

# Carkeek Park Environmental Learning Center

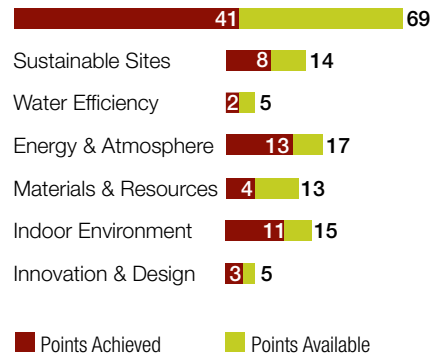
## Seattle Parks and Recreation



Photo by Erik Stuhaug

**Square Feet:** 1,756, 1 (plus) story  
**Site:** 13,068 square feet  
**Location:** Broadview neighborhood  
**Construction Cost:** \$317/square feet  
**Completed:** May 2003

### LEED Facts - NC Gold



### Benefits

- 66% reduction in energy use
- 33% reduction in overall potable water uses
- 50% less potable water used for irrigation
- 8% decrease in impervious surface on site
- 80% demolition and construction waste recycled

### Project Overview

The Environmental Learning Center (ELC) at Carkeek Park, in the Broadview neighborhood of northwest Seattle, is small, multi-purpose building designed to demonstrate sustainable systems while providing a setting for environmental education programs. With its open plan and high clerestory windows, the building envelope is designed to integrate daylighting and ventilation and to bring in views.

Operated by the Seattle Department of Parks and Recreation (Parks), it is available to school and community groups for natural history and awareness programs. It also serves as a venue for private events including meetings, receptions and yoga classes. A small kitchen used for social events also serves as a wet laboratory for education sessions. There is an office for one facilities manager.

A central classroom and meeting room



Photos left and middle by Miller Hayashi, right by Erik Stuhaug

The ELC focuses on providing environmental education and stewardship activities to a wide range of clients. It was also designed to create an additional community gathering and meeting space. The ELC offers a beautifully diverse array of experiential opportunities, some tailored for particular age groups, including tiny tots, teenagers, mature adults and teens new to outdoor recreation. In the summer of 2008 alone, the ELC offered 11 events spanning low tide exploration, work parties to remove invasive plants, full watershed tours, creating fish-friendly car wash kits, outdoor nature games, forestry tours and community-based partner meetings. These meetings involve Carkeek Area Neighbors, Carkeek Watershed Community Action Project and Piper Orchard at Carkeek Park. These cooperative relationships have been indispensable in returning Pipers Creek to better water quality after decades of poor quality from pathogens and heat and providing a more place-based connection with Pipers Creek for residents and businesses.

accommodates up to 60, with outdoor spillover space in the form of a terrace on one side.

## Sustainable Sites

Carkeek Park is a hilly, naturalized woodland site which spans the ravines and delta of the Pipers Creek watershed in northwest Seattle. Visitors are immersed elements of the wild northwest landscape: native fish in shaded streams where fresh water enters the Puget Sound. The creek itself, which had been degraded during the urbanization of the surrounding area, has been restored to a viable salmon run through the combined efforts of community groups and public agencies. The Carkeek Watershed Council galvanized public interest in urban streams and inspired countless hours of volunteer effort, and the City of Seattle, Seattle Public Utilities and King County Metro worked together to revise urban infrastructure (such as storm drains, streetscapes and waste systems) to better protect these urban streams.

Recreational areas are concentrated on the bluff above Puget Sound and adjacent to the park loop road. The site for the ELC is in a small cluster of Parks service buildings located near the entrance to the park. The footprint of an existing single story structure, constructed as a residence in the 1950s and later converted to classroom use, was used as the building site.

One of the primary goals of the ELC is to translate long term goals for the Pipers Creek watershed into a model for residential-scale development.

Rainwater that hits the roof is collected in a

cistern and rain barrels. The water stored in the cistern is used for flushing toilets and the rain barrels store water for irrigating the landscape when needed. A metal roof was selected for water collection, and the roofing was specified with an Energy Star finish.

Most of the stormwater from paved surfaces is directed to an infiltration trench and is naturally filtered as it seeps into the ground. Some stormwater from the parking lot is collected in a detention vault and treated for total suspended solids and total phosphorous to reduce pollutants before being discharged into the receiving water body, Puget Sound.

Healthy soils amended with compost absorb and hold moisture and native and adapted plants were selected to create habitat and preserve biodiversity. Irrigation needs were carefully calculated; rainwater harvested from the rooftop and stored in rain barrels will be used to irrigate only when and where water is needed. Parks will reduce pollution by relying primarily on natural fertilizers and pest control methods. Native landscaping requires no fertilizers. Straightforward landscape strategies are designed to be adaptable by homeowners or businesses in the watershed and elsewhere.

The project took advantage of the existing disturbed area to minimize site impacts and directed the flow of demolition debris from the old structure to minimize waste. To enhance habitat, existing tree snags were preserved and native landscaping was reinforced.

There are no impervious surfaces in the landscape. Over 30 permeable walkway





Photos left by Miller Hayashi, right by Erik Stuhau

surfaces are shaded in the summertime peak. Site disturbance was limited to within 40 feet of the building. Existing curbs and roadways on two sides and a steep hill on a third side also helped contain construction activity.

Existing parking just met City's minimum standard for the new use, so no additional parking was added.

## Water Efficiency

The site palette has resulted in a total site imperviousness of 38.71 percent, even with twice the roof area of the previous structure. This is a net reduction of 8 percent compared to the previous site. Excess roof runoff in high rain winter conditions is directed to infiltration trenches, providing treatment up to the two-year storm event.

A 3,850-gallon stormwater catchment cistern serves a pressurized stormwater re-use system for toilet flushing and hose bibs for irrigation.

In addition a smaller "rain barrel" system is used for hand irrigation demonstration, since it is an easy step for homeowners to duplicate. A palette of native and drought tolerant landscaping combined with a generally shady site minimize the need for irrigation once established. Hand irrigation, if required, uses harvested rainwater under most conditions. The cistern and a system of pre-filters and ultraviolet (UV) purification provides water supply for the pressurized toilet flushing system in all but the driest months.

The landscaping is designed to reduce water use by 50 percent from City of Seattle baseline standards, saving about

10,518 gallons per year. Documentation showed that the highest anticipated use period (demand for toilet flushing) and the highest baseline requirement for irrigation levels both occur during the dry summer months. The concurrent uses lower savings. Water savings improve substantially as the building receives more wintertime use. Savings in overall potable water use at the ELC is approximately 33 percent over City of Seattle baseline standards, a total of 15,638 gallons.

## Energy & Atmosphere

The building is expected to use 66 percent less energy than a similar building designed to meet the ASHRAE 90.1 standard (the American Society of Heating, Refrigerating and Air Conditioning Engineers' minimum requirements for energy efficient design of buildings), and approximately 45 percent less energy than if it was designed to simply meet the Seattle Energy Code.

Since electric lighting can consume as much as 50 percent of the total building energy, the project team oriented the building to take advantage of natural daylight. In addition to providing a higher light quality than electric lighting, natural light has been shown to improve the health and comfort of occupants. The daylight design illuminates the space while controlling for heat gain and glare. Low-e glazing, overhangs and blinds control direct sunlight, and a clerestory window introduces daylight high in the ceiling space.

The design integrates a high-performance insulation package, a radiant heating

system and natural ventilation. The structural envelope was designed to conserve energy by taking maximum advantage of passive daylighting and passive ventilation. When the windows located lower on the south side are shaded, a high north clerestory balances the daylight. This arrangement also makes use of the prevailing breezes and the stack effect for cross ventilation. In addition, large rolling doors open the classroom up to an adjacent covered terrace on the west, inviting programs to spill out into the outdoors.

The building is used by large groups of people for relatively short time periods. Wintertime programs may be only an hour long at various times of the day or evening. The selected system of radiant panels allows for quick start up and puts the heat in proximity to building users, minimizing overall heating energy. Radiant heat systems maximize efficiency and user comfort. Air conditioning is not necessary. A combination of occupancy sensors and daylight sensors reduce electricity needs for lighting.

The ELC also creates its own energy. Because the building site is shaded by the woods, a solar electric system was located on the adjacent visitor center's roof and on poles in the meadow. In addition to providing renewable energy, the panels form a dramatic array and help to create public awareness for this program. The renewable energy system produces an estimated 3,100 kilowatt hours (kWh) per year, 22 percent of the anticipated total energy load. The solar project was installed with the assistance of Seattle City

Light's Green Power program. Electricity generation may be tracked using a web-based monitoring system. Through net metering, any solar generation that exceeds the building's immediate needs, results in the electric meter literally running backwards, accumulating energy credit for later use.

The combined solar electric (photo-voltaic) production and radiant panel heating and lighting systems deliver a 66 percent energy savings over the energy code baseline building, or 6,202 kilowatt hours of electricity.

## Materials & Resources

The ELC makes an effort to put resource friendly and recycled materials up front where people using the building can touch and see them. Finish materials were chosen for their expressively sustainable qualities, including natural linoleum flooring, recycled concrete countertops, homasote acoustical board, and Bio-fiber cabinet board.

Products with recycled content include concrete, backfill, wood composite casework, insulation, and flooring. Salvaged materials include peeler logs from a naval building in South Lake Union.

An existing house structure on the site was studied for the possibility of reuse, but it did not have the structural spans needed for the program. A recycling approach was chosen instead.

Defining clear expectations for waste stream management and documentation in the specifications made it possible to divert more than 80 percent of construction and demolition waste from landfill. Items salvaged and reused included finish items from the existing building, timber poles previously used for dock pilings, existing plant materials, concrete foundation, and carpet tile. Careful tracking of materials sources shows that regionally manufactured products comprise 68 percent by value of all materials, and that regionally 'extracted' products comprise 54 percent of all materials.

## Indoor Environment

The goal of the project was to create an environment that fosters and supports environmental education and also gives the volunteers that steward the park a base for their programs. The interior is intended to feel like part of the park. It

provides generous daylight and views, opening the interior to prevailing breezes and sheltering outdoor areas next to the classroom and using natural materials and finishes.

To protect interior air quality, low emitting adhesives, sealants, paints, carpet and wood products were specified and CO<sup>2</sup> monitoring is provided.

Operable windows and lighting controls provide a high degree of occupant control over ventilation, and lighting energy efficiency. In the mild Pacific Northwest climate, natural ventilation provides a high degree of thermal comfort relative to standards. While glazing is limited to 16 percent for energy performance, the compact structure and careful design creates a high level of daylighting performance and views that enhance the ELC programs.

## Innovation & Design

- Education/interpretation
- Plant rescue
- LEED accredited professional

## Lessons Learned

Bidding around structural re-use means there will be some uncertainty. The public bid process allows very little room to develop a fine tuned approach to cost-sensitive issues of re-use of building assemblies or structural components. Particularly on smaller projects, construction approaches and budget assumptions must be made without benefit of extensive contractor pricing and constructability review.

A cistern system will be subject to competing demands. The cistern design is intended to meet Environmental Learning Center goals for stormwater management and reduction in use of potable water. It also provides a great visualization device for the hydrological 'closed loop'. However, high summer usage of the building (and toilet flushing), combined with an especially hot dry summer and high irrigation demand, and has meant that a larger cistern would have been needed to meet all of the gray water demands for the building.

December 2008

## Rating & Awards

U.S. Green Building Council LEED® for New Construction Gold Rating

## The Team

### Owner

City of Seattle  
[www.seattle.gov](http://www.seattle.gov)  
Seattle Parks and Recreation  
[www.seattle.gov/parks](http://www.seattle.gov/parks)

### Architect

Miller Hayashi Architects  
[www.millerhayashi.com](http://www.millerhayashi.com)

### Mechanical Engineer

Notkin Engineers, Inc.  
[www.notkin.com](http://www.notkin.com)

### Landscape Architect

Herrera Environmental Consultants, Inc.  
[www.herrerainc.com](http://www.herrerainc.com)

### Civil Engineer

Herrera Environmental Consultants, Inc.  
[www.herrerainc.com](http://www.herrerainc.com)

### Electrical Engineer

Case Engineering  
[www.caseeng.com](http://www.caseeng.com)

### Community Steering Committee

Carkeek Watershed Community Action Project  
Carkeek Park Advisory Council  
[www.seattle.gov/parks/parkspaces/carkeekpark/advisory.htm](http://www.seattle.gov/parks/parkspaces/carkeekpark/advisory.htm)

### Contractor

Gemkow Construction  
[www.gemkowconstruction.com](http://www.gemkowconstruction.com)

### Commissioning

CHDS Commissioning and Engineering  
[www.chdsco.com](http://www.chdsco.com)

## To Learn More

### Seattle Parks and Recreation

[www.seattle.gov/parks](http://www.seattle.gov/parks)

### Salmon-friendly Landscaping

[www.seattle.gov/util/RESCONS/plantNaturally/salmonfriendly.htm](http://www.seattle.gov/util/RESCONS/plantNaturally/salmonfriendly.htm)

### Rain Barrels

[www.seattle.gov/util/rainbarrel](http://www.seattle.gov/util/rainbarrel)

### Seattle City Light Green Up program enables customers to invest in new renewable resources.

[www.seattle.gov/light/green/greenpower](http://www.seattle.gov/light/green/greenpower)

### Daylighting Tips

[www.lightingdesignlab.com](http://www.lightingdesignlab.com)

LEED® is the national benchmark for high performance green buildings developed by the US Green Building Council.

[www.usgbc.org](http://www.usgbc.org)

City Green Building is making green building standard practice in Seattle through education, technical assistance and incentives.

[www.seattle.gov/dpd/greenbuilding](http://www.seattle.gov/dpd/greenbuilding)