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Water Availability Analysis



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WATER AVAILABILITY ANALYSIS

ZD WINES

8383 SILVERADO TRAIL
NAPA, CA 94558

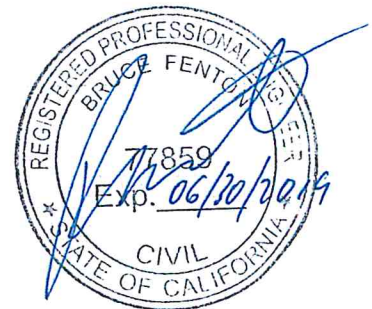
APN 030-200-005

Prepared for:

ZD Wines, LLC
8383 Silverado Trail
Napa, CA 94558

#4114037.0

September 27, 2017





I. Executive Summary

The owners of the ZD Winery are requesting a Use Permit modification to increase wine production from 70,000 gallons per year to 120,000 gallons per year. Per the existing Use Permit, ZD Winery currently maintains 25 Full-time Employees, 10 Part-time Employees and 225 Visitors per day. This modification proposes no increase in visitation or employees, and no new construction or landscaping.

Usage Type	Existing Usage [af/yr]	Proposed Usage [af/yr]
Vineyard		
Irrigation	1.52	1.52
Reclaimed Process Wastewater for Vineyard Irrigation	-0.73	-0.95
Winery		
Process Water	1.07	1.84
Landscaping	0.35	0.35
Domestic Water	1.37	1.37
Totals (Acre-ft per Year)	3.59	4.13
Estimated Groundwater Recharge (Acre-ft per Year)	5.75	5.75

The proposed increase in production will result in a net increase in water use of 0.54 ac-ft. The proposed water use of 4.13 af/yr is less than the estimated groundwater recharge rate of 5.75 af/yr. A groundwater recharge of 1.0 af/yr/acre for valley floor was adopted for the 5.75 acre parcel to give a total groundwater recharge of 5.75 af/yr. There are no wells within 500 feet of the existing well on the parcel as shown on the attached Well & Irrigation Exhibit.



II. Water Use Calculation

Existing Vineyard, Landscape and Winery Process Water Demand

Vineyard – Irrigation only – (0.5 af/ac-yr x	3.04	acres vineyard) =	1.52	af/yr
Reclaimed Process Water for Irrigation*	0.73	acre-feet/year) =	-0.73	af/yr
Landscape – (0.5 acre feet water / 100,000 gal wine x	70,000	gal wine/year) =	0.35	af/yr
Process Water – (5 gal water / 1 gallon wine x	70,000	gal wine/year) =	1.07	af/yr
		Total =	2.21	af/yr

Existing Winery Domestic Water Demand

FT Employees – (15 gal/person/day x 365 days/yr x	25	employees/day) =	0.42	af/yr
PT Employees – (15 gal/person/day x 365 days/yr x	10	employees/day) =	0.17	af/yr
Visitors – (3 gal/person/day x 365 days/yr x	225	visitors/day) =	0.76	af/yr
Charitable Marketing Events – (149 visitors average @ 10 gpd x	4	days/year) =	0.02	af/yr
Mid-sized Marketing Events – (25 visitors average @ 10 gpd x	12	days/year) =	0.01	af/yr
		Total =	1.37	af/yr

Proposed Vineyard, Landscape and Winery Process Water Demand

Vineyard – Irrigation only – (0.5 af/ac-yr x	3.04	acres vineyard) =	1.52	af/yr
Reclaimed Process Water for Irrigation*	0.95	acre-feet/year) =	-0.95	af/yr
Landscape** – (0.5 acre feet water / 100,000 gal wine x	70,000	gal wine/year) =	0.35	af/yr
Process Water – (5 gal water / 1 gallon wine x	120,000	gal wine/year) =	1.84	af/yr
		Total =	2.77	af/yr

Proposed Winery Domestic Water Demand

FT Employees – (15 gal/person/day x 365 days/yr x	25	employees/day) =	0.42	af/yr
PT Employees – (15 gal/person/day x 365 days/yr x	10	employees/day) =	0.17	af/yr
Visitors – (3 gal/person/day x 365 days/yr x	225	visitors/day) =	0.76	af/yr
Charitable Marketing Events – (149 visitors average @ 10 gpd x	4	days/year) =	0.02	af/yr
Mid-sized Marketing Events – (25 visitors average @ 10 gpd x	12	days/year) =	0.01	af/yr
		Total =	1.37	af/yr

*See attached Irrigation Water Balance for calculation

** Landscape Irrigation unchanged, based on 70,000 GPY Production

**Reclaimed Process Wastewater
Water Balance for Irrigation and Storage**



Existing - 70,000 Gallons wine/Year

Project Description		Annual Process Waste Flow Volume	
Project Number:	4114037.0	Wine Production:	70,000 gal/year
Project Name:	ZD Wines		
Prepared By:	DOB	Annual Process Waste per Gallon Wine:	5 gal/year
Date:	June 20, 2017	Total Annual Process Waste Generated:	350,000 gal/year

Vineyard Irrigation Parameters	
Acres of irrigated vineyard:	2.40 acres
Row spacing:	10.0 feet
Vine spacing:	6.0 feet
Total number of vines:	1,742 vines
Water use per vine per month (peak):	26 gal
Total peak monthly irrigation demand:	45,302 gal

Cover Crop Irrigation Parameters	
Crop type / name:	Vineyard cover crop
Total irrigated acres of crop:	2.40 acres

Monthly Process Wastewater Generation												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly process wastewater generated as % of annual total:	4%	6%	6%	5%	6%	7%	9%	10%	14%	14%	11%	8%
Monthly process wastewater generated [gallons]:	14,000	21,000	21,000	17,500	21,000	24,500	31,500	35,000	49,000	49,000	38,500	28,000

Monthly Vineyard Irrigation Water Use												
(Based on per-vine water use)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Beginning of month reclaimed water in storage [gallons] (This number brought forward from end of previous month)	0	0	0	0	0	0	0	0	0	0	0	0
Vineyard irrigation as % of peak month irrigation demand:	6%	6%	10%	100%	100%	100%	100%	100%	100%	100%	10%	10%
Irrigation per month per vine (gallons):	1.6	1.6	2.6	26.0	26.0	26.0	26.0	26.0	26.0	26.0	2.6	2.6
Total vineyard irrigation demand [gallons]:	2,718	2,718	4,530	45,302	45,302	45,302	45,302	45,302	45,302	45,302	4,530	4,530
Will vineyard be irrigated with reclaimed water this month?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Process wastewater generated this month, reclaimed for vineyard irrigation [gallons]	2,718	2,718	4,530	17,500	21,000	24,500	31,500	35,000	45,302	45,302	4,530	4,530
Remaining vineyard irrigation demand after using this month's process water [gallons]	0	0	0	27,802	24,302	20,802	13,802	10,302	0	0	0	0
Drawdown from storage for remaining vineyard irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Well water required to satisfy remaining vineyard irrigation demand	0	0	0	27,802	24,302	20,802	13,802	10,302	0	0	0	0
Net storage after vineyard irrigation drawdown [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
This month's process wastewater, remaining after vineyard irrigation, available for landscape irrigation [gallons]	11,282	18,282	16,470	0	0	0	0	0	3,698	3,698	33,970	23,470

Water balance continues on next page for cover crop irrigation.

Monthly Cover Crop Irrigation Water Use												
(Based on evapotranspiration crop demand and irrigated area)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
This month's process wastewater, remaining after vineyard irrigation, available for cover crop irrigation [gallons] (From sheet 1)	11,282	18,282	16,470	0	0	0	0	0	3,698	3,698	33,970	23,470
Reference ET (ETo) (in/month) (see note 1)	0.93	1.68	2.79	4.20	5.58	6.30	6.51	5.89	4.50	3.10	1.50	0.93
Crop Coefficient (kc) (see note 2)	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Crop water demand per acre [inches]	0.56	1.01	1.67	2.52	3.35	3.78	3.91	3.53	2.70	1.86	0.90	0.56
Crop water demand per acre [gallons]	15,151	27,370	45,453	68,424	90,906	102,636	106,057	95,957	73,311	50,503	24,437	15,151
Total crop water demand for irrigated area [gallons]	36,362	65,687	109,087	164,218	218,175	246,327	254,537	230,296	175,948	121,208	58,649	36,362
Will cover crop be irrigated with reclaimed water this month?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Process wastewater remaining after vineyard irrigation, reclaimed for cover crop irrigation [gallons]	11,282	18,282	16,470	0	0	0	0	0	3,698	3,698	33,970	23,470
Cover Crop irrigation water required from storage or other source [gallons]	25,081	47,405	92,618	164,218	218,175	246,327	254,537	230,296	172,250	117,511	24,679	12,893
Drawdown from storage for cover crop irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Process wastewater generated this month, unused for irrigation, to be reclaimed and stored [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Net end-of-month reclaimed water storage after all irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	0

End of Water Balance

Peak Monthly Storage = 0 gallons
Annual Process Wastewater Reclaimed For Vineyard Irrigation = 239,132 gallons = 0.73 acre feet

Notes:

- Reference ETo from California Irrigation Management Information System
- Crop Coefficient from Table I of "Estimating Irrigation Water Needs of Landscape Plantings in California", University of California Cooperative Extension, August 2000.

**Reclaimed Process Wastewater
Water Balance for Irrigation and Storage**



Proposed - 120,000 Gallons wine/Year

Project Description		Annual Process Waste Flow Volume	
Project Number:	4114037.0	Wine Production:	120,000 gal/year
Project Name:	ZD Wines		
Prepared By:	DOB	Annual Process Waste per Gallon Wine:	5 gal/year
Date:	June 20, 2017	Total Annual Process Waste Generated:	600,000 gal/year

Vineyard Irrigation Parameters	
Acres of irrigated vineyard:	2.40 acres
Row spacing:	10.0 feet
Vine spacing:	6.0 feet
Total number of vines:	1,742 vines
Water use per vine per month (peak):	26 gal
Total peak monthly irrigation demand:	45,302 gal

Cover Crop Irrigation Parameters	
Crop type / name:	Vineyard cover crop
Total irrigated acres of crop:	2.40 acres

Monthly Process Wastewater Generation												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly process wastewater generated as % of annual total:	4%	6%	6%	5%	6%	7%	9%	10%	14%	14%	11%	8%
Monthly process wastewater generated [gallons]:	24,000	36,000	36,000	30,000	36,000	42,000	54,000	60,000	84,000	84,000	66,000	48,000

Monthly Vineyard Irrigation Water Use												
(Based on per-vine water use)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Beginning of month reclaimed water in storage [gallons] (This number brought forward from end of previous month)	0	0	0	0	0	0	0	0	0	0	0	2,821
Vineyard irrigation as % of peak month irrigation demand:	6%	6%	10%	100%	100%	100%	100%	100%	100%	100%	10%	10%
Irrigation per month per vine (gallons):	1.6	1.6	2.6	26.0	26.0	26.0	26.0	26.0	26.0	26.0	2.6	2.6
Total vineyard irrigation demand [gallons]:	2,718	2,718	4,530	45,302	45,302	45,302	45,302	45,302	45,302	45,302	4,530	4,530
Will vineyard be irrigated with reclaimed water this month?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Process wastewater generated this month, reclaimed for vineyard irrigation [gallons]	2,718	2,718	4,530	30,000	36,000	42,000	45,302	45,302	45,302	45,302	4,530	4,530
Remaining vineyard irrigation demand after using this month's process water [gallons]	0	0	0	15,302	9,302	3,302	0	0	0	0	0	0
Drawdown from storage for remaining vineyard irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Well water required to satisfy remaining vineyard irrigation demand	0	0	0	15,302	9,302	3,302	0	0	0	0	0	0
Net storage after vineyard irrigation drawdown [gallons]	0	0	0	0	0	0	0	0	0	0	0	2,821
This month's process wastewater, remaining after vineyard irrigation, available for landscape irrigation [gallons]	21,282	33,282	31,470	0	0	0	8,698	14,698	38,698	38,698	61,470	43,470

Water balance continues on next page for cover crop irrigation.

Monthly Cover Crop Irrigation Water Use												
(Based on evapotranspiration crop demand and irrigated area)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
This month's process wastewater, remaining after vineyard irrigation, available for cover crop irrigation [gallons] (From sheet 1)	21,282	33,282	31,470	0	0	0	8,698	14,698	38,698	38,698	61,470	43,470
Reference ET (ETo) (in/month) (see note 1)	0.93	1.68	2.79	4.20	5.58	6.30	6.51	5.89	4.50	3.10	1.50	0.93
Crop Coefficient (kc) (see note 2)	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Crop water demand per acre [inches]	0.56	1.01	1.67	2.52	3.35	3.78	3.91	3.53	2.70	1.86	0.90	0.56
Crop water demand per acre [gallons]	15,151	27,370	45,453	68,424	90,906	102,636	106,057	95,957	73,311	50,503	24,437	15,151
Total crop water demand for irrigated area [gallons]	36,362	65,687	109,087	164,218	218,175	246,327	254,537	230,296	175,948	121,208	58,649	36,362
Will cover crop be irrigated with reclaimed water this month?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Process wastewater remaining after vineyard irrigation, reclaimed for cover crop irrigation [gallons]	21,282	33,282	31,470	0	0	0	8,698	14,698	38,698	38,698	58,649	36,362
Cover Crop irrigation water required from storage or other source [gallons]	15,081	32,405	77,618	164,218	218,175	246,327	245,840	215,598	137,250	82,511	0	0
Drawdown from storage for cover crop irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Process wastewater generated this month, unused for irrigation, to be reclaimed and stored [gallons]	0	0	0	0	0	0	0	0	0	0	2,821	7,107
Net end-of-month reclaimed water storage after all irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	2,821	9,928

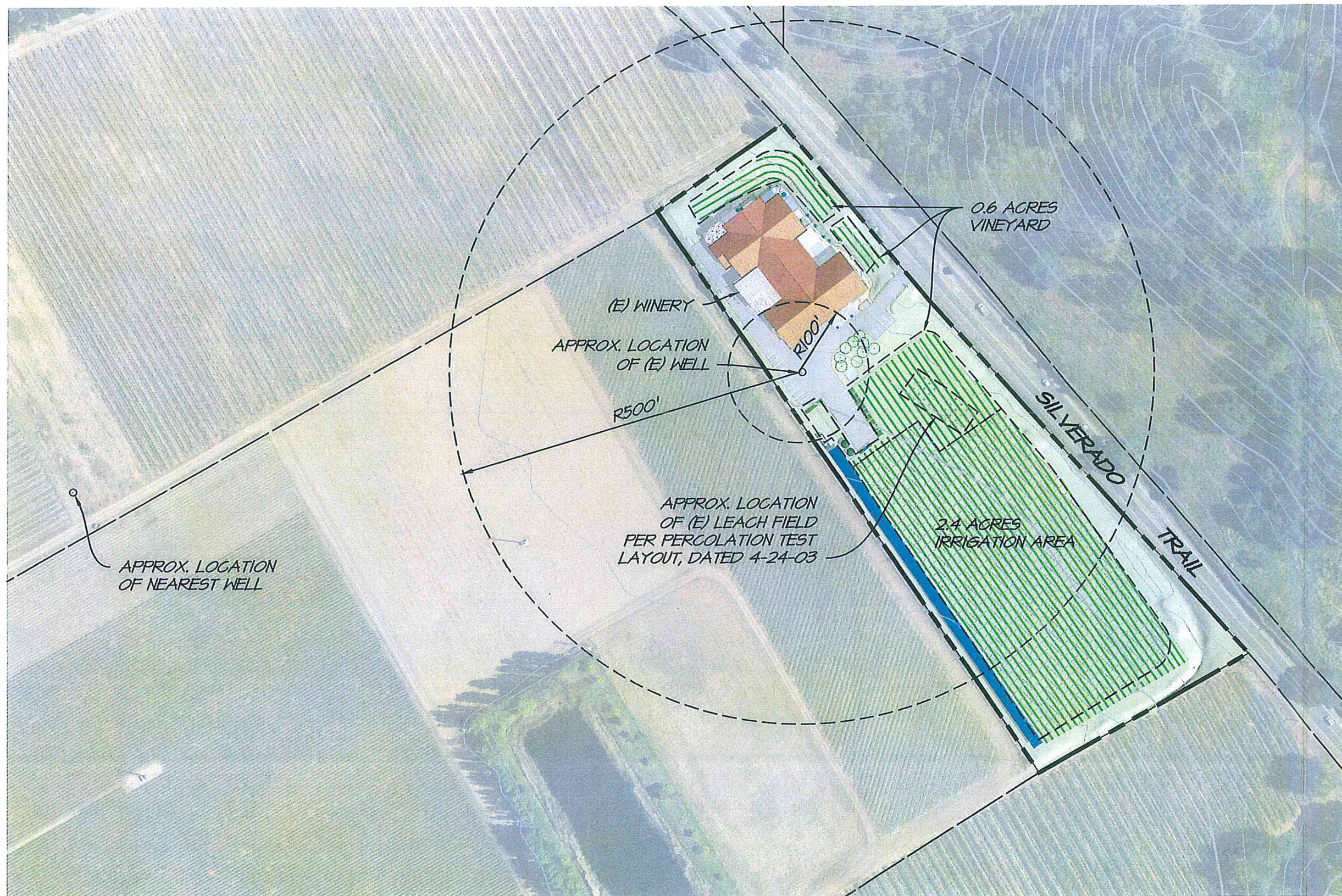
End of Water Balance

Peak Monthly Storage = 9,928 gallons
Annual Process Wastewater Reclaimed For Vineyard Irrigation = 308,237 gallons = 0.95 acre feet

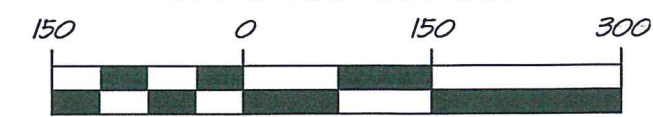
Notes:

- Reference ETo from California Irrigation Management Information System
- Crop Coefficient from Table 1 of "Estimating Irrigation Water Needs of Landscape Plantings in California", University of California Cooperative Extension, August 2000.

ZD WINES WELL & IRRIGATION MAP



GRAPHIC SCALE



(IN FEET)
1 inch = 150 FT

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