Many municipalities have vast areas of developed impervious acreage from which stormwater drains without any form of treatment. These drainage systems were designed decades ago, predating regulatory requirement for nonpoint source pollution control. Every year pollutants from these sites discharge high levels of sediment, nutrients, trash, and heavy metals into local waters, impairing usage, harming wildlife, and ruining aesthetics. Redevelopment projects within the municipality, particularly waterfront projects, represent opportunities to rectify stormwater problems of the past.

Large redevelopment projects are generally undertaken by developers with the support of local municipalities as part of revitalization projects. In effect, there is synergy between the public and private sectors to improve the overall quality of these sites. A major part of this improvement relates to reducing the impact of stormwater runoff. Developers are called upon to mitigate stormwater pollution to the maximum extent practicable (MEP) for these redevelopment projects. However, there are typically a number of issues when dealing with stormwater in these “end of pipe” applications. Generally, there is limited area to build a stormwater treatment structure and the developer must contend with upstream flow and associated pollutants entering the site. These design constraints often require innovative designs.

With respect to system design, off-the-shelf solutions can be a challenge to use because redevelopment projects are typically constrained by physical design parameters, such as footprint, available head, tight hydraulics grade lines, and high flow rates. Therefore, many projects require engineered solutions to meet the design objectives. These engineered solutions represent site-specific designs and are typically adaptations of proven technologies.

The patented XK BaySaver Separation System was conceived to satisfy stormwater applications with treatment flow rates of over 22 cfs (cubic feet per second) and peak design flow rates of over 100 cfs. The system is designed to effectively and economically remove sediment, petroleum hydrocarbons, and gross debris. This is done by gravity separation, flotation, and flow control.

The XK can be designed either inline or offline. The XK BaySaver Separation System has three levels of treatment that vary accordingly to the rate of flow through the system (see Figures 1 and 2). Under low flow conditions, polluted stormwater is treated in series through both compartments. Influent flows enter the primary compartment where, due to loss of velocity, coarse sediment and debris falls out. Flow then passes from the primary compartment to the storage compartment by way of the trapezoidal weir, which is cast in the center baffle wall. This weir acts as flow control and limits the amount of flow that can enter the storage compartment. After going through the weir, the flow is further slowed in the storage compartment, which in turn, allows for greater separation of fine sediment and floatables. Flow exits the storage compartment by way of the return pipe, which is attached to the outlet control box. Once the flows reach the outlet control box, it passes to the outlet (See Figure 1).

As flow rate increases, the water surface elevation rises in the primary compartment and flow begins to pass up the hood in the outlet control box and through the hood weir. This hood weir acts the same way as the T-pipes in the standard BaySaver Separation System by conveying flow from the center of the water column in the primary compartment, thereby ensuring that floatables and some of the suspended sediments are still being transported to the storage compartment under this moderate rate.
Super Size My Stormwater Treatment System, Please!  cont. from page 1

During very large storm events and when the XK BaySaver Separation System is installed online, the water surface elevation in the primary compartment will rise to the point that it will begin to crest the top of the outlet control box. Although some treatment of sediment and debris is still occurring at this stage, the design goal is to convey the flow through the system as quickly as possible without creating a backwater on the influent pipe.

This information was extracted from a paper by Austin Meyerman, COO of PCANY Member Bay Saver Technologies, Mount Airy, MD, with our thanks. Contact PCANY or Bay Saver for the complete paper, which also includes three case studies that highlight site specific engineered stormwater treatment solutions.

The Need for Watertight Stormwater and Drainage Systems

Key reasons to use the same watertight practices for Stormwater and Drainage Systems.

- Prevent Infiltration into the system
- Prevent Exfiltration into groundwater
- Lower cost of piping and manhole installation

Preventing Infiltration

As structures settle and age mortared joints will crack and leak, allowing fine particles in the soil to be carried with the infiltrating water through the cracks and into the system creating two problems:

- Subsidence of the surrounding soil, pipe and structure
- Reduced carrying capacity of the system

Subsidence creates settlement of pavement, sinkholes, etc. The cost to repair these problems is huge compared to the much lower cost of gasketed connections for drainage systems. (If corrugated polyethylene pipe or metal pipe is used, the mortar will not adhere to these materials creating an even more rapid rate of cracking and deterioration)

Reduced carrying capacity creates obvious problems when the fines, especially a problem in sandy, clay, or silty soils, fill the pipe. Pipes can no longer hold the flow and backup occur creating street flooding, etc.

PCANY Meetings

Plan to attend our fall association meeting in Albany on September 27 in the afternoon, with a dinner and speaker in the evening. The next day, September 28, we will hold our fall joint meetings with the NYSDOT, Materials in the morning and Structures in the afternoon. Specific location and time details will be sent out next month.

PCANY Website

All PCANY members now have access to the Members Only Page, where varied reports, communications, meeting notes, etc. will be posted. There is also a new category listing, Complimentary One Year Membership, which will be given to every attendee at a PCANY seminar or workshop; or it may be requested simply by visiting...

www.pcan.org

Preventing Exfiltration

Drainage systems carry all the pollutants from the street, soil runoff, etc into the system. As they become full and create head pressure, the cracked joints allow all the pollutants to enter the surrounding soil and eventually contaminate the groundwater.
Environment 21, New York Based Stormwater BMP Solution Provider

Environment 21 Systems are designed with the precast manufacturer in mind and the majority of its internal components are produced and available locally. When Environment 21 started over 10 years ago, they first met with local pre-cast manufacturers and civil engineers to determine what products are standard or simple to produce, and integrated their technology and hydraulic analysis to develop a variety of different Stormwater Treatment Systems. Environment 21 works with engineers worldwide assisting them in the design of Stormwater projects. One of the key features they offer with every system sold is a site specific hydraulic report detailing information such as pump out interval, system efficiency based on site hydraulics, system head loss, and much more.

The V2B1 is comprised of two pre-cast manholes operating by vortex separation in the first manhole and an underflow baffle in the second manhole. The V2B1 components are made up of pre-cast manholes & baffle walls, in addition to PVC pipe that the pre-cast manufacturer can purchase locally.

The "PuriStorm" Stormwater Treatment System is a primary treatment product used widely by engineers; it utilizes a series of filter cartridges to remove hydrocarbons and sediment. As with many of their other products, this system can be designed in a vault or manhole based on project restrictions or local product availability.

The “UniStorm” Stormwater Treatment System is a single structure with a hydraulic design backed by sedimentation science. The UniStorm can be configured in a pre-cast vault or manhole. The internal components are comprised of a series of pre-cast baffle walls and various non corrosive flow control plates that are fabricated or purchased by the manufacturer.

This system utilizes a series of screens and baffle walls to remove floatable material, suspended solids, and coarse sediment. As with all of their other products the UniScreen provides clear access to all areas of the chamber for inspection and maintenance.

One of their newest items being prepared is a Catch Basin Insert capable of removing hydrocarbons and sediment at 10% of the stand alone structural treatment units.

Thanks to Jeff Benty, Environment 21, for this story and photos. Besides information, they offer AutoCad drawings and specification data at www.ENV21.com.

Watertight Stormwater and Drainage Systems cont. from page 2

Lower Cost of System Installation
It is a common misconception that mortaring a joint is less expensive than a flexible collector, both in pipes and pipe-to-manhole connections. The time and materials to mortar a large 36” or greater connection is likely to exceed $200, plus the trench must remain open until it cures. An open cut is both a safety problem and can be disruptive to traffic patterns. A 36” seal with the same installed cost can be installed in a small fraction of the time it takes to construct a mortared joint. So, contractors can actually finish installation much more quickly. Saving time in construction is saving large dollars.

Many municipalities and design firms are beginning to recognize the benefits of watertight stormwater and drainage systems. The long term cost to the owners is greatly reduced and the systems function as designed.

Article and photos submitted by Randy Snyder, NPC Inc.
WATERTIGHT STORM SEWERS

Understand Design Considerations: • Specify precast concrete for all structures • Specify flexible watertight pipe-to-structure connections • Specify rubber gasketed pipe • Specify preformed butyl sealants for structure joints • Use near-90 degree pipe penetrations in all structures • Use round structures for odd angles • Eliminate pipe entry into joints or corners • Require formed structure penetrations • Pipes and structures located and installed accurately

Performance Improvements: • Elimination of silt in effluent • Reduction in subsidence and settlement • Control of water entering and exiting the system • Accommodation of deflection at joints & structures • Improved system performance and longevity at a comparable installed price

Cost Benefits Gained: • Lower total labor and material costs • Faster and less expensive installations • Higher quality product at same cost • Lower maintenance costs • Lower exposure for environmental problems • Longer life for streets and roads

[ Taken from Watertight Storm Sewers by The Watertight Storm Sewer Group, Press-Seal Gasket Corp. and A-LOK Products ]