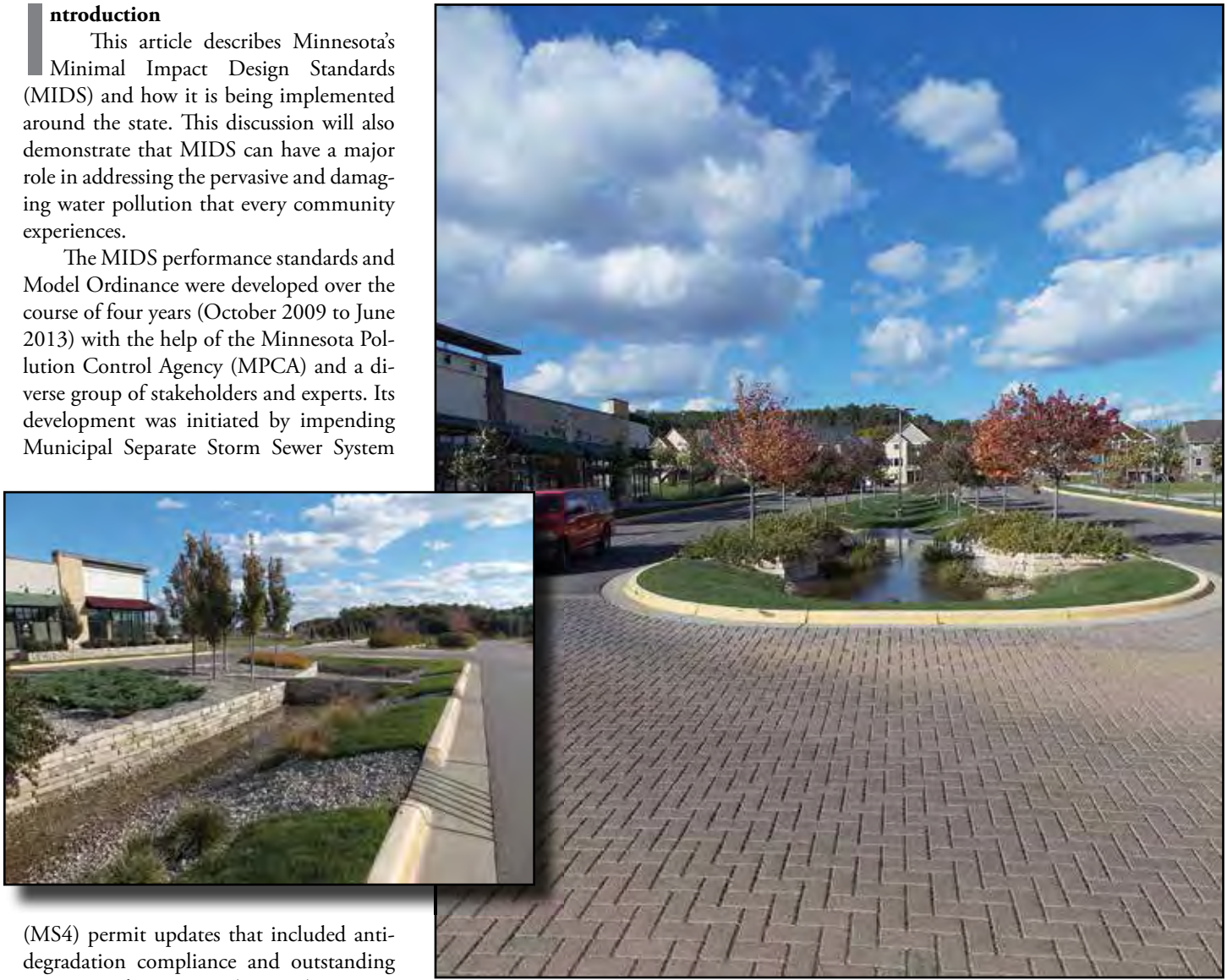
# Minimal Impact Development Standards: A New Cutting Edge in Stormwater Management

**Introduction**

This article describes Minnesota's Minimal Impact Design Standards (MIDS) and how it is being implemented around the state. This discussion will also demonstrate that MIDS can have a major role in addressing the pervasive and damaging water pollution that every community experiences.

The MIDS performance standards and Model Ordinance were developed over the course of four years (October 2009 to June 2013) with the help of the Minnesota Pollution Control Agency (MPCA) and a diverse group of stakeholders and experts. Its development was initiated by impending Municipal Separate Storm Sewer System (MS4) permit updates that included antidegradation compliance and outstanding resource value waters (ORVW) requirements. In response, a diverse collection of stakeholders, including the Minnesota



**Median raingarden showing pervious pavers at intersection. Inset: Median raingarden showing curb cuts to direct runoff.**

Cities Stormwater Coalition, MS4 communities, the League of Minnesota Cities, the Builder's Association of the Twin Cities, environmental advocacy organizations, local watershed districts, the Stormwater Steering Committee of the Minnesota Pollution Control Agency (MPCA), and key state legislators convened to develop a set of tools to address the general problems of stormwater management and the MS4 permit updates. The coalition's efforts culminated in legislative support and funding for the MIDS concept,[1] and development of the MIDS Model Ordinance and Community Assistance Package.[2]

Part I of this article provides a brief history of stormwater management, and reviews the development of the MIDS Model Ordinance and performance standards. Part II describes the basic principles and the crucial components and tools of the MIDS Model Ordinance and Community Assistance Package. Finally, Part III reviews the success Emmons & Olivier Resources has had in working with communities across Minnesota to integrate the MIDS system in local ordinance to improve protection of local and regional water resources.


**Example of 'new' development parking standards.**

### I. Stormwater Management History & Development of MIDS

Water is one of the most important natural resources in Minnesota. It is important to local economies, crucial for wildlife, and a critical component of Minnesotans' lifestyles and recreational pursuits. Clean, abundant water is a key issue all across the state: from the beautiful north shore of Lake Superior, to the game fishing and water recreation on the numerous in-land lakes, to the agricultural heartland of the south and west. The State's tourism and agriculture industries are both multibillion dollar industries heavily reliant on water resources.[3] Fourteen of the state's top 35 grossing attractions are water related, including several state parks, and Lake Superior.[4] The pervasive importance of water is the fundamental rationale for protecting and restoring the State's highly valued water resources. One key component in protecting and restoring Minnesota's water resources is effective stormwater management.

From the 1890s to the 1960s concern for stormwater runoff was almost nonexistent, with dilution being the only solution.[5] However, a new environmental consciousness swept the nation in the 1970s, most notably after a major fire on the heavily polluted Cuyahoga River.[6] In fact, the late 1960s and early 1970s were a major turning point for environmental protections in U.S.—the Clean Water Act, the Clean Air Act, and the National Environmental Policy Act were all passed by the U.S. Congress, dramatically accelerating the improvement of natural resources. The evolution of stormwater management can largely be traced to amendments to the Water Pollution Control Act (predecessor to the Clean Water Act) in 1972, which recognized the deleterious effects of urban runoff. However, at this time, it was still "uncertain" (at least to Federal agencies) whether urban runoff actually caused significant impacts to water resources.[7] The U.S. Environmental Protection Agency's (EPA) "National Urban Runoff Program" (NURP), established in 1978, was one of the first comprehensive efforts to study the characteristics of urban stormwater runoff, the extent of impact of that runoff, and the effectiveness of existing runoff management programs and practices. The NURP project culminated in a final report published in 1983.[8] Stormwater management has evolved substantially during the past 30 years. Until recently, stormwater management solutions concentrated on directing stormwater off-site quickly and reducing flooding concerns. The main tool to achieve these goals was collecting runoff in stormwater ponds and other detention facilities.

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The shortcomings of these approaches are well documented.[9] Worse, the results of continued stormwater pollution can be seen first-hand in nearly any urban water body and in thousands of impaired waters across the nation. Unfortunately, water re-

**Lakeview rain garden.**

sources in and around the Minnesota have not avoided damage or degradation from the failures of outdated stormwater management.[10] In fact, there are 4,603 "impaired waters" just in the state of Minnesota. Even the most popular, most iconic, and arguably the most beautiful waterbodies in the state are "impaired." The Mississippi River, the Minnesota River, the St. Croix River, Lake Calhoun, Leech Lake, Lower Whitefish Lake, and Lake Mille Lacs, to name only a few, all appear on the impaired waters list. Furthermore, the pollution issues in Minnesota waterbodies go beyond just nutrients and sediment, but includes toxic, lethal substances such as mercury, fecal coliform, arsenic, dioxins, DDT, PCBs and E. coli. Clearly, more effective methods of protecting waterbodies are necessary to protect the State's precious water resources. Modern stormwater management systems, like MIDS and the Low Impact Development (LID) practices MIDS is based on, focus on retaining the raindrop where it falls through the use of retention methods. This minimizes runoff, reduces pollution, and increases infiltration and groundwater recharge. Stormwater retention, as opposed to detention, is the overarching concern of the Minimal Impact Design Standards (MIDS).

## II. The Minimal Impact Design Standards Explained

### *Basic Principles of MIDS*

The Minimal Impact Design Standards represent the next generation of stormwater management in Minnesota. The foundation of MIDS is Low Impact Development (LID) standards, which use technologies and best management practices (BMP) to mimic a site's natural hydrology as the landscape is developed. The package of tools includes performance goals, a calculator for determining stormwater credits for best management practices, and ordinance guidance for communities. Using Low Impact Development (LID) principles, MIDS emphasizes keeping the raindrop where it falls in order to minimize stormwater runoff and pollution. Low Impact Development is an internationally recognized approach to stormwater management that mimics a site's natural hydrology as the landscape is developed.[11] The LID approach preserves and protects environmentally-sensitive sites and natural features, including riparian buffers, wetlands, steep slopes, valuable trees, floodplains, woodlands, and highly permeable soils.

The standards and procedures in MIDS are a set of effective, flexible, and adaptable tools designed to retain stormwater where it falls. In fact, these tools go beyond just managing stormwater, but also provide solutions for numerous issues associated with utility and infrastructure projects such as requiring financial securities, codifying fair and effective enforcement procedures, and ensuring facility inspection and maintenance. MIDS incorporates these concepts to achieve more effective stormwater management with four main components:

- Strong, consistent performance standards for the full range of constructions projects.
- Flexible Treatment Alternatives designed to achieve high water quality standards despite site constraints such as high water tables, karst geology, or soil issues.
- A MIDS Design Sequence Flow Chart to assist all stakeholders—from the most experienced developer to a first-time home builder—navigate, understand, and effectively apply MIDS to specific projects.
- A new calculator and credit calculations that standardize the use of a range of innovative structural stormwater practices and facilities.

### *Performance Standards*

The MIDS Model Ordinance ensures consistent and effective management of a range of stormwater issues, including reducing the velocity at which stormwater leaves a particular property (rate), reducing the amount of water generated by the impervious surfaces on that property (volume), and removing sediment, nutrients, and other pollutants contained in the stormwater (water quality). These factors have important impacts on the body of water receiving stormwater—if not properly managed, each can damage, or even destroy a body of water. Performance standards differ depending on the severity of the storm (e.g. the 1-year, 2-year, 10-year, and 100-year, 24-hour storm events). Generally under MIDS, new development and redevelopment projects must capture, and retain on-site, up to 1.1 inches of runoff from all impervious surfaces on the site.[12] This volume represents the 90th percentile storm. In other words, ninety percent of all storm events in a single year result in less than 1.1 inches of total precipitation; only ten percent of storms are large events with more than 1.1 inches of precipitation. Linear development (e.g. road construction) must retain at least half the volume (0.55") from

new or fully reconstructed projects, or 1.1 inches of runoff volume from the net increase in impervious surfaces from the site.[13] The MIDS model ordinance also sets a consistent and strong threshold for when these performance standards must be met.

When adopted, MIDS can help communities achieve both stormwater quality and quantity goals. For instance, MIDS can be used to meet anti-degradation requirements; achieve rate and volume controls, and actively reduce several pollutant loads. In Minnesota, MIDS is an approved approach for satisfying the requirements for new development and redevelopment outlined in Minimum Control Measure (MCM) 5 of the General Permit for small Municipal Separate Storm Sewers (MS4 Permits). The clear, concise, and quantifiable standards provided by MIDS also prevent anyone in the community from avoiding, exploiting, or neglecting the requirements of the ordinance. Simply put, the standards cannot be flouted or abused.

Further, communities can use MIDS to achieve waste load reductions as specified in a Total Maximum Daily Load (TMDL) standard. These Federal regulatory standards, mandatory for every state under section 303(d) of the Clean Water Act, require states to submit lists of "impaired waters." These are waters that are polluted and do not achieve water quality standards. States must then establish Total Maximum Daily Loads (TMDL) for each of the impaired waters. A TMDL is pollution budget for a particular body of water. It identifies all sources of a specific pollutant (i.e. phosphorous, nitrates, etc.) and allocates how much each source must reduce its contribution in order to meet the water quality standard applicable to that pollutant.[14] In some cases where a water body is considered special or impaired, a higher standard may be necessary to improve water quality or protect the resource. The MIDS model can be adapted to meet these situations.

**Integrated stormwater management in park design.**

### *Flexible Treatment Alternatives*

Many developers and land owners are leery of updates to development policies. They believe new regulations may result in impracticable requirements for a previously undeveloped site or redevelopment project. These beliefs are often especially strong in communities where development policies are less stringent or are applied infrequently. The MIDS development group foresaw these obstacles, and purposely integrated measures of flexibility in the Model Ordinance and its performance standards. If an applicant is unable to achieve the full MIDS performance goals due to site restrictions as documented by the applicant and attested by the local authority, the development project may instead follow the Flexible Treatment Alternatives process.

The first alternative is to retain a smaller volume of runoff, remove a large percentage of the total phosphorous load from the discharged runoff, and attempt to address constraints by relocating project elements. If the first alternative is unfeasible, the second alternative reduces the volume standards to a "maximum extent practicable" level, further decreases the percentage of total phosphorous that must be removed, and may permit relocation of project elements. Finally, if the first two alternatives are unattainable, the third alternative allows off-site mitigation equivalent to the full volume reduction performance goal (1.1 inches). These alternatives are intended to be used in sequence. Each step of the sequence must be documented, reviewed, and approved by the local authorities.

### *MIDS Calculator*

One of the greatest aspects of MIDS is that it standardizes the benefits of non-structural and structural stormwater practices.[15] The MIDS Best Management Practice (BMP) calculator is a Microsoft Excel-based tool used to determine stormwater runoff volume and pollutant reduction capabilities of various low impact development (LID) BMPs. The MIDS calculator estimates the stormwater runoff volume reductions for various BMPs based on the MIDS performance goal (1.1 inches of runoff from impervious surfaces) and annual pollutant load reductions for total phosphorus (including a breakdown between particulate and dissolved phosphorus) and total suspended solids (TSS).

Standardizing stormwater Best Management Practices (BMPs) simplifies the development process. All the Best Management Practices recommended by the MIDS system have been reviewed and approved by a host of stormwater professionals, including the Minnesota Pollution Control Agency (MPCA). This eliminates the need for technically complicated, expensive, one-off designs for stormwater infrastructure. It also allows all non-technical stakeholders to visualize and understand the positive impacts of a particular stormwater best management practice.

Standardization also supports decision-makers in determining which design aspects will satisfy a community's goals.

**Silt fence protecting wetland.**

The MIDS Calculator helps communities quantify load reductions for specific pollutants, as well as overall volume and rate, which is frequently necessary for federal and state water quality standards. Moreover, the objective, verifiable reductions are important outcomes that can be used in applications for grants and other funding opportunities. In short, the MIDS Calculator reduces workloads for developers and City Staff, and clarifies the stormwater management possibilities to even the most inexperienced user.

***Overlapping Authority and MIDS***

MIDS can be especially effective in Minnesota because it is typically implemented by several overlapping authorities, including watershed districts (WDs), watershed management organizations (WMO), counties, and municipalities. In fact, nearly every level of water governance in the state has adopted the MIDS approach. The MIDS development process and state wide application is codified in state statute.[16] The Minnesota Department of Natural Resources, a state-level agency, incorporated the MIDS performance goals into its Stormwater and Shoreline Best Management Practices for Public Water Accesses.[17] Further, the Minnesota Pollution Control Agency (MPCA), the state agency responsible for issuing permits and overseeing many pollution prevention and water quality programs, was heavily involved in the development of MIDS. The MPCA has also approved MIDS as a method for achieving the regulatory requirements for several state-wide programs.

At the watershed level, a significant number of Watershed Districts and Water Management Organizations and the communities within their boundaries, have adopted, or are actively preparing to adopt MIDS standards.[18] These organizations play a critical role in achieving the water quality and resource conservation goals set at the state and local level. Finally, nearly a dozen counties and municipalities have formally adopted at least parts of the MIDS model ordinance, with a few adopting the model ordinance in its entirety. In fact, the Middle St. Croix Watershed Management Organization was awarded a Clean Water grant in 2014 to implement the MIDS Community Assistance Package. This watershed management organization is currently working with the communities in the St. Croix Basin to adopt local ordinance revisions to incorporate MIDS. Many of these communities have already updated their codes, and several are in the process of approving updates.

***Consistency and the MIDS Approach***

MIDS also ensures a community's stormwater management ordinance is internally consistent and straightforward. Many municipal codes use obsolete or multiple terms (i.e. drainage, stormwater, runoff, etc.) when regulating stormwater runoff. This could cause a developer or landowner significant confusion as these terms have ambiguous meanings. Communities that do have stormwater management codes, often also have confusing or ineffective regulatory thresholds. Some ordinances have multiple triggers for implementing stormwater best management practices that vary depending on project type, proximity to waterbody or natural feature, or intended use (residential v. commercial). Still other codes permit numerous exceptions or exemptions from stormwater management and erosion control regulations.

The MIDS model ordinance simplifies these convoluted triggers and thresholds, and instead uses simple thresholds that apply regardless of location, project type, or intended use.[19] The Model Ordinance addresses land disturbance and development projects that may not necessarily meet the main trigger as a result of multiple, small, distributed sites, as well as projects a community believes might impact an environmentally sensitive area.

More problematic is the fact that many municipal codes are cumbersome and disorganized. The relevant terms and standards are scattered throughout codes with no organization or consistency. In many of the municipal codes reviewed by the authors, stormwater provision appear in various places, including zoning, subdivision, land development, environmental, and performance standards. In fact, several codes did not even mention the term "stormwater management" or concepts related to modern stormwater management. Many code sections, especially zoning codes, can be very long, with several dozen subchapters, sections and subsections. It is may be the case that even City or County staff may be unaware or unsure of existing stormwater management requirements, as a result of voluminous, lengthy ordinances. This forces developers to look through several hundred pages to find the provisions that determine the particular stormwater and erosion control requirements for a project. Creating a stormwater pollution prevention plan for a project is thus a ma-

jor undertaking requiring frequent contact with City staff, long hours reviewing the City Code, and possibly even hiring professional help.

Adopting MIDS offers an alternative. First, the MIDS provisions can simply be slotted into the existing codes. Alternatively, MIDS can be integrated into the existing codes as a standalone chapter, or as an addition to an existing chapter. No major rewrite is required, beyond deleting conflicting or supplemented sections. More importantly, a stand-alone chapter offers myriad benefits. A single, organized stormwater management chapter would save developers and City staff enormous amounts of time and money. Instead of searching through a cumbersome set of ordinances, both staff and developers would need to look at only one chapter of the code to determine what stormwater management standards must be met. Even first time builders or developers, new to an area could easily integrate the performance standards, and use the simple tools in the MIDS ordinance to develop a state-of-the-art stormwater management system.

**III. The Success of MIDS**

Adoption of the MIDS approach to stormwater management has slowly gained momentum since its release in 2013. As part of the MSCWMO-administered grant mentioned above, and with the help of Emmons & Olivier Resources, Inc., six communities have already adopted the MIDS approach.[20] Four other Lower St. Croix River communities are in the process of approving similar updates.[21] Across Minnesota, three communities within the Crow Wing Soil and Water Conservation District (Crosby, Deerwood, and Irondale) have or are in the process of adopting the MIDS approach. Lindstrom, Center City, and Chisago City, communities in the Chisago Lakes Lake Improvement District, are also adopting MIDS. Finally, a number of communities in western Wisconsin, and several in Iowa are actively considering MIDS updates to their respective ordinances.

**Conclusion**

Communities have much to gain from adopting the Minimal Impact Design Standards in Minnesota. The MIDS model provides clear, consistent, and effective performance standards and regulatory thresholds. The model ordinance does not place an unreasonable burden on landowners or developers, and in fact benefits the project itself, as well as local and regional water resources. Thanks to the Flexible Treatment Alternatives, MIDS offers substantial flexibility to development projects forced to manage site constraints. MIDS also provides communities state-of-the-practice stormwater management while also seamlessly integrating local approaches with neighboring communities and other overlapping layers of authority. Finally, MIDS improves the effectiveness and consistency of the county and municipal codes by presenting a comprehensive package of tools that can be approved as a stand-alone chapter, or easily integrated into existing codes. All water resources in Minnesota, and across the nation, deserve and will greatly benefit from the reduced runoff volumes and rates, and decreased pollution loads MIDS will generate when fully implemented. **L&W**

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## References


[1] See 2009 Minn. Laws Ch. 37, art 1, § 37, available at https://www.revisor.mn.gov/laws/?year=2009&type=0&doctype=Chapter&id=37.

[2] Minnesota Pollution Control Agency, MIDS Community Assistance Package, available at http://stormwater.pca.state.mn.us/index.php/Community_Assistance_Package.

[3] These industries grossed $13.6 billion and $22 billion, respectively, in 2014. Star Tribune, "Minnesota's water war: Battle brews over needs of tourism, agriculture" June 9, 2015 available at http://www.startribune.com/water-rules-divide-tourism-agriculture/306330241/.

[4] See "Top Minnesota Attractions, 2010", Explore Minnesota, available at http://www.exploreminnesota.com/industry-minnesota/research-reports/researchdetails/?nid=141.

[5] U.S. Environmental Protection Agency, Results of the Nationwide Urban Runoff Program: Final Report, Washington D.C., Dec. 1983, available at https://www3.epa.gov/npdes/pubs/sw_nurp_vol_1_finalreport.pdf.

[6] Jennifer Laston, "The Burning River That Sparked a Revolution," June 22, 2015 available at http://time.com/3921976/cuyahoga-fire/.

[7] Ibid. at 1-1. Uncertainties were so great and cost estimates were so high that funding for treatment of separate stormwater discharges was deleted from the Clean Water Act of 1977 (P.L. 95-217).

[8] U.S. Environmental Protection Agency, Results of the Nationwide Urban Runoff Program, available at shttps://www3.epa.gov/npdes/pubs/sw_nurp_vol_1_finalreport.pdf.

[9] See, i.e., Vladimir Novotny & Harvey Olem, Water Quality: Prevention, Identification, and Management of Diffuse Pollution, Wiley, 1994; E. E. Geldreich, et al., The Bacteriological Aspects of Stormwater Pollution, 40 J. of Water Pollution Control Federation 1861 (Nov. 1968).

[10] See MPCA, 2016 Draft Impaired Waters List, available at https://www.pca.state.mn.us/water/minnesotas-impaired-waters-list.

[11] Michael E. Dietz, Low Impact Development Practices: A Review of Current Research and Recommendations for Future Directions, 1 Water, Air, and Soil Pollution 351 (Sept. 2007).

[12] See MIDS Community Assistance Package, Long-Form Stormwater Ordinance, § 6(d)

[13] See MIDS Community Assistance Package, Long-Form Stormwater Ordinance, § 6(c)

[14] For Minnesota specific TMDL information, see Minnesota Pollution Control Agency, "Total maximum daily load (TMDL) projects," https://www.pca.state.mn.us/water/total-maximum-daily-load-tmdl-projects for Minnesota specific information about TMDLs. For federal information, or more information about your state's TMDL requirements, see U.S. EPA, "Implementing Clean Water Act Section 303(d): Impaired Waters and Total Maximum Daily Loads (TMDLs)," https://www.epa.gov/tmdl.

[15] According to Mike Isensee, MSCWMO Administrator, "Since adopting MIDS in 2015 we have conducted 13 project reviews that required permanent stormwater treatment. In all cases, design was achieved with few iterations. The clarity of the flexible treatment options and the MIDS calculator have removed ambiguity from the design process which simplifies our review and saves both the watershed and project owners time and money."

[16] See Minn. Stat. 115.03 Subd. 5c(c).

[17] Minnesota Dept. of Nat. Resources, Stormwater and Shoreline Best Management Practices for Public Water Accesses, available at http://www.dnr.state.mn.us/water_access/bmp/index.html.

[18] See "Minnesota Stormwater Manual - Communities that Adopted MIDS," at http://stormwater.pca.state.mn.us/index.php/Community_Assistance_Package.

[19] See MIDS Community Assistance Package, Long-Form Stormwater Ordinance, § 2(a) & 2(b).

[20] Bayport, Baytown Township, Lakeland, Lakeland Shores, Lake St. Croix Beach, & St. Mary's Point.

[21] Afton, Oak Park Heights, Stillwater, & West Lakeland Township.