



STORMWATER BEST MANAGEMENT PRACTICE GUIDELINES

APRIL 2018

Stormwater management is an important aspect of site development and construction in all areas of Town. As noted in the Town's Stormwater Management Plan (SMP) and Local Comprehensive Plan (LCP), Stormwater Best Management Practices (BMPs), when properly designed and implemented, can protect water quality, reduce the risk of flooding, minimize the expense of conventional infrastructure, and become part of an attractive landscape. All stormwater management facilities should be designed in accordance with applicable regulations and engineering standards, including the Town's Protective Zoning Bylaw and Subdivision Rules and Regulations. These require that stormwater be managed with naturally vegetated low areas on the site that are designated for drainage and protected from future development. This approach is one element of Low-Impact Design, which can be highly effective, and is recommended for incorporation with all site development. The LCP states:

Low-Impact Design Applications

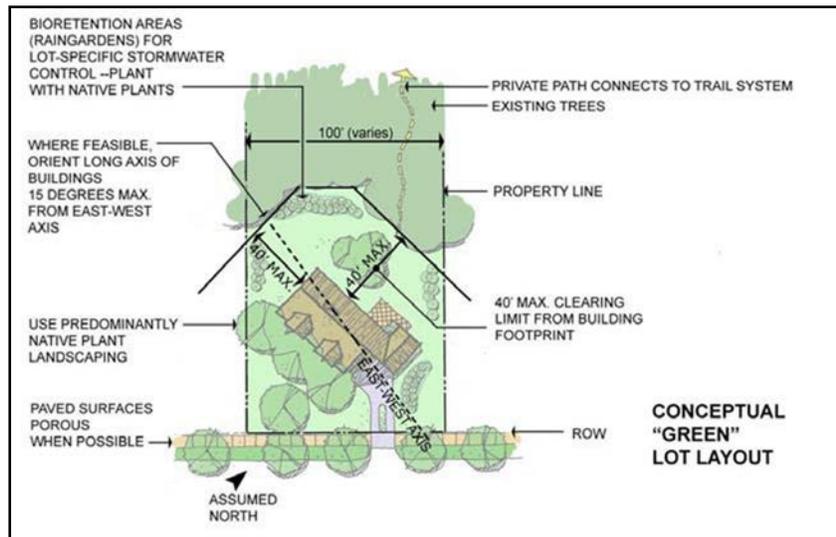
The low-impact development, or LID, site design approach is a precise arrangement of natural and engineered technologies. The devices, or Integrated Management Practices (IMPs), function as a comprehensive system across the site to achieve the goals of:

- *Peak flow control;*
- *Volume reduction;*
- *Water quality improvement (filter and treat pollutants); and*
- *Water conservation.*

Future development in Sandwich should use LID principles, which can be generally described as incorporating a series of techniques in the conceptual site plans with decentralized stormwater management to reduce the environmental footprint of new development.

Specific measures identified in the LCP include:

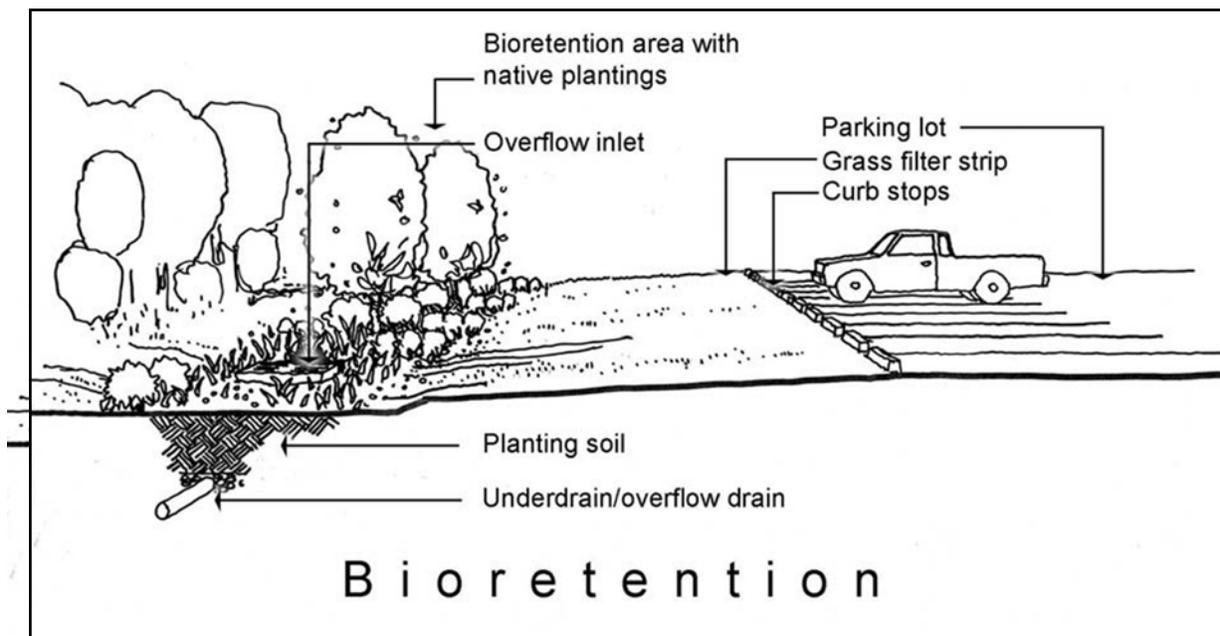
Site Design and Layout - LID applications used in Sandwich should integrate hydrology and stormwater management into site design using existing conditions to influence the location and layout of roadways, buildings, and parking areas. Buildings and roadways are placed in areas less sensitive to disturbance, and the stormwater management system design creates a symbiotic relationship between the development and natural hydrology.



Decentralized Stormwater Treatment System - The goal for Sandwich is to reduce impervious surface areas that drain directly into conventional pipe-and-pond stormwater systems. Creating small drainage basins and more natural treatment systems such as swales, bioretention areas, infiltration structures, and filter strips should include LID stormwater treatment design.

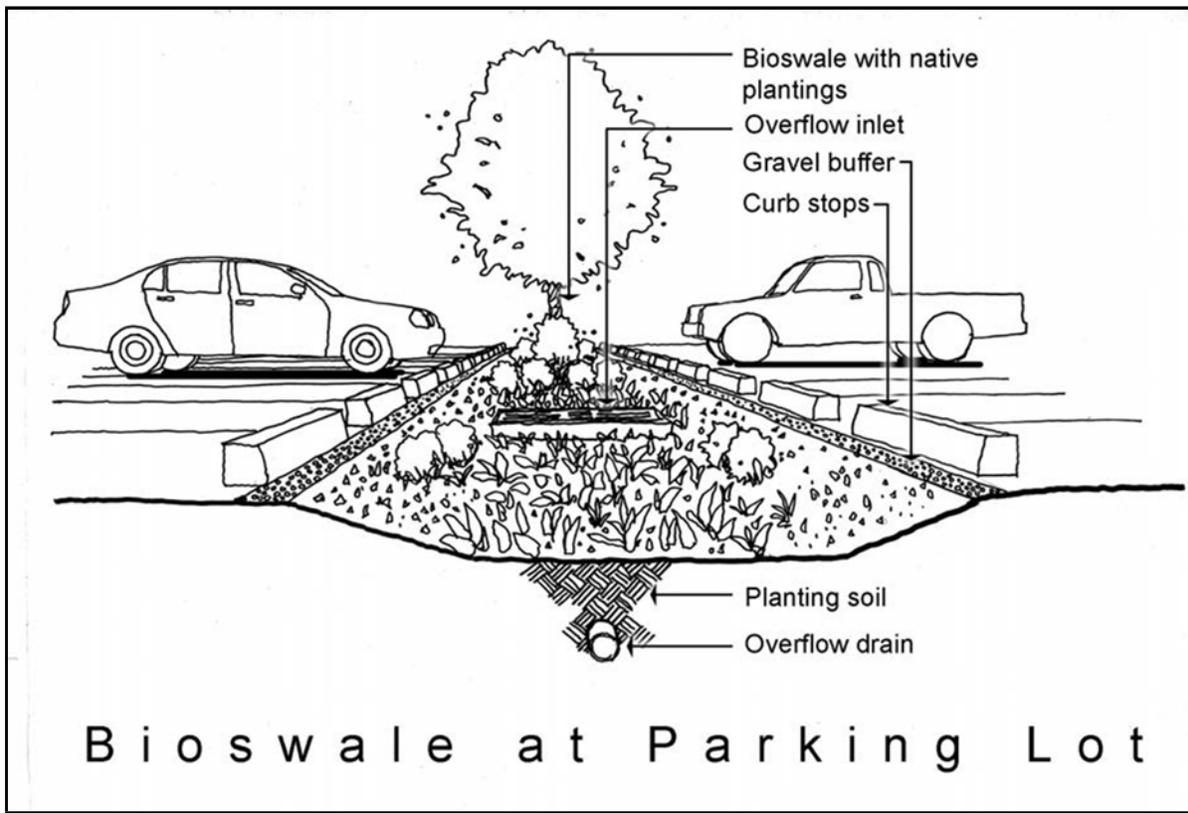
Filter Strips – Filter strips are bands of densely vegetated slopes, designed to reduce water runoff volume and improve water quality prior to entering stormwater drainage basins.

Bioretention Cells (Rain Gardens) – Rain gardens, also known as bioretention cells, are vegetated depressions that store and infiltrate runoff. Rain gardens are designed to encourage vegetative uptake of stormwater to reduce runoff volume and pollutant concentrations.

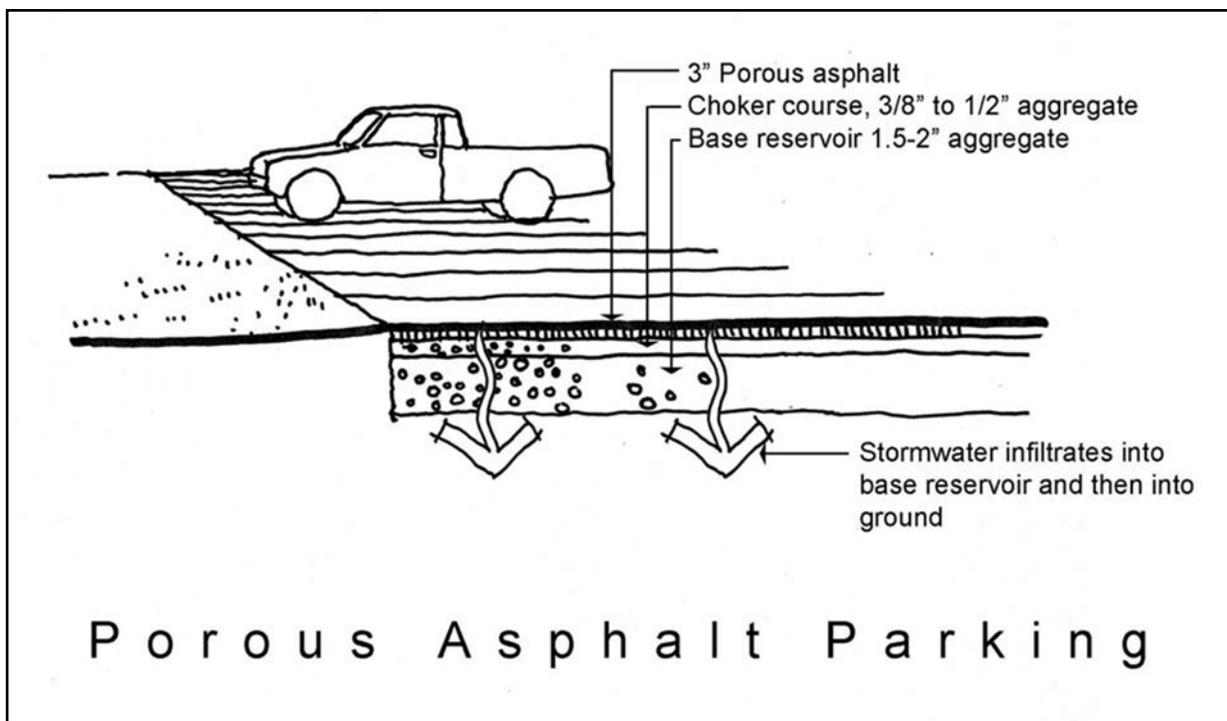


Vegetated Swales (Bioswales) – Vegetated swales are broad, shallow channels designed to convey and infiltrate stormwater runoff. The design of swales in Sandwich should seek to reduce

stormwater volume through infiltration, improve water quality through infiltration and vegetative filtering, and reduce runoff velocity by increasing flow path lengths and channel roughness.



Infiltration – Infiltration includes designs that enhance water percolation through a media matrix that slows and partially holds stormwater runoff. Infiltration practices also promote groundwater recharge and facilitate pollutant removal.



Subsurface Retention Facilities (Stormwater Vaults) – Subsurface retention facilities are typically constructed below parking lots (either permeable or impervious) and can be built to any depth to retain, filter, infiltrate, and alter the runoff volume and timing. This practice is well suited to dense urban areas or areas with constraints of open space uses such as in Sandwich Activity Centers.

Pocket Wetlands – Pocket wetlands are constructed wetland systems designed to control stormwater volume and facilitate pollutant removal. Pocket wetlands generally have less biodiversity than natural wetlands, but still require a base flow through the wetland to support the aquatic vegetation present. Pollutant removal in these systems occurs through the settling of larger solids and coarse organic material and also by uptake in the aquatic vegetation.

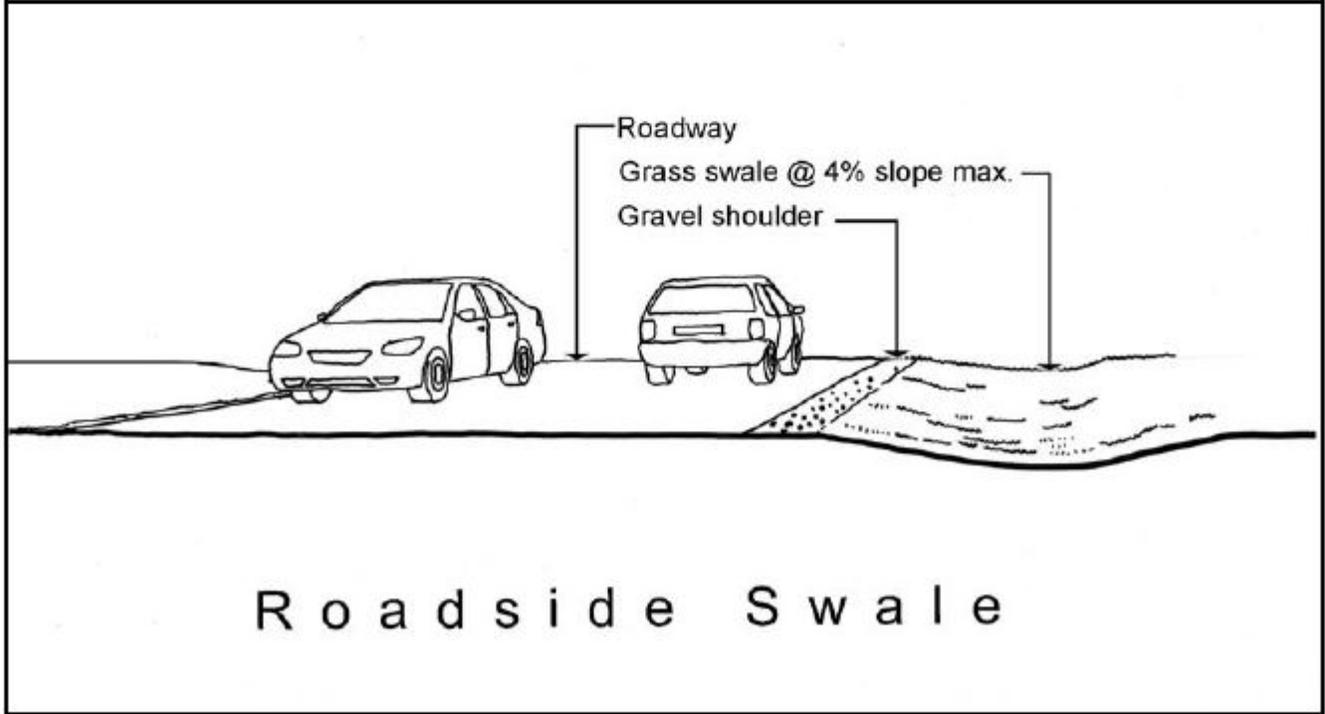
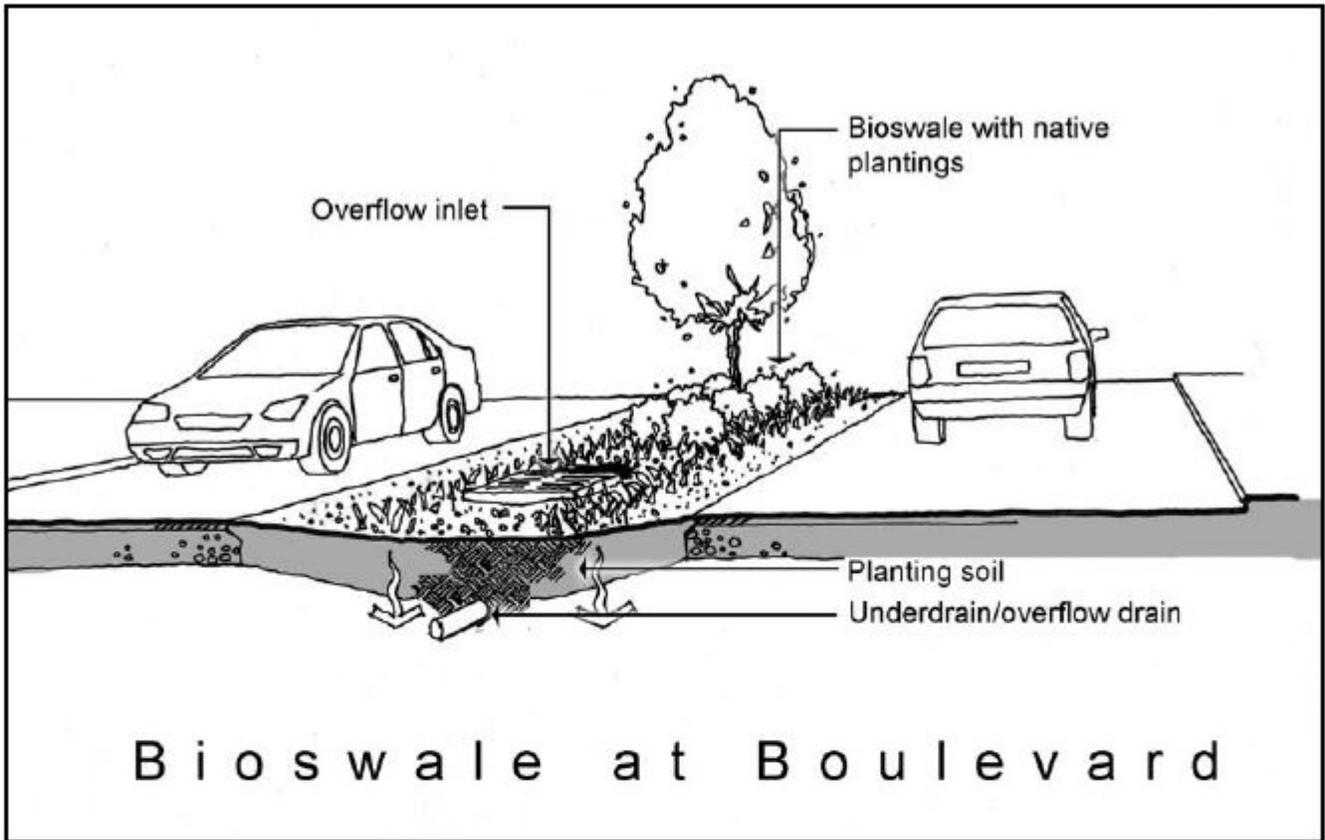
Roadway Design - Basic strategies for low-impact roadway design in Sandwich should include narrow road widths, shared driveways, and open-section roadways. Parking lot design includes breaking up large paved areas into smaller lots, maximizing shared parking, providing adequate parking (based on actual demand rather than general standards), and using permeable paving where appropriate. The design objectives for roadways and parking lots are to:

- Reduce total impervious surfaces;
- Reduce road and parking construction and long-term maintenance costs;
- Provide safe access and adequate parking;
- Minimize disturbance to natural site hydrology;
- Create opportunities for stormwater treatment and infiltration; and
- Improve site appearance.



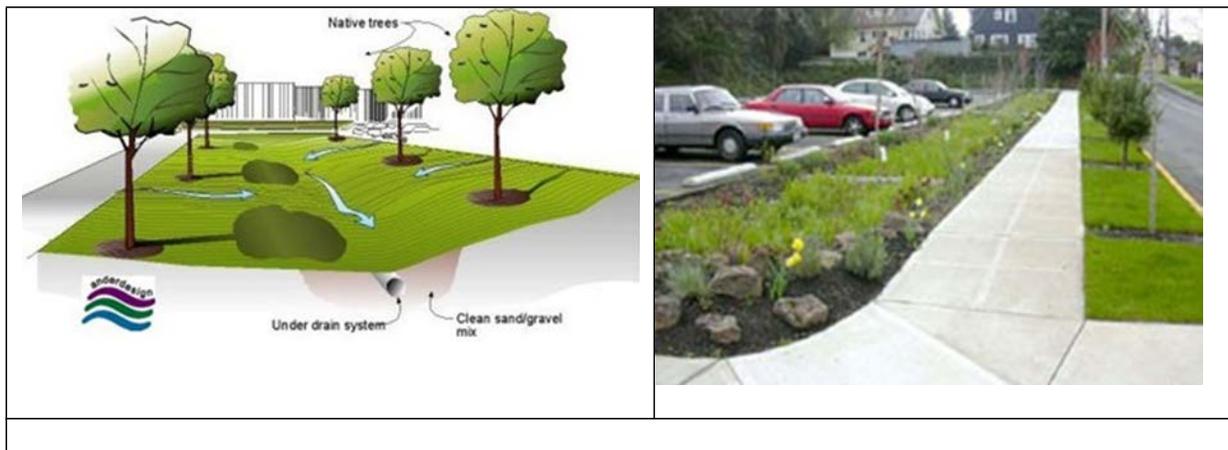
Example Open-Section Road For LID Development in NH

Low-impact roadways use a narrower, more traditional design that enhances site character and produces less runoff, which is directed to roadside swales for treatment and conveyance. This technique helps to filter roadway runoff, promote infiltration, and reduce runoff velocity, resulting in lower peak discharge rates. If properly designed, open section roadways will be no more prone to flooding than conventional roadway profiles.



Turnarounds and Cul-De-Sacs - Cul-de-sacs should be designed to reduce runoff and improve character, while still providing sufficient room for emergency vehicles and delivery trucks to maneuver. One treatment for the circles is landscaped islands built as bioretention areas with proper grading to catch and treat roadway runoff.

Parking Lot Design - Expansive parking lots that drain to catch basins create large volumes and high velocities that require pipe-and-pond stormwater infrastructure. LID parking design should be incorporated into new developments in Sandwich to create multiple parking areas at different elevations that can reduce the amount of grading necessary to preserve natural hydrology.



Example Bioswale Treatment in Parking Lots

Natural Landscaping and Xeriscaping - Natural resource preservation and Xeriscaping™ can be used to minimize the need for irrigation systems and enhance property values. Preserving existing wooded areas, mature trees, and natural terrain can give new developments a premium "mature landscape" appearance and provide residents with additional recreational amenities. Both of these features can improve marketability. Xeriscaping refers to landscaping with plants native to area climate and soil conditions. These plants thrive naturally, requiring less maintenance and irrigation than most hybrid or imported varieties.

Contact the Town of Sandwich Engineering Department for a list of storm-water projects that can be viewed locally.

Additional information may be found at the following:

[Town of Sandwich Local Comprehensive Plan](http://www.sandwichmass.org/Documents.asp?iFrame=Sandwich LCP May 2009.pdf&ID=159&DID=109)

<http://www.sandwichmass.org/Documents.asp?iFrame=Sandwich LCP May 2009.pdf&ID=159&DID=109>

[Massachusetts Stormwater Handbook](http://www.mass.gov/eea/agencies/massdep/water/regulations/massachusetts-stormwater-handbook.html)

<http://www.mass.gov/eea/agencies/massdep/water/regulations/massachusetts-stormwater-handbook.html>

[Low Impact Development Center](https://lowimpactdevelopment.org/)

<https://lowimpactdevelopment.org/>

[UNH Stormwater Center](https://www.unh.edu/unhsc/)

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[Town of Sandwich Zoning Bylaw and Subdivision Rules & Regulations](http://www.sandwichmass.org/Documents.asp?ID=113&DID=7)

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