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Wastewater Dispersal Feasibility Study

Saintsbury Winery Major Modification P18-00027
Planning Commission Hearing August 19, 2020

June 2017
Job No. 00-87

BARTELT ENGINEERING

ONSITE WASTEWATER DISPERSAL FEASIBILITY STUDY FOR SAINTSBURY WINERY 1500 LOS CARNEROS AVENUE, NAPA COUNTY APN 047-212-002

As required by Napa County Planning, Building and Environmental Services (PBES), this study outlines the feasibility of providing onsite wastewater dispersal for an existing winery and tasting room on the above referenced parcel located at 1500 Los Carneros Avenue in Napa County, CA.

PROJECT DESCRIPTION

The project proposes improvements to the existing onsite sanitary wastewater treatment system that serves the existing hospitality building and full crush winery located on an existing 15.83± acre parcel. A new groundwater well will also be drilled on the subject parcel as part of the proposed improvements. The parcel is currently developed with an existing hospitality building and a full crush winery with a permitted production capacity of 135,000 gallons of wine per year. Refer to the attached Use Permit Major Modification Drawings for the existing conditions and proposed improvements.

The existing winery is proposing to employ 13 full time employees, one (1) part-time employee and five (5) seasonal (harvest) employees. The existing winery is proposing to modify the existing marketing plan to include a maximum number of 95 visitors for tour and tastings per day. The winery is proposing to offer food and wine pairings to a maximum of 10 tour and tasting visitors per day. Furthermore, the winery is proposing to host six (6) 50 person Wine Club events and two (2) 100 person Large Events. During Large events two (2) additional event staff are proposed to be utilized. The Applicant is not proposing to increase the wine production capacity. The proposed staffing and marking plan is used to size the proposed sanitary wastewater system improvements.

Table 1 summarizes the current and proposed staffing plan:

TABLE 1: STAFFING PLAN SUMMARY

Description	Number of Employees	Frequency
Full-time Employees	13	Daily
Part-time Employees	1	Daily
Harvest/Seasonal Employees	5	Daily

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1303 Jefferson Street, 200 B, Napa, CA 94559
www.barteltengineering.com Tel: 707-258-1301 Fax: 707-258-2926

Table 2 summarizes the marketing plan:

TABLE 1: MARKETING PLAN SUMMARY

Description	Number of Guests	Event Staff	Frequency
Tour & Tasting Visitors	95 per day	0 per day	Daily
Food & Wine Pairings	10 per day	0 per day	Daily
Wine Club / Release Events	50 per event	0 per event	6 per year
Large Event	100 per event	2 per event	2 per year

As part of our services, representatives from Bartelt Engineering have reviewed the operational methods for the winery with our Client, reviewed the parcel files at Napa County PBES, held conversations with Napa County PBES staff, performed a reconnaissance of the site to view existing conditions and conducted a site evaluation on November 15, 2016 to evaluate the feasibility of installing a new onsite wastewater dispersal system to serve the existing winery, offices and tasting room.

This study and the associated Use Permit Major Modification Drawings are provided to demonstrate that the proposed sanitary wastewater system improvements can feasibly be developed and that all sanitary wastewater can be adequately treated and dispersed onsite.

WASTEWATER ANALYSIS

Process Wastewater Flow

The project is not proposing a modification to wine production nor is it proposing improvements to the process wastewater system. Refer to the attached Wastewater Feasibility Study submitted with the Very Minor Use Permit Modification (P17-00172) for information on the process wastewater flows.

Sanitary Wastewater Flow

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

Employees:

- 13 Full-Time Employees x 15 gpd per employee = 195 gpd
- 1 Part-Time x 15 gpd per employee = 15 gpd
- 5 Harvest Season x 15 gpd per employee = 75 gpd

Guests[1]:

- Tour and Tasting Visitors:
  - (95 guests per day) x (3 gpd per guest) = 285 gpd per day
- Food and Wine Pairings with catered food service:
  - (10 guests per day) x (5 gpd per guest) = 50 gpd per day
- Wine Club / Release Events with catered food service:
  - (50 guests per event) x (5 gpd per guest) = 250 gpd per event
- Large Event with catered food service:
  - (100 guests per event) x (5 gpd per guest) x 60% usage rate = 300 gpd per event
  - (2 event staff) x (15 gpd per event staff) = 30 gpd per staff

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

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

Table 3 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.

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

	Daily Occurrence							
	Harvest				Non-Harvest			
Employees	285	285	285	285	210	210	210	210
Tours and Tastings	285	255	-	-	285	255	-	-
Food and Wine Pairing[2]	-	50	-	-	-	50	-	-
Wine Club Event	-		250	-	-		250	-
Large Event	-		-	330	-		-	330
Total Flow (gpd)	570	590	535	615	495	515	460	540

[1] Wastewater generation rate during tours and tastings is 3 gpd and during catered meal pairings and events is 5 gpd.

[2] During food and wine pairings, the remaining maximum number of tour and tasting visitors to the winery is 85 guests per day.

Table 3 shows that the greatest SW flow during the harvest and non-harvest seasons is generated during a typical staffing day with a Large Event hosted at the winery.

Design Wastewater Flows

The greatest practical harvest and non-harvest season peak sanitary wastewater flow is summarized in the following table:

TABLE 4: HARVEST AND NON-HARVEST SEASON PEAK DAILY FLOW SUMMARY

Wastewater Source	Harvest (gpd)	Non-Harvest (gpd)
Sanitary Wastewater	615	540

The greatest SW daily flow occurs during the harvest season.

WASTEWATER TREATMENT AND DISPERSAL METHODS

The proposed sanitary wastewater system is discussed further in the following sections as well as summarized in the attached wastewater treatment diagram. Refer to the associated Use Permit Major Modification Drawings for location of the proposed primary and replacement dispersal areas.

Existing Wastewater Systems

The existing wastewater systems serving the existing winery production facility and hospitality building include a sanitary wastewater Wisconsin mound system and a process wastewater pond treatment system. Under the approved Very Minor Use Permit Modification (P17-00172), the existing mound system can be demolished and replaced with a new subsurface drip dispersal field with pretreatment in a new location.

The existing process wastewater system includes a screen, lift station, aeration treatment pond, dual cell settling pond and effluent pump tank followed by surface dispersal. Under the approved Very Minor Use Permit Modification (P17-00172), the existing PW system can be modified to include a temporary Hold & Haul system followed by a pretreatment system, conversion of the Hold & Haul storage tank to a vineyard irrigation storage tank and dispersal of treated winery wastewater through subsurface drip irrigation on 12.4 acres of vineyard. Further modifications to the process wastewater system are not included with this Use Permit Application.

Proposed 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 615 gpd. The winery production facility, offices and tasting room SW would continue to gravity flow to a series of existing septic tanks. From the septic tanks, SW effluent flows by gravity to a recirculation/dose tank. From the recirculation/dose tank, stored effluent is pumped to an Orenco AdvanTex AX Pretreatment 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 November 15, 2016, suitable area is available onsite for a subsurface drip dispersal field. The primary dispersal

area is proposed to be located near test pit #7 which has an observed depth of 43 inches with Clay Loam soil. 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. For Clay Loam type soil, Napa County recommends a soil hydraulic loading rate[3] of 0.50 gal/sf/day and GeoFlow Incorporated recommend a soil hydraulic loading rate[4] of 0.60 gal/sf/day for pretreated effluent. The lesser of these two values (0.5 gal/sf/day) is recommended for sizing the area of the dispersal field.

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

$$\text{Subsurface Drip Field Area} = \frac{\text{design flow rate}}{\text{hydraulic loading rate}} = \frac{615\,\frac{\text{gal}}{\text{day}}}{0.5\,\frac{\text{gal}}{\text{day/ft}^2}} = 1{,}230\ \text{ft}^2$$

Based on site slopes less than 5% in the primary area, two (2) foot spacing is recommended between driplines per Napa County Standards. The recommended drip field contains 10 driplines each 65 feet long. The total recommended primary area is 1,300 square feet.

The sanitary wastewater subsurface drip field approved under the Use Permit Very Minor Modification (P17-00172) includes a recommended primary dispersal area of 1,200 square feet to accommodate the existing marketing and staffing plan. This project is proposing to increase the approved primary dispersal field from 1,200 square feet to 1,300 square feet to accommodate the increase in flows from the proposed staff and marketing plan.

Sanitary Wastewater 200% Replacement Area

The replacement area is proposed to be located near test pits #7 and #8 which had an observed depth of 42 to 43 inches with Clay Loam soil. The same application rate (0.5 gal/sf/day) used for the primary area is used to size the 200% replacement area, as shown below:

$$\text{Replacement Area} = 200\% \times \left(\frac{\text{design flow rate}}{\text{hydraulic loading rate}}\right) = (200\%) \times \frac{615\,\frac{\text{gal}}{\text{day}}}{0.5\,\frac{\text{gal}}{\text{day/ft}^2}} = 2{,}460\ \text{ft}^2$$

Based on site slopes less than 5% in the replacement area, two (2) foot spacing is recommended between driplines per Napa County Standards. The recommended replacement area is 2,600 square feet.

[3] Referenced from *Table III-2 Sewage Dispersal System Hydraulic Loading Rates (gal/ft²/day) Based on Soil Profile* from Napa County Onsite Wastewater Treatment Systems (OWTS) Technical Standards, Final Draft.

[4] 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.

WASTEWATER TREATMENT TANK SIZING

Septic Tank(s)

The existing SW septic tank(s) are proposed to be utilized with the proposed improvements unless their existing condition is reported to be inadequate for continued use by a licensed contractor. Any new septic tank(s) will be sized to provide a minimum of three (3) days of hydraulic retention time during peak wastewater flows. Furthermore, the septic tank(s) will also 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.

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:

Tank Option (SW flows only) = 1 day x 615 gallons
= 615 gallons, 1,500 gallons recommended

Subsurface Drip 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:

Tank Volume (SW flows only) = 1.5 days x 615 gpd
= 923 gallons, 1,500 gallons recommended

OPERATION AND MAINTENANCE

Per Napa County requirements, the sanitary wastewater system is classified as an Alternative Sewage Treatment Systems (ASTS) and therefore must have a Service Provider. The Service Provider would be assigned prior to operation and final approval of the installed wastewater system.

SUMMARY & CONCLUSIONS

Sanitary wastewater generated from the existing winery and hospitality building is anticipated to increase as a result of the proposed changes to the staff and marketing plan.

The project proposes to improve the existing onsite sanitary wastewater system and expand the subsurface drip dispersal field and pretreatment system that is approved under the Use Permit Very Minor Modification (P17-00172) to accommodate the increase in sanitary wastewater flows. This study demonstrates that all sanitary wastewater generated from the proposed project can feasibly be developed onsite. Modifications to the approved wine production capacity and process wastewater system are not proposed as part of this Use Permit Modification.

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

ATTACHMENTS

Proposed Wastewater Treatment Diagram

Wastewater Feasibility Study dated April 2017 (submitted with Use Permit Very Minor Modification P17-00172)

Site Evaluation Report

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.

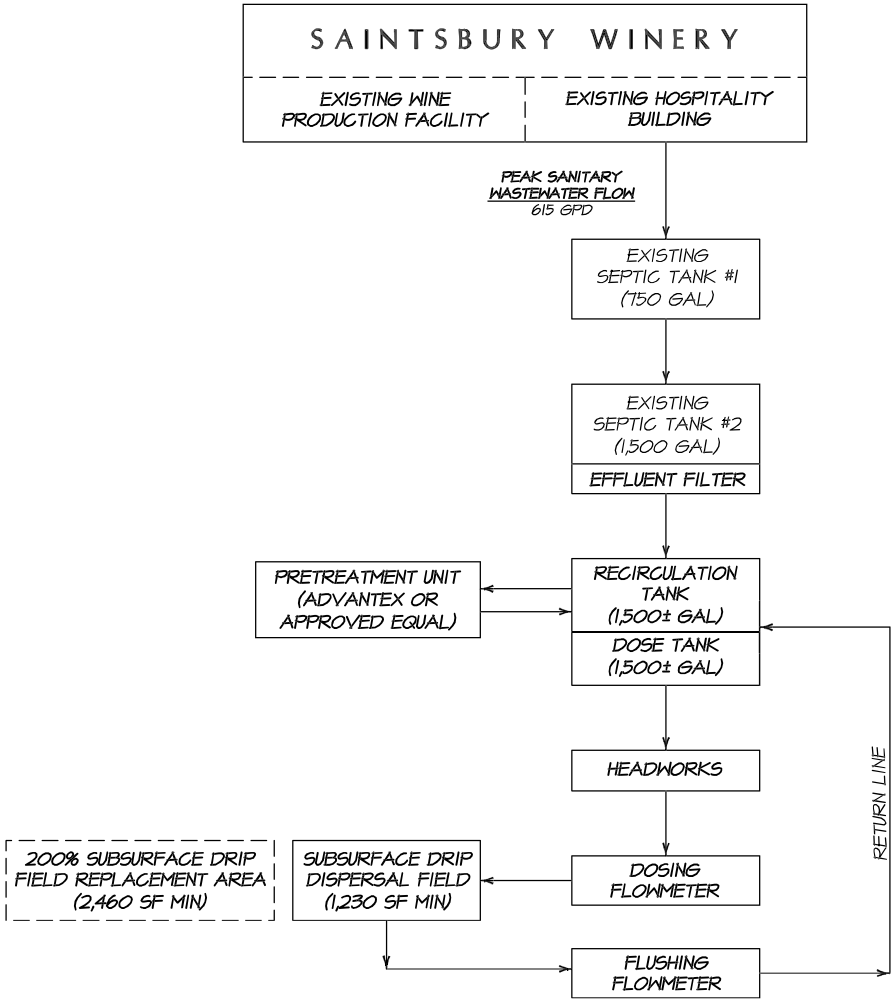
Telsco Industries. "Turf Irrigation Manual." By James A. Watkins. 1987.

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.

Napa County Planning, Building and Environmental Services, "Napa County Onsite Wastewater Treatment Systems (OWTS) Technical Standards." Final Draft.

Orenco Systems, Incorprated. "AdvanTex Design Criteria for Commercial Treatment Systems". Rev.1.6. January 2016.



SANITARY WASTEWATER TREATMENT DIAGRAM

NO SCALE

BARTELT ENGINEERING
CIVIL ENGINEERING · LAND PLANNING
1303 Jefferson Street, 200 B, Napa, CA 94559
www.barteltengineering.com
· Telephone: 707-258-1301 ·

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SUBSURFACE DRIP FIELD SIZING

Wastewater source:	Sanitary Wastewater
Flow rate - harvest season:	615 gpd
Flow rate - non-harvest season:	540 gpd
Annual wastewater flow	164,160 gallons per year
Primary Area	
Near test pits[1]:	#7
Soil texture:	Clay loam
Soil structure:	Moderate
Effluent type:	PTE
Hydraulic loading rate	
Napa County PBES[2]:	0.50 gal/day/ft^2
GeoFlow Inc.[3]:	0.60 gal/day/ft^2
Minimum subsurface drip field area:	1,230 ft^2
Number of driplines:	10 lines
Dripline length:	65 feet
Site slopes in primary area	5%
Dripline spacing:	2 feet
Total recommended primary area:	***1,300 ft^2***
Replacement Area	
Near test pits[1]:	#7 and #8
Required replacement area:	200%
Soil texture	Clay loam
Soil structure:	Moderate
Effluent type:	PTE
Hydraulic loading rate	
Napa County PBES[2]:	0.50 gal/day/ft^2
GeoFlow Inc.[3]:	0.60 gal/day/ft^2
Minimum replacement area:	2,460 ft^2
Site slopes in primary area	5%
Dripline spacing:	2 feet
Total recommended replacement area:	***2,600 ft^2***

Notes:

[1] Refer to the site evaluation report prepared by Bartelt Engineering and witnessed by Napa County PBES on November 15, 2016 for more information

[2] Referenced from *Table III-2 Sewage Dispersal System Hydraulic Loading Rates (gal/ft^2/day) Based on Soil Profile* from Napa County Onsite Wastewater Treatment Systems (OWTS) Technical Standards, Final Draft

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

April 2017
Job No. 00-87

BARTELT ENGINEERING

WASTEWATER FEASIBILITY STUDY FOR SAINTSBURY WINERY 1500 LOS CARNEROS AVENUE, NAPA COUNTY APN 047-212-002

As required by Napa County Planning, Building & Environmental Services (PBES), this study outlines the feasibility of improving the existing process and sanitary wastewater systems that currently serve the existing winery and tasting room on the above referenced parcel located at 1500 Los Carneros Avenue in Napa, CA.

PROJECT DESCRIPTION

The project proposes installation of a temporary Hold & Haul (H&H) system for winery process wastewater until a permanent pretreatment system can be installed. Treated effluent from the pretreatment system is proposed to be stored in an irrigation storage tank (previously utilized as the H&H storage tank) and dispersed through surface drip vineyard irrigation. The project also proposes to abandon and remove the existing sanitary wastewater mound system and install a new subsurface drip dispersal field with pretreatment.

The 15.83± acre subject parcel is currently developed with an existing hospitality building and a full crush winery with a permitted production capacity of 135,000 gallons of wine per year. As part of the proposed improvements the onsite vineyard area will reduce from 12.5 acres to 12.4 acres. Refer to the attached Use Permit Drawings for the existing conditions and proposed improvements.

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 Napa County PBES, held conversations with Napa County PBES staff, performed a reconnaissance of the site to view existing conditions and conducted a site evaluation on November 15, 2016 to evaluate the feasibility of installing a new onsite wastewater dispersal system.

This study and the associated Use Permit Drawings are provided to demonstrate that the proposed temporary H&H system and onsite wastewater pretreatment system improvements can feasibly be developed on the subject parcel.

WASTEWATER ANALYSIS

Under the existing Use Permit 97556-UP the winery is permitted to host eight (8) private lunches/dinners per year with up to 25 guests and one (1) 50 person Wine Club event per year. Annual visitation to the winery is 1,300 tasting guests with an average of four (4) tasting guests per day and 12 guests per day during peak visitation. The existing winery is also permitted to have 10 employees. The current staffing and marking plan as well as the wine production capacity are utilized to size the proposed wastewater treatment improvements. Modifications to the existing permitted uses are not being requested at this time.

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www.barteltengineering.com Tel: 707-258-1301 Fax: 707-258-2926

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 the harvest and non-harvest seasons are based on historical wastewater data collected by the winery facility during the 2011, 2013 and 2014 seasons. Based on the historical wastewater data, the harvest season typically occurs from September to October (60± days) and produces 34.3% of the total annual PW flow. During the harvest season, historical data shows that the peak daily wastewater flow occurs during September where 16.9% of the total annual PW flow occurs. The peak harvest PW daily flow is calculated by dividing the monthly flow by number of days per month as shown in the following equation:

Harvest Peak PW Flow =

$$\left(\frac{135{,}000\ \text{gallons of wine}}{\text{year}}\right)\times\left(\frac{6\ \text{gallons of water}}{1\ \text{gallon of wine}}\right)\times\left(\frac{16.9\%}{30\ \text{days in September}}\right)=$$

Harvest Peak PW Flow = 4,573 gallons per day (gpd)

The average daily PW flow during the non-harvest season (November to August) is calculated to be 1,750 gpd. Refer to the attached Table 1 for summary of the historical data and a breakdown of the monthly and daily PW flows.

Sanitary Wastewater Flow

The sanitary wastewater (SW) generated at the winery production facility, offices and tasting room including employees, tasting guests and events are itemized below:

Employees:

- 10 Employees x 15 gpd per employee = 150 gpd

Guests[1]:

- Tours and Tasting Visitors:
  - (12 guests per day) x (3 gpd per guest) = 36 gpd
- Private Lunch or Dinner Events:
  - (25 guests per event) x (5 gpd per guest) = 125 gpd per event
- Wine Club / Release Event:
  - (50 guests per event) x (5 gpd per guest) = 250 gpd per event

> ***Note:*** *This feasibility study assumes that offsite meal preparation and catering services are utilized during all events.*

[1] Wastewater generation rate during tours and tastings is 3 gpd and during catered events is 5 gpd.

Peak Sanitary Wastewater Flow

The peak sanitary wastewater flow is estimated to occur on a day when all permitted activities occur. This includes a full work day with the maximum number of employees, peak visitation at the winery, a private lunch or dinner event and a wine club/release event all occurring on the same day. The peak sanitary wastewater flow is calculated by summing the itemized flows listed above which equates to 561 gpd.

WASTEWATER TREATMENT AND DISPERSAL METHODS

The proposed wastewater systems 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

The existing process wastewater system includes a screen, lift station, aeration treatment pond, dual cell settling pond and effluent pump tank followed by offsite discharge to an existing irrigation pond located on parcel APN 047-160-022. Offsite discharge to the existing irrigation pond is no longer a mutually agreed upon method of wastewater discharge from the subject parcel to APN 047-160-022. Therefore, the winery has been utilizing hold and haul from the existing wastewater treatment ponds on an emergency basis.

The existing sanitary wastewater system includes several septic tanks and a Wisconsin mound dispersal system.

Proposed Process Wastewater Hold & Haul System

The proposed winery PW H&H system provides a temporary method of offsite discharge until a permanent onsite dispersal method can be installed. PW would continue to be collected in trench drains and floor drains and flow by gravity to the existing lift station prior to entering the existing screen. Screened PW would continue to flow by gravity to the existing aeration treatment pond that has a total volume of 10,303± gallons and includes two (2) surface aerators. Effluent from the aeration pond would flow to the existing dual cell settling pond that has a total volume of 25,770± gallons. Effluent from the dual cell settling pond is proposed to be pumped to the H&H tank. Base on site constraints, a 10-wheel pumper truck (3,400± gallons) is anticipated to haul the stored effluent from the H&H tank to an approved wastewater treatment plant (East Bay MUD or equivalent).

Per Napa County PBES requirements, the H&H storage tank must be able to store a minimum of seven (7) days of peak PW flows as calculated below:

H&H Storage Tank = 7 days x 4,573 gpd
= 11,222 gallons minimum

The proposed H&H storage tank is an above ground 200,000 gallon corrugated bolted steel tank. Hauling of stored wastewater will be performed by a Napa County PBES approved septage hauler. As part of the H&H system, an approved onsite dispersal system must be designated for winery PW as a replacement area. The proposed future pretreatment system followed by surface drip vineyard irrigation serves as the replacement area for the H&H system and is described in the following section.

Future PW Pretreatment & Surface Drip Irrigation

The permanent method for onsite treatment and dispersal includes a pretreatment system followed by surface drip vineyard irrigation. PW would continue to be collected in trench drains and floor drains and flow by gravity to the existing lift station prior to entering the existing screen. Screened PW would flow by gravity to the existing aeration treatment pond for equalization. The existing aeration/equalization pond has a total volume of 10,303± gallons and is equipped with two (2) surface aerators. Effluent from the existing aeration/equalization pond would be pumped via a new lift station to the proposed pretreatment system. Examples of a pretreatment system include (but not limited to) BioFiltro, Cloacina or Lyve Systems.

The pretreatment system selected for installation is anticipated to include a pH adjustment system, primary treatment tank equipped with an aeration system and a filtration system. The PW pretreatment system must be capable of treating PW to an acceptable level for surface drip irrigation in vineyard areas per jurisdictional requirements. From the pretreatment system, PW effluent is proposed to be pumped to an irrigation storage tank. The H&H tank included in the *Proposed Process Wastewater Hold & Haul System* would be repurposed and serve as the irrigation storage tank. The existing dual cell settling pond could be used for additional post treatment storage or converted to an evaporation pond to aid in the removal of treated wastewater during warmer months.

Process Wastewater Surface Drip Irrigation

A PW flow balance was determined by evaluating the historical monthly PW flow rates (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 has a recommended storage of 200,000 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 (onsite well and recycled water from the Los Carneros Water District[2]) is used to supply additional irrigation water.

The total vineyard area where treated PW is dispersed through surface drip irrigation is based on a future replant of 12.4± acres to include 15,433 vines with a seven (7) foot row width and five (5) foot vine spacing. 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

[2] Refer to the attached Will Serve Letter from the Los Carneros Water District.

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 part of the future improvements to the PW system, the existing sanitary mound system would be abandoned and removed. The future PW pretreatment system is proposed to be installed where the existing sanitary mound system is located. This is an ideal location that is downstream from the existing PW treatment ponds and adjacent to the converted irrigation storage tank. Furthermore, the existing sanitary mound system was installed in 1988 and is likely near the end of its useful lifespan.

The proposed future SW dispersal field is sized for a peak daily flow of 561 gpd. The winery production facility, offices and tasting room SW would continue to flow by gravity to a series of existing septic tanks. Effluent from the existing septic tanks is proposed to flow by gravity to a new recirculation/dose tank. Septic tank effluent in the recirculation/dose tank 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 November 15, 2016, suitable area is available onsite for a subsurface drip dispersal field. The primary dispersal area is proposed to be located near test pit #7 which has an observed depth of 43 inches with Clay Loam soil. 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. For Clay Loam type soil, Napa County recommends a soil hydraulic loading rate[3] of 0.50 gal/sf/day and GeoFlow Incorporated recommend a soil hydraulic loading rate[4] of 0.60 gal/sf/day for pretreated effluent. The lesser of these two values (0.5 gal/sf/day) is recommended for sizing the area of the dispersal field.

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

$$\text{Subsurface Drip Field Area} = \frac{\text{design flow rate}}{\text{hydraulic loading rate}} = \left(\frac{561 \frac{\text{gal}}{\text{day}}}{0.5 \frac{\text{gal}}{\text{day/ft}^2}} \right) = 1{,}122 \text{ ft}^2$$

Based on site slopes less than 5% in the primary area, two (2) foot spacing is recommended between driplines per Napa County Standards. The recommended drip field contains 10 driplines each 60 feet long. The total recommended primary area is 1,200 square feet.

[3] Referenced from *Table III-2 Sewage Dispersal System Hydraulic Loading Rates (gal/ft²/day) Based on Soil Profile* from Napa County Onsite Wastewater Treatment Systems (OWTS) Technical Standards, Final Draft.

[4] 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.

Sanitary Wastewater 200% Replacement Area

The replacement area is proposed to be located near test pits #7 and #8 which had an observed depth of 42 to 43 inches with Clay Loam soil. The same application rate (0.5 gal/sf/day) used for the primary area is used to size the 200% replacement area, as shown below:

$$\text{Replacement Area} = 200\% \times \left(\frac{\text{design flow rate}}{\text{hydraulic loading rate}} \right) = (200\%) \times \left(\frac{561 \frac{\text{gal}}{\text{day}}}{0.5 \frac{\text{gal}}{\text{day/ft}^2}} \right) = 2{,}244 \text{ ft}^2$$

Based on site slopes less than 5% in the replacement area, two (2) foot spacing is recommended between driplines per Napa County Standards. The recommended replacement area is 2,244 square feet.

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. A Service Provider would be assigned for the proposed ASTS prior to operation and final approval of the installed wastewater system(s).

SUMMARY & CONCLUSION

The project proposes improvements to the existing wastewater systems to allow for onsite dispersal for this Use Permit Modification. Associated improvements include a temporary Hold & Haul system and a surface drip dispersal system with pretreatment for winery wastewater. A subsurface drip dispersal system with pretreatment is also being proposed for dispersal of sanitary wastewater. An increase or modification to the existing staffing/marketing plan and wine production capacity are not being requested.

Full design calculations and improvement 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

Sanitary Wastewater Design Worksheet

Los Carneros Water District Will Serve Letter

Site Evaluation Report

REFERENCES

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

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

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

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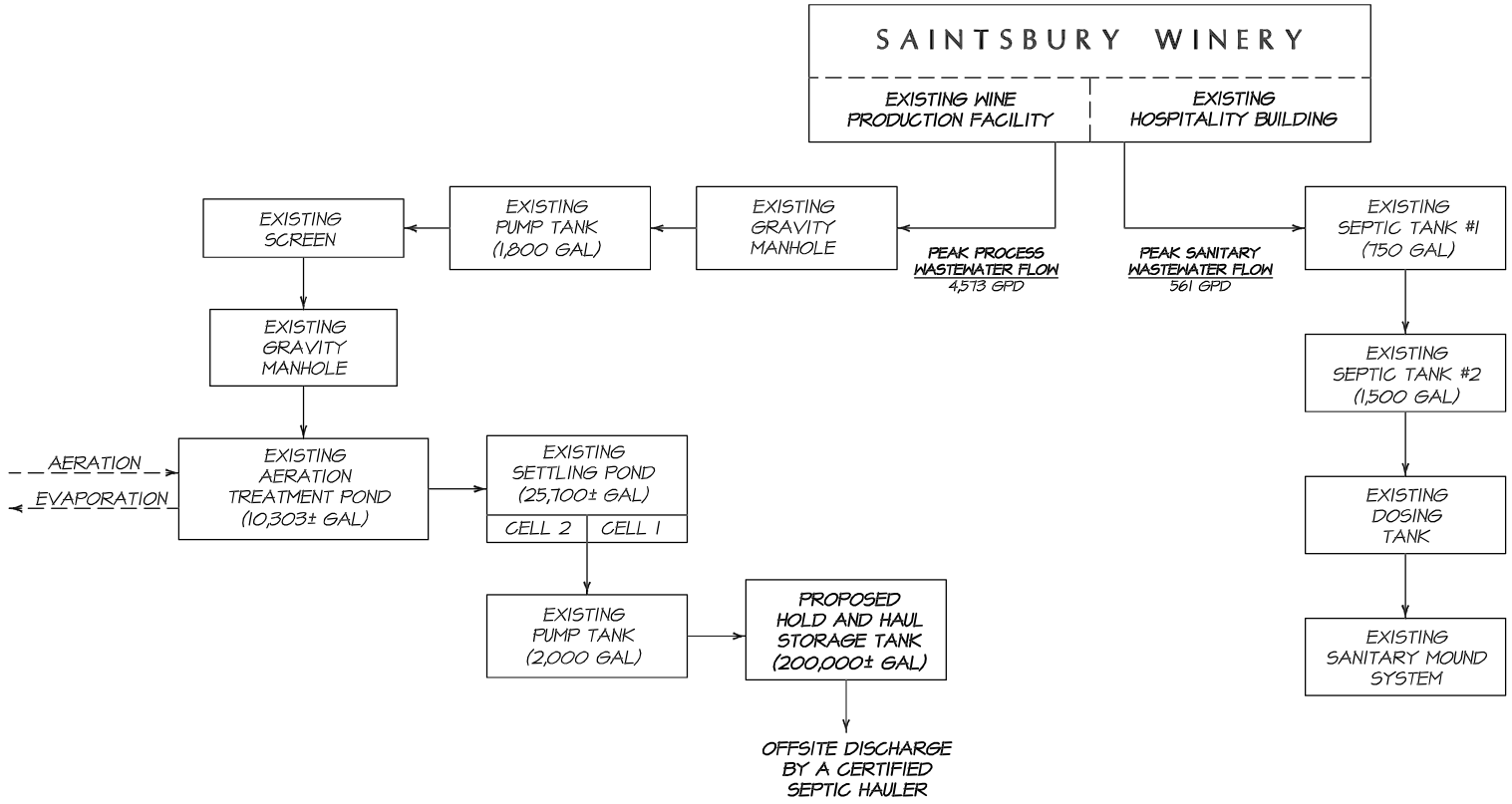
Napa County Planning, Building and Environmental Services, "Napa County Onsite Wastewater Treatment Systems (OWTS) Technical Standards." Final Draft.

Orenco Systems, Incorprated. "AdvanTex Design Criteria for Commercial Treatment Systems". Rev.1.6. January 2016.



PROPOSED TEMPORARY PROCESS WASTEWATER HOLD & HAUL SYSTEM AND EXISTING SANITARY WASTEWATER SYSTEM

NO SCALE

BARTELT ENGINEERING
CIVIL ENGINEERING · LAND PLANNING
1303 Jefferson Street, 200 B, Napa, CA 94559
www.barteltengineering.com
· Telephone: 707-258-1301 ·

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Saintsbury Winery
1500 Los Carneros Avenue
Napa, CA 94558
APN 047-212-002
Job No. 00-87
April 2017
Sheet 1 of 3

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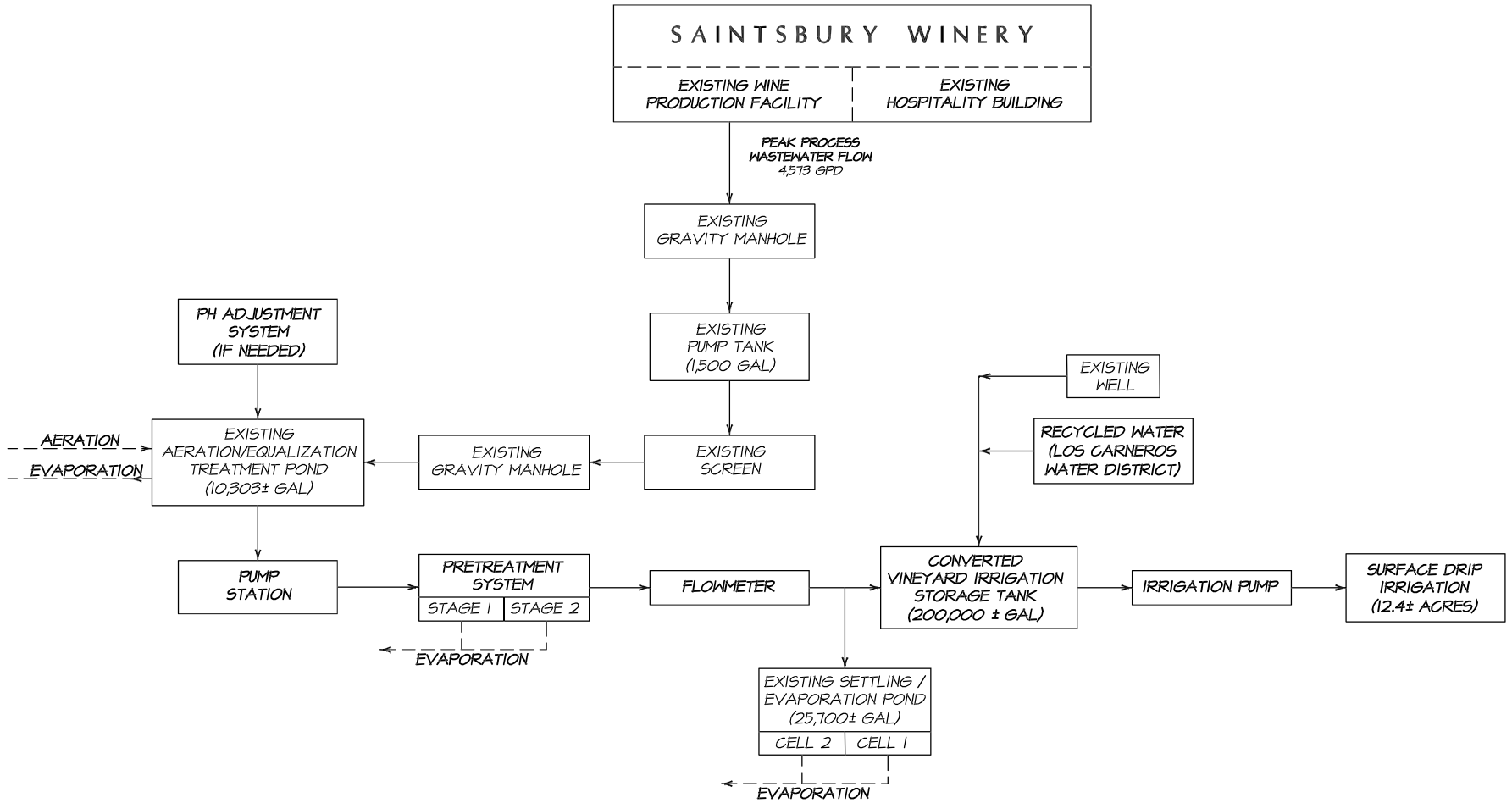

PROPOSED PROCESS WASTEWATER TREATMENT DIAGRAM

NO SCALE

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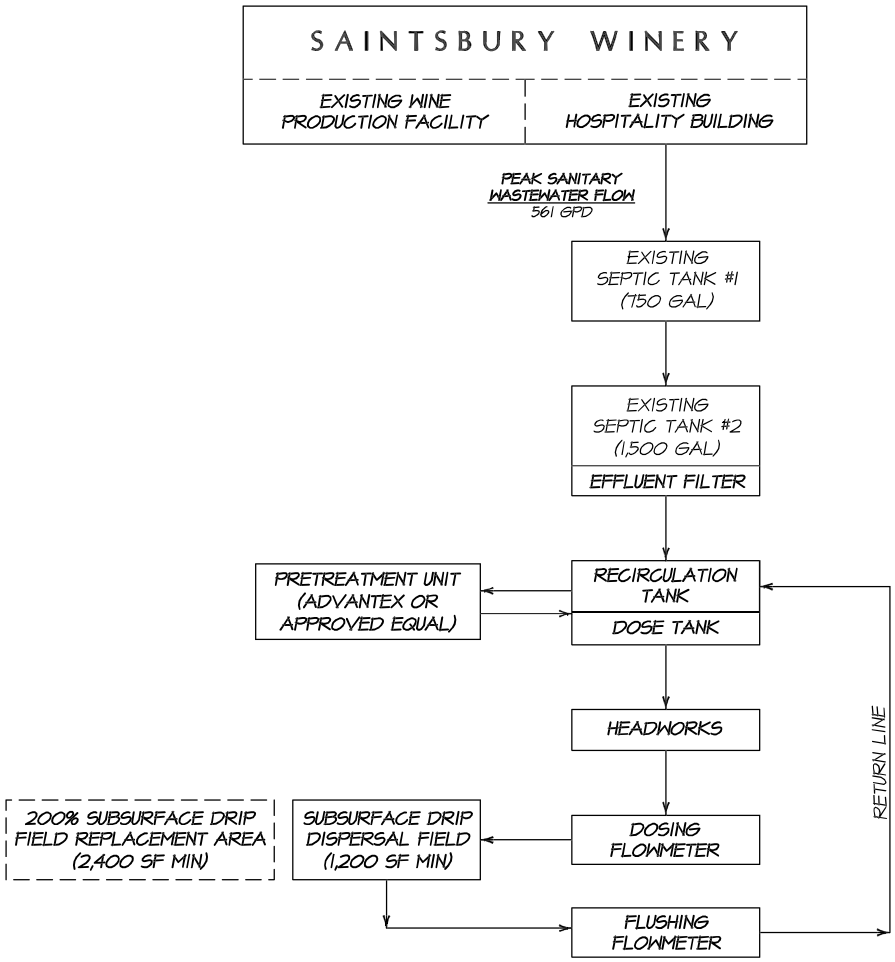

PROPOSED SANITARY WASTEWATER TREATMENT DIAGRAM

NO SCALE

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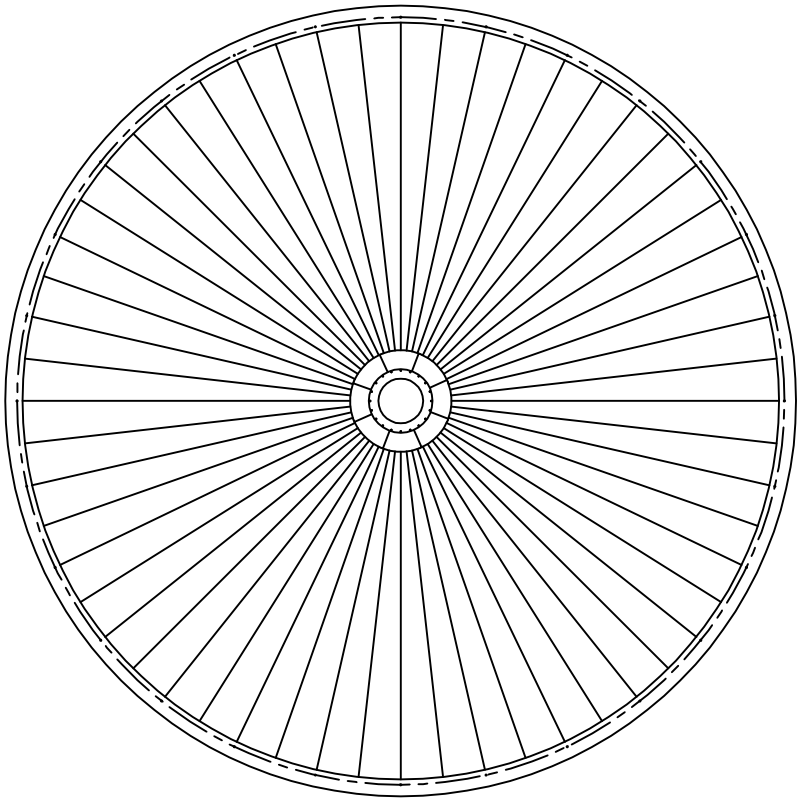
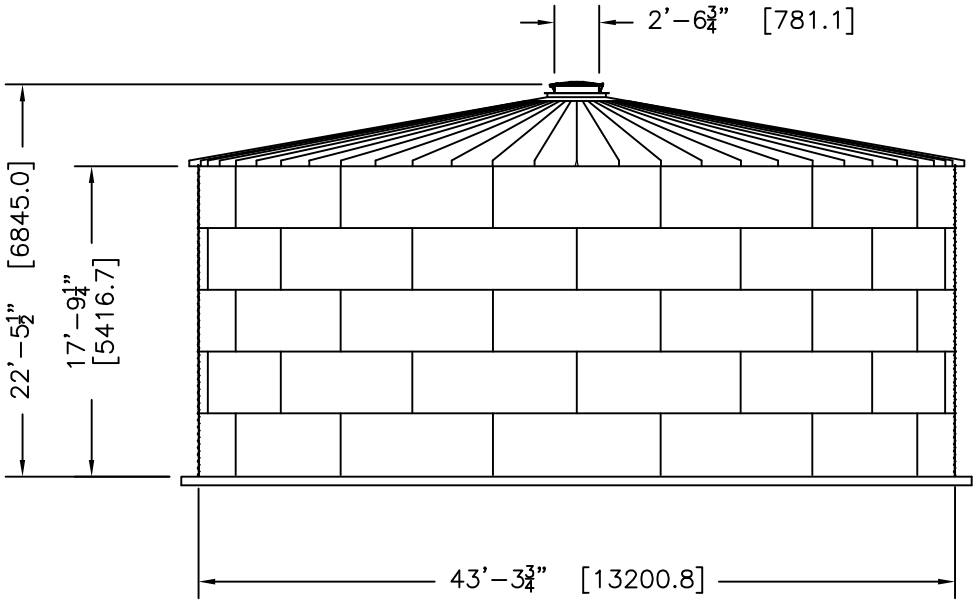
SAINTSBURY HOLD & HAUL TANK



PLAN



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DWN	XXX	XX/XX/XX
CKD		
ENG		

TITLE STEELCORE WATER TANK SCT-4305-LVR
WTU14-05 30"PR 10DEG V-RIB
NOMINAL CAPACITY - 191,479 GALLONS (US)

DWG. NO. SCT4305-LVR WTU14-05

REV. NO.

SIZE: A

SCALE: 3/32"=1'-0"

SHEET 1 OF 1

THIS DRAWINGS DEPICTED ON THIS PRINT AND INFORMATION CONTAINED HEREIN ARE PROPRIETARY TO STEEL CORE TANK, LLC. AND SHALL NOT BE USED IN WHOLE OR PART WITHOUT WRITTEN CONSENT OF STEEL CORE TANK, LLC. 2015

BARTELT ENGINEERING

Saintsbury Winery
Process Wastewater Flow
Table I

Total annual wine production (gallons):	**135,000**
Annual water usage per gallon of wine (gallons):	**6**
Annual process wastewater flow (gallons):	810,000
Average process wastewater flow (gpd):	2,219
Harvest water usage per gallon of wine (gallons):	1.5
Length of Harvest (days):	45.0
Harvest process wastewater flow (gallons per day):	**4,500**
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):	**1,898**

MONTHLY PROCESS WASTEWATER FLOW (gallons/month):

PROCESS WASTEWATER FLOW			
		Wastewater Flow	
Month	**Percent[1]**	**Monthly**	**Daily**
September (Start of Harvest Season)	**16.9%**	**137,177**	**4,573**
October (End of Harvest Season)	**17.4%**	**140,944**	**4,547**
November	**8.1%**	**65,404**	**2,180**
December	**4.6%**	**37,081**	**1,196**
January	**4.7%**	**38,434**	**1,240**
February	**5.9%**	**47,906**	**1,711**
March	**8.3%**	**67,394**	**2,174**
April	**5.3%**	**42,685**	**1,423**
May	**5.1%**	**41,657**	**1,344**
June	**6.8%**	**55,072**	**1,836**
July	**5.9%**	**48,188**	**1,554**
August	**10.9%**	**88,058**	**2,841**
TOTALS	100%	810,000	

Notes:

[1] The monthly percentages of process wastewater flow is based on flow recordings taken by Heritage Systems for Saintsbury Winery during the 2011, 2013 and 2014 seasons.

BARTELT ENGINEERING

Saintsbury Winery
Vineyard Process Wastewater Irrigation
Table II

Vineyard area (acres):	12.4
Row width (feet):	7.0
Vine spacing (feet):	5.0
Total number of irrigated vines:	15,433
Seasonal irrigation (May - October)	
Seasonal irrigation per vine (gallons/season):	**80**
Non-Seasonal irrigation (November - March):	
Non-seasonal irrigation per vine (gallons/season):	**4**

ESTIMATED VINEYARD PROCESS WASTEWATER IRRIGATION

Month	Seasonal Percent (%)	Seasonal Irrigation[1] (gal/vine)	Non-Seasonal Irrigation (gal/vine)	Total Irrigation (gallons)
September	15%	12		185,192
October	15%	12		185,192
November	0%	0	2	30,865
December	0%	0	0	0
January	0%	0	0	0
February	0%	0	0	0
March	0%	0	2	30,865
April	5%	4		61,731
May	10%	8		123,461
June	15%	12		185,192
July	20%	16		246,923
August	20%	16		246,923
TOTAL	100%	80	4	**1,296,346**
				3.98 acre-feet

Notes:
[1] Vineyard irrigation values are based on irrigation data provided by Edwards Engineering for Saintsbury Winery 2015 season.

BARTELT ENGINEERING

Saintsbury Winery
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	137,177	185,192	0
October	0	140,944	185,192	0
November	0	65,404	30,865	34,539
December	34,539	37,081	0	71,620
January	71,620	38,434	0	110,054
February	110,054	47,906	0	157,960
March	157,960	67,394	30,865	194,488
April	194,488	42,685	61,731	175,442
May	0	41,657	123,461	0
June	0	55,072	185,192	0
July	0	48,188	246,923	0
August	0	88,058	246,923	0
	TOTALS	**810,000**	**1,296,346**	
	Average	**67,500**	**108,029**	**62,009**

Recommended Tank Storage (gallons): 200,000
Recommended Tank Storage (acre-feet): 0.61

Notes:

> 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.

> Water balance calculations assume storage tank is empty at the beginning of November due to post-harvest irrigation.

BARTELT ENGINEERING

SUBSURFACE DRIP FIELD SIZING

Wastewater source:	Sanitary Wastewater
Design Flowrate:	561 gpd
Primary Area	
Near test pits[1]:	#7
Soil texture:	Clay loam
Soil structure:	Moderate
Effluent type:	PTE
Hydraulic loading rate	
Napa County PBES[2]:	0.50 gal/day/ft^2
GeoFlow Inc.[3]:	0.60 gal/day/ft^2
Minimum subsurface drip field area:	1,122 ft^2
Number of driplines:	10 lines
Dripline length:	60 feet
Site slopes in primary area	5%
Dripline spacing:	2 feet
Total recommended primary area:	***1,200 ft^2***
Replacement Area	
Required replacement area:	200%
Near test pits[1]:	#7 and #8
Soil texture	Clay loam
Soil structure:	Moderate
Effluent type:	PTE
Hydraulic loading rate	
Napa County PBES[2]:	0.50 gal/day/ft^2
GeoFlow Inc.[3]:	0.60 gal/day/ft^2
Minimum replacement area:	2,244 ft^2
Site slopes in primary area	5%
Dripline spacing:	2 feet
Total recommended replacement area:	***2,244 ft^2***

Notes:

[1] Refer to the site evaluation report prepared by Bartelt Engineering and witnessed by Napa County PBES on November 15, 2016 for more information

[2] Referenced from *Table III-2 Sewage Dispersal System Hydraulic Loading Rates (gal/ft^2/day) Based on Soil Profile* from Napa County Onsite Wastewater Treatment Systems (OWTS) Technical Standards, Final Draft

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

January 30, 2017

Conservation, Development and Planning Department – County of Napa
1195 Third Street, Room 210
Napa, CA 94559

SUBJECT: APN 047-212-002 – Saintsbury Winery
NSD Will Serve #60 – Recycled Water

To Whom It May Concern:

The Napa Sanitation District (District) has received a request to provide a "Will Serve" letter for proposed winery improvements located on the subject parcel. The District will provide recycled water service to this parcel.

The following items will be required by the owner/developer:

1. Install the recycled water improvements as specified in the District's Conditions of Approval for the project.
2. Pay the appropriate development fees. The facility shall be subject to all applicable rules and regulations of the District.
3. Enter into a Recycled Water User Agreement with the District for purchase and use of recycled water.

This parcel is within the Los Carneros Water District (LCWD). The development will be required to install the necessary facilities to utilize recycled water for irrigation.

The District currently has an irrigation season (May 1 – October 31) supply of recycled water of 3,700 acre-feet. The District's source for recycled water is wastewater generated by sewer customers within the District's sewer service area.

LCWD was issued a will-serve letter for 450 acre-feet of recycled water during the irrigation season which is a portion of the 3,700 acre-feet supply. The subject parcel is allocated 1.73 acre-feet of recycled water during the irrigation season which is a portion of the LCWD allocation. The District will provide recycled water service to this parcel.

This "Will Serve" letter for sanitary sewer and recycled water service is valid for a period of three (3) years from the date of this letter. If the proposed development has not obtained its required Connection Permits from the District at the end of this time, this "Will Serve"

letter shall become void. If you have any questions regarding this matter, please contact me at (707) 258-6007 or adamron@napasan.com.

Sincerely,

Andrew Damron, P.E.
Technical Services Director

cc: Christina Nicholson, Bartelt Engineering
David Graves, Saintsbury Winery

Napa County Department of Environmental Management

REVISED 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 #: E16-00791

APN: 047-212-002

(County Use Only)
Reviewed by: Date:

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner Saintsbury, LLC, c/o David Graves	☐ New Construction ☐ Addition ☐ Remodel ☒ Relocation ☐ Other:
Property Owner Mailing Address 1500 Los Carneros Avenue	☐ Residential - # of Bedrooms: Design Flow : gpd
City State Zip Napa CA 94559	☒ Commercial – Type: Winery Sanitary Waste: 570 gpd Process Waste: gpd
Site Address/Location 1500 Los Carneros Avenue, Napa County, 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 November 15, 2016

Primary Area See below	Expansion Area See below
Acceptable Soil Depth: 42 in. Test pits #: 7	Acceptable Soil Depth: 42 in. Test pits #: 7 and 8
Soil Application Rate (gal. /sq. ft. /day): 0.5 – 0.6	Soil Application Rate (gal. /sq. ft. /day): 0.5 – 0.6
System Type(s) Recommended: Subsurface Drip, PD leachfield	System Type(s) Recommended: Subsurface Drip, PD leachfield
Slope: < 5 %. Distance to nearest water source: 100+ feet	Slope: < 5 %. 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 November 15, 2016 by Paul Bartelt, Christina Nicholson and Rich Paxton of Bartelt Engineering. Test pits were excavated by McCollum General Engineering utilizing a mini-excavator equipped with a 22 inch bucket. Rebecca Setliff of Napa County Environmental Health visited the site to observe soil conditions. Test pits # 1-3 and #6-12 showed suitable soil for the installation of an Alternative Sewage Treatment System (ASTS) dispersal field and replacement area within the area tested. Test pits #4-5 and #13-15 did not show enough suitable soil for the installation of an ASTS dispersal field.

Test Pit # 1 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
*0-12”	C	< 15%	SCL	SAB	H	FRB	S/P	MF, MVF	CC, CVF	None
*12-28”	C	< 15%	SCL	SAB	H	FRB	S/P	MF, MVF	CC, CVF	None
28-36”		< 5%	C	MAB	H	FRB	S/VP	CVF, CF	None	None

Slope = < 5%. Acceptable soil depth observed: 36 inches.
Assigned soil application rate = PTE 0.5 gal/sf/day (for SCL) and 0.25 gal/sf/day (for C) for ASTS
PTE Geoflow[1] = 0.6 gal/sf/day (for SCL) and 0.3 gal/sf/day (for C) for ASTS-Subsurface Drip

No refusal at 36 inches deep. No groundwater observed.
*See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated November 30, 2016.
[1] Referenced from *Table 1 Drip Loading Rates Considering Soil Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated, 2007.

Test Pit # 2 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
*0-20”	C	< 15%	SCL	SAB	H	FRB	S/P	MF, MVF	CM, FC	None
20-24”	C	< 15%	C	MAB	H	FRB	S/VP	CVF, CF	None	None
24-34”		> 50%	Cemented	Rock						F, F, Ft[2]

Slope = < 5%. Acceptable soil depth observed: 24 inches.
Assigned soil application rate = PTE 0.25 gal/sf/day for ASTS
PTE Geoflow[1] = 0.3 gal/sf/day for ASTS-Subsurface Drip

Refusal at 34 inches deep. No groundwater observed.
*See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated November 30, 2016.
[1] Referenced from *Table 1 Drip Loading Rates Considering Soil Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated, 2007.

[2] Some mottling observed by Rebecca Setliff of Napa County Environmental Health Division at 24 inch soil depth.

Test Pit # 3

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-20”	C	< 15%	SCL	SAB	H	FRB	S/P	MF, MVF	CM, FC	None
20-24”	A	< 15%	C	MAB	H	FRB	S/VP	CVF, CF	None	None
24-48”	C	45%	C	MAB	H	FRB	S/VP	CVF, CF	None	F, F, Ft[2]
40-48”		> 50%	Cemented	Rock						

Slope = < 5%. Acceptable soil depth observed: 24 inches.
Assigned soil application rate = PTE 0.25 gal/sf/day for ASTS
PTE Geoflow[1] = 0.3 gal/sf/day for ASTS-Subsurface Drip

Refusal at 48 inches deep. No groundwater observed.
[1] Referenced from *Table 1 Drip Loading Rates Considering Soil Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated, 2007.

[2] Some mottling observed by Rebecca Setliff of Napa County Environmental Health Division at 24 inch soil depth.

Test Pit # 4

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-18”	G	<15%	SCL	SAB	H	FRB	S/P	MF, MVF	FF, FM	None
18-48”		15-30%	C	MC[1]	H	FRB	S/VP	CVF, CF	None	None
Slope = < 5%. Acceptable soil depth observed: 18 inches.										
No refusal at 48 inches deep. No groundwater observed. [1] Texture observed to be massive cemented clay by Rebecca Setliff of Napa County Environmental Health Division.										

Test Pit # 5

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-18”	G	<15%	SCL	SAB	H	FRB	S/P	MF, MVF	CF, CM, FC	None
18-58”		15-30%	C	MC[1]	H	FRB	S/VP	CVF, CF	FM	None
Slope = < 5%. Acceptable soil depth observed: 18 inches.										
No refusal at 58 inches deep. No groundwater observed. [1] Texture observed to be massive cemented clay by Rebecca Setliff of Napa County Environmental Health Division.										

Test Pit # 6 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
*0-16”	G	<15%	SCL	MAB	H	FRB	S/VP	CVF, CF	CF, FC, CVF	None
16-45”		<15%	C	MAB	H	FRB	S/VP	CVF, CF	FC, FF	None
Slope = < 5%. Acceptable soil depth observed: 45 inches. Assigned soil application rate = STE 0.2 gal/sf/day for ASTS PTE 0.25 gal/sf/day for ASTS PTE Geoflow[1] = 0.3 gal/sf/day for ASTS-Subsurface Drip										
No refusal at 45 inches deep. No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated November 30, 2016. [1] Referenced from *Table 1 Drip Loading Rates Considering Soil Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated, 2007.										

Test Pit # 7 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
*0-22”	G	<15%	L	SAB	H	FRB	S/P	MF, MVF	FF, FC	None
*22-43”	C	<15%	CL	MAB	H	FRB	S/VP	CVF, CF	FC	None
43-50”		<15%	C	MAB	H	FRB	S/VP	CVF, CF	None	FF

Slope = < 5%. Acceptable soil depth observed: 43 inches.
Assigned soil application rate = STE 0.35 gal/sf/day for ASTS
PTE 0.5 gal/sf/day for ASTS
PTE Geoflow[1] = 0.6 gal/sf/day for ASTS-Subsurface Drip

Refusal at 50 inches deep. No groundwater observed.
*See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated November 30, 2016.
[1] Referenced from *Table 1 Drip Loading Rates Considering Soil Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated, 2007.

Test Pit # 8

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-22”	G	<15%	L	SAB	H	FRB	S/P	MF, MVF	FC, FF	None
22-42”	C	<15%	CL	MAB	H	FRB	S/VP	CVF, CF	FM	None
42-48”		<15%	C	MM	VH	F	VS/VP	CVF	None	FF

Slope = < 5%. Acceptable soil depth observed: 42 inches.
Assigned soil application rate = STE 0.35 gal/sf/day for ASTS
PTE 0.5 gal/sf/day for ASTS
PTE Geoflow[1] = 0.6 gal/sf/day for ASTS-Subsurface Drip

No refusal at 48 inches deep. No groundwater observed.
[1] Referenced from *Table 1 Drip Loading Rates Considering Soil Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated, 2007.

Test Pit # 9

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-24”	C	<15%	CL	SAB	H	FRB	S/P	MF, MVF	CM, FF	None
24-45”		<15%	C	MAB	H	FRB	S/VP	CVF, CF	FM, FF	FF

Slope = < 5%. Acceptable soil depth observed: 24 inches.
Assigned soil application rate = PTE 0.5 gal/sf/day for ASTS
PTE Geoflow[1] = 0.6 gal/sf/day for ASTS-Subsurface Drip

No refusal at 45 inches deep. No groundwater observed.
[1] Referenced from *Table 1 Drip Loading Rates Considering Soil Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated, 2007.

Test Pit # 10

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-22”	C	<15%	L	SAB	H	FRB	S/P	MF, MVF	CM,FF	None
22-43”		<15%	CL	MAB	H	FRB	S/VP	CVF, CF	None	None

Slope = < 5%. Acceptable soil depth observed: 43 inches.
Assigned soil application rate = STE 0.35 gal/sf/day for ASTS
PTE 0.5 gal/sf/day for ASTS
PTE Geoflow[1] = 0.6 gal/sf/day for ASTS-Subsurface Drip

No refusal at 43 inches deep. No groundwater observed.
[1] Referenced from *Table 1 Drip Loading Rates Considering Soil Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated, 2007.

Test Pit # 11 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
*0-20”	D	<15%	L	SAB	H	FRB	S/P	MF, MVF	FM, FF	None
20-36”	A	<15%	CL	MAB	H	FRB	S/VP	CVF, CF	FM	None
36”-52”		<15%	CL	MAB	H	FRB	S/VP	CVF, CF	FM	F, F, Ft[2]

Slope = < 5%. Acceptable soil depth observed: 36 inches.
Assigned soil application rate = STE 0.35 gal/sf/day for ASTS
PTE 0.5 gal/sf/day for ASTS
PTE Geoflow[1] = 0.6 gal/sf/day for ASTS-Subsurface Drip

No refusal at 52 inches deep. No groundwater observed.
*See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated November 30, 2016.
[1] Referenced from *Table 1 Drip Loading Rates Considering Soil Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated, 2007.
[2] Some mottling observed by Rebecca Setliff of Napa County Environmental Health Division at 36 inch soil depth.

Test Pit # 12

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-24”	G	<15%	L	SAB	H	FRB	S/P	MF, MVF	FF	None
24-30”	A	<15%	CL	MAB	H	FRB	S/VP	CVF, CF	FC	None
30”-50”		<15%	CL	MAB	H	FRB	S/VP	CVF, CF	FC	F, F, Ft[2]

Slope = < 5%. Acceptable soil depth observed: 30 inches.
Assigned soil application rate = STE 0.35 gal/sf/day for ASTS
PTE 0.8 gal/sf/day (for L) and 0.5 gal/sf/day (for CL) for ASTS
PTE Geoflow[1] = 0.8 gal/sf/day (for L) and 0.6 gal/sf/day (for CL) for ASTS-Subsurface Drip

No refusal at 50 inches deep. No groundwater observed.
[1] Referenced from *Table 1 Drip Loading Rates Considering Soil Structure* of The Subsurface Drip Dispersal and Reuse Design, Installation and Maintenance Guidelines prepared by GeoFlow Incorporated, 2007.
[2] Some mottling observed by Rebecca Setliff of Napa County Environmental Health Division at 36 inch soil depth.

Test Pit # 13

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-18”	G	<15%	SCL	SAB	H	FRB	S/P	MF, MVF	FC	None
18-21”	G	<15%	SiL	SAB	H	FRB	S/P	MF, MVF	FC	CMD
21-48”		<15%	CL	MAB	H	FRB	S/VP	CVF, CF	FF, FC	CMD

Slope = < 5%. Acceptable soil depth observed: 18 inches due to the presence of mottling.

No refusal at 48 inches deep. No groundwater observed.

Test Pit # 14

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-20”	G	<15%	L	SAB	H	FRB	S/P	MF, MVF	CF, FM	None
20-48”		<15%	CL	MAB	H	FRB	S/VP	CVF, CF	FM, FC	CMD

Slope = < 5%. Acceptable soil depth observed: 20 inches due to the presence of mottling.

No refusal at 48 inches deep. No groundwater observed.

Test Pit # 15 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
*0-16”	G	<15%	SCL	SAB	H	FRB	S/P	MF, MVF	FC, FVC	None
16-20”	G	<15%	SCL	SAB	H	FRB	S/P	MF, MVF	FC, FVC	F, F, Ft
20-44”		<15%	CL	MAB	H	FRB	S/VP	CVF, CF	FVC	F, F, Ft
Slope = < 5%. Acceptable soil depth observed: 20 inches due to the presence of mottling.										
No refusal at 44 inches deep. No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated November 30, 2016.										

From: Setliff, Rebecca
To: Richard Paxton
Subject: site eval 1500 Los Carneros047-212-002
Date: Friday, March 10, 2017 10:07:20 AM

Hi Rich,

After reviewing the site eval report, my notes were the same as yours for test pits 7 and 8 but different for some of the other test pits. Remember we talked about the massive clay in test pit 4 which started around 18 inches? I believe we also observed similar soil at 18 inches in test pit 5. I also discussed it with Kim when I got back to the Office and she conquered and then I let you know and you said you thought that was going to be the result.

My notes show the following for test pits 2,3,4,5,11, and 12

Test pits 2 and 3 had some mottling beginning around 24 inches

Test pit 4 from 18-48 was massive, cemented clay
Test pit 5 acceptable soil to 18 inches, massive cemented clay

Test pit 11 mottling observed at 36 inches
Pit 12 observed mottling at 30 inches

Thank you,

Rebecca E. Setliff, REHS
Planning, Building, and Environmental Services
1195 Third Street, Suite 210
Napa, CA 94559
(707) 253-4339, (707) 253-4545 Fax

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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.

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

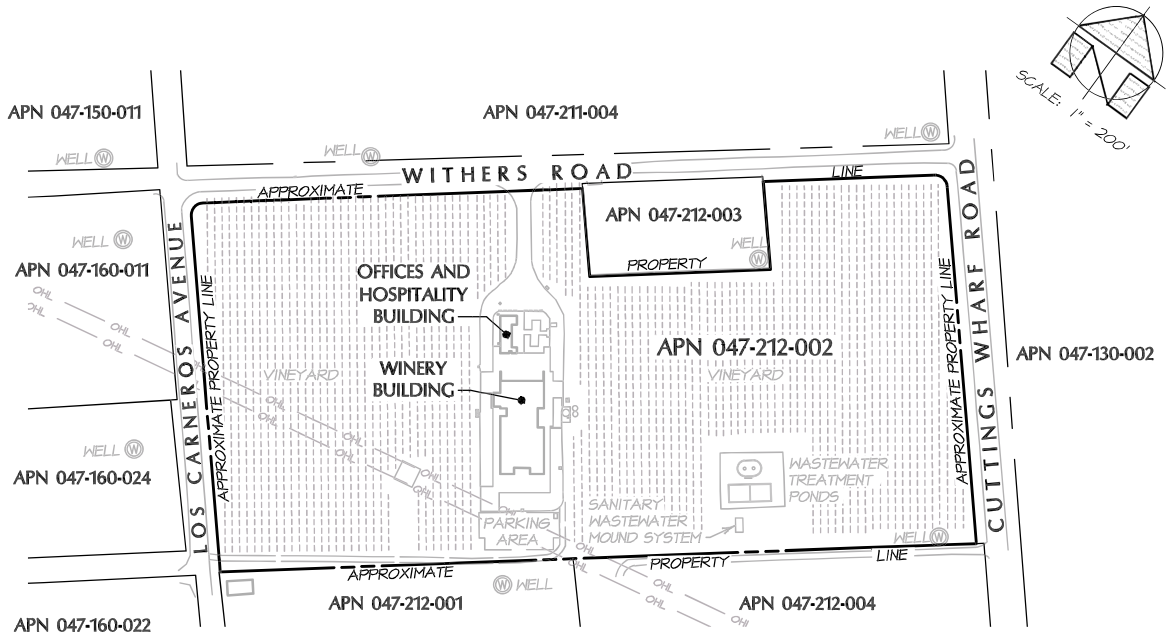
CONVENTIONAL SEWAGE TREATMENT SYSTEM SOIL APPLICATION RATES BASED ON PERCOLATION RATES	
Percolation Rate (mpi)	Application Rate (STE)
< 5 MPI	Prohibited
5 to 10 MPI	0.5
10-20 MPI	0.33
20-60 MPI	0.25
> 60 MPI	Prohibited

TABLE 1

DRIP LOADING RATES CONSIDERING SOIL STRUCTURE.

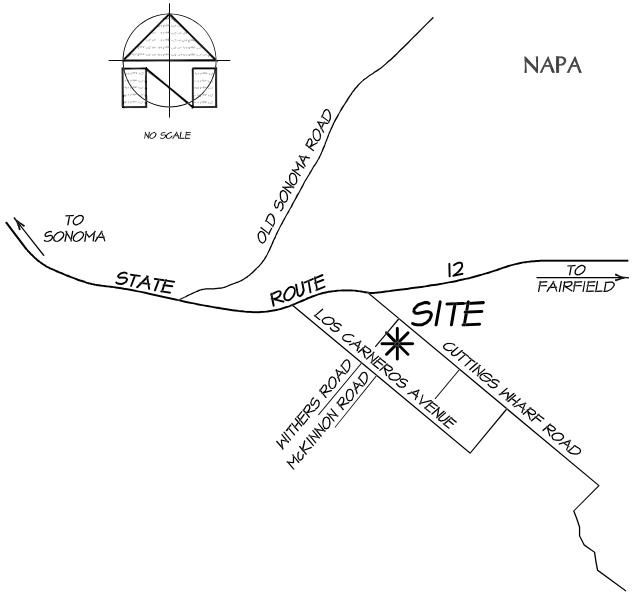
Table 1 is taken from the State of Wisconsin code and was prepared by Jerry Tyler.
Provided for guidelines and budgeting purposes. Refer to your local regulations and qualified soil scientists to determine best loading rates.

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



OVERALL SITE PLAN
TEST PIT LOCATION MAP

SCALE: 1" = 200'



LOCATION MAP

NO SCALE

BARTELT ENGINEERING
CIVIL ENGINEERING · LAND PLANNING
1303 Jefferson Street, 200 B, Napa, CA 94559
www.barteltengineering.com
· Telephone: 707-258-1301 ·

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1500 Los Carneros Avenue
Napa, CA 94559
APN 047-212-002
Job No. 00-87
November 2016
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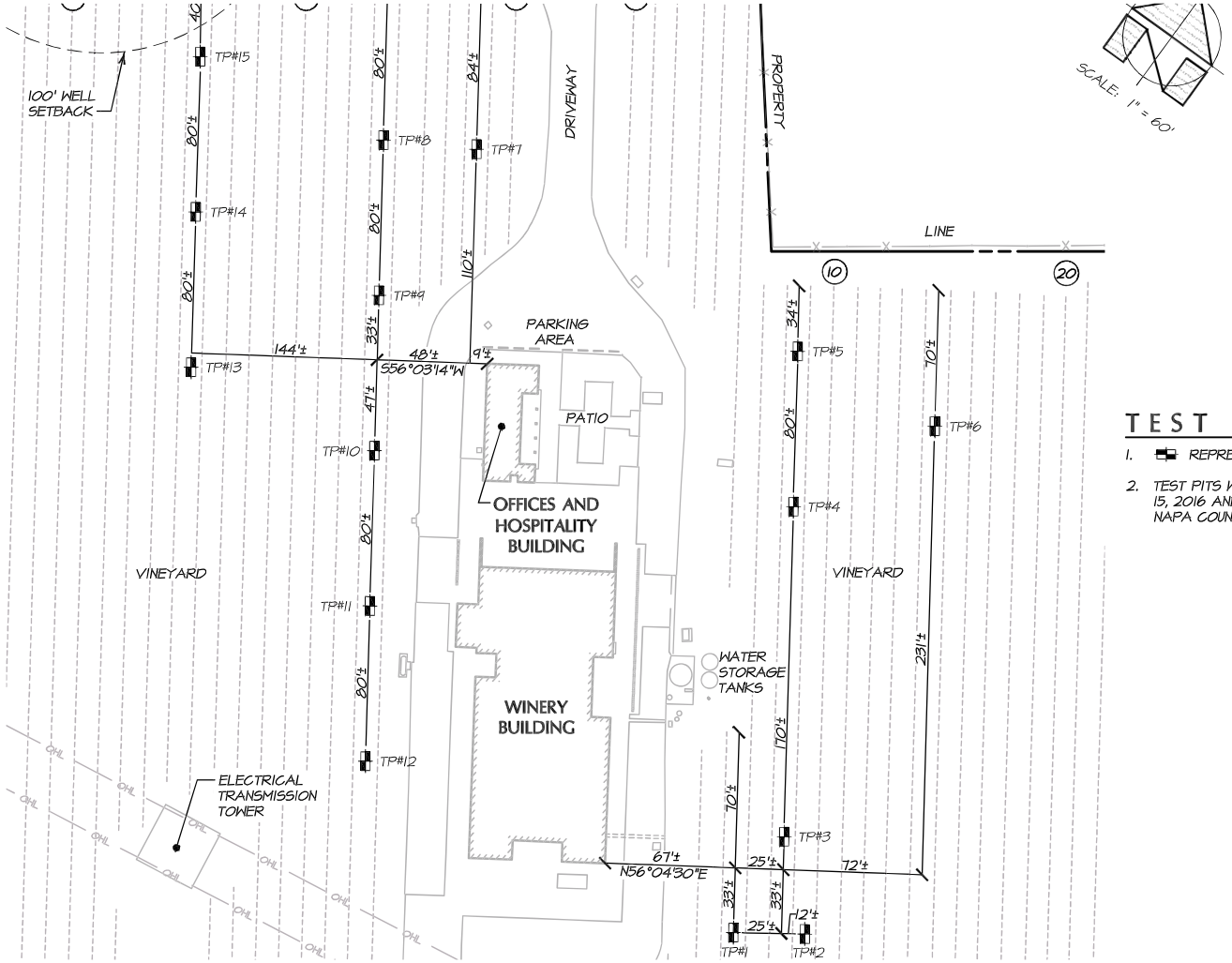

TEST PIT EXPLORATION NOTES:

1. ⊏⊐ REPRESENTS TEST PIT LOCATION.
2. TEST PITS WERE EXCAVATED BY MCCOLLUM GENERAL ENGINEERING ON NOVEMBER 15, 2016 AND WITNESSED BY A REPRESENTATIVE FROM BARTELT ENGINEERING AND NAPA COUNTY ENVIRONMENTAL HEALTH.

TEST PIT LOCATION MAP

SCALE : 1" = 60'

BARTELT ENGINEERING
CIVIL ENGINEERING · LAND PLANNING
1303 Jefferson Street, 200 B, Napa, CA 94559
www.barteltengineering.com
· Telephone: 707-258-1301 ·

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Napa, CA 94559
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