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Wastewater Feasibility Study

Davis Estates, P14-00411
Planning Commission Hearing Date - October 3, 2018

WASTEWATER FEASIBILITY STUDY

Davis Estates Winery

4060 Silverado Trail,
Calistoga, California 94515
APN 021-020-003

SUMMIT

CIVIL STRUCTURAL ELECTRICAL WATER|WASTEWATER

Project No. 2017043
May 2, 2017

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DAVIS ESTATES
Calistoga, California
WASTEWATER SYSTEM FEASIBILITY

PROJECT OVERVIEW

Davis Estates located on Silverado Trail (APN 021-010-003) in Calistoga, Napa County California is proposing to increase the existing production capacity of 30,000 gallons of wine per year to 100,000 gallons of wine per year and increase onsite visitor serving functions. The following wastewater management system description details the proposed wastewater management system conditions.

The winery proposes to continue to provide process wastewater treatment through a Package Treatment System. A Package Treatment System is a small footprint high-rate treatment system provided by equipment manufacturers with irrigation reuse for disposal. A Lyve treatment system is currently installed, which will continue to treat the process wastewater associated with the current production of 30,000 gallons of wine per year. When the facility decides to build out to full capacity (100,000 gal of wine per year); a new or upgraded high-rate treatment system will be designed, permitted, and installed to treat the additional process wastewater (PW). These upgrades will be triggered by the need for a building permit for additional cave barrel storage.

For this wastewater feasibility study, a Lyve treatment system will be discussed in the following sections although an equivalent package treatment system may be designed and installed for the future treatment of PW associated with the production of 100,000 gallons wine per year. Installation of a new or upgraded PW management system will be permitted and inspected by Napa County Planning, Building, and Environmental Services (PBES).

A separate sanitary sewage (SS) disposal system for this facility has been permitted, installed, and is operational. Due to the proposed increase visitation and events associated with this Use Permit Modification, upgrades to the existing Orenco AdvanTex treatment and subsurface disposal system will be needed as described in this document.

SITE DESCRIPTION

The existing facility is located on the valley floor with vineyards and scattered residences or wineries to the north, south, and west. The eastern side of the property is forested. The topography of the site slopes to the west. Surface drainage flows overland to the southwest.

The proposed and approved process wastewater (PW) treatment tanks, buildings, vineyards, roads, SS disposal system, well locations, and property lines are located on the Overall Site Plan, located in Enclosure A.

WINERY PROCESS WASTEWATER MANAGEMENT SYSTEM

The current facility has the capacity to produce 30,000 gallons of wine per year and the existing PW treatment system is able to treat all wastewater flow from this production. When the facility proceeds with the second

phase of the project, a new or upgraded treatment system will have to be installed to treat PW associated with the production of 100,000 gallons of wine per year.

PROCESS WASTEWATER CHARACTERISTICS

Winery process wastewater will consist primarily of wastewater collected at floor drains and trenches within the winery, receiving, crush, tank, and washdown areas. No sanitary wastewater will be discharged into the PW management system. Typical winery wastewater characteristics are as summarized below:

Characteristic	Units	Crushing Season Range	Non-crushing Season Range
pH	--	2.5 - 9.5	3.5 - 11.0
Dissolved Oxygen	mg/L	0.5 - 8.5	1.0 - 10.0
BOD_s	mg/L	500 – 12,000	300 – 3,500
COD	mg/L	800 – 15,000	500 – 6,000
Grease	mg/L	5 - 30	5 - 50
Settleable Solids	mg/L	25 - 100	2 - 100
Nonfilterable Residue	mg/L	40 - 800	10 - 400
Volatile Suspended Solids	mg/L	150 - 700	80 - 350
Total Dissolved Solids	mg/L	80 – 2,900	80 – 2,900
Nitrogen	mg/L	1 - 40	1 - 40
Nitrate	mg/L	0.5 - 4.8	-
Phosphorous	mg/L	1 - 10	1 - 40
Sodium	mg/L	35 - 200	35 - 200
Alkalinity ($CaCO_3$)	mg/L	40 - 730	10 - 730
Chloride	mg/L	3 - 250	3 - 250
Sulfate	mg/L	10 - 75	20 - 75

PROCESS WASTEWATER DESIGN FLOWS

Based on typical flow data from wineries of similar size and characteristics and corresponding process wastewater (PW) generation rates, projected flows are calculated as follows:

Proposed Annual production	=	100,000 gal wine/year
PW generation rate	=	6 gal PW/gal wine[a]
Annual PW Flow	=	100,000 gal wine x 6 gal PW/gal wine
	=	600,000 gal PW/year
Average PW Flow	=	(600,000 gal PW/year) / (365 days)
	=	1,640 gal PW/day
Napa County Peak Day Flow	=	(100,000 gal PW/year x 1.5[b] %)/(60 day harvest)
	=	2,500 gal PW/day
Average Day Peak Harvest Month Flow	=	(600,000 gal PW/year x 16.4[c] %)/(30 day)
	=	3,280 gal PW/day
Average Day, Peak Harvest Week Flow	=	(182 tons/week x 225[d] gal PW/ton)/(7 days/week)
	=	**5,850 gal PW/day**

[a] Generation rate based on industry standards and water data for similar wineries
[b] Based on Napa County's formula for wineries with a production over 50,000 gallons of wine/year
[c] The harvest month of September accounts for approximately 16.4 percent of the annual water demand.
[d] Based on data from similar facilities. Assumes 30% of total tonnage is processed in one week

The design flow rate will account for the most conservative flow estimation approach, which is the Average Day Peak Harvest Week Flow. The design flow rate shall be 5,850 gal PW/day.

PROCESS WASTEWATER CONVEYANCE, TREATMENT, AND DISPOSAL

The features described below will be incorporated into the process wastewater management system. Refer to the process wastewater management system schematic in Enclosure A for a flow diagram of the PW management system.

1. Initial screening – Provided by screened baskets and strainers installed on the trench drains and floor drains within the winery. Screen opening sizes are approximately 1/4 inch for exterior drains and 1/8 inch for interior drains.
2. Gravity collection system – Designed to provide low maintenance and no infiltration or exfiltration. Piping is and will be compatible with PW and satisfies Uniform Plumbing Code and local requirements.

3. Future rotary screen – A future rotary screen may need to be added for removal of solids prior to the PW sump pump. The rotary screen should be added if solids management becomes an issue and/or inhibits treatment capabilities of the PW management system.
4. Existing PW Pump Sump – The existing 60" sump with duplex pumps will be capable of pumping all of the anticipated process wastewater flow ranges with lead/lag and alternating pump capabilities. The lead pump would be used for all but the most extreme PW flow conditions. The second (lag) pump would be activated during peak hour events or similar events of infrequent occurrence and short duration. Duplex pumps have been designed to provide for redundancy of operation in case of a single pump failure. This pump sump currently has enough capacity to handle the increase in flow.

   The PW Pump Sump will be fitted with a High Water Alarm (HWA) as a means to warn operating staff of a problem and pump malfunction. Storage above the HWA would provide some additional factor of safety. This allows for some level of continued facility operation in case of equipment failure or power outage. Additional volume is available in the gravity collection system should the sump start to fill up. The force main to the equalization/aeration tank is sized based on the anticipated peak flow rate.

5. Inline Rosedale Screen – An inline Rosedale basket screen is provided upstream of the Lyve treatment system to remove any solids that are conveyed from the winery. The screen has a pressure gauge installed to alert winery personnel to clean the screen when the pressure drop across the screen is too large.
6. Lyve package treatment system - Treatment of the winery process wastewater could continue to be accomplished through a Lyve treatment system. Currently a Lyve L10 package treatment system is being used to treat the PW from the first phase (30,000 gallons of wine per year or 4,000 gallons per day peak PW flow). Lyve treatment systems are packaged treatment systems specifically designed for winery wastewater. Lyve utilizes aerobic activated sludge treatment in a modular design. These systems are capable of producing high quality effluent while taking up a small footprint. Based on the anticipated peak PW flows of 5,850 gallons per day, the Lyve L10 system would need to either be expanded or replaced. A Lyve L25 unit is an option for treating the wastewater. Other high rate treatment systems may also be used as long as they produce an effluent quality that meets the surface disposal standards for reclaimed PW. If needed, the existing combination treatment tank could be repurposed and used for equalization, sludge storage, or effluent storage.
   a. pH control system –A pH monitoring and control system has been provided as part of the Lyve package system. The combination of naturally occurring alkalinity in source water and alkaline cleaning compounds used within wineries usually provides sufficient buffering to maintain pond pH above 6.5. Neutralizing chemicals should only be used when absolutely necessary. Since the PW is ultimately disposed via irrigation, the neutralizing chemicals would be applied to the land.

      If any changes to the facility require pH adjustment of the wastewater to above 6.5 or below 8.5, there is an automatic adjustment system consisting of a pH sensor, controller/recorder and control piping manifold, sparger and chemical storage. A pH probe is available for

monitoring. Aqueous ammonia and phosphorous are available and are introduced in the equalization tank. The adjustment of the pH also reduces the chances for emission of hydrogen sulfide odors that can occur in a low pH environment.

7. Existing effluent transfer pump – An existing above-grade self-priming centrifugal pump is provided to transfer treated PW from the effluent storage zone to the existing vineyard irrigation storage tank. The effluent transfer pumping system is controlled through the Lyve system control panel and level control sensor. A simplex pump is currently provided. Adequate space on the reinforced concrete equipment pad has been provided to allow for a future (duplex) pump, if needed. The existing pump will have sufficient capacity to handle the projected increase in flow.
8. Flow measurement – An existing inline magnetic flow measurement device will continue to measure the flows from the effluent storage zone to the existing vineyard irrigation tank.
9. Vineyard irrigation storage tanks – Three existing 5,000 gallon irrigation storage tanks are designated for storage of treated process wastewater. An initial 5,000 gallon tank receives PW effluent from the transfer pump, where it is then pumped higher up the slope to two 5,000 gallon irrigation storage tanks. These tanks utilize gravity to feed the irrigation system in the vineyards. Flow equalization and wet weather storage are required for proper operation of the disposal (irrigation) system. The minimum sizing criteria of the PW storage is accomplished by verifying the tanks are large enough to handle harvest and non-harvest periods.

   The two existing 5,000 gallon aboveground irrigation storage tanks are adequate to store the anticipated PW effluent flows, based on the included tank and effluent dispersal balance in Enclosure B, with the first 5,000 gallon storage tank only being used for intermediate holding while transferring to the irrigation tanks. Currently, only 15,000 gallons of tankage is proposed, but a total of 25,000 gallons would provide 15 days of hydraulic residence time during non-harvest periods, and can be provided if necessary. This would provide wet weather storage during periods of rain and/or when saturated soil conditions exist and the irrigation system cannot operate.
10. Irrigation disposal area (reuse) – Final reuse (disposal) of effluent will continue to be accomplished through drip irrigation of a minimum 3.0 acres of vineyard. Refer to the tank and effluent dispersal balance in Enclosure B for proposed application rates to the disposal areas and effluent storage volumes. The irrigation demand is the lowest during the wet season (November through April) and application rates during this period should be less than 0.5 inches per month. Only the two 5,000 gallon tanks directly tied into the irrigation system are used for demonstrating adequate retention, as the first 5,000 gallon tank is only used for intermediate storage during pumping. Irrigation will be manually controlled by the vineyard manager. The treated PW will not be recycled for winery use or landscape irrigation uses.

SOLID WASTES

Solid wastes from the winery primarily include pomace, seeds, and stems. The estimated quantities of these wastes (at peak capacity) are as follows:

$$Peak\ annual\ production = \ 100{,}000\ gal\ wine\ \times \frac{1\ ton}{165\ gal} = 606\ tons$$

$$Ultimate\ Annual\ Total = \ 35\% \times \ 606\ tons = 212\ tons$$

Based on a unit weight of 38 pounds per cubic foot, the annual volume of solids wastes would be:

$$212\ tons\ \times \frac{2{,}000\ lb}{1\ ton} = 424{,}200\ lb$$

$$424{,}200\ \text{lbs}\ \times \frac{1\ ft^3}{38\ lb} \times \frac{1\ yd^3}{27\ ft^3} = 413\ yd^3$$

These organic solids can be hauled to an off-site composting location or can be composted onsite and land applied to the existing vineyards.

OTHER CONSIDERATIONS

Odor Control

There should be no obnoxious odors from a properly designed and operated treatment system of these types. See Alternative Courses of Action for operation alternatives for unforeseen conditions.

Ground Water Contamination

The nearest water well to the any of the winery process wastewater treatment and disposal systems is a minimum of 100 feet. No disposal of reclaimed wastewater will occur within 100 feet of any existing wells. Irrigation/disposal of treated effluent is considered a beneficial use and is considered an effective means to protect groundwater quality. Well water may supplement treated PW for irrigation when capacity permits.

Protection

Exposed wastewater treatment facilities should be posted with appropriate warning signs. The pretreatment areas should be protected to restrict access and potential damage to the system.

Alternative Courses of Action

Although no operational difficulties are foreseen, the following additional courses of action would be available if necessary:

1. Increased use of irrigation/disposal area to increase discharge capacity
2. Additional water conservation at winery
3. Light irrigation during periods between storms -- not exceeding the assimilative capacity of the soil
4. Increased irrigation during the months of planned irrigation
5. Pumping and truck transfer of treated and diluted wastewater to an approved treatment plant or land disposal site

SANITARY SEWAGE MANAGEMENT SYSTEM

The owner has installed a new onsite system in accordance with all necessary Napa County criteria and in alignment with the current Use Permit (P12-00373). Sanitary sewage (SS) flows from the winery buildings and residences will be handled by the pretreatment and disposal systems. Due to the proposed increase in events and visitation, some components of the treatment and disposal system will need to be upgraded.

SANITARY SEWAGE CHARACTERISTICS

SS will consist primarily of wastewater generated from restrooms, laboratories, tasting room facilities, and onsite residences. No PW will be discharged into the SS management system. Typical SS characteristics are as summarized below:

Characteristic	Units	Raw Wastewater[1] Range
BOD_s	mg/L	110 - 220
Grease	mg/L	50-100
Total Suspended Solids (TSS)	mg/L	100 - 220
Volatile Suspended Solids	mg/L	80 - 165
Total Dissolved Solids (TDS)	mg/L	250 - 500
Nitrogen	mg/L	20 - 40
Nitrate	mg/L	0
Phosphorous	mg/L	4 - 8
Alkalinity ($CaCO_3$)	mg/L	50 - 100
Chloride	mg/L	30 - 50
Sulfate	mg/L	20 - 30

[1]Typical composition of untreated domestic wastewater, Metcalf & Eddy, "Wastewater Engineering, Third Edition", 1991

SANITARY SEWAGE DESIGN FLOWS

The proposed winery sanitary sewage (SS) management system at Davis Estates consists of typical wastewater generated from restrooms, tasting room facilities, and onsite residences. The proposed marketing events for the facility, as outlined in the Use Permit Application, are summarized below along with the event frequency and maximum number of attendees:

- 24 events per year, 100 attendees maximum
- 15 events per year, 200 attendees maximum

The system will be designed to handle all flows from a 100 person event. Events larger than 100 people will use portable toilets and be catered if meals are served.

Average Day w/o Event							
Employee (full-time)	25	x	15	gpcd	=	375	gal/day
Tasting Visitors (no meals served)	100	x	3	gpcd	=	300	gal/day
Tasting Cheese Plate	80	x	0.75	gpcd	=	60	gal/day
Event Visitors	0	x	15	gpcd	=	0	gal/day
4 Bedroom House	4	x	120	gpcd	=	480	gal/day
1 Bedroom Cottage	1	x	150	gpcd	=	150	gal/day
Total					=	1,365	gal/day
					=	**1,400**	**gal/day**

Peak Tasting Day with Event							
Employee (full-time)	25	x	15	gpcd	=	375	gal/day
Tasting Visitors (no meals served)	200	x	3	gpcd	=	600	gal/day
Tasting Cheese Plate	160	x	0.75	gpcd	=	120	gal/day
Event Visitors	100	x	15	gpcd	=	1,500	gal/day
4 Bedroom House	4	x	120	gpcd	=	480	gal/day
1 Bedroom Cottage	1	x	150	gpcd	=	150	gal/day
Total					=	3,225	gal/day
					=	**3,300**	**gal/day**

The SS management system will be upgraded to accommodate the peak daily SS flow of 3,300 gal/day.

KITCHEN DESIGN FLOWS

For the events where meals are prepared onsite (100 guests), a generation rate of 5 gallons of kitchen waste per meal is assumed. Therefore, the maximum flow associated with meal preparation generated is calculated as follows based on the 100 person onsite event:

$$100 \text{ meals} \times \frac{5 \text{ gal WW}}{1 \text{ meal}} = 500 \text{ gallons}$$

The SS management system will be upgraded to accommodate the kitchen SS flow of 500 gal/day.

SANITARY SEWAGE CONVEYANCE, TREATMENT AND DISPOSAL

The winery SS treatment and disposal system has the components described below. Certain components of the system will need to be upgraded due to the change in employees and marketing plan. Refer to the wastewater management system schematic in Enclosure A for a flow diagram of the winery SS management system.

1) Gravity Collection System – Designed to provide low maintenance and no infiltration or exfiltration. Piping is compatible with sanitary sewer and satisfies Uniform Plumbing Code and local requirements.

2) Grease Interceptor – The maximum flow generated by the kitchen is projected to be 500 gpd. The grease interceptor is to be sized as follows:

   Minimum Volume = Maximum number of meals prepared onsite × WW Generation Rate × Retention Time

   $$100 \text{ meals} \times \frac{5 \text{ gal WW}}{1 \text{ meal}} \times 3 \text{ days} = 1{,}500 \text{ gallons}$$

   The existing 1,500 gallon grease interceptor has sufficient capacity to accommodate the expected kitchen flows of 500 gpd, as well as provide a retention time of 3 days, as is recommended for a commercial SS system by Orenco Systems, Inc. (pretreatment system manufacturer).

3) Septic Pump Sumps – There are two existing septic pump sumps. Sump #1 collects SS that flows by gravity from the grease tank and the winery, and sends it to sump #2. Sump #2 collects SS from Sump #1, the historic barn, and the residence and sends it to the septic tank.

4) Septic Tank with Effluent Filter – The required septic tank size for the increased winery SS flows was determined by evaluating sizing recommendations based on the Uniform Plumbing Code (UPC) formula and Orenco's commercial SS recommendation for a 3 day retention time, as shown below:

   Uniform Plumbing Code Method:

   $$Volume = 1{,}125 + 0.75 \times Flow\ Rate$$

   $$Volume = 1{,}125 + 0.75 \times 3{,}300\ gpd$$

   $$Volume = 3{,}600\ gallons$$

   3 Day Retention Time Method:

   $$Volume = 3{,}300\ gpd \times 3\ days = 9{,}900\ gallons$$

   The more conservative method was used to select a septic tank volume of approximately 10,000 gallons for solids removal prior to pre-treatment. The current septic tank volume installed is 4,890 gallons and is combined in a baffled compartment of an 11,000 gallon tank (more information below). To meet the required Orenco retention time, an additional 5,000 gallons of septic volume would need to be installed in combination with the existing septic tank. The new septic tank will have its own effluent filter. Removal of solids in the septic tank helps to reduce BOD loads on the system, minimize the frequency of sludge removal in aerobic systems, and reduce the potential for clogging the soil pores in the drip field. A septic tank capacity of 10,000 gallons will provide approximately 3 days of retention at peak harvest flows.

5) Existing AdvanTex Textile Filter Pretreatment System – Consisting of the following elements:

   a) Recirculation/Blending – Orenco Systems Inc. recommends a recirculation/blending tank volume of a minimum of 75 percent of peak daily flows, equivalent to a recirculation capacity of 2,475 gallons. The existing 2,691 gallon recirculation tank should provide adequate volume to accommodate the additional SS flows and the existing pumps should be able to accommodate the increase in recirculation flows. A simplex pumping system is installed in the recirculation/blending tank to dose the AdvanTex Treatment System. The recirculation/blending tank is provided for dilution and buffering of peak hydraulic and organic loads.

   b) AdvanTex Textile Filter Pre-treatment System – Orenco System's AdvanTex Treatment System is a packed bed textile filter that supports attached growth biological treatment. Package treatment systems have been widely utilized for sanitary sewage treatment and have been successful in providing consistent reliable treatment when properly designed and operated. The facility currently utilizes one AdvanTex AX100 treatment pod. It has been confirmed with the treatment system manufacturer that the existing AX100 unit can provide sufficient treatment capacity for the increase in flows.

   c) Existing Dosing Tank– County standards requires that the dosing tank have a minimum retention time of 1.5 days; this would require a 4,950 gallon dosing tank. The existing dosing tank is 3,578 gallons, so an additional 1,500 gallons of dosing tankage capacity will be provided for a total dose tank volume of 5,078 gallons; providing 1.54 days of retention time.

6) Subsurface Drip Disposal System – The subsurface drip system was sized for disposal of SS from the winery and is located near the southern entrance of the site as shown on the Overall Site Plan. A site evaluation was performed by Summit Engineering, Inc. and Napa County PBES on November 22, 2011 in the proposed winery SS primary and reserve disposal areas (see Enclosure C).

   Based on the soil type and topography, it is proposed to continue to use the installed subsurface drip system for disposal of pretreated SS effluent from the AdvanTex Treatment System, but the dripfield will need to be expanded. Based on the site evaluation a hydraulic loading rate of 0.7 gal/SF/day was used. Each Geoflow drip line was be placed approximately 6-8" below ground surface. The required drip field size is projected as follows:

$$\text{Minimum Drip Field sizing} = \frac{3{,}300 \text{ gpd}}{0.7 \frac{\text{gal}}{\text{SF-day}}} = 4{,}714 \text{ SF}$$

The existing drip field has 2,503 SF of disposal area; therefore an additional 2,211 SF of drip field will need to be installed. A reserve area of 1,600 SF is available in addition to the existing reserve area of 7,886, for a total available reserve area of 9,486 SF (201%). See Enclosure A for a site plan with locations of the existing and proposed primary and reserve drip field locations.

SS TREATMENT SIZING SUMMARY

Grease Interceptors:	1,500 gallon tank (existing)
Combined 11,000 gallon tank (baffled septic, recirculation, and dosing compartments)	
Septic Volume	4,890 gallon compartment (existing)
	5,000 gallon tank (new)
AdvanTex Unit:	1 – AX100 Filter Pod (existing)
Recirculation Volume	2,691 gallon compartment (existing)
Dosing Volume:	3,578 gallon compartment (existing)
	1,500 gallon tank (new)
Effluent Disposal Area:	Subsurface drip system, primary area 2,503 SF, reserve area 7,886 SF (existing)
	Subsurface drip system, primary area 2,211 SF, reserve area 1,600 SF (new)

The new 5,000 gallon septic tank and the new 1,500 gallon dosing tank will be installed adjacent to the existing 11,000 gallon baffled tank. See the schematics in Enclosure B for more information.

OTHER CONSIDERATIONS

Odor Control

There should be no noxious odors from a properly designed and operated treatment system.

Ground Water Contamination

The nearest water well to the any of the wastewater treatment and disposal systems is a minimum of 100 feet. No disposal of wastewater will occur within 100 feet of any existing wells.

Protection

Exposed wastewater treatment and disposal facilities should be posted with appropriate warning signs. The treatment areas will be protected to restrict access and potential damage to the system.

Alternative Courses of Action

Although no operational difficulties are foreseen, the following additional courses of action would be available if necessary:

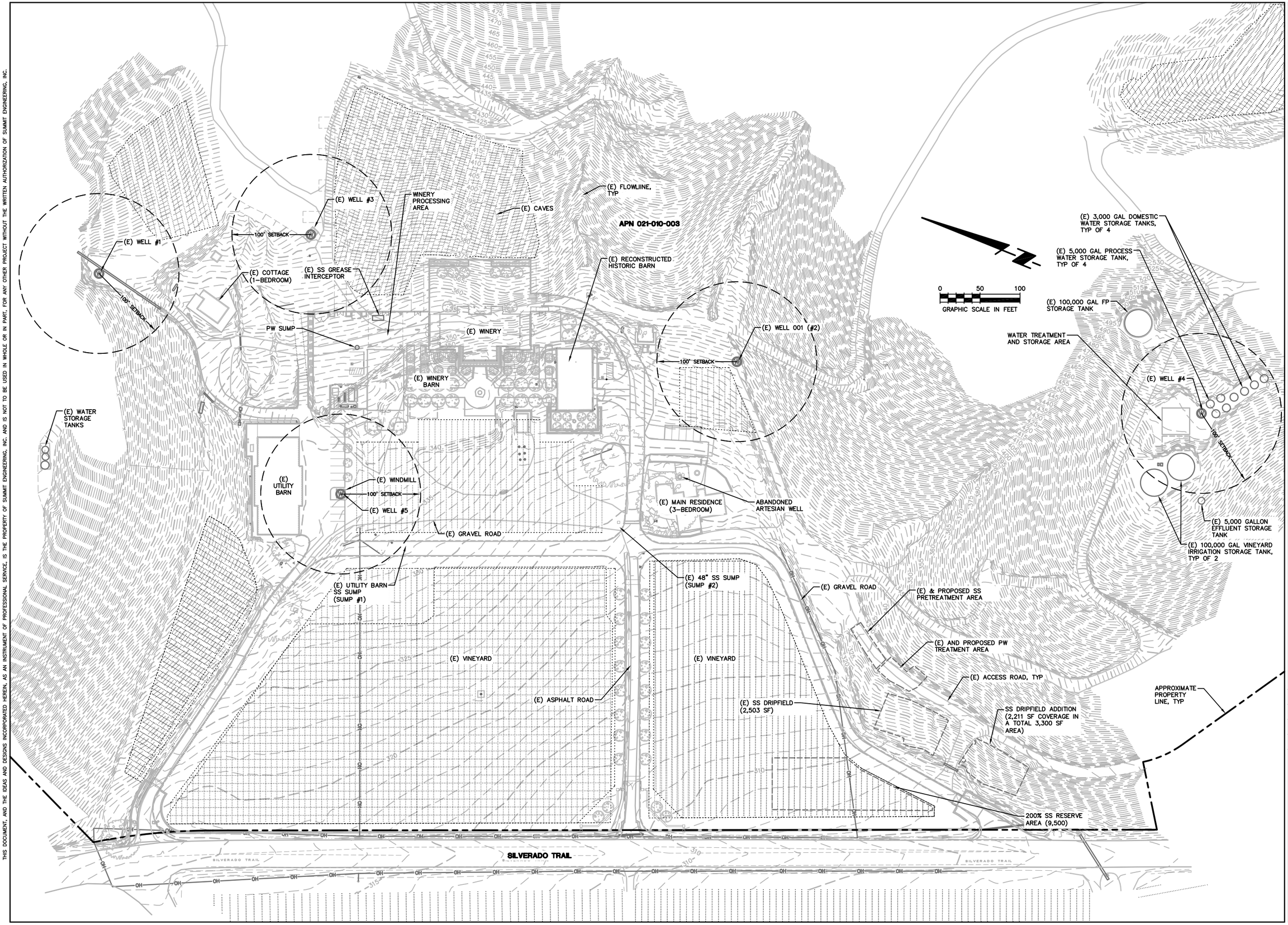
- Expansion of SS treatment and disposal system
- Pumping and truck transfer of treated and diluted wastewater to an approved treatment plant or land disposal site would be used as additional courses of action

ENCLOSURE A

OVERALL SITE PLAN

PW MANAGEMENT STSTEM SCHEMATIC

SS MANAGEMENT SYSTEM SCHEMATIC



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DAVIS ESTATES
4060 SILVERADO TRAIL
CALISTOGA, CA 94515
APN 021-010-003

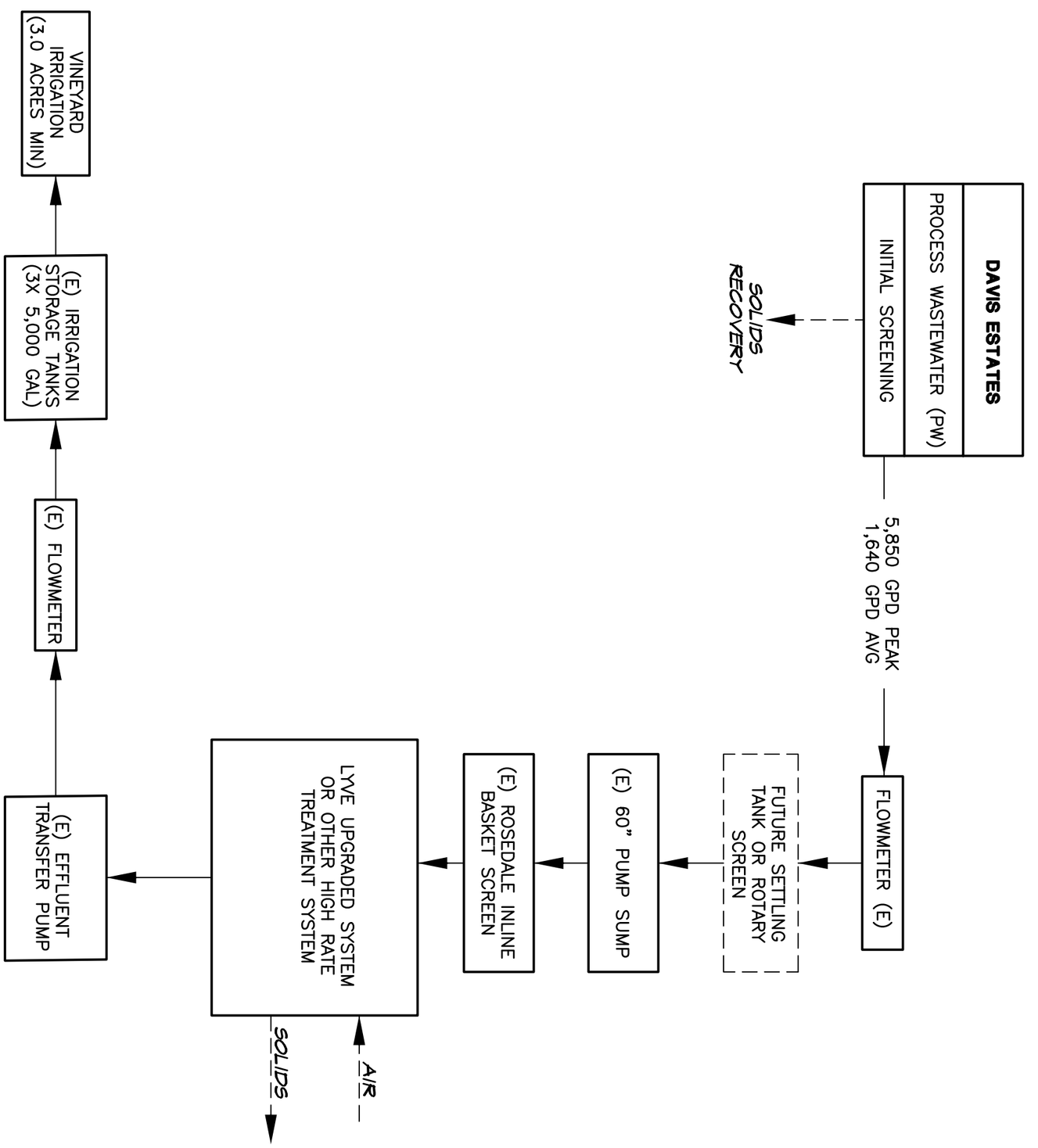
DAVIS ESTATES USE PERMIT

WASTEWATER SYSTEMS OVERALL SITE PLAN

2017-04-25	UP MOD RESUBMITTAL

DATE: 2017-04-25
JOB NO: 2017043
SCALE: AS SHOWN
DRAWN: JA
CHECKED: GG

SHEET
WW1



DAVIS ESTATES
4060 SILVERADO TRAIL
CALISTOGA, CA
APN 021-010-003

PW MANAGEMENT SYSTEM SCHEMATIC

PROJECT NO. 2017043 DATE 2017-04-21
BY SW CHK GG SHT NO 1 OF 1

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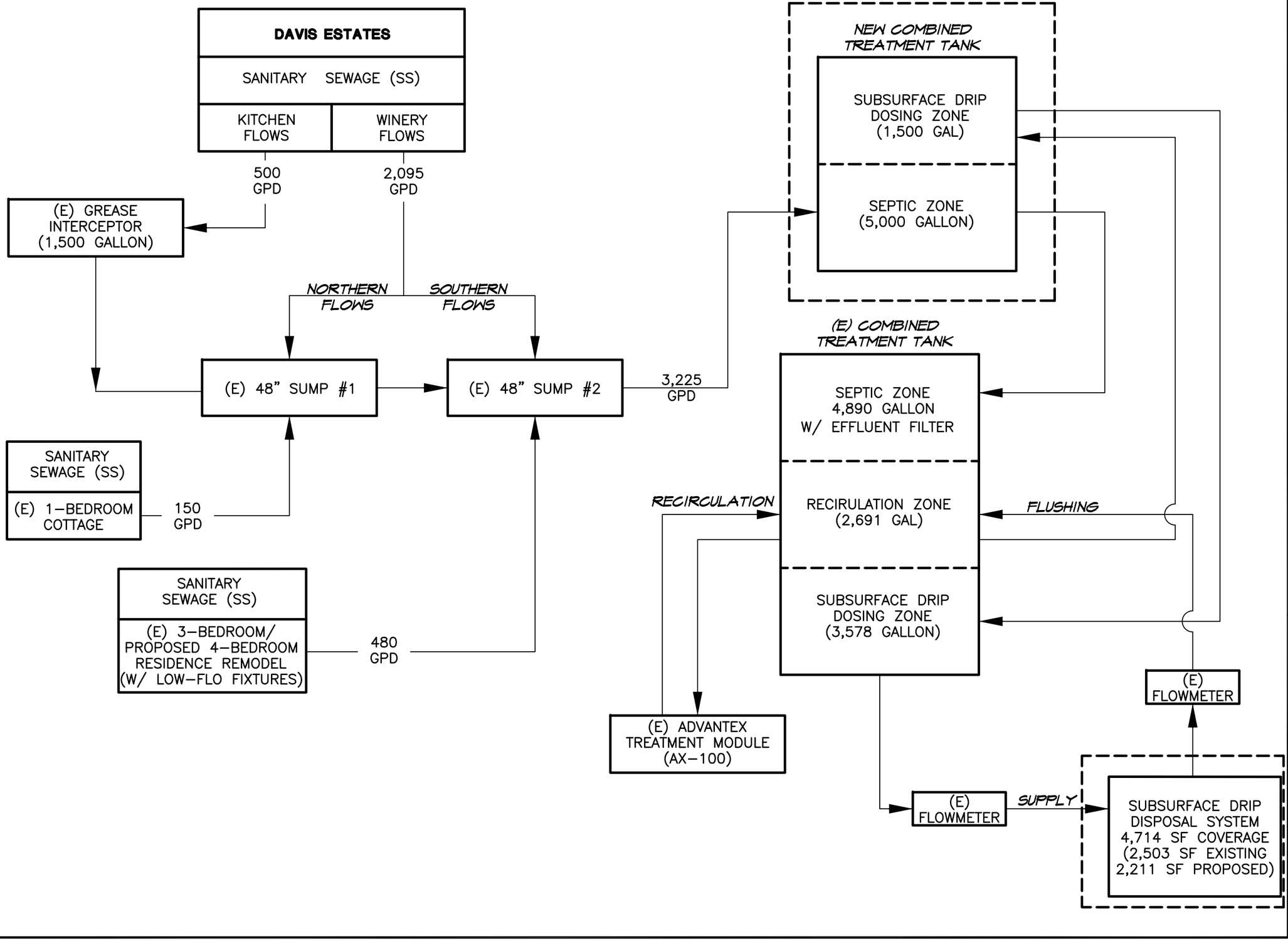

PROPOSED SS MANAGEMENT SYSTEM SCHEMATIC

PROJECT NO. 2017043 DATE 2017-05-03
BY SW CHK GG SHT NO 1 OF 1

DAVIS ESTATES
4060 SILVERADO TRAIL
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PLOTTED ON: 5/3/2017 9:08 AM

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ENCLOSURE B

PW SYSTEM DISPOSAL BALANCE

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	DAVIS ESTATES Process Wastewater Design Criteria	PROJECT NO. 2017043 BY: SW CHK: GG

DESIGN CRITERIA

Annual Production	100,000	gal wine/year
	41,667	cases/year
PW Generation Rate	6.0	gal PW/gal wine
Annual PW Flow	600,000	gal PW/year
Months of Harvest	Aug-Oct	
Average Day Harvest Flow	2,700	gal PW/day
Average Day Peak Harvest Month Flow	3,280	gal PW/day
Annual Average Day Flow	1,640	gal PW/day
Napa County Peak Flow	3,333	gal PW/day
Total Storage Volume	15,000	gal
Total Storage HRT (Harvest)[c]	4.5	days
Total Storage HRT (Non-Harvest)	9.1	days

DESIGN FLOWS	Process Wastewater	
Month	Monthly Percentage of Annual Flow[a] (%)	Monthly Flow (gal)
August	10.5%	62,714
September	16.4%	98,427
October	12.9%	77,325
November	7.4%	44,468
December	6.4%	38,494
January	6.6%	39,385
February	7.2%	43,335
March	7.6%	45,777
April	6.8%	40,642
May	6.4%	38,694
June	5.6%	33,568
July	6.2%	37,171
Total	**100%**	**600,000**

[a] Monthly percentage of annual flow based on average of PW flow data from (11) wineries.

[b] Peak crush week assumes 30% tons crushed in one week, 225 gal pw/ton, 7 days processing

[c] Based on Napa County peak day

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	DAVIS ESTATES Climate Data	PROJECT NO. 2017043 BY: SW CHK: GG

Month	Days	Average Temp[a] (F)	Reference Evapotranspiration[b] (in)	Pan Evaporation[c] (in)	Lake Evaporation[d] (in)	Average Precipitation[e] (in)	10-Year Precipitation[f] (in)	100-Year Precipitation[f] (in)
August	31	70.7	5.9	7.2	5.5	0.1	0.2	0.3
September	30	67.6	5.2	6.4	4.9	0.3	0.5	0.7
October	31	61.7	3.3	3.9	3.0	1.8	3.0	4.2
November	30	52.3	1.1	1.9	1.5	4.0	6.6	9.3
December	31	46.6	1.2	1.4	1.1	6.5	10.7	15.2
January	31	46.0	0.8	1.5	1.2	7.9	13.0	18.4
February	28	50.2	2.3	2.0	1.5	5.8	9.5	13.5
March	31	52.3	3.6	3.4	2.6	4.8	7.9	11.2
April	30	56.3	5.2	4.2	3.2	2.2	3.6	5.1
May	31	62.4	6.7	5.9	4.5	0.7	1.2	1.7
June	30	68.0	7.0	6.5	5.0	0.2	0.3	0.5
July	31	71.1	6.9	8.9	6.9	0.0	0.0	0.0
Total	**365**	**58.8**	**49.2**	**53.2**	**41.0**	**34.4**	**56.4**	**80.1**

[a] Average monthly temperature observed between 1961 and 1995, for St. Helena, CA. See http://www.worldclimate.com

[b] Average monthly reference evaporation rates for Zone 8, Inland San Fransisco Bay Area, typical rainfall year, CIMIS, DWR, 2001. See www.itrc.org.

[c] Average monthly pan evaporation rates observed at Yountville, CA between 1962 and 1969.

[d] Pan evaporation rates adjusted by a factor of 0.77 to determine lake evaporation.

[e] Average monthly rainfall observed between 1931 and 1995, for St. Helena, CA. See http:/www.worldclimate.com

[f] Average monthly rainfall adjusted by the ratio of 10-yr and 100-yr wet year return storm identified by Pearsons Log III Distribution.

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	DAVIS ESTATES Tank Volume	PROJECT NO. 2017043 BY: SW CHK: GG

Initial Tank Height = 1 ft
Tank Volume = 10,000 gallons
Tank Height = 13 ft

Unit Volume = 769 gal/ft

Month	Initial Volume (gal)	PW Inflow (gal)	Total Volume (gal)	Divert Volume (gal)	Final Volume (gal)	Final Depth (ft)
August	769	62,714	63,483	62,000	1,483	1.9
September	1,483	98,427	99,910	99,000	910	1.2
October	910	77,325	78,235	77,000	1,235	1.6
November	1,235	44,468	45,703	41,000	4,703	6.1
December	4,703	38,494	43,197	41,000	2,197	2.9
January	2,197	39,385	41,582	41,000	582	0.8
February	582	43,335	43,917	41,000	2,917	3.8
March	2,917	45,777	48,694	41,000	7,694	10.0
April	7,694	40,642	48,335	40,000	8,335	10.8
May	8,335	38,694	47,030	40,000	7,030	9.1
June	7,030	33,568	40,598	38,000	2,598	3.4
July	2,598	37,171	39,769	39,000	769	1.0

SUMMIT ENGINEERING, INC. Consulting Civil Engineers	DAVIS ESTATES Irrigation & Effluent Application Rates	PROJECT NO. 2017043 BY: SW CHK: GG

Applied Irrigation Area Vineyard 3.0 acres
Pasture acres

Total Area Available for Irrigation Vineyard 10.0 acres
Pasture acres

Month	Reference ET[a]	Pasture Crop Coefficient[b]	Vineyard Crop Coefficient[c]	Pasture ET[d]	Vineyard ET[d]	Precipitation[e]	Irrigation Demand[f]		Operating Days per Month[g]	Percolation Capacity[h]		Assimilative Capacity[i]		Effluent Applied			Excess Capacity
	(in)			(in)	(in)	(in)	(in)	(Mgal)	(d)	(in)	(Mgal)	(in)	(Mgal)	(Mgal)	(gpd)	(in)	(Mgal)
August	5.9	0.9	0.5	5.3	2.6	0.3	2.4	0.195	31	130.20	10.613	132.6	10.808	0.062	2,000	0.76	10.75
September	5.2	0.9	0.3	4.7	1.3	0.7	0.6	0.051	30	126.00	10.271	126.6	10.322	0.099	3,300	1.22	10.22
October	3.3	0.9	0.1	3.0	0.2	4.2	0.0	0.000	16	67.20	5.478	67.2	5.478	0.077	4,813	0.95	5.40
November	1.1	0.8	0.0	0.8	0.0	9.3	0.0	0.000	14	58.80	4.793	58.8	4.793	0.041	2,929	0.50	4.75
December	1.2	0.8	0.0	1.0	0.0	15.2	0.0	0.000	5	21.00	1.712	21.0	1.712	0.041	8,200	0.50	1.67
January	0.8	0.8	0.0	0.6	0.0	18.4	0.0	0.000	6	25.20	2.054	25.2	2.054	0.041	6,833	0.50	2.01
February	2.3	0.8	0.0	1.8	0.0	13.5	0.0	0.000	5	21.00	1.712	21.0	1.712	0.041	8,200	0.50	1.67
March	3.6	0.8	0.0	2.9	0.0	11.2	0.0	0.000	12	50.40	4.108	50.4	4.108	0.041	3,417	0.50	4.07
April	5.2	0.9	0.2	4.7	0.8	5.1	0.0	0.000	13	54.60	4.451	54.6	4.451	0.040	3,077	0.49	4.41
May	6.7	0.9	0.6	6.0	3.9	1.7	2.2	0.183	16	67.20	5.478	69.4	5.661	0.040	2,500	0.49	5.62
June	7.0	0.9	0.7	6.3	5.0	0.5	4.5	0.367	17	71.40	5.820	75.9	6.187	0.038	2,235	0.47	6.15
July	6.9	0.9	0.6	6.2	4.4	0.0	4.4	0.359	30	126.00	10.271	130.4	10.630	0.039	1,300	0.48	10.59
Total	**49.2**			**43.4**	**18.4**	**80.1**	**14.2**	**1.2**	**195.0**	**819.0**	**66.8**	**833.2**	**67.9**	**0.600**		**7.4**	**67.31**

(a) Average monthly reference evapotranspiration rates, see Climate Data Worksheet.
(b) Kc coefficients for pasture from Table 5-1, "Irrigation with Reclaimed Municipal Wastewater-A Guidance Manual"- California State Water Resources Control Board, July 1984 (San Joaquin Valley).
(c) Kc coefficients for vineyards from Table 5-12, Irrigation with Reclaimed Municipal Wastewater - A Guidance Manual, 84-1 wr, SWRCB.
(d) ET=ETo x Kc. A weighted value is determined on the basis of the available irrigated acreage of vineyard and pasture.
(e) Precipitation, 100-year rainfall event, see Climate Data Worksheet.
(f) Irrigation Demand = ET-Precipitation, inches. A weighted value is determined on the basis of the available irrigated acreage of vineyard and pasture.
(g) Number of operating days per month based on estimated irrigation days available based on 24-hr post storm criteria for a 100-year return period. Summit Engineering, NBRID Capacity Study, April 1996.
(h) Design percolation rate is a maximum of 3.5 inches per hour for the number of operating day per month. Design perc rate based on soil testing onsite in 2011 and using NCEM ASTS Table 3 guidelines adjusted by a 0.05 safety factor to account for typical slow rate land application design methodology.
(i) Assimilative capacity is the sum of irrigation demand and percolation applied.

ENCLOSURE C

SITE EVALUATION REPORT

Napa County Department of Environmental Management

SITE EVALUATION REPORT

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

Permit #:
APN:
(County Use Only) Reviewed by: Date:

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner	☐ New Construction ☐ Addition ☐ Remodel ☐ Relocation ☐ Other:
Property Owner Mailing Address	☐ Residential - # of Bedrooms: Design Flow : gpd
City State Zip	☐ Commercial – Type: Sanitary Waste: gpd Process Waste: gpd
Site Address/Location	☐ Other: Sanitary Waste: gpd Process Waste: gpd

Evaluation Conducted By:

Company Name	Evaluator's Name	Signature (Civil Engineer, R.E.H.S., Geologist, Soil Scientist)
Mailing Address:		Telephone Number
City State Zip		Date Evaluation Conducted

Primary Area	**Expansion Area**
Acceptable Soil Depth: in. Test pit #'s:	Acceptable Soil Depth: in. Test pit #'s:
Soil Application Rate (gal. /sq. ft. /day):	Soil Application Rate (gal. /sq. ft. /day):
System Type(s) Recommended:	System Type(s) Recommended:
Slope: %. Distance to nearest water source: ft.	Slope: %. Distance to nearest water source: ft.
Hydrometer test performed? No ☐ Yes ☐ (attach results)	Hydrometer test performed? No ☐ Yes ☐ (attach results)
Bulk Density test performed? No ☐ Yes ☐ (attach results)	Bulk Density test performed? No ☐ Yes ☐ (attach results)
Groundwater Monitoring Performed? No ☐ Yes ☐ (attach results)	Groundwater Monitoring Performed? No ☐ Yes ☐ (attach results)

Site constraints/Recommendations:

Test Pit # ☐

PLEASE PRINT OR TYPE ALL INFORMATION

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

Test Pit # ☐

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

Test Pit # ☐

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

Attach additional sheets as needed

Test Pit # ☐

PLEASE PRINT OR TYPE ALL INFORMATION

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

Test Pit # ☐

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

Test Pit # ☐

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Attach additional sheets as needed

Test Pit # ☐

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Test Pit # ☐

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
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Test Pit # ☐

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

Attach additional sheets as needed

Contact:
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