LEWIS & CLARK COLLEGE:

Exploring the Frontier Of Sustainable Irrigation Design

By Eric Bode, Doug Macy and Chelsea Cochran, Walker Macy Landscape Architects

Lewis & Clark College, the largest independent college in Oregon, is nestled in the wooded hills southwest of downtown Portland. The 130-acre campus is highlighted by its grand setting on the grounds of the former Fir Acres estate, with its landmark manor house overlooking a formal garden mall with views of Mt. Hood and beyond.

PHOTO COURTESY OF WALKER MACY

RIGHT: A close-up shows stonework detail at one of the aqueduct spillways, which feed rainwater into six planting beds around the building. The custom black granite work was completed by Washington-based Guinett Masonry.

In 1991, realizing the significance of the manor house, formal gardens, and the surrounding wooded environment to the identity of the institution, Lewis & Clark College launched a bold initiative to better capitalize on these essential assets. The college commenced a long-term redevelopment campaign resulting in a master plan designed to renew the inherent splendor of the campus and establish a fitting framework for future growth and change. Because of Lewis & Clark's longstanding tradition of environmentalism, sustainability and environmental protection, these goals were naturally woven into the Howard Hall Project.

A key feature of the design work is an innovative reclamation system that filters and collects most of the site's runoff water. The design team selected a plant palette of native and other species that tolerate a wide range of moisture levels. Sprinkler systems were installed for the key establishment period (which took place during unseasonable drought conditions) but may be removed and reused once landscape plants put down roots.

Student participation—during and after the design phase—is another unique project characteristic. A number of courses plan to incorporate the reclamation system into their coursework. By their close and daily proximity, students will follow the landscape's development as it expands from its scraggly beginning into fields of green.

"That's the funny thing about landscape architecture," project manager Eric Bode said. "The site often looks worse at the beginning than it does several years down the road."

PHOTOS BY ERIC BODE, WALKER MACY.

ABOVE: Irrigated lawn was used sparingly to minimize water use, but this 24 x 40-foot turfgrass area was considered important for this social space.

MIDDLE: Stone aqueducts channel water from the downspouts to the garden beds—which contain plants with high drought and moisture tolerance. (The channels are made of black granite, which is softer and more workable than basalt.) Joining the dogwood in the foreground here is *Rosa rugosa* (along the wall) and pennisetum grass.

BELOW: These Rain Bird 1800 Series spray nozzles are temporarily used to moisten a bed that includes ornamental pear trees during the critical establishment period. The hardware is designed to be moved elsewhere when the trees, shrubs and groundcover develop sturdy root systems.

Goals & Objectives

The design team's overall goal was to build the Howard Center for Social Sciences as an integrated part of a greater campus eco-system. The landscape architect focused on these objectives for the project:

- Design an adaptable and durable facility that emphasizes education in the social sciences and environmental stewardship while providing flexibility to accommodate college needs now and into the future.
- Use and reuse materials as feasible to complement the historic character of the existing campus. Select new materials that uphold the environmentally-responsible goals of the college.
- Integrate the functional requirements of storm water treatment and recovery with the character of the campus and the original estate.

Lewis & Clark College requested the landscape architect to develop innovative, environmentally responsible solutions that consider sustainability in all decisions. At the same time, the college sought plans that would also minimize long-term operations and maintenance costs. To implement this strategy, the college adopted the US Green Building Council, Leadership in Energy and Environmental Design (LEED™) methodology. LEED™ is based on accepted energy and environmental principles and strikes a balance between known effective practices and emerging concepts. The LEED™ methodology helped guide the design process in the following areas:

- *Use natural and existing resources efficiently*
- *Provide ecologically sound and healthy site materials*
- *Develop partnerships to achieve sustainable design goals*
- *Foster dialogue and education*
- *Minimize impact on surrounding environments.*

Site Characteristics

The first consideration of the Howard Hall plan was that new improvements would respect the elegant context set by the historic estate, while incorporating forward-thinking environmentally responsible techniques. This consideration brings the campus site design out of the classic traditions and into the future needs of our society. Through team collaboration, this project integrates the building, site, and surrounding campus, allowing all the pieces to work together as one. With this guiding concept, these elements were incorporated into the Center for Social Sciences:

1. *An innovative stormwater filtration and recovery system*
2. *Environmentally-responsible use of plants, irrigation and construction materials*
3. *Culturally-sustainable open spaces for flexible use*
4. *Ecological education opportunities*

Stormwater Innovation

The college originally requested plans that would comply with the city's stormwater management requirement that stormwater be treated before leaving the site. The Landscape Architect decided to look beyond simple compliance and created a unique stormwater reuse plan that can accommodate a three-story, 50,000-square-foot academic building and link it to the rest of the campus.

ABOVE: This enclosure holds two Rain Bird controllers that adjust watering rates based on data supplied by the Maxicom ET-data network. Project contractor Art Meisner shows off the unit, which is tucked under a patio where it is easily accessible.

PHOTOS BY ERIC BODE, WALKER MACY.

ABOVE: The water collection system utilizes a traditional storm pipe for collection and distribution to the overall campus system. The T-handle at top closes an overflow gate that can be left open to drain excess rainwater when the collecting pond is full.

BELOW: The Landscape Architect paid careful attention to minimizing the visibility of irrigation equipment. The black valve boxes in the newly-planted beds are nearly invisible and will be completely hidden when the vegetation fills in.

PHOTOS BY ROBERT REYNOLDS, LEWIS & CLARK COLLEGE.

LEFT: A view of the old Fir Acres estate taken around 1930 shows the property's pool, which is oriented to show off 11,249-foot Mt. Hood in reflection. The pool is filled from an on-campus well, which has provided irrigation water since the campus' founding.

BELOW: The design team put this historic pool, which dates to the 1920s, to new use as a reservoir for storm runoff. (The pool also serves as a collection point for the well water that also supplies the irrigation system.) The campus system can draw on the stored water in late summer, reducing pressure on limited well water.

"That's the funny thing about landscape architecture. The site often looks worse at the beginning than it does several years down the road." –*Project manager Eric Bode*

The plan focused on the potential for storing runoff from the building's roof for irrigation purposes and toilet flushing.

It was determined that cost savings alone would not make the plan feasible since the annual cost of projected irrigation water for the site would be insignificant.

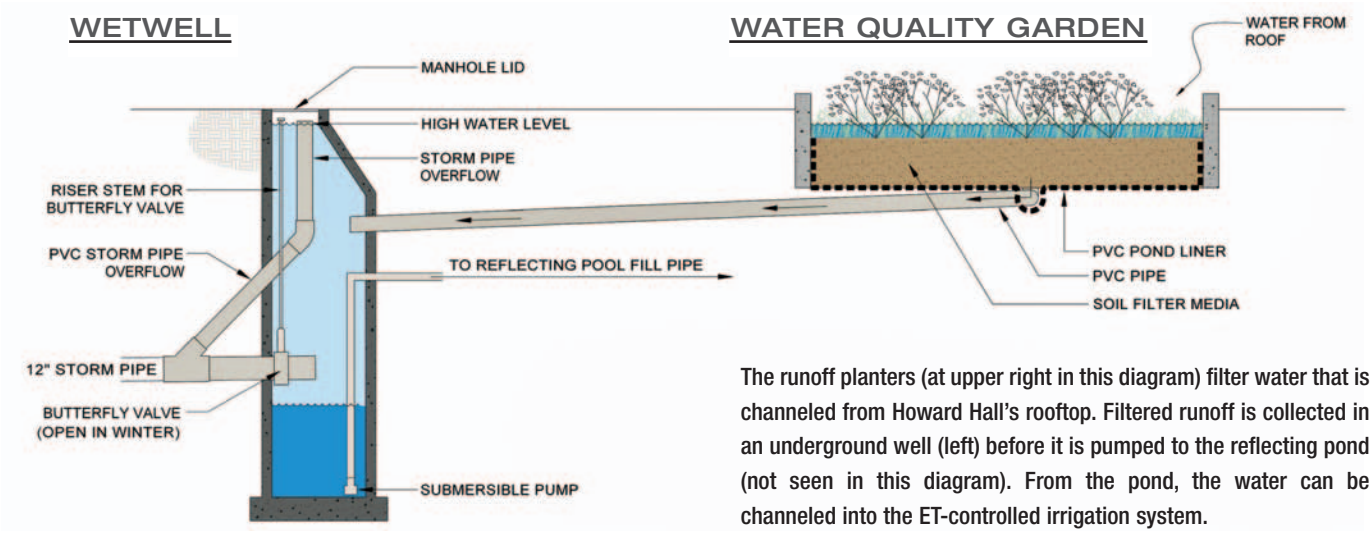
It was only through the simple adaptation of the required piped stormwater system and the use of an existing historic reflecting pool for water storage that the Landscape Architect was able to show Lewis & Clark College that the reuse system would only add a nominal amount to the expected construction cost.

The college was impressed with the proposed innovation and, despite the lack of cost savings from water reuse, determined that the environmental responsibility, academic benefits, and ingenuity of the project was consistent with the college's objectives and would warrant implementation.

The solution to stormwater management includes provisions for collection, filtration, pumping and storage.

Runoff from the large roof flows through traditional downspouts into hand-crafted stone aqueducts, which channel water to the water-quality gardens. The water cascades into gardens where it is temporarily stored during higher intensity rainfall events. The soil in the water quality gardens consists of sand, organics, and soil polymers to filter sediment while retaining moisture and nutrients for the plants. Native and adapted shrubs and grasses are selected to tolerate seasonal fluctuations between periods of intense rain and heat. Besides their function to filter roof runoff, the gardens and stone channels provide strong formal features in the landscape.

After filtration through the water quality gardens, water is stored in the stormwater piping and wet well system modified for water capture and reuse. The filtered water is then diverted to the reflecting pool, a fixture of the original estate garden, which currently stores well water and is pumped to irrigate other areas of the campus. By carefully balancing the amount of available water from runoff with the water requirements of the plant



RENDERING COURTESY OF WALKER MACY.

The runoff planters (at upper right in this diagram) filter water that is channeled from Howard Hall's rooftop. Filtered runoff is collected in an underground well (left) before it is pumped to the reflecting pond (not seen in this diagram). From the pond, the water can be channeled into the ET-controlled irrigation system.

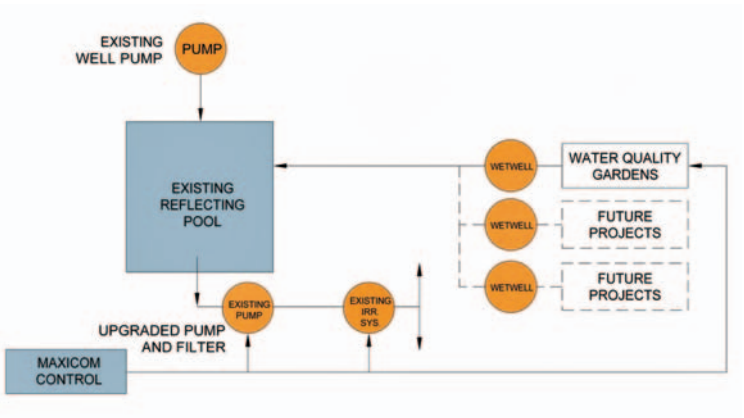
materials, the new project will produce minimal net gain in irrigation well water use over an average year of rainfall.

Howard Hall is the first of five buildings planned for the academic north campus. The recovery system is designed to link all future buildings in the academic area to the proposed system, furthering the sustainable goals of the college.

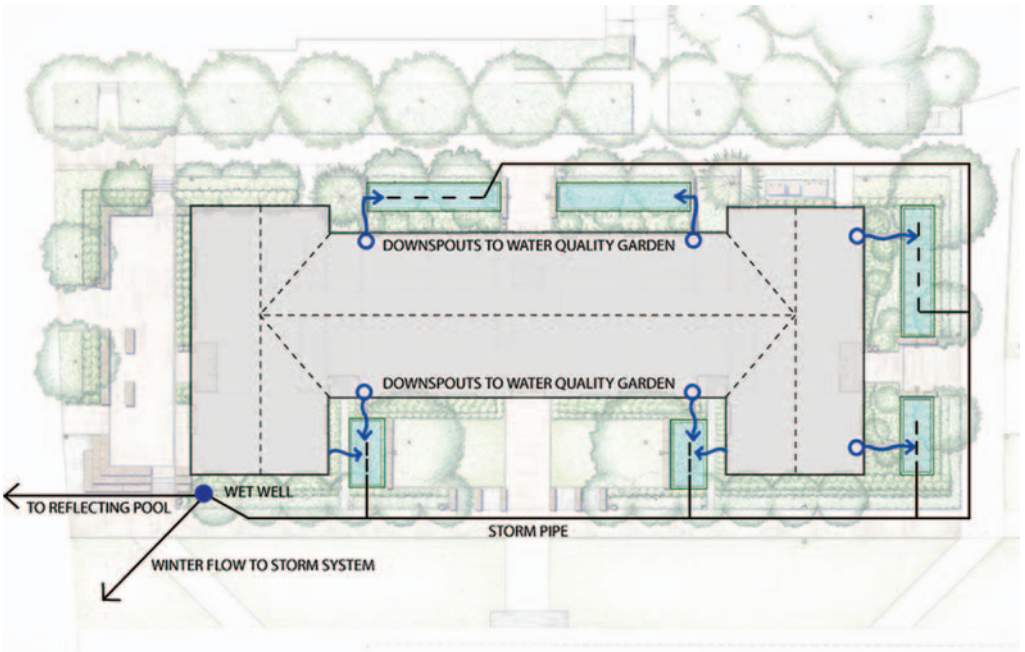
Sustainable Use of Materials and Plants

In the design of the project, the Landscape Architect strove to create a place that was environmentally and culturally sustainable through the use and reuse of local and adapted building and planting materials.

Previous development had neglected or abandoned large quantities of stone materials from the original estate. The plan called for cobble paving to be salvaged and incorporated into the new construction. To complement these substantial and venerable materials, the designer selected an understated and refined palette that would complement the existing campus. Virtually all new paving consists of stone cobble salvaged from this and other projects on campus or pre-cast



ABOVE: A simple flow chart outlines the system's design. Arrows from the Maxicom evapotranspiration control system at lower left show the flow of electric signals that activate the water pump and irrigation system. Additional gardens can be added to the system, as is indicated at right.



RIGHT: At Howard Hall, rooftop runoff is sent straight to planting beds for irrigation. Excess water (during heavy winter storms) flows through the beds into the wet well at lower left and to the reflecting pool for storage. From the wet well, heavy winter flow is routed into local storm sewers.

concrete unit pavers. The concrete pavers are either salvaged from the campus or made from 100% local materials and contain recycled and post-industrial products. The paving system is also pervious which minimizes surface runoff to nearby streams. The materials and design combine to create a timeless setting that will age gracefully alongside the estate.

The Landscape Architect selected plant materials that maintain the dignified character of the surrounding campus and "Fir Acres" estate while reaching the goals of environmentally responsible design. All plants chosen for the Center are indigenous or adapted to the local climate. Plant materials, excluding those in the water quality gardens and the two small lawns, were chosen to be reminiscent of the original estate yet possess the ability to withstand summer drought conditions. This will allow Lewis & Clark College to minimize irrigation to occasional watering during the late summer months.

Culturally Sustainable Open Spaces

The site was designed for flexible use within the context of an academic setting. Several gathering spaces are built into the site plan for informal exchange between students and faculty and are planned to be used as outdoor classrooms. These include a large plaza adjacent to a "cyber café" with stone "soap box" seating for impromptu student assemblies, stone block seating for smaller groups, and two small lawns for larger outdoor classroom space. Howard Hall is designed as a culturally sustainable place providing flexibility in use to accommodate students' needs now and into the future. Subsequent development of a major central campus quadrangle adjacent to the building will be guided by this showcase project.

PHOTOS BY ERIC BODE, WALKER MACY

Environmental Education

The Landscape Architect was encouraged by the Lewis & Clark College staff to work with students in related academic programs including: Environmental Economics, Hydrology, Introduction to Environmental Science, and Energy and Atmosphere. The designer assisted the faculty and attended several classes to work with students to study different aspects of the project. Students were empowered to assist the design team in preparing sustainable development concepts. Students prepared an economic analysis of recycling rainwater; developed a science based analysis of rainfall data, rainfall characteristics, rainfall patterns and collection methodologies; and formulated approaches to providing educational displays and information about the building and site. The students were also involved with construction budgeting, priority-setting and the cost implications of green building.

The project has become a model for engaging students in the planning and design of campus facilities as part of the curriculum at Lewis & Clark College. The built project serves as a visible learning tool, showing how stormwater can be collected, cleaned and reused. Students can monitor the system and collect data on stormwater recovery and irrigation usage using the campus central-control irrigation system.

Role of the Designer

The Landscape Architect was responsible for master planning the academic core of the campus in concert with the long-range plans for the entire campus of Lewis & Clark College. The designer also developed a detailed site design for the new Center

ABOVE: A pair of filtration gardens frame the Howard Hall entrance, inviting students' curiosity about the integrated design. The Sternberg metal halide light fixture at right was selected for its energy efficiency and soft, white light.

RIGHT: Howard Center for the Social Sciences is the newest building on campus and the first of five new structures planned. The tumbled pavers here (from Mutual Materials) are permeable and help keep runoff to a minimum.

PHOTO COURTESY OF WALKER MACY.

ABOVE: Storm water planters line both sides of the building's entrance. The rectangular structure in the planting bed is an aqueduct that channels roof runoff to the bed. The runoff feeds dwarf red twig dogwood, which has a wide tolerance for dry and wet conditions.

LEFT: Smaller roof areas are allowed to drain across cobblestone paths into the water quality gardens. The cobbles were salvaged from redeveloped areas of the former estate, and date from the 1920s. Note that the spillway portion is grouted, but the areas to either side are open to let water percolate into the ground.

for Social Sciences. This project is the first phase for the complete redevelopment of the academic core of campus. Through sustainable long-range planning, collaboration, and design innovation, the Landscape Architect advanced the College's commitment to environmental stewardship and education.

To achieve this, the Landscape Architect:

- *Selected a site that was previously developed.*
- *Collaborated with other consultants on the project to integrate systems and LEED™ methodologies.*
- *Collaborated with administration, students, and instructors to integrate the project into the curriculum.*
- *Initiated and developed a unique stormwater management plan for water reuse.*
- *Utilized sustainable materials and construction practices.*
- *Designed the site for water efficiency and reduced heat island effect.*
- *Crafted a project that is a timeless extension of the campus character.*

Conclusion

Howard Hall is a significant achievement of sustainability encouraged and designed by the Landscape Architect. Early on, the team adopted the vision of Howard Hall as an integrated part of a greater campus eco-system and educational experience. Through team collaboration between the Landscape Architect, architect, client, & student body, the Center seamlessly links the building, the site and the surrounding environment. This project serves as a model of teamwork and of cultural and environmental sustainability. The project is expected to achieve at least a LEED™ Gold Level certification.

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ABOVE: Some of the aqueducts spill from the ends, others from the center (the outflow is at center right here). The water channel runs the length of the water-quality garden to create an eye-pleasing line.

BELOW: Another view of the aqueduct and spillway that pours into the Howard Hall water-filtration garden. Planted at the start of 2005, the dwarf red twig dogwood will fill this space with leafy green when it fills out over the next growing season.

PHOTOS BY ERIC BODE, WALKER MACY.