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Protecting Lake Superior

University incorporates permeable pavers made from recycled materials in its plan to curb stormwater runoff.

By Mindy Granley

Stormwater management is a critical element of sustainability. For the University of Minnesota Duluth (UMD), protecting the local watershed from uncontrolled rain runoff is a priority for the campus community.

UMD is situated at the western end of Lake Superior within the City of Duluth, Minnesota. According to UMD Chancellor Kathryn Martin, as a great university on one of the Great Lakes, UMD has a stewardship responsibility for the waterways that flow into Lake Superior, the largest of the Great Lakes and the largest freshwater lake in the world by surface area.

UMD is one mile northwest of the lake. The main portion of the UMD campus encompasses more than 240 acres. Impervious surfaces cover 75 acres (about 30 percent of the total). This includes more than 50 academic and residence buildings, parking lots, roads, sidewalks, and impervious recreational areas. UMD's elevation ranges from 450 to 600 feet above the lake. The campus has more than six miles of storm sewer lines, and stormwater is divided into three localized drainage basins. The campus discharges into two trout streams and ultimately to Lake Superior.

The geography of the campus combined with local geology make stormwater management a difficult challenge. The soil has a high clay content and does not readily absorb water. Rainwater from the campus can get down from the top of the hill to the lake in just 10 to 15 minutes.

Holding back stormwater during heavy rains reduces erosion and water pollution. Controlling the volume and velocity of runoff is therefore essential for UMD.

Comprehensive Stormwater Management

In the summer of 2002, UMD directed a team of campus representatives to develop a stormwater management plan. The Stormwater Pollution Prevention Program (SWPPP) is overseen by the UMD Storm Water Steering Committee, comprised of major stakeholders and interested parties from across the UMD community. They work to develop and review policies and procedures outlined in the plan's best management practices.

The SWPPP is comprehensive, encompassing Public Education and Outreach; Public Involvement and Participation; Illicit Discharge Detection and Elimination; Construction Storm Water Runoff Control; Post-Construction Storm Water Management; and Pollution Prevention and Good Housekeeping.

In addition, regional cooperation on stormwater education and outreach is a commitment the university takes seriously. UMD is an active member of the Regional Stormwater Protection Team and collaborates with other groups working to protect water quality in the Western Lake Superior area around Duluth and Superior, Wisconsin. As a member of the regional team, UMD often pioneers tactics that are then utilized elsewhere.

Managing Impervious Surface Runoff

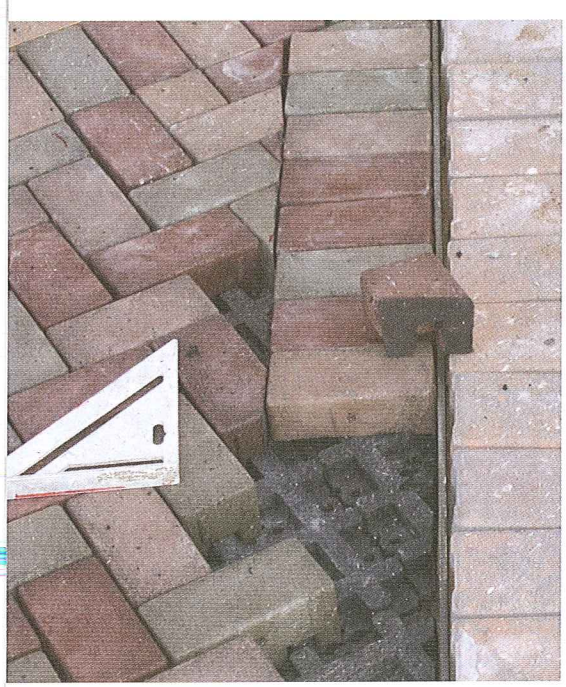
There is a strong link between imperviousness within a watershed and water quality. Relatively low levels of impervious cover (10 to 20 percent) can degrade streams and other waterways. Thus, controlling stormwater runoff from UMD's impervious surfaces is one of 15 best management practice areas under the Pollution Prevention and Good Housekeeping section of the SWPPP. UMD strives to manage, reduce and replace them. For instance, the UMD Rain Garden is the largest in the area and can hold up to 60,000 gallons. It moderates runoff from a large parking lot and protects Oregon Creek, which runs through the campus. UMD also decreases the width of some sidewalks and removes those that are infrequently used.

Given the clay content of the campus soil, when UMD replaces impervious areas with permeable surfaces, they often install them with drainage systems to moderate the amount and rate of runoff. This was the case when the university undertook a test of permeable pavers in 2007.

Evaluating Permeable Pavers

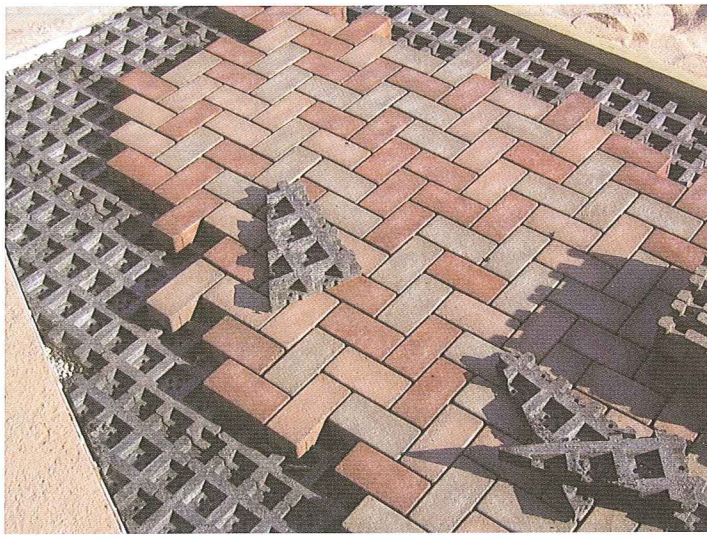
UMD is constructing a new civil engineering building, scheduled for completion in January 2010. Consistent with the university's emphasis on impervious surface management, the plans call for a permeable paver installation at the entrance to the building. The designer suggested VAST Permeable Composite Pavers because of their recycled content as well as their permeable function. VAST Enterprises manufactures pavers with its composite green building material engineered from up to 95 percent recycled automobile tires and gallon-size plastic containers.

In the autumn of 2007, UMD undertook a test to compare and evaluate concrete and VAST permeable pavers. Two areas were selected for the test. The first is a 600 square-foot location on the north side of the university's heating plant. The area gets heavy truck traffic for deliveries and parking. According to John King, director of facilities management at UMD, this was an appropriate area for the test because the site had poor drainage and became muddy after significant rainfall. Concrete and VAST Permeable Composite Pavers were installed in side-by-side sections. The second area is a roughly 75 square-foot triangle outside the Sports and Health Center. Building and Grounds crews had attempted to landscape the area, but with persistent foot traffic from students cutting across the triangle, plants could not be maintained. Moreover, UMD sports teams load and unload buses right in front, and that also took a toll on the site. VAST Permeable Composite Pavers were installed to determine if they would make this area more user-friendly and easier to maintain.



Side-by-side test of concrete and VAST Permeable Composite Pavers.

Rehbein Environmental Solutions designed the paver installations. The base consists of an EPDM (ethylene propylene diene monomer) rubber liner, seven inches of clean 2.5-inch crushed rock, four inches of clean 3/4-inch crushed rock, filter fabric, two inches of washed 3/8-inch crushed rock and finally the pavers on top. Within the rock layers, an EPIC chamber drainage system was installed to move the infiltrated water from the base into a sand/peat holding area under adjacent sod. With the flip of a valve, the water can be used for sub-grade irrigation or allowed to drain out completely.



The VAST grid system automatically spaces and aligns the pavers.

Test Results

The paver installation design proved to be an effective solution for UMD's soil conditions. VAST pavers have withstood the rigors of Northeastern Minnesota winters better than the concrete pavers. The concrete pavers look worn, while the VAST pavers still look new. Their recycled content is an extra sustainable feature. Plans for completing the new civil engineering building include a permeable paver installation with VAST, and UMD continues to identify and assess opportunities to replace impervious with permeable surfaces. **SLDT**

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