MEETING THE GREEN INFRASTRUCTURE REQUIREMENT (N.J.A.C. 7:8-5.3)

The amendments to the Stormwater Management rules that became operative March 2021 require that major development projects meet the groundwater recharge, stormwater runoff quality and quantity standards through the use of green infrastructure. For the groundwater recharge and stormwater runoff quality requirements, those green infrastructure systems must meet any applicable drainage area limitation at N.J.A.C. 7:8-5.3(b). Those limitations are:

Best Management Practice	Maximum Contributory Drainage Area
1. Dry Well	1 acre
2. Manufactured Treatment Device	2.5 acres
3. Pervious Paving Systems	Area of additional inflow cannot exceed three times the area occupied by the BMP
4. Small-scale Bioretention Systems	2.5 acres
5. Small-scale Infiltration Basin	2.5 acres
6. Small-scale Sand Filter	2.5 acres

Therefore, any of the above listed BMPs will need to be designed to meet the applicable drainage area limit if those BMPs are intended to be used to comply with either of the groundwater recharge or stormwater runoff quality standards. While the stormwater runoff quantity standard must still be met using green infrastructure, BMPs utilized for the stormwater runoff quantity standard alone do not need to meet the contributory drainage area limitations.

WHAT IS GREEN INFRASTRUCTURE?

Green infrastructure is a well-established stormwater management technique within the stormwater management field and is recognized as an effective stormwater management strategy by the Department, the U.S. Environmental Protection Agency (USEPA), and cities throughout the country.

Specifically in New Jersey, the Stormwater Management rules at N.J.A.C. 7:8-1.2 define green infrastructure as "a stormwater management measure that manages stormwater close to its source by:

1. Treating stormwater runoff through infiltration into subsoil;
2. Treating stormwater runoff through filtration by vegetation or soil; or
3. Storing stormwater runoff for reuse."

WHY REQUIRE GREEN INFRASTRUCTURE?

Green infrastructure is widely recognized to be a cost-effective and resilient approach to managing stormwater while simultaneously providing environmental, social, and economic co-benefits. These co-benefits include reduction in urban heat island effect, decreased energy use, removal of pollutants from

the air through greater utilization of vegetation, beautification of public spaces, and increased property values.

Green infrastructure BMPs more effectively maintain or mimic natural hydrology and provide environmental benefits by infiltrating precipitation to replenish groundwater and stream base flow, evapotranspiring and evaporating precipitation to reduce stormwater discharge volume, and intercepting precipitation to reduce runoff and erosion. Because of these aspects of GI, the discharge of stormwater downstream of a GI system is reduced in comparison to the discharge that would occur if that same stormwater was managed using a traditional detention basin. In addition to the benefits noted above, this volume reduction directly improves the quality of the discharge and helps to prevent flooding.

How to meet the New Requirements

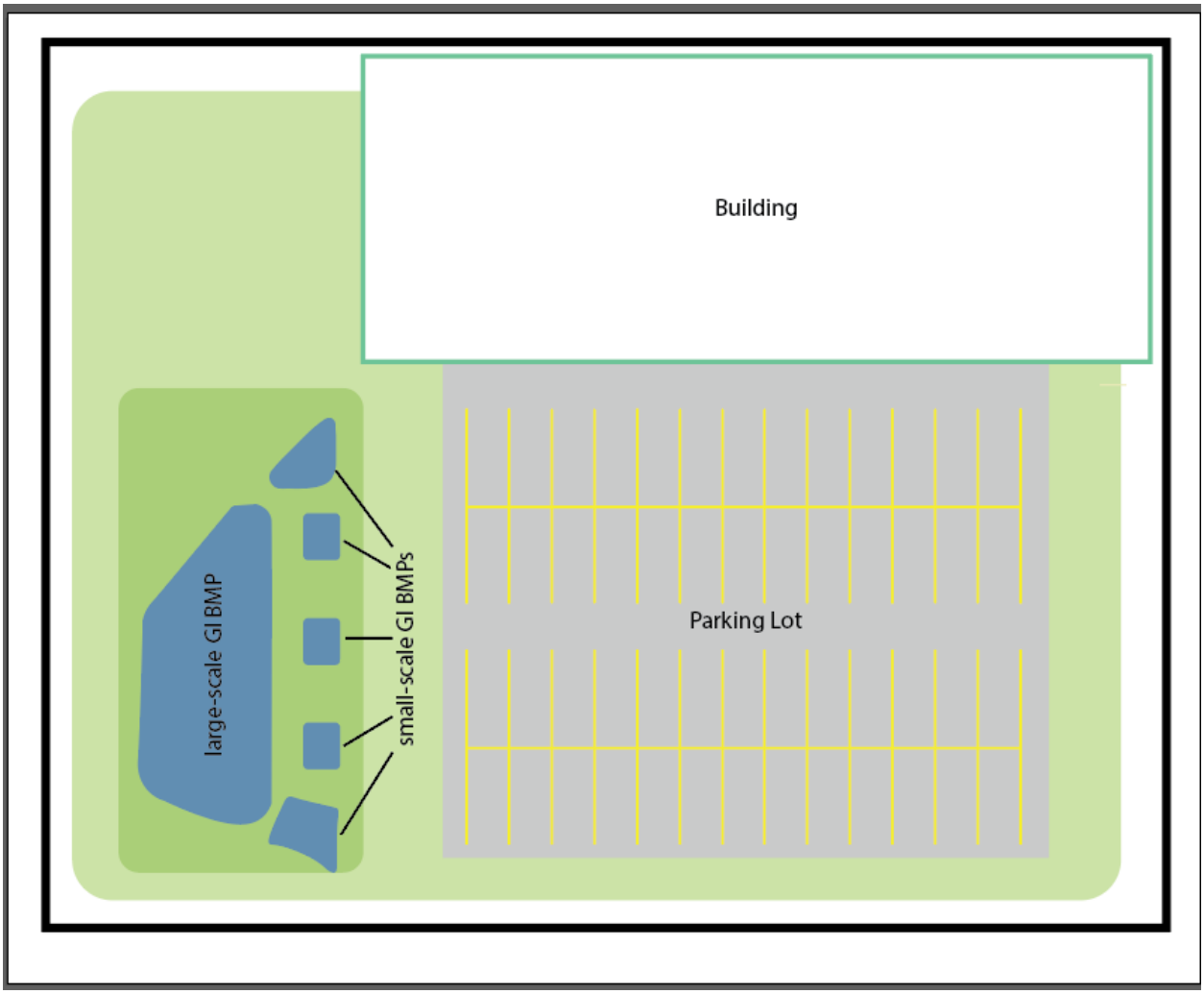
The intent of the green infrastructure requirement is to mimic the natural hydrologic cycle. To do so, the rules require stormwater water runoff to be treated near the source with distributed and small-scale (limited contributory drainage area) green infrastructure BMPs. Small-scale GI BMPs are achieved through the contributory drainage area limitations. It is necessary to meet those limits in order to comply with the rule requirements. Further, the definition of GI requires that the stormwater be managed "close to its source." In order to provide BMPs close to the source, it is necessary to have those BMPs disturbed throughout the site. As such, in order to meet the rule standard, GI BMPs must be both small-scale and distributed throughout the site. Subsequently, with any design there are 3 questions that must be asked. Those questions are:

1. Is the stormwater managed close to its source?
2. Are the BMPs distributed throughout the site?
3. Are the drainage area limitations met?

If the answer to any of the questions detailed above is no, then the design does not comply with the requirements.

What Doesn't Meet the New Requirements?

As discussed above, GI BMPs must be distributed throughout the site in order to manage the stormwater runoff close to its source and must also meet the drainage area limitations at N.J.A.C. 7:8-5.3(b). Therefore, BMPs cannot be clustered in one corner of the site as shown in the example design on the following page.



Using this illustration as an example, ask the 3 questions noted above:

1. Is the stormwater managed close to its source?

Mostly, no. Since these BMPs are concentrated in one part of the site, the stormwater runoff from the farther portions of the site is not managed close to the source.

2. Are the BMPs distributed throughout the site?

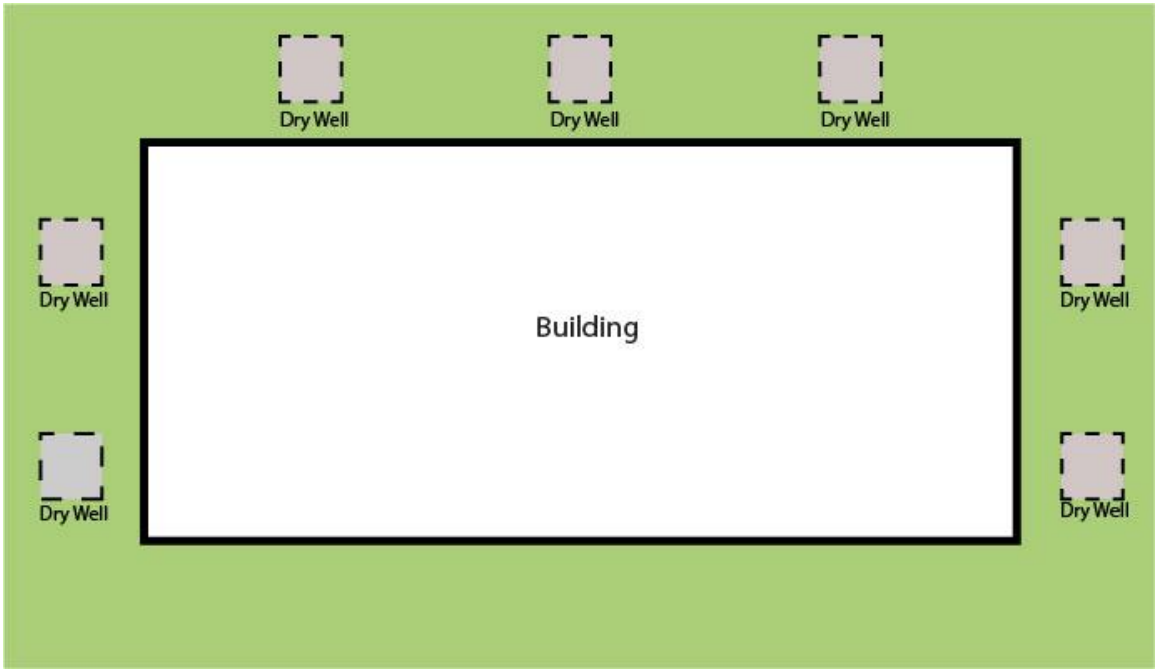
In this scenario, no. The BMPs are concentrated in one portion of the site and are not distributed.

3. ARE THE DRAINAGE AREA LIMITATIONS MET?

The drainage area limitations may be met; however, this design does not manage stormwater close to its source using distributed BMPs. Thus, even if the drainage area limitations are met, the design does not meet the definition of green infrastructure, and, thus, does not meet the rules.

DOES THIS MEAN THAT GI BMPS CAN NEVER BE LOCATED NEAR ONE ANOTHER?

The example above should not be interpreted to mean that GI BMPs can never be located near one another. Particularly on large sites with many BMPs, it may be necessary to have some BMPs close to one another. This is allowable as long as the BMPs are managing stormwater close to its source, are distributed throughout the site, and meet the drainage area limitations. The example below shows several dry wells around a building.



As with the example above, the 3 questions can be used again to determine if this meets the GI requirements:

1. IS THE STORMWATER MANAGED CLOSE TO ITS SOURCE?

Yes. The dry wells are located adjacent to the building, which is the source of the stormwater runoff managed by the dry wells.

2. Are the BMPs distributed throughout the site?

Again, the answer here is yes. The BMPs are not concentrated in any one location and are distributed around three sides of the building.

3. Are the drainage area limitations met?

Assuming the building is less than 7 acres in size and no more than 1 acre of runoff is directed to any individual dry well, the drainage area limitations are met.

This example shows only a single building, and most major developments are likely to include other development, such as parking lots or roadways in addition to the building or buildings. However, the same concept can be expanded out to include other portions of the development.

Can the distributed BMPs be interconnected?

Once BMPs are distributed throughout the site, it is necessary to consider if individual discharges are necessary from each BMP or if they can be interconnected. Looking at the example above, if separate discharges were constructed for each dry well, there would be 7 separate discharges and that is just for these dry wells. If this was part of a larger project, there could be many others from the other GI BMPs distributed throughout the site. However, having a separate discharge from each GI BMP is not necessary. As long as these BMPs function separately during the water quality and recharge storm events, the BMPs can be interconnected or could have connecting piping systems to a single discharge. In order to ensure that they function separately in the water quality and recharge storms, any interconnections must be above the water surface elevations of the water quality and recharge storm events in those BMPs. Usually, the higher of the two will be the water quality design storm elevation; however, the recharge storm elevation can be higher in some cases if the option to infiltrate the difference in the 2-year storm is selected for recharge compliance.

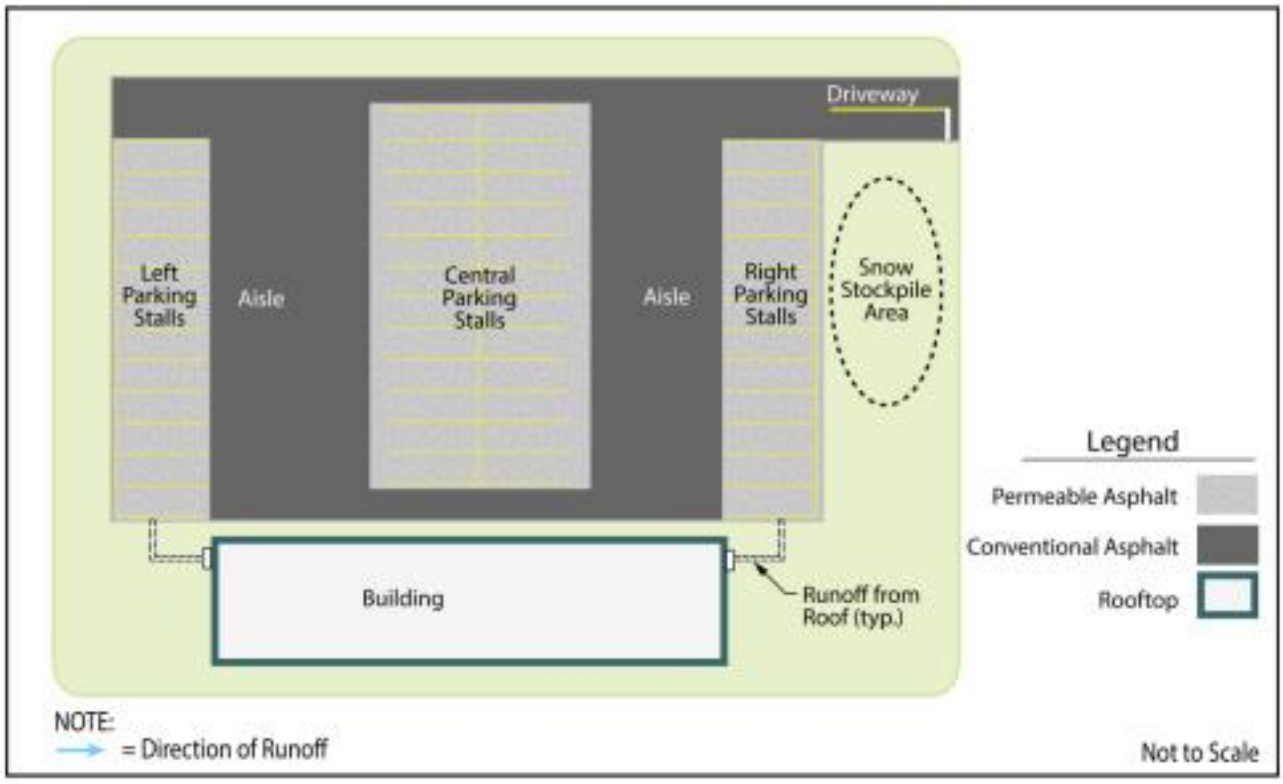
What Does Meet the New Requirements?

A couple of ways to meet the new rules are through the use of either pervious paving systems or bioretention basins. Either choice can potentially be used to comply with the water quality, quantity, and groundwater recharge standards, both are GI, and both can be designed with or without underdrains.

1. Pervious Paving Systems

In addition to the water quality, quantity, and groundwater recharge benefits that pervious paving systems provide, they occupy little to no developable land area on the site, since they are incorporated directly into the proposed roadways, parking areas, and/or sidewalks of the site. This, plus the ability to provide compliance for all of the requirements, makes pervious paving systems the ideal choice to comply with the rule requirements all in one system. An example of a

building plus a parking lot using a pervious paving system is shown below. This design complies with the drainage area limitations without needing to use pervious paving beyond the parking spaces. Though if the building was larger, the pervious paving system could be expanded into the remaining portions of the parking lot to maintain compliance with the drainage area limitation.



- ## Is the stormwater managed close to its source?

  Yes. The pervious paving systems are located adjacent to the building and parking areas, which are the source of the stormwater runoff managed by the pervious paving.

- ## Are the BMPs distributed throughout the site?

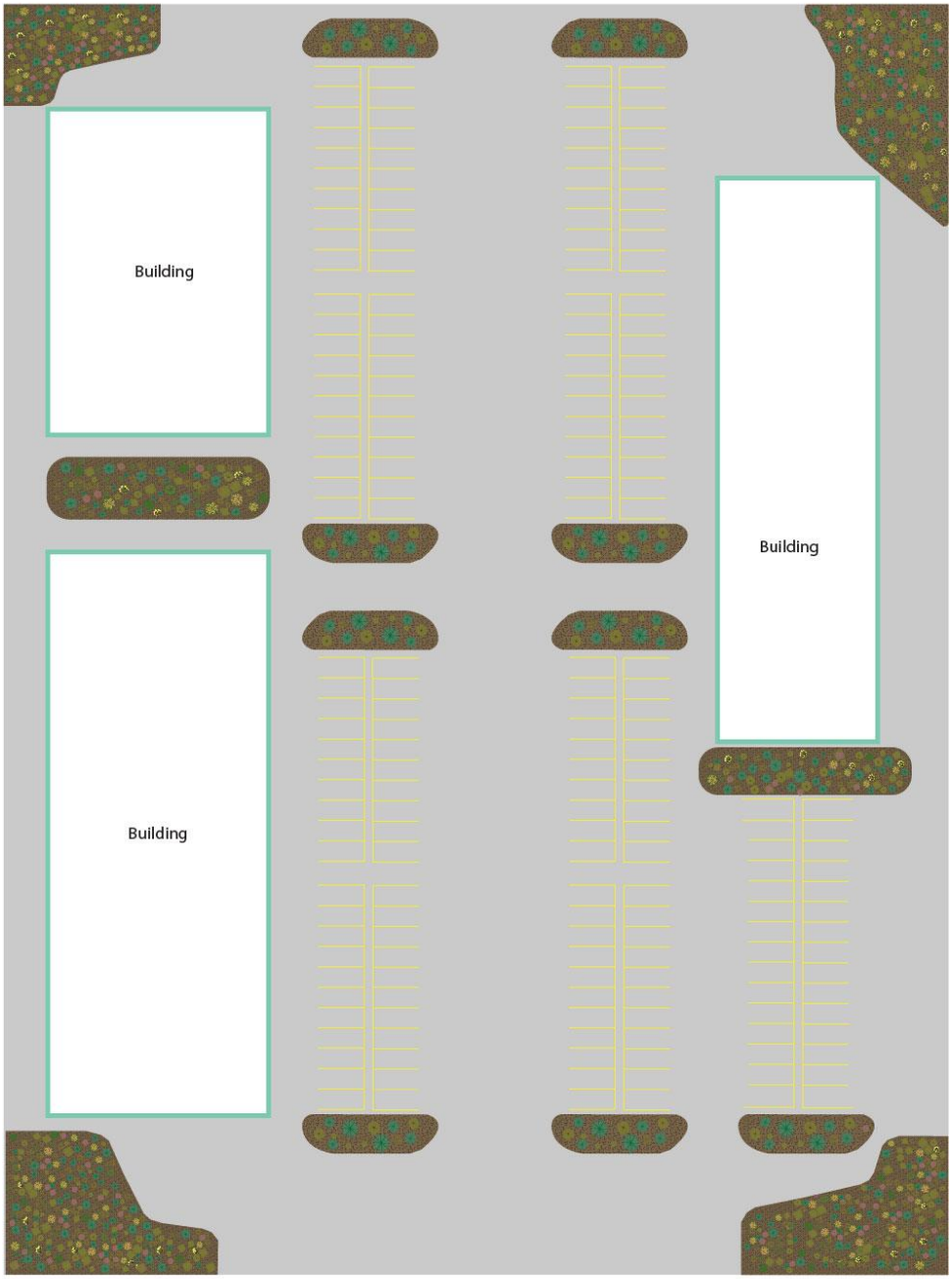
  Again, the answer here is yes. The BMPs are not concentrated in any one location and are distributed around the site.

- ## Are the drainage area limitations met?

  Yes. Each pervious paving system does not exceed the 3:1 ratio of additional inflow to pervious paving area.

2. Distributed Bioretention Systems

Like a pervious paving system, bioretention system can be used to comply with all of the rule requirements. However, bioretention systems do occupy land area on the site. Due to the flexibility of bioretention systems, the use of developable land area on-site can be minimized by dispersing bioretention systems through the site in areas that would be otherwise left as open space. Ideal areas include parking lot islands, landscaped areas, yards, and strips of land along roadways and parking lots that would otherwise be grassed.



- ### Is the stormwater managed close to its source?

  Yes. The bioretention systems are located adjacent to the buildings and parking areas, which are the source of the stormwater runoff managed by the pervious paving.

- ### Are the BMPs distributed throughout the site?

  Again, the answer here is yes. The BMPs are not concentrated in any one location and are distributed around the site.

- ### Are the drainage area limitations met?

  Yes. There are sufficient BMPs to meet the drainage area limits. So, as long as the drainage area to any individual bioretention system that provides water quality or groundwater recharge is less than 2.5 acres, the drainage area limits are met.

Because each of the last two examples have small-scale GI BMPs distributed throughout the site, the answer to all 3 of the questions will be yes. Therefore, these designs would meet the new GI requirement. While these are two of the simplest methods for meeting the new requirements, any of the green infrastructure BMPs listed in Table 5-1 can be used for compliance, and any BMP from Table 5-2 can be used for water quantity control. Since there are a number of available BMPs, there are many potential designs that can meet the rules.

When preparing a design make sure that the answer to each of the 3 questions is yes.

1. ### Is the stormwater managed close to its source?

2. ### Are the BMPs distributed throughout the site?

3. ### Are the drainage area limitations met?