Volume 6, Issue 2

Summer 2008

FRANKLIN SOIL AND WATER CONSERVATION DISTRICT

The Urban Review

Sediment & Erosion Control Information Newsletter

Innovative Street Design

by Matt Peoples, Canal Winchester

Thanks to financial assistance from the Ohio Public Works Commission (OPWC), the Village of Canal Winchester is reconstructing West Columbus Street, one of the oldest streets in the Village's historic residential area and a connector street between arterial High and Washington streets. Using an innovative design, the Village has been able to add bump outs - street areas separated from the roadway by a depressed curb and gutter - for street parking while saving many mature trees along historic West Columbus Street.

West Columbus Street formerly was an asphalt pavement 33 feet wide on the west end and nearly 38 feet wide at the eastern end with on-street parking the entire length. The separation between travel lanes and parking areas was not well defined and when cars parked on both sides, opposing traffic was forced to slow down or pull over in order to safely pass one another. A survey of residents' concerns yielded a majority of comments centering on safety, saving trees, parking and street lighting.

In response to resident feedback, the Village took a novel approach for the reconstruction of W. Columbus Street based on an idea presented by the Village's Street Tree Advisory Board (STAB). The concept was developed by Village staff and designed by EMH&T, allowing for mature trees to be saved. Once trees to be saved had been identified, travel lanes were set to 10.5 feet, providing an excess of 13 feet of tree lawn for the selected trees. In areas where there were no trees, bump outs were devised to provide safe, well defined on-street parking for the residents and churches located along the street.

Previously, road reconstruction projects have included the complete removal of all existing trees, sidewalks, curbs, gutters and roadway. This method would result in an expanse of asphalt pavement with little or no remaining mature landscape features. The pavement sections designed for West Columbus Street have allowed many trees that would have been removed to be saved, provided well defined and safer parking areas and improved the flow of traffic.

In addition to these improvements, the Village selected pavement materials to improve post construction stormwater management, adding another unique feature to the West Columbus Street reconstruction project. During the time the Columbus Street reconstruction was being designed, the Village enacted a stormwater utility for its residents and businesses based on the amount of impervious area calculated for their properties. In support of the stormwater utility, the Village utilized a pervious concrete pavement system for the bump out parking areas, reducing the impervious "footprint" of the roadway and improving the storm water quality. The 7 inches of pervious concrete pavement, in conjunction with an 11 inch #4 aggregate base detention layer, collects, filters and discharges the storm water, as well as carrying the traffic it was designed for. The pervious concrete was tinted to a buff color to soften the look of the pavement while still maintaining a

(continued on page 3)

Engineering Short Courses Offered

On July 10th and 11th Professors Phil De Groot and Michael Menoes from Cleveland State University will be presenting the second in their series of engineering short courses. Hydro 130, Hydraulic Design of Bioretention Basins and Hydro 210, Fundamentals of Open Channel Hydraulics are hands-on courses designed specifically for engineers.

Bring your laptops and join us at our office at 1328 Dublin Road, Suite 101 in Grandview Heights. For more detailed information on these courses or to register, visit www.hydrosphere-engineering.com/continuing_ed. The cost to attend is $160 for each short course. Certificates for 6 continuing professional development (CPD) hours will be presented at the completion of each course. Lunch will be provided.

Inside This Issue

Rainfall, infiltration, & groundwater recharge

The average rooftop in our suburban neighborhoods is about 2,000 ft^2 and sheds 1,250 gallons of water for every inch of rainfall. Our average yearly rainfall in central Ohio is close to 40 inches. That's 50,000 gallons a year running off each and every one of our houses, the amount of water in an Olympic size pool! If we were to use this amount of residential tap water, our yearly water bill would increase by $5,243. Most often this runoff is directed to our downspouts which, by municipal ordinance, are to be connected to the storm sewer system that discharges to stormwater ponds in many instances, or outlet directly to our neighborhood creeks and streams. This is, in part, the hydrologic cycle and storm water runoff is to be expected.

Now consider that most of our suburban houses have basements and under-drain systems that are tied into sump pumps and dewater the ground area around our foundations. This is a good thing because no one wants flooded basements and the potential for mold growth in our homes. Our streets are also constructed with an under drain system beneath the curbing to protect the street foundation from the effects of excess water.

The effect of this subsurface drainage is many fold. It lowers the groundwater table which disrupts plant growth and interferes with the soil processes that bind carbon. Subsurface drainage short circuits the hydrologic cycle by interfering with infiltration. Infiltration promotes water quality and reduces the quantity of stormwater runoff. A net loss of groundwater recharge affects the base flows of our streams causing many creeks to dry up in the summer, and increases the amount of storm water discharging to our creeks causing higher storm flows and channel erosion.

So what can we do that will help to promote the positive effects of groundwater recharge without compromising our structures and safety? We can start off small.

Our treatment of stormwater has been directed at large quantities of runoff and getting the most "bang for our buck". Large infrastructure projects are necessary to handle the stormwater generated by the streets and facilities we pay taxes to maintain. Storm water ponds are designed to store the runoff and release it at a rate that will not cause stream erosion but also drain enough to be ready for the next storm event, usually 24 to 48 hours. Stormwater facilities do not promote infiltration, ground water recharge or water quality, they only affect the rate of stormwater reaching our streams. We, as home owners need to emulate the hydrologic cycle by storing and using the rain water at our homes. The hydrologic cycle starts where the raindrop falls.

Each of our homes is responsible for about 125 cubic feet of rainwater for each ¾" rain event, that's 935 gallons! This would be the required amount of stormwater treated on an individual lot basis according to current stormwater regulations for larger developments, like our subdivisions we live in. Remember, however, that the majority of rainfall events are smaller than this.

The hydrologic cycle starts where the rain drop falls.

The first line of defense is green roof technology; it slows the raindrops' journey and promotes the evaporation and transpiration of rain water. Studies have shown detention times of 20 to 40 minutes and peak flow reductions of 25% to 60%. A side benefit is the energy savings to heat and cool the home not to mention the reduction of the urban heat island effect. Over sized gutter systems can be added to further detain rainwater, and preserve the potential energy and head pressure of falling water for mechanical use.

The next practice, and easiest, available to a homeowner is harvesting rainwater. Harvesting is done with cisterns and rain barrels. A typical rain barrel holds 55 gallons while cistern systems can be as large as necessary. Cisterns are widely used in island nations, where freshwater may be limited to rainfall events, and often service entire households. Advanced gray water systems can function with the household plumbing. Harvested rainwater is most often used for watering lawns and gardens.

When these systems are full, runoff is generated. And as home owners, we can use ground water infiltration for our benefit and to reduce our impact on both the stormwater infrastructure and our streams. Rain gardens, bio-swales, exfiltration trenches, soil amendments, and permeable pavers are all examples of ground water infiltration practices that promote onsite use of rain water. Reduced groundwater levels promote shrinking soils that can lead to building foundation damage, loss of existing soil carbon and the sequestration abilities of the soil, and it can change the infiltration rates of soils as they dry and become difficult to rewet.

Infiltration practices directly affect the amount of stormwater runoff by removing it from the storm event. The vast majority of rain fall events are small and localized. These home practices can handle many of the storm events while adding important benefits to the land and our natural surroundings. Visit our website for further information at www.franklinswcd.org.

Using Permeable Pavers to Meet NPDES Goals

Increased impervious area is the largest cause of increased stormwater runoff resulting from development. Any type of surface that does not allow water to penetrate is considered impervious. Permeable pavers can be used to locally infiltrate rainwater and reduce the runoff leaving a site. They can substantially reduce stormwater runoff volume, restore permeability and infiltration, and provide detention capacity in highly urbanized areas. Land developers, architectural engineers, and building owners are recognizing permeable paving systems as important elements of their new projects. Opportunities to reduce the amount of impervious area exist on practically every project. The word permeable refers to water moving through openings between pavers and aggregate. Permeable pavers with open-graded aggregate systems work to mimic predevelopment hydrology and reduce the negative effects of urbanization on waterways.

These systems are ecological, since they improve a site's water quality by allowing rainwater infiltration and natural groundwater recharge. They allow more water to infiltrate back into the ground instead of contributing to the intense runoff that occurs with typical impervious paved surfaces.

They are also economically smart. Though initial investment may be somewhat higher than for conventional pavement, developers often find they can reduce construction costs by eliminating or reducing the size of drainage and retention systems. In most cases these systems are an acceptable post-construction Best Management Practice (BMP) used to meet the state and federal stormwater management requirements. Over the past 22 years permeable pavers with the open-graded aggregate system have been installed over millions of square feet in the Chicago area. (Chicago's Green Alley Program) A private road was installed on one site using the permeable pavers over aggregates. If built using traditional methods it would have been the development's greatest source of runoff and pollutants. Using the paver system with built-in detention in the aggregate layers below, a conveyance infrastructure and detention pond were not needed. In the end, cost savings on the infrastructure more than compensated for the higher cost of the permeable pavement system.

Although builders, designers and developers have the ability to incorporate these types of alternative systems in their projects, it is the local governmental agencies that will actually determine what can and will be used. It is in the best interest of communities to allow some alternative design options, especially in the face of current NPDES Phase II stormwater regulations.

In summary, permeable pavers offer many storm water management solutions. They can:

- Permit infiltration to reduce storm water runoff that leaves parking lots
- Reduce thermal loading on surface waters
- Reduce pollutants reaching surface waters
- Provide groundwater recharge/storage to reduce flooding and erosion of stream banks
- Outperform other systems during freeze-thaw cycles
- Meet pedestrian slip resistance standards for the Americans with Disabilities Act (ADA) Architectural Guidelines.

Permeable Pavers

For more information visit: www.gradingandexcavating.com/sw
www.paversearch.com/permeable-pavers-menu.htm
www.cityofchicago.org/transportation/cdotprograms/green alleys
www.dnr.state.oh.us/water/rainwater/

Innovative Street Design (continued from page 1)

clearly defined separation between parking areas and travel lanes.

The Columbus Street project in the Village of Canal Winchester signifies the first time pervious concrete has been used in a public right of way to this magnitude, with approximately 1,000 square yards being placed. It is estimated that through saving the trees and using pervious concrete in the bump out areas, there is a 32% net reduction of impervious area in the section of roadway between High Street and Washington Street.

The Village would like to thank EMH&T for taking the village's radical concept and turning it into reality, Ohio Ready Mixed Contractors Association and Buckeye Redi-mix who assisted with the design of the pervious concrete and Columbus Asphalt Paving who was awarded the construction contract.

For more information about the project contact Matt Peoples, Director of Public Works, at mpeoples@canalwinchesterohio.gov or Bill Sims, Construction Services Administrator, at wsims@canalwinchesterohio.gov.

FRANKLIN SOIL AND WATER
CONSERVATION DISTRICT

1328 Dublin Road, Suite 101
Columbus, Ohio 43215
(614) 486-9613 Fax: (614) 486-9614
www.franklinswcd.org

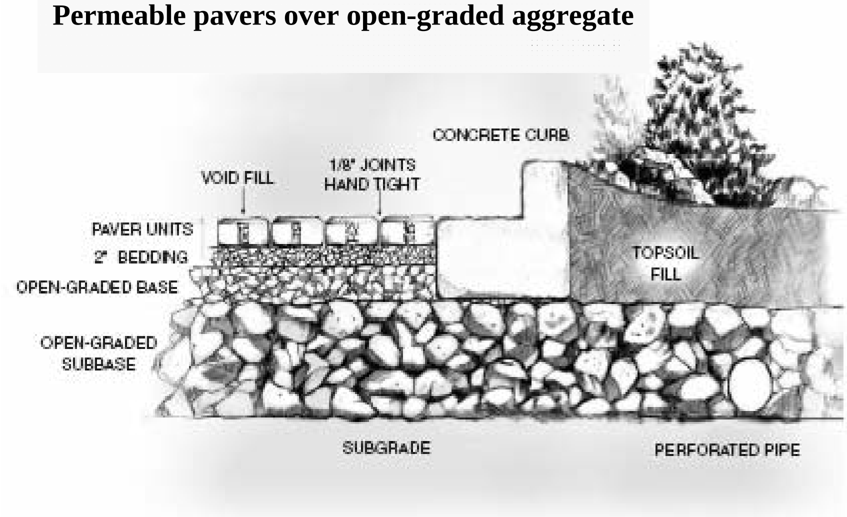
NON-PROFIT
U.S. POSTAGE
PAID
COLUMBUS, OH
PERMIT NO. 1568

BMP Review: Permeable paver system installation

The open-graded aggregate system consists of aggregate layers placed and compacted to provide a stable surface for heavy vehicles. Pavers over the full 18 inch thick system also provide detention capacity. The layers from bottom to top are as follows:

1. 12 inches of 1.5-inch all-fracture-face #4 aggregate is compacted in lifts. Railroad ballast or #2 aggregate may also be used for the sub-base.
2. 4 inches of 0.75-inch all-fracture-face #67 aggregate, or choker course, chokes off the top of the larger aggregate and allows water to flow down into the void space of the 1.5 inch aggregate below. The smaller rock does not sift into the voids. This layer is also compacted.
3. 2 inches of three-eighths inch granite "chip" material is placed on top of the base courses and forms the setting bed. This must be all-fracture-face and not rounded gravel. The setting bed is not compacted.
4. Pavers are placed on top of the setting bed. The joints between blocks are filled with 0.25 inch material, and a compactor is run over the pavers to vibrate and lock in the pavers.

Permeable pavers over open-graded aggregate



Creating Conservation Solutions For Over 60 Years