



Sustainability = Continuous Improvement

Water is life. A resource we've always taken for granted with our lawns, garden hoses and long showers -- yet nothing on earth is more precious. Now, our beautiful bountiful California is experiencing a very serious drought which conceivably could span as much as ten years. Yet, Trend is not Destiny, and if we all do something to reverse waste, the effects of the drought can be less dire.

— Francis Ford Coppola



Where We are Now

Certified Sustainable - Francis Ford Coppola Winery and the surrounding estate vineyards are both certified by the California Sustainable Winegrowers Alliance.



Water - All winery water on site is recycled and reused for site irrigation. So every drop is used twice.



Energy - We are an EPA Green Power Partner and source 36% our electricity from renewable sources like geothermal and wind.



Grapes - We pay a price premium to our growers for sustainably certified grapes and provide trainings to help our growers improve the environmental impact of their vineyards.

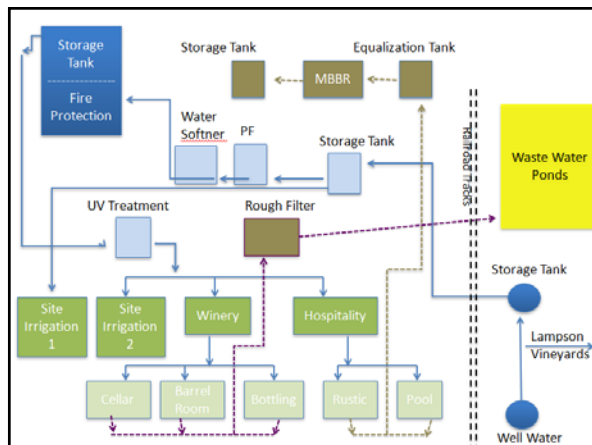


Different Water Streams

Water Types

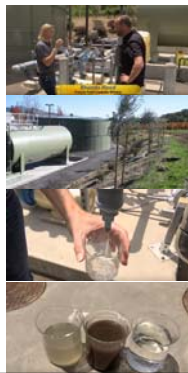
- Potable Water
- Process Wastewater
- Sanitary Wastewater
- Reclaimed Water (process)
- Reclaimed Water (sanitary)





Current Sanitary Treatment System

- For sanitary wastewater we have a MBR system installed
- The system processes over 2 million gallons a year
- Water is cleaned, disinfected with chlorine and used for vineyard and landscape irrigation

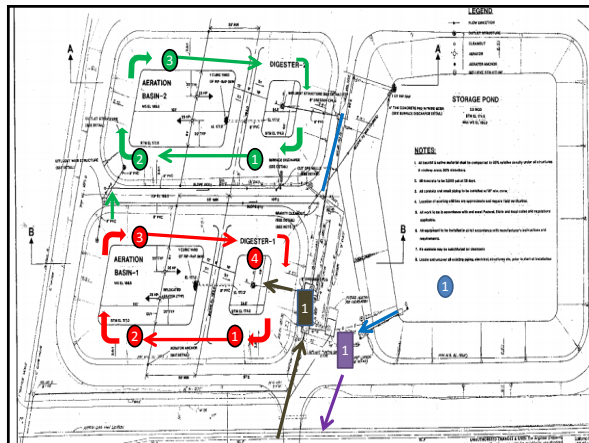
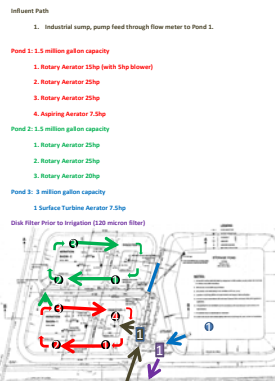


Current Process Treatment System

- Facultative ponds designed for both aerobic and anaerobic treatment.

- Three pond treatment process with final polishing occurring in the third pond.

- Water retention times of 60 to 90 days, with a total pond capacity of 6 million gallons.



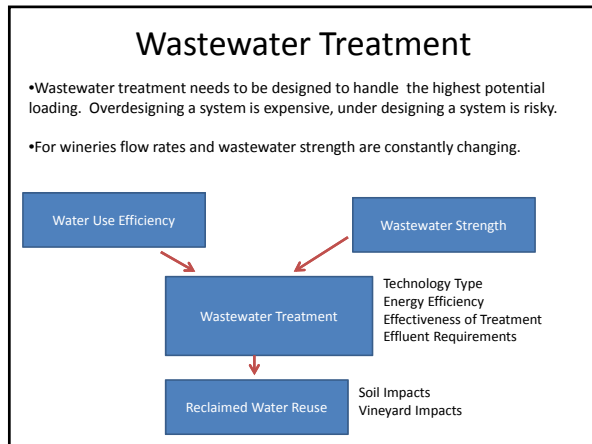
Wastewater Project Goals

Current: Water used on site is treated to a very high quality and reclaimed water is reused for vineyard and site irrigation.

Future: An improved wastewater treatment system combined with water efficiency will

- Increase reclaimed water quality
- Increase the capacity of our existing treatment system
- Improve the energy efficiency of our treatment process





What data do we have?

- Water Flow Records
- Influent Quality
- Effluent Quality
- Contamination Sources





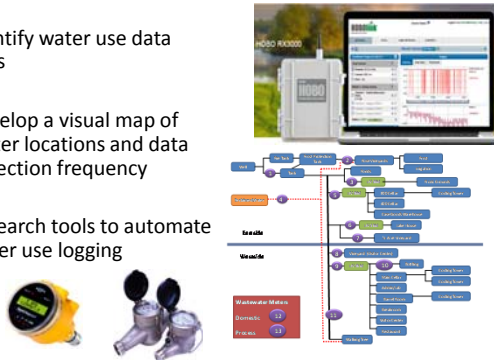
Where does our wastewater come from?

- Crush Pad operations
- Tanks Washing
- Barrel Washing
- Bottling Line
- Cooling Towers
- Process Systems
- Wine Transfers
- Misc



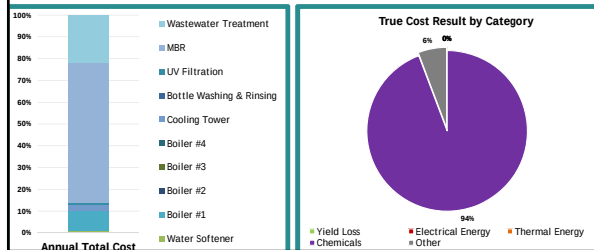
Measuring Water Use

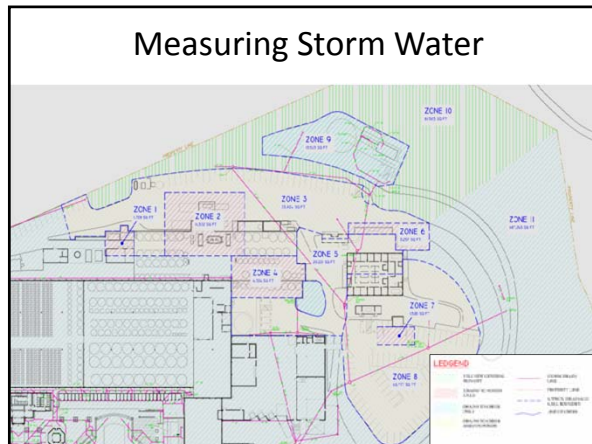
- Identify water use data gaps
- Develop a visual map of meter locations and data collection frequency
- Research tools to automate water use logging



Putting a Price on Water

- \$0.02 is our average cost per gallon of water
- This does not include labor costs associated with maintaining our water and wastewater systems





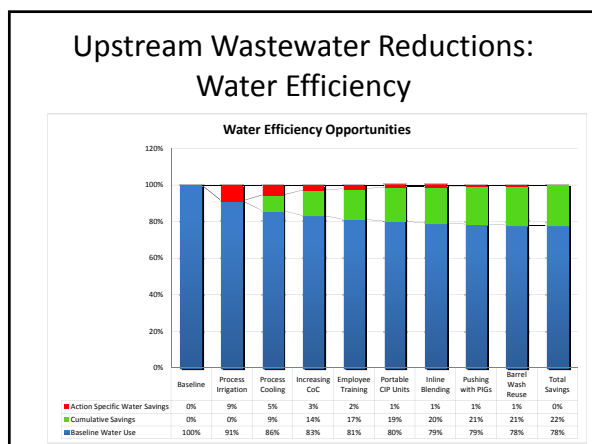
Water Efficiency Projects

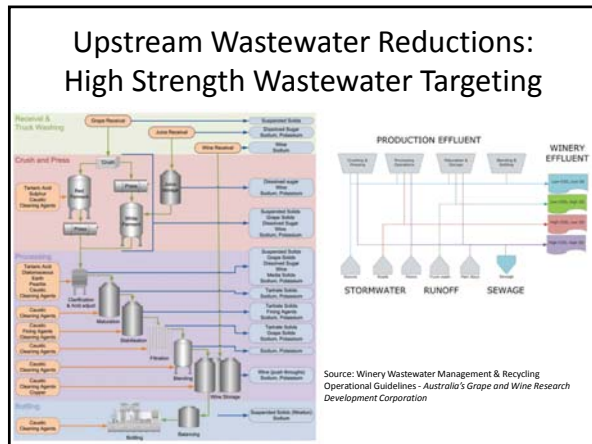
• **Reduce**

- Cooling Tower Efficiency
- Landscaping Efficiency
- Sanitation SOPs
- Push wine with PIGs
- Employee Education and low tech tools (brooms & squeegees)
- Minimizing Tank Movements
- High pressure hosing and cleaning can be more efficient
- Automatic shut off valves

• **Reuse**

- Capture and Reuse Cleaning Chemicals
- Using reclaimed water or rainwater for cooling towers
- Use the last rinse from one sanitation (mostly clean water) for the first rinse of a second sanitation





Reducing Wastewater Strength

- Reduce salt use for water softening
- Identify alternative cleaners to reduce BOD and salt loading
- Reduce solids and screen out contaminants as close to the source as possible
- Reduce lees, DE, pomace and high solids from going down the drain
- Remove marc and lees from wastewater as soon as possible

High Strength Wastes	Estimated BOD Load
1% Citric Acid	7,496 mg/L
Lees (estimated for a 2% solids slurry)	20,000 mg/L
Juice	245,850 mg/L
Wine	265,810 mg/L

Sanitation

- What level are you cleaning for?
- Cleaning Chemistry
- Sanitation Tools
- Staff Education
- Rinse water and Cleaning Chemical Reuse



**CALIFORNIA WINERY
WASTEWATER GUIDES**

California Winery Wastewater Guides





Make data driven decisions

Facility Water Balance
Estimates help identify
water use hot spots



Mapping out wastewater

Mapping out wastewater
contributions from specific
activities can help identify
solutions



Water balance

Water balance
calculates the difference
between water use and
water discharge



Water mapping

Water mapping
identifies the source of
wastewater



Water balance and mapping

Water balance and mapping
combines the two to
provide a comprehensive
view of water use and
discharge

From Data to Planning

Consider all the variables

- Know your wastes
- Reuse/Disposal options
- Treatment Options
- Water Efficiency
- Reducing Wastewater Strength
- Reuse options in operations
- Treating water for reuse

Recommendations from Australia



"CLEAN WATER FOR PEOPLE"
TECHNOLOGY FOR WATER PURIFICATION
AICM - LEADER PROJECT 2012



Project description:
Water for the world's most vulnerable populations
PureDrops: WATER PURIFICATION
PureDrops: Water Purification and
Distribution

Research Department of WASH, UNICEF and WFP Leadership
10th April 2012

1. The use of cleaning chemicals
2. Reducing the number of tank transfers
3. The implementation of leas separation techniques



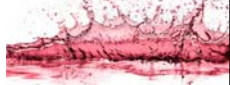
Wastewater Constituents

Figure 21. Potential environmental impacts from winery wastewater (Winewatch 2008, EPA 2006)

Winery waste constituents	Indicators	Source	Possible effects
Organic matter	BOD, TSS, COD	- Product loss - juice, wine and lees - Residue in cleaning water - Residue in DE filter waste - Solids washing wastewater drains including silos, seeds, etc.	- Depletes oxygen when discharged into water - May cause oxygen imbalances in wastewater to inefficient removal of organic contaminants from soil or impacts to plant health - Malodors if waste is stored in open lagoons or land applied
Acidity/alkalinity	pH	- Ion exchange - acidic, pH around 2 - Product loss - juice and wine - acidic, pH 3.5 to 5.5 - Alkaline waste - Microbial metabolism of organic substrates during storage of wastewater further acidifies the wastewater	- Death of aquatic organisms at extreme pH - Affects microbial activity in biological treatment processes - Affects the solubility of heavy metals in the soil and availability within toxicity in waters - Affects plant growth
Nutrients	Nitrogen, phosphorus, potassium, sulphur	- Product loss - juice, wine and lees - Product recovered from wine by gravity have are a source of nitrogen and for a less extent phosphorus - Phosphate detergents and phosphoric acid	- Eutrophication when discharged to water or stored in lagoons - Is an irritant and can be toxic to infants - Toxic to plants in large amounts - Can acidify soil over time - Phosphorus may affect soil structure, resulting in decreased infiltration
Salinity	EC, TDS	- Affual washing - caustic - Saline groundwater used for cleaning - Product loss - juice, wine and lees - Ion exchange	- Toxic to some aquatic organisms - Affects water uptake by crops - Affects nutrient balance, i.e. salts and crops
Sodicity	SAR, ESP	- Affual washing - caustic - Product loss - juice, wine and lees - Saline groundwater used for cleaning	- Affects soil structure, resulting in low infiltration and hydraulic conductivity, poor aeration, hard and dense subsoil - May increase susceptibility of soil to waterlogging
Heavy metals		Al, Cu, piping and tanks, Pb soldering, brass fittings	Toxic to plants and animals
Solids	TSS	- Product loss - juice, wine and lees - Residue in caustic/acid cleaning waste - Residue in DE filter waste - Solids washing wastewater drains including silos, seeds, etc.	- Reduces soil permeability, leading to reduced oxygen uptake - Can reduce light transmission in water - Can smother habitat - Odour generated from anaerobic decomposition

The most important characteristics are:

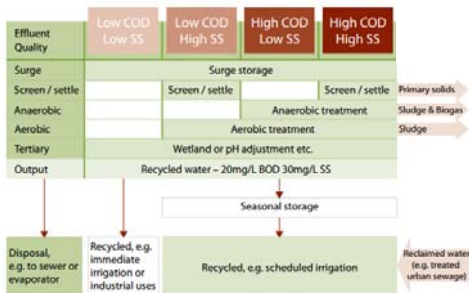
- Organic loads
- Suspended Solids
- Acidity/Alkalinity (pH)
- Salinity and sodicity
- Nutrients (e.g. nitrogen and phosphorus)



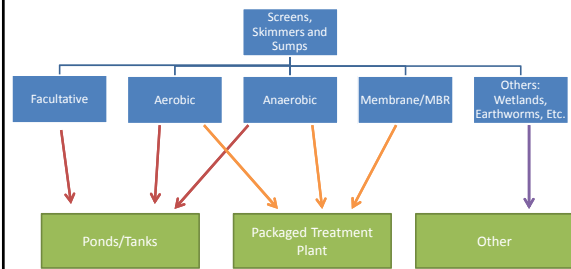
Effluent Design Parameters

	Wastewater In	Ideal Vineyard Reuse	Ideal Cooling Tower Reuse
BOD Average (Max)	2,000 (8,000) mg/L	<30 mg/L	<30 mg/L
TSS Average (Max)	200 (600) mg/L	<30 mg/L	<30 mg/L
DO	2 mg/L	--	--
pH	4 -10	6.5- 7.5	6.5 – 8.5
Chloride		<140 mg/L	<200 mg/L
TDS		<500 mg/L	<500 mg/L
Sodium		<100 mg/L	<100 mg/L

Wastewater Treatment Matrix



Wastewater Treatment Technologies



Pre-Screening and Filtration

- Rotary Screens
- Settling/Equalization Tanks
- Pre-Treatment Filtration?



Treatment Selection Process

Decision to focus on Fine bubble aeration technology

- Proven technology that can work with variations in strength and flow rate
- Works with existing ponds
- Energy Efficient



Vendor	System Type	
Elutriate Systems	Bottom mounted	
EDI Floating Laterals	Floating Laterals aeration	
TriplePoint Environmental	Retrievable bottom mounted aeration unit	
EP Aeration	Retrievable bottom mounted aeration unit	
ClearBlu Environmental	Individual floating fine bubble aerators	
Parkson	Floating Laterals aeration	
BioFiltro	Earthworm technology	

Energy Rebates

- BASE energy has logged our aeration energy use and helped model energy use for proposed systems.
- Current rebate are \$150 for each kW reduced and \$0.08 for each kWh reduced

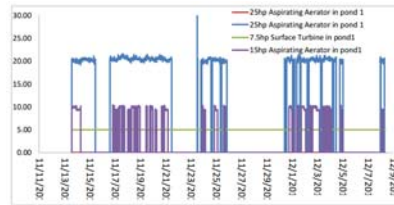


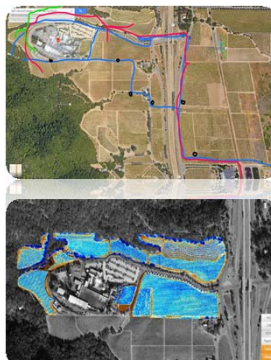
Figure 4-5 Logged Data for the Aerators in Pond 1, 11/13/2015 - 11/20/2015

Reclaimed Water Use

We use every drop twice.

Treating and reusing water is part of how we run our winery.

It reduces water use and lets us produce top notch wines.



Planned Improvements

- We have been using reclaimed water in our vineyards for over 15 years with no detrimental impact
- We upgrading our wastewater treatment to decrease energy use and increase pond capacity
- This will reduce costs and drive an internal effort to increase water efficiency and reduce water contaminants.

Resources



- Sustainable Water Management Handbook for Small Wineries – *California Sustainable Winegrowing Alliance*
- Sustainable Management of Winery Water Guide and Associated Energy - *Wine Institute*
- Cleaner Production: New Technology for Water Recycling and Cleaner Production – *Australia's Grape and Wine Research Development Corporation*
- Winery Wastewater Management & Recycling Operational Guidelines - *Australia's Grape and Wine Research Development Corporation*
- BASE Energy – for estimating wastewater rebates
- PG&E Lending Library for borrowing clamp on flow meters to measure hard piped equipment.



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