Water: Manage Your Business through the Ebbs and the Flows

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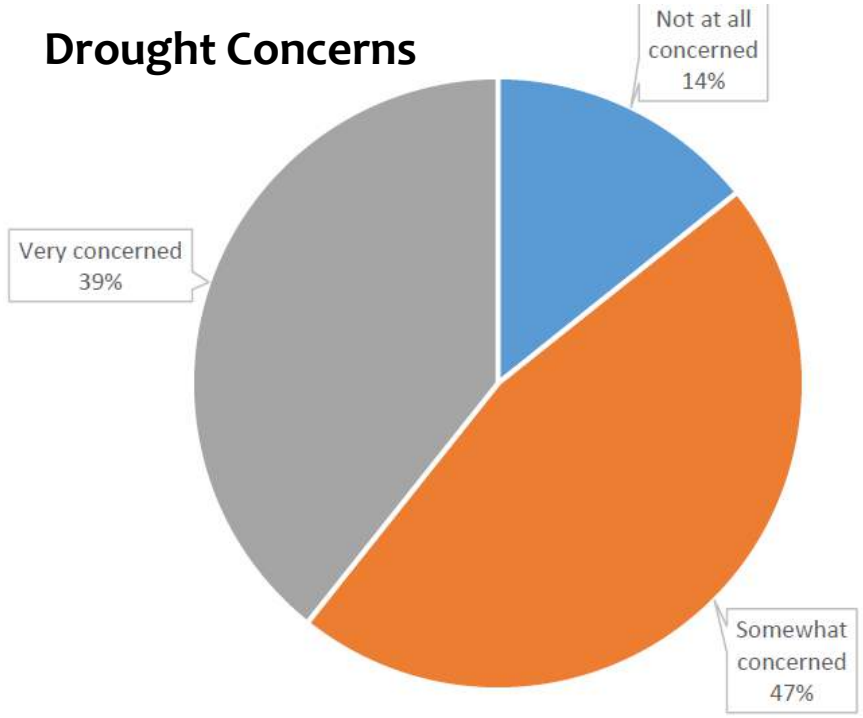
20 CBE 16 CRAFT BEVERAGE EXPO

Current Craft Beverage Concerns

- **Impediments to Growth**

Issue
Access to capital
Land/space/available real estate
Distribution
Water/wastewater management
Availability/price of inputs/materials
Permits/local regulation
Marketing
State/federal regulation
Taxes



Source: National University System Institute of Policy Research, San Diego Craft Brewing Industry: 2016 Update

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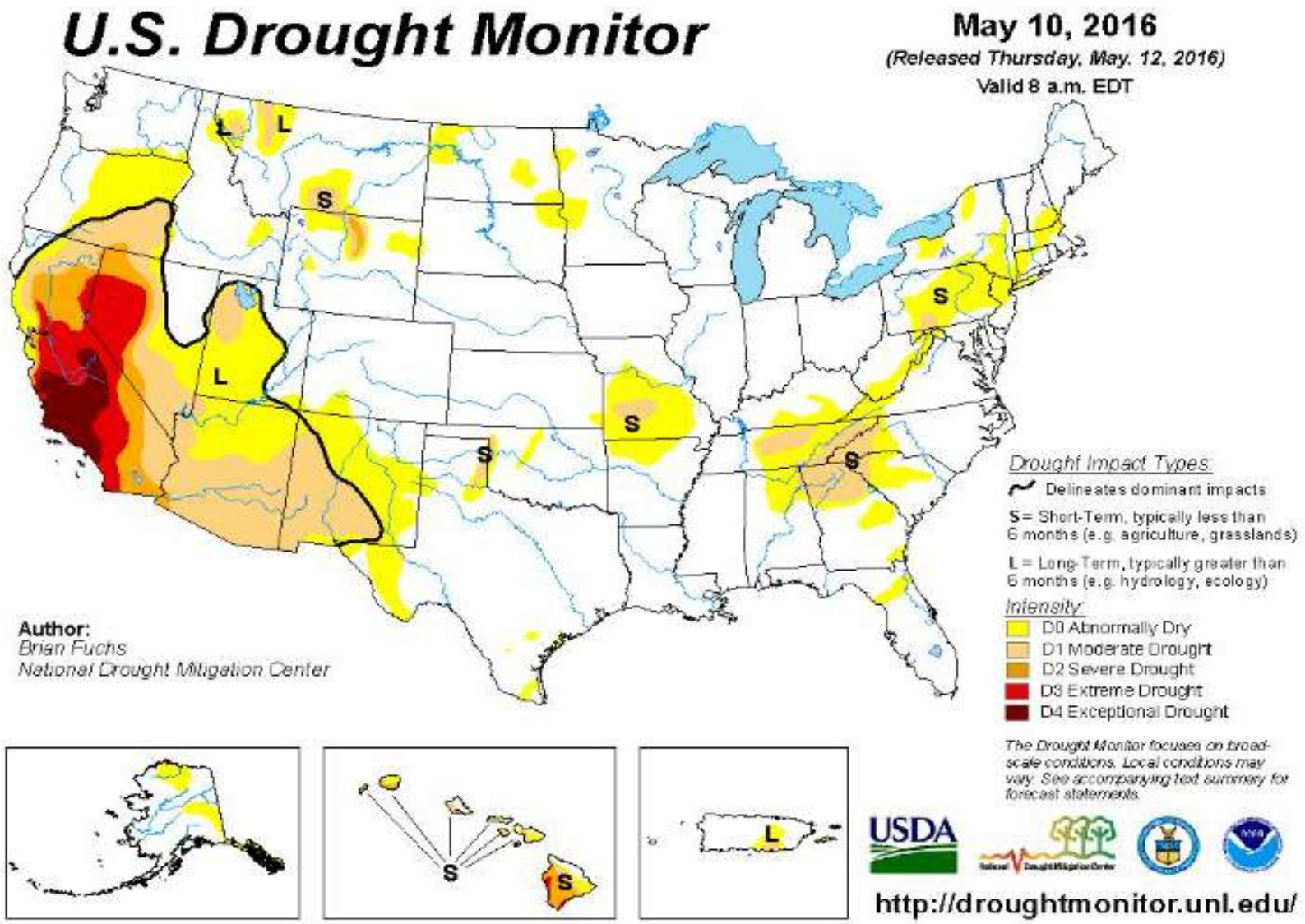
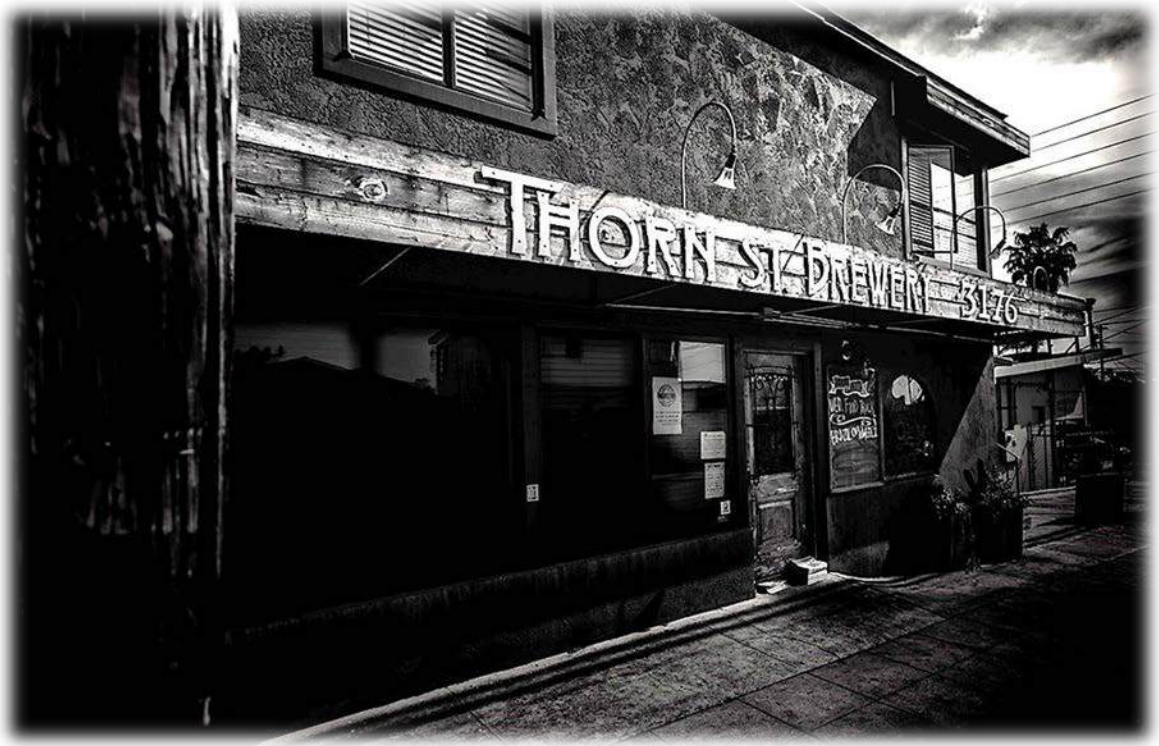
Current Water Situation in the United States



Craft Brewery Considerations



Craft Brewery Considerations of Water Issues

- Similar to other craft beverage subsectors
- Geography dependent
  - Availability, quality, and cost of water
  - Availability and cost of wastewater treatment
  - Equivalent Residential Units (ERU)
    - 10,000 bbls/yr = 1000 homes
- Improving product quality
- Growth and expansion versus efficiency
- Ultimate return/value on capital investment
- Financial, environmental, social nexus

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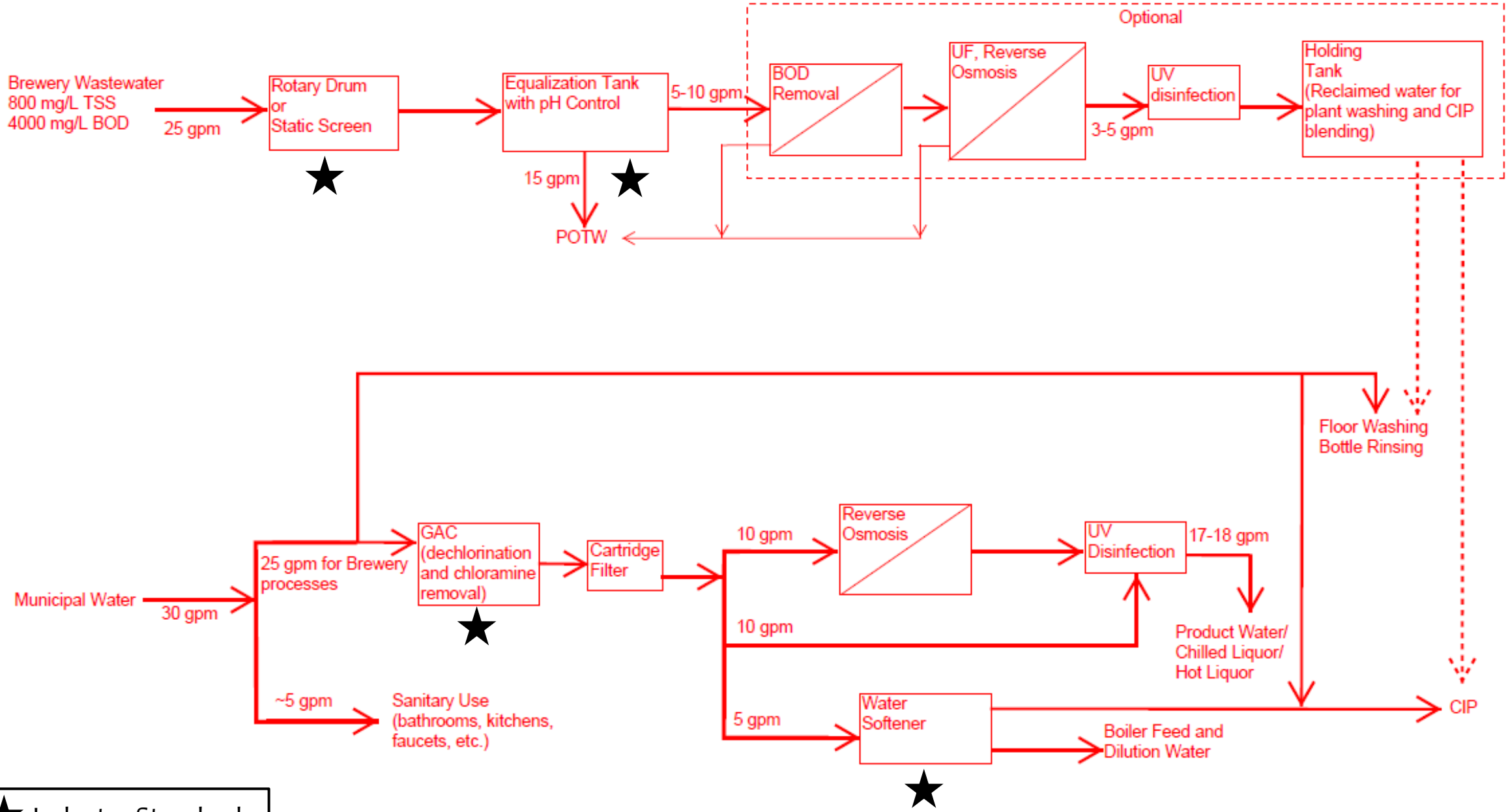
Typical Craft Brewery Water and Wastewater Considerations



★ Industry Standard

Craft Brewery Water Treatment Equipment

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What Do the Statistics Show?

- US West Coast breweries of production capacity of 50,000 bbls/yr or more
  - 26 breweries: AZ, CA, CO, OR, WA
  - Almost all perform some pH control as needed before discharge of wastewater effluent
  - 5 breweries: On-site biological wastewater treatment
  - 5 breweries: Considering on-site biological wastewater treatment
  - Threshold for on-site biological treatment: Production capacity of greater than 100,000-150,000 bbls/yr

What Else Do the Statistics Show?

Parameter	Typical Range
Water to Beer Ratio (bbl/bbl)	4 - 13
Wastewater to Beer Ratio (bbl/bbl)	3 - 10
Wastewater to Water Ratio (bbl/bbl)	0.60 – 0.90
Biochemical Oxygen Demand (mg/L)	2000 - 5000
Total Suspended Solids (mg/L)	600 - 2000
Flow ($/1000 gal)	3.00 – 10.00
BOD surcharge ($/lb)	0.20 – 0.60
TSS surcharge ($/lb)	0.11 – 0.60

Source: Brewer's Association Benchmarking Study (2016)

Typical Regulations: BOD= 200 mg/L, TSS= 250 mg/L

Good Operating Practices

- Sustainability begins from Day 1…not at some later time
- Follow simple to more complex pathway: Reduce, Reuse, Recycle
- Conduct water and wastewater audit

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Water and Wastewater Considerations

Water and Wastewater

- Education: Set Standard Operating Practices (SOPs)
- Sub metering

Water

- Minimize leaks
- Turn off water when not in use- Cut-off nozzles
- Process Integration and Automation (i.e., timers, CIP)
- Low-flow faucets, toilets
- Rainwater collection and reuse

Wastewater

- Add tankage to release loads during off-peak hours
- Segregation
  - Malt husks, spent grain, hops - Animal feed component. Bread, cookies, dog treats
  - Wet and dry yeast, trub - Animal feed component

Winery Considerations

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Winery Considerations of Water Issues

- Effluent Characteristics
- BOD (Biological Oxygen Demand): 7,500 ppm (Pure Wine, 16% alcohol, 160,000 ppm)
- pH 4-12
- TSS Total Suspended Solids: 100-5,000 ppm
- TDS Total Dissolved Solids: 200-4,000 ppm
- Nitrate, Nitrite, Ammonia, Sodium, Chlorine

Waste Water Treatment Methods

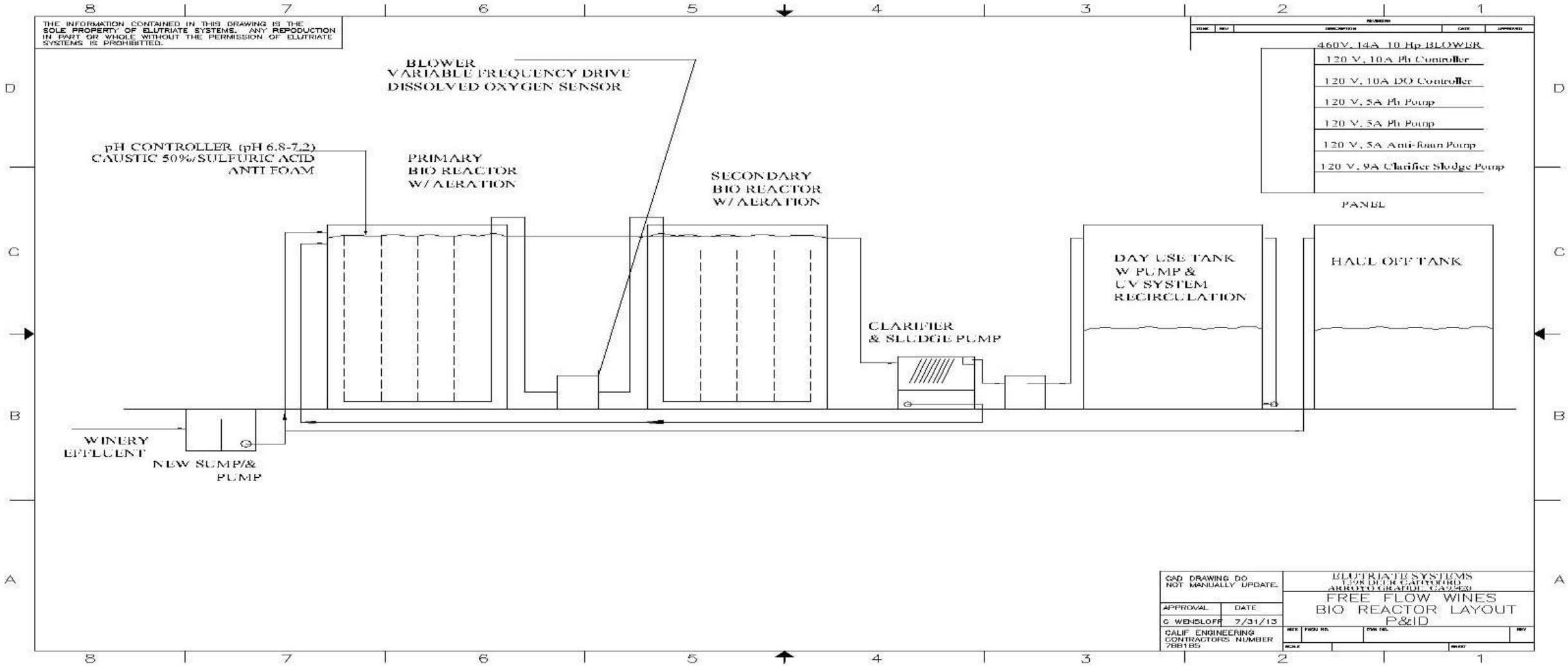
- Discharge to city Sewer directly, easiest, costly hook up fees
- To city Sewer with treatment, costly hook up fees
- To Septic/Leach Line System, distribution not much treatment
- To Waste Water Ponds, Facultative, Odors Sludge build up, Wetlands
- To Waste Water Ponds, W/ fine bubble diffuser systems to Bio Reactor, BOD Treatment
- To Membrane Bio Reactor, BOD treatment, smaller footprint
- Don’t discharge, operate in a closed loop, MBR, RO, new development

Optimize Waste Water Cost & Hook up Fees

- Water like all other aspects to your operation can be optimized
- Similar to optimizing rent, labor rates, use of power electricity & gas
- Not only in quantity required, but also in treatment costs
- And also amount to be reused
- Hook up fees are based upon volume used and volume discharged

Examples of Winery Waste Water Treatment Systems

P&ID for a Typical Winery or any High BOD effluent



Conclusions

- All sectors face water and wastewater issues
- Understand and assess the quality of:
  - water and wastewater
  - product
- Work closely with the City, Water Providers, and Wastewater Facility Management
- Proactive decisions will pay dividends now, and more so later
- Take incremental steps to reach objectives
- Reactive position will tend to be more costly

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