"I"

Wastewater Studies

I. INTRODUCTION

This project is requesting a Use Permit to establish a new winery on a 24.68 acre parcel located at 1016 Dunaweal Lane by owners and applicants Rich and Carolyn Czapleski. The winery will include conversion of the ground floor of the existing barn/office to a 925 square-foot winery, construction of a covered outdoor crush pad, uncovered pad for tank storage and loading/unloading of supplies and materials, and outdoor tasting area. Other improvements include widening of a gravel road, construction of 4 parking spaces including an accessible space, and construction of a fire pump house/trash enclosure.

This report has been prepared to evaluate the feasibility of constructing a wastewater disposal system(s) to serve both domestic and process wastewater for the proposed facilities.

Based on the proposed marketing plan for the winery, the maximum number of winery staff on-site on any given day is estimated to be three (3) full-time employees and one (1) part-time employee during harvest.

In addition to the employees, the winery marketing plan allows for up to ten (10) visitors per day in addition to winery special events. To limit the size of the proposed domestic wastewater system, special events will use portable toilets and outside catering. The following special events are proposed in the marketing plan:

- *Wine Club/Release Events – 4/Year with up to 75 guests each*
- *Special Auction-related Event – 2/Year with 100 guests each*

This report presents a preliminary plan for treating and dispersing the wastewater generated from the proposed winery production and hospitality buildings.

All plumbing fixtures in the approved winery shall be low flow, water-saving fixtures per the Uniform Plumbing Code as adopted by the Napa County Building Department.

II. WINERY DOMESTIC WASTEWATER FLOW

A. Wastewater Generation

The domestic wastewater (DW) generated at Canard Vineyard is dependent on the daily number of employees and visitors present at the winery. The marketing plan, as presented in the Introduction of this report determines the maximum number of guests the winery is permitted to serve in one day, as well as the maximum number of permanent employees that the winery needs to functionally operate. In terms of wastewater generation, this gives the maximum number of people that will be contributing to the daily peak wastewater flow rate.

B. Estimating Wastewater Quantity

To calculate the daily peak DW flow rates generated at Canard Vineyard, the maximum number of people present at the site, as well as the amount of wastewater each person will generate, must be estimated. The marketing plan proposes a total of 4 employees and 10 daily visitors. Napa County estimates the wastewater generated by visitors is 3 gallons per day per person, and 15 gallons per day per employee[1].

The peak effluent generated in a day will occur when the winery requires four (4) employees on staff and receives ten (10) visitors a single day. *Based on this combination, the peak daily domestic wastewater flow is 90 gallons per day.* For design purposes, this shall be taken as the minimum daily flow considered for storage and treatment requirements.

C. Estimating Wastewater Quality

The quality of domestic wastewater generated at a winery is similar to wastewater generated from a residence. The main effluent quality parameters that must be estimated from a winery's wastewater are the 5-day Biochemical Oxygen Demand (BOD5) and the Total Suspended Solids (TSS). The BOD5 concentration is a measurement used to estimate the amount organic matter present in wastewater. The TSS concentration is a measure of solid particles that have not yet settled out of the wastewater. Several additional wastewater constituents must also be estimated, as they have a direct correlation with the treatment processes used to reduce BOD5 and TSS concentrations. Fats, oils, and grease (FOG) will likely be discharged to the sewer system, and can damage the biological processes that take place in wastewater treatment. The total dissolved solids (TDS) present in wastewater can be an indicator for cleaning agents, which can affect the pH balance and destroy the bacteria that reduce organic matter in wastewater. The pH value affects bacteria that consume organic matter in the wastewater. The dissolved oxygen (DO) level can tell wastewater treatment operators that the bacteria need more or less oxygen in order to consume and reduce organic matter present in the wastewater. In addition to oxygen, bacteria need nitrogen to fuel their consumption of organic matter. The total nitrogen concentration in wastewater will alert wastewater treatment operators to how much nitrogen they need to add to the wastewater in order for bacteria to most efficiently consume organic matter. If a high level of wastewater treatment is required, it is important to know the type and amount of harmful bacteria and pathogens that are present in the effluent so the most appropriate form of disinfection can be applied. In domestic wastewater, fecal coliform's are extremely prevalent, and are detrimental to human health. **Table 1** provides a description of the expected strength of each wastewater constituent.

Table 1: Typical Domestic Wastewater Values

Constituent	Unit	Domestic
FOG	Mg/L	31-164
BOD5	Mg/L	110-400
TSS	Mg/L	100-350
TDS	Mg/L	280-850
Nitrogen (total as N)	Mg/L	20-85
Total Coliform	MPN/100 mL	10^7-10^8
Fecal Coliform	MPN/100 mL	10^4-10^5

[1] Napa County Regulations for Design, Construction, and Installation of Alternative Sewage Treatment Systems, Appendix 1, Table 4, 2006.

III. WINERY PROCESS WASTEWATER FLOW

A. Production Methods

Winery wastewater outflow and strength varies throughout the winemaking year. A typical winemaking year begins with harvest preparation and harvest. These events occur during the months of August, September, and October. The harvest season typically generates both the largest volume and maximum strength of process wastewater. A breakdown of the different winemaking phase's are detailed below.

Harvest and Crush – As previously mentioned, a winery will harvest and crush its fruit during the months of August, September, and October. Once the grapes have reached maturity, the fruit will be separated from the stems, and crushed to collect the juice for fermentation. Floor drains typically collect the juice, stems, seeds, and skins that are washed off of the equipment in the crush process. Grate covers on the drains can prevent larger solids from entering the wastewater system, but seeds and skins can often enter the primary wastewater tank.

Fermentation – Juice from crush is collected and stored in tanks for fermentation. Yeast will be added to the juice in order for sugar to be converted to alcohol. The fermentation process can take anywhere from one to three weeks to complete. Once the fermentation process is complete, the wine will be drained from the tank into barrels for aging. Wine drained from the fermentation tanks will carry excess skins and seeds into the barrel. The remaining solids, known as pomace, will remain at the bottom of the tank. If desired by the winemaker, the pomace can be pressed to produce more wine with different characteristics for the blending process. The remaining solids will be disposed of at a solid waste facility. The empty fermentation tanks and pomace bins will be washed out with a combination of water and sodium hydroxide or potassium hydroxide. These additives can reduce the pH of the wastewater, and contribute to the total dissolved solids (TDS) concentration.

Clarification and Racking – Due to the excess grape skins and seeds carried over from the fermentation tanks, wine can have a high concentration of suspended solids directly after fermentation. These solids are called "lees" and are allowed to settle in the barrel during the aging process. To improve the clarity and quality of the wine, the liquid will be removed from the initial barrel, and placed in a new barrel that is free of settled solids. This process is called "racking" and will often occur several times through the wine aging process, which can last for several years. The first racking will most likely occur between the months of November and January. The lees that are washed out of barrels after the first racking are known as "gross lees." Gross lees represent the largest solid particles collected during the racking process. Responsible wineries will de-water the gross lees, and dispose of the solids off-site. However, lees are often washed out of barrels and allowed to drain to the process wastewater system due to their high water content. Wastewater generated from this process will typically have very high total suspended solids (TSS) content, and a very high biological oxygen demand (BOD). Additionally, tartaric acid can be added to the wine to adjust the acidity. Process wastewater generated by racking after pH treatment can negatively affect the natural biological treatment process in the primary wastewater tanks. As clarification and racking are part of the process used to "age" wine, it is possible for wastewater to be generated by this phase year round.

Filtering and Bottling – Wine that has reached the end of its aging process will be filtered and bottled. This process can occur throughout the year due to wine types aging at different rates and the winery's production schedule. The wine storage barrels will often be washed and reused. Equipment used for bottling will be washed on a daily basis. The wastewater strength at this stage of the wine making process is typically much lower than the previous three stages of winemaking.

B. Estimating Wastewater Quantity

As every individual winery incorporates differing winemaking methods and equipment, the actual annual wastewater produced varies for each winery. The amount of wine produced in one year is the most important part in estimating a specific winery's wastewater generation. Once a winery determines the volume of wine they will produce, various factors can be applied to estimate the wastewater that will be generated from production. Furthermore, it is very important to estimate the peak volume of wastewater that can be generated in one day. Undersized storage tanks and pumps can lead to the costly failure of wastewater treatment systems, and halt the production process. Two methods are currently used by the local wastewater engineering consultants to determine both the annual and daily peak process wastewater flows generated from a winery. The Napa County Method is used to estimate the peak wastewater flow that could occur in one day during harvest. The Industry Method estimates the annual wastewater generation, then distributes a percentage of that flow to each month based on the seasonal behaviors of winemaking. The daily peak flow is then estimated by dividing the volume of wastewater generated during the peak month by the number of days in the month. The Industry Method generally produces a more realistic estimate of wastewater flows. This report will analyze and compare both methods to determine the volume of process wastewater produced. However, The Industry Method will be used to estimate the quantity of wastewater generated at Canard Vineyard.

Napa County Method

The Napa County Method focuses on determining the maximum daily flow a wastewater system would be required to treat. This method uses two base assumptions: the amount of process wastewater generated annually is only distributed during harvest period, and a multiplication factor of 1.5 is used for process waste generation. The harvest period, shown in **Table 2** below, is divided into days that grapes are crushed based on annual production in order to obtain a flow rate in gallons per day (GPD).

Table 2: Napa Method: Crush Days

Annual Wine Production (gallons)	# of Crush Days
<20,000	30
20,000-50,000	45
>50,000	60

Based on the projected wine production (10,000 gallons), the multiplication factor (1.5), and the number of crush days (30) that wastewater generation is distributed over, the Napa Method estimates a process wastewater (PW) peak harvest flow of 500 GPD (see Appendix 1).

Industry Method
The Industry Method uses a ratio of 4-12 gallons of PW generated per gallon of finished wine produced to determine the annual PW volume produced. The ratio depends on the water conservation techniques utilized within each individual winery. In rare cases, if the winery is water conscious, the ratio can be as low as 4. For a typical winery, the ratio is higher. For Canard Vineyard, a value of 8 gallons of PW per gallon of wine is analyzed. The next step in estimating wastewater quantity is to determine the peak daily flow. The annual estimated PW is broken down into monthly percentage flows. This method attempts to consider the winery operations, which vary by month depending on the winemaking season. For example, with this method, the percentages increase for the harvest months and the percentages decrease for the non-harvest months.

Based on the annual wine production of 10,000 gallons of wine and 8 gallons of PW generated per gallon of wine, the Industry Method estimates 80,000 gallons of PW produced annually. **Table 3** shows the percentage breakdown for monthly and daily flows. This table is located in the 'Wastewater Flow Generation' page of the Water Balance Spreadsheet, found in **Appendix 1**.

Table 3: Monthly Process Wastewater Flows

Month	Day/mo	Estimated % of PW	Monthly PW Flow (gallons)	Average Daily PW Flow (gallons)	Month
Jan	31	6%	5,700	180	Jan
Feb	28	6%	5,700	200	Feb
Mar	31	7%	6,650	210	Mar
Apr	30	7%	6,650	220	Apr
May	31	7%	6,650	210	May
Jun	30	6%	5,700	190	Jun
Jul	31	6%	5,700	180	Jul
Aug	31	12%	11,400	370	Aug
Sep	30	15%	14,250	480	Sep
Oct	31	15%	14,250	460	Oct
Nov	30	7%	6,650	220	Nov
Dec	31	6%	5,700	180	Dec
	TOTAL	100%	95,000		
			Peak Average Daily Flow:	480	gpd
				Sep	

Based on Table 3 above, the peak daily process waste flow is 480 gallons. This peak value is used in the feasibility analysis for this report.

C. Estimating Wastewater Quality

The effluent strength parameters for all wineries vary throughout the year as different processes take place in each stage of the winemaking process. Furthermore, the strength of effluent at each individual winery can vary due to differences in the winemaker's technique and philosophy. The main effluent quality parameters that must be estimated from a winery's wastewater are the 5-day Biochemical Oxygen Demand (BOD5) and the Total Suspended Solids (TSS), as the concentrations of these constituents are regulated by both the Bay Area Water Quality Control Board and Napa County. The

BOD5 concentration is a measurement used to estimate the amount organic matter present in wastewater. The typical BOD5 concentration of raw winery wastewater is 5,000 mg/L[4]. The TSS concentration is a measure of solid particles that have not yet settled out of the wastewater.

Several additional wastewater constituents must also be estimated, as they have a direct correlation with the treatment processes used to reduce BOD5 and TSS concentrations. The total dissolved solids (TDS) present in wastewater can be an indicator for the amount of additives used to clean winery equipment, which can affect the pH balance and destroy the bacteria that reduce organic matter in wastewater. The pH value affects bacteria that consume organic matter in the wastewater. The dissolved oxygen (DO) level can tell wastewater treatment operators that the bacteria need more or less oxygen in order to consume and reduce organic matter present in the wastewater. In addition to oxygen, bacteria need nitrogen to fuel their consumption of organic matter. The nitrogen concentration in wastewater will alert wastewater treatment operators to how much nitrogen they need to add to the wastewater in order for bacteria to most efficiently consume organic matter. Fortunately, the presence of fecal coliform's and other pathogens are not detectable in process waste, and will not be considered a constituent of concern. The following table provides a range of the expected strength of each wastewater constituent throughout the winemaking year.

Table 4: Typical Process Wastewater Values

Constituent	Unit	Peak Season[a]	Off Season[b]
PH		3.8-7.8	3.8-7.8
BOD5	Mg/L	5,000	1,000
TSS	Mg/L	57-3,950	12-400
TDS	Mg/L	315-1,240	214-720
Nitrate	Mg/L	0.63-362	0.23-53
Ammonia	Mg/L	2.25	
D.O.	Mg/L	2.3-6.3	2.3-6.3

[a] Peak season runs from September through March

[b] Off season runs from April to August

IV. SITE EVALUATION

A site evaluation is required to determine available on-site areas for subsurface dispersal of wastewater generated from the winery. Delta Consulting & Engineering completed a site evaluation on June 11, 2015 to locate applicable soils for a proposed wastewater dispersal area on the property. Four (4) test pits were excavated in two different areas of the vineyard, Area 1 and 2. The intent of the separate areas was to identify an area for a primary dispersal field (Area 1) as well as the required reserve area (Area 2). The site evaluation denoting the test pit locations and soil findings can be found in **Appendix 2** of this report.

Test Pits 1 and 2 (Area 1) contained sufficient soil depth to support a standard gravity leach field. The application (infiltration) rate of the soil in this area is recommended to be 0.25 gallons per square foot per day.

Due to the limited depth of Test Pit 3 in Area 2, the only available wastewater system type for the reserve area is a sub-surface drip engineered wastewater system. The application (infiltration) rate of the soil in this location for this system type is recommended to be 0.6 gallons per square foot per day.

V. WASTEWATER TREATMENT SYSTEM

The proposed system design handles the domestic and process wastewater separately, and disperses effluent into separate standard leach lines.

A. Domestic Wastewater

The domestic wastewater from the winery is to be treated via a standard septic tank (primary treatment) with final disposal via gravity to leach lines. The primary treatment system shall be equipped with effluent filters and will treat and remove settleable solids to acceptable concentration levels.

The disposal area for the domestic wastewater is proposed to be located in Area 1 as identified in the site evaluation. Based on the soils within Area 1, an application rate of 0.25 gal/ft²/day is used for the design of the domestic wastewater system.

Required Leach Line Length:

$$linear\ feet\ of\ leach\ line : \frac{90 gpd}{0.25 gal / ft^2} = 360\, ft^2 \div 4 \frac{ft^2}{ft} = 90 lf$$

The primary disposal area shall consist of 90 linear feet of leach line located in Area 1 as specified in the Site Evaluation Report found in **Appendix 2**.

Following is a schematic of the proposed domestic wastewater treatment system:

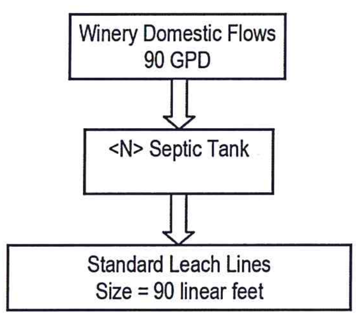

Figure 1: Conventional Domestic Wastewater Treatment System Schematic

B. Process Wastewater - Primary Treatment

Primary treatment provides partial removal of TSS and BOD through the gravitational settling of solids, as well as a small amount of biological treatment. Raw wastewater will flow via gravity from various sources throughout the site into a septic tank system. All septic tanks are to be equipped with an effluent filter. Within the septic tanks, solids will settle out of solution, and the remaining wastewater will continue to gravity flow to the next step of the treatment process. Detention time in the holding tank plays a large factor in reduction of TSS and BOD. In general, a longer detention time means more reduction of pollutants.

The strength of process wastewater is generally not reduced to the same extent as domestic wastewater. The reduction of BOD5 is typically below 30%, and depends on the detention time.

C. Process Wastewater - Secondary Treatment

The semi-treated effluent will enter into a secondary treatment, consisting of a single tank with two areas: an aeration portion and a secondary settline portion. The BOD level shall be reduced by 95% to less than 300 mg/L and the TSS shall be reduced to less than 300 mg/L prior to entering the standard leach lines.

D. Process Wastewater Disposal – Primary Area

The disposal area for the process wastewater is proposed to be located in Area 1 as identified in the site evaluation. Based on the soils within Area 1, an application rate of 0.25 gal/ft²/day is used for the design of the domestic wastewater system.

Required Leach Line Length:

$$linear\ feet\ of\ leach\ line: \frac{480\,gpd}{0.25\,gal/ft^2} = 1{,}920\,ft^2 \div 4\frac{ft^2}{ft} = 480\,lf$$

The primary disposal area shall consist of 480 linear feet of leach line located in Area 1 as specified in the Site Evaluation Report found in **Appendix 2**.

Following is a schematic of the proposed domestic wastewater treatment system:

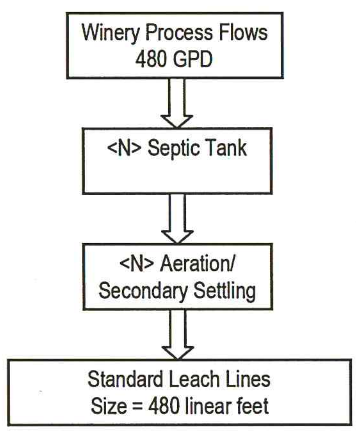

Figure 2: Process Wastewater Treatment System Schematic

E. Domestic and Process Wastewater Reserve Areas

In the event a reserve area is required, suitable area has been identified in Test Pits 3 & 4 (Area 2). Due to the limited depth of Test Pit 3 in Area 2, the only available wastewater system type for the reserve area is a sub-surface drip engineered wastewater system. The application (infiltration) rate of the soil in this location for this system type is recommended to be 0.6 gallons per square foot per day.

Using this application rate, we can calculate the required reserve area for both domestic and process wastewater as follows:

$$square\ feet\ of\ reserve\ (200\%): \frac{570\,gpd}{0.60\,gal/ft^2} = 950\,ft^2 \times 200\% = 1{,}900\,ft^2$$

Please see Appendix 2 for a map showing Test Pits 3 & 4, which cover a significantly larger area than the required 200% reserve.

VI. CONCLUSION

Based on the analysis performed in this report, the Canard Vineyard project is feasible with regard to wastewater disposal. The parcel is more than adequate to support the project from a wastewater treatment perspective. See the Use Permit Plans for the proposed sizes and location of the primary and reserve areas for all the options described previously. Detailed calculations and construction plans will be submitted to the Napa County Department of Environmental Management for approval prior to the construction of the final disposal system.

IX. APPENDIX

1 Water Balance Calculations
2 Site Evaluation Report

APPENDIX 1:
WATER BALANCE CALCULATIONS

Project: Canard Vineyard
Water Balance
Issue Date: 07/24/15

DELTA CONSULTING & ENGINEERING
OF ST. HELENA

Wastewater Flow Generation

Overall System Operation

Process Wastewater

Winery Production (WP) =	4,167	cases/year
	10,000	gallons (2.4 gallons/case)

Harvest Period: Estimated Peak Process Flows*

Number of Crush Days=	30	
Process Wastewater (Harvest Period) =	500	gpd
Estimated theoretical total PEAK PW generated during Harvest period=	15,000	gallons PW generated during harvest

*Napa County Enviromental Management Method

Non-Harvest (Remainder of Wine Making Year outside of Harvest Period)

Estimated Gallons of Process Water Generated per Gallon of Wine Produced=	8	gallons ww/gallon of wine produced
Gallons of Process Waste Generated Per Year=	80,000	gallons/year
MG of Prcoess Watse Generated Per Year=	0.080	MG/year
Remaining Days of Year Outside Crush Period=	335	days
Estimated Process Daily (non-crush) Flows=	239	gpd

Process Waste Production Summary

Crush Period Flows=	15,000	Gallons/year
Non-Harvest Flows=	80,000	Gallons/year
Total Estimated PW Flows	95,000	**Gallons per year**
Annual Basis, Average Daily PW Flows=	260	**gpd**

Process Flow Design for Peak Flow

Month	Day/mo	Estimated % of PW	Monthly PW Flow (gallons)	Average Daily PW Flow (gallons)	Month
Jan	31	6%	5,700	180	Jan
Feb	28	6%	5,700	200	Feb
Mar	31	7%	6,650	210	Mar
Apr	30	7%	6,650	220	Apr
May	31	7%	6,650	210	May
Jun	30	6%	5,700	190	Jun
Jul	31	6%	5,700	180	Jul
Aug	31	12%	11,400	370	Aug
Sep	30	15%	14,250	480	Sep
Oct	31	15%	14,250	460	Oct
Nov	30	7%	6,650	220	Nov
Dec	31	6%	5,700	180	Dec
	TOTAL	100%	95,000		

Peak Average Daily Flow:	480	gpd
	Sep	

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Project: Canard Vineyard
Water Balance
Issue Date: 07/24/15

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Domestic Wastewater

Use Type	Maximum Quantity (persons)	Waste Flow (GPP)*	Days Contributed	Gallons per Day	Annual DW Produced (gallons)
Guests/day	10	3	365	30	10,950
staff/day	4	15	365	60	21,900
	Total Estimated DW Flows =			90	32,850
			Average Daily DW Flows=		90 gpd

*GPP = gallons per person; Values From Napa County Department of Environmental Management

Visitation Information (Winery Estimates)

Month	Day/mo	Estimated % of DW*	Monthly DW Flow (gallons)	Average Daily PW Flow (gpd)
Jan	31	6%	1,971	64
Feb	28	6%	1,971	70
Mar	31	7%	2,300	74
Apr	30	7%	2,300	77
May	31	7%	2,300	74
Jun	30	6%	1,971	66
Jul	31	6%	1,971	64
Aug	31	11%	3,614	117
Sep	30	16%	5,256	175
Oct	31	15%	4,928	159
Nov	30	7%	2,300	77
Dec	31	6%	1,971	64
	TOTAL	100%	32,850	

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Combined Annual Estimated Wastewater Flow Summary

			Percentage
Total Estimated PW Flows=	95,000	gallons/year	74%
Total Estimated DW Flows=	32,850	gallons/year	26%

Total Estimated Wastewater Flows= 127,850 Gallons per year

Combined Flow Breakdown

		PROCESS FLOWS		DOMESTIC FLOWS		COMBINED FLOW TOTALS			
Month	Day/mo	Monthly PW Flow (gallons)	Daily PW Flows (gallons)	Monthly DW Flow (gallons)	Daily DW Flows (gallons)	Total Monthly Flows (gallons)	Combined Annual Percentage Flow:	Month	Combined ADF (gpd)
Jan	31	5,700	184	1,971	64	7,671	6%	Jan	247
Feb	28	5,700	204	1,971	70	7,671	6%	Feb	274
Mar	31	6,650	215	2,300	74	8,950	7%	Mar	289
Apr	30	6,650	222	2,300	77	8,950	7%	Apr	298
May	31	6,650	215	2,300	74	8,950	7%	May	289
Jun	30	5,700	190	1,971	66	7,671	6%	Jun	256
Jul	31	5,700	184	1,971	64	7,671	6%	Jul	247
Aug	31	11,400	368	3,614	117	15,014	12%	Aug	484
Sep	30	14,250	475	5,256	175	19,506	15%	Sep	650
Oct	31	14,250	460	4,928	159	19,178	15%	Oct	619
Nov	30	6,650	222	2,300	77	8,950	7%	Nov	298
Dec	31	5,700	184	1,971	64	7,671	6%	Dec	247
	TOTAL	95,000		32,850		127,850	100%		

Peak Flow Month Breakdown by Each Flow Stream

Summary		Monthly Flows (gallons)			Daily Flows (gallons)			Percentage Breakdown	
Peak Type	Peak Month	Type Monthly Flows	Other Stream Flow	Total	Process	Domestic	Daily flow	Process	Domestic
From Peak DW Standpoint:	Sep	5,256	14,250	19,506	475	175	650	73%	27%
From Peak PW Standpoint:	Sep	14,250	5,256	19,506	475	175	650	73%	27%

Maximum Month:	Sep	19,506	650	15.3%	<---percentage of annual flow

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APPENDIX 2:
SITE EVALUATION REPORT

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 #:	E15-00386
APN:	020-150-027
(County Use Only) Reviewed by:	Date:

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner: Richard & Carolyn Czapleski	☐ New Construction ☐ Addition ☐ Remodel ☐ Relocation ☒ Other: Use Permit
Property Owner Mailing Address: 1016 Dunaweal Lane	☐ Residential - # of Bedrooms: Design Flow: gpd
City: Calistoga State: CA Zip: 94515	☒ Commercial – Type: Sanitary Waste: 96 gpd Process Waste: 480 gpd
Site Address/Location: 1016 Dunaweal Lane, Calistoga, CA 94515	☐ Other: Sanitary Waste: gpd Process Waste: gpd

Evaluation Conducted By:

Company Name	Evaluator's Name	Signature (Civil Engineer, R.E.H.S., Geologist, Soil Scientist)
DELTA CONSULTING & ENGINEERING	Joel Dickerson, P.E.	[signature]
Mailing Address: 1104 ADAMS STREET, SUITE 201		Telephone Number: 707/963-8456
City: ST. HELENA	State: CA Zip: 94574	Date Evaluation Conducted: 6/11/15

Primary Area	Expansion Area
Acceptable Soil Depth: 62 in. Test pit #'s: 1 & 2	Acceptable Soil Depth: 30 in. Test pit #'s: 3 & 4
Soil Application Rate (gal. /sq. ft. /day): 0.25	Soil Application Rate (gal. /sq. ft. /day): 0.6
System Type(s) Recommended: Standard	System Type(s) Recommended: Sub-Surface Drip
Slope: 0 %. Distance to nearest water source: >100 ft.	Slope: 0 %. Distance to nearest water source: >100 ft.
Hydrometer test performed? No ☒ Yes ☐ (attach results)	Hydrometer test performed? No ☒ Yes ☐ (attach results)
Bulk Density test performed? No ☒ Yes ☐ (attach results)	Bulk Density test performed? No ☒ Yes ☐ (attach results)
Percolation test performed? No ☒ Yes ☐ (attach results)	Percolation test performed? No ☒ Yes ☐ (attach results)
Groundwater Monitoring Performed? No ☒ Yes ☐ (attach results)	Groundwater Monitoring Performed? No ☒ Yes ☐ (attach results)

Site constraints/Recommendations:

Ground water monitoring will be required in order to verify that high ground water conditions do not exist prior to installing a standard system for the primary field.

Test Pit # 1

PLEASE PRINT OR TYPE ALL INFORMATION

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-6	TOPSOIL									
6-36	C	5	SCL	M-SB	SH	FRB	NS	FF	NA	F/F @ 24"
36-48	C	25	LS	M-G	S	NA	SS	MM	NA	F/F
48-62	C	0	SC	M-SB	H	FRB	SS	FF	NA	F/F

Test Pit # 2

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-9	TOPSOIL									
9-22	C	10	SCL	M-SB	SH	F	NS	FF	FF	F/F @ 24"
22-48	C	20	SCL	M-SB	S	FRB	SS	FM	FM	F/F
48-64	C	0	SC	M-SB	H	FRB	SS	FF	NA	F/F

Test Pit # 3

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-9	TOPSOIL									
9-44	C	25	SCL	M-SB	S	FRB	NS	CM	FM	NA

Attach additional sheets as needed

Test Pit # 4

PLEASE PRINT OR TYPE ALL INFORMATION

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-8	TOPSOIL									
8-26	G	10	SCL	M-SB	SH	F	NS	FF	CM	NA
26-45	C	45	LS	M-G	L	NA	NS	FF	FF	F/F @ 30"
45-64	C	5	SC	M-SB	H	FRB	SS	MC	FF	F/F

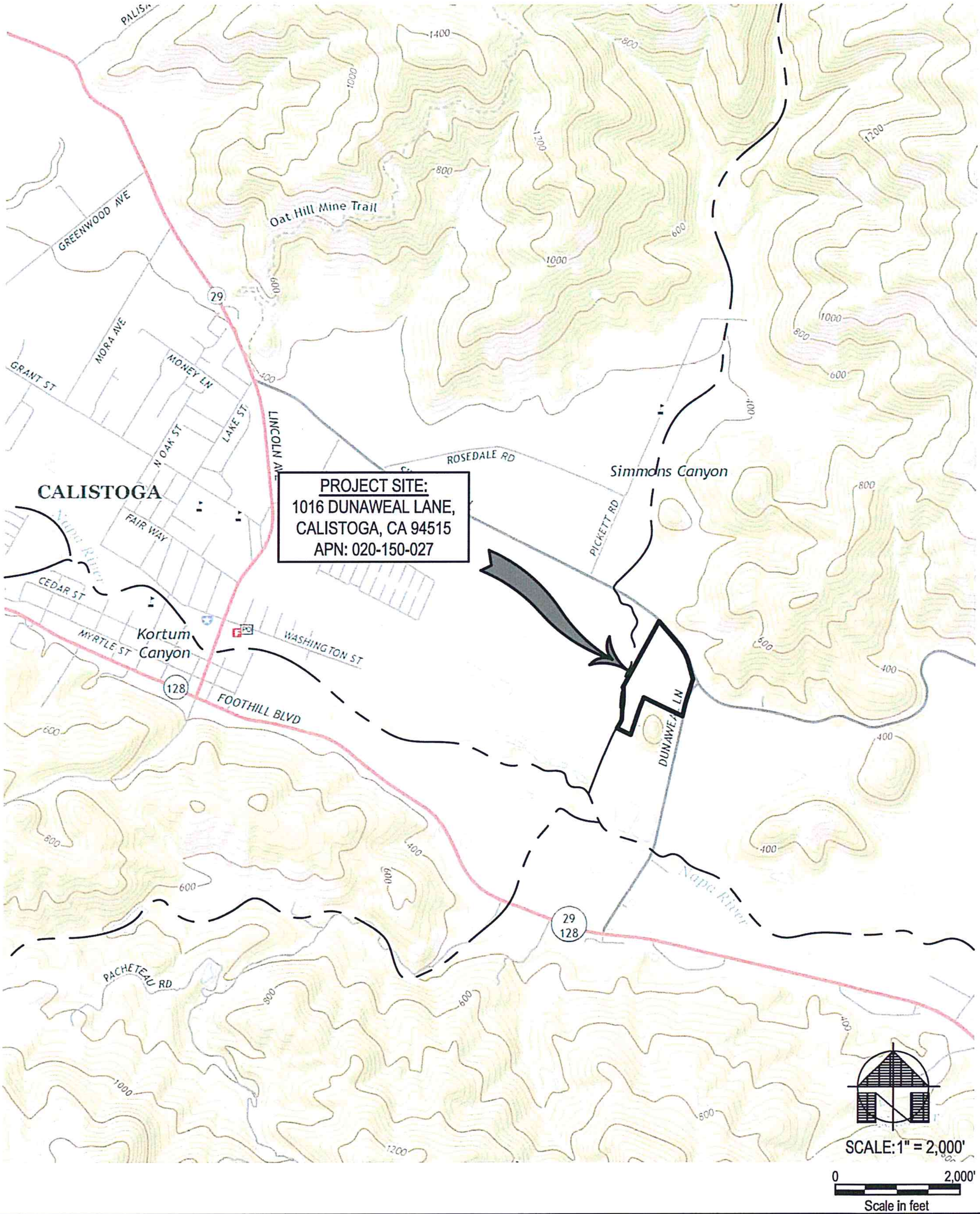
Test Pit #

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			

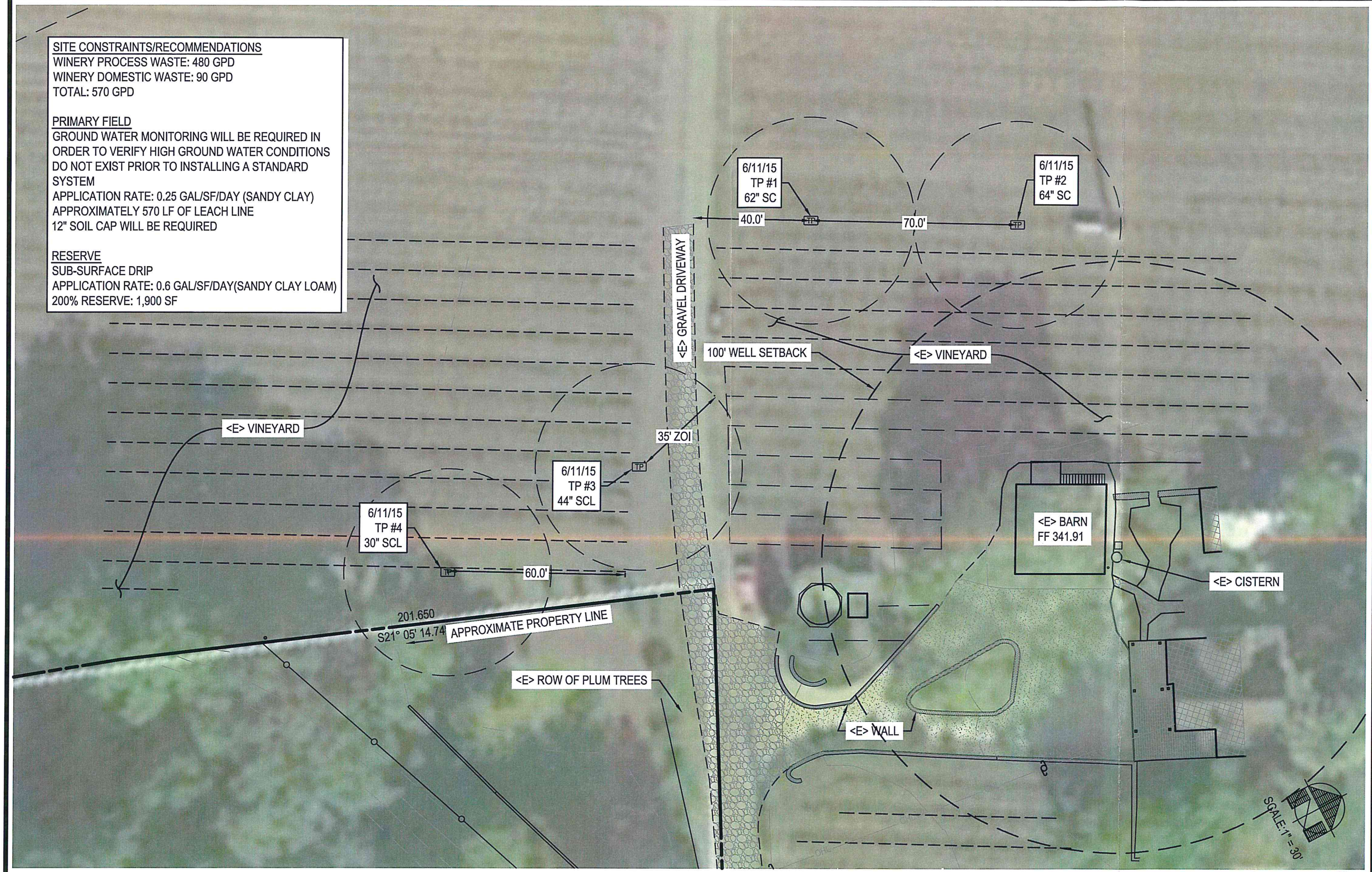
Test Pit #

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			

Attach additional sheets as needed



SITE EVALUATION REPORT VICINITY MAP	DELTA CONSULTING & ENGINEERING OF ST. HELENA 1104 ADAMS STREET, SUITE 203 - ST. HELENA, CALIFORNIA 94574 707-963-8456 + 707-963-8528 FAX		SHEET 1 OF 3
	DATE: 6/12/15	JOB # O-118	
	SCALE: AS NOTED	APN: 020-150-027	



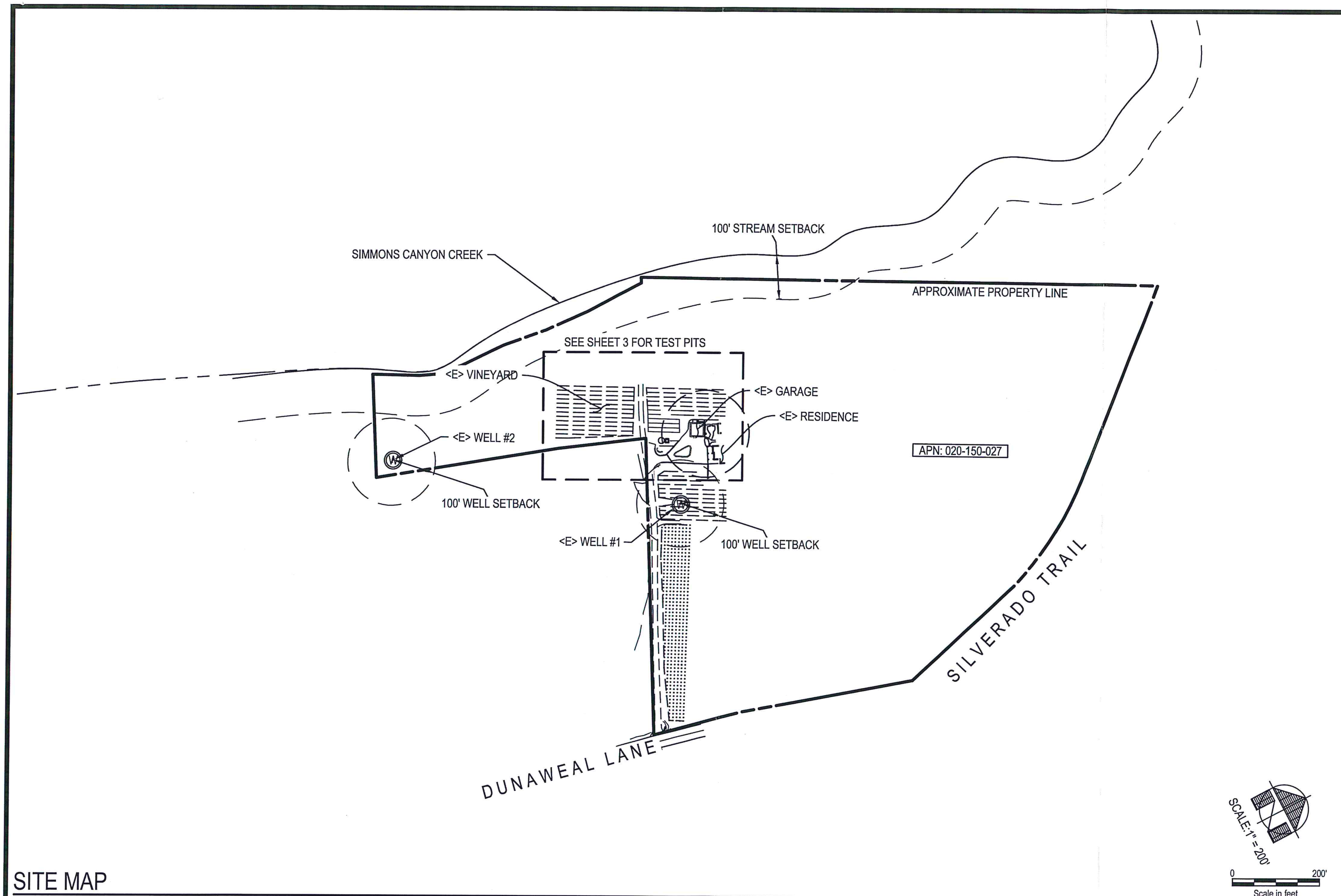
TEST PIT LOCATIONS MAP

0 30'
Scale in feet

SITE EVALUATION REPORT
TEST PIT LOCATIONS MAP
CALISTOGA CALIFORNIA

DELTA CONSULTING & ENGINEERING OF ST. HELENA
1104 ADAMS STREET, SUITE 203 - ST. HELENA, CALIFORNIA 94574
707-963-8456 + 707-963-8528 FAX

DATE: 7/24/15
SCALE: 1" = 30'
JOB #: O-118
APN: 020-150-027



SITE MAP

SITE EVALUATION REPORT
SITE MAP

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DELTA CONSULTING & ENGINEERING
OF ST. HELENA
1104 ADAMS STREET, SUITE 203 · ST. HELENA, CALIFORNIA 94574
707-963-8456 + 707-963-8528 FAX

DATE: 6/11/15
SCALE: 1" = 200'
JOB #: O-118
APN: 020-150-027

2 OF 3