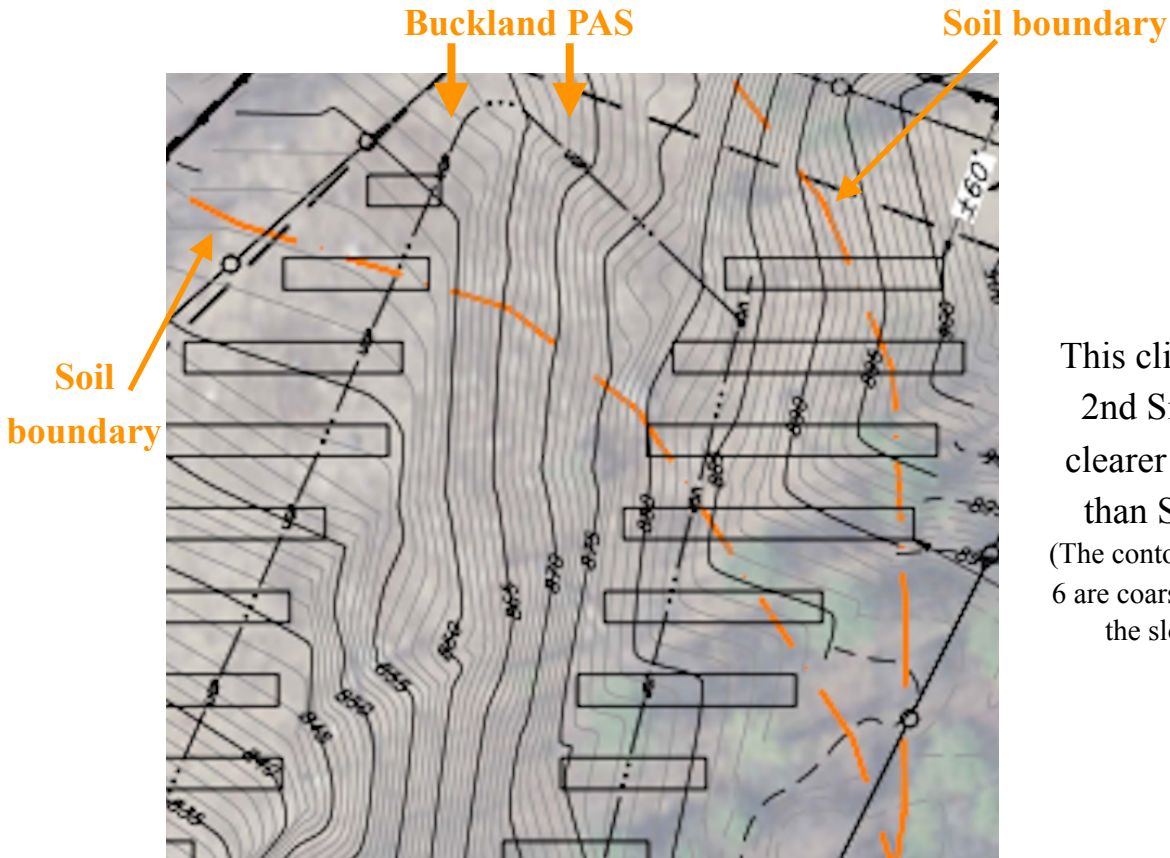


When the array does not follow contour lines, the panels concentrate water flow. Level Spreaders cannot be used under the drip edge because Level Spreaders need to be level.

When the panels and the ground slope in the same direction, the water may flow in a sheet. Level Spreaders are used if the slope is over 5%.



For the most part, the panels on the Petitioner's proposed array do not follow contour lines. Extreme engineering is required when panels are not on contours and the slope is greater than 15%. Some of that extreme engineering will be on Buckland PAS with slopes greater than 25%.



This clipping is taken from the 2nd Site Plan because it has clearer and finer contour lines than Site Plans 3 through 6. (The contour lines in site plans 3 through 6 are coarser and somewhat obscured by the slopes layer in those plans). See exhibit MB-39

The array is perpendicular to the contour lines on steep soils, including PAS.

Solar Panels are impervious, but if there is space between them they are “Disconnected Impervious Cover”. In many jurisdictions Disconnected Impervious Cover may be considered, from a Stormwater perspective, to be Pervious Cover if conditions are met.

The remaining pages of this exhibit are a compendium of excerpts from other jurisdictions that allow, if conditions are met, Disconnected Impervious Cover to be treated as Pervious.

All of the jurisdictions would require that the solar panels in the present project be treated, for the purpose of stormwater engineering, as impervious surfaces because of the slopes and contours on the site.

Pennsylvania Permitting for Solar Panel Farms FAQ 2019 (Exhibit MB-44A)

[underlined emphasis is in the original]

FAQ #4: What are the PCSM requirements for a fixed-panel unit?

If the following conditions are met, then the project area of a fixed photovoltaic solar panel farm project can be considered pervious cover, a detailed stormwater analysis is not needed, and PCSM BMPs are not necessary:

[condition #5] Solar panels must be situated on slopes of 10% or less.

Pennsylvania extensively rewrote the above document in 2021 and doubled its length. It is much more explicit about the requirements for the engineering design of solar arrays on slopes greater than 10%.

Pennsylvania Permitting for Solar Panel Farms FAQ 2021 (Exhibit MB-44B)

[emphasis mine]

Solar panel farm projects completed on slopes exceeding 15% can be permitted, however they would be pushing the threshold of current constructability, especially if any substantial earth disturbance is proposed. These areas may become more viable over time as technology for solar farm installation practices advance. There may be some sites with isolated locations having slopes greater than 15% that may be easier to incorporate into a project design depending on other site conditions. These would need to be evaluated on a case-by-case basis. Currently, sites with slopes exceeding 15% will need to be closely evaluated and will require a detailed stormwater analysis by a qualified professional engineer. At a minimum, additional E&S BMPs such as surface roughening and waterbars should be installed across disturbed areas; and additional PCSM BMPs such as retentive grading, infiltration trenches or infiltration berms should be installed downgradient at a frequency that helps prevent concentrated flow and erosion.

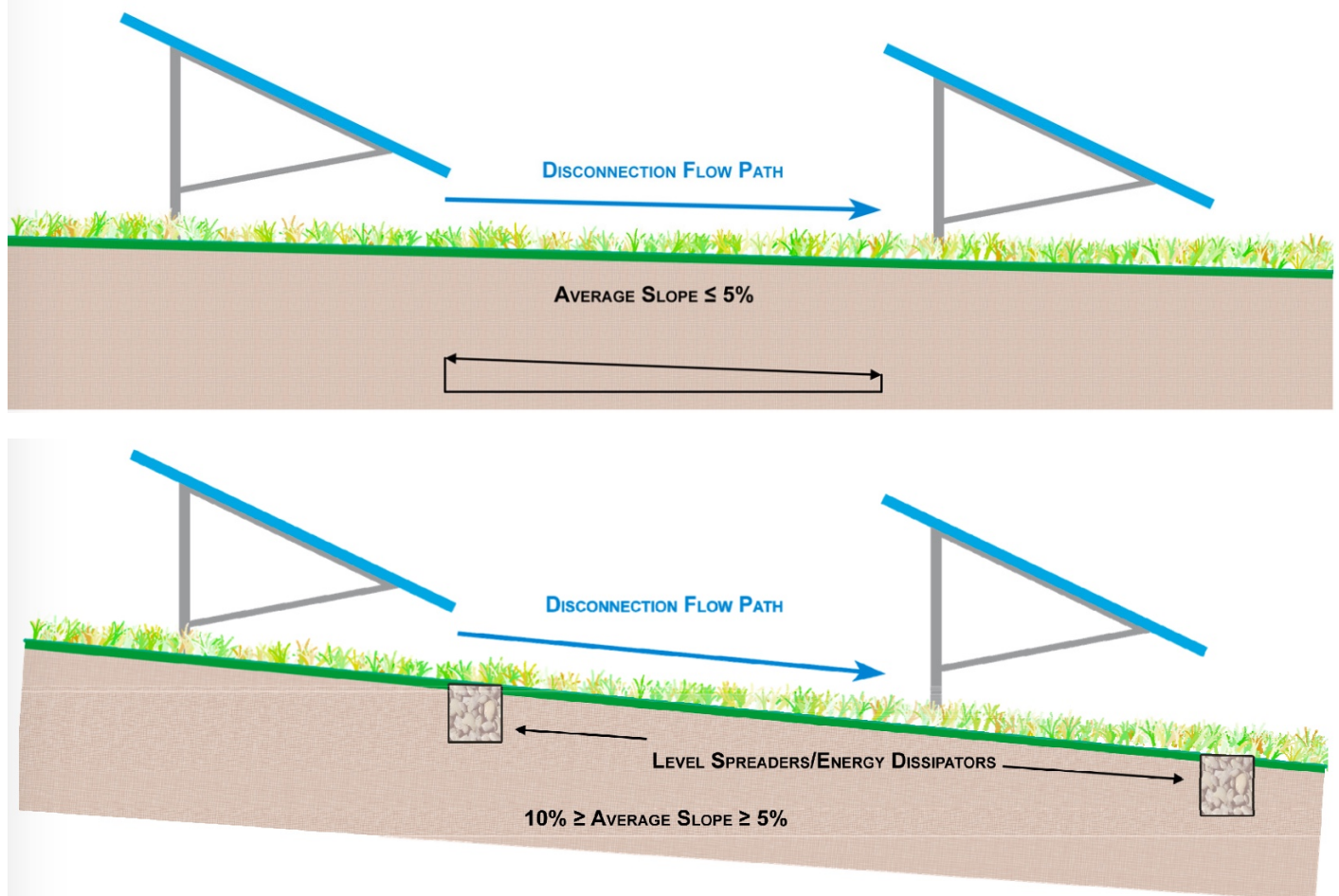
PCSM = Post Construction Stormwater Management [what we in Vermont call “Operational Stormwater Management”]

BMP = Best Management Practices

E&S = Erosion and Sedimentation

Maryland's illustrations are used in NY and CT stormwater publications, as well as the Vermont DEC Solar Literature Review. [see Exhibits MB-45 and MB-47]

Maryland's Design Guidance for Solar Panels (exhibit MB-43).



“Disconnections should be located on gradual slopes ($\leq 5\%$) to maintain sheetflow. Level spreaders, terraces, or berms may be used to maintain sheetflow conditions if the average slope is steeper than 5%. However, installations on slopes greater than 10% will require an engineered plan that ensures adequate treatment and the safe and non-erosive conveyance of runoff to the property line or downstream stormwater management practice.”

Rhode Island Ground-Mounted Solar Array Guidance (Exhibit MB-46)

[**Bold** emphasis is in the original]

Permitting Application Guidance Site Plans:

(2) Site plans should depict the following (in addition to standard site plan requirements):

- All areas of moderate (8-15%) and steep slopes (>15%). Be sure to include erosion control measures for moderate and steep slopes.

(5) Provide details and notes regarding potential areas of scour immediately below the solar panel drip edges on steep slopes. Provide options for scour control if instances of erosion/scour develop beneath panel drip edges at any point after construction.

Stormwater Site Planning, Analysis and Design

1) Where panels are not oriented generally parallel with the slope and/or where slopes are moderate or steep (>8%), runoff needs to be either intercepted by stone trenches for infiltration and/or directed non-erosively to an infiltration practice. This requirement may be waived if the site is considered “ideal” by meeting the following criteria for greater than 80% of the site:

- Flat to gentle well-vegetated slopes are present (<8 %);
- Solar panel drip edges align with elevation contour lines (i.e. drip edges are not perpendicular (± 15 degrees) with the elevation contour lines)

3) When rows of panels run perpendicular to the elevation contours, runoff may not be adequately dispersed into sheet flow and may also create the potential for erosion. **The design should include adequate measures to achieve and maintain sheet flow from the drip edges of the panels, such as level spreaders, terraces, and/or berms.** If adequate sheet flow cannot be achieved, propose a stable conveyance of runoff directed into a BMP such as an infiltration basin, sand filter, or bioretention practice.

Connecticut Guidance Regarding Solar Arrays and the General Permit
for the Discharge of Stormwater (Exhibit MB-45)

(1) all solar panels in the array should also be considered effective impervious cover for the purposes of calculating the WQV if the proposed post-construction slopes at a site are equal to or greater than 15% or if the post-construction slopes at a site are less than 15% and the conditions in (a) – (e), inclusive, below have not been met:

(c) The following conditions are satisfied regarding the design of the post-construction slope of the site:

- for slopes greater than 5%, but less than 10%, practices including, but not limited to, the use of level spreaders, terraces or berms as described in Figure 2, below, shall be used to ensure long term sheet flow conditions.
- for slopes equal to or greater than 10% and less than 15%, the Plan includes specific engineered stormwater control measures with detailed specifications that are designed to provide permanent stabilization and non-erosive conveyance of runoff to the property line of the site or down gradient from the site.

WQV = Water Quality Volume