EPA National Community
Decentralized Demonstration Projects

City of Seattle

Part I: Sliver by the River

Part II: Lakewood Raincatchers

Introduction

This application is a request for $1.342M under the State and Tribal Assistance Grants: 2004 National Community Decentralized Demonstration Projects.

This funding is for two demonstration projects:

- Part I: Sliver by the River Decentralized Wastewater ($300,000)—this project will use asset management techniques to determine the most cost effective, environmentally and socially beneficial methods to upgrade and/or replace failing on-site septic systems in an urban area;

- Part II: Lakewood RainCatchers ($1,042,000)—this project will reduce combined sewer overflows in an urban basin by re-routing roof runoff through rain gardens.

Background

The City of Seattle occupies 84 square miles on Puget Sound, sandwiched between Puget Sound, a deep sea inlet to the west and Lake Washington, a deep glaciated lake to the east. Several rivers and streams are found within the city boundaries, with many still carrying important runs of salmon and other fish. The city is home to 563,374 people, with a population density of 6,736 people per square mile. It averages 35 inches of rain annually, most of which falls between October and May.

When the city began to develop its stormwater and wastewater management system in the late nineteenth century the emphasis was on conveyance systems that moved water from one place to another to avoid flooding. Over time, more complex approaches have been developed that still move water to avoid flood damage and other problems, but also take into account the effect of the city's drainage system on the surrounding environment.

Ultimately, Seattle's wastewater and stormwater is discharged into the surrounding receiving waters, primarily Lake Washington, the Duwamish River, and Puget Sound. Most of this water is treated, but some untreated stormwater runoff drains directly into the city's waterways. In heavy rainstorms, combined sewer overflows (CSOs) discharge untreated wastewater and stormwater directly into receiving waters. King County plant operators estimate that up to 2 billion gallons of storm-driven sewage water is directed at West Point during the largest storm events. The plant and conveyance system can only handle 460 million gallons per day—the rest overflows into Seattle's lakes, rivers and streams.

Like many jurisdictions around the country, the City of Seattle is working to upgrade its drainage and treatment system to meet mandated water quality levels—including the Washington state requirement that CSOs discharge no more than once per year on a five year average. With costs of land and construction escalating, and limited funding options, the city has been willing to consider other alternatives. Alternatives for capital projects are evaluated using a technique known as "asset management", which weighs a project's economic, environmental, and social benefits. Reducing combined sewer overflow events is an important goal of the Wastewater Program at the Seattle's Public Utility (SPU), with $100 million estimated as the remaining budget for implementing the projects described in the 2001 Combined Sewer Overflow Reduction Plan Amendment (compared to the $490 million spent to date by SPU on CSO control). A proposed update to this plan is currently under review.

Seattle's decentralized stormwater and wastewater management program

The City of Seattle has taken the lead in implementing innovative approaches to stormwater and wastewater management. Through its asset management program, city staff considers the full life of a project and incorporates social and environmental benefits and costs into conventional economic cost benefit analysis. The city can then demonstrate the economic, social, and environmental benefits that accrue from these innovative approaches, while also identifying and managing the risks surrounding new techniques.

Conventional stormwater management systems are designed to collect and convey stormwater runoff to prevent damage to property and loss of life. Because the focus is on moving rainwater away from the place where it falls, less infiltrates into the ground, which causes a number of problems, such as lowered water tables and water levels in streams, less streamside habitat in open-creek basins, and increased chances for combined sewer overflows in combined or partially combined basins. In addition, rapid conveyance can lead to increased pollution entering waterways, as the "first flush" of stormwater (the first inch or so of a storm) carries the bulk of the pollution.

Decentralized systems are designed to capture smaller storms "on-site" and allow rainwater to filter into the ground. By so doing they can improve local waterways, by replenishing water tables and streams and by reducing the contribution of stormwater to overburdened sewage systems. By capturing the "first flush" they can also significantly reduce the amount of pollutants entering receiving waterways (Department of Environmental Resources, Prince George's County, Maryland, 1999). Infiltration of rainwater is key to ensuring that post-development hydrology resembles the pre-development hydrology, as it reduces stormwater volume and discharge (Livingston, 2000).

Seattle is in many ways an ideal location for decentralized stormwater and wastewater management structures. The city has been engaged in decentralized neighborhood planning for a number of years (City of Seattle, 2002). Community leaders and volunteers are actively involved in developing infrastructure plans for their neighborhoods. Through this process, communities have developed a strong "sense of place" and a desire to express this sense of place through neighborhood improvements. In many parts of Seattle, infrastructure improvements are badly needed, and alternatives to traditional, large-scale water management projects are appealing because of their potential additional benefits and less disruption to neighborhoods during their construction.

Rainwise Initiative

This new initiative, when passed, will reduce volumes of stormwater entering receiving water through incentives that will encourage property owners to manage stormwater on-site rather than relying solely on the public conveyance system. These incentives will include:

- a drainage credit program for on-site stormwater management facilities;
- expansion of the RainCatcher program (see below);
- a Drainage and Wastewater Partnership Program to provide funding and technical assistance to property owners who install systems that go beyond regulatory compliance, and;
- a Rainwise Stewardship Program to educate property owners about on-site stormwater management techniques.

Natural Drainage Systems

‘Natural drainage’ systems (NDS) projects retrofit existing urban developments, within street rights-of-ways, with low-impact designs that mimic natural hydrological processes. Swales, rain gardens and other components mimic the natural landscape prior to development more closely than traditional piped systems. The initial pilot called Street Edge Alternatives (SEA Streets), reduces impervious surfaces by 11% when compared with traditional streets and reduces by 98% the total volume of stormwater leaving the street for a 2-year storm event. The NDS program has continued to install SEA Streets with the Broadview GreenGrid and Pinehurst GreenGrid Projects (www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/Natural_Drainage_Systems/index.asp).

Additionally, in the High Point neighborhood of south Seattle, SPU is taking advantage of a major redevelopment to integrate natural drainage systems throughout a large high density residential area via the traditional curb, gutter, and sidewalk approach required by the project’s street layout goals. The natural system design incorporates swales and rain gardens to store and treat runoff.

Seattle RainCatchers

This program installs rain gardens and cisterns on private property to store and infiltrate stormwater. Rain gardens (also known as bioretention cells) are small gardens that store and infiltrate rain water that otherwise would drain to the combined sewer. Cisterns have the potential to slow roof water and promote water conservation. These strategies are being investigated and implemented across the country for the purpose of retrofitting highly urban environments to accomplish rainwater runoff management objectives, including flow attenuation, volume reduction, and water quality improvement. This approach has the potential to supplement traditional CSO control strategies, and provide ancillary benefits such as water conservation, stewardship opportunities, educational and economic benefits.