ONSITE WASTEWATER DISPOSAL FEASIBILTY STUDY

FOR

JOSEPH CELLARS WINERY

LOCATED AT:
4455 Saint Helena Highway
Calistoga, CA 94515
NAPA COUNTY APN 020-180-058

PREPARED FOR:
J Cellars Investments, LLC
c/o Joseph Bartholomew
4455 Saint Helena Highway
Calistoga, CA 94515
Telephone: (707) 812-3441

PREPARED BY:

APPLIED
CIVIL ENGINEERING
INCORPORATED

2074 West Lincoln Avenue
Napa, California 94558
Telephone: (707) 320-4968
www.appliedcivil.com

Job Number 08-158

Michael R. Muelrath 3/27/2009
Michael R. Muelrath R.C.E. 67435 Date

TABLE OF CONTENTS

LIST OF APPENDICES

INTRODUCTION

J Cellars Investments, LLC is applying for a Use Permit to construct and operate a new winery at their property located at 4455 Saint Helena Highway in Napa County, California. The subject property is located along the western side of State Route 29 (Saint Helena Highway), immediately south of Diamond Mountain Road. The subject parcel is also known as Napa County Assessor's Parcel Number (NCAPN) 020-180-058.

There is currently an existing residence / bed and breakfast on the subject parcel. Other existing improvements include a septic system, two wells, a paved driveway, approximately 8.4 acres of vineyard and the associated utility and infrastructure improvements typical of the existing residential and agricultural uses. The use permit application under consideration proposes the construction and operation of a winery with the following characteristics:

- Wine Production:
  - 30,000 gallons of wine per year
  - Full wine production including:
    - Crushing
    - Fermenting
    - Aging
    - Bottling

- Employees:
  - Four (4) full-time employees
  - Four (4) part-time employees

- Marketing Plan:
  - Daily Tours and Tastings by Appointment
    - 75 visitors per day maximum
  - Private Food and Wine Events for Trade
    - 2 per week
    - 40 guests maximum
  - Wine Auction & Release Party Events
    - 2 per year
    - 200 guests maximum

Joseph Bartholomew, on behalf of J Cellars Investments, LLC has requested that Applied Civil Engineering Incorporated (ACE) evaluate the feasibility of disposing of the winery process wastewater and the domestic sanitary wastewater that will be generated by the proposed winery via an onsite wastewater disposal system.

The existing residence / bed and breakfast is served by an existing leach line that will be removed during construction of the winery facility.

The remainder of this report describes the onsite soil conditions, the predicted process and sanitary wastewater flows and outlines the conceptual design of an onsite wastewater disposal system to serve the existing residence / bed and breakfast and the proposed winery.

SOILS INFORMATION

The United States Department of Agriculture Soil Conservation Service Soils Map for Napa County shows approximately 40 percent of the parcel, bordering State Route 29, mapped as Bale loam, 0 to 2 percent slopes and the remainder of the parcel mapped as Forward gravelly loam, 30 to 75 percent slopes.

A site specific soils analysis was conducted during a site evaluation performed by Applied Civil Engineering Incorporated on December 5, 2008. The site evaluation consisted of the excavation and observation of fifteen test pits in the western one-half of the parcel near and within the existing vineyard. During the site evaluation we discovered variable acceptable soil depths generally consisting of sandy loam, sandy clay loam and loamy course sand with moderate subangular blocky structure. Our analysis of soil texture was based on field methods and laboratory testing was not performed. Perched groundwater was not observed in any of the fifteen test pits at the time of excavation or within the following two hours. Please refer to the Site Evaluation Report in Appendix 4 for further soil information.

PREDICTED WASTEWATER FLOW

Winery Process Wastewater

We have used the generally accepted standard that six gallons of winery process wastewater are generated for each gallon of wine that is produced each year and that 1.5 gallons of wastewater are generated during the crush period for each gallon of wine that is produced. Based on the size of the winery and the expectation that both white and red wine will be produced at the winery, we have assumed a 45 day crush period. Using these assumptions, the annual, average daily and peak winery process wastewater flows are calculated as follows:

$$\text{Annual Winery Process Wastewater Flow} = \frac{30{,}000 \text{ gallons wine}}{\text{year}} \times \frac{6 \text{ gallons wastewater}}{1 \text{ gallon wine}}$$

Annual Winery Process Wastewater Flow = 180,000 gallons per year

$$\text{Average Daily Process Wastewater Flow} = \frac{180{,}000 \text{ gallons wastewater}}{\text{year}} \times \frac{1 \text{ year}}{365 \text{ days}}$$

Average Daily Winery Process Wastewater Flow = 493 gallons per day

$$\text{Peak Winery Process Wastewater Flow} = \frac{30{,}000 \text{ gallons wine}}{\text{year}} \times \frac{1.5 \text{ gallons wastewater}}{1 \text{ gallon wine}} \times \frac{1 \text{ year}}{45 \text{ crush days}}$$

Peak Winery Process Wastewater Flow = 1,000 gallons per day (gpd)

Winery Sanitary Wastewater

The peak sanitary wastewater flow from the winery is calculated based on the number of winery employees, the number of daily visitors for tours and tastings and the number of guests attending marketing events. In accordance with Table 4 of the Napa County Environmental Management Department "Regulations for Design, Construction, and Installation of Alternative Sewage Treatment Systems" we have used a design flow rate of 15 gallons per day per employee and 3 gallons per day per visitor for tours and tastings. Table 4 does not specifically address design wastewater flows for guests at marketing events. Since the applicant is proposing that full meals may be prepared onsite for marketing events with up to 40 people in attendance, we have conservatively estimated 15 gallons of wastewater per guest at marketing events. Based on these assumptions, the peak winery sanitary wastewater flows are calculated as follows:

Employees

Peak Sanitary Wastewater Flow = 8 employees X 15 gpd per employee

Peak Sanitary Wastewater Flow = 120 gpd

Daily Tours and Tastings

Peak Sanitary Wastewater Flow = 75 visitors per day X 3 gallons per visitor

Peak Sanitary Wastewater Flow = 225 gpd

Marketing Events

Peak Sanitary Wastewater Flow = 40 guests X 15 gallons per guest

Peak Sanitary Wastewater Flow = 600 gpd

Total Peak Winery Sanitary Wastewater Flow

Assuming that daily tours and tastings and a marketing event may occur on the same day, the total peak winery sanitary wastewater flow is calculated as follows:

Total Peak Winery Sanitary Wastewater Flow = 120 gpd + 225 gpd + 600 gpd

Total Peak Winery Sanitary Wastewater Flow = 945 gpd

Residential Sanitary Wastewater

The peak sanitary wastewater flow from the existing residence / bed and breakfast is calculated based on the number of potential bedrooms in the residence and the number of guests at the bed and breakfast. We understand that there are three rooms available for the bed and breakfast and one room for the residence. We have assumed two people per bedroom at the bed and breakfast.

In accordance with Napa County Code, the peak flow for single family residences is calculated as 150 gpd per bedroom for the first three bedrooms and an additional 100 gpd for each bedroom in excess of five bedrooms. Furthermore, Table 4 of the Napa County Environmental Management Department "Regulations for Design, Construction, and Installation of Alternative Sewage Treatment Systems" recommends a design flow of 75 gallons per day per person for Hotels/Motels with private bath and kitchen facilities. Based on the assumption of two people per bedroom, this also corresponds to a peak flow of 150 gallons per day per bedroom. Therefore the peak residential sanitary wastewater flow is calculated as follows:

Peak Residential Sanitary Wastewater Flow = 4 bedrooms X 150 gpd per bedroom

Peak Residential Sanitary Wastewater Flow = 600 gpd

Combined Peak Wastewater Flow

Combined Peak Wastewater Flow = Peak Winery Process Wastewater Flow + Total Peak Winery Sanitary Wastewater Flow + Peak Residential Sanitary Wastewater Flow

Combined Peak Flow = 1,000 gpd + 945 gpd + 600 gpd

Combined Peak Flow = 2,545 gpd

RECOMMENDATIONS

Based on the anticipated wastewater flows and the finding of 72 to 76 inches of acceptable sandy loam soil with a moderate subangular blocky structure in the vicinity of Test Pits #1, #2, #7 and #8, we have identified three possible scenarios for disposing of the process and sanitary wastewater generated at the subject parcel.

Option #1 – Combined Sanitary and Process Wastewater Leach Field

Option #2 – Sanitary Wastewater Leach Field and Process Wastewater Treatment for Vineyard Irrigation

Option #3 - Sanitary Wastewater Leach Field and Process Wastewater Hold and Haul

The decision about which type of wastewater disposal system to implement will be made by the property owner and the engineer at the time of building permit submittal. It should also be noted that an engineered system could be used in place of the standard leach field in any of the above options.

The following sections of this report outline the conceptual design of the wastewater disposal systems for each of these three options.

Option #1 – Combined Sanitary and Process Wastewater Leach Field

In this scenario all sanitary and process wastewater would be disposed of onsite in a standard gravity distribution type septic system.

Required Disposal Field Area

The disposal field area is calculated based upon the design hydraulic loading rate for the soil conditions and the effective trench sidewall area. Based on the findings of 72 to 76 inches of acceptable soil depth and a minimum requirement of 36 inches of undisturbed soil between the trench bottom and the limiting condition, we recommend using 36 inch deep trenches filled with 24 inches of gravel. The invert of the distribution lateral should be placed eighteen inches below existing grade, within the gravel strata. Twelve inches of native soil will be placed in the trenches above the gravel to match existing grade. This proposed trench configuration provides three square feet of sidewall area per lineal foot of trench. Based on these design parameters, the required length of trench is calculated as follows:

$$\text{Required Length of Trench} = 2{,}545 \text{ gpd} \times \frac{1 \text{ square foot}}{0.5 \text{ gpd}} \times \frac{1 \text{ lineal foot}}{4 \text{ square feet}}$$

Required Length of Trench = 1,273 lineal feet, use 1,300 lineal feet

Available Disposal Field Area

Based on the topographic map prepared by Horizon Land Surveys, ACE has determined that there is enough area to install the required 1,300 lineal feet of standard gravity distribution laterals in the vicinity of Test Pits #1 and #2. The conceptual layout of the laterals is shown on the Joseph Cellars Winery Use Permit Conceptual Site Plan prepared by ACE, dated February 2009 (see Appendix 2).

100% Reserve Area

Napa County code requires that an area be set aside to accommodate a future onsite wastewater disposal system in the event that the primary system fails. Based on the topographic map prepared by Horizon Land Surveys, ACE has determined that there is enough area to set aside for an additional 1,300 lineal feet of standard gravity distribution laterals in the vicinity of Test Pits #7 and #8.

Septic Tank Capacity

We recommend that at least two 1,500 gallon septic tanks be installed to provide a minimum of three days hydraulic retention time for peak winery process wastewater flows. Furthermore, for ease of operation and maintenance, we recommend that the sanitary wastewater flows from the winery building be kept separate from the process wastewater flows and be directed to a separate series of two 1,500 gallon septic tanks. The series of two 1,500 gallon sanitary wastewater septic tanks will provide the recommended three days of hydraulic retention time

for the sanitary wastewater flows. Furthermore, a 1,500 gallon grease interceptor should be installed to facilitate removal of fats, oils and grease from the kitchen waste stream. Effluent from the grease interceptor should be directed to the inlet of the first sanitary wastewater septic tank. Effluent from the winery process wastewater septic tanks and effluent from the winery sanitary wastewater septic tank should then join in a distribution box that will evenly distribute the effluent to the gravity distribution laterals in the disposal field. Depending on final site design parameters, a sump tank and pumping system may be required to deliver effluent from the septic tanks to the distribution box and disposal field.

The existing septic tank that serves the existing residence / bed and breakfast is located near the structure. The existing septic tank was inspected by McCollum General Engineering on December 19, 2008 and was found to be in compromised condition. We recommend that the existing septic tank be repaired or replaced with a new 1,500 gallon septic tank dedicated to serving the existing residence / bed and breakfast. Effluent from the septic tank should be directed to the effluent line for the winery wastewater downstream of the new winery septic tanks.

Option #2 – Sanitary Wastewater Leach Field and Process Wastewater Treatment for Vineyard Irrigation

In this scenario the sanitary wastewater would be disposed of in a standard septic system and the winery process wastewater would be treated, stored and used onsite for irrigation of the existing vineyards.

Required Disposal Field Area

Sanitary wastewater disposal is similar to the system described in Option #1 above, however the size of the leach field is much smaller since only the sanitary wastewater is being disposed of. The required disposal field area is calculated as follows:

$$\text{Required Length of Trench} = 1{,}545 \text{ gpd} \times \frac{1 \text{ square foot}}{0.5 \text{ gpd}} \times \frac{1 \text{ lineal foot}}{4 \text{ square feet}}$$

Required Length of Trench = 773 lineal feet, use 800 lineal feet

Available Disposal Field Area

There is enough area to install the required 800 lineal feet of standard gravity distribution laterals in the vicinity of Test Pits #1 and #2.

100% Reserve Area

There is enough area to set aside for an additional 800 lineal feet of standard gravity distribution laterals in the vicinity of Test Pits #1 and #2 or #7 and #8.

Septic Tank Capacity

Sanitary wastewater septic tank requirements in this scenario are the same as previously described in Option #1 above.

Process Wastewater Treatment

Based on the winery's planned production level we recommend that treatment be achieved through the use of a package plant type system or other treatment system designed to accept winery process wastewater that is capable of meeting the following treatment requirements:

Parameter	Pre-treatment*	Post Treatment**
pH	3 to 10	6 to 9
BOD_5	500 to 12,000 mg/l	<160 mg/l
TSS	40 to 800 mg/l	<80 mg/l
SS	25 to 100 mg/l	<1 mg/l

* Reference California Regional Water Quality Control Board Central Coast Region General Waste Discharge Requirements Order No. R3-2008-0018 for winery process wastewater characteristics

** Required for discharge to land via surface irrigation by Napa County Environmental Management Department for samples taken at the discharge of the treatment unit.

Process Wastewater Disposal

We propose that disposal of the treated winery process wastewater be via irrigation of the existing onsite vineyard. The existing vineyard totals approximately 8.4 ± acres; however, approximately 0.4 acres will be displaced by the winery development and an additional 1 ± acre lies within well and stream setbacks. For the purpose of this study we have assumed that 7± acres of vineyard will be irrigated with the treated winery process wastewater. All application of treated winery process wastewater must comply with the requirements of the Napa County Environmental Management Department Winery Process Wastewater Guidelines for Surface Drip Irrigation.

In order to accommodate differences in the timing of wastewater generation and the irrigation demand, a storage tank will be required. We have prepared a water balance calculation to size a tank that will temporarily store wastewater generated at the winery before it is applied to the vineyard. The water balance calculation assumes a monthly wastewater generation rate and a monthly vineyard irrigation schedule based on our past experience with projects of this type. The water balance calculations show that the storage tank should have a minimum capacity of approximately 42,000 gallons (see Appendix 3).

Option #3 – Sanitary Wastewater Leach Field and Process Wastewater Hold and Haul

In this scenario the sanitary wastewater would be disposed of in a standard septic system and the winery process wastewater would be temporarily stored and then would be hauled offsite for treatment and disposal by the Napa Sanitation District, East Bay Municipal Utility District or a similar municipal wastewater treatment plant.

Required Disposal Field Area

Sanitary wastewater disposal is the same as that described in Option #2 above.

Winery Process Wastewater Disposal

The winery process wastewater hold and haul system must be designed to hold at least seven days of peak flow (7,000 gallons), have a water level alarm and be designed and constructed in accordance with the requirements outlined in the Napa County Environmental Management Department Hold and Haul for Winery Process Wastewater Management information sheet.

CONCLUSION

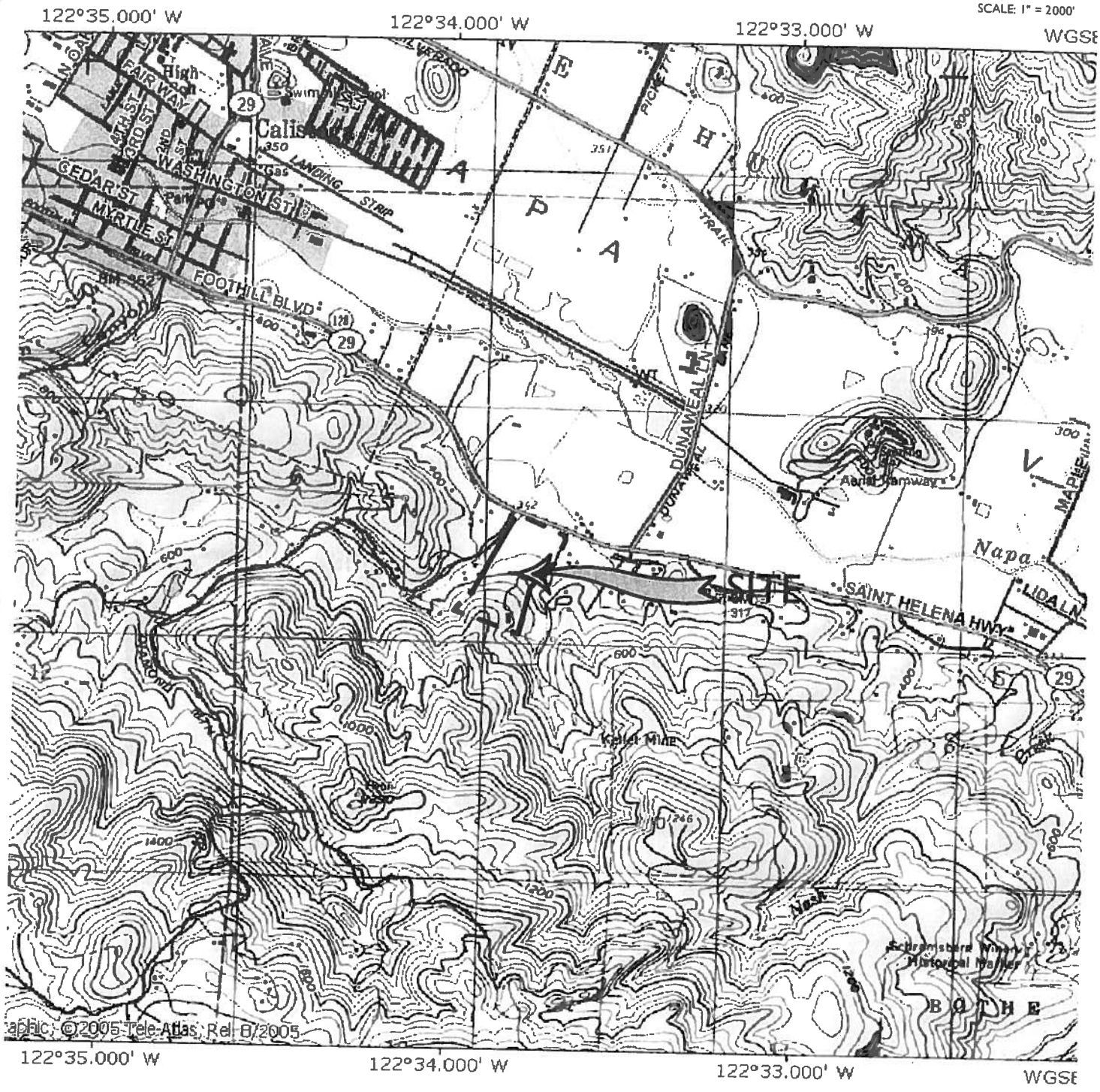
It is our opinion that the wastewater from the existing residence / bed and breakfast and the proposed winery can be accommodated in any of the three options previously described. Full design calculations and construction plans for the wastewater system(s) should be prepared in accordance with Napa County Environmental Management Department standards at the time of building permit application.

APPENDIX 1: Site Topography Map

SITE TOPOGRAPHY MAP

REPRESENTS A PORTION OF THE USGS 7.5 MINUTE QUADRANGLE "CALISTOGA"
REPRODUCED FROM NATIONAL GEOGRAPHIC TOPO!
OUTDOOR RECREATION MAPPING SOFTWARE

SCALE: 1" = 2000'



APPLIED CIVIL ENGINEERING

JOSEPH CELLARS WINERY

4455 SAINT HELENA HIGHWAY
CALISTOGA, CA 94515
APN 020-180-058

JOB NO. 08-158

MARCH 2009

APPENDIX 2: Joseph Cellars Winery Use Permit Conceptual Site Plan

APPENDIX 3: Water Storage Tank Calculations

Irrigation Storage Tank Water Balance

Month	Beginning Balance	Process Wastewater	Vineyard Irrigation	Ending Balance
January	9,000	7,200	0	16,200
February	16,200	9,000	0	25,200
March	25,200	9,000	0	34,200
April	34,200	7,200	0	41,400
May	41,400	7,200	171,518	0
June	0	9,000	285,863	0
July	0	10,800	285,863	0
August	0	27,000	171,518	0
September	0	32,400	114,345	0
October	0	27,000	114,345	0
November	0	25,200	60,984	0
December	0	9,000	0	9,000
		180,000	1,204,434	

Notes:

1. All values shown above for beginning balance, inflow, outflow and ending balance are in units of gallons.
2. See attached tables for detailed explanation of process wastewater and irrigation data presented in this table.
3. This water balance is based on the assumption that the tank is empy in August, just prior to crush.
4. Where irrigation demand exceeds availble treated wastewater availability additional irrigation water will be provided by a well.

Winery Process Wastewater Generation Analysis

Annual Wine Production	30,000 gallons
Wastewater Generation Rate	6 gallons per gallon of wine
Annual Wasewater Generation	180,000 gallons
Crush Season Length	45 days
Wastewater Generated During Crush	1.5 gallons per gallon of wine
Peak Wastewater Generation Rate	1,000 gallons per day

Winery Process Wastewater Generation Table			
Month	Percentage of Annual Total	Monthy Flow (gallons)	Average Flow (gpd)
January	4.0%	7,200	232
February	5.0%	9,000	321
March	5.0%	9,000	290
April	4.0%	7,200	240
May	4.0%	7,200	232
June	5.0%	9,000	300
July	6.0%	10,800	348
August	15.0%	27,000	871
September	18.0%	32,400	1,080
October	15.0%	27,000	871
November	14.0%	25,200	840
December	5.0%	9,000	290
Total	100.0%	180,000	

Notes:

1. Wastewater generation rates and monthly proportioning are based on our past experience with similar projects and input from the winery management team.

Irrigation Schedule Analsysis

Vineyard Information:

Total acres of vines	7 acres
Vine Row Spacing	10 feet
Vine Spacing	6 feet
Vine density	726 vines per acre
Total Vine Count	5,082 vines

Irrigation Information:

Seasonal Irrigation[2]	225.0 gallons per vine (May through October)
Non-Irrigation Application	12 gallons per vine (November)

Irrigation Schedule					
Month	Monthly Percentage	Irrigation per Vine (gallons)	Irrigation (gallons)	Non-Seasonal Irrigation Application (gallons)	Total (gallons)
January		0.0	0	0	0
February		0.0	0	0	0
March		0.0	0	0	0
April		0.0	0	0	0
May	15%	33.8	171,518	0	171,518
June	25%	56.3	285,863	0	285,863
July	25%	56.3	285,863	0	285,863
August	15%	33.8	171,518	0	171,518
September	10%	22.5	114,345	0	114,345
October	10%	22.5	114,345	0	114,345
November		0.0	0	60,984	60,984
December		0.0	0	0	0
Total	100%	225.0	1,143,450	60,984	1,204,434

Notes:

1. Irrigation per vine is based on 0.5 acre-feet per acre of vines per Napa County guidelines.

Monthly vineyard irrigation percentages are based on our past experience with projects of this type.

Napa County Department of Environmental Management

SITE EVALUATION REPORT

Please attach an 8.5" x 11" plot map showing the locations of all test pits triangulated from permanent landmarks or known property corners. The map must be drawn to scale and include a North arrow, surrounding geographic and topographic features, direction and % slope, distance to drainages, water bodies, potential areas for flooding, unstable landforms, existing or proposed roads, structures, utilities, domestic water supplies, wells, ponds, existing wastewater treatment systems and facilities.

Permit #:E08-00647
APN: 020-180-058
(County Use Only) Reviewed by: Date:

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner J Cellars Investments, LLC	X New Construction ☐ Addition ☐ Remodel ☐ Relocation ☐ Other:
Property Owner Mailing Address 4455 St. Helena Highway	☐ Residential - # of Bedrooms: Design Flow : gpd
City: Calistoga State: CA Zip: 94515	X Commercial – Type: Winery Sanitary Waste: 750 to 1,000 gpd Process Waste: 750-1,000 gpd
Site Address/Location 4455 St. Helena Highway Calistoga, CA 94515	☐ Other: Sanitary Waste: gpd Process Waste: gpd

Evaluation Conducted By:

Company Name Applied Civil Engineering Incorporated	Evaluator's Name Michael R. Muelrath, R.C.E. 67435	Signature (Civil Engineer, R.E.H.S., Geologist, Soil Scientist) Michael R Muelrath
Mailing Address: 2074 West Lincoln Avenue		Telephone Number (707) 320-4968
City: Napa State: CA Zip: 94558		Date Evaluation Conducted December 5, 2008

Primary Area

Acceptable Soil Depth: 72 to 76 inches Test pit #'s: 1 & 2

Soil Application Rate (gal. /sq. ft. /day): 0.5

System Type(s) Recommended: Standard

Slope: 0 to 5 % Distance to nearest water source: 100+ feet

Hydrometer test performed? No X Yes ☐ (attach results)

Bulk Density test performed? No X Yes ☐ (attach results)

Percolation test performed? No X Yes ☐ (attach results)

Groundwater Monitoring Performed? No X Yes ☐ (attach results)

Expansion Area

Acceptable Soil Depth: 78 to 84 inches Test pit #'s: 5 & 6

Soil Application Rate (gal. /sq. ft. /day): 0.5

System Type(s) Recommended: Standard

Slope: 0 to 5% Distance to nearest water source: 100+ feet

Hydrometer test performed? No X Yes ☐ (attach results)

Bulk Density test performed? No X Yes ☐ (attach results)

Percolation test performed? No X Yes ☐ (attach results)

Groundwater Monitoring Performed? No X Yes ☐ (attach results)

Site constraints/Recommendations:

Test Pits #1 though #13 were excavated to locate a primary and reserve area for a septic system to serve a new winery.

Test Pits #14 & #15 were excavated in the vicinity of the existing septic system serving the existing bed and breakfast.

Test Pit #5 should be used as the northern most limit of area with acceptable soil to 78 inches. The north end of Test Pit #5 revealed >50% rock at 24 inches.

A 70 foot setback must be maintained from the centerline of the right of way of State Route 29.

A 100 foot setback must be maintained from the top of bank of the creek located immediately north of the property and all wells.

We recommend a standard gravity type septic system in the vicinity of Test Pits #1 and #2. The reserve area can be located in the vicinity of Test Pits #5 & #6. The application rate should be 0.5 gallons per square foot per day. Other types of engineered systems would be suitable for these areas as well and may yield a smaller footprint.

APPENDIX 4: Site Evaluation Report and Test Pit Map

Test Pit #1

PLEASE PRINT OR TYPE ALL INFORMATION

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-36	G	<15	SL	MSB	S	VFRB	NS	CF/FM	CF/FM	NONE
36-76		15-30	SL	MSB	S/SH	VFRB	NS	CF	CF/FM	NONE

Test Pit #2

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-24	G	<15	SL	MSB	S	VFRB	NS	CF/FM	FF/FM	NONE
24-72		15-30	SL	MSB	S/SH	VFRB	NS	CF	FF	NONE

Test Pit #3

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-48	C	<15	SL	MSB	S	VFRB	NS	CF/FM	CF/FM	NONE
48-78		30-50	LCS	SG	S	VFRB	NS	CF/FM	FF/FM	NONE

Test Pit #4

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-24	G	<15	SL	MSB	S	VFRB	NS	CF/FM	FF/FM	NONE
24-72		30-50	LCS	SG	S	VFRB	NS	CF/CM	FF/FM	NONE

Test Pit #5

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-56	C	0-15	SL	MSB	S	VFRB	NS	CF/CM	CF/FM	NONE
56-78		30-50	SL	MSB	S	VFRB	NS	CF/CM	FF/FM	NONE

Test Pit #6

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-60	G	<15	SL	MSB	S	VFRB	NS	CF/FM	CF/FM	NONE
60-84		<15	SL	MSB	S/SH	VFRB	NS	CF/CM	FF	NONE

Test Pit #7

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-48	G	<15	SL	MSB	S	VFRB	NS	CF/FM	CF/FM	NONE
48-76		<15	SL	MSB	S/SH	VFRB	NS	CF/CM	CF	NONE

Test Pit #8

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-36	C	<15	SL	MSB	S	VFRB	NS	CF/FM	FF/FM	NONE
36-60	G	15-30	SL	MSB	S/SH	VFRB	NS	CF/CM	FF/FM	NONE
60-72		30-50	LCS	SG	S	VFRB	NS	CF	FF	NONE

Test Pit #9

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-24	C	15-30	SCL	MSB	SH	VFRB	SS	CF	CF/FM	NONE
24-60		>50								

Test Pit #10

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-42	G	<15	SL	MSB	S	VFRB	NS	CF/FM	CF/FM	NONE
42-56	C	30-50	LCS	SG	S	VFRB	NS	CF/CM	FF/FM	NONE
56-72		15-30	SL	MSB	S	VFRB	NS	CF/CM	FF/FM	NONE

Test Pit #11

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-30	C	<15	SL	MSB	S	VFRB	SS	CF/FM	FF/FM	NONE
30-72		>50								

Test Pit #12

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-24	C	<15	SL	MSB	S	VFRB	NS	CF/FM	FF	NONE
24-36	C	30-50	LCS	SG	S	VFRB	NS	CF/CM	FF/CM	NONE
36-72	G	<15	SL	MSB	S	VFRB	NS	CF/FM	FF/FM	NONE
72-76		>50								

Test Pit #13

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-54	G	<15	SL	MSB	S	VFRB	NS	CF/FM	CF/FM	NONE
54-60		>50								

Test Pit #14

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-24	C	<15	SCL	MSB	SH	VFRB	SS	CF/CM	CF/FM	NONE
24-48	C	15-30	LCS	SG	S	VFRB	NS	CF/FM	CF	NONE
48-60		>50								

Test Pit #15

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-24	C	<15	SCL	MSB	SH	VFRB	SS	CF/CM	CF	NONE
24-36	C	15-30	LCS	SG	S	VFRB	NS	CF/FM	FF	NONE
36-60	G	15-30	SL	MSB	S	VFRB	NS	CF/CM	FF	NONE
60-72		30-50	SL	MSB	S	VFRB	NS	CF/CM	FF	NONE

LEGEND

Boundary	Texture	Structure	Consistence			Pores	Roots	Mottling
			Side Wall	Ped	Wet	Quantity:	Quantity:	Quantity:
A=Abrupt <1" C=Clear 1"-2.5" G=Gradual 2.5"-5" D=Difuse >5"	S=Sand LS=Loamy Sand LCS=Loamy Course Sand SL=Sandy Loam SCL=Sandy Clay Loam SC=Sandy Clay CL=Clay Loam L=Loam C=Clay SiC=Silty Clay SiCL=Silty Clay Loam SiL=Silt Loam Si=Silt	W=Weak M=Moderate S=Strong G=Granular Pl=Platy Pr=Prismatic C=Columnar B=Blocky AB=Angular Blocky SB=Subangular Blocky M=Massive SG=Single Grain CEM=Cemented	L=Loose S=Soft SH=Slightly Hard H=Hard VH=Very Hard ExH=Extremely Hard	L=Loose VFRB=Very Friable FRB=Friable F=Firm VF=Very Firm ExF=Extremely Firm	NS=NonSticky SS=Slightly Sticky S=Sticky VS=Very Sticky NP=NonPlastic SP=Slightly Plastic P=Plastic VP=Very Plastic	F=Few C=Common M=Many Size: VF=Very Fine F=Fine M=Medium C=Coarse VC=Very Coarse	F=Few C=Common M=Many Size: F=Fine M=Medium C=Coarse VC=Very Coarse ExC=Extremely Coarse	F=Few C=Common M=Many Size: F=Fine M=Medium C=Coarse Contrast: Ft=Faint D=Distinct P=Prominent

Notes:
Structure is recorded as Modifier then Structure - for example, Moderate (M) Subangular Blocky (SB) is recorded as MSB
Pores and Roots are recorded as Quantity then Size – for example Few (F) Coarse (C) is recorded as FC
Mottling is recorded as Quantity then Size then Contrast – for example Few (F) Coarse (C) Distinct (D) is recorded as FCD