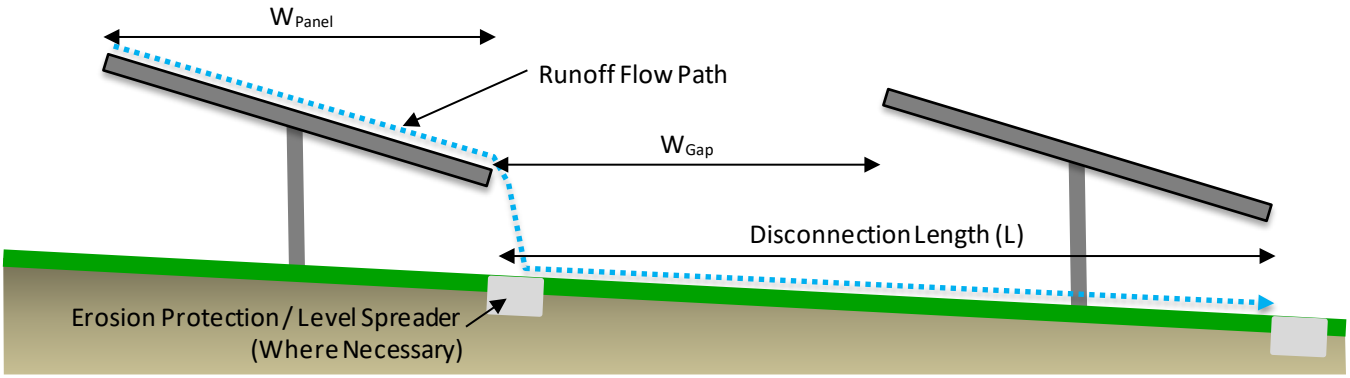
# Guidance on Post-Construction Stormwater Management for Solar Panel Fields

Large arrays of ground-mounted, elevated solar or photovoltaic (PV) panels are often installed with vegetated pervious ground around, between, and under them. In this case, impervious surface disconnection may be an effective approach to managing post-construction stormwater runoff shed from the PV panels. This fact sheet describes how those pervious areas can be used to manage the water quality volume (WQv) required in the Ohio EPA NPDES construction stormwater general permit as impervious surface disconnection. Refer to Chapter 2.1 of Ohio EPA's Rainwater and Land Development manual[1] for detailed design guidance on this practice.




## Simplified Runoff Reduction Volume Crediting

Runoff reduction volume credits in Rainwater and Land Development Chapter 2.1[1] define the disconnection length (L) as illustrated in Figure 1 necessary to manage the WQv generated by the PV panel row. To simplify the credit calculation, Table 1 expresses L as a factor of the horizontal coverage of the PV panel ($W_{Panel}$) and a corresponding ratio of $W_{Panel}$ to the open gap between the panel rows ($W_{Gap}$). Table 1 applies to disconnection areas meeting the conditions that follow. Note the mean daily position determines the $W_{Panel}$ of tracking PV panels.

***Table 1: simplified impervious surface disconnection to manage the WQv.***

| Disconnection Area | L | $W_{Panel}$:$W_{Gap}$ |
|---|---|---|
| Deep rooting grasses & forbs | 2.0 × $W_{panel}$ | 1:1 |

## Conditions Required to Use Impervious Surface Disconnection

The following conditions are required to manage the WQv generated by PV panels solely by impervious surface disconnection.

### 1. Establish a cover of dense, deep-rooting vegetation.

Vegetation plays two key roles in stormwater management – it protects soil from surface erosion and its root action develops a soil structure that promotes water storage, uptake, and infiltration. Unless alternative agricultural uses are planned, a vegetation plan must, at a minimum, specify 1) a seed mix of deep-rooting forbs and grasses (non-turf type) appropriate for the regional climate and site conditions, 2) dates and procedures for seeding and seed bed preparation, 3) temporary stabilization measures, and 4) a maintenance plan where activities that may cause soil compaction will be infrequent.

The plan should address the short-term establishment period (first two years). Certain plants may take considerable time to fully establish, leaving a finished or near-finished site exposed to erosion and the proliferation of weeds, both of which may be difficult to subsequently fix. Include rapidly establishing species in the permanent seed mix or supplement a temporary (annual) cover that will not interfere with the long-term vegetation plan. If feasible, consider seeding prior to installation as a measure to help control erosion during construction and expedite a permanent cover.

The plan must specify deep-rooting grasses and forbs compatible with the PV panel height. Ohio EPA recommends selecting from the species listed in Appendix A of the Ohio Department of Natural Resources' *Recommended Requirements for Proposed Solar Energy Facilities in Ohio* available at: ***ohiodnr.gov/static/documents/real-estate/ODNR Recommended Requirements for Proposed Solar Energy Facilities in Ohio.pdf***

### 2. Ensure post-construction soils are in good hydrologic condition.

Impervious surface disconnection spreads runoff over pervious area in good hydrologic condition to promote infiltration. Soil in good hydrologic condition has not been compacted and/or stripped of topsoil through grading, excavation, and the operation of equipment. The Stormwater Pollution Prevention Plan (SWP3) must specify measures to minimize severe soil degradation so that proper establishment of deep-rooted plants can be relied on to continuously restore soil structure and add organic matter through vigorous root action. Limit grading to localized areas and require topsoil removal and replacement at them. Where feasible, direct construction traffic to stabilized access roads.

The clay soils prevalent in Ohio are prone to rutting and compaction by equipment operated in wet conditions. This destroys soil structure which can be difficult to repair. If work on very wet soils cannot be restricted, limit the equipment axel load to 6 tons (Duiker, 2004) and/or specify decompaction measures in the SWP3. A field cultivator or other implement is recommended to loosen compacted soils while smoothing soil for seedbed preparation and weed control.

### 3. Establish non-erosive flow over the disconnection length.

Runoff from PV panels must fall and disperse without producing accelerated erosion or concentrated flow. A stone splash pad or similar measure may be placed under a static drip edge to protect the dissipate energy and spread flow. Additional level spreaders and energy dissipaters are recommended on average slopes greater than five percent (Maryland, 2013).

## Limitations on Impervious Surface Disconnection

Impervious surface disconnection cannot be used to manage the WQv for PV panels installed over gravel or other hard surfaces, where structural support (piling) will disrupt sheet flow, or where stormwater is to be collected in swales, ditches, or storm sewers. Standard post-construction stormwater management practices listed in permit tables 4a and 4b and detailed in Chapter 2 of the Rainwater and Land Development manual are more appropriate in these instances.

## Impervious Surface Disconnection in the Stormwater Pollution Prevention Plan

Include typical section drawings (similar to Figure 1) in the Stormwater Pollution Prevention Plan (SWP3) to demonstrate compliance. The SWP3 must also address the post-construction stormwater management of associated roads (paved or gravel) and buildings. Standard post-construction stormwater management practices are recommended for large sub-stations. Ensure the SWP3 complies with all conditions of the general permit.

1. Available at: ***epa.ohio.gov/divisions-and-offices/surface-water/guides-manuals/rainwater-and-land-development***

## References

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Ohio Environmental Protection Agency. 2018. *General Permit Authorization for Storm Water Discharges Associated with Construction Activity under the National Pollutant Discharge Elimination System*. Ohio EPA Permit Number OHC000005. April 23, 2018.

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