INTERNATIONAL LIVING FUTURE INSTITUTE℠

WATER PETAL CASE STUDY
TYSON LIVING LEARNING CENTER

LOCATION
EUREKA, MO

TYPE
EDUCATION CENTER

SIZE
2,968 SQUARE FEET

OCCUPANTS
10 FULL-TIME
20 VISITORS PER WEEK

RAINWATER HARVESTED/YEAR
13,000 GALLONS

WATER USE INTENSITY (WUI)
4.3 GALLONS/SF/YEAR

AVERAGE WUI*
12.8 GALLONS/SF/YEAR

CLIMATE
MIXED HUMID
42 inches of rain/year
45 days of precipitation/year

**Average WUI by building type according to Seattle 2030 District data*

The Living Learning Center (LLC) is located at Tyson Research Center, an environmental field station for Washington University in St. Louis. The site and building builds on the sustainable eco-systems research ongoing at Tyson. The site has been transformed from a degraded asphalt parking lot to a native landscaped garden replete with pervious concrete, local stone pavers, and a central raingarden. The team's success in achieving the Water Petal, especially as one of the first Living Buildings in the world, has proven the feasibility of closed-loop systems. Dan Hellmuth of Hellmuth + Bicknese Architects, the architect on the project, has gone on to work on eight more Living Buildings, increasing familiarity and generating momentum for the Living Building Challenge.

SYSTEMS

RAINWATER HARVESTING

A sloped metal roof with metal guttering collects clean precipitation after a first flow diverter assembly diverts dirt and debris from the rainwater tank. Rainwater is stored in a 3000-gallon underground fiberglass collection tank with a shallow well pressurization pump and bladder to maintain water pressure. The water is filtered via two sediment filters, an active carbon block, a ultraviolet sterilizer and sinks with final bacteria barriers.

GREYWATER REUSE

Water that is used in the sinks is collected in a greywater conversion tank where it is then dispersed into an engineered greywater irrigation system within the landscape.

BLACKWATER TREATMENT

Solid waste is collected and processed in a self-contained unit where it is broken down through aerobic biological conversion into a composted solid nutrient. The converted liquid nutrient and composted solid nutrient is then used in the landscaping and used for the organic vegetable garden with produces food for human consumption, creating waste that can be processed in the building to start the cycle over again.

WATER + NUTRIENT DIAGRAM

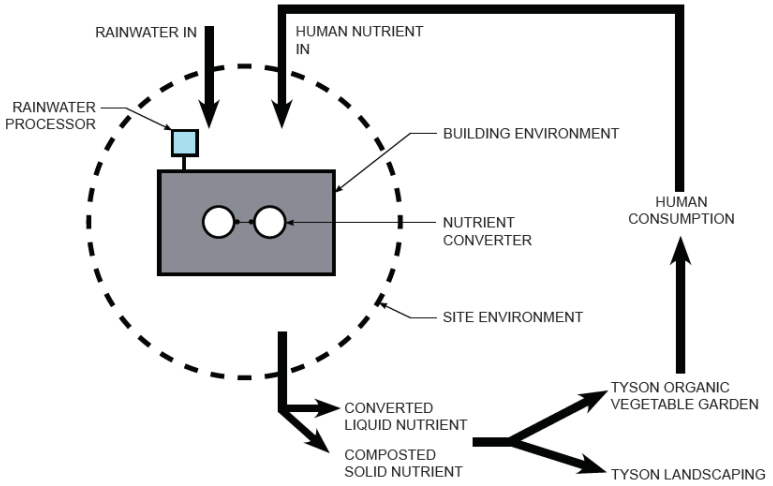

DIAGRAM COURTESY TYSON RESEARCH CENTER

WATER PETAL CASE STUDY
POLICY SOLUTIONS

PROCESS

The team was strategic in their attempts to get their water system permitted. During the concept phase, they placed an anonymous call to unincorporated St. Louis County (the authority having jurisdiction) to get a sense of what was possible without jeopardizing the conversation with their project specifics. As it turned out, none of the proposed systems were currently permissable under the building code.

As they worked their way through concept phase, the team established that the way they frame the conversation and the legitimacy of their design team would be crucial for a successful permitting process. They scheduled a meeting with the local head of planning and invited their whole design team and the head of facilities from Washington University in St. Louis. During the meeting, they presented a complete design package with pictures and successful national examples, and asked the planning department how they could do it, rather than if they could. Presented with this vision, the jurisdiction ruled that they could proceed with permitting under an alternate compliance pathway, as long as they met the water quality-testing and other end goals.

LOWERING TLL'S RAINWATER CISTERN

PHOTO COURTESY TYSON RESEARCH CENTER

BLACKWATER TREATMENT

Though it was a convoluted process, the team was able to attain permission to spread the nutrient-rich product from their composting toilets on site. The team went through their local Department of Natural Resources and referenced the EPA's guidance on fertilizers made from domestic septage and sewage sludge (biosolids). The EPA requires that projects separate liquid waste from the biosolids for use as a nutrient supplement, and create a comprehensive management plan. There was little funding for the local department that analyzes these plans, which made the permitting process tedious.

The team worked with local plumbers to train them to operate the system and remove the biosolids for use in the garden, completing the nutrient cycle.

MOVING FORWARD

As a practitioner that has pursued the Water Petal on several projects, Hellmuth notes that there are a few crucial steps to tipping the scales for decentralized and closed-loop water systems.

PARTNERSHIPS WITH UTILITIES: How do we include utilities in managing these systems moving forward? As it currently stands, they have a disinclination to approve systems that take away from their fee-based revenue.

REAL COST ANALYSIS: How do we make the business case for high-performance water systems when water remains extremely cheap in the United States? Somehow we must capture the economic impact of downstream pollution along with the upkeep and replacement of centralized systems.

INCORPORATE INTO CODE: How do we codify and clarify the pathway to permitting these systems? Though using alternative means and methods has been successful for many LBC projects, it requires the duplication of effort in every jurisdiction and relies on the discretion of individual inspectors.