#4107019.0
June 13, 2007

CONSULTING CIVIL ENGINEERS
RIECHERS SPENCE ASSOCIATES

WASTEWATER FEASIBILITY STUDY For CONSTELLATION-MONDAVI (ROBERT MONDAVI WINERY)

#4107019.0

Prepared for:
Robert Mondavi Winery
P.O. Box 106
Oakville, CA 94562

#4107019.0
June 13, 2007

Executive Summary

Facility Winemaking Activities

The Robert Mondavi Winery is currently designed for the harvest and processing of 2.3 MG (16,600 tons of grapes) per year. The facility is requesting a Use Permit Modification for the ability to receive and bottle an additional 1.4 million gallons (MG) of wine per year. Harvest, blending, and other winemaking activities will not be altered.

Winery Wastewater Generation

The existing wastewater system can handle peak daily flows up to 0.092 million gallons per day (MGPD). A comprehensive water use audit determined that actual peak daily wastewater generation is 0.074 MGPD—less than the permitted amount. Proposed production was calculated to generate an additional 0.011 MGPD with a 100% factor of safety.

Allowable, Existing, and Proposed Conditions

	Harvest & Winemaking (MG)	Bottling (MG)	Peak Daily Waste (MG)
Original Design Conditions	2.3	N/A	**0.092**
Existing Conditions	1.4	1.6	**0.074**
Proposed Additional Conditions	0	1.4	**0.011**
Future Total Activity	Up to 1.6	Up to 3.0	**0.085**

Winery Wastewater Treatment

The existing process wastewater system consists of two treatment ponds. As shown in the above table, future peak daily waste generation is expected to be within the existing system capacity. This report demonstrates that the existing ponds are currently operating under-capacity, even under the following conservative assumptions:

- 100% factor of safety for future peak wastewater flows
- Very high-strength wastewater
- Doubling the required residence time

The existing ponds are confirmed to provide adequate storage, residence time, and treatment for peak daily wastewater generation from 2.3 MG harvest and winemaking activities, plus 3.0 MG bottling per year.

#4107019.0
June 13, 2007

Background

The Constellation-owned Robert Mondavi Winery, just off of Highway 29, currently occupies two adjacent parcels: APN #027-280-050 for the winery, and APN #027-280-061 for the two winery process wastewater treatment ponds. The current use permit, UP #208788, allows production up to 1.6 MG of wine per year. With the addition of a 21,438 square foot red wine fermentation building in 1998, the use permit modification #98071-MOD states wastewater treatment capacity for waste flows up to 92,000 GPD.

The existing process wastewater system utilizes two ponds for treatment of organic constituents, sludge settling, and storage of treated water. The ponds were designed by Kennedy/Jenks Consultants[1] in 1974 with the following design parameters[2]:

- Usable storage capacity of 5.99 MG
- Maximum annual harvest and processing of 2.3 MG (16,600 tons)[3]

Actual crush—including grapes received and crushed onsite and custom crush juice received—totaled less than 1.0 MG (7,267 tons) for Harvest 2005, and less than 0.8 MG (5,520 tons) for Harvest 2006.

The Owner proposes a Use Permit Modification to bottle another 1.4 MG, increasing "production" to 3.0 MG annually:

- The additional 1.4 MG is for bottling only.
- No additional grapes will be harvested, nor additional juice received.
- There will not be any additional wine processing at this facility.
- The additional 1.4 MG will be trucked in, transferred to bottling staging tanks, and bottled soon thereafter.

RSA performed a water-use and facility operations audit to determine actual operating trends and process waste generation from each type of winery operation:

- Winemaking activities
- Harvest/crush
- Bottling

All of the 1.4 MG of received wine will be bottle-ready and only 10% of it is expected to require filtration. As such, "bottling" is the only winery operation this proposed modification affects. Processes involved in receiving and bottling this 1.4 MG of wine are the only sources for additional process wastewater generation.

---

[1] Formerly Kennedy Engineers, Inc.

[2] *Operation Guide for the Robert Mondavi Winery, Wastewater Treatment Facilities.* Prepared by Kennedy Engineers, Inc., December 1974.

[3] 140 gallons per ton conversion used to obtain maximum estimate

#4107019.0
June 13, 2007

Actual peak daily wastewater flow was determined to be less than the system capacity of 92,000 GPD. In 2006, for example, actual peak daily flow was roughly 74,200 gallons. The additional bottling activity is not expected to exceed 11,000 GPD waste flow generation[4]. Thus, 85,200 GPD is expected with peak future activity, and is within the existing system capacity.

This report confirms that sufficient storage and treatment exists to meet Napa County effluent regulatory standards with the additional facility bottling. The existing ponds are not operating at full capacity, and can accommodate additional wastewater generation from 1.4 MG bottling.

The methodology behind this report includes:

- Validation of design parameters
- Waste generation: current and future
- Demonstration that expected wastewater generation is less than available as-built pond capacity
- Demonstration that the pond effluent can meet regulatory requirements.

[4] This figure includes a 100% factor of safety.

#4107019.0
June 13, 2007

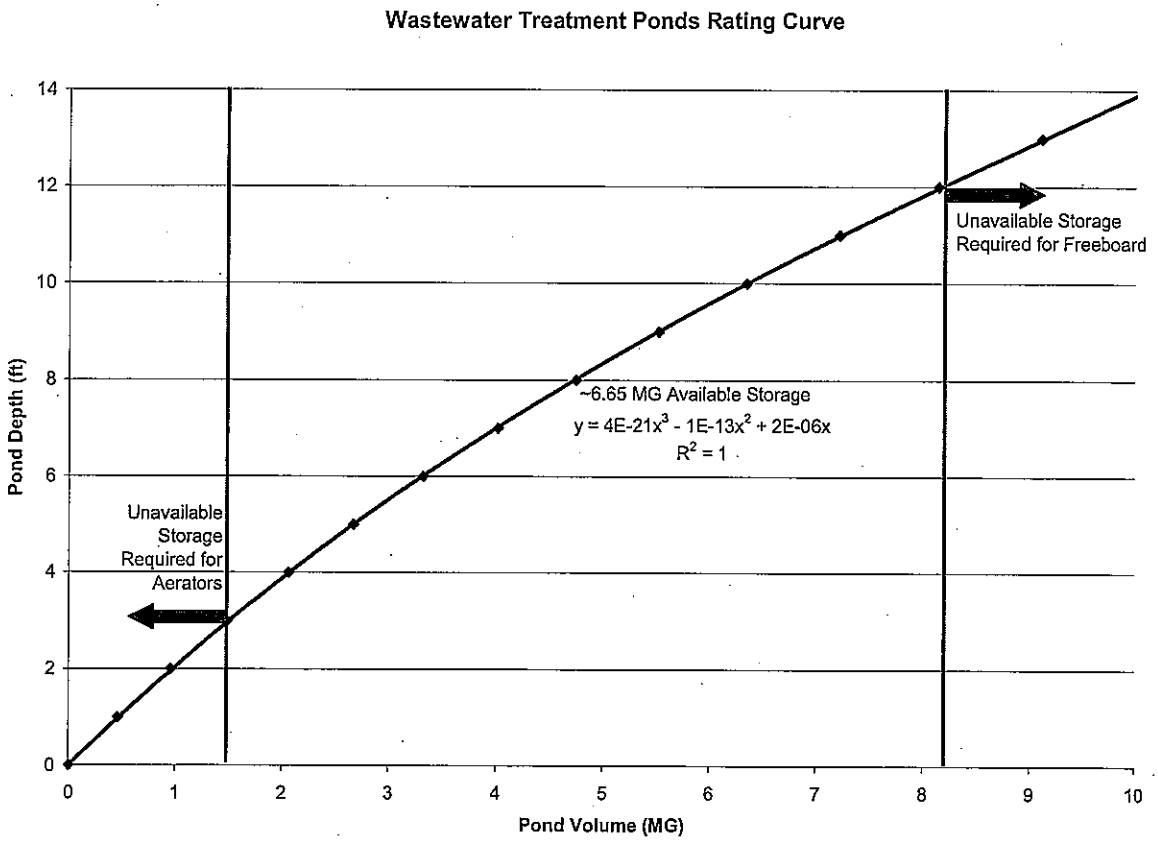
Validation of Design Parameters

RSA conducted an analysis to determine the ponds' as-built capacities[5]:

Design versus Actual Pond Capacity

	Usable Storage Capacity (MG)	Total Storage Capacity (MG)
Design	5.99	7.29
Actual	6.65	8.14

The pond rating curve (below) and supporting calculations conclude that the ponds were constructed larger than originally designed.



[5] Analysis conducted using the average-end method on an as-built aerial photograph. Calculations follow at the end of this report.

#4107019.0
June 13, 2007

CONSULTING CIVIL ENGINEERS
RIECHERS SPENCE ASSOCIATES

Waste Generation

RSA also performed a facility operations audit to determine actual water use. The facility has a total available wine storage capacity of 1.54 MG (including all tanks and barrels). No additional equipment or storage (tanks or barrels) will be purchased with the proposed bottling increase. The following summarizes winery activities that generate process wastewater, and notes whether there will be any significant changes with the proposed bottling expansion:

Winemaking Activities: Will NOT be affected

- Wine processing (centrifuging, other types of filtering)
- Blending
- Transfers/racking
- Daily cellar sanitation

Harvest Activities: Will NOT be affected

- Receiving grapes
- De-stemming and sorting
- Crushing
- Receiving juice
- Transfers into fermentation tanks
- Harvest equipment sanitation

Bottling: This is the only facility activity that WILL be affected

- Receive wine (tankers)
- Prepare and fill staging tanks
- Cross flow filtering of wine for bottling(if necessary)
- Sanitize bottling line and equipment

The facility will not be increasing production of wine – it will only receive a greater quantity of ready-to-bottle wine: 1.4 MG total. Effectively, the proposed change is that two back-to-back shifts will bottle per day as opposed to just one shift. A majority of the time, the additional daily shift will bottle the same product as the preceding shift. In cellar operations, vessels and equipment do not require sanitizing in between immediate uses for an identical product.

The expected waste flows from the additional 1.4 MG of bottling are calculated in the following section. Information used in these calculations were compiled from a comprehensive survey filled out by the Cellar Master, (with input from the Production

Manager and Facility Coordinator), and a facility audit. Portions of this survey follow at the end of this report[6].

Receiving Wine

- A maximum of three tankers per day can be expected with the proposed bottling increase. The tankers are not expected to be cleaned at this facility. The wine will go directly into the existing staging tanks.

- 100 gallons spillage per tanker is assumed, for an additional 300 GPD waste generation for this activity:

$$\frac{3\,trucks}{day} \times \frac{100\,gal}{truck} = 300\,GPD$$

Staging Tanks

- It is anticipated that no more than (8) 6,000 gallon staging tanks will be used per peak bottling day.

- Sanitation prior to filling one of these tanks with wine requires a total of approximately 350 gallons.

- This water use is not expected to change drastically from current production to future because the only difference is that two shifts will be run back-to-back. The majority of the time, the back-to-back shifts will bottle the same cuvee, in which case there will be no additional tank cleaning relative to what currently occurs.

- Worst case scenario during a peak day is complete sanitation in between shifts, or an additional 2,800 GPD for this activity:

$$\frac{350\,gal}{tk} \times \frac{8\,tks}{day} = 2{,}800\,GPD$$

Filtering

- It is anticipated that only 10% of the wine received for bottling will require pad filtration prior to bottling.

- Based on 1.4 MG of wine that will be received under the requested modification, 140,000 additional gallons of wine is expected to require in-line filtering prior to entering the bottle.

---

[6] RSA conducted a facility walk-through on on March 7, 2007, and a conducted a waster-use audit and facility operations survey by means of a survey filled out by winery staff and followed up with another facility site visit and interview with the Cellar Master on March 19, 2007.

#4107019.0
June 13, 2007

CONSULTING CIVIL ENGINEERS
RIECHERS SPENCE ASSOCIATES

- Worst case scenario is that the VELO pad filter will need to be flushed twice per day, for a conservative 50 minutes each time. The wash flowrate is likely closer to 2 to 5 GPM, but again a more conservative value was used:

$$\frac{50\,\text{min}}{clean\,cycle} \times \frac{10\,gal}{\text{min}} \times \frac{2\,clean\,cycles}{day} = 1{,}000\,GPD$$

Filler Bowl

- The production line filler bowl is a vessel that transfers the bulk wine into the bottle. The "bowl" itself has a capacity of 300 gallons.

- The filler bowl requires sanitation at the end of each bottling day, or would require a flush if there is a cuvee changeover. Worst case scenario is that the filler bowl will need to be cleaned or flushed twice per day.

- It is assumed that no more than twice the filler bowl capacity would be needed to either flush or clean the device:

$$\frac{600\,gal}{cleaning} \times \frac{2\,cleanings}{day} = 1{,}200\,GPD$$

Line Sanitation

- Outside of sanitation for the staging tanks, the pad filter, and the filler bowl, bottling sanitation is minimal. Typical winery operations will pressure wash the production floor only at the end of the day, when bottling is complete.

- Worst case scenario is that the bottling floor might be cleaned one additional time per day with the addition of second bottling shifts.

- The production floor will be washed down using one of the winery's ALTO Industrial Cleaning System's high pressure washers. High pressure washers like the ALTO 52C3KA (the model currently being used at this facility) typically have flowrates less than 2 GPM, but a more conservative figure was used here. Also, the bottling room at this facility is fairly small, and a half hour of floor washing should be more than sufficient:

$$\frac{5\,gal}{\min} \times 30\,\min = 150\,GPD$$

Breakage

- Bottles can break on the bottling line, and their contents are another source of bottling-generated waste. Breakage, while fairly insignificant, does occur.

- Quality Control records from production estimate 0.01317% breakage by day[7]. Realistically, to bottle an additional 1.4 MG, at least 230 additional bottling shifts would be required. To demonstrate the minimal impact from breakage, 100 bottling days were used:

$$\frac{1{,}400{,}000\,gal}{yr} \times \frac{yr}{100\,additional\ bottling\ shifts} \times 0.0001317 = 1.84\,GPD$$

[7] Breakage statistic provided by Production Manager, Noreen Messina, on March 23, 2007

#4107019.0
June 13, 2007

RIECHERS SPENCE & ASSOCIATES
CONSULTING CIVIL ENGINEERS

Total Impact

A maximum additional waste generation of 5,452 GPD is anticipated with the additional bottling demand. With a 100% factor of safety on top of the already conservative figures, this report assumes 11,000 GPD peak wastewater generation on top of the peak daily flow from existing operations.

In 2006 the peak daily winery wastewater flow was roughly 74,200 GPD; the system can handle a peak daily flow of 92,000 GPD. Therefore, existing operations plus the proposed bottling activity is expected to yield a peak daily flow of 85,200 GPD. A summary of the findings follow:

Summary of Existing Waste Generation and Future Impact

Parameter	Unit	2005	2006	Future	Design Limit
Approximate maximum bulk wine inventory at one point in time, (includes tanks and barrels)	MG	1.08	0.99	No Significant Change	N/A
Grapes and custom crush juice received during Harvest	Tons	7,267	5,520	No Significant Change	16,600
Peak number of bottling shifts	Shifts/ Month	23	23	46	N/A
Peak process wastewater generation	GPD	N/A	~74,200	~85,200	92,000
Total number of bottling shifts	Shifts/ Year	186	223	450	N/A

Effluent Quality
Treated pond water is used to drip irrigate the property's vineyards. In order to do so, the following conditions apply:

- Adequate storage capacity: discharges not allowed to rain-soaked ground
- Treatment reliability: reasonable residence times to ensure BOD effluent at or below 160 gm/L
- Treatment reliability: sufficient aerator capacity to ensure BOD effluent at or below 160 gm/L

Storage Capacity

A pond water balance was performed based on future conditions, and follows at the end of this report[8]. Maximum used volume for storage and treatment is expected to occur in March at 6.37 MG, which is less than 6.65 MG total storage capacity.

Residence Time

The existing ponds are able to treat future waste flows to the desired BOD effluent concentration of 160 mg/L. The steady-state equation for BOD degradation—assuming high-strength wastewater BOD concentration of 9,000 mg/L— requires 26.9 days of residence time to meet the effluent regulation of 160 mg/L at 20°C.[9]

$$C_e = C_0 e^{-kt}$$
$$k = 0.15\,days^{-1}$$
$$\ln\left(\frac{160\,mg/L}{9{,}000\,mg/L}\right) = -0.15t$$
$$t = 26.9\,days$$

It should be noted that Kennedy Engineers, Inc. designed the ponds with a minimum residence time of 60 days. Therefore, sixty days – twice the calculated residence time— was used to determine required storage capacity. As previously calculated, peak future wastewater flowrates are expected to be 85,200 GPD. Therefore, 5.11 MG of storage is required in order to meet effluent regulations.

[8] Future wastewater flows used in pond water balance were 13% greater that peak existing monthly flows. Additionally, rain water was taken into account for reducing irrigation demand.
[9] "k-constant" (reaeration constant) of 0.15 days^{-1} from Table 3.1, *Environmental Engineering, Third Ed.*, Vesilind, Peirce, and Weiner; 1994.

$$residence\,time = \frac{required\,volume}{Flowrate}$$

$$60\,days = \frac{V_{req'd}}{85{,}200\,GPD}$$

$$V_{req'd} = 5.11\,MG$$

There are 6.65 MG of available pond storage, so we conclude that the pond is of adequate size to accommodate required residence time.

Aerator Capacity

According to the original design report compiled by Kennedy Engineers, Inc., the aerators were specified to deliver 28,000 pounds of oxygen per day. These conditions allow for the consumption of up to 16,471 lbs BOD per day, based on requiring 1.7 pounds of dissolved oxygen for every pound of BOD consumed:

$$\frac{28{,}000\,lb\,DO}{day} \times \frac{lb\,BOD}{1.7\,lb\,DO} = \frac{16{,}4741\,lb\,BOD}{day}$$

Under peak conditions, less than 6,400 pounds per day BOD is expected to enter the ponds:

$$\left(\frac{9{,}000\,mg}{L} \times \frac{3.7854\,L}{gal} \times \frac{2.2046 \times 10^{-6}\,lb}{mg}\right) \times \frac{85{,}200\,gal}{days} = \frac{6{,}399\,lb\,BOD}{day}$$

Even with the assumption of high-strength wastewater, aeration capacity is more than sufficient. This analysis further validates the high level of treatment and containment reliability of these ponds, even under extreme volume and BOD loading rates[10].

[10] Note: flow generated from the additional bottling is mostly water and in reality is expected to dilute BOD loading on the ponds. A pond balance generated for future peak flows is included at the end of this report for reference.

#4107019.0
June 13, 2007

CONSULTING CIVIL ENGINEERS
RIECHERS SPENCE ASSOCIATES

Conclusion

Harvest capacity and winemaking activities will NOT increase under the requested modification; only bottling activities will change. The expected peak daily flow for existing plus requested operations is 85,200 GPD. This is 7.4% less than the system capacity of 92,000 GPD.

The existing ponds have an actual usable storage capacity of about 6.65 MG, and are designed to handle up to a 2.3 MG (16,600 ton) harvest. Neither of these conditions is currently at capacity. The existing ponds provide adequate treatment and storage to accommodate the additional bottling activities.

#4107019.0
June 13, 2007

CONSULTING CIVIL ENGINEERS
RIECHERS SPENCE ASSOCIATES

Pond Rating Curve Calculations: Average-End Method

Assumption: 3:1 sideslope

Western-most pond

Depth (ft)	Pond surface area at height (sqft)	Pond Volume (Avg End Method) cu ft	gal	Available storage (gal)
0	28822			
1	31083	29,953	224,045	**Minimum volume required for aerators**
2	33408	62,230	465,478	
3	35790	96,918	724,945	
4	38229	134,102	1,003,079	278,134
5	40742	173,911	1;300,852	575,907
6	43276	216,295	1,617,888	892,943
7	45885	261,475	1,955,833	1,230,887
8	48550	309,490	2,314,983	1,590,038
9	51272	360,424	2,695,974	1,971,029
10	54051	414,364	3,099,440	2,374,495
11	56886	471,393	3,526,017	2,801,072
12	59777	531,596	3,976,337	**3,251,392**
13	62725	595,058	4,451,037	**Required for freeboard**
14	65730	661,865	4,950,750	

#4107019.0
June 13, 2007

CONSULTING CIVIL ENGINEERS
RIECHERS SPENCE ASSOCIATES

Combined Ponds

Depth (ft)	Pond surface area at height (sqft)	Pond Volume (Avg End Method) cu ft	gal	Available storage (gal)
0	59469		0	
1	64032	61,751	461,897	**Minimum volume required for aerators**
2	68684	128,154	958,590	
3	73480	199,425	1,491,697	
4	78394	275,727	2,062,437	**570,741**
5	83443	357,282	2,672,467	**1,180,771**
6	88573	444,127	3,322,068	**1,830,372**
7	93834	536,560	4,013,471	**2,521,775**
8	99208	634,708	4,747,613	**3,255,917**
9	104695	738,738	5,525,763	**4,034,067**
10	110295	848,822	6,349,192	**4,857,495**
11	116009	965,129	7,219,168	**5,727,471**
12	121835	1,087,829	8,136,961	**6,645,265**
13	127775	1,217,091	9,103,842	**Required for freeboard**
14	133829	1,353,086	10,121,080	

#4107019.0
June 13, 2007

CONSULTING CIVIL ENGINEERS
RIECHERS SPENCE ASSOCIATES

FUTURE POND WATER BALANCE CHART

Design Parameters
Top Surface Area of pond = 87,120 SF
Bottom Surface Area of pond = Unknown
Minimum Pond Water Level = 3 ft.
Maximum Pond Water Level = 12 ft
Total storage capacity = 7.29 MG
Available storage capacity = 5.99 MG
Irrigation: 130 acres vineyard + 1.5 acres landscape

Actual Parameters
Top Surface Area of pond = ~ 133,800 SF
Bottom Surface Area of pond = ~ 59,400 SF
Minimum Pond Water Level = 3 ft.
Maximum Pond Water Level = 12 ft
Total storage capacity = 8.14 MG

Available storage capacity = 6.65 MG
Irrigation: ~200 acres available for disposal; calcs based on 130

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep
Eto (inch)	3.54	2.75	1.22	1.19	1.76	6.12	4.63	6.04	6.81	7.23	6.41	4.94
Crop Constant	0.58	0.58	0.00	0.00	0.00	0.50	0.60	0.60	0.80	0.80	0.80	0.80
ET (inch)	2.05	1.60	0.00	0.00	0.00	3.06	2.78	3.62	5.45	5.78	5.13	3.95
Irrigation Demand After Rain (in)	0.72	0.10	0.00	0.00	0.00	0.00	0.62	2.10	5.10	5.78	4.84	3.85
Irrigation Demand after Rain (MG)	**2.55**	**0.34**	**0.00**	**0.00**	**0.00**	**0.00**	**2.18**	**7.43**	**17.99**	**20.42**	**17.08**	**13.60**
Pan Evaporation (inch)	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	5.72	2.48	1.66
Pan Evaporation (MG)	**0.04**	**0.03**	**0.01**	**0.06**	**0.10**	**0.12**	**0.15**	**0.13**	**0.10**	**0.06**	**0.03**	**0.02**
Precipitation (inch)	1.33	1.50	8.03	7.56	7.25	5.11	2.16	1.52	0.35	0.00	0.29	0.10
100 YR RP Precipitation (inch)	2.00	2.25	12.05	18.84	10.88	7.67	3.24	2.28	0.53	0.00	0.44	0.15
Annual Precipitation (MG)	**0.02**	**0.03**	**0.13**	**0.21**	**0.12**	**0.09**	**0.04**	**0.03**	**0.01**	**0.00**	**0.00**	**0.00**
Wastewater Flows (MG)	**2.52**	**1.49**	**1.50**	**0.83**	**0.83**	**1.43**	**1.43**	**1.62**	**1.62**	**2.19**	**2.19**	**2.51**
Required Storage (MG)	**2.50**	**1.52**	**3.14**	**4.12**	**4.97**	**6.37**	**5.51**	**1.51**	**1.53**	**2.12**	**2.16**	**2.50**
Total Pond Volume (MG)	**3.80**	**2.82**	**4.44**	**5.42**	**6.27**	**7.67**	**6.81**	**2.81**	**2.83**	**3.42**	**3.46**	**3.80**