Low Impact Development

Balancing Development with Water Quality Protection

LID NEWS is a newsletter designed to inform elected and appointed officials in southwest Michigan about LOW IMPACT DEVELOPMENT (LID). The LID approach to land development utilizes various land use planning and design practices and technologies to simultaneously protect water quality and reduce infrastructure costs.

What is A Watershed?
A watershed is the area of land that catches rain and snow and drains or seeps into a marsh, stream, river, lake or groundwater. You are sitting in a watershed now. Homes, farms, ranches, forests, small towns, big cities and more can make up watersheds. Some watersheds cross county, state, and even international borders such as the Great Lakes Basin. Watersheds come in all shapes and sizes. Some are millions of square miles, others are just a few acres. Just as creeks drain into rivers, watersheds are nearly always part of a larger watershed or basin. For example the St. Joseph River Watershed is part of the Lake Michigan Watershed which is part of the Great Lakes Basin. Every stream, tributary or river has an associated watershed.

Most watersheds are composed of a mixture of uplands, wetlands, riparian areas, streams and lakes. The most common component of almost all watersheds is the upland area, covering in many cases over 99% of the total watershed area. The rain and snow that falls onto a watershed, and that does not evaporate, is stored in the soil, and over a period of time is released down slope through groundwater, wetlands and streams. This water then moves through a network of drainage pathways, both underground and on the surface.

The next time it rains, look to see where the water that runs off of your roof and the driveway goes. Usually you will see it running down the street and into a storm sewer or a ditch along the road. Where does the rainwater eventually go? There are many paths that the water can take, but eventually it all ends up in the nearest stream, lake or wetland. Some of it soaks into the soil to become groundwater and slowly replenishes streams and lakes. Some water runs overland (called runoff) or through storm sewers and ditches then quickly flows into the nearest creek, river or wetland.

This is one of a series of six newsletters that will be developed focusing on Low Impact Development. This newsletter was developed by the Southwestern Michigan Commission with assistance from the MDEQ, EPA, and the following watershed projects: Black, Galien, Gun and Paw Paw River Watersheds. For additional information on LID and to download this newsletter visit www.swmicomm.org.

This Nonpoint Source Pollution Control project has been funded in part through the Michigan Nonpoint Source Program by the United States Environmental Protection Agency under assistance agreement C9975464-05 to the Southwestern Michigan Commission for the Paw Paw River Watershed Planning project. The contents of the document do not necessarily reflect the views and policies of the EPA, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.
All of west Michigan (dark blue area on map to the left) is in the Lake Michigan Watershed which is part of the Great Lakes drainage basin. (A drainage basin is another word for a watershed. A basin is usually a larger watershed made up of several large watersheds or drainage areas.)

The Connection Between Land Use and Water Quality

What is Non-Point Source Pollution?

Unlike pollution from factories and sewage treatment plants, non-point source pollution comes from many different areas with no particular place of origin. It is caused by rainfall or snow-melt moving over and through the ground. As this water moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, creeks, rivers, wetlands and even underground sources of drinking water. Pollutants can come from all land uses (residential, agricultural, commercial, golf courses, industrial, etc.)

Pollutants include:

- Excess fertilizers, herbicides, and insecticides from farms, residential, commercial or municipal owned lawn areas and golf courses.
- Oil, grease, and toxic chemicals from urban runoff and energy production
- Sediment from improperly managed construction sites, crop and forest lands, and eroding stream banks
- Bacteria and nutrients from livestock, pet waste, and faulty septic systems
- Salt and sand from roads

In a healthy watershed, after a rain event, vegetation and wetlands intercept and slow the flow of water as it travels through the watershed, removing sediment and allowing large quantities of water to enter the soil and percolate into the groundwater. This groundwater is then available to contribute to late season stream flow, to the benefit of fisheries and water quality. In comparison, a watershed with more impervious surfaces and the loss of vegetation and wetlands, responds differently after a rain event. More water runs over the land instead of replenishing groundwater. This larger volume of water quickly reaches water bodies reducing the time available for the water to be cleansed and filtered and also causing erosion of stream banks.
Most human activities and development have the potential to adversely affect the overall health and quality of a watershed. Timber harvest on unstable slopes can cause erosion. Agricultural activities can increase levels of harmful bacteria and overload runoff with nutrients. Also, poorly planned urban and industrial growth can cause many of the same problems as farming and timber harvest in addition to contamination from toxic chemicals. Even seemingly harmless activities such as rural development and recreational activities along rivers and creeks can be harmful, impacting the watershed's sensitive riparian vegetation which is important for water quality protection and wildlife habitat.

When viewed individually, most human activities have little effect on the general health of the watershed. However, the effects of numerous activities within a watershed are cumulative and when combined can greatly diminish the watershed's overall health. Every activity has the potential to impact the area of the watershed downstream. As people place more demands on a watershed, greater efforts must be made to reduce these cumulative effects. Having clean water will require communities to work together to ensure that activities do not negatively impact those downstream.

**One solution is LID ~ LOW IMPACT DEVELOPMENT**

Low Impact Development is an ecologically friendly approach to site development and stormwater management that aims to mitigate development impacts to land, water and air. The approach emphasizes the integration of site design and planning techniques that conserve natural systems and hydrologic functions on a site. The practice has been successfully integrated into many municipal development codes and storm water management ordinances throughout the United States. **Specifically LID aims to:**

- Preserve open space and minimize land disturbance
- Protect natural systems and processes (drainage ways, vegetation, soils, wetlands)
- Reexamine the use and sizing of traditional infrastructure (lots, streets, curbs, gutters, sidewalks) and customize site design
- Incorporate natural site elements (wetlands, stream corridors, mature forests) as design elements
- Decentralize and micromanage stormwater at its source

**Internet Resources on LID:**
- Low Impact Development Center
  www.lowimpactdevelopment.org
- Nonpoint Education for Municipal Officials
  http://nemonet.uconn.edu/
- Planning with Power
  www.planningwithpower.org
- USEPA Low Impact Development page
  www.epa.gov/owow/nps/lid
  www.urban-advantage.com/images_HTM.htm
What is LID? Low Impact Development is an approach to designing a site for development or redevelopment that takes into account the natural resources and pre-development hydrology. It includes a suite of landscaping and design techniques that attempt to maintain the natural, pre-developed ability of a site to manage rainfall. LID techniques capture water on site, filter it through vegetation, and let it soak into the ground where it can recharge the local water table rather than being lost as surface runoff. An important LID principle includes the idea that stormwater is not merely a waste product to be disposed of, but rather that rainwater is a resource.

Where should LID be used? LID can be applied to new development, urban retrofits, and redevelopment/revitalization projects at many scales. At a small scale, LID techniques can be used to better handle rainfall for a single family lot through rain barrels and rain gardens. At a larger scale, proper site design in combination with many landscaping and infiltration techniques distributed throughout a subdivision or development will cumulatively improve water quality and reduce runoff.

Future Issues of this newsletter will address:
Benefits of LID for developers, municipalities and for water resources
LID techniques (rain gardens, green roofs, porous pavement options, use of native plants, etc.)
Examples of LID in southwest Michigan (the Black, Gun, Galien, Dowagiac, Lower St. Joseph and Paw Paw River Watersheds)*

*If you know of a LID project in southwest Michigan, please contact: Marcy (269) 925-1137 x25 colcloughm@swmicomm.org
For more information or questions, please contact:
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Paw Paw River Watershed Project: Matt Meersman (269) 925-1137 x22

Conventional Development vs. LID: Conventional development techniques often clear all trees and valuable topsoil from a site and re-grade it so that all water ends up in one large detention basin. Resulting problems include loss of recharge, increased water temperature, decreased water quality and higher runoff volumes. The LID approach protects the natural ability of the site to capture precipitation, keep it clean and allow it to recharge the local water table.
Low Impact Development

Balancing Development with Water Quality Protection

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What is LID and What are the Benefits of Utilizing LID?
What if development and infrastructure costs could be reduced, while the environment is protected, and the marketability of a development is increased? It may sound too good to be true, but many developers throughout the nation have been able to meet these ambitious goals. How? By incorporating a growing collection of innovative practices and technologies into their existing land development processes and practices. Low Impact Development (LID) is an approach to land development that uses various land planning and design practices and technologies to simultaneously conserve and protect natural resource systems and reduce infrastructure costs. LID still allows land to be developed, but in a cost-effective manner that helps mitigate potential environmental impacts.

There are numerous design practices and technologies developers can use through the LID approach. It is important for municipal officials to encourage developers during the planning stages of a development to identify opportunities to protect water and other natural resources. Examples of opportunities include saving trees on the site, not building on sensitive areas (wetlands and steep slopes), orienting roads and lots to allow for passive solar orientation of homes, and providing wildlife habitat and open spaces. Such efforts have resulted in rapid sales, enhanced community marketability, and higher-than-average lot yields.

The LID approach seeks to do the following:

1. Preserve Open Space and Minimize Land Disturbances

Many municipal officials are recognizing the value of open space, mature landscapes, and native vegetation. Open-space tracts incorporated into community designs and planned as components of larger, contiguous areas are highly desirable; in fact, homeowners frequently seek assurances that their community enjoys easy access to undeveloped areas located nearby. Minimizing land disturbance helps lessen the impacts to water quality both on and off the site.
2. Utilize a Site Analysis to Protect Sensitive Natural Features and Processes

Protection of a site’s sensitive natural features and natural processes is paramount to planning for LID. The way to achieve is for municipalities to require a thorough site analysis to help identify developable and non-developable areas of a site and to understand the pre-development hydrology of the site. By avoiding sensitive areas (wetlands, floodplains, steep slopes, forested areas, etc) and directing development into areas that will have the least impacts on air, water, soil, and vegetation, the best balance between development and the protection of water and natural resources can be achieved.

3. Identify and Link On- and Off-Site “Green Infrastructure”

Green infrastructure represents the planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that support native species, maintain natural ecological processes, and sustain air and water resources. Municipal officials should strive to identify on-site opportunities to support and connect to green infrastructure in their communities.

4. Incorporate Natural Features (Wetlands, Riparian Corridors, Mature Forests) into Site Designs

LID takes advantage of natural resources for both their functional and aesthetic qualities. For instance, when designed correctly, pond systems can provide storm water management solutions as well as aesthetic and recreational benefits for the entire community, thus increasing lot and community marketability.

5. Decentralize and Micromanage Storm Water at Its Source

Understanding the difference between pre- and post-development hydrologic patterns is critical to LID. The use of best management practices to reduce the amount of impervious surfaces, disconnect flow paths (i.e., downspouts connected to storm sewers), and treat storm water at its source all help minimize the impacts to water quality and local hydrology.

With Conventional Development water is moved off site as quickly as possible with curb, gutter, and storm sewers. With Low Impact Development water is slowed down and allowed as many opportunities as possible to soak into the ground.
**Benefits of LID**

Overall, using LID can lead to the protection of water quality and wildlife habitat, increased open spaces, protection of trees, reduced land disturbance, decreased infrastructure costs, and reduced homeowner energy bills. To developers, LID can offer both infrastructure savings and a way to respond to increasingly stringent environmental regulations. For municipalities, LID can help contain burgeoning street and storm water management costs. For community residents and visitors, LID can encourage local environmental stewardship and attract those that want to live in a more sustainable community. And, for the environment, the benefits speak for themselves.

**Summary of LID Benefits**

<table>
<thead>
<tr>
<th>Developers</th>
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<tbody>
<tr>
<td>Minimizes land clearing and grading costs</td>
<td></td>
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<tr>
<td>Reduces infrastructure costs (streets, curbs, gutters, sidewalk)</td>
<td></td>
</tr>
<tr>
<td>Reduces storm water management costs (reduces or eliminates storm sewers and ponds)</td>
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<tr>
<td>Increases lot sale yields and reduces permit fees</td>
<td></td>
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<tr>
<td>Increases lot and community marketability</td>
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<table>
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<tr>
<th>Municipalities</th>
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<tbody>
<tr>
<td>Protects site and regional water quality by reducing sediment, nutrient, and toxic loads to waterbodies</td>
<td></td>
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<tr>
<td>Balances growth needs with natural resource protection</td>
<td></td>
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<tr>
<td>Reduces municipal infrastructure and utility maintenance costs (streets, curbs, gutters, sidewalks, storm sewers and ponds)</td>
<td></td>
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<tr>
<td>Fosters public/private partnerships</td>
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<table>
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<tr>
<th>Home Buyer</th>
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<tbody>
<tr>
<td>Provides local accessibility to open spaces, recreation and wildlife areas</td>
<td></td>
</tr>
<tr>
<td>Preserves and protects amenities that can translate into more saleable homes and communities</td>
<td></td>
</tr>
<tr>
<td>Provides shading for homes and properly orients homes to help decrease monthly utility bills</td>
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<tr>
<th>Environment</th>
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<tbody>
<tr>
<td>Preserves integrity of ecological and biological systems</td>
<td></td>
</tr>
<tr>
<td>Protects site and regional water quality by reducing sediment, nutrient, and toxic loads to water bodies</td>
<td></td>
</tr>
<tr>
<td>Reduces impacts to local terrestrial and aquatic plants and animals</td>
<td></td>
</tr>
<tr>
<td>Preserves trees and natural vegetation</td>
<td></td>
</tr>
<tr>
<td>Creates connected corridors of wildlife habitat</td>
<td></td>
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</tbody>
</table>
### Low Impact Development Vs. Conventional Development Cost Comparison

<table>
<thead>
<tr>
<th>Development Item</th>
<th>LID Costs</th>
<th>Conventional Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grading</td>
<td>$358,500</td>
<td>$441,600</td>
</tr>
<tr>
<td>Paving</td>
<td>$255,760</td>
<td>$335,665</td>
</tr>
<tr>
<td>Concrete (sidewalks, curbs)</td>
<td>$259,995</td>
<td>$271,800</td>
</tr>
<tr>
<td>Storm Sewer</td>
<td>$204,100</td>
<td>$444,300</td>
</tr>
<tr>
<td>Sanitary Sewer</td>
<td>$385,280</td>
<td>$415,600</td>
</tr>
<tr>
<td>Main Water Line</td>
<td>$384,240</td>
<td>$405,950</td>
</tr>
<tr>
<td>Landscaping</td>
<td>$120,000</td>
<td>$65,000</td>
</tr>
<tr>
<td><strong>TOTAL COSTS</strong></td>
<td><strong>$1,967,875</strong></td>
<td><strong>$2,379,915</strong></td>
</tr>
</tbody>
</table>

*Cost Comparison provided by JF New & Associates and Belinski Homes- Laurel Springs*

In this example, by utilizing LID Development Practices a **Total Cost Savings** of **$412,040** was realized! Start talking to developers in your community about using Low Impact Development techniques!

**Future Issues of this newsletter will address:**
LID techniques (rain gardens, green roofs, porous pavement options, open space/cluster developments, use of native plants, etc.) and examples of LID in southwest Michigan.*

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See more on LID at www.swmpc.org/LID.asp

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General LID Concepts
One of the largest components of LID involves stormwater management. Conventional stormwater management methods move rainwater off-site, usually through pipes, as quickly as possible. LID aims to mimic natural hydrology and processes by using small-scale, decentralized practices that infiltrate, evaporate, and transpire rainwater. With LID, the ultimate goal is to keep as much rainfall on-site as possible through infiltration. What cannot be kept on-site is treated/filtered and slowed down before leaving the site. Specifically, LID aims to identify solutions that integrate the following concepts:

- Utilize clustered housing sites to preserve open space, minimize land disturbance and reduce street length
- Protect and incorporate natural systems (wetlands, stream/wildlife corridors, mature forests) as design elements;
- Minimize impervious surfaces (roofs, roads, driveways);
- Increase the flow path for stormwater runoff; and
- Utilize smaller, more decentralized treatment practices instead of centralized collection or detention areas

LID Techniques
LID techniques perform both runoff volume reduction and pollutant filtering functions resulting in cleaner water and less potential for flooding. These techniques work for new development and redevelopment projects.

**LID Techniques Include:**
1. Open Space and Sensitive Area (wetlands, floodplains, dunes, etc.) Preservation
2. Bioretention Areas/Rain Gardens
3. Grassed Swales (instead of curb and gutter)
4. Native Plant Landscaping
5. Permeable/Porous Pavement
6. Reduced Impervious Surfaces
7.Disconnected Downspouts (rain barrels)
8. Green Roofs

*This newsletter edition will explore techniques 1-4 and the next edition will go into more depth on techniques 5-8.*

Most photographs in this edition are courtesy of the Pokagon Band of Potawatomi Indians. The photos showcase their low impact housing development southeast of Dowagiac, Cass County, Michigan. This development helps to maintain water quality in the Dowagiac River Watershed.
1. Open Space and Sensitive Area Preservation
Site development layouts should be prepared with the preservation of natural features and the clustering of buildings and infrastructure. These techniques can significantly reduce the stormwater impacts of development.

- **Clustering buildings** allows for maximum preservation of natural areas, a reduction in infrastructure such as roads, and minimization of impervious area.

- **Building setbacks and naturally vegetated buffers** along sensitive environmental areas such as streams, rivers and wetlands are essential to protect water quality. A 100 foot buffer is the most effective in most situations; however even a 25-50 foot buffer is better than none at all.

- **Natural vegetation** should be preserved as much as possible. Particular attention should be paid to protecting larger trees and areas of native vegetation that act as buffers between building areas and environmentally sensitive areas such as rivers, streams, wetlands and lakes. Vegetation acts as a filter and absorbs water, which reduces the amount of stormwater runoff. Without this filtering, runoff would flow through storm drains and directly into streams, lakes or wetlands. *Lawns and turf areas are not adequate substitutes for meadows and woods.*

- **Steep slopes** should be considered environmentally sensitive areas and should be disturbed as little as possible. Steep slopes have significant potential for erosion when disturbed, increasing sediment loading to water resources.

2. Bioretention Areas/Rain Gardens
Storm water directed to these shallow depressions in the landscape is filtered, stored, and infiltrated into the ground by native plants and soils. These areas are designed to drain in 24-hours, with no risk of standing water and breeding of mosquitoes. A rain garden typically does not have the full spectrum of engineered features that bioretention areas have, such as underdrains and a special soil mix. Rain gardens can be easily designed and built by homeowners and located near a drainage area, such as a roof downspout. Typical uses include parking lot islands, edges of paved areas (roads or parking lots), and adjacent to buildings, open space, or in median strips. They are ideal for commercial, industrial, and residential (urban, suburban, ultra-urban) and are suitable for new construction and redevelopment projects. Visit [www.raingardens.org](http://www.raingardens.org) to learn how to plant a rain garden in your yard.

Did you know that communities designed to maximize open space and preserve mature vegetation are highly marketable and command higher lot prices?
3. Grassed Swales
Vegetated or grassed swales are used to convey stormwater runoff, but unlike standard drainage channels, they are designed to also improve stormwater quality. These open, shallow channels with dense vegetation slow runoff, filter it, and promote infiltration into the ground; and as a result, runoff volumes are smaller, peak discharge rates are lower, and runoff is cleaner. In contrast, the standard approach of using curbing on streets and parking areas impairs natural drainage systems and quickly conveys polluted runoff to nearby streams, rivers and lakes.

Engineered grassed swales can be a low-cost alternative to curbs, gutters, and storm drains. The cost for traditional structural conveyance systems ranges from $40–$50 per running foot. This is two to three times more expensive than an engineered grass swale (Center for Watershed Protection, 1998). Concerns that open channels are potential nuisance problems, present maintenance problems, or impact pavement stability can be alleviated by proper design. Periodic removal of sediments and mowing are the most significant maintenance requirements.

Typical uses include edges of paved areas (roads or parking lots), parking lot islands, common or open spaces, and adjacent to buildings. Grassed swales are appropriate for commercial, industrial, residential (urban, suburban, ultra-urban); transportation projects (highway medians); new construction, and redevelopment projects.

4. Native Plant Landscaping
It is increasingly recommended that native plants (vegetation that grows naturally in particular climates or regions) be used because of their performance, site enhancement, and life cycle cost benefits. Native plants typically cost more initially (depending on local availability); however, they are more cost-effective in the long run because they require less water and fertilizer, and are more resistant to local pests and diseases than non-native ornamentals. Native plants are also known to be very effective in managing storm water because many species have deep root systems which stabilize soil and facilitate the infiltration of storm water runoff. Additionally, native plants provide habitat for birds, butterflies and other wildlife.

When selecting native plants for a landscape design, it is important to have knowledge of the site conditions. Plant materials should be selected for their form, color, and texture, as well as solar, soil, and moisture requirements. Plants that do well in various microclimates on a site are considered "site appropriate."

For more on native plants visit: http://www.macd.org/rollovers/nativeplants/nphome.html
5 Things YOU Can Do To Promote LID in YOUR Community

1. **Learn more about LID and become an advocate.**
   Although low impact development is gaining popularity, it is still a relatively new approach. Learning more about it and how it might work in your community is a good first step, allowing you to become an informed advocate of the approach. Several excellent websites can be found at [www.swmpc.org/LID.asp](http://www.swmpc.org/LID.asp).

2. **Spread the word, especially to decision-makers.**
   Once people learn about the multiple benefits of LID, they often become strong advocates themselves. It is especially important to speak with public works and engineering staff, planning commission members and local elected officials about the LID approach and its benefits.

3. **Reach out to developers.**
   Many communities are recognizing the benefits of establishing stronger working relationships with developers in fostering more sustainable development practices. Low impact development represents an excellent opportunity for such cooperation. Developers can be acquainted with the approach and its benefits, and encouraged to integrate LID features into proposed projects.

4. **Get projects on the ground.**
   A completed project that employs LID principles and techniques is a powerful public education tool for promoting the approach. There’s nothing like having a successful project to help to convert critics. A municipal project is the perfect place to start. It is easy to incorporate LID techniques into small and large municipal projects such as landscaping work, park improvements, parking areas, new buildings, etc.

5. **Make sure your ordinances are LID friendly.**
   If your ordinances contain provisions that not only allow, but also promote the approach, LID projects are much more likely to be proposed and built in your community.

**Future Issues of this newsletter will address:** More LID techniques, barriers to implementing LID, what local government can do to promote LID and examples of LID projects in southwest Michigan. *

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4. Native Plant Landscaping
5. Permeable/Porous Pavement
6. Reduced Impervious Surfaces
7. Disconnected Downspouts (rain barrels)
8. Green Roofs

This newsletter edition will explore techniques 5-8. The previous newsletter edition explored techniques 1-4. (Visit www.smpc.org/lid.asp for past newsletter editions.)

5. Permeable/Porous Pavement

Permeable or porous pavement surfaces are suited for parking lots, low traffic residential streets and sidewalks. The porous or permeable surfaces allow stormwater to infiltrate into underlying soils promoting pollutant treatment and groundwater recharge, as opposed to producing large volumes of rainfall runoff requiring conveyance and treatment.

Since paved surfaces make up a large portion of the urban (or developed) landscape, the use of porous/permeable surfaces is very effective at stabilizing the hydrologic condition of a site. A secondary benefit of porous/permeable paving is its performance in snowy conditions. Cahill Associates

Most photographs in this edition are courtesy of the Pokagon Band of Potawatomi Indians. The photos showcase their low impact housing development southeast of Dowagiac, Cass County, Michigan.
reports an increase in demand for the installation of permeable asphalt in the Northeast as a result of reduced maintenance costs (snow shoveling and desalting) due to rapid snowmelt as a result of the permeable surfaces.

Typical uses include parking bays, parking lanes, sidewalks, and roads. Block pavers, bricks and porous/permeable asphalt or concrete are generally used in higher traffic parking and roadway applications; while plastic grid systems are more commonly used in auxiliary parking areas and roadways. Porous pavement is ideal for commercial, industrial, and residential (urban, suburban, ultra-urban) and is suitable for new construction and redevelopment projects.

For more information on permeable or porous paving options visit: http://www.greenworks.tv/stormwater/porouspavement.htm

6. Reduced Impervious Surfaces
Many strategies exist to reduce the amount of impervious surface in development areas.

Development Layout and Design
The clustering of buildings limits the amount of roads and other infrastructure needed to serve the development. The building footprint size can be reduced by constructing a taller building or including parking facilities within the building itself.

Roads/Streets/Parking Areas
Often, road widths specified in traditional subdivision regulations and parking lot requirements are often far larger than necessary. Road widths can be reduced to the minimum required for traffic considerations and emergency vehicle access. The national standard for road width is 18 feet. Cul-de-sacs may similarly be reduced in size, although in some cases this will require modifications of frontage requirements. Often alternative street designs rather than traditional grid patterns and reduced setbacks and frontages for homes will reduce road and driveway lengths.

Other practices include shared driveways and parking lots and porous pavements for overflow parking areas. Vegetated islands in cul-de-sacs reduce overall impervious surface and can be designed to receive stormwater runoff from the surrounding pavement.

Sidewalks
Limiting sidewalks to one side on local low traffic roads and limiting the area of impervious sidewalk by utilizing permeable surfacing can reduce the overall area of impervious sidewalks.
7. Disconnected Downspouts (rain barrels)
It is beneficial to view rainwater as a resource that can be reused on site. For example, downspouts from roofs can be disconnected from underdrains and the water directed to vegetated areas or a rain garden (see last newsletter edition for more on rain gardens). This will reduce runoff volume, promote infiltration and slow and filter runoff from the roof area. As long as the water is transported well away from foundations, concerns of structural damage and basement flooding can be alleviated.

Cisterns and rain barrels are simple techniques to store rooftop runoff for reuse in landscaping and other nonpotable uses. You can make your own rain barrel by following instructions on this website: http://www.raingardens.org/Rain_Barrels.php.

8. Green Roof
Green roofs are an effective means of reducing stormwater runoff by reducing the percentage of impervious surfaces in urban areas. A green roof is a low-maintenance vegetated roof system that stores rainwater in a lightweight soil medium, where the water is taken up by plants and transpired into the air. As a result, much less water runs off the roof, as compared to conventional rooftops. Green roofs can be used on expansive concrete roof buildings ("big boxes") or small-scale residential roof structures. They are especially effective in older urban areas with chronic combined sewer overflow (CSO) problems due to high levels of imperviousness.

Green roofs offer a variety of other benefits beyond water quality, such as:

- extending the life of a roof (2 to 3 times more than a conventional roof)
- reducing building energy costs,
- providing aesthetic improvements in urban areas
- reducing the urban “heat island” effect
- improving air quality and
- conserving valuable land that would otherwise be required for stormwater runoff controls.

For more information on green roofs visit: http://www.hrt.msu.edu/greenroof/ or http://www.epa.gov/hiri/strategies/greenroofs.html

Did you know… one inch of rain on a 1,000 square-foot roof yields approximately 623 gallons of water?

Green roofs can be seen in Battle Creek, Chicago and Grand Rapids. In fact, there are over 40 green roofs in Chicago. Many municipalities are installing green roofs on public buildings (city halls or public works buildings) to demonstrate the benefits to developers.
Overcoming Barriers to LID

To increase the use of LID in SW Michigan, some barriers must be overcome. People must realize that LID techniques can be applied in both new and redevelopment projects. LID practices are dependent on site conditions, and are not based strictly on spatial limitations. Evaluation of soil permeability, slope and water table depth must be considered in order to choose appropriate LID techniques. One of the major barriers to using LID is many communities have development rules that may restrict innovative practices that would reduce impervious cover. These "rules" refer to a mix of subdivision codes, zoning regulations, parking and street standards and other local ordinances that determine how development happens (Center for Watershed Protection, 1998). These rules are often responsible for wide streets, expansive parking lots and large-lot subdivisions that reduce open space and natural features. Additionally, community perception of LID may slow its implementation. Many homeowners claim to want large-lots and wide streets and view reduction of these features as undesirable and even unsafe. Furthermore, many people believe that without conventional controls, such as curbs, gutters and end of pipe basins, they will be required to contend with basement flooding and subsurface structural damage. We must all work to dispel these misconceptions and remove these barriers so that LID can flourish in southwest Michigan.

Future Issues of this newsletter will address:
What local government can do to promote LID and examples of LID in southwest Michigan.*

*If you know of a LID project in southwest Michigan, please contact: Marcy (269) 925-1137 x25 colcloughm@swmpc.org. For more information or questions, please visit these websites or contact the watershed coordinators:

Black River Watershed: Erin Fuller (269) 657-4030 x5                    www.vbco.org/blackriver_2.asp
Galien River Watershed: Jean Brokish (269) 469-2330                   www.swmpc.org/galien_river.asp
Gun River Watershed: Shawn McKenney (269) 673-8965 x3                   www.allegancd.org/gun-river

See more on LID at www.swmpc.org/LID.asp
Balancing Development with Water Quality Protection

LID NEWS is a newsletter designed to inform elected and appointed officials in southwest Michigan about LOW IMPACT DEVELOPMENT (LID). The LID approach to land development utilizes various land use planning and design practices and technologies to simultaneously protect water quality and reduce infrastructure costs.

5 things Township, Village and City Officials Can Do to Promote Low Impact Development in Local Ordinances

Local ordinances are often identified as an impediment to LID. In some cases, ordinances prohibit or discourage certain LID techniques. Perhaps more commonly, ordinances are silent on the approach, leaving planning boards and developers to rely on the “conventional” approaches to stormwater or site design.

The following Top 5 list offers concise guidance for planning commissioners on typical land use ordinances that often limit or sometimes prohibit Low Impact Development.

1. **Make Sure Ordinances Don’t Prohibit/Discourage LID**

A first step is ensuring that LID techniques aren’t prohibited or discouraged in local ordinances – either explicitly or implicitly. Become familiar with LID techniques (see newsletter editions 3 & 4 at www.swmpc.org/lid.asp) and evaluate how your ordinances would treat proposals using each LID technique. The local ordinance may not only contain outright prohibitions on certain measures (for example, not allowing pervious pavement treatments in commercial parking areas); but also, provisions that may act to discourage LID features – such as treating them as structures that must meet setback requirements or not allowing them to be accounted for in determining required areas for landscaping or open space.

2. **Revise Street and Parking Standards to Reduce Impervious Surfaces**

LID’s focus on reducing impervious surfaces is often difficult to achieve with local ordinance requirements. Often ordinances set minimum standards, that, while intended to ensure adequate traffic circulation, parking and access for public safety vehicles, can result in excessive paving, at least for certain types of projects or improvements. Consider reevaluating your ordinance standards that dictate the size of roads, drives and parking areas. The goal should not be to look solely at pavement reduction, but on ways that circulation, safety and parking needs can be approached in a balanced fashion.
Areas that deserve particular attention include:

- **Pavement widths on residential streets.** Consider allowing widths of 24 feet or less for residential streets (18-22 feet may be a reasonable standard for low-volume streets). For a good discussion of both street width and design, see [http://www.metrocouncil.org/Environment/Watershed/BMP/CH3_RPImpStreet.pdf](http://www.metrocouncil.org/Environment/Watershed/BMP/CH3_RPImpStreet.pdf)

- **Turning radius for cul-de-sacs.** Reducing the radius of a cul-de-sac from 40 feet to 30 feet, for example, yields a 45% reduction in paved surface. Emergency vehicle access should be a consideration, but should be balanced with other objectives. See an excellent discussion at [http://www.metrocouncil.org/environment/Watershed/BMP/CH3_RPImpCuldeSac.pdf](http://www.metrocouncil.org/environment/Watershed/BMP/CH3_RPImpCuldeSac.pdf)

- **Number of parking spaces.** If your ordinance requires more than 3 spaces per 1,000 square feet of gross floor areas for offices, and 4.5 spaces per 1,000 square feet of gross floor area for retail, consider reducing these standards.

- **Other Opportunities for More Efficient Parking Areas.** In evaluating parking standards and making changes, take into account the availability of on-street-parking and excess parking capacity in the vicinity, as well as opportunities for allowing smaller spaces for compact cars and shared parking among businesses with different peak uses.

3. **Pay attention to Street and Parking Lot Layout and Design**

Besides allowing for the reduction of paved areas, local ordinances can promote design of roads and parking areas that incorporate a decentralized approach to stormwater management consistent with LID principles. Three good examples of this are:

- **Use of vegetated swales as an alternative to curbs and gutters.** Typical ordinances provisions either mandate or strongly promote curb and gutter profiles for streets, which serves to concentrate stormwater and increase its velocity. Consider adopting provisions that allow or encourage “open section” roadways that utilize vegetated swales, especially for more rural projects.

- **Incorporate LID measures into parking lot design and landscaping.** Ordinance language can also be revised to promote breaking up large paved expanses into multiple parking areas punctuated with natural vegetation and bio-retention areas. If your ordinances now require parking areas to be paved, consider allowing use of permeable paving treatments as well. To build familiarity with the approach, your ordinance might be revised to require porous paving for overflow parking areas.

- **Install rain gardens into cul-de-sac design.** Cul-de-sac vegetated islands with depressions, in conjunction with open curb treatments, can serve as infiltration areas for the paved areas that surround them.

4. **Incorporate LID Site Planning/Design Principles (including promotion of conservation or open space subdivisions)**

Some of the best opportunities for creating low impact projects occur at the site planning and design stage. By careful attention to natural features, drainage patterns and the placement of
buildings and improvements, projects can be made to work with, rather than against, the site’s existing hydrology. Your ordinances can help promote this approach to site planning and design.

Conservation or open space subdivisions are an approach to site planning and design that can facilitate LID objectives as well as provide other benefits. At the very least, your ordinances should allow for a somewhat modified review process needed to facilitate these projects, and the flexibility to allow clustering of buildings or lots to create open space. Ideally, your ordinance should require or strongly encourage open space subdivisions. For example, Chikaming Township in Berrien County offers density bonuses for developments that utilize the open space/cluster option. A wealth of online resources exist on conservation subdivisions. A particularly good reference for those who are unfamiliar with or have concerns about the approach is a resource developed by Land Choices at http://www.landchoices.org/ConservationSubdivisions.htm.

Even projects that don’t involve lot size reductions or clustering can be designed to better meet LID objectives. Your ordinances may already contain standards such as minimizing site disturbances and retaining natural features. Such provisions can be given more teeth by requiring mapping of significant natural features or submission of tree preservation plans. Pre-application conferences or “sketch plan” meetings represent an excellent opportunity to discuss project planning and design issues – consider adding more guidance in your ordinances regarding expectations and submittals for this stage of the process.

5. **Add Additional LID-promoting Provisions to Your Ordinances**

Steps 1-4 above are geared to making relatively modest changes to your ordinances to better accommodate LID development. If your community wants to not only allow, but to more strongly encourage LID techniques, you may want to consider the adoption of additional ordinance language that promotes or provides more guidance on the approach.

When it comes to adding language on LID to your ordinances, you are generally better off selectively incorporating principles and general standards of performance that are likely to be well understood and applied – as opposed to the bulk adoption of pages of detailed design specifications of various LID techniques and practices.

If adopting a new ordinance is the route you want to take, it’s usually preferable to adopt a comprehensive integrated stormwater management ordinance that includes LID principles and standards and which apply to all projects allowed in the zoning ordinance. Your planning department or board can also maintain links to LID manuals to assist developers and others who want detailed guidance.

**The State of Michigan is currently creating a statewide LID manual. This manual should be available Summer 2008. Watch for more information at [www.swmpc.org/lid.asp](http://www.swmpc.org/lid.asp).**
As a local official, you can ensure that your zoning ordinance allows, or better yet, encourages LID techniques to be used in all new developments or redevelopments in your community. If you need assistance, ask your planning and zoning staff and/or consultant. For more information visit www.swmpc.org/lid.asp. Also see LID NEWS edition #2 on this website for a cost comparison of LID and a typical development.

Future Issue of this newsletter will address:
Examples of Low Impact Development in southwest Michigan.*

LID Examples in SW Michigan
Long Meadow Development, Niles Township, Berrien County
Pokagon Band, Elder Housing, Cass County
Dowagiac Industrial Park, City of Dowagiac, Cass County
Lion's Park raingarden, Bangor City, Van Buren County
Housing Development, Watervliet, Berrien County
Urban Stormwater Demonstration Site, Watervliet, Berrien County

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www.allegancd.org/gun-river
Paw Paw River Watershed: Matt Meersman (269) 925-1137 x22
www.swmpc.org/pprw.asp

See more on LID at www.swmpc.org/LID.asp

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