

# NE Siskiyou Green Street Project

NE Siskiyou Street between NE 35<sup>th</sup> Pl. and NE 36<sup>th</sup> Ave., Portland, Oregon

## Project Summary

<b>Project Type:</b>	Stormwater retrofit to an existing residential street – demonstration project
<b>Technology:</b>	A pair of stormwater curb extensions
<b>Major Benefits:</b>	<ul style="list-style-type: none"><li>• The extensions capture runoff from approximately 9,300 sq. ft. of paved surfaces, treating and infiltrating a large proportion of the runoff (see Flow Test Report<sup>1</sup>).</li><li>• The curb extensions converted about 590 square feet of pavement to landscape.</li><li>• They are attractive additions to the neighborhood, improve the urban environment, and increase pedestrian safety at the intersection.</li></ul>
<b>Cost:</b>	The total project cost, including management, design, and construction was \$20,000 of which \$3,000 is attributed to ancillary street and sidewalk repairs costs that may not be needed for other similar projects. Total cost for the stormwater curb extensions only was \$17,000 or \$1.83 per square foot of impervious area managed.
<b>Constructed:</b>	City crews constructed the extensions in two weeks in October 2003.
<b>Maintenance</b>	Portland Parks and Recreation will maintain the facilities during the two-year establishment period (until October 2005); the source of long-term maintenance services is to be determined.

## Features

- This was Portland’s first Green Street project to use landscaped stormwater curb extensions to manage street runoff.
- The design provides water quality treatment but also maximizes infiltration of the runoff. Each facility has four compartments separated by check dams to promote infiltration.
- The project demonstrates one of the simplest types of Green Street retrofits. The existing street curb was left intact and no modifications were made to the stormwater collection system.
- The design integrates well with its surroundings. The low evergreen plantings blend with landscape areas on the adjacent residential properties.
- The adjacent neighbors have played a major role in maintaining the two facilities, providing seasonal watering and weeding.



<sup>1</sup> Flow Test Report for the Siskiyou Curb Extension, October 2004; BES

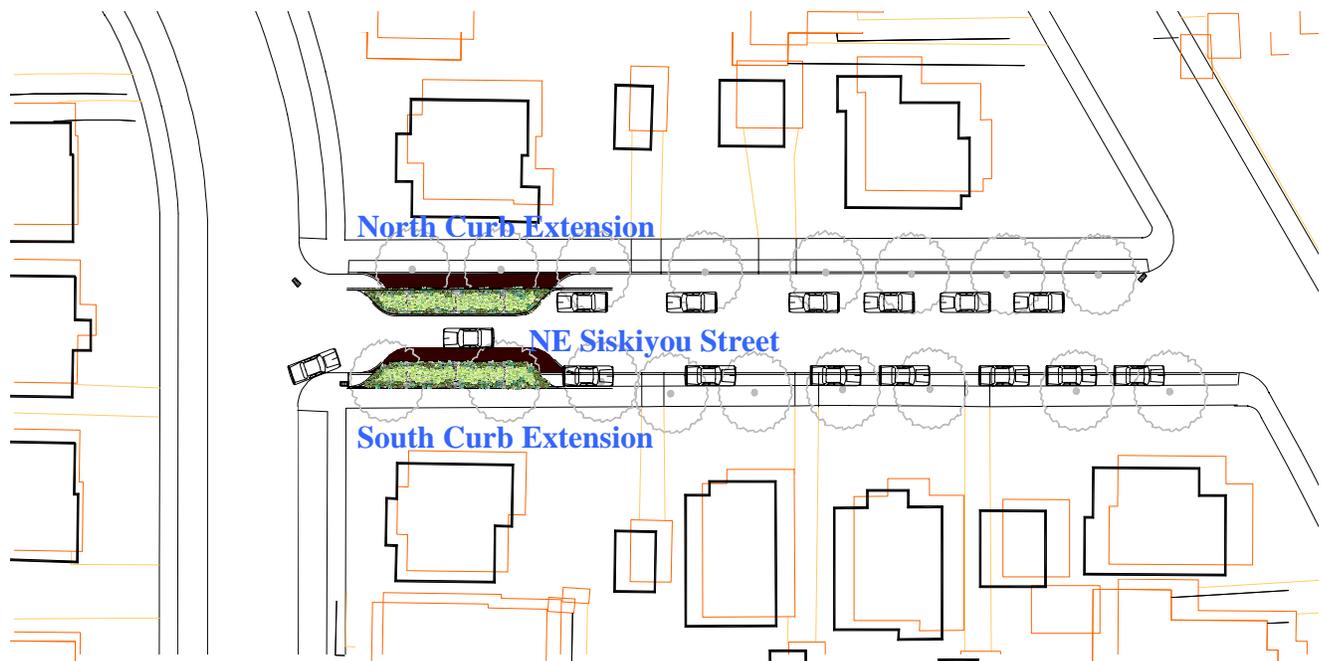
March 2005

## Background

The Environmental Services Sustainable Management Team undertook the project in 2003 as part of an on-going evaluation of techniques for managing runoff from streets. Urban stormwater runoff pollutes rivers and streams and contributes to combined sewer overflows (CSOs) to the Willamette River. It can also cause localized backups of the combined sewer during large storms.

Stormwater curb extensions hold particular promise as a sustainable practice for managing runoff from existing streets. These natural systems capture and filter runoff and allow it to infiltrate into the ground. They are an alternative to traditional stormwater sumps for managing street runoff. In addition to treating and disposing of runoff, they integrate well with existing neighborhood vegetation and generally improve the urban environment. Portland has constructed many curb extensions over the years to improve pedestrian safety; this new version of the curb extension provides many additional benefits.

The project on Siskiyou was the first retrofit to an existing street in Portland. Environmental Services built a second set of curb extensions on Ankeny Street (at SE 56<sup>th</sup>) in 2004, and by 2005 both the City and private developers were implementing a number of similar projects. These types of facilities can be constructed in a variety of configurations, as retrofits or as part of new development, and are referred to alternatively as bump-out swales, pocket swales, or street stormwater planters.



NE Siskiyou Green Street Plan View

## Site Selection Criteria

- **Traffic Impacts:** City traffic engineers considered the low-traffic residential setting ideal for a demonstration project. The street is 28 feet wide. The addition of two 7-foot wide curb extensions created an acceptable queuing configuration.
- **Stormwater Catchment Areas:** The size of the catchment, a little over 9,000 sq. ft., was considered fairly representative of conditions in the surrounding neighborhood.
- **Utility Conflicts:** Water lines were the only subsurface utilities within the project area and did not present obstacles. See a detailed discussion under “System Configuration.”
- **Loss of Parking Spaces:** The project did not eliminate on-street parking. Adjacent property owners can park in front of their houses on SE 35<sup>th</sup> Place.
- **Street Slope:** The moderate street slope (2%) was suitable for a first test of the technology.
- **Suitability For Monitoring:** The configuration of the local combined sewer allowed for placement of a flow monitor. There is also a rain gage near the project.
- **Soil Infiltration Rates:** Specialized infiltration tests were not required at the site. See “Stormwater Capacity and System Configuration” for details.
- **Space Available for the Facilities:** The space available for the curb extensions – length of curb unbroken by driveways or near a fire hydrant – is considered representative of conditions in other areas.

## Stormwater Capacity and System Configuration

### Stormwater Management Goals

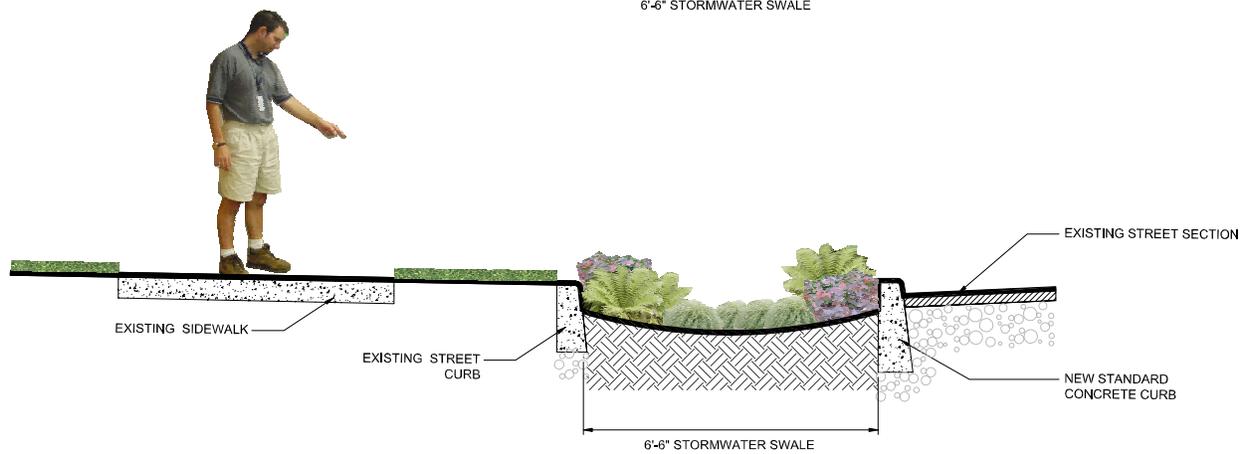
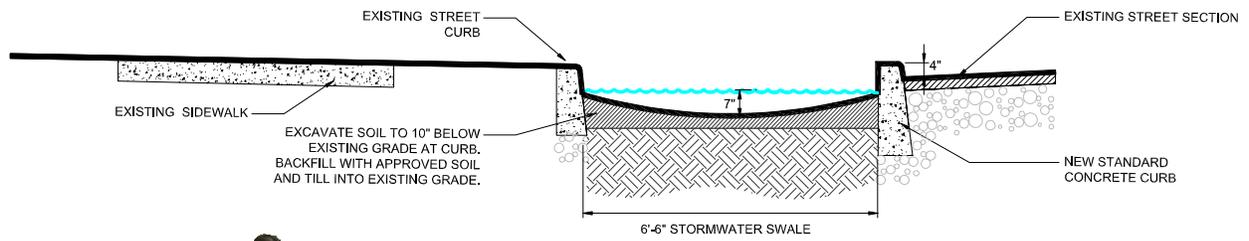
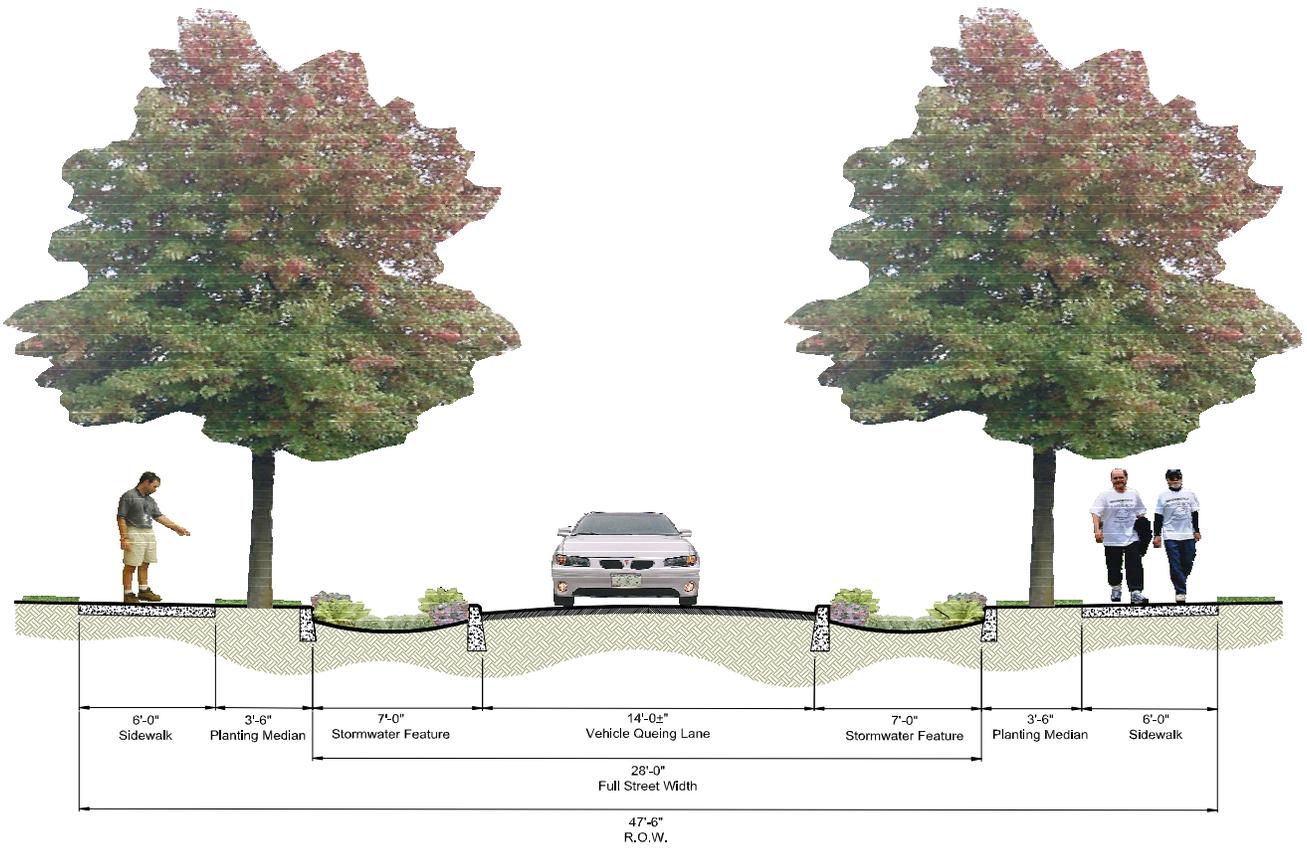
The objective was to maximize the capture, treatment, and infiltration of street runoff while providing a visual amenity for the neighborhood and improved pedestrian safety.

### Geotechnical Evaluation

An infiltration test was not required before construction. Adequate documentation of characteristics of the local soils already existed. The Natural Resources Conservation Service (NRCS) soil survey for Multnomah County classifies the soils as 51A-Urban Land and well-drained Multnomah soils. The surface horizon typically is dark brown silt loam about 25” thick. Soil below this depth is gravelly silt loam and gravelly sand to a depth of approximately 60”.



March 2005



NE Siskiyou Green Street (Cross Section)

## **System Configuration**

With few exceptions, the two curb extensions are identical in configuration.

*Catchment Areas (pavement, driveways):*

- North curb extension: 3,000 square feet
- South curb extension: 6,300 square feet

*Street Slope:* Approximately 2%

*Facility Dimensions (applies to each facility):*

- Length: 60 feet; width: 7 feet
- Total area: 275 square feet
- Depth at curb: 6 inches
- Depth at center: 12 inches
- Maximum ponding depth: 7 inches at center

*Internal Storage Volume:* 120 cubic feet

*Overflow:* Overflow exits through a curb cut at the west end of the facility, draining to the combined sewer via the street gutter and the existing street inlet. No modifications were made to the inlet.

*Check Dams:* Each curb extension has three checkdams, with four separate compartments for ponding runoff and slowing its passage through the facility.

*Additional Information:*

- The asphalt crown on Siskiyou Street is north of the center of the street, a large factor in the difference in catchment sizes.
- The gravel subgrade under the asphalt on Siskiyou Street is about 4 inches thick.
- The two extensions were excavated to a depth of 14 inches below grade. The native soil was tilled prior to importing 8 inches of soil mix and then the material was tilled a second time. There is not a gravel trench underlying the facility (a common feature of some designs).
- Excavation in the north extension intersected the top of a gravel-filled trench containing a water utility line. The trench runs the length of the middle of the facility, about 3 feet from the pre-existing curb. Excavation of the southern extension did not intersect the adjacent water utility trench, which runs underneath the new curb (about seven feet off the pre-existing curb).
- The check dams were constructed of compacted clay and covered with pea gravel and river rock to minimize erosion. See “Success and Lessons Learned” for details.
- The first compartment (forebay) in each curb extension has the same configuration and planting regime as the other compartments.



**Landscaping**

The facilities were excavated throughout to 14 inches below grade and backfilled with a 3-way mix of sand, topsoil, and compost. The mix was tilled into the native soil and spread to create a shallow parabolic cross section (see illustration).

The plants were selected for their drought tolerance, evergreen foliage, and short stature. The typical mature height of the plants is less than two feet. These characteristics were a priority in order to minimize maintenance and address safety concerns. The most common plants, including sedges, rushes, ferns, and broadleaf evergreen shrubs, are native species. The planting plan also included some non-native plants, primarily to provide seasonal color accents. Rushes are the dominant plant in the lowest portions of the two facilities. Their stiff structure helps slow the passage of water and they thrive in the variable moisture conditions. There is no permanent irrigation system in the curb extensions.

The plants were installed at a density greater than required by the Environmental Services Stormwater Management Manual in order to reduce weeding and other maintenance requirements and to quickly create an aesthetically appealing landscape.



Curb cuts: inflow point (top), side inlet (bottom)

	BOTANICAL NAME	COMMON NAME	PNW Native
<b>SHRUBS</b>			
	<i>Euonymus japonica "Microphylla"</i>	Boxleaf Euonymus	no
	<i>Mahonia repens</i>	Creeping Oregon Grape	yes
	<i>Polyshtichum munitum</i>	Swordfern	yes
<b>PERENNIALS</b>			
	<i>Helictotrichon sempervirens</i>	Blue Oat Grass	no
	<i>Deschamsia caespitosa "Northern Lights"</i>	Variegated Tufted Hair Grass	native cultivar
	<i>Iris spp.</i>	Iris Bulbs	no
	<i>Narcissus spp.</i>	Daffodil bulbs	no
<b>BASIN PLANTINGS</b>			
	<i>Carex testacea</i>	New Zealand Orange Sedge	no
	<i>Juncus patens</i>	California Grey Rush	yes

NE Siskiyou Green Street Plant List

## Project Costs

The final project cost was \$20,000 for design, management, construction activities, and ancillary sidewalk repairs.

### I. Budget Elements

#### **1. Construction Management and Overhead**

Project and construction management cost \$4,500 or 23% of the total.

#### **2. Construction Activities (Curb Extensions Only)**

Curb extension construction and landscaping cost \$12,500 or 62% of the total budget.

- **Curb Extension Construction**

The core construction activities cost \$8,250 or 41% of the total project cost. This included sawcutting and removing existing asphalt, excavation, concrete curb installation, soil import and preparation, grading, and safety painting and reflectors on the curbs.

- **Landscape Construction**

Landscape construction cost \$4,250 or 21% of the total project costs. This included check dam construction, fine grading, plant procurement, plant material, and mulch installation.

#### **3. Ancillary Construction Activities**

Miscellaneous street and sidewalk repair work cost \$3,000 or 15% of the total.

### II. Budget Discussion

It's likely that design and project management costs will decline for curb extension projects as they become more routine. The project included one-time costs such as the development of outreach materials and standard drawings. Ancillary construction tasks – repair to the adjacent pavement as well as the sidewalk – may have also made this project more expensive than subsequent projects.



The south planter; fall 2004



South curb extension. Spring 2004

## Maintenance and Monitoring

### Maintenance

Adjacent property owners have voluntarily modified their home irrigation systems to help water the curb extensions. In the long term, the City is responsible for providing any irrigation required. Given the shady location of the curb extensions, irrigation after the 2-year startup period should be minimal.

Portland Parks and Recreation will maintain the curb extensions for two years after construction, ending October 2005. Maintenance includes hand weeding (non-chemical applications), trimming plants, plant replacement, and major leaf and debris removal as needed. Environmental Services will re-evaluate maintenance requirements in December 2005 and make arrangements for long-term maintenance services.



### Monitoring

Environmental Services will monitor hydraulic performance, maintenance requirements, the success of the planting regime, and comments from neighborhood residents. Environmental Services conducted a first flow test in summer 2004. See *Flow Test Report: Siskiyou Curb Extensions, August 4<sup>th</sup>, 2004* online at [www.portlandonline.com/shared/cfm/image.cfm?id=63097](http://www.portlandonline.com/shared/cfm/image.cfm?id=63097).

## Successes and Lessons Learned

- The data suggest that the curb extensions on Siskiyou are capturing and infiltrating a large proportion of the runoff that drains to them.
- The plants grew vigorously during the first year and little weeding was required.
- In the first year the vegetated forebays filled twice with sediment and debris (to a depth of 4-6 inches). City staff removed the sediment by hand with a shovel and rakes. The cleanings typically required about 30 minutes per forebay.
- The earthen checkdams are susceptible to erosion during large storms, as observed during the hose test in August 2004. A more substantial structural design should be employed in the future.