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BARTELT ENGINEERING

ONSITE WASTEWATER DISPERSAL FEASIBILITY STUDY FOR THE ALOFT WINERY 430 COLD SPRINGS ROAD, NAPA COUNTY, CA APN 024-340-010

As required by Napa County Planning, Building & Environmental Services (PBES), this study outlines the feasibility of providing onsite wastewater dispersal for a potential winery and tasting room located on the subject parcel at 430 Cold Springs Road, Angwin, CA 94508.

PROJECT DESCRIPTION

The project proposes the installation of a new access road through APN 024-340-011 and APN 024-340-010 to provide access to a proposed tasting room, commercial kitchen, full crush winery and wine caves on a 50.07± acre parcel (APN 024-340-010) with the intent of the facility having the capability of producing 50,000 gallons of wine per year. APN 024-340-011 is currently developed with two (2) residences, a garage, a pond and provides access to APN 024-340-010 through an existing easement and gravel access road. APN 024-340-010 is currently developed with 23.2± acres of vineyard, access roads and three (3) stormwater infiltration detention basins. The vineyard area is estimated to be reduced to 20.9± acres as a result of the proposed improvements. Refer to the attached Use Permit drawings for the existing and proposed development for both parcels.

Along with the proposed wine production at the site, the project proposes a moderate staffing and marketing plan which includes six (6) full-time employees, two (2) part-time employees and two (2) seasonal (harvest) employees. The project also proposes to offer private tour and tasting appointments for a maximum number of twenty (20) guests per day. Furthermore, the Applicant plans to offer two (2) food and wine pairing lunch or dinner events per month for parties up to 40 persons. Additionally, the Applicant intends to host four (4) wine club/release events per year for groups of up to 75 persons, with up to five (5) additional event staff. Two (2) 125 person large event with 10 additional event staff per year is also being proposed at the winery.

Table 1 summarizes the proposed staffing plan:

TABLE 1: STAFFING PLAN SUMMARY

Description	Number of Employees	Frequency
Full-time Employees	6	Daily
Part-time Employees	2	Daily
Harvest/Seasonal Employees	2	Daily

Table 2 summarizes the proposed marketing plan:

TABLE 2: MARKETING PLAN SUMMARY

Description	Number of Guests	Event Staff	Frequency
Private Tours & Tasting	20 per day	0 per day	Daily
Food & Wine Pairings	40 per event	0 per event	2 per month
Wine Club / Release Events	75 per event	5 per event	4 per year
Large event	125 per event	10 per event	2 per year

As part of our services, representatives from Bartelt Engineering have reviewed the planned operational methods for the winery with our Client, reviewed the parcel files at PBES, held conversations with PBES staff, performed a reconnaissance of the site to view existing conditions and conducted a site evaluation on October 20, 2015 to evaluate the feasibility of installing a wastewater system to serve the proposed winery and tasting room.

This study and the associated Use Permit Drawings are provided to demonstrate that the proposed winery improvements and marketing plan can feasibly be developed and that all wastewater can be adequately treated and dispersed onsite.

WASTEWATER ANALYSIS

All plumbing fixtures in the winery production facility and tasting room are proposed to be water saving fixtures per the California Plumbing Code as adopted by the Napa County Building Division.

Process Wastewater Flow

The winery production process wastewater (PW) flow rates for harvest and non-harvest seasons can be calculated as follows:

Harvest Peak Winery PW Flow =

$$\left(\frac{50{,}000\ \text{gallons of wine}}{\text{year}}\right)\times\left(\frac{1.5\ \text{gallons of water}}{1\,\text{gallon of wine}}\right)\times\left(\frac{1\text{year}}{45\,\text{days of crush}}\right)=$$

Harvest Peak PW Flow = 1,667 gallons per day (gpd)

Non-Harvest Peak PW Flow =

$$\left(\frac{50{,}000\ \text{gallons of wine}}{\text{year}}\right)\times\left(\frac{4.5\ \text{gallons water}}{1\,\text{gallon of wine}}\right)\times\left(\frac{1\ \text{year}}{320\ \text{days}}\right)=$$

Non-Harvest Peak PW Flow = 704 gpd

Sanitary Wastewater Flow

The sanitary wastewater (SW) generated at the winery production facility and tasting room including full-time employees, part-time employees, seasonal (harvest) employees and guests and can be itemized as follows:

Employees:

- 6 Full-Time Employees x 15 gpd per employee = 90 gpd
- 2 Part-Time x 15 gpd per employee = 30 gpd
- 2 Harvest Season x 15 gpd per employee = 30 gpd

Guests[1]:

- Private Tours and Tasting:
  - (20 guests per day) x (3 gpd per guest) = 60 gpd per guest
- Food and Wine Pairings – Lunch or Dinner:
  - (40 guests per event) x (15 gpd per guest) = 600 gpd per event
- Wine Club / Release Events:
  - (75 guests per event) x (3 gpd per guest) x 60% usage rate = 135 gpd per event
  - (5 event staff) x (6 gpd per event staff) = 30 gpd per staff
- Large event:
  - (125 guests per event) x (3 gpd per guest) x 60% usage rate = 225 gpd per event
  - (10 event staff) x (6 gpd per event staff) = 60 gpd per staff

Note: *This feasibility study assumes that portable toilets, offsite meal preparation and catering services are utilized during Wine Club / Release and Large events regardless of the season. 60% of the event guests are assumed to use the winery restrooms during these events.*

Kitchen Sanitary Wastewater Flow

During proposed food and wine pairings, meal preparation is proposed to occur in the winery commercial kitchen. Kitchen waste consisting primarily of fats, oils and grease (FOG) as well as organic material would be generated during these events. Per PBES requirements, grease interceptors are required to be plumbed to a commercial kitchen with an onsite wastewater treatment system.

Wastewater generated during the Food and Wine Pairings is calculated per PBES requirements which includes a generation rate of 15 gpd per guest. This generation rate consists of 5 gallons of kitchen waste from meal preparation/clean-up and 10 gallons from guest restroom use. The sanitary wastewater flow generated from kitchen waste is calculated below:

[1] Wastewater generation rate for guests includes 15 gpd for non-catered events and 3 gpd during catered events.

Kitchen Waste:

- Food and Wine Pairings – Lunch of Dinner:
  - (40 guests per event) x (5 gpd per guest) = 200 gpd

Total Harvest Season and Non-Harvest Season Peak Sanitary Wastewater Flow

The total proposed harvest season peak SW flow is the combination of the winery production facility and tasting room SW flows during the months of August through October (harvest). The total proposed non-harvest season peak SW flow is the combination of the winery production facility and tasting room SW flows during the months of November through July (non-harvest).

Table 3 below uses the marketing schedule to calculate the SW flows generated by employees and guests during daily event sequences in harvest and non-harvest seasons. Wastewater flows in the same column indicate the events may occur on the same day. For example, Private Tours and Tastings without food can occur on the same day as Food and Wine Pairings during both harvest and non-harvest seasons; however, no other events can occur on the same day when a Wine Club / Release Event or Large Event is scheduled regardless of the season. Food and wine pairings are proposed to occur for either lunch or dinner, with only one occurring per day.

TABLE 3: HARVEST AND NON-HARVEST SEASON DAILY SANITARY WASTEWATER FLOWS

	Daily Occurrence							
	Harvest				Non-Harvest			
Employees	150	150	150	-	120	120	120	120
Tours and Tastings	60	60	60	-	60	60	60	-
Food and Wine Pairing	-	600	-	-	-	600	-	-
Wine Club / Release Event	-	-	165	-	-	-	165	-
Large Event	-	-	-	-	-	-	-	285
Total Flow (gpd)	210	810	375	-	180	780	345	405

Table 3 shows that the greatest SW flow during the harvest and non-harvest seasons is generated during a typical staffing day with peak visitation and food and wine pairings.

Design Wastewater Flows

The estimated harvest and non-harvest season peak process and sanitary wastewater flows are summarized in the following table:

TABLE 4: HARVEST AND NON-HARVEST SEASON PEAK DAILY FLOW SUMMARY		
Wastewater Source	**Harvest** (gpd)	**Non-Harvest** (gpd)
Process Wastewater	1,667	704
Sanitary Wastewater	810	780
Combined Wastewater	2,477	1,484

The greatest PW and SW daily flow occurs during the harvest season. The greatest wastewater scenario is the combination of PW and SW peak daily flows during the harvest season.

WASTEWATER TREATMENT AND DISPERSAL OPTIONS

Bartelt Engineering proposes several options for the dispersal of wastewater generated by the winery production facility, tasting room and commercial kitchen. A final treatment and dispersal option will be selected for installation following approval of the Use Permit Application. The proposed options are discussed further in the following sections as well as summarized in the attached wastewater treatment diagrams. Refer to the associated Use Permit Drawings for location of the proposed treatment and dispersal methods.

Existing Wastewater Systems

An existing wastewater dispersal system is located on parcel APN 024-340-011 and currently serves the existing residence located on that parcel. The existing residence dispersal system will remain separate from the proposed winery wastewater system(s) and is not proposed to be modified as part of the Use Permit Application. Based on file research at PBES, there does not appear to be an existing wastewater system on the winery parcel (APN 024-340-010).

Proposed Preferred Wastewater Option

Under the preferred option, separate wastewater conveyance, treatment and dispersal systems are proposed. Process wastewater would be pretreated then surface and/or subsurface applied as vineyard/landscape irrigation. Sanitary wastewater would also be pretreated then dispersed via a subsurface drip field.

Process Wastewater Pretreatment System

As summarized in the Table 4, the PW system is proposed to have a peak daily flow of 1,667 gpd. The proposed PW collection, treatment and dispersal system consists of several steps. The floors of the proposed winery and caves would be sloped so that all PW is collected in trench drains and floor drains. The drains would be fitted with baskets to collect a majority of the larger debris. The winery PW collected in the trench and floor drains would then gravity flow to the proposed pretreatment system. Based on the location of the PW pretreatment system selected for installation, a pump station may be necessary to transfer collected PW from the winery facility to the pretreatment system. Examples of a pretreatment system include (but not limited to) Cloacina, Bio-Microbics or Lyve Systems.

The pretreatment system selected for installation is anticipated to include an equalization (EQ) tank, screening equipment, pH adjustment system, primary treatment tank equipped with an aeration system and a membrane or media filtration system. The PW pretreatment system must be capable of treating PW to an acceptable level for surface drip irrigation in vineyard/landscape areas per jurisdictional requirements. From the pretreatment system, PW effluent is proposed to be either pumped to a storage tank prior to vineyard/landscape irrigation or dispersed in a subsurface drip field.

Process Wastewater Surface Drip Irrigation

A PW flow balance was determined by estimating the monthly PW produced (see Table I), the average irrigation flow based on reported vineyard irrigation demands (see Table II) and sizing a storage tank to be able to store excess treated PW effluent until it can be properly dispersed via surface drip irrigation throughout the vineyard (see Table III).

Based on the PW flow balance, the storage tank should have a minimum volume of 80,000 gallons (see Table III) to provide temporary storage of treated effluent through winter months when surface drip land application is minimal and to equalize differences between the wastewater generation rate and the irrigation application rate. It is assumed that available groundwater in the root zone is depleted by April and that irrigation is primarily applied to the vines for the months of April through October. In the months where the irrigation demand exceeds the amount of treated effluent that is available for irrigation, it is assumed that the entire irrigation requirement for the vines is not met or that another water source (existing onsite well) is used to supply additional irrigation water.

Vineyard areas where treated PW is dispersed through surface drip irrigation is based on 20.9± acres or approximately 37,934 existing grape vines located on parcel APN 024-340-010. The area for surface drip irrigation will need to be verified once all dispersal field setbacks are determined and a final vineyard irrigation plan has been developed. Furthermore, all surface drip dispersal field areas will need to be labeled with signage indicating the use of treated effluent for irrigation in accordance with PBES standards.

Sanitary Wastewater Subsurface Drip Dispersal Field with Pretreatment

As summarized in Table 4, the SW dispersal field is proposed to have a peak daily flow of 810 gpd. The winery facility and tasting room SW would gravity flow to a septic tank fitted with filters for solids removal. Kitchen waste would flow into a grease interceptor prior to entering the septic tank. From the septic tank, SW effluent gravity flows to a recirculation/dose tank where the effluent would be pretreated through an Orenco AdvanTex AX Treatment System (or approved equal). Pretreated effluent is proposed to be dispersed through a subsurface drip field by means of a timed-dose pumping system.

Based on the site evaluation performed by Bartelt Engineering on October 20, 2015, test pits #2 and #3 showed similar results and are acceptable for a subsurface drip dispersal field. The site evaluation determined the soil in the area of these test pits to be Clay Loam with an acceptable depth of 55 to 59 inches. For Clay Loam type soil, Napa County and

GeoFlow Incorporated recommend a soil hydraulic loading rate[2,3] of 0.60 gal/sf/day. Napa County Standards require a minimum of 24 inches of acceptable soil below the bottom of the drip lines with a minimum of six (6) inches of acceptable soil cover material placed over the drip lines.

The minimum required primary area for the subsurface drip field is calculated below:

$$\text{Subsurface Drip Field Area} = \frac{\text{design flow rate}}{\text{hydraulic loading rate}} = \left(\frac{810 \frac{\text{gal}}{\text{day}}}{0.6 \frac{\text{gal}}{\text{day/ft}^2}} \right) = 1{,}350 \text{ ft}^2$$

Based on site slopes less than 15% in the primary area, two (2) foot spacing is recommended between driplines per Napa County Standards. The recommended drip field contains 12 driplines each 57 feet long. The total recommended primary area is 1,368 square feet.

Sanitary Wastewater 200% Replacement Area

The replacement area is proposed to be located near test pits #6 and #7. Test pits #6 and #7 had an observed depth of 27 to 33 inches with Sandy Loam soil. Napa County Standards and GeoFlow Incorporated recommend a hydraulic loading rate[4,5] of 1.0 gal/sf/day and 0.90 gal/sf/day for Sandy Loam soils respectively. The lesser of these two values (0.90 gal/sf/day) is recommended for sizing the replacement area. The 200% subsurface drip replacement area is calculated based on the design flow and hydraulic loading rate, as shown below:

$$\text{Replacement Area} = 200\% \times \left(\frac{\text{design flow rate}}{\text{hydraulic loading rate}} \right) = (200\%) \times \left(\frac{810 \frac{\text{gal}}{\text{day}}}{0.9 \frac{\text{gal}}{\text{day/ft}^2}} \right) = 1{,}800 \text{ ft}^2$$

Based on site slopes less than 15% in the replacement area, two (2) foot spacing is recommended between driplines per Napa County Standards. The recommended replacement area is 1,800 square feet.

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[2]Hydraulic loading rate is based on *Table III-2 Soil Hydraulic Loading Rates* from Napa County Onsite Wastewater Treatment Systems (OWTS) Technical Standards, Final Draft.

[3] Referenced from *Table 1 Drip Loading Rates Considering Soils Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated.

[4] Referenced from *Table 9 Minimum Surface Area Guidelines to Dispose of 100 gpd of Secondary Treated Effluent* of Napa County's Regulations for Design, Construction and Installation of Alternative Sewage Treatment Systems.

[5] Referenced from *Table 1 Drip Loading Rates Considering Soils Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated

Proposed Alternative Options

Alternative #1 - Combined Pretreatment System, Subsurface Drip Dispersal Field and 200% Replacement Area

As summarized in Table 4, a combined pretreatment system and dispersal field are proposed to have a peak daily flow of 2,477 gpd. The proposed collection and conveyance system would be similar to the proposed preferred option. The winery facility and tasting room SW would gravity flow to a septic tank fitted with filters for solids removal. Kitchen waste would flow into a grease interceptor prior to entering the septic tank. Winery PW collected in the trench drains and floor drains would also flow by gravity to the septic tank prior to combining with SW and KW. From the septic tank(s), combined wastewater effluent flows by gravity to a recirculation/dose tank where effluent would be pretreated through an Orenco AdvanTex AX Treatment System (or approved equal). The combined pretreated effluent is proposed to be dispersed through a subsurface drip field by means of a timed-dose pumping system.

The proposed combined wastewater subsurface drip field would also be located near test pits #2 and #3 which has an observed suitable depth of 55 to 59 inches with Clay Loam soils. The same hydraulic loading rate (0.60 gal/sf/day) used to calculate the primary area for the Preferred Option is also used to calculate the combined wastewater primary subsurface drip field area shown below:

$$\text{Subsurface Drip Field Area} = \frac{\text{design flow rate}}{\text{hydraulic loading rate}} = \left(\frac{2{,}477 \dfrac{\text{gal}}{\text{day}}}{0.6 \dfrac{\text{gal}}{\text{day/ft}^2}} \right) = 4{,}129 \text{ ft}^2$$

Based on site slopes less than 15% in the primary area, two (2) foot spacing is recommended between driplines per Napa County Standards. The recommended combined subsurface field contains 24 driplines each 87 feet long. The total recommended combined wastewater primary area is 4,176 square feet.

The replacement area is also proposed to be located near test pits #6 and #7 which has an observed suitable depth of 27 to 33 inches with Sandy Loam type soils. The hydraulic loading rate (0.90 gal/sf/day) used to calculate the replacement area for the Preferred Option is also used to calculate the combined wastewater replacement area as shown below:

$$\text{Replacement Area} = 200\% \times \left(\frac{\text{design flow rate}}{\text{hydraulic loading rate}} \right) = (200\%) \times \left(\frac{2{,}477 \dfrac{\text{gal}}{\text{day}}}{0.9 \dfrac{\text{gal}}{\text{day/ft}^2}} \right) = 5{,}505 \text{ ft}^2$$

Based on site slopes less than 15% in the replacement area, two (2) foot spacing is recommended between driplines per Napa County Standards. The recommended replacement area is 5,505 square feet.

Alternative #2 - Process Wastewater Subsurface Dispersal and 200% Replacement Area

Under Alternative #2, PW and SW would be conveyed and pretreated separately as discussed under the Proposed Preferred Option. From the PW pretreatment system,

pretreated effluent would be directed through a three-way ball valve to either the above ground storage tank prior to vineyard irrigation (see Proposed Preferred Option) or to the dosing tank where it will combine with SW prior to subsurface drip dispersal (see Alternative #1). Refer to the attached wastewater treatment diagrams for further clarification.

Alternative #2 provides flexibility as well as a higher level of control for surface applying pretreated PW to the vineyard. During periods of rainfall when irrigation of pretreated PW is not permitted per PBES standards or when irrigation is not desired during periods of high PW generation, pretreated PW could be dispersed through the combined subsurface drip field. During times when vineyard irrigation is desired and permitted, pretreated PW can be beneficially reused for vineyard irrigation.

WASTEWATER TREATMENT TANK SIZING

Grease Interceptor

During Food and Wine Pairings, the kitchen is assumed to prepare at most three (3) meals per guest per hour with multi-service utensils. Hours of operation for the kitchen are also assumed to be less than eight (8) hours per day. The grease interceptor tank would be sized per the following formula[6]:

Grease Interceptor (KW flows only) = (Peak number of meals per hour) x (Wastewater flowrate) x (Retention time) x (Storage factor)

Grease Interceptor (KW flows only) = (40 guests x 3 meals/hour) x (5 gpd per meal) x (2.5) x (1)
= 1,500 gallons; 2,000 gallons recommended

Septic Tank(s)

The proposed septic tank(s) is sized to provide a minimum of three (3) days of hydraulic retention time during peak wastewater flows. The septic tank(s) would be equipped with an effluent filter to aid in the reduction of Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD) in the wastewater effluent stream. Below is a breakdown of the minimum recommended septic tank volumes for the proposed options:

Preferred Option (SW flows only) = 3 days x 810 gpd
= 2,430 gallons; 3,000 gallons recommended

Alternative #1 (SW and PW flows) = 3 days x 2,477
= 7,431 gallons; 8,000 gallons recommended

Alternative #2 (SW flows only) = 3 days x 810 gpd
= 2,430 gallons; 3,000 gallons recommended

[6] The grease interceptor sizing formula, retention time and storage factor are based on Napa County's Regulations for Design, Construction, and Installation of Alternative Sewage Treatment Systems

Recirculation Tank

The proposed recirculation tank is sized to provide a minimum of one (1) day of hydraulic retention time during peak wastewater flows. Below is a summary of the recommended tank volume:

Preferred Option (SW flows only)	= 1 day x 810 gpd = 810 gallons; 1,000 gallons recommended
Alternative #1 (SW and PW flows)	= 1 day x 2,477 = 2,477 gallons; 2,500 gallons recommended
Alternative #2 (SW flows only)	= 1 day x 810 gpd = 810 gallons; 1,000 gallons recommended

Dosing Tank

The proposed dosing tank is sized to provide a minimum of one and a half (1.5) days of hydraulic retention time during peak wastewater flows. Below is a summary of the recommended tank volume:

Preferred Option (SW flows only)	= 1.5 days x 810 gpd = 1,215 gallons, 1,500 gallons recommended
Alternative #1 (SW and PW flows)	= 1.5 days x 2,477 = 3,716 gallons, 4,000 gallons recommended
Alternative #2 (SW and PW flows)	= 1.5 days x 2,477 = 3,716 gallons, 4,000 gallons recommended

Process Wastewater Equalization Tank

The winery PW pretreatment system is proposed to be preceded by an EQ tank for buffering of peak flows. The proposed EQ tank is sized to provide a minimum of three (3) days of hydraulic retention time. A fine bubble diffused air system may be provided to keep PW adequately mixed prior to entering the primary treatment tank.

Preferred Option (PW flows only)	= 3 days x 1,667 gpd = 5,001 gallons, 10,000 gallons recommended
Alternative #2 (PW flows only)	= 3 days x 1,667 gpd = 5,001 gallons, 10,000 gallons recommended

Process Wastewater Primary Treatment Tank

The winery PW pretreatment system manufacturer selected for installation will size the primary treatment tank, aeration system, membrane filtration system and effluent pump. The pretreatment system manufacturer may also use chemical additions for pH adjustment and nutrient additions to promote biological growth and improve treatment efficiency.

OPERATION AND MAINTENANCE

Per Napa County requirements, all Alternative Sewage Treatment Systems (ASTS), including winery wastewater treatment systems with pretreatment, are required to have a Service Provider. The Service Provider would be assigned prior to operation and final approval of the installed wastewater system(s).

WINE CAVE SETBACKS TO DISPERSAL FIELDS

Napa County Environmental Health files were reviewed to determine if any existing dispersal fields are located within 400 feet of the proposed cave location. Based on the Napa County Geographic Information System topographic maps and parcel boundary overlay, we have identified one neighboring parcel that is located within 400 feet of the proposed cave which has ground elevations higher than the proposed cave finished floor. The identified parcel is shown on the enclosed "Cave & Dispersal Field Location Map".

The following is a summary of our findings per Napa County Environmental Health records regarding any existing dispersal systems identified on nearby parcels:

APN 024-340-011 (entrance parcel)	There is an existing residential dispersal field located on this parcel at a higher elevation and at a distance greater than 400 feet from the proposed caves.
APN 024-340-010 (winery parcel)	The proposed PW and SW dispersal field for the winery are proposed to be located at a lower elevation and a minimum distance of 10 feet from the proposed caves.
APN 024-332-012 (neighboring parcel)	There does not appear to be an existing dispersal field within 400 feet of the proposed caves on this parcel.

CONCLUSIONS

Process and sanitary wastewater generated as a result of the proposed project, which includes a full crush winery, tasting room, commercial kitchen and caves, can feasibly be treated and dispersed onsite in accordance with Napa County PBES standards. The proposed caves are in a location that conforms to Napa County PBES setback requirements to septic systems.

Full design calculations and construction plans will be completed after approval of the Use Permit under consideration.

ATTACHMENTS

Proposed Wastewater Treatment Diagrams

Table I – Process Wastewater Flow

Table II – Vineyard Process Wastewater Irrigation

Table III – Treated Process Wastewater Irrigation Storage Tank Balance

Cave & Dispersal Field Location Map

Site Evaluation

REFERENCES

California Onsite Wastewater Association (COWA). "Pumping and Pressure Distribution Systems." May 1998.

Geoflow, Inc. *Wastewater Design, Installation and Maintenance Guidelines.* v1, 2007.

Napa County Department of Environmental Management. "Design, Construction and Installation of Alternative Sewage Treatment Systems." April 12, 2010.

Telsco Industries. "Turf Irrigation Manual." By James A. Watkins. 1987.

U.S. Department of Health, Education and Welfare, Public Health Service Publication. *Manual of Septic-Tank Practice.* 1967.

U.S. Environmental Protection Agency. "Onsite Wastewater Treatment Systems Manual." February 2002.

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Aloft Winery
Process Wastewater Flow
Table I

Total annual wine production (gallons):	**50,000**
Annual water usage per gallon of wine (gallons):	**6**
Annual process wastewater flow (gallons):	300,000
Average process wastewater flow (gpd):	822
Harvest water usage per gallon of wine (gallons):	1.5
Length of Harvest (days):	45.0
Harvest process wastewater flow (gallons per day):	**1,667**
Non-harvest water usage per gallon of wine (gallons):	4.5
Length of Non-Harvest (days):	320
Non-harvest process wastewater flow (gallons per day):	**703**

MONTHLY PROCESS WASTEWATER FLOW (gallons/month):

ESTIMATED PROCESS WASTEWATER FLOW		
Month	**Percent**	**Wastewater Flow**
September	**16.7%**	**50,100**
October (End of Harvest Season)	**13.1%**	**39,300**
November	**9.5%**	**28,500**
December	**6.8%**	**20,400**
January	**5.6%**	**16,800**
February	**5.5%**	**16,500**
March	**5.5%**	**16,500**
April	**5.5%**	**16,500**
May	**5.5%**	**16,500**
June	**7.3%**	**21,900**
July	**7.5%**	**22,500**
August (Start of Harvest Season)	**11.5%**	**34,500**
TOTALS	100.0%	300,000

Notes:
> Wastewater monthly proportioning is based on general winery operations and a 45 day harvest

>The annual water usage per gallon of wine is assumed to be 6 gallons

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Aloft Winery
Vineyard Process Wastewater Irrigation
Table II

Vineyard area (acres):	20.9
Row width (feet):	4.0
Vine spacing (feet):	6.0
Total number of irrigated vines:	37,934

Seasonal irrigation (May - October)
Seasonal irrigation per vine (gallons/season): **60**

ESTIMATED VINEYARD PROCESS WASTEWATER IRRIGATION				
		Estimated		
Month	**Seasonal Percent (%)**	**Seasonal Irrigation (gal/vine)**	**Non-Seasonal Irrigation[1] (gal/vine)**	**Total Irrigation (gallons)**
September	20.0%	12.0		455,202
October	12.0%	7.2		273,121
November	5.0%	3.0		113,801
December[1]	0.0%		0.00	0
January[1]	0.0%		0.00	0
February[1]	0.0%		0.00	0
March[1]	0.0%		0.00	0
April	6.0%	3.6		136,561
May	6.0%	3.6		136,561
June	6.0%	3.6		136,561
July	25.0%	15.0		569,003
August	20.0%	12.0		455,202
TOTAL	100.0%	60.0	0.0	**2,276,010**
				6.98 acre-feet

[1] *Total non-seasonal irrigation =*
*= (vineyard area) * (43,560 sq.-ft./acre) * (depth of irrigation/12 in./ft.) * (7.48 gal./cu.-ft.)*

Note:

> Vineyard irrigation values are based on irrigation data provided by Barbour Vineyard Management for the Cold Springs Vineyards from 2011-2015 seasons

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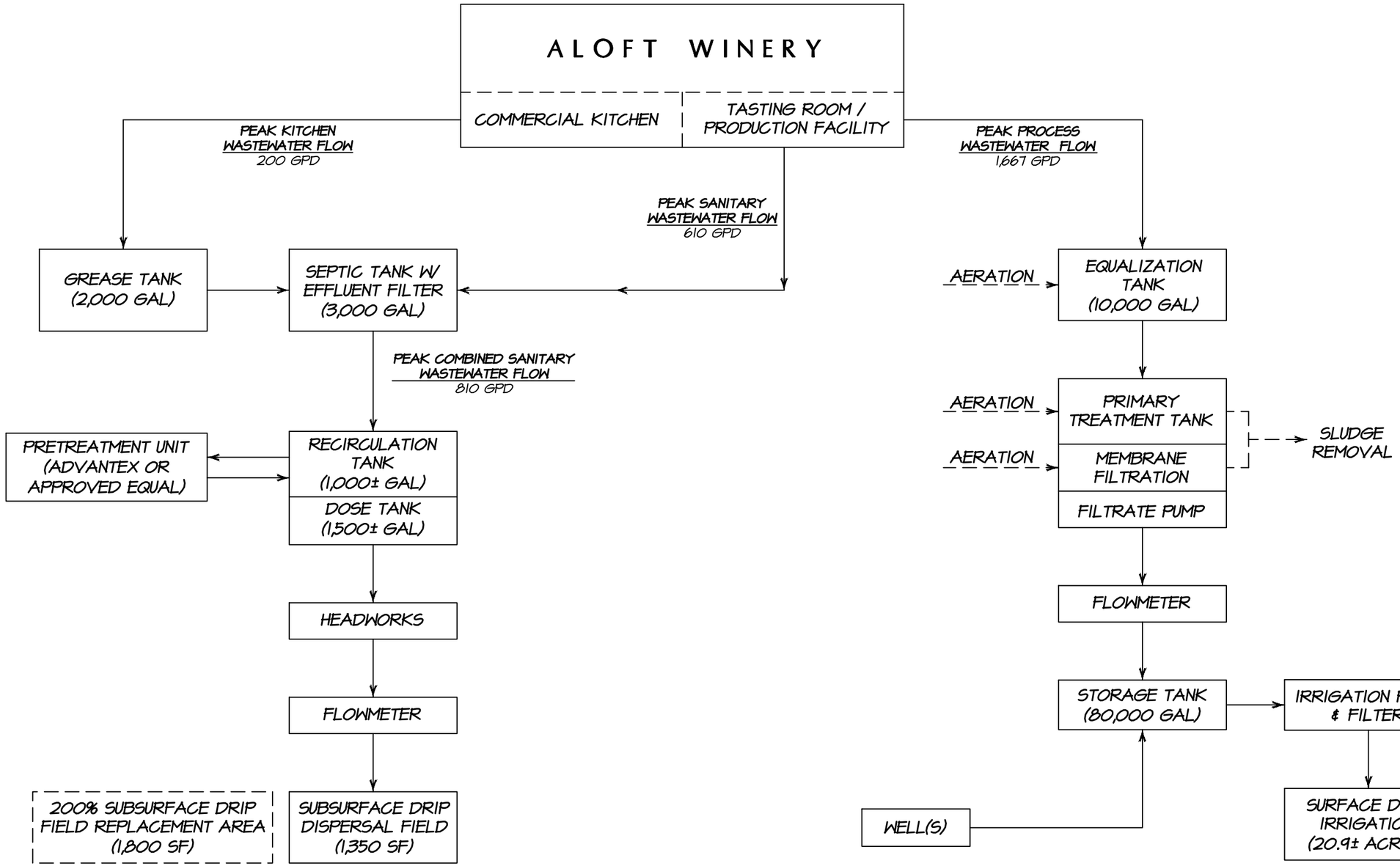
Aloft Winery
Treated Process Wastewater Irrigation Storage Tank Balance
Table III

ESTIMATED PROCESS WASTEWATER IRRIGATION TANK BALANCE				
Month	**Beginning Balance (gallons)**	**Wastewater Flow (gallons)**	**Vineyard Irrigation (gallons)**	**Tank Volume (gallons)**
September	0	50,100	455,202	0
October	0	39,300	273,121	0
November	0	28,500	113,801	0
December	0	20,400	0	20,400
January	20,400	16,800	0	37,200
February	37,200	16,500	0	53,700
March	53,700	16,500	0	70,200
April	70,200	16,500	136,561	0
May	0	16,500	136,561	0
June	0	21,900	136,561	0
July	0	22,500	569,003	0
August	0	34,500	455,202	0
TOTALS (gallons)		**300,000**	**2,276,010**	
TOTALS (acre-feet)		**0.92**	**6.98**	
Average		**25,000**	**189,668**	**15,125**

Recommended Tank Storage (gallons): 80,000
Recommended Tank Storage (acre-feet): 0.25

Note:
> In months when the irrigation demand exceeds the beginning balance plus the wastewater flow it is assumed that the full irrigation demand is not met or that the additional irrigation water is supplied from an alternate source.



PROPOSED PREFERRED OPTION WASTEWATER TREATMENT DIAGRAM

NOT TO SCALE

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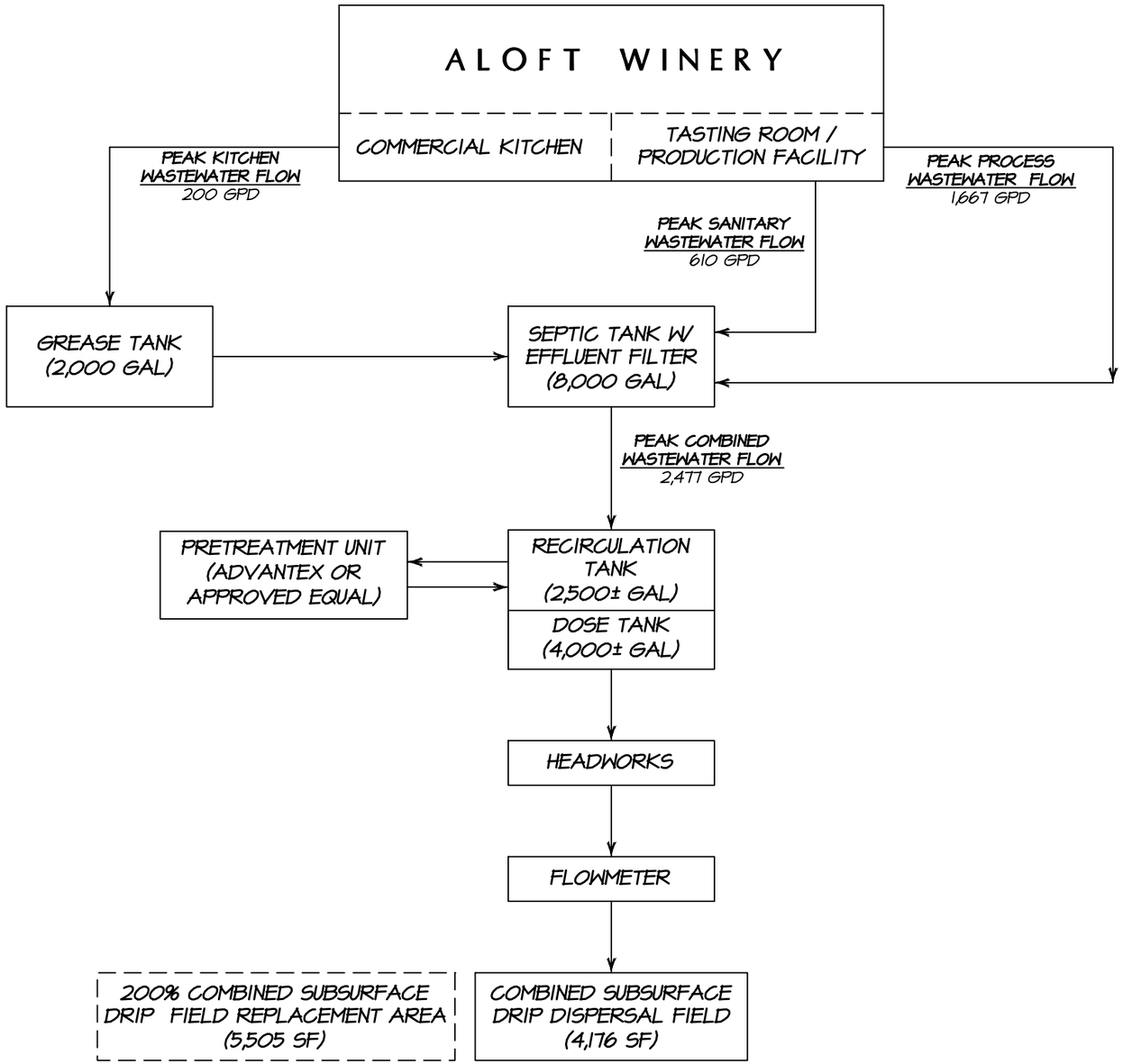
Aloft Winery
430 Cold Springs Road
Angwin, CA 94508
APN 024-340-010
Job No. 14-26
May 2017
Sheet 1 of 3



PROPOSED ALTERNATE #1
WASTEWATER TREATMENT DIAGRAM

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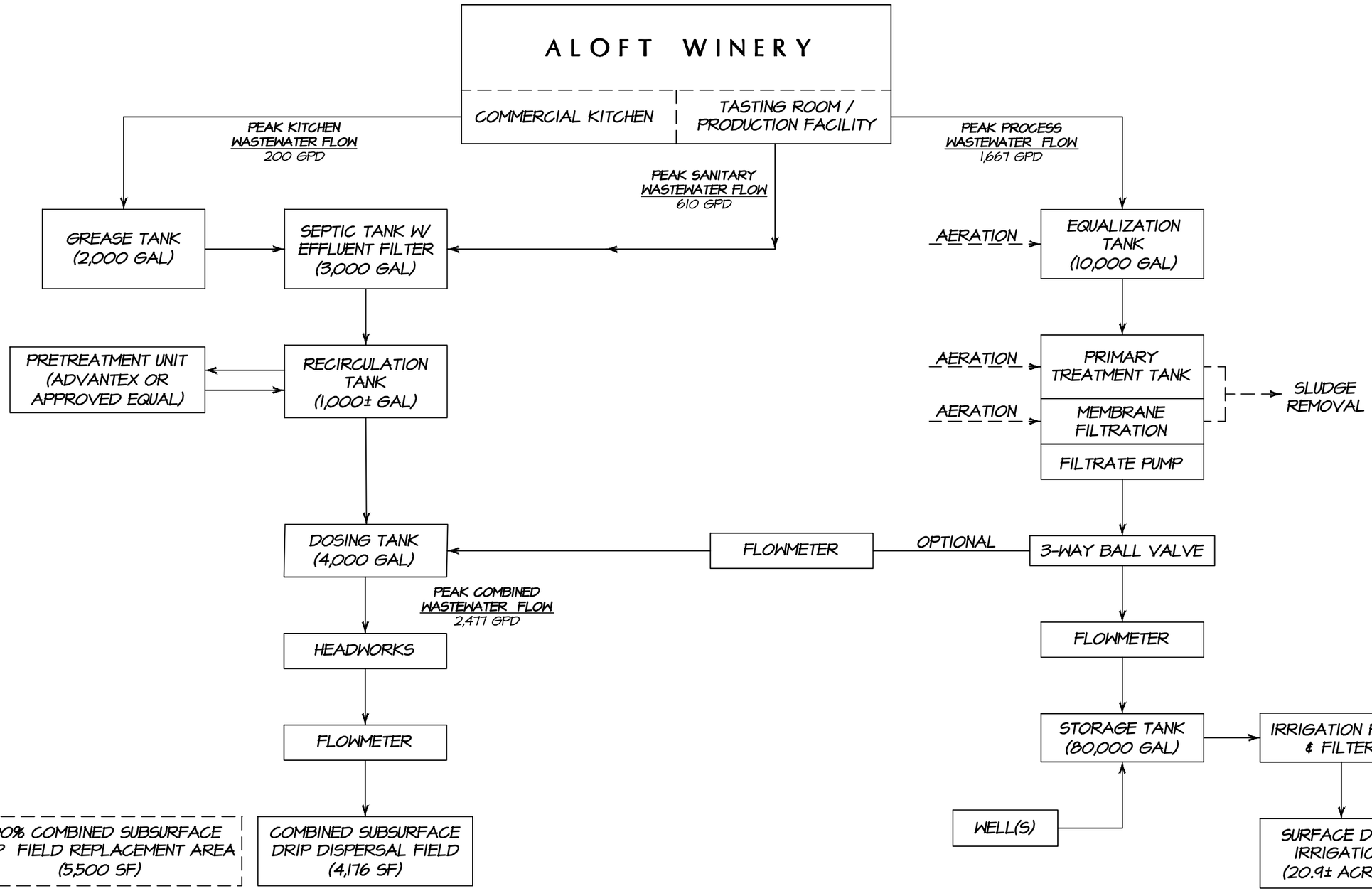
Sheet 2 of 3



PROPOSED ALTERNATE #2
WASTEWATER TREATMENT DIAGRAM

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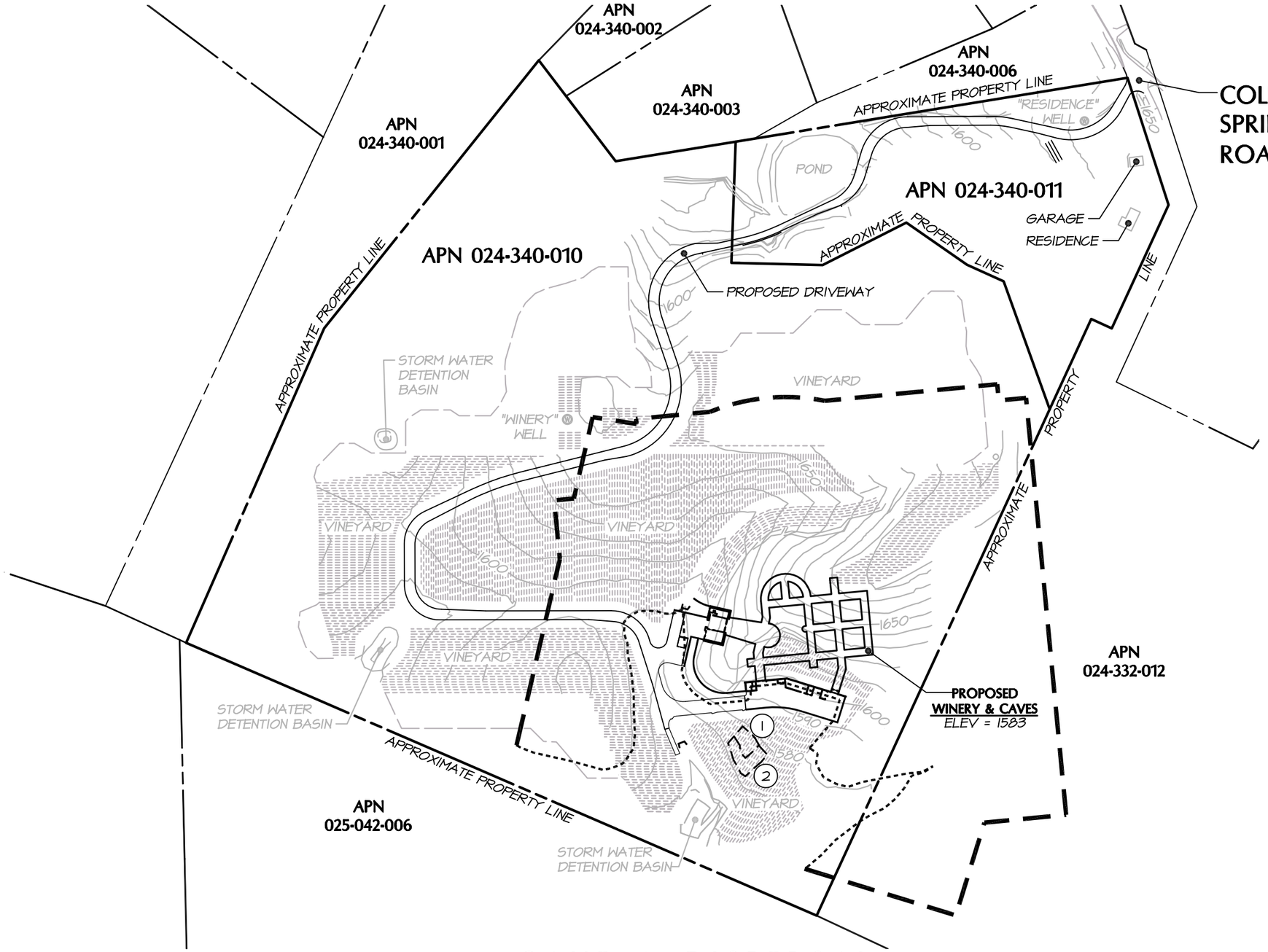

SCALE: 1" = 250'

CAVE & DISPERSAL FIELD LOCATION MAP

SCALE: 1" = 250'

LEGEND

- APPROXIMATE LOCATION OF EXISTING DISPERSAL FIELD (INSTALLATION DATE UNKNOWN)
- 10 FEET DOWNHILL RANGE SETBACK
- 400 FEET UPHILL RANGE SETBACK

NOTES:

1. PROPOSED PREFERRED SANITARY WASTEWATER DISPERSAL FIELD LOCATION (ELEV = 1579)
2. PROPOSED ALTERNATIVE COMBINED WASTEWATER DISPERSAL FIELD LOCATION (ELEV = 1579)

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Sheet 1 of 1

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 #: E15-00827

APN: 024-340-010

(County Use Only)
Reviewed by: Date:

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner Cold Springs Limited Partnership	☒ New Construction ☐ Addition ☐ Remodel ☐ Relocation ☐ Other:
Property Owner Mailing Address P.O. Box 191	☐ Residential - # of Bedrooms: Design Flow : gpd
City State Zip St. Helena, CA 94574	☒ Commercial – Type: Winery Sanitary Waste: 810 gpd Process Waste: gpd
Site Address/Location Cold Springs Road, Angwin, CA	☐ Other: Sanitary Waste: gpd Process Waste: gpd

Evaluation Conducted By:

Company Name Bartelt Engineering	Evaluator's Name Paul N. Bartelt, P.E.	Signature (Civil Engineer, R.E.H.S., Geologist, Soil Scientist)
Mailing Address: 1303 Jefferson Street, 200 B		Telephone Number (707) 258-1301
City State Zip Napa CA 94559		Date Evaluation Conducted October 20, 2015

Primary Area See below	Expansion Area See below
Acceptable Soil Depth: 55-59 in. Test pits #: 2 & 3	Acceptable Soil Depth: 27-33 in. Test pits #: 6 & 7
Soil Application Rate (gal. /sq. ft. /day): 0.6	Soil Application Rate (gal. /sq. ft. /day): 0.9
System Type(s) Recommended: Pressure Distribution (PTE)	System Type(s) Recommended: Subsurface Drip
Slope: 14%. Distance to nearest water source: 100+ feet	Slope: 10%. Distance to nearest water source: 100+ feet
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)
Groundwater Monitoring Performed? No ☒ Yes ☐ (attach results)	Groundwater Monitoring Performed? No ☒ Yes ☐ (attach results)

Site constraints/Recommendations:

A site evaluation was conducted on October 20, 2015 by Paul Bartelt, Rich Paxton and Christina Nicholson of Bartelt Engineering. Test pits were excavated by Barbour Vineyard Management with a 24 inch mini-excavator. Rebecca Setliff of Napa County Environmental Health visited the site to inspect soil conditions. Test pits # 2 and 3 showed suitable soil for the installation of an Alternative Sewage Treatment System (ASTS) Pressure Distribution System within the area tested. Test pits # 6 & 7 showed suitable soil for an ASTS Subsurface Drip dispersal field replacement area.

Test Pit # 1 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-33*		15-30	L	MSB	S	FRB	S/NP	MVF, MF, CM, FC	CM, CF, FC	None
33-53	C	>50	Decomposing Rock							
53-66	A	>50	Decomposing Rock							

Slope = 34%. Acceptable soil depth observed: 30 inches.
Assigned soil application rate = Insufficient depth for a Conventional – Standard System
Insufficient depth for an ASTS – Pressure Distribution System
Subsurface Drip = 0.7 gal/sf/day (per Napa County regulations)
Subsurface Drip = 0.8 gal/sf/day (per recommended Geoflow drip loading rates)

Refusal at 66 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated November 2, 2015.

Test Pit # 2 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-30*		0-15	CL	SSB	S	FRB	S/NP	MVF, MF, CM	CC, MF, CM	None
30-59*	C	0-15	SCL	SSB	VH	FRB	S/NP	MVF, MF	FM, FF	None

Slope = 14%. Acceptable soil depth observed: 59 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.60 gal/sf/day for ASTS – Pressure Distribution System
PTE 0.75 gal/sf/day for ASTS – Pressure Distribution System
Subsurface Drip = 0.6 gal/sf/day (per Napa County regulations)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow drip loading rates)

Refusal at 59 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated November 2, 2015.

Test Pit # 3

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-34		15-30	CL	MSB	H	FRB	S/NP	MVF, MF, CM	FM, CF	None
34-55	C	0-15	SCL	SSB	VH	FRB	S/NP	MVF, MF	FF	None

Slope = 13%. Acceptable soil depth observed: 55 inches.
Assigned soil application rate = STE 0.33 gal/sf/day for a Conventional – Standard System
STE 0.60 gal/sf/day for ASTS – Pressure Distribution System
PTE 0.75 gal/sf/day for ASTS – Pressure Distribution System
Subsurface Drip = 0.6 gal/sf/day (per Napa County regulations)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow drip loading rates)

No refusal at 55 inches deep.
No Groundwater observed.

Test Pit # 4

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-18		15-30	SL	MSB	S	FRB	S/NP	MVF, MF, CM	CC, MF, CM	None
18-32	C	>50[1]	SL	MSB	VH	FRB	S/NP	MVF, MF	MF, MM	None

Slope = 15%. Acceptable soil depth assigned: 18 inches.
Assigned soil application rate = Insufficient depth for a Conventional – Standard System
Insufficient depth for an ASTS – Pressure Distribution System
Insufficient depth for an ASTS – Subsurface Drip

No refusal at 32 inches deep.
No groundwater observed.
1) Horizon observed to contain greater than 50% rock content by Napa County. Bartelt Engineering observed 15-30% rock.

Test Pit # 5 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-18		15-30	SL	MSB	S	FRB	S/NP	MVF, MF, CM	MM, FC, MF	None
18-48*	C	>50[1]	SL	SSB	H	F	S/NP	MVF, MF	CF	None

Slope = 15%. Acceptable soil depth assigned: 18 inches.
Assigned soil application rate = Insufficient depth for a Conventional – Standard System
Insufficient depth for an ASTS – Pressure Distribution System (PTE and STE)
Insufficient depth for an ASTS – Subsurface Drip

Refusal at 48 inches deep.
No groundwater observed.
*See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated November 2, 2015.
1) Horizon observed to contain greater than 50% rock content by Napa County. Bartelt Engineering observed 15-30% rock.

Test Pit # 6

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-33		30-49	SL	MSB	S	FRB	S/NP	MVF, MF, CM	CC, MF, CM	None

Slope = 9%. Acceptable soil depth observed: 33 inches.
Assigned soil application rate = Insufficient depth for a Conventional – Standard System
Insufficient depth for an ASTS – Pressure Distribution System (PTE and STE)
Subsurface Drip = 1.0 gal/sf/day (per Napa County regulations)
Subsurface Drip = 0.9 gal/sf/day (per recommended Geoflow drip loading rates)

Refusal at 33 inches deep.
No groundwater observed.

Test Pit # 7

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-27		0-15	SL	MSB	S	FRB	S/NP	MVF, MF, CM	CF, FM, FC	None
27-44	C	>50	Decomposing Rock Layer							
Slope = 10%. Acceptable soil depth observed: 27 inches. Assigned soil application rate = Insufficient depth for a Conventional – Standard System Insufficient depth for an ASTS – Pressure Distribution System (PTE and STE) Subsurface Drip = 1.0 gal/sf/day (per Napa County regulations) Subsurface Drip = 0.9 gal/sf/day (per recommended Geoflow drip loading rates)										
Refusal at 44 inches deep. No groundwater observed.										

Test Pit # 8

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-18		0-15	SL	MSB	S	FRB	S/NP	MVF, MF, CM	CF, FM, FC	None
18-55	C	>50	Decomposing Rock Layer							
Slope = 16%. Acceptable soil depth observed: 18 inches. Assigned soil application rate = Insufficient depth for a Conventional – Standard System Insufficient depth for an ASTS – Pressure Distribution System (PTE and STE) Insufficient depth for an ASTS – Subsurface Drip										
Refusal at 55 inches deep. No groundwater observed.										

Test Pit # 9

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-36		>50	Decomposing Rock Layer							
Slope = 20%. Acceptable soil depth observed: 0 inches. Assigned soil application rate = Insufficient depth for a Conventional – Standard System Insufficient depth for an ASTS – Pressure Distribution System (PTE and STE) Insufficient depth for an ASTS – Subsurface Drip										
Refusal at 36 inches deep. No groundwater observed.										

Table of Abbreviations

Boundary	Texture	Structure	Consistence			Pores	Roots	Mottling
			Side Wall	Ped	Wet			
A=Abrupt <1” **C**=Clear 1”-2.5” **G**=Gradual 2.5”-5” **D**=Difuse >5”	**S**=Sand **LS=**Loamy 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 **AB**=Angular Blocky **SB**=Subangular Blocky _____ **M**=Massive **C**=Cemented	**L**=Loose **S**=Soft **SH**=Slighty 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	**Quantity:** **F**=Few **C**=Common **M**=Many **Size:** **VF**=Very Fine **F**=Fine **M**=Medium **C**=Coarse	**Quantity:** **F**=Few **C**=Common **M**=Many **Size:** **VF**=Very Fine **F**=Fine **M**=Medium **C**=Coarse **VC**=Very Course	**Quantity:** **F**=Few **C**=Common **M**=Many **Size:** **F**=Fine **M**=Medium **C**=Coarse **VC**=Very Course **ExC**=Extremely Coarse **Contrast:** **Ft**=Faint **D**=Distinct **P**=Prominent

Attach additional sheets as needed

Alternative Sewage Treatment System Soil Application Rates

TEXTURE	STRUCTURE		APPLICATION RATE (Gal/ft^2 /day)	
	Shape	Grade	STE[1]	PTE[1,2]
Coarse Sand, Sand, Loamy Coarse Sand	Single grain	Structureless	1.0	1.2
Fine Sand, Loamy Fine Sand	Single grain	Structureless	0.6	1.0
Sandy Loam, Loamy Sand	Massive	Structureless	0.35	0.5
	Platy	Weak	0.35	0.5
	Prismatic, blocky, granular	Weak	0.5	0.75
		Moderate, Strong	0.8	1.0
Loam, Silt Loam, Sandy Clay Loam, Fine Sandy Loam	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak, moderate	0.5	0.75
		Strong	0.8	1.0
Sandy Clay, Silty Clay Loam, Clay Loam	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak, moderate	0.35	0.5
		Strong	0.6	0.75
Clay, Silty Clay	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak		
		Moderate, strong	0.2	0.25

1. See Table 1 in the Design, Construction and Installation of Alternative Sewage Treatment Systems.
2. A higher application rate for pretreated effluent may only be used when pretreatment is not used for one foot of vertical separation credit.

MINIMUM SURFACE AREA GUIDELINES TO DISPOSE OF 100 GPD OF SECONDARY TREATED EFFLUENT FOR SUBSURFACE DRIP DISPERSAL SYSTEMS

		Soil Absorption Rates		Design Application Rate (Gal/ft^2/day)	Total Area Required Sq. ft./100 gallons per day
Soil Class	Soil Type	Est. Soil Perc. Rate minutes/inch	Hydraulic Conductivity inches/hour		
I	Coarse sand	1 – 5	>2	1.400	71.5
I	Fine sand	5 – 10	1.5 – 2	1.200	83.3
II	Sandy loam	10 – 20	1.0 – 1.5	1.000	100.0
II	Loam	20 – 30	0.75 – 1.0	0.700	143.0
III	Clay loam	30 – 45	0.5 – 0.75	0.600	167.0
III	Silt - clay loam	45 – 60	0.3 – 0.5	0.400	250.0
IV	Clay non-swell	60 – 90	0.2 – 0.3	0.200	500.0
IV	Clay - swell	90 – 120	0.1 – 0.2	0.100	1000.0

1. For design purpose, the “Soil Type” category to be used in the above table shall be based on the most restrictive soil type encountered within two feet below the bottom of the drip line.
2. Dispersal field area calculation: Total square feet area of dispersal field = Design flow divided by loading rate.

Conventional Sewage Treatment System Soil Application Rates

TEXTURE	STRUCTURE		APPLICATION RATE (Gal/ft^2 /day)
	Shape	Grade	STE
Coarse Sand, Sand, Loamy Coarse Sand	Single grain	Structureless	Prohibited
Sandy Loam, Loamy Sand	Massive	Structureless	Prohibited
	Platy	Weak, mod, strong	Prohibited
	Prismatic, blocky, granular	Weak	0.33
		Moderate, strong	0.5
Loam, Silt Loam, Sandy Clay Loam, Fine Sandy Loam	Massive	Structureless	Prohibited
	Platy	Weak, mod, strong	Prohibited
	Prismatic, blocky, granular	Weak	0.25
		Moderate, Strong	0.33
Clay Loam	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak, moderate	0.25
		Strong	0.33
Sandy Clay, Silty Clay Loam	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak, moderate	Prohibited
		Strong	0.25
Clay, Silty Clay	Massive	Structureless	Prohibited
	Platy	Weak, moderate, strong	Prohibited
	Prismatic, blocky, granular	Weak	Prohibited
		Moderate, strong	Prohibited

CONVENTIONAL SEWAGE TREATMENT SYSTEM SOIL APPLICATION RATES BASED ON PERCOLATION RATES	
Percolation Rate (mpi)	Application Rate (STE)
< 5 MPI	Prohibited
5 to 10 MPI	0.5
10-20 MPI	0.33
20-60 MPI	0.25
> 60 MPI	Prohibited

TABLE 1

DRIP LOADING RATES CONSIDERING SOIL STRUCTURE.

Table 1 is taken from the State of Wisconsin code and was prepared by Jerry Tyler.
Provided for guidelines and budgeting purposes. Refer to your local regulations and qualified soil scientists to determine best loading rates.

Soil Textures	**Soil Structure**	Maximum Monthly Average **BOD_5<30mg/L TSS<30mg/L** (gallons/ft^2/day)	Maximum Monthly Average **BOD_5>30mg/L TSS>30mg/L** (gallons/ft^2/day)
Course sand or coarser	N/A	1.6	0.4
Loamy coarse sand	N/A	1.4	0.3
Sand	N/A	1.2	0.3
Loamy sand	Weak to strong	1.2	0.3
Loamy sand	Massive	0.7	0.2
Fine sand	Moderate to strong	0.9	0.3
Fine sand	Massive or weak	0.6	0.2
Loamy fine sand	Moderate to strong	0.9	0.3
Loamy fine sand	Massive or weak	0.6	0.2
Very fine sand	N/A	0.6	0.2
Loamy very fine sand	N/A	0.6	0.2
Sandy loam	Moderate to strong	0.9	0.2
Sandy loam	Weak, weak platy	0.6	0.2
Sandy loam	Massive	0.5	0.1
Loam	Moderate to strong	0.8	0.2
Loam	Weak, weak platy	0.6	0.2
Loam	Massive	0.5	0.1
Silt loam	Moderate to strong	0.8	0.2
Silt loam	Weak, weak platy	0.3	0.1
Silt loam	Massive	0.2	0.0
Sandy clay loam	Moderate to strong	0.6	0.2
Sandy clay loam	Weak, weak platy	0.3	0.1
Sandy clay loam	Massive	0.0	0.0
Clay loam	Moderate to strong	0.6	0.2
Clay loam	Weak, weak platy	0.3	0.1
Clay loam	Massive	0.0	0.0
Silty clay loam	Moderate to strong	0.6	0.2
Silty clay loam	Weak, weak platy	0.3	0.1
Silty clay loam	Massive	0.0	0.0
Sandy clay	Moderate to strong	0.3	0.1
Sandy clay	Massive to weak	0.0	0.0
Clay	Moderate to strong	0.3	0.1
Clay	Massive to weak	0.0	0.0
Silty clay	Moderate to strong	0.3	0.1
Silty clay	Massive to weak	0.0	0.0

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Experience is the difference

November 2, 2015
File: 9147.62

Bartelt Engineering
1303 Jefferson Street, Ste. 200B
Napa, CA 94559

Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
Aloft Winery, # 14-26

Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. We performed a Soil Texture Analysis by the Bouyoucos Hydrometery Method with the following results:

Size/Density	TP-1 Hor. 1
+ #10 Sieve	5.7 %
Sand	45.0 %
Clay	23.8 %
Silt	31.2 %
Db g/cc	--

We trust this provides the information required at this time. Should you have further questions, please call.

Yours very truly,

RGH GEOTECHNICAL

George Fotou
Laboratory Manager

RGH CONSULTANTS

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November 2, 2015
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Dear Mr. Bartelt:

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Size/Density	TP-2 Hor. 1
+ #10 Sieve	5.9 %
Sand	43.0 %
Clay	30.8 %
Silt	26.2 %
Db g/cc	--

We trust this provides the information required at this time. Should you have further questions, please call.

Yours very truly,

RGH GEOTECHNICAL

George Fotou
Laboratory Manager

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Size/Density	TP-2 Hor. 2
+ #10 Sieve	9.6 %
Sand	44.0 %
Clay	33.8 %
Silt	22.2 %
Db g/cc	--

We trust this provides the information required at this time. Should you have further questions, please call.

Yours very truly,

RGH GEOTECHNICAL

George Fotou
Laboratory Manager

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Dear Mr. Bartelt:

This letter transmits the results of our laboratory testing performed for the subject project. We performed a Soil Texture Analysis by the Bouyoucos Hydrometery Method with the following results:

Size/Density	TP-5 Hor. 2
+ #10 Sieve	28.5 %
Sand	53.0 %
Clay	18.8 %
Silt	28.2 %
Db g/cc	--

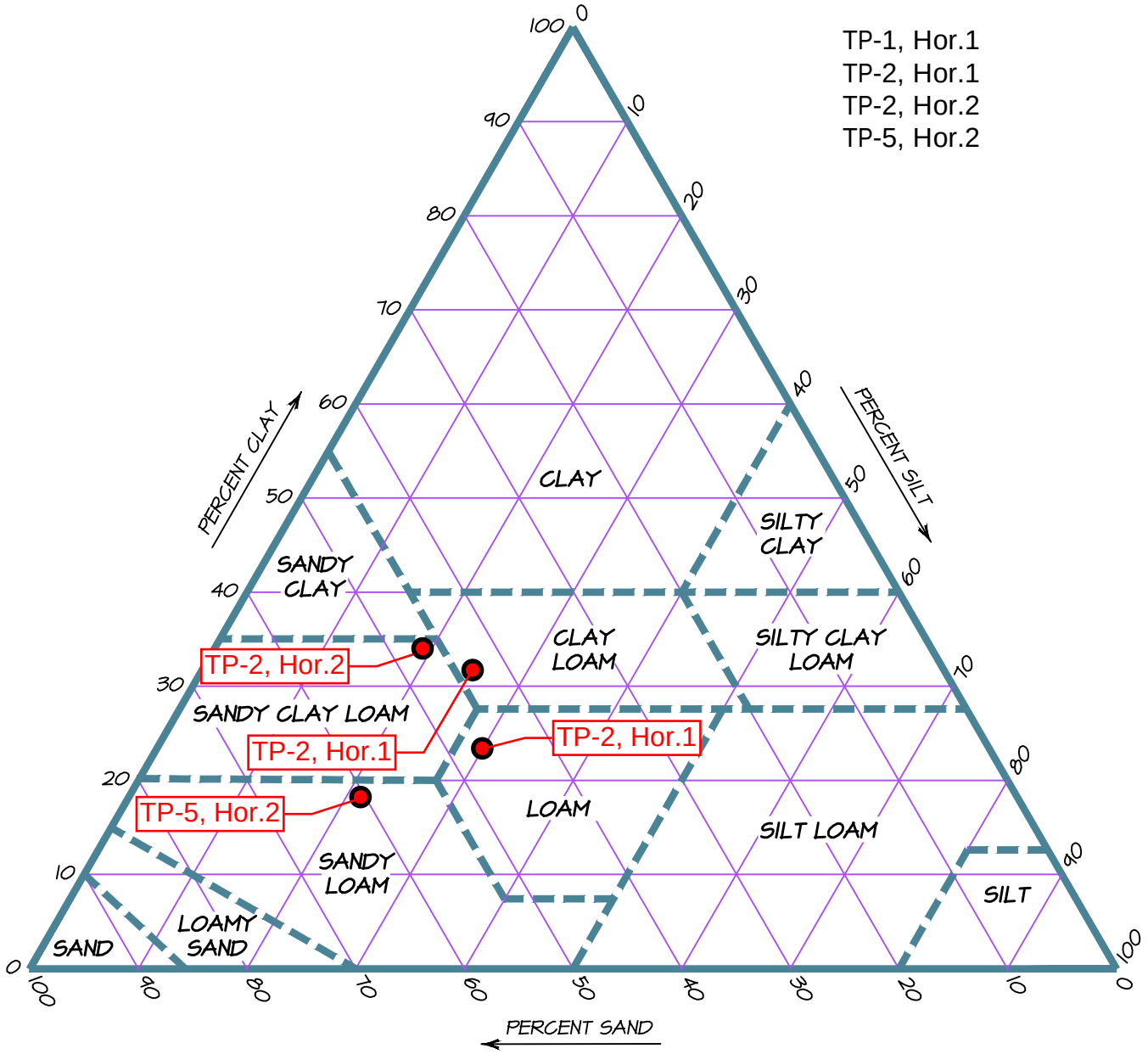
We trust this provides the information required at this time. Should you have further questions, please call.

Yours very truly,

RGH GEOTECHNICAL

George Fotou
Laboratory Manager

SOIL TEXTURE ANALYSIS CHART
BY BOUYOUCOS HYDROMETER METHOD



INSTRUCTIONS:

1. PLOT TEXTURE ON TRIANGLE BASED ON PERCENT SAND, SILT AND CLAY AS DETERMINED BY HYDROMETER ANALYSIS.
2. ADJUST FOR COARSE FRAGMENTS BY MOVING THE PLOTTED POINT IN THE SAND DIRECTION AN ADDITIONAL 2% FOR EACH 10% (BY VOLUME) OF FRAGMENTS GREATER THAN 2mm IN DIAMETER.
3. ADJUST FOR COMPACTNESS OF SOIL BY MOVING THE PLOTTED POINT IN THE CLAY DIRECTION AN ADDITIONAL 15% FOR SOILS HAVING A BULK-DENSITY GREATER THAN 1.7gm/cc.

NOTE:

FOR SOILS FALLING IN SAND, LOAMY SAND OR SANDY LOAM CLASSIFICATION, A BULK DENSITY ANALYSIS WILL GENERALLY NOT AFFECT SUITABILITY AND ANALYSIS IS NOT NECESSARY.

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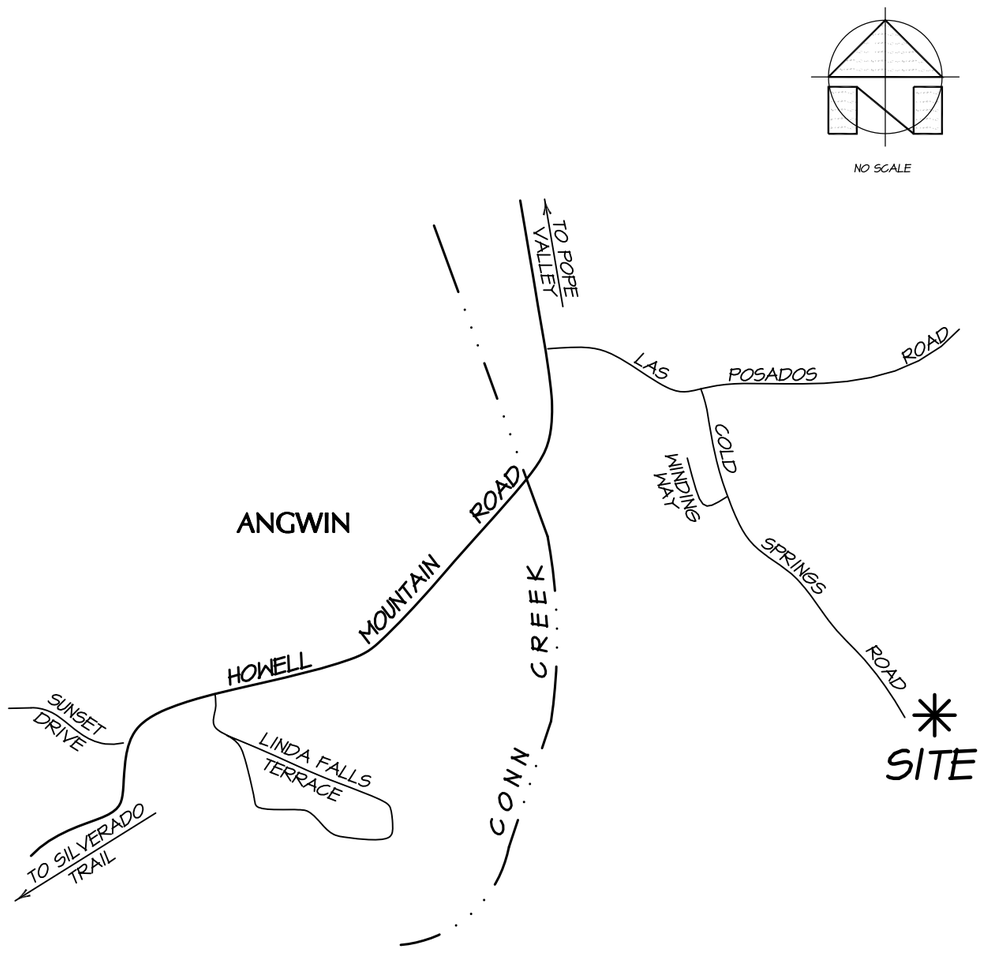
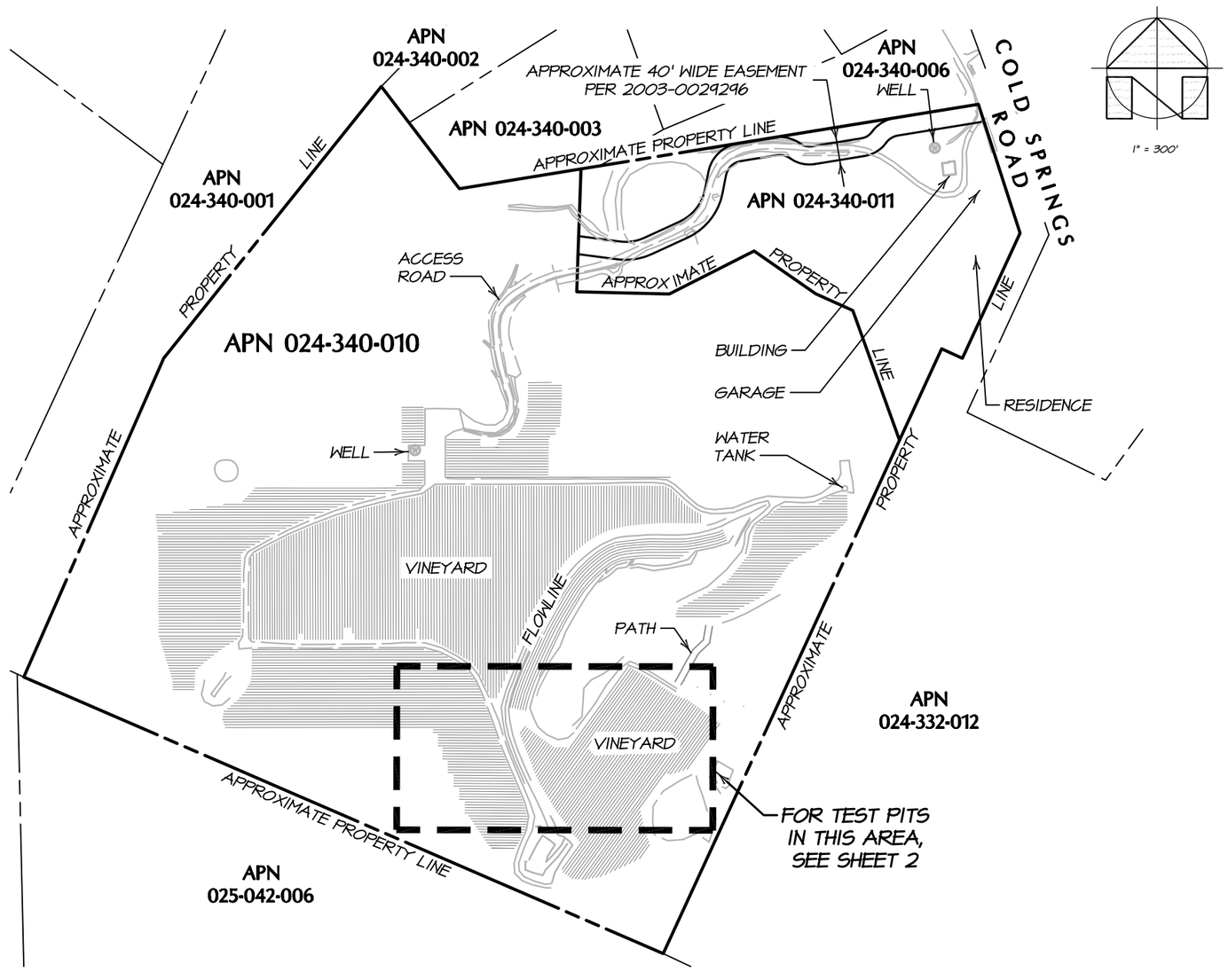
Aloft Winery
Cold Springs Road
Angwin, Napa County, CA
APN 024-340-010
Job No. 14-26 **October 2015**



LOCATION MAP

NO SCALE



OVERALL SITE PLAN
TEST PIT EXHIBIT

SCALE: 1" = 300'

BARTELT ENGINEERING
CIVIL ENGINEERING · LAND PLANNING
1303 Jefferson Street, 200 B, Napa, CA 94559
www.barteltengineering.com
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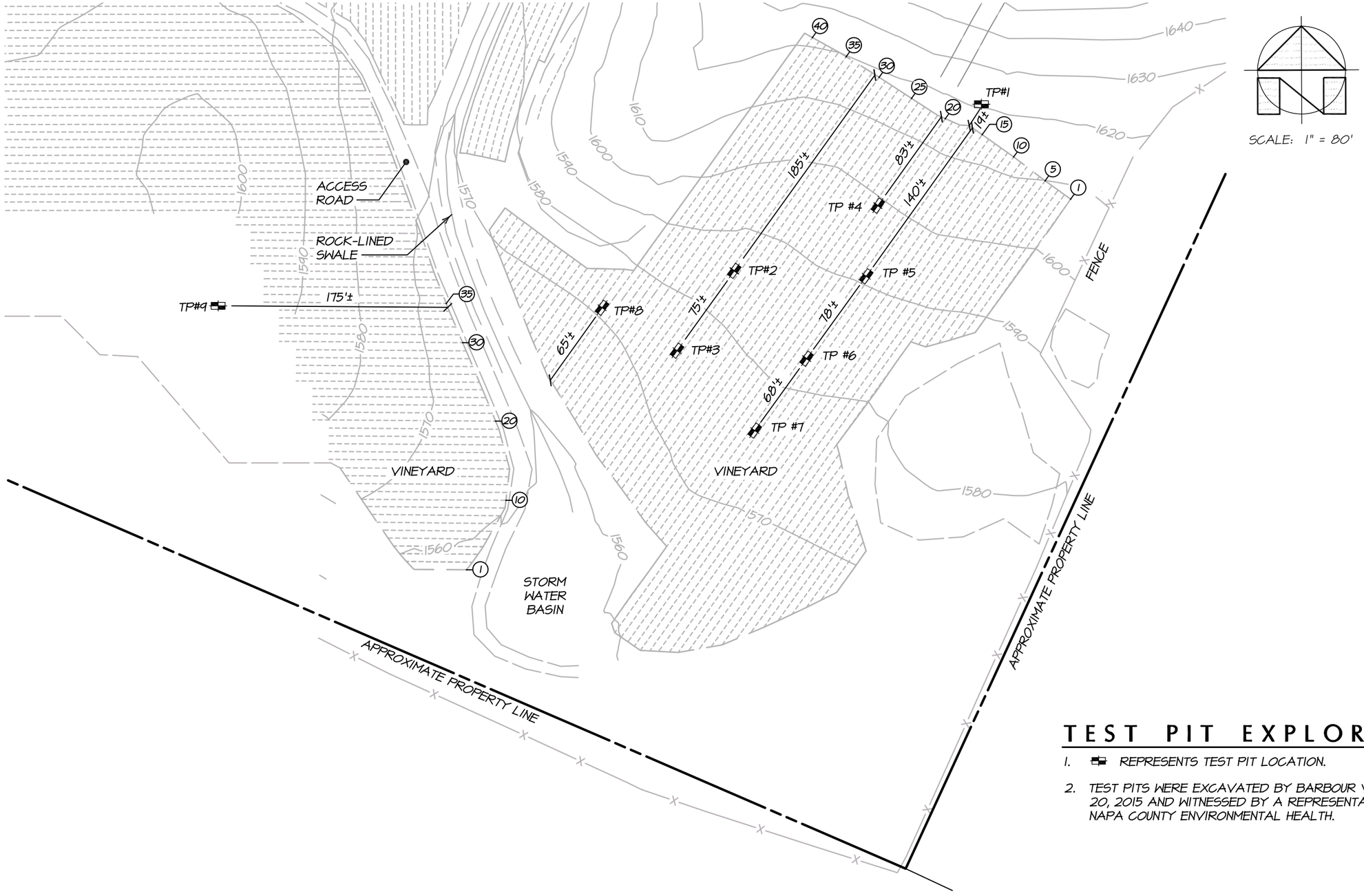

SCALE: 1" = 80'

TEST PIT EXPLORATION NOTES:

1. ▬ REPRESENTS TEST PIT LOCATION.
2. TEST PITS WERE EXCAVATED BY BARBOUR VINEYARD MANAGEMENT ON OCTOBER 20, 2015 AND WITNESSED BY A REPRESENTATIVE FROM BARTELT ENGINEERING AND NAPA COUNTY ENVIRONMENTAL HEALTH.

TEST PIT LOCATION MAP

SCALE: 1" = 80'

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