

green building at New Columbia

healthy, resource-wise housing and site design at Portland's largest urban redevelopment



Photos above, from left: Framers at work on a roof; Solar collection panels; Plumbing lines for solar-heated water.

WHY WE BUILD SUSTAINABLY

Buildings use 35% of all energy consumed in the United States. The average Portland-area resident throws away more than 1,500 pounds of solid waste in a single year. 27% of renters in Multnomah County spent more than half of their monthly income on rent and utilities in 2003.

Statistics can be very discouraging.

Our knowledge of the impacts of construction on the environment and human health is rapidly expanding. In the last 15 years common sense, health-conscious alternatives to typical construction methods and building products have entered the market place and been tagged with the labels "green" and "sustainable". Green building is a holistic approach to managing the life-cycle impact of buildings on the environment and our health. A simple construction project, like a single family house, consumes tons of building materials, and each material represents environmental impacts at multiple levels: extraction, processing, manufacturing, packaging, transportation, and—at some unspecified time in the future—disposal. Owners, architects and contractors who practice green building weigh the comprehensive environmental impact and the long-term financial cost of each decision against the up-front construction cost to arrive at a balanced, lowest-impact-possible solution.

As the field grows, so does the number of satisfied consumers. Green buildings are generally perceived as being better built with durable, high quality materials. Occupants benefit from reduced utility bills, improved comfort and healthier indoor air. Building owners benefit from higher worker productivity and lower utility, maintenance and operational costs.

HUD's HOPE VI program, which provided the \$35 million seed grant for the redevelopment of this property, encourages HOPE VI grant recipients to set high standards for urban planning and transit access, to use sustainable demolition and construction practices, and to pursue advanced technologies that will improve the quality, durability and environmental performance of the nation's housing. This isn't a difficult challenge for Portland. A city that sets the bar when it comes to smart growth and transit-oriented development. That conserves. Recycles. Deconstructs. That is a national leader in sustainable construction. And when project stakeholders—staff from the Housing Authority of Portland and the city of Portland, residents of Columbia Villa and the Portsmouth neighborhood—began to think about the property's potential, they continually asked each other: What's the absolute best that can be done with this 82 acres? It's not only a lot of land, it's a lot of responsibility and, most importantly, a lot of opportunity.

New Columbia demonstrates what can be accomplished with a coordinated, big picture approach. From planning to construction to operations, community leaders, architects, engineers, builders and maintenance personnel have focused on the quality and longevity of the final product and the on-going benefit to the end users—the generations who will call New Columbia "home".

POWERED BY THE SUN

Harnessing energy from the sun to heat water is nothing new, and solar water and space heating are proven environmentally sound ways to reduce energy bills. But with high up front equipment costs, solar power isn't usually a viable alternative to electricity and natural gas in affordable housing developments.

Not so at New Columbia. *The Energy Trust of Oregon has donated solar water and space heating equipment for two apartments!* Solar collection panels are mounted on the south-facing roofs of two townhouses on North Fessenden Street. These collectors save energy by using the sun to pre-heat water before it goes to the water heater. The hot water is then distributed to plumbing fixtures and to furnaces that heat the apartments and bring in fresh air to improve the residents' comfort in winter. By monitoring the energy usage of these two townhouses for 12 months and comparing the data with that from a similar installation in Bend, Oregon, the Energy Trust will obtain useful information for future solar projects.



ABOUT NEW COLUMBIA

Envision a neighborhood of diverse housing choices, welcoming parks, and community meeting places. People who live in the neighborhood represent many cultures, age groups, and income levels. They have access to good transit systems and some of Portland's best outdoor recreation areas. They socialize, shop, work and learn in the local area.

This is the vision for New Columbia, and it's a vision that's becoming a reality. With help from public and private partners, the Housing Authority of Portland (HAP) is transforming Columbia Villa, Oregon's most physically and economically distressed public housing development, into a well-planned, attractive and sustainable community. This report documents some of New Columbia's most exciting achievements—the intelligent design and construction that make it a wonderful place to live.



PLAN FOR A SUSTAINABLE COMMUNITY

Everyone wants to live in a healthy and sustainable community, but what does it take to make one?

New Columbia is a neighborhood that exemplifies “Location Efficient Design”, or LED. The goals of LED are to maximize accessibility and affordability by linking housing areas with job centers through good transit systems, create good cycling and walking conditions, and conserve land by redeveloping underutilized sites. Easy access to good transit reduces dependence on fossil fuel. Redeveloping urban sites conserves rural land for farms and wildlife. Denser housing—like the townhouses at New Columbia—consumes fewer resources and gives more households the benefits of living close in.

New Columbia is located on one of Tri-Met’s high ridership bus lines and is just a few stops from the Interstate Max Light Rail, making for an easy commute to almost anywhere in the metro area. It’s also close to some of Portland’s best recreational opportunities, like the 40 mile loop and the Smith and Bybee Lakes Wildlife Refuge. The circular street pattern that existed in the area has been replaced with a grid that connects to the larger neighborhood, making for easy vehicular and pedestrian access. Long central blocks are bisected by pedestrian paths that lead to McCoy Park and the bus line, and a small neighborhood commercial zone on North Trenton Street—within walking distance of the furthest corner of the development—will be home to useful community services and small, locally-owned retail businesses when construction is complete.

The 82 acre site, which now has 850 new dwelling units, was formerly home to a 462 unit low density housing development that didn’t make the best and highest use of the land. New housing types range from single family houses to apartment buildings with 30+ units, giving households many housing options within a relatively small area. A benefit of increased density is a greener neighborhood—more than seven acres of land have been developed as parks and open space, including a new four acre city park!

At the sidewalk level, housing units have spacious front porches that encourage neighborly interaction. Very few curb cuts interrupt the streetscape because off-street parking is located on alleys behind the housing. Windows of primary rooms—living rooms and kitchens—face the streets and alleys so residents can easily keep an eye on their children, watch for the bus, and know what’s happening on their street. Four ¼ acre “pocket” parks provide outdoor play areas close to homes. *New Columbia is designed to make the day-to-day activities of life easy and pleasant.*

COMMUNITY-BASED PLANNING REALLY WORKS!

The New Columbia design team set new standards for community-based planning. Residents of Columbia Villa (who all have the opportunity to return to New Columbia) and neighbors participated in 10 months of lively and challenging design workshops. The site plan and housing reflect the community’s top priorities: tree preservation, salvage and recycling during demolition, street grid repair, safe and attractive outdoor areas, stormwater management, water conservation, energy efficiency, a variety of housing types, clean indoor air, and durable building materials.

LEEDERS ON TRENTON STREET

Two mixed-use buildings HAP is developing on North Trenton Street are under construction. The three story buildings face each other across North Trenton Street, and are located immediately east and southeast of McCoy Park. The ground floors will be home to New Columbia’s management offices, PCC community classrooms and small retail opportunities. There will be a total of 74 units of tax credit rental housing on the upper floors of the buildings.

The respective architects of the two buildings—Mithūn, Inc. of Seattle and Robertson Merryman Barnes of Portland—have designed the buildings to qualify for the U.S. Green Building Council’s LEED certification! LEED (Leadership in Energy and Environmental Design) is the premier national program for sustainable buildings. HAP will apply for the certifications when construction is complete in 2006. The buildings will boast many features unique in affordable housing and HOPE VI developments:

- A stormwater education exhibit
- An irrigation system that uses no potable water
- Landscaping and building envelopes designed to reduce heat islands
- Secure indoor bicycle storage for apartment residents
- Secure indoor bicycle storage and showers for commercial tenants
- Sustainable framing lumber, per Forest Stewardship Council guidelines
- Low-VOC and VOC-free interior finishes
- Solar water heating systems that supply 1/3 of the hot water demand
- Hydronic (water-based) space heaters in apartments
- Plumbing systems that outperform Oregon’s water code by 30%
- Energy Star appliances and lighting

SKINNY STREET

North McCoy Court, located one block north of Houghton Street, is just 28’ wide from curb to curb—that’s 4’ narrower than a typical Portland street! Skinny streets are good for the environment because they generate less runoff and function as traffic calming devices.



SUSTAINABLE STORMWATER

Stormwater management is a key element in maintaining and enhancing Portland's livability. As the city is developed, new impervious surfaces increase the amount of run-off during rainfall events and disrupt the natural hydrologic cycle. These conditions erode stream channels and prevent groundwater aquifer recharge. Parking lots, streets and roofs increase the pollution levels and temperature of stormwater run-off that is transported to our streams and rivers. Protecting these waters is vital for a great number of uses, including fish and wildlife habitat, drinking water, and recreation.

New Columbia's stormwater management system employs Low Impact Development (LID) strategies. LID uses topography, vegetation and soil features to naturally infiltrate rain water into the groundwater aquifer where it falls. LID eliminates the need for expensive conveyance systems and is a foundation of sustainable development at a community-wide scale. *New Columbia has 80% less underground stormwater piping than a comparable traditional development, and retains 98% of the stormwater that falls on public and private property on site!*

The city's Bureau of Environmental Services calls New Columbia "the ultimate green streets development". With 101 pocket swales, 31 flow-through planter boxes and 40 public infiltration dry wells, New Columbia is Portland's largest green streets site.

Stormwater from the public streets is treated in biofiltration areas (swales and planter boxes) located within the public rights-of-way. Biofiltration areas are designed to allow run-off to filter through the planter soils and then infiltrate into native soils. Small storm events are completely infiltrated by the swales and planter boxes. Large storm events cause the swales and planter boxes to overflow into 30' deep drywells located below the streets.



PERMEABLE PAVING DEMONSTRATION

New Columbia's private stormwater is collected in common greens and alleys. The alleys located on blocks 1 through 7 (bordered by Fiske Avenue, Trenton Street, Adriatic Avenue and Columbia Boulevard) are one of Portland's largest porous pavement demonstration areas. At the centerline of these alleys, a strip of porous pavers sits on top of a soakage trench. Stormwater from the private property enters the soakage trench through the pavers and filters to 30' deep drywells located at the either end of each alley. The trenches filter hazardous pollutants like phosphorous, lead and motor oil from the water before returning it—cleaner than it was when it entered the trench—to the aquifer.



Photos from top:

A pocket swale is inspected by an engineer from BES before it's backfilled and planted.

Testing a pocket swale.

A soakage trench in an alley, under construction.

STRONG PUBLIC PARTNERSHIPS

New Columbia wouldn't be as great as it is without the support of the City of Portland. During the planning phase, staff from the development bureaus participated in a Technical Advisory Committee, a group formed especially for New Columbia to brainstorm and troubleshoot innovative ideas on stormwater management, street and utility design, uses for recreational space, and other sustainability-related topics. Additionally, the Office of Sustainable Development hosted two green building workshops during the planning phase for design consultants, residents, and operations and maintenance personnel. These workshops surfaced and resolved concerns and issues that usually aren't discussed until after a project is built and occupied!

SWALES, SUMPS, SOAKAGE TRENCHES...*they're not all the same. The following techniques are all used at New Columbia. Definitions are from the Bureau of Environmental Services Stormwater Management Manual:*

BIOFILTRATION: *The combined physical, biological, and chemical processes that remove pollutants from stormwater in a vegetated treatment facility such as a pond, wetland, or swale.*

DRYWELL (ALSO A SUMP): *A structural subsurface facility with perforated sides or bottom, used to infiltrate stormwater into the ground.*

INFILTRATION: *The percolation of water into the ground.*

FLOW-THROUGH PLANTER BOX: *A structural facility filled with topsoil and*

gravel and planted with vegetation. A perforated collection drain in the bottom directs stormwater to an acceptable disposal point.

SOAKAGE TRENCH: *A linear excavation backfilled with sand and gravel, used to filter pollutants from and infiltrate stormwater into the ground.*

VEGETATED SWALE (ALSO A POCKET SWALE): *A surface facility planted with a variety of trees, shrubs, and grasses. Stormwater is directed through the swale, where it is slowed and infiltrated, allowing pollutants to settle out.*



THE NOSE KNOWS

Volatile Organic Compounds are gaseous chemicals that can cause a wide variety of illnesses, especially in people with chemical sensitivities. They are present in materials we encounter every day, including plastics, tobacco smoke and cosmetics, and are common in interior finishes. VOCs can produce strong odors and lower air quality when new, but they fade over time. At New Columbia's rental units:

- Interior paints are VOC-free. Other solvents and adhesives used indoors are certified as low-VOC or VOC-free.
- Carpeting is a 100% nylon fiber that contains no VOCs and is installed over a high-quality VOC-free pad.
- Vinyl flooring is a high quality, durable and inflexible material (the more flexible the vinyl, the higher the concentration of VOCs).
- Wood trim treated with solvent-based finishes was finished and cured in the factory and installed after VOCs had evaporated.
- Walsh Construction Company implemented a "No Smoking" policy for all contractors working inside New Columbia rental units, assuring no tobacco odor taints the new housing.
- Thorough ventilation with industrial fans prior to occupancy removed residual contaminants.

Photos from left:

Installation of a plumbing manifold.

9518 North Adriatic Avenue is one of four buildings framed entirely with certified lumber.

Flow-through planter boxes are planted with native species.

CONSERVING WATER

It's a simple equation: the less water humans use, the more water is available for the fish and wildlife that need it for habitat. But humans use a lot of water—the typical Oregonian uses a whopping 235 gallons of fresh water every day! The architects and engineers of New Columbia developed a two-pronged approach to water usage: conserve at the site-scale, and conserve at the building-scale.

NATIVE PLANTS The landscape architects who designed New Columbia's parks and open spaces specified native tree and shrub species. Once established, natives are drought-tolerant and can survive on the rainfall typical to a region.

ECOLOGY MIX An environmentally friendly replacement for traditional seed mix, ecology mix has been planted in lawn areas. It requires little water, no fertilizer, is fragrant, and attracts butterflies!

CENTRALIZED IRRIGATION New Columbia has an advanced system that monitors rainfall, humidity and soil moisture to determine actual water needs. The system is zoned to allow areas to be shut off after new trees and shrubs are established and no longer require irrigation.

PLUMBING FIXTURES Toilets, showers and faucets account for 60% of all indoor water usage. Fixtures installed in New Columbia rental units outperform the state's conservation requirements by at least 20%.

PLUMBING MANIFOLDS Also called "home run" systems, manifolds save water and energy by reducing the diameter of pipes and the number of connections. Several fixtures can be used simultaneously without noticeable changes in pressure or temperature.

WATER SUBMETERS Every apartment has a submeter to allow residents to track their own conservation efforts and to help maintenance personnel isolate and correct leaks.

LAUNDRY Family housing rental units at Columbia Villa are equipped with washer and dryer hook ups. This saves transportation time and money, but there is an up-front cost for appliances. The Energy Trust of Oregon has offered residents of New Columbia rental housing a \$50 in-kind contribution towards the purchase of a new Energy Star clothes washer, in addition to other state tax credits!



THE BEST BUILDING MATERIALS

Wood, concrete, metal, plastics...all types of materials are used in construction. Until recently it was thought that operational costs over the life of a building exceeded the environmental and financial costs of manufacturing building materials, but researchers are re-evaluating that assumption. Thankfully, there are a variety of construction methods and materials available today that can increase a building's sustainability by reducing resource consumption. Utilization at New Columbia includes:

More than 35,000 board feet of certified sustainable lumber purchased from Warm Springs Forest Products in Warm Springs, Oregon—enough lumber to frame 14 residential units!

Advanced framing techniques, used wherever the structural engineers allowed, reduced the overall amount of framing lumber required.

Floor joists, beams, and headers made of engineered lumber—a strong composite of smaller pieces.

Recycled-content fiber-cement siding. It looks like traditional wood siding, but it's non-combustible and has an expected lifespan of 50 years!

LEED-certified drywall, made of 100% synthetic gypsum with a recycled paper face.

High recycled fiber content batt insulation.

Plywood instead of particleboard (which contains the carcinogen formaldehyde).

Locally manufactured products whenever possible. All windows, millwork and metal products were made in Western Oregon and Washington!

CONSERVING ENERGY

The Oregon Public Utility Commission estimates the average household paid about \$136 per month for electricity and/or natural gas in 2004, up from about \$121 in 2003. Increases in basic household operational costs are burdensome on low- and middle-income families and seniors; when the cost of heat and light rises, the amount left for food, transportation and medication goes down.

To combat rising energy prices, project partner Energy Trust of Oregon provided funding to dramatically increase the energy performance of New Columbia's rental units. With a contribution ranging from \$475 to \$548 per unit, the Energy Trust funded Energy Star appliances, windows, water heaters and light fixtures that will save the average household \$105 per year at today's energy prices!

And to further improve the comfort and energy performance of the apartments:

- Hydronic baseboard heaters were installed in all bedrooms. Hydronic heat minimizes the effects of indoor allergens, important in rooms where the primary function is sleeping.
- Blower door tests were performed on a random sample of rental units. Such tests help the contractor determine where leaks are likely to occur and where sealing efforts should be concentrated.

REDUCE, REUSE, RECYCLE

Construction of a typical single family residence consumes more than one acre of forest and generates three to seven tons of waste during construction, so the process of building more than 550 new rental housing units could actually generate a quantity of waste that would more than offset the amount of material salvaged from the Columbia Villa buildings.

Walsh Construction Company developed a waste minimization plan for all phases of construction—including demolition—that all contractors working at New Columbia adopted. The plan established a goal of 80% total waste reuse and recycling by weight and included on-site storage for all materials to be recycled: wood, drywall, metal, plastic, glass, cardboard, and organic debris.

Salvage and recycling efforts were particularly important because the site was not a greenfield—more than 200 existing buildings were taken down before construction of New Columbia began. Demolition contractors salvaged and recycled 82% of the building materials on site and diverted more than 28,500 tons of “waste” from the landfill!

100% of the concrete and asphalt rubble generated by the demolition of Columbia Villa—all 22,000 tons of it—was ground into gravel-sized pieces and reused on site as road base and structural fill around building foundations. The rubble made a road base so strong that contractors could drive heavy construction equipment on it during the winter months before final paving was completed.

The Rebuilding Center deconstructed two four unit buildings and salvaged every component of the buildings—with the exception of plaster and insulation—for resale.

23 of Columbia Villa’s duplex buildings were purchased by local house moving companies, unbolted from their foundations, and removed from the site intact.

3,200 tons of wood debris were ground into chips and reused on site for erosion control or sold to farmers and ranchers as hog fuel (a mulch-like bedding used in animal pens).

A storage building was purchased and disassembled on site by a landscape contractor. The building was reassembled in Vancouver, Washington.

Salvaged materials from Columbia Villa have been reused locally and all over the world: Heavy timbers were resawn for use as architectural finish material in Japan; a Tongan man living in Portland purchased enough lumber, roofing, windows, appliances and plumbing fixtures to build three houses for his family in Tonga; 1,200 square feet of roofing material was donated to reroof an elderly woman’s home in Salem; enough windows and siding were donated to the Amity school district to refurbish an entire school and gymnasium.

WHAT HAPPENED TO COLUMBIA VILLA’S WINDOWS?

Columbia Villa’s windows were replaced in the 1990s in an effort to eradicate lead paint on the property and they were still in good condition when the buildings were taken down. However, the windows couldn’t be reused at New Columbia because the manufacturer’s warranty was voided when they were removed from the buildings. But, not a single window from Columbia Villa went to the landfill! Windows were sold to other housing developers, to neighboring homeowners who wanted to upgrade their own windows, and were donated to the Habitat for Humanity ReStore and the Rebuilding Center.

MINIMIZING MOLD AND MILDEW

Buildings are filled with potentially toxic chemicals that impact our health, and mold and mildew have become chronic problems in recent years. The architects and contractors of New Columbia’s rental housing worked together to develop construction methods that minimize the risk of mold and mildew.

- Front and rear doors are protected by porches and deep overhangs, eliminating the introduction of wind-driven rain into the structure at these vulnerable areas.
- At all exterior walls, joints between sheets of sheathing (on the exterior) and drywall (on the interior) are sealed with draft sealants.
- Mechanical fans installed in all kitchens, bathrooms and utility rooms are quiet, vented to the outside, and run at low speed around the clock to reduce the risk of mold in these rooms and to insure indoor chemicals are quickly evacuated.
- Fresh make-up air is brought into units through operable window vents.
- Radiant heaters are located below windows to prevent condensation and mold growth on glass and nearby surfaces.
- Blower door tests were performed on a random sample of rental units. Such tests measure how air moves in and out of penetrations in the building envelope and let the contractor make adjustments to the construction.



Photos from top:

Salvaged metal roofing ready to be removed from the site.

A building on blocks is prepped to move.

A large pile of concrete rubble waits to be ground up and reused.

WASTE NOT, WANT NOT

Many salvaged building materials were returned to HAP for use at other public and affordable housing sites. Contractors and private parties purchased the remaining items. Salvaged materials include:

windows • metal roofing
siding • structural timber
plywood • cabinetry • doors
door hardware • appliances
furnaces • water heaters
toilets • sinks • bath tubs



PRESERVING HISTORIC TREES

Mature broad-canopy trees are important to our environment for many reasons: in summer, they provide shade and reduce ground and air temperatures; in winter, they provide wind protection; they improve air quality by absorbing pollutants; they protect nearby waterways by filtering and reducing stormwater run-off; and they reduce soil erosion.

Before redevelopment began, this property was home to more than 430 trees. About half of these trees were planted in 1942 when the site's previous development was built to house World War II shipyard workers. Their age, quality and quantity make them one of North Portland's most significant natural resources.

The city of Portland's zoning code requires that 35% of existing trees be preserved when a site is redeveloped. Through careful planning and good design, the team of architects, engineers and contractors who have designed and built New Columbia have preserved more than half of the existing trees, many with diameters greater than 48 inches! The city's Urban Forester considers this a remarkable accomplishment, especially because so many trees were in locations that conflicted with the almost three miles of new streets that have been built.

Root balls of large trees that were removed were donated to streambed restoration projects. Many small caliper trees were moved from building sites and roadways to McCoy Park, and open spaces were designed around the site's largest and most beautiful trees so that everyone—renters, homeowners, and neighbors of New Columbia—can enjoy the benefits of these beautiful trees.

BIG, BIGGER, BIGGEST

A street realignment was discarded in order to preserve the biggest tree on site—a silver maple with a breast-height diameter of 64 inches! The urban forester gave this tree the highest rating for appearance and health. It's located at the southwest corner of the intersection of Columbia Boulevard and Fiske Avenue.

Photos, clockwise from top left:

An existing London plane tree, photographed before redevelopment began.

A tree removed from a new right-of-way is carefully cut to be used as public art.

The project arborist identifies a tree to be protected.

A tree is relocated to McCoy Park.

NEW COLUMBIA'S SUSTAINABILITY PARTNERS

Primary Consultants: Mithūn, Inc. • Robertson Merryman Barnes Architects • Michael Willis Architects • Urbsworks, Inc. • KPFF Consulting Engineers • ABHT Structural Engineers • Murase Associates • Greenworks • Glumac International • Parametrix, Inc. **General Contractor:** Walsh Construction Company **City of Portland:** Bureau of Development Services • Bureau of Environmental Services • Bureau of Housing & Community Development • Bureau of Water Works • Office of Planning & Development Review • Office of Transportation • Parks & Recreation • Office of Sustainable Development • Portland Development Commission **Financial Partners:** Albina Community Bank • Alliant Capital • Bank of America • Cascadia Revolving Fund • Energy Trust of Oregon • Enterprise Social Investment Corporation • Federal Home Loan Bank of Seattle • MMA Financial • Network for Oregon Affordable Housing • Oregon Department of Energy • Oregon Economic and Community Development • Oregon Housing & Community Services • Oregon State Treasurer • U.S. Department of Housing & Urban Development **Special thanks to:** Cascade Sunworks • The Rebuilding Center



The Housing Authority of Portland is a public corporation serving all Multnomah County. HAP provides housing and housing-related services to those who face barriers due to income or disability. HAP's housing and rent assistance programs serve 33,000 residents throughout the county. HAP is governed by a citizen commission of volunteer members appointed by the city of Portland, the city of Gresham and Multnomah County.

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