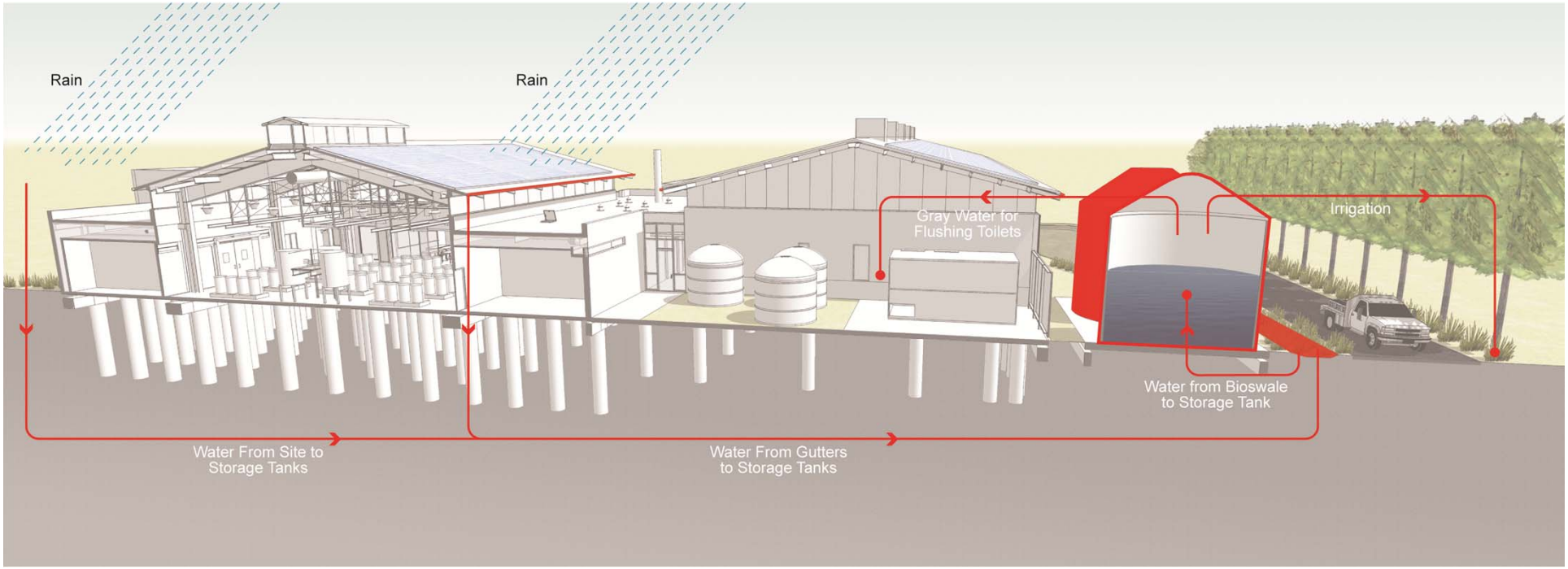


UC Davis Brewery, Winery & Food Pilot Facilities

Rainwater Harvesting

Project Overview

32,000 sq. ft.

Research & teaching winery for Viticulture & Enology

Research & teaching brewery, food processing and milk processing lab for Food Science & Technology

Construction July 2009 to August 2010

Goal of LEED Platinum Certification

Large donation by wine industry with interest in achieving innovations for “green” wineries

Rainwater Harvest System Overview

Rainwater is directed from roofs and surface areas into bioswale

1

2 Bioswale filters and pipes the water to the lift station

3 Lift station pumps water into first water storage tank

focus on water

Reduced stormwater runoff

Reduced reliance on municipal water supplies

Improved water quality

Educational value

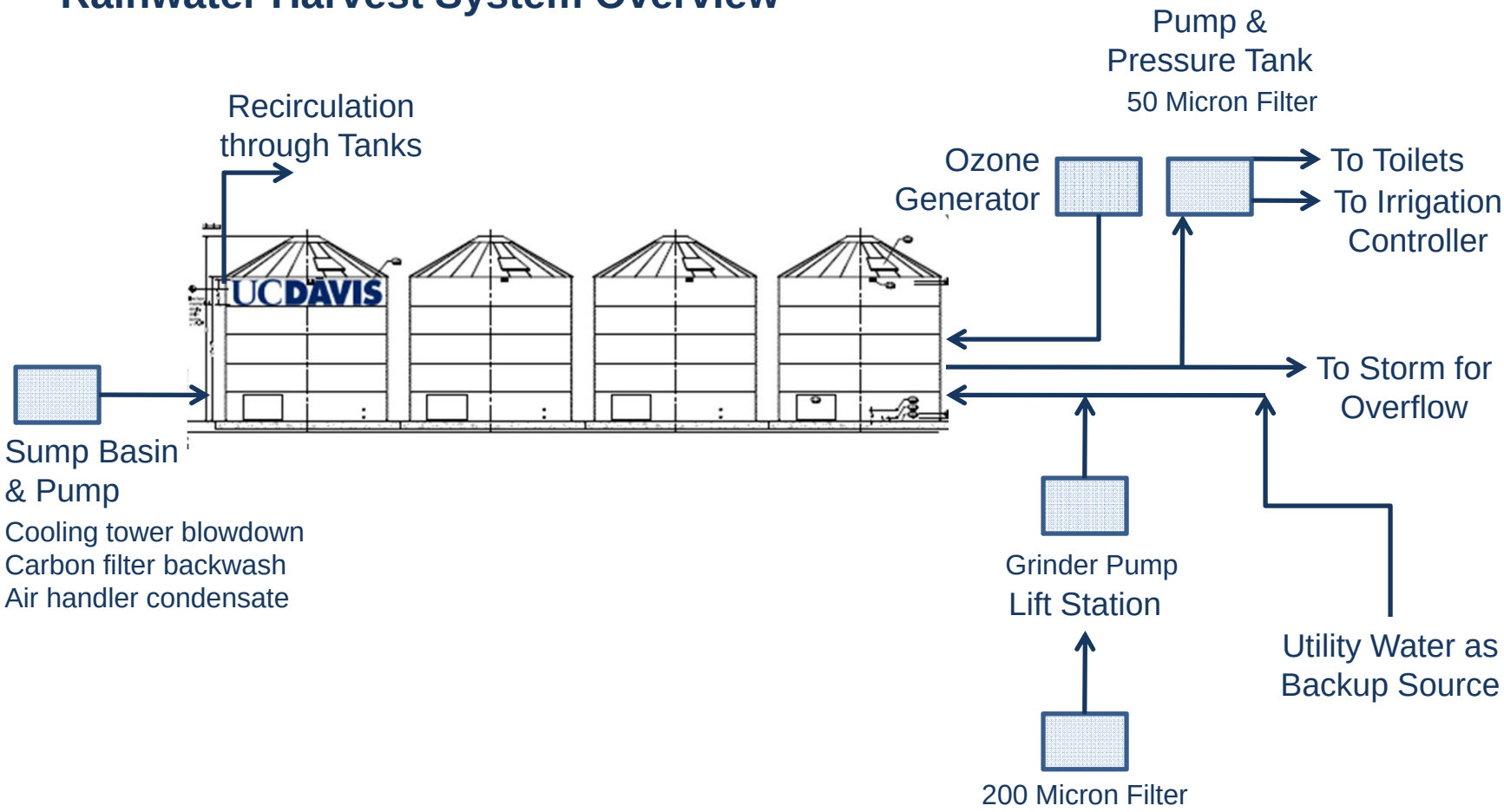
Implement solutions now rather than leave full weight of task to future generations

Commercial value to industry

Achieve credits under LEED Platinum building certification

Potential for harvesting process water in future

Rainwater Harvest System Overview



Four tanks 24ft high & 21ft in diameter; 44,000 gal. each
176,000 net gallons of total storage

Connected by supply and return lines and valved so each tank can be taken off-line while leaving other tanks in operation

above ground storage

4 tanks, 24ft high, 21ft diameter

44,000 gal. each, 176,000 gal. total storage

Food grade, 25mil liner

designing the system

Filtration

Bioswale, 200 micron

50 micron self-flushing filter

Water Treatment

Ozone, UV or chlorine

Low flow continuous circulation

Safety & Use Features

Lockable access ladders

Cleaning ports for silt removal

High & low alarms and shutoffs

Lift station shutoff

Manual back up water

Sight glass & analog level sensor

Tank Setup

Ladder & Top Access Hatch

Emergency Overflow Outlet
Lift Station Shutoff (High) at 18ft-3in
High Point Alarm at 18ft

Header Return
Header Supply
Inlet from Side Stream Ozone

Low Point Alarm at 9in
Pump Shutoff (Low) at 6in

Low Access Hatch &
Exterior Vacuum Connection for Cleaning

Corrugated galvanized steel with geo-textile pre-liner
and a food grade 25mil PVC flexible membrane main liner.

water availability & use calculations

Used effective runoff from 10 year historical rainfall

Used only impervious areas as percolation in landscape unknown

Available Water nput by Month

Watershed Area (sf) *(only impermeable area is used for this calculation)*												58,167
Hist. Ave Precip (in.)	3.67	3.05	2.15	1.23	0.44	0.14	0.02	0.03	0.15	0.93	1.86	3.16
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Eff. Precip (-.2*75%)	2.60	2.14	1.46	0.77	0.18	0.00	0.00	0.00	0.00	0.55	1.25	2.22
Rainwater Capture (gal.)	93,663	76,798	52,317	27,292	5,803	0	0	0	0	19132	44,429	79,790
Winery Process	0	0	0	0	0	0	0	0	0	0	0	0
On-Site Recovery	1,020	1,020	1,020	1,020	1,020	1,020	1,020	1,020	1,020	1020	1,020	1,020
TOTAL (gal.)	**94,685**	**77,820**	**53,338**	**28,313**	**6,823**	**1,020**	**1,020**	**1,020**	**1,020**	**20152**	**45,450**	**80,812**

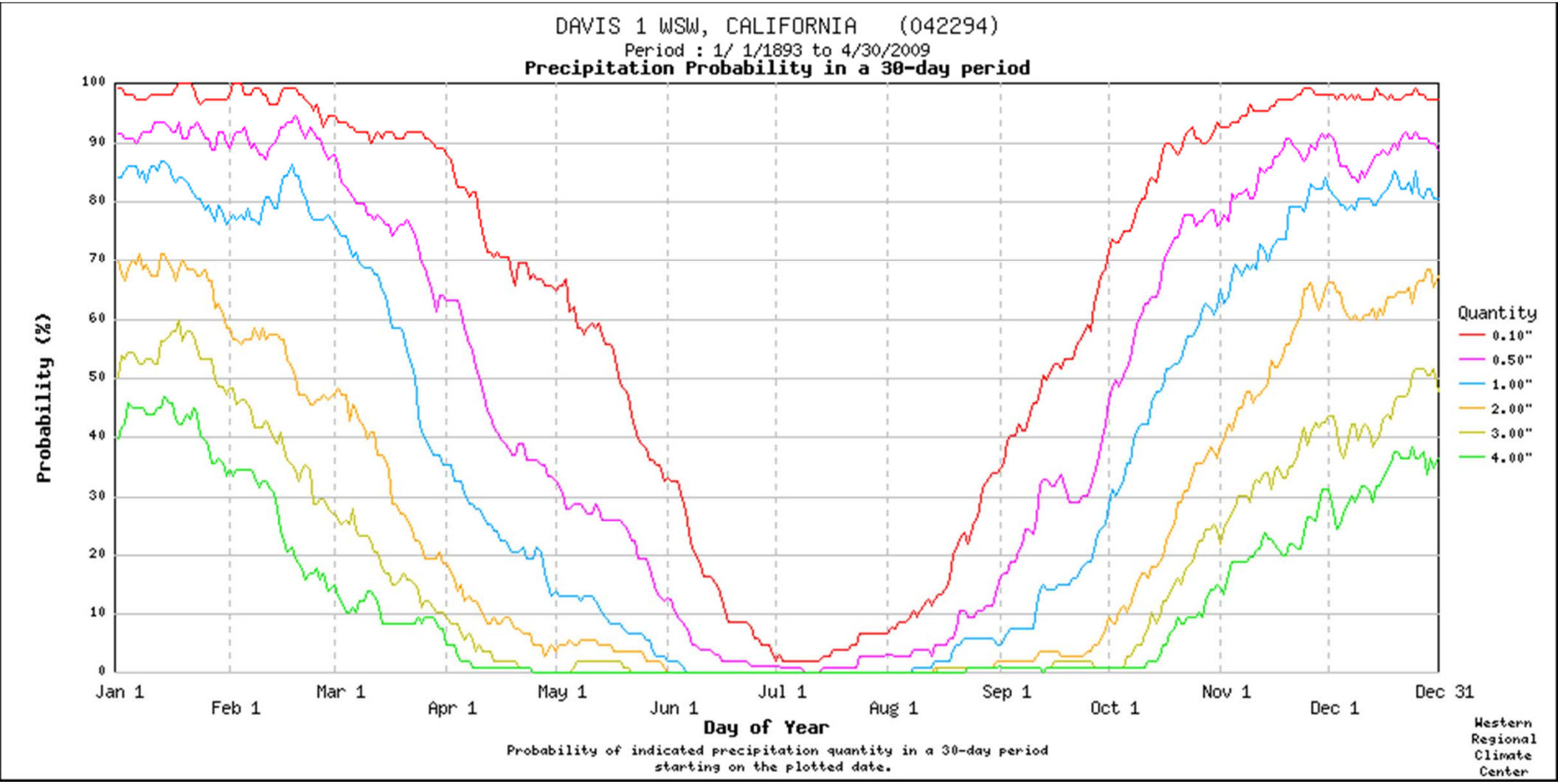
Yearly Water From Site 411,474 gal

Water Use by Month

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Hydrozone #1 gal.	1,091	1,907	3,714	5,029	7,594	8,949	9,357	8,244	6,381	4673	2,248	1,278
Hydrozone #2 gal.	723	1,263	2,461	3,995	5,032	5,930	6,201	5,463	4,229	3097	1,490	847
Hydrozone #3 gal.	1,662	2,904	5,656	9,181	11,564	13,629	14,250	12,554	9,718	7116	3,424	1,947
Hydrozone #4 gal.	1,133	1,980	3,857	5,261	7,886	9,294	9,717	8,561	6,627	4853	2,335	1,328
Interior Flushing	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1860	1,860	1,860
Winery	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**6,469**	**9,914**	**17,549**	**27,325**	**33,936**	**39,662**	**41,384**	**36,682**	**28,815**	**21599**	**11,357**	**7,260**

Yearly Water For Irrigation & Flushing 281,950 gal

rainfall in davis, california



Cost

Capital cost is calculated at $1.50/gallon.

Major costs are storage and treatment.

Operational costs - Water pumping costs estimated at one cent per gallon per year.

Maintenance

2 year project warranty, 10 year tank warranty.

Check/clean filters prior to rain season and mid-season.

Maintain pump assemblies.

Remove sediment in tanks (yearly check but expected removal is 10 years due to filtration).

Tanks expected to last 30-50 years. Liners 15-20 years.

Ozone maintenance of belts & filters yearly.

code & regulations

Lack of direction in codes

2004 US EPA “Guidelines for Water Reuse”

2009 IAPMO “Draft Green Plumbing and Mechanical Code Supplement”

Regulations

Rainwater is not Graywater or Recycled water.

Recycled water is covered under Title 22.

Stormwater under Plumbing code.

Other States have responded to rainwater harvesting.

Oregon code addresses potable vs. non-potable rainwater use. For potable, calls for chemical, UV or ozone treatment.

Texas passed state guidelines and property tax exemptions.

Arizona has tax rebates for installations. Tucson is first US city to require developers to harvest rainwater for irrigation (as of Oct. 2008).

Other countries have harvested rainwater for many years.

Germany has a tax for site runoff and uncollected water.

UK provides rebates for installations.

Australia has some districts with mandated tanks plumbed to clothes washing and outdoor fixtures.

As of August 1, 2009, California adopted Green Building Standards into code (CCR Title 24, Part 11) effective in 2010.

603.4 Wastewater reduction. Each building shall reduce the generation of wastewater by one of the following methods: 1. The installation of water-conserving fixtures or 2. Utilizing nonpotable water systems

OUTDOOR WATER USE (604)
604.1 Water budget. A water budget shall be developed for landscape irrigation use.
604.2 Potable water reduction. Provide water efficient landscape irrigation design that reduces by 50 percent the use of potable water. Methods used to accomplish the requirements of this section shall include, but not be limited to, the items listed in Section 604.2.
604.3 Potable water elimination. Provide a water efficient landscape irrigation design that eliminates the use of potable water beyond the initial requirements for plant installation and establishment. Methods used to accomplish the requirements of this section shall include, but not be limited to, the items listed in Section 604.3.
604.4 Graywater irrigation system. Install graywater collection system for onsite subsurface irrigation using graywater.
604.5 Rainwater or stormwater collection systems. Constructed water collection devices may store water for landscape irrigation.

Similar Projects

Portland State University Epler Hall Dorms using rainwater for irrigation and toilet flushing.

UC Santa Cruz identified non-potable use for rainwater – irrigation, cooling tower makeup and toilet flushing. Rainwater reuse with UV to toilets at Porter College. Irrigation at East Field, Arboretum and Cowell College.

Mills College using rainwater and UV to flush toilets in two of their campus buildings.

Glumac engineering office in Folsom using rainwater for toilet flushing. Treatment includes filter and UV.

Heron’s Head Park in San Francisco using rainwater for toilet flushing with no treatment.

Tahoe Center for Environmental Sciences uses rainwater for toilet flushing.

lessons learned

Bark clogging pumps

Regulations not clear

Think through metering

Not a financial solution

Reduction of use is key

Majority of water use is process