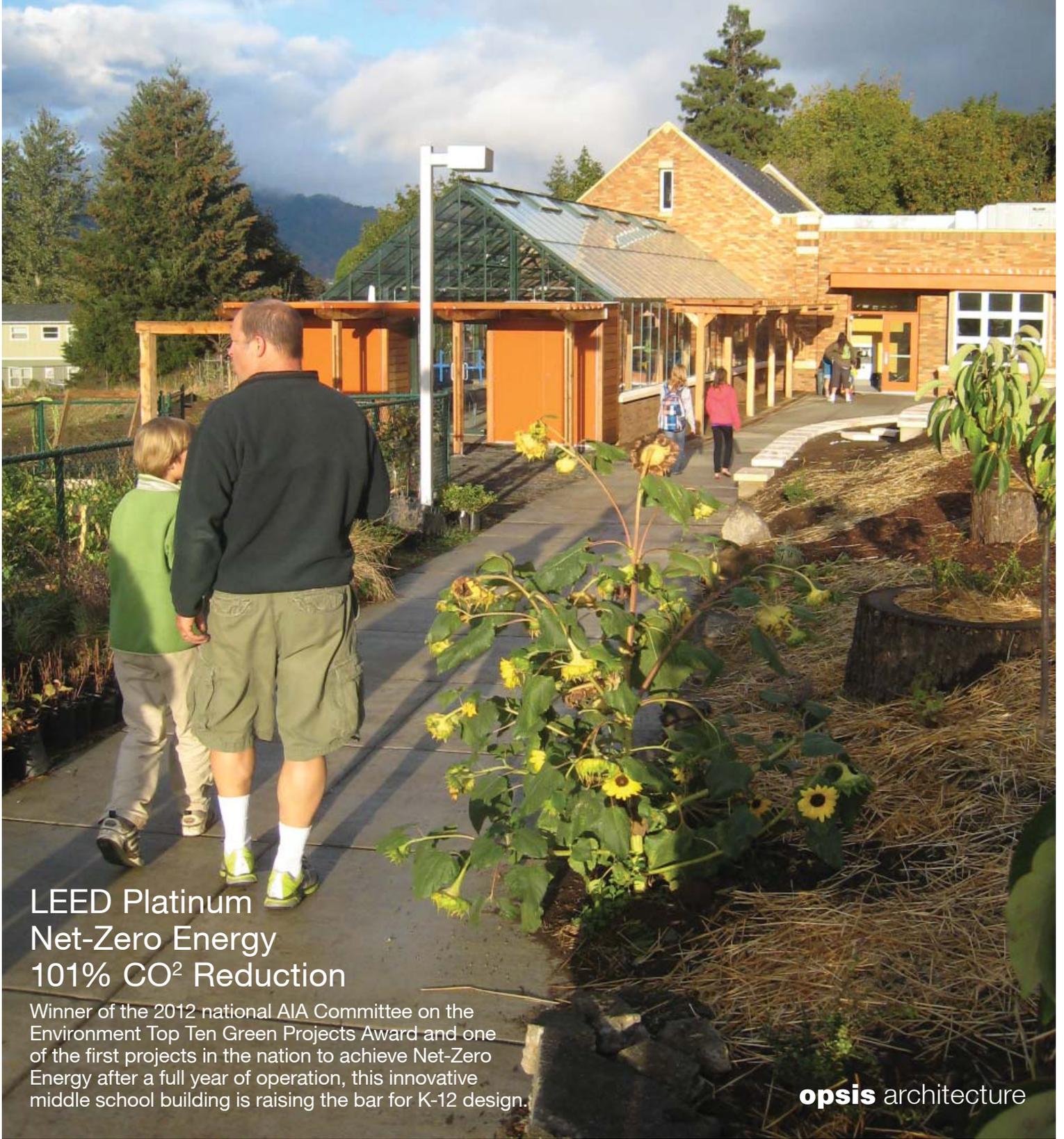


# Music and Science Building

Hood River Middle School | Hood River, Oregon



LEED Platinum  
Net-Zero Energy  
101% CO<sup>2</sup> Reduction

Winner of the 2012 national AIA Committee on the Environment Top Ten Green Projects Award and one of the first projects in the nation to achieve Net-Zero Energy after a full year of operation, this innovative middle school building is raising the bar for K-12 design.

**opsis** architecture



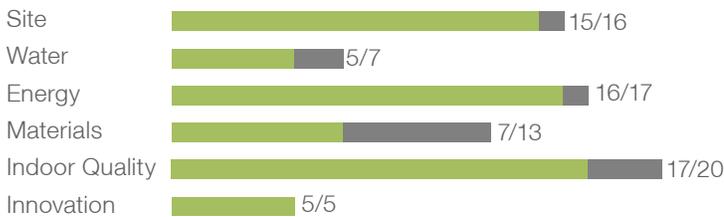
Existing 1927 National Historic Register Building

The Music and Science Building is the latest addition to the Hood River Middle School campus in Hood River, Oregon, providing a new facility to serve the school's remarkable and unique Outdoor Classroom Project based on the principles of permaculture. Situated directly adjacent to the historic main school building on the campus, the design of the Music/Science Building had two primary objectives: create a public building that truly fuses sustainable design with sustainability curriculum, and carefully integrate the facility into the existing National Historic Landmark site. The new building is home to a new music room, practice rooms, teacher offices, a science lab and a greenhouse.

## SITE ECOLOGY & LAND USE

The project is located in a scenic area near the Columbia River Gorge, a site that receives moderate annual rainfall, good solar exposure and significant seasonal temperature swings. It is fairly rural in character, surrounded by farms and orchards to the south and west and Hood River's downtown Main Street to the northeast. The school sits at the heart of Hood River, a small community in the Columbia River Gorge and serves as a host to a variety of community events. The interface between the building and its environmental and cultural landscape is particularly important for the curriculum at Hood River Middle School. The new music room will not only provide a new home for the school's music classes, but will also be available for other community arts groups. The

### LEED for Schools Credits

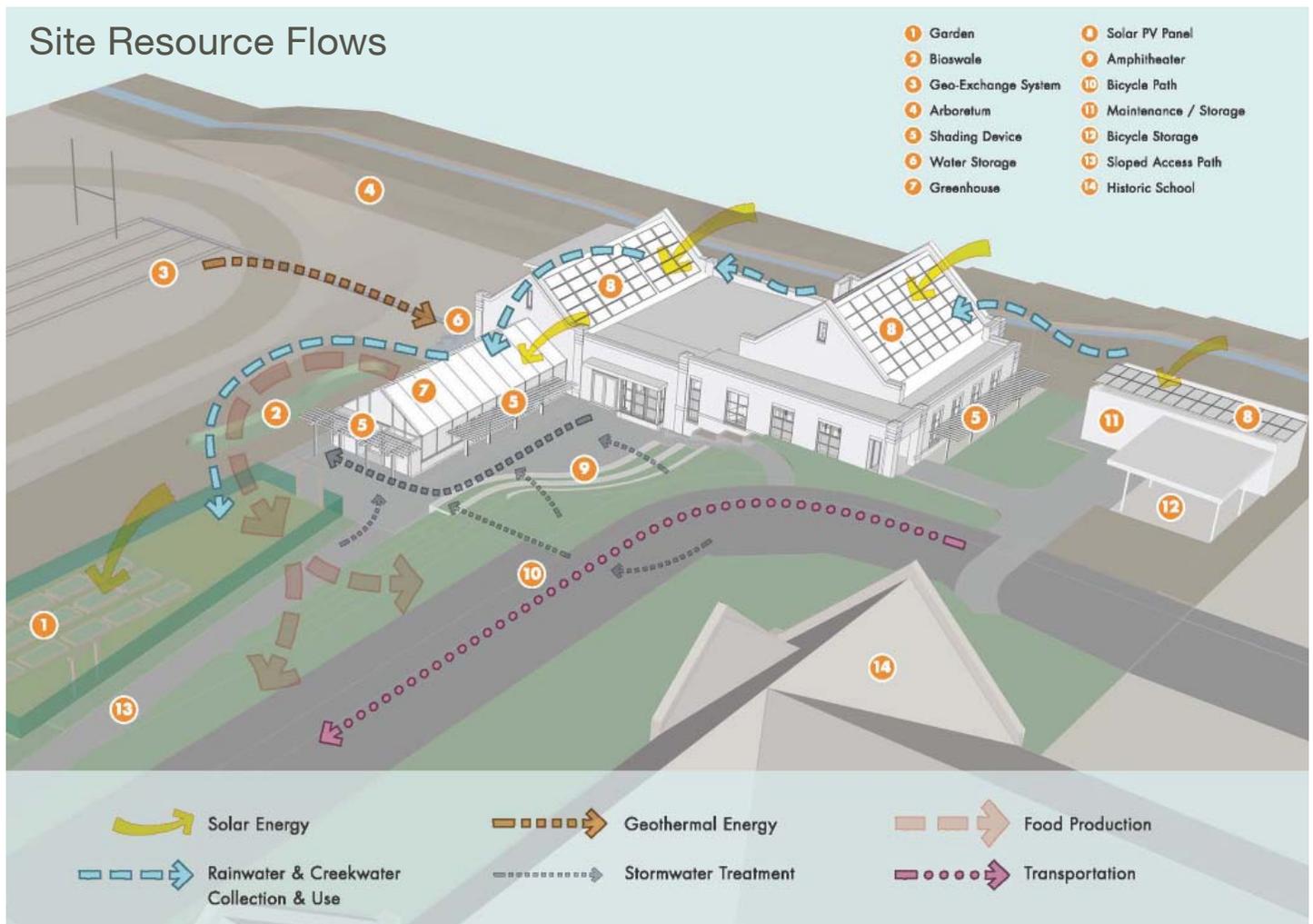


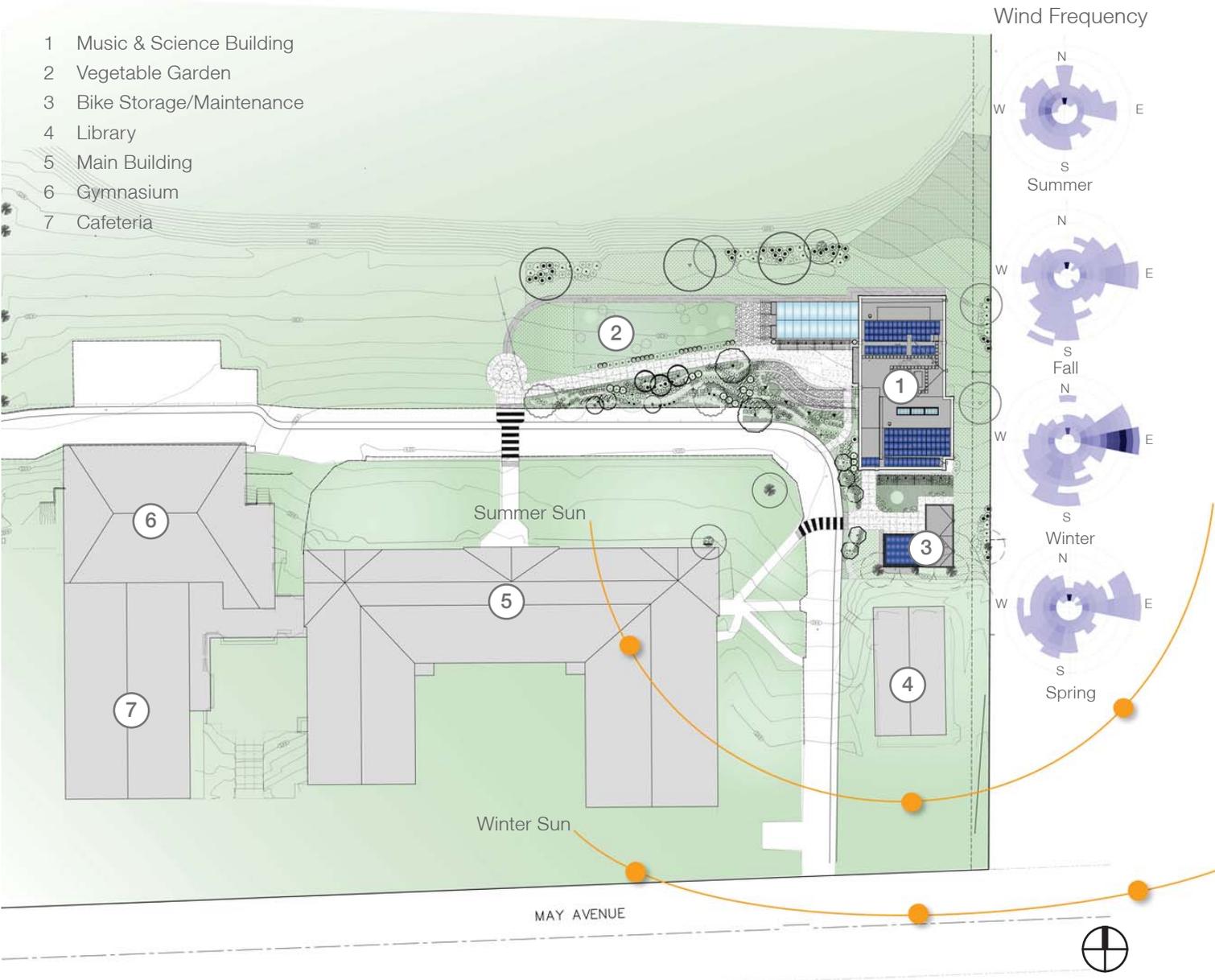
students' growing and harvesting efforts in the greenhouse and garden serve as a venue to bring the larger community to the school campus, and every Thursday students participate in the Gorge Grown Farmer's Market hosted at the school site.

Over 21,000 sf of open space was preserved at the site. Design of the site combines native plants and plants to be used for instructional purposes including food production, fiber and building materials and plant-based dye, creating a landscaped area that responds to the natural climate and uses very little water. To balance habitat creation and plants used for functional human production, fruit and vegetable plantings are limited to the fenced garden area. The arboretum is planted with native understory, shrub and tree species, the swale contains water-loving sedges, grasses and shrubs, and the meadow has dryer grasses and perennials with a few shrubs and trees. A mixed native and edible plant area is located along the southwest border of the project site, and reflects the school's permaculture curriculum, utilizing plants that attract beneficial insects, provide mulch, balance nitrogen in the soil and provide an edible yield.

To encourage alternative transportation methods to the school, ample bike parking is available in a new bike shed and dedicated bike lanes have been striped through campus. No new parking was created to service the new facility, and after closing the driveway through the campus during construction, the School decided to make this closure permanent and make the campus a car-free zone.

**Project Summary**  
 Location: Hood River, Oregon  
 Gross SF: 6,887 sf  
 Building Footprint: 7,203 sf  
 Cost: \$2M  
 Completed: September 2010





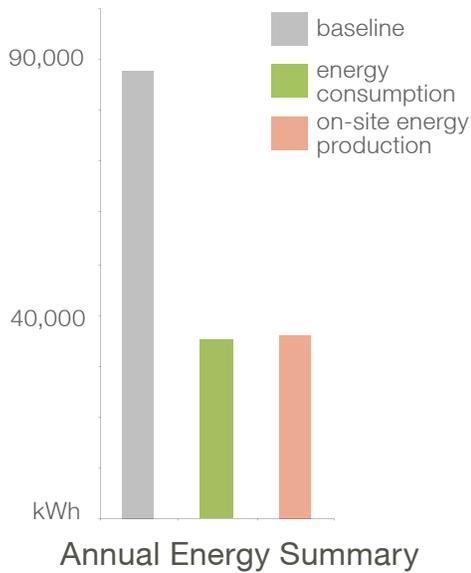


- 1 Science Classroom
- 2 Greenhouse
- 3 Music Practice Rooms
- 4 Music Office
- 5 Music Classroom
- 6 Vegetable Garden
- 7 Outdoor Amphitheatre



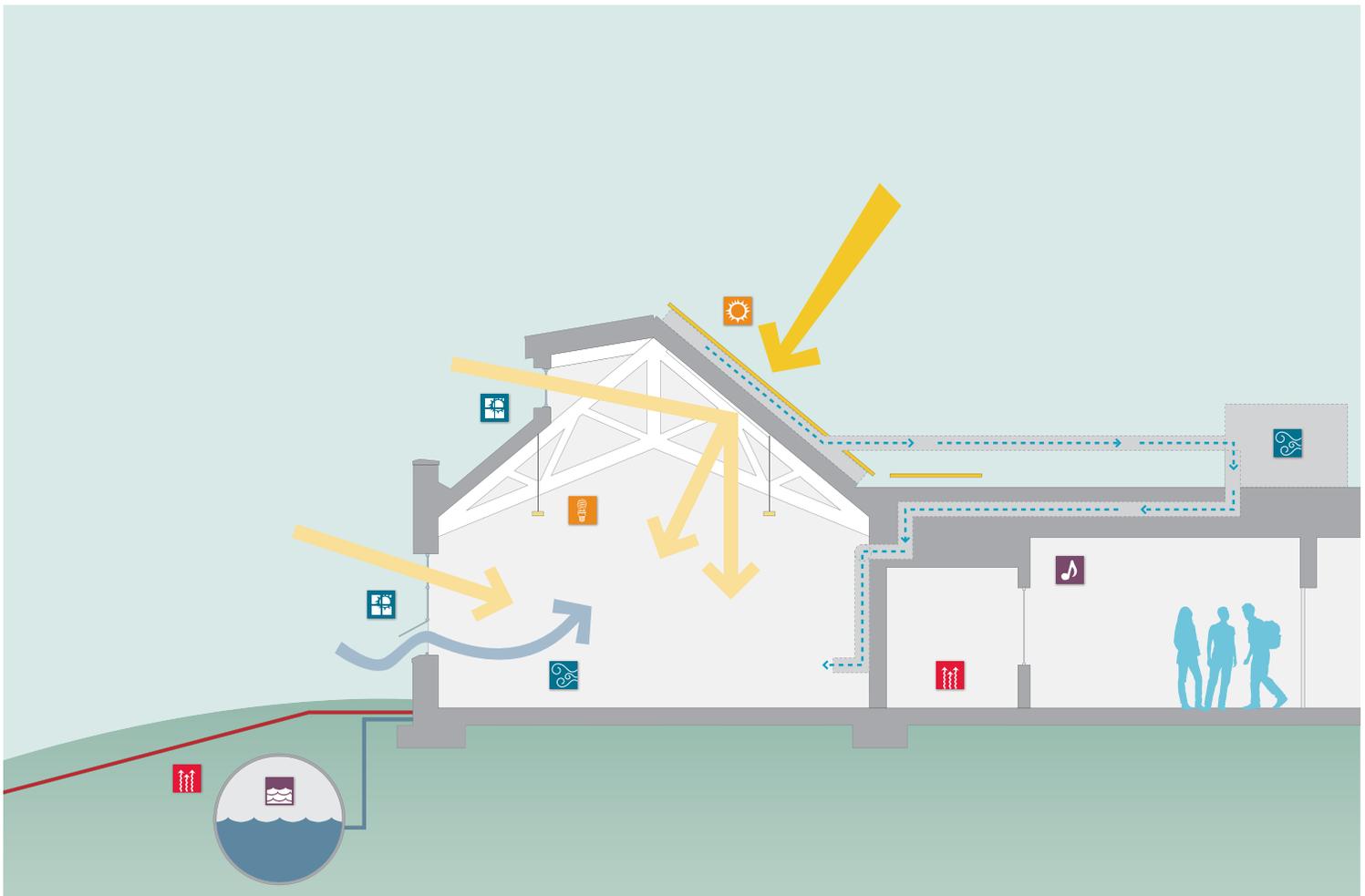
Students preparing their vegetables for the Gorge Grown Farmer's Market

# 101% CO<sup>2</sup> Emissions Reduction



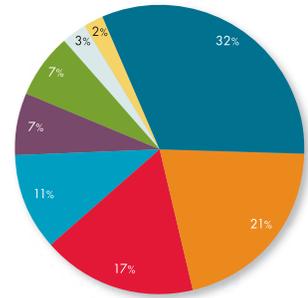
## ENERGY FLOWS

Design of the building envelope sought to achieve the highest degree of thermal efficiency while remaining sensitive to the historic context. Insulated concrete form-work walls are augmented with a brick veneer carefully detailed to complement the pattern of the existing building. Triple-glazed windows complete the air-tight, well-insulated building envelope with good thermal mass to buffer against Hood River’s seasonal temperature swings. The high performance envelope is coupled with geothermal heating and cooling, using heat exchange with water from an adjacent stream, a radiant slab and heat recovery ventilators using displacement air distribution. A plenum sits under a 35 kilowatt solar panel system, simultaneously preheating air for the building and cooling the panels to make them more efficient. Based on the energy model used to evaluate and enhance the building design, the Music/Science Building is estimated to consume approximately 35,000 kWh, all of which will be supplied by the photovoltaic array on the roof. Part of the curriculum at the school will include managing a resource budget and tracking the building’s performance through a ‘building dashboard’ website.

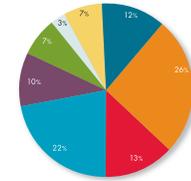




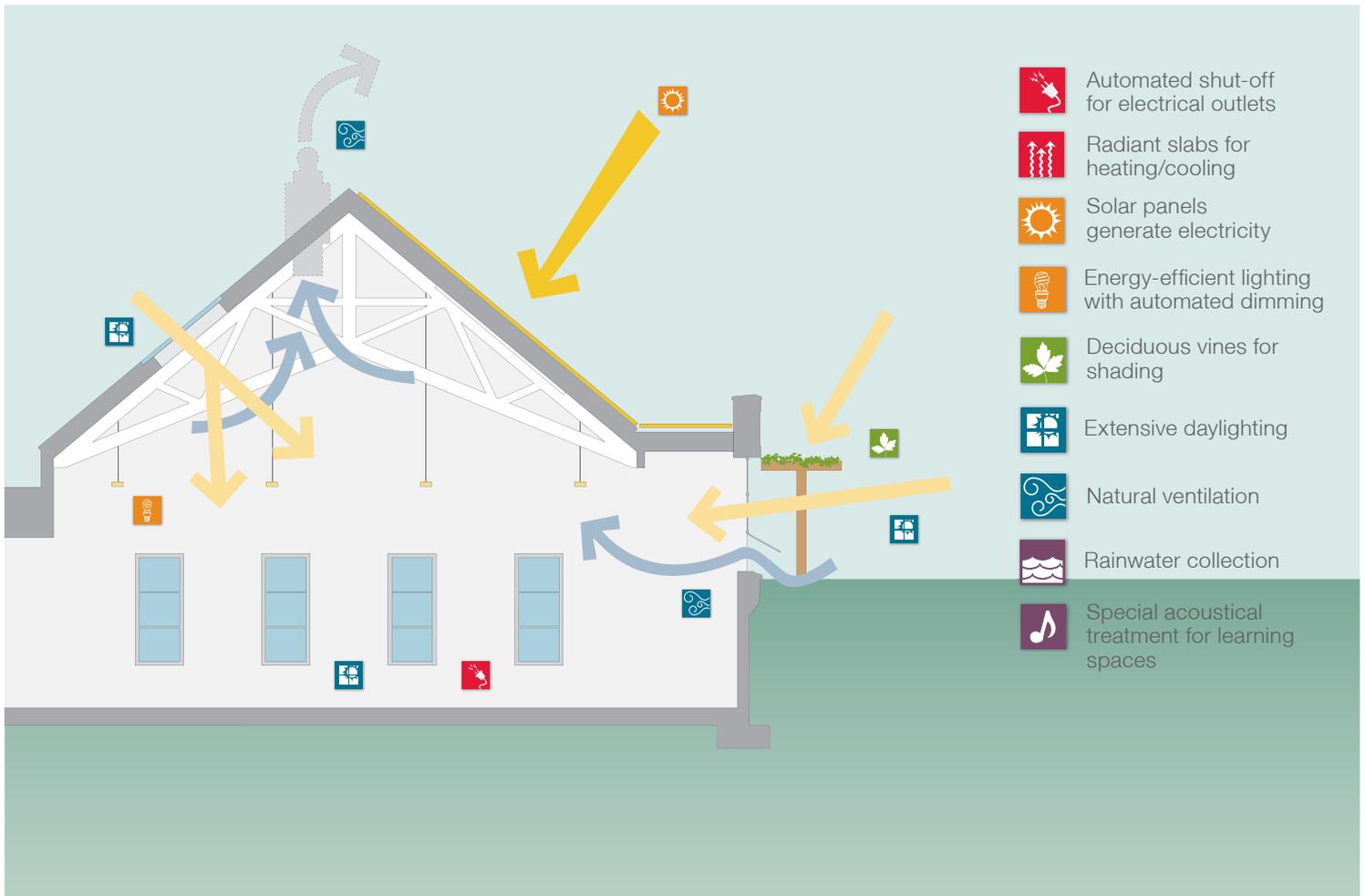
Baseline Energy Consumption  
298.7 MBtu/yr



Music/Science Bldg Energy Consumption  
119.8 MBtu/yr



Ventilation Fans	Water Heating
Interior Lighting	Exterior Use
Space Heating	Space Cooling
Miscellaneous Equipment	Pumps

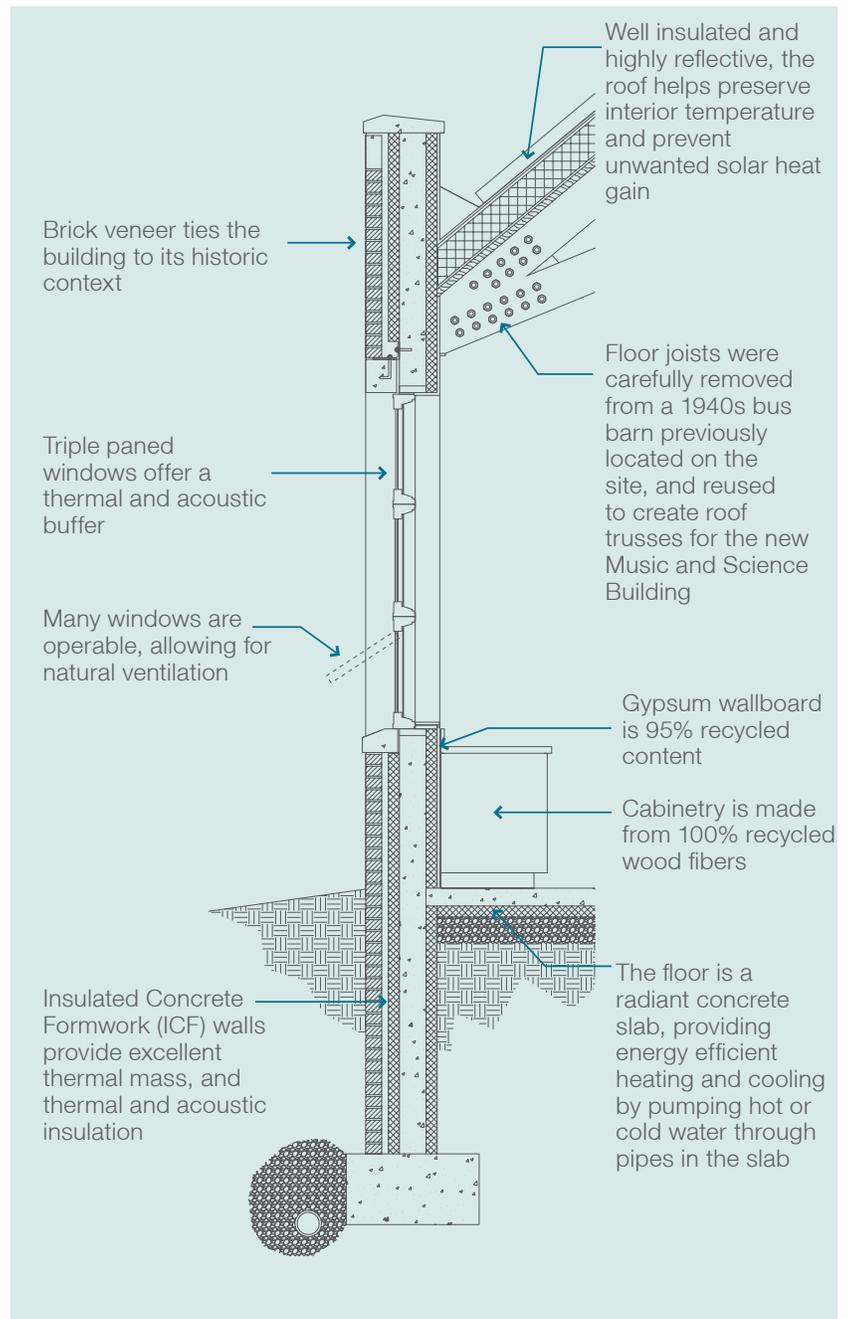




## MATERIALS & CONSTRUCTION

The Music/Science Building replaced a 1940s bus storage barn previously located at the site. This structure was carefully deconstructed, and the new building's wood scissor trusses were created from the materials set aside. Sections of the wall and floor assemblies remain exposed so that students can see how they work.

Additionally, over 95% of the construction waste generated on site was recycled, over 10% of the materials used were recycled and over 20% of the materials used were extracted, processed and manufactured within 500 miles of the project site.



# LIGHT & AIR

To achieve the optimum level of daylight in the music and science classrooms and balance a high level of energy efficiency, the project team performed multiple detailed daylighting studies. The resulting design combines translucent skylights, clerestory windows and traditional windows with deciduous vines for seasonal shading. The project also takes advantage of natural ventilation through a system that combines operable windows and rooftop ventilators. When outdoor air temperatures are appropriate for natural ventilation, a red light/green light indicator will inform the building users. When open, the rooftop ventilators help draw outdoor air through the space, providing enhanced indoor air quality and thermal comfort control for building users. Automated CO<sup>2</sup> sensors located throughout the building also trigger outdoor air flow, if the set maximum level is exceeded.

Maintaining a high level of indoor air quality was very important to the design team, both during construction and once the building was occupied. Only low-Volatile Organic Compounds (VOCs) adhesives, paints, flooring systems, and composite wood products were used during construction. All ducts and equipment openings were sealed off during construction to prevent an accumulation of dust and other particulates, and air quality testing was performed after the project was completed to ensure that all of the spaces met EPA air quality standards. Walkoff mat systems at building entries and high efficiency filters in the building's mechanical system will continue to preserve the air quality in the facility over time.

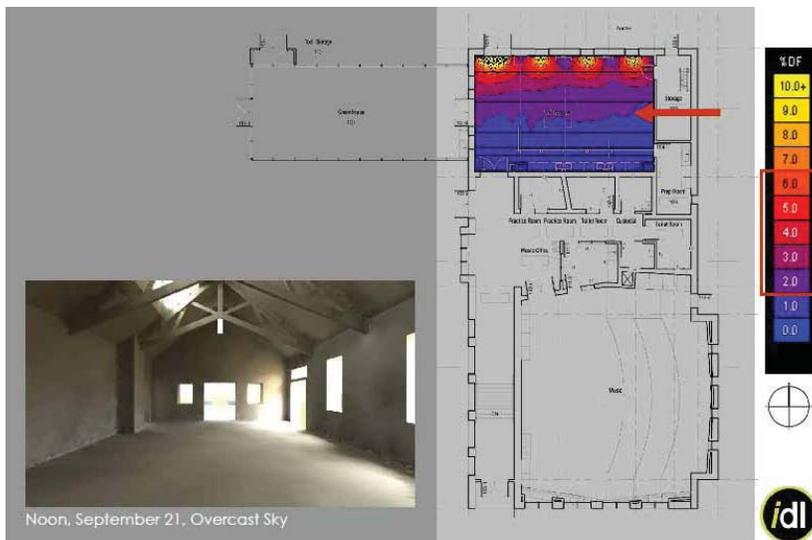
95%  
Core Learning  
Areas with Ample  
Daylight

94%  
Building Areas  
with Views to  
the Outdoors



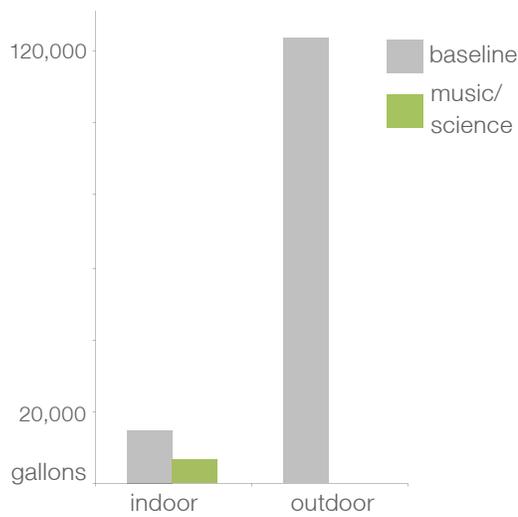
21 JUNE 12PM

21 DECEMBER 12PM



# WATER CYCLE

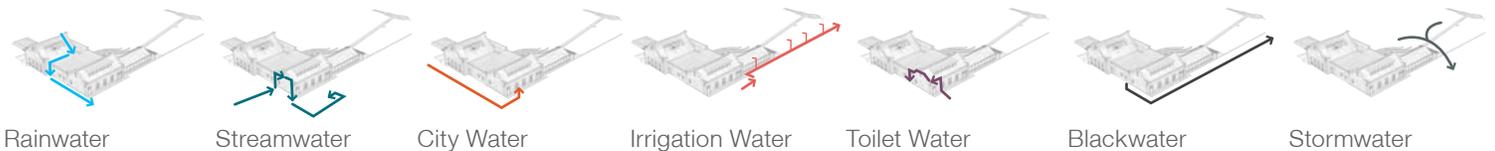
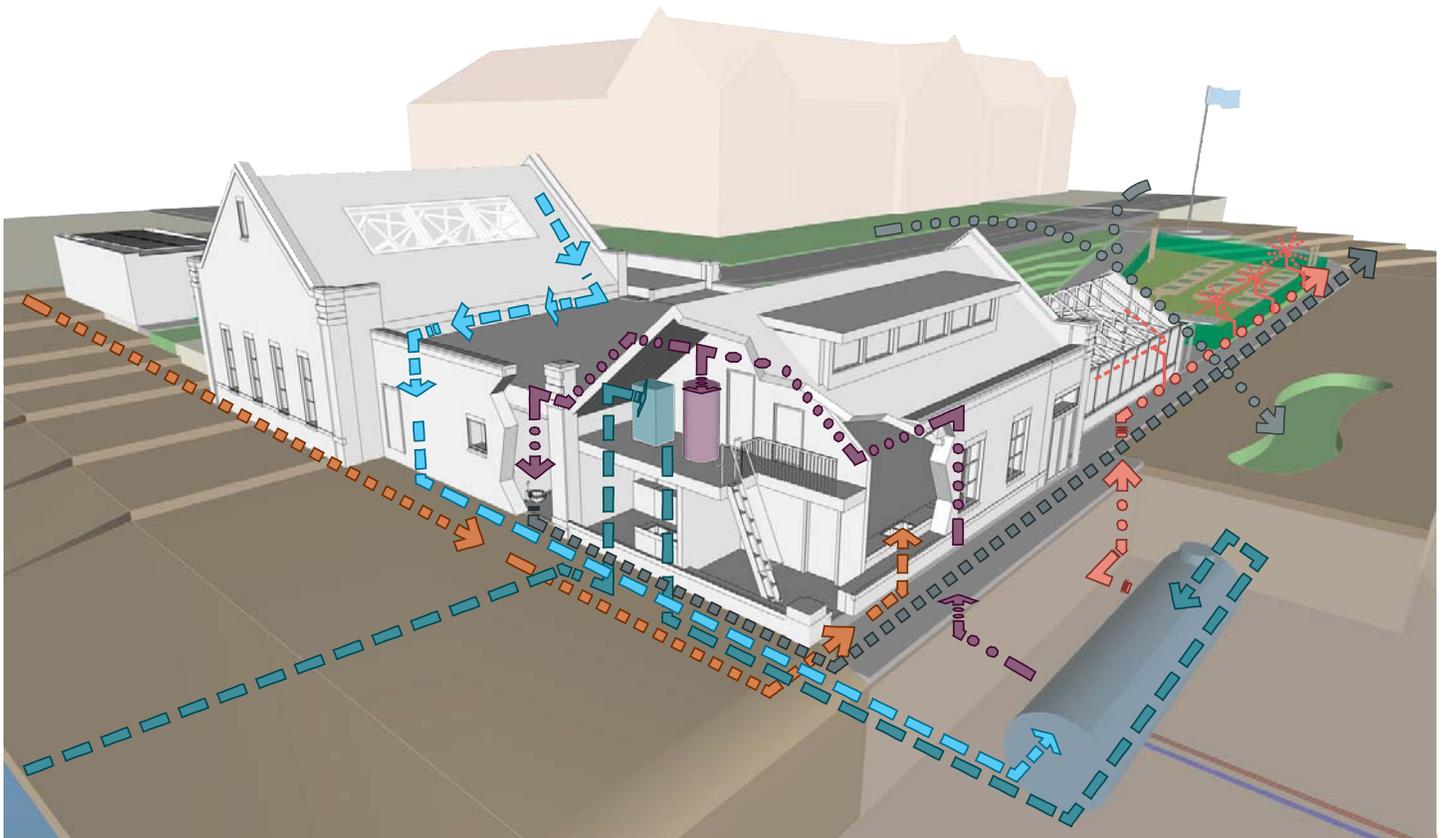
## Annual Potable Water Use Reduction



169,902 gal/yr  
Potable Water Use Reduction

Reducing outdoor water use at the Music and Science Building begins with 18,100 sf of low-water, native vegetation, which covers nearly all of the landscaped area surrounding the project. Rainwater that is harvested, collected and stored in an underground 14,000 gallon cistern supplies nearly all of the remaining water needed for irrigation. Additional water used is drawn from a nearby stream, eliminating the need for potable water use for irrigation purposes, and saving over 123,000 gallons annually.

Inside the building, low-flow faucets, a waterless urinal and dual flush toilets that use collected rainwater for flushing, save an additional estimated 46,025 gallons of potable water annually, or 88%, of the annual water used in the building. During the design process, the possibility of completing the water cycle by collecting for potable use was explored, but state regulations would not allow the system without daily testing. The project team also explored the possibility of treating wastewater on site and encountered similar obstacles with state regulations.



# INTEGRATING DESIGN & CURRICULUM

The Music and Science Building provides a home for Hood River Middle School's Outdoor Classroom Project, a program in which the students are active researchers, engineers, designers, architects and builders. The program blends science, technology and permaculture into the curriculum; with the completion of the new Music and Science Building, the program will also incorporate lessons on building systems and green design. The building is literally a living laboratory for the students, and the project team worked integrally with the school teachers to include and enhance building components that will be incorporated into the curriculum.

From the science classroom, the students have access to the heart of the building's geothermal and water system, the pump room, labeled and metered specifically to be used for classroom demonstration and instruction. Building systems metering is also accessible through the building dashboard system, a user-friendly interface that provides real time updates on system performance. Part of the students' science curriculum will include regular metering and analysis of the building's energy and water performance. Sections of the wall and floor assemblies for the building also remain exposed through glass, so that students can see how they work.

In keeping with the school's permaculture curriculum, landscaping and site design focused on creating an outdoor classroom and laboratory for the students. In the greenhouse, an organic composter and a living machine to process fish waste will generate fertilizer to be used in the outdoor vegetable garden. Students then have the opportunity to market and sell their produce at the Gorge Grown Farmer's Market hosted weekly at the project site.



## Awards & Recognition

LEED Platinum Certified

1st Energy Trust Net-Zero Project Completed In Oregon

1st Winner of the 2030 Challenge Design Award for AIA Portland, 2010

AIA Committee on the Environment Top Ten Green Projects Award, 2012

Masonry and Ceramic Tile Institute of Oregon Hammurabi Award of Merit for Design and Use of Brick Masonry, 2011

ICF Builder Magazine Awards, Finalist Commercial Light, 2010

ICFA (Insulating Concrete Form Association) Excellence Awards: Gold for Commercial Projects

Daily Journal of Commerce Oregon Top Projects: First Place Public Buildings \$1M - \$5M, 2011

## DESIGN & CONSTRUCTION TEAM

Opsis Architecture, Architect and Sustainability  
KPF Consulting Engineers, Structural and Civil Engineer  
Interface Engineering, MEP Engineer  
GreenWorks, Landscape Architect  
Listen Acoustics, Acoustical Engineer  
McKinstry, Commissioning  
Kirby Nagelhout Construction Company, Contractor



**For additional information on this project visit:**

<http://www.opsisarch.com/k-12.swf>  
<http://dash.hoodriver.k12.or.us/dashboard/hood-river-music-science/>  
<http://www.clearingmagazine.org/online/archives/881>  
[http://architecture2030.org/index.php?id=229&proj\\_id=177](http://architecture2030.org/index.php?id=229&proj_id=177)  
<http://www.aiatopten.org/node/77>

Opsis Architecture  
Alec Holser  
alec@opsisarch.com  
920 NW 17<sup>th</sup> Avenue  
Portland, OR 97209  
503.525.9511  
www.opsisarch.com

