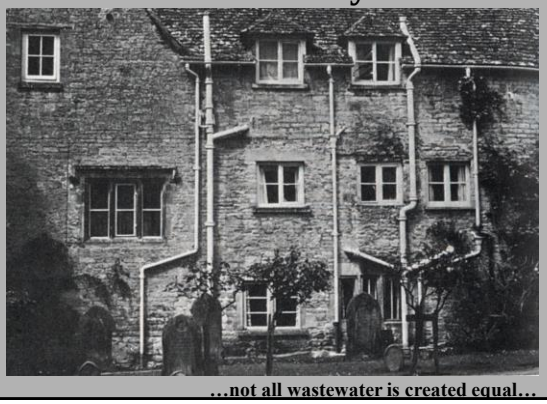
Black Water/Gray Water



…not all wastewater is created equal…

1

Passfield Hall
London

2

TRIBUNE NEWS SERVICE

President Joe Biden speaks during a visit to the Belmont Water Treatment Plant on Friday in Philadelphia.

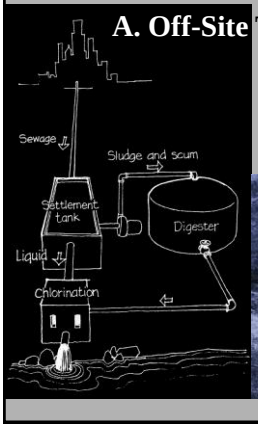
3

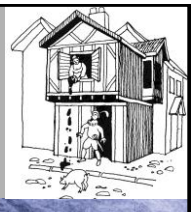
Wastewater Treatment Options

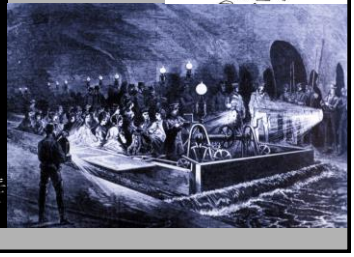
A		All off-site
B		Storm water on-site Black + Gray off-site
C		Storm + Gray on-site Black off-site
D		All on-site

4

A. Off-Site Treatment



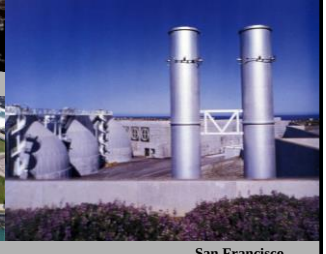




5

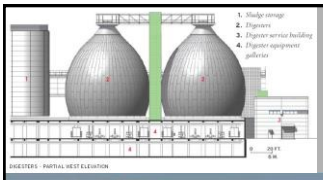
Option 1: Wastewater as Evil

Chicago



San Francisco

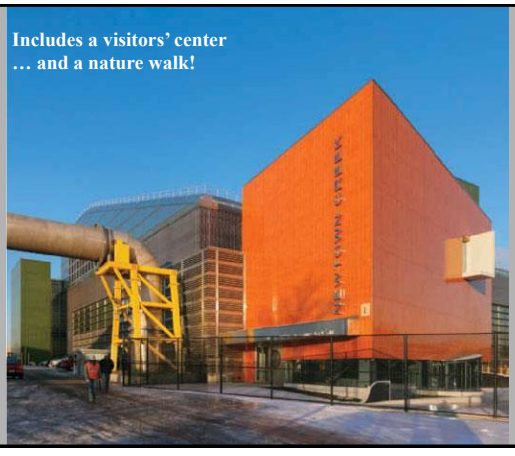
6



Newtown Creek Water Pollution Control Plant, Brooklyn
—Polshek

Treats 310 million gallons/day.
Captures methane (and odors) in anaerobic digesters.

7



Includes a visitors' center … and a nature walk!

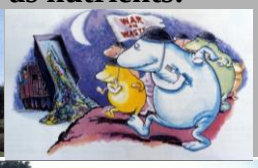
8

…and the digesters look great at night!

9

Option 2: Wastewater as nutrients:

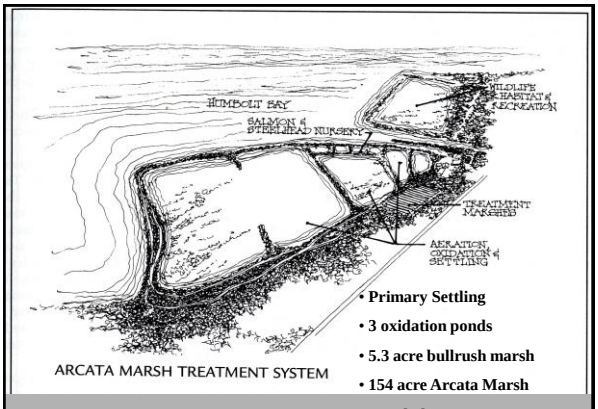
Wisconsin



California

Constructed Wetlands
City Scale

10



ARCATA MARSH TREATMENT SYSTEM

- **Primary Settling**
- **3 oxidation ponds**
- **5.3 acre bullrush marsh**
- **154 acre Arcata Marsh**
- **Humbolt Bay**

11

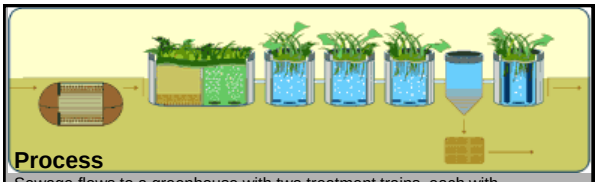
Case Study
South Burlington, Vermont

Built in late 1995, the South Burlington Living Machine® was ramped-up to full design flow by April 1996. This facility was built with a grant from the Environmental Protection Agency for innovative technology. This Living Machine® has demonstrated excellent treatment performance, even at very cold temperatures.

It treats 80,000 gallons per day of municipal sewage, generated by approximately 1,600 residential users. The waste stream is diverted from the City's conventional treatment plant.

<http://www.livingtechnologies.com/>

12



Process

Sewage flows to a greenhouse with two treatment trains, each with five aerobic reactors, a clarifier and three Ecological Fluidized Beds. The open aerobic reactors have aerators and are planted with a variety of aquatic plant species in floating plant racks. The air and plants provide an environment that hosts a variety of organisms that eat the waste in the wastewater. Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) are reduced and ammonia nitrified in this stage of treatment. A clarifier follows the open aerobic reactors to settle out the solids.

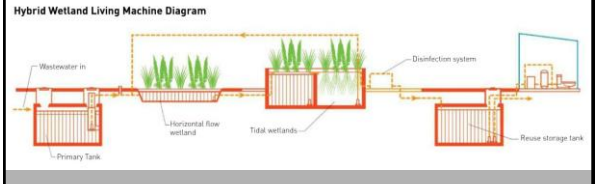
Ecological Fluidized Beds (EFBs) in each train follow the clarifier for final 'polishing'. These beds operate aerobically and provide final polishing, nitrification, and suspended solids digestion.

13

Performance Summary South Burlington, VT Living Machine

Water Characteristics	Units	Influent	Target	Effluent
Chemical Oxygen Demand	mg/L	454.0	<50	31.0
Biochemical Oxygen Demand	mg/L	219.0	<10	5.9
Total Suspended Solids	mg/L	174.0	<10	4.8
Total Nitrogen	mg/L	23.0	<10	2.2
Total Kjeldahl Nitrogen	mg/L	23.0	5	1.3
Ammonia	mg/L	14.0	1	0.25
Total Phosphorous	mg/L	4.8	3	2.2
Fecal Colliform	col/100ml	~9million	<2000	1177.0

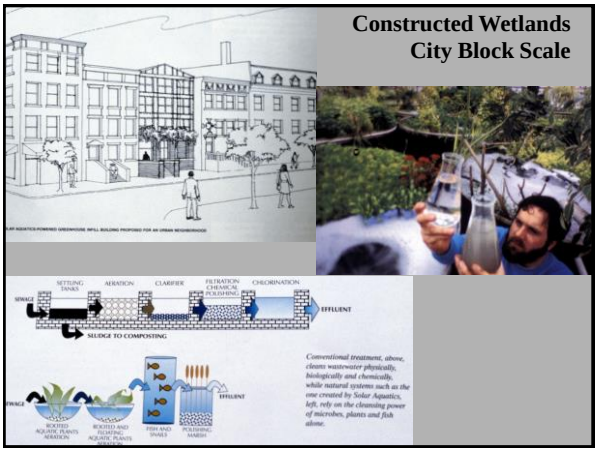
14



Tidal wetland cells are filled and drained 12 times/day
When filled — plants and microbes digest nutrients,
When empty — oxygen is introduced.

More effective and energy-efficient!

15

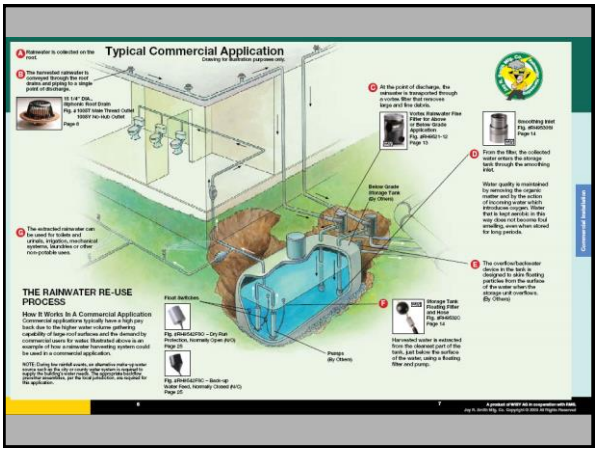


16

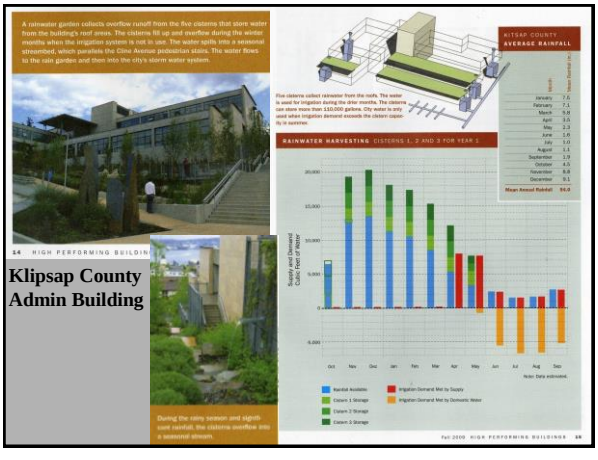
***COSMO*, the winner of MoMA PS1's Young Architects Program, by Andrés Jaque, naturally purified water—3,000 gallons every four days during summer 2015.**

17

18


Typical Commercial Application
THE RAINWATER RE-USE PROCESS
How It Works In A Commercial Application

19

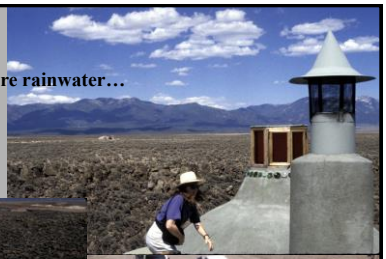

Klipsap County Admin Building
KITSAP COUNTY AVERAGE RAINFALL
RAINWATER HARVESTING

20


C. On-Site Gray & Storm Water Treatment
Earthships
Greenhouses treat wastewater…

21

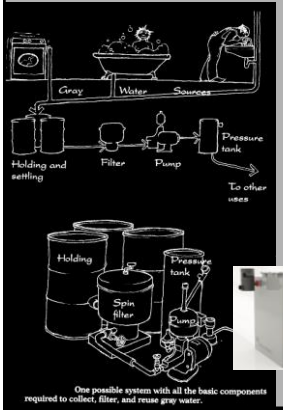
…cisterns built to store rainwater…
[all 8" annually!]



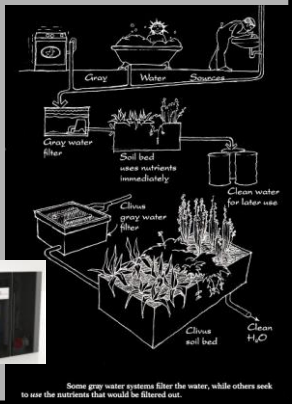
…roofs shaped to catch rainfall…

22

Mechanical vs. Natural Gray Water Treatment

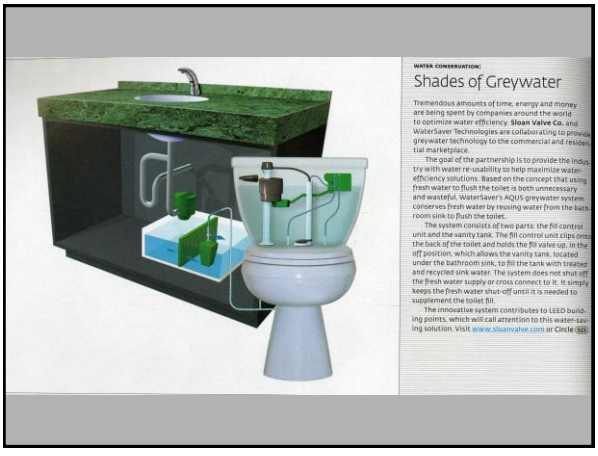


One possible system with all the basic components required to collect, filter, and reuse gray water.



Some gray water systems filter the water, while others seek to use the nutrients that would be filtered out.

23



WATER CONSERVATION:

Shades of Greywater

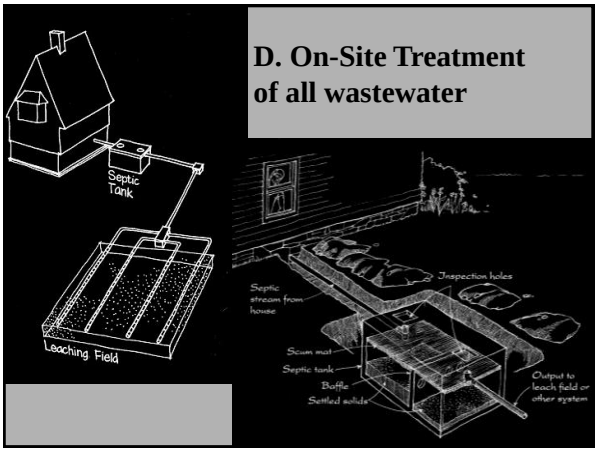
Tremendous amounts of time, energy and money are being spent by companies around the world to optimize water efficiency. **Sloan Valve Co.** and WaterSaver Technologies are collaborating to provide greywater technology to the commercial and residential marketplace.

The goal of the partnership is to provide the industry with water re-usability to help maximize water-efficiency solutions. Based on the concept that using fresh water to flush the toilet is both unnecessary and wasteful, WaterSaver's AQUS greywater system conserves fresh water by reusing water from the bathroom sink to flush the toilet.

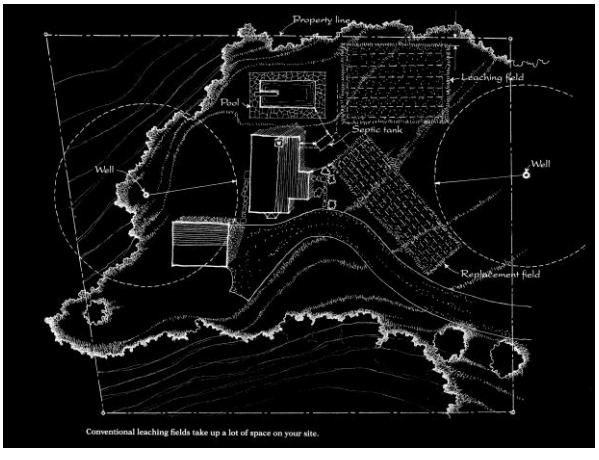
The system consists of two parts: the fill control unit and the vanity tank. The fill control unit clips onto the back of the toilet and holds the fill valve up. In the off position, which allows the vanity tank, located under the bathroom sink, to fill the tank with treated and recycled sink water. The system does not shut off the fresh water supply or cross connect to it. It simply keeps the fresh water shut-off until it is needed to supplement the toilet fill.

The innovative system contributes to LEED building points, which will call attention to this water-saving solution. Visit www.sloanvalve.com or Circle 521

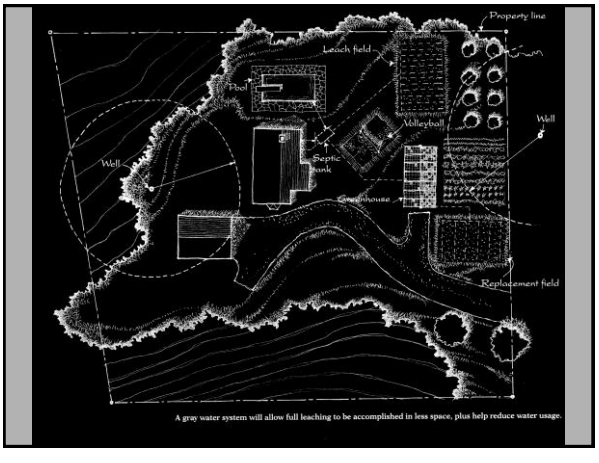
24


D. On-Site Treatment of all wastewater
Septic Tank
Leaching Field
Inspection holes
Septic stream from house
Scum mat
Septic tank
Baffle
Settled solids
Output to leach field or other system

25

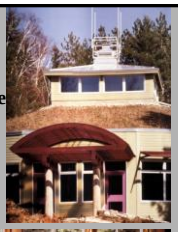

Property line
Leaching field
Pool
Septic tank
Well
Well
Replacement field
Conventional leaching fields take up a lot of space on your site.

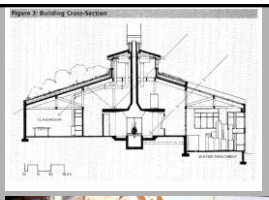
26

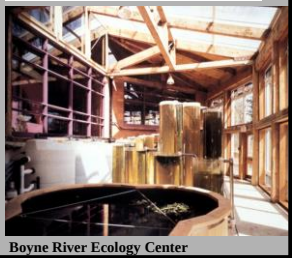

Property line
Leach field
Pool
Volleyball
Well
Well
Septic tank
Greenhouse
Replacement field
A gray water system will allow full leaching to be accomplished in less space, plus help reduce water usage.

27

Constructed Wetlands—Building Scale







Boyne River Ecology Center

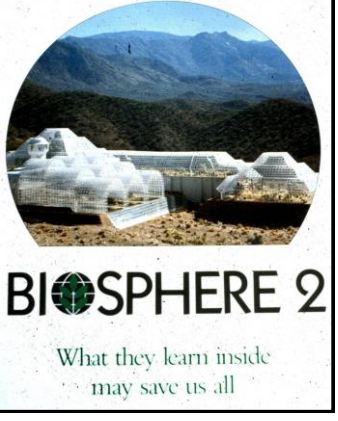
28

Living Machine—Large Building Scale

SF PUD building

29

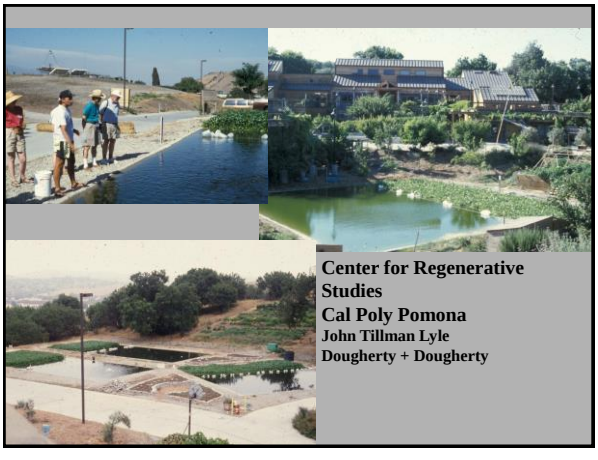
A few case studies…



30

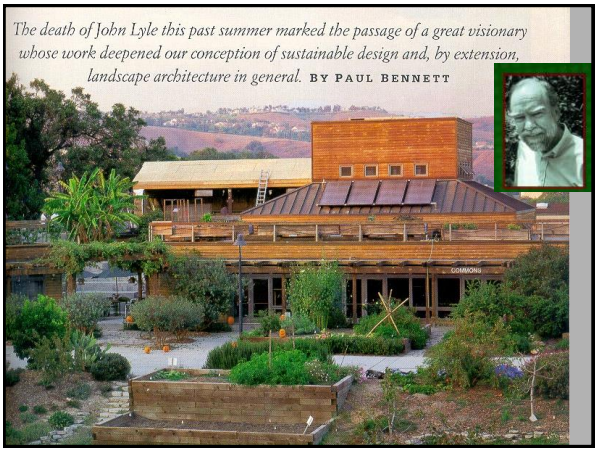
Lagoon at Biosphere 2

31



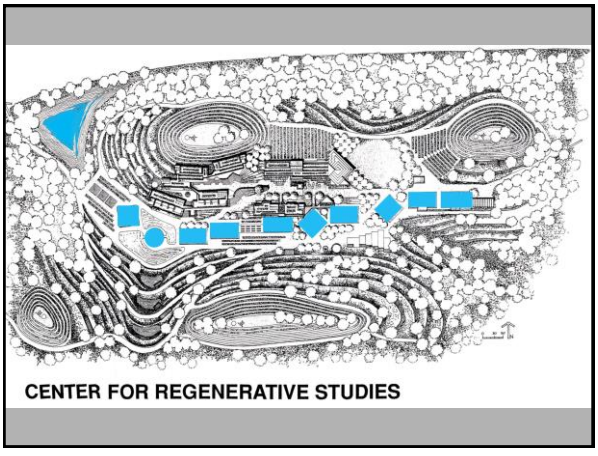
Center for Regenerative Studies
Cal Poly Pomona
John Tillman Lyle
Dougherty + Dougherty

32

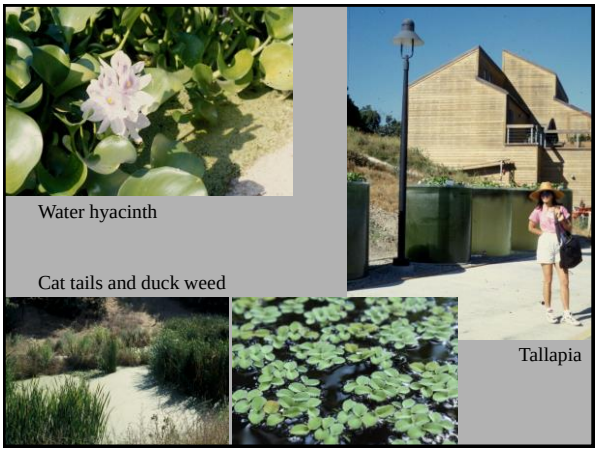


The death of John Lyle this past summer marked the passage of a great visionary whose work deepened our conception of sustainable design and, by extension, landscape architecture in general. BY PAUL BENNETT

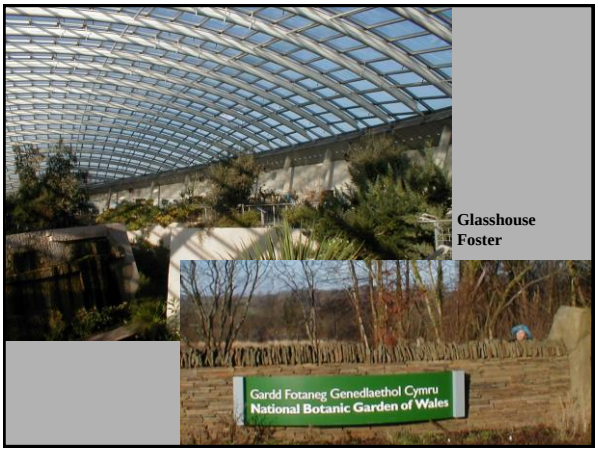
33


CENTER FOR REGENERATIVE STUDIES

34


Water hyacinth
Cat tails and duck weed
Tallapia

35

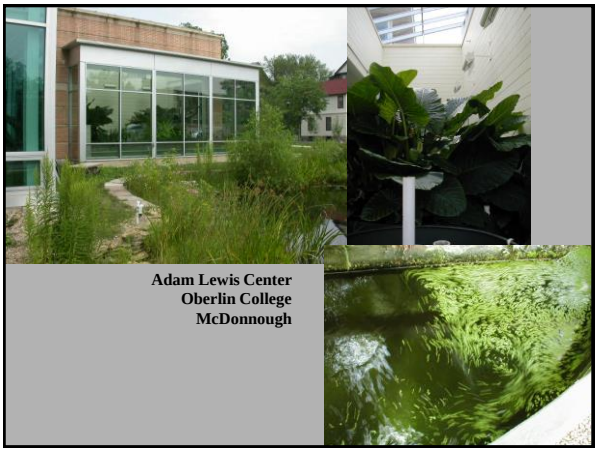

Glasshouse
Foster
Gardd Fotaneg Genedlaethol Cymru
National Botanic Garden of Wales

36

37

38

39



Adam Lewis Center
Oberlin College
McDonnough

40

Paws Inc.
Solar Aquatic System

Paws operates its own solar aquatic system water treatment plant. A prime example of Jim Davis' commitment to the environment, the S.A.S. plant treats Paws' waste water in a chemical-free manner, using natural purifiers such as algae, snails, bulrushes and minnows. As a result, the water is returned to the ground 95 percent free of impurities.

The Paws S.A.S. plant is the first permanent, licensed water treatment plant of its kind in the world, opened in September 1990, to support the new 36,000 square foot studio.

<http://www.garfield.com/news/paws/paws.html>

41

42

43

44

45

46

"Over 350 plant species have been tested at the South Burlington Living Machine®."

47

48


On a tip from Kurt Zenner, Mahlum Architects…
D.R. Wortd
Clatsop Community College
MERTS Campus Development
Wastewater Treatment / Demonstration and Training Laboratory
"The Living Machine"
U.S. Environmental Protection Agency
Oregon Department of Environmental Quality
MAHLUM Architects, Inc.
Living Machines, Inc.
Lease Crutcher Lewis

49

50


Clatsop Community College
MERTS Campus Development
Wastewater Treatment / Demonstration and Training Laboratory
"The Living Machine"
U.S. Environmental Protection Agency
Oregon Department of Environmental Quality
MAHLUM Architects, Inc.
Living Machines, Inc.
Lease Crutcher Lewis

51


Active Wastewater Treatment Plant, Please Use Caution

52


2006 Update

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Islandwood
Mithun

54