Wastewater Feasibility Study

Kenzo Estates Winery P15-00293
Planning Commission Hearing September 21, 2016

WINERY WASTEWATER FEASIBILITY REPORT

KENZO ESTATE
3200 MONTICELLO ROAD
NAPA, CALIFORNIA

APN 033-110-075

PROPERTY OWNER:

Kenzo Estate Inc.
3200 Monticello Road
Napa, California

August 31, 2015
Project #4112041.0

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WASTEWATER FEASIBILITY REPORT
KENZO ESTATE

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INTRODUCTION

The owner is applying to the County of Napa for a Winery Use Permit Modification to increase production from 85,000 to 102,000 gallons of wine per year and for additional visitation and employees. The current Use Permit allows an 85,000 gallon per year winery on a 36.13 +/- acre parcel located at 3200 Monticello, Napa (APN 033-110-075). Access to the property is an existing driveway connecting to Monticello Road.

The topography on the parcel ranges from steep slopes to mostly level areas. The parcel is used for vineyards and the existing winery. One well exists on the site. Appendix 1 contains a Site Location Map and a USGS Site Map showing the parcel topography, features and boundary.

This report will evaluate the disposal of winery process and domestic wastewater.

EXISTING WASTEWATER SYSTEMS

Information from Napa County Environmental Health Department files for the parcel show an existing septic system for domestic wastewater designed by Summit Engineering in 2006. The system has been designed for a peak flow of 2,125 gpd of process wastewater and 891 gpd of domestic wastewater. Both systems discharge into dedicated pressure distribution dispersal fields. Documentation shows that both systems have the required reserve areas. Information on these systems is contained in Appendix 2.

An additional domestic wastewater system was constructed in 2014 to serve the winery production building. This system was designed with a capacity of 105 gpd. The design report for this system is contained in Appendix 3.

WINERY DOMESTIC WASTEWATER GENERATED

The proposed wastewater generation is shown in Table 1 below. The number of employees and visitors is based on information provided by the owner/applicant. The projected flow is based on Napa County Environmental Management guidelines. The following is a summary of the estimated flows from the proposed visitation and employee increases.

Table 1

Source	Number	Projected Flow (gpd)	Employees & Daily Visitors	Projected Flow Wine & Food Pairing Event and Mon - Thurs Visitors (gpd)	Projected Flow Wine Release Event and Mon - Thurs Visitors (gpd)	Projected Flow Friday - Saturday Visitors (gpd)
Full-time Employees	17	15	255	255	255	255
Harvest Employees	6	15	90	90	90	90
Wine Tasting Visitors Monday - Thursday	50	3	150	150	150	150
Wine Tasting Visitors Friday - Sunday	100	3	300	-	-	300
Wine & Food Pairing – Catered	50	10	-	500	-	-
Wine Release	150	10	-	-	1,500	-
Total Peak Flow			**495**	**995**	**1,995**	**795**

Wine and Food pairing events will be off-site catered.

PROPOSED DOMESTIC WASTEWATER TREATMENT SYSTEM

The total capacity of the existing domestic systems is 996 gpd. These systems can treat and disperse the 995 gallons of wastewater generated on a day with 50 visitors for wine tasting and 50 visitors for wine and food pairings. On days when wine & food pairing events occur wine tasting will be limited to 50 visitors. For Wine Release events and events with 75 guests portable sanitation facilities will be used.

No additional domestic wastewater treatment or dispersal system is needed.

WINERY PROCESS WASTEWATER GENERATION

Wine Production:

102,000 gallons of wine per year
2.38 gallons of wine per case
= 102,000 gal/year/2.38 cases/year
= 42,860 cases/year

Wastewater Production:

5 gallons of wastewater/gallon of wine
= 102,000 gal/year x 5 gal wastewater/gal
= 510,000 gal/year wastewater

Peak Daily Wastewater Flow:

Crush Period = 60 days
102,000 gallons x 1.5 / 60 days
= 2,550 gallons/day

Average Daily Flow:

510,000 gal/year
= 510,000 gallons/year/365
= 1,397 gallons/day

Monthly Wastewater Flows:

(See Table 2)

TABLE 2

	% By Month	Waste/Month	
Sept	15%	76,500	Gal/Month
Oct	13%	66,300	Gal/Month
Nov	11%	56,100	Gal/Month
Dec	8%	40,800	Gal/Month
Jan	4%	20,400	Gal/Month
Feb	6%	30,600	Gal/Month
Mar	6%	30,600	Gal/Month
Apr	5%	25,500	Gal/Month
May	6%	30,600	Gal/Month
Jun	7%	35,700	Gal/Month
Jul	9%	45,900	Gal/Month
Aug	10%	51,000	Gal/Month
Totals	100%	510,000	Gal/Year

WINERY PROCESS WASTEWATER CHARACTERISTICS

According to Napa County Environmental Management Sewage Treatment System Design Guidelines, winery process wastewater must be treated prior to surface discharge. Based on our experience, winery wastewater characteristics are as follows:

Characteristics	Units	Average
pH		3.5
BOD5	mg/l	6000
TSS	mg/l	500
Nitrogen	mg/l	20
Phosphorus	mg/l	10

The treatment goal is 160 mg/L BOD and 80 mg/L TSS. To meet this treatment goal a treatment train including a septic tank, treatment tank with High Strength Membrane Bio-Reactor (HSMBR) unit, and pump tank are proposed. Three options are presented below. These treatment train options may be modified for more desirable treatment processes prior to submitting construction plans. The following sections describe the process options in more detail. The proposed systems are shown in Appendix 2.

OPTION 1 – ENLARGE EXISTING PRESSURE DISTRIBUTION SYSTEM WITH VINEYARD IRRIGATION FOR RESERVE AREA

The existing pressure distribution will be expanded to accommodate the increased flow. Below is an analysis of the process wastewater produced from 17,000 gallons of wine per year increase. Using the peak day projected flows and design values taken from the 2006 design from Summit Engineer Inc. found in Appendix 3, we have developed a conceptual design for a pressure distribution system in accordance with the Napa County guidelines.

Increase in Wastewater Production:
5 gallons of wastewater/gallon of wine
= 17,000 gal/year x 5 gal wastewater/gal
= 85,000 gal/year wastewater

Increase in Peak Daily Wastewater Flow:
Crush Period = 60 days
17,000 gallons x 1.5 / 60 days
= 425 gallons/day

Increase in Average Daily Flow:
85,000 gal/year
= 85,000 gallons/year/365
= 233 gallons/day

Septic Tank

The process wastewater will flow into a new 1,500 gallon septic tank and then into the existing two 4,000 gallon tanks, providing a detention time of 3.7 days in peak flow conditions and 6.8

days in average daily flow conditions consistent with the installed system design by Summit Engineering. The septic tank will serve as a primary settling tank for the process wastewater.

Pump Tank
The pump tank will serve to hold treated wastewater prior to pumping to the pressure distribution system. The existing 3,000 gallon pump tank will be kept however dual pumps will be installed to handle the increased flow.

Pressure Distribution Field and Reserve
Using the application rate of 0.657 gal/sf/day and trench sidewall area of 2.67 sf/lineal foot, both from the 2006 design by Summit Engineering, the length of additional trench required is 243 feet.

According to the design the existing system has an additional 150 feet of trench above the required 1,210 lineal feet. An additional 93 feet will be installed to disperse the increased flow. Proposed layout is shown in Appendix 3.

For the existing dispersal system an area to trench length ratio was calculated as 8 sf/lf based on the existing 1,360 linear feet of trench occupying approximately 11,064 square feet. With the ratio of 8 sf/lf, 93 feet of line requires an area of 744 square feet and a 100% reserve area. After 744 square feet of the existing reserve area from the 2006 design by Summit Engineering is used, the remaining reserve area of 10,320 square feet would have a capacity of 2,262 gpd.

The reserve for the remaining flow of 288 gpd would be satisfied with vineyard irrigation. Treatment of the 288 gpd would consist of the HSMBR system described in option 2. Treated process wastewater would be dispersed onto 3 acres of vineyard. Based on monthly analysis shown in Appendix 4, a storage capacity of 269 gallons is required. Storage capacity of 2,000 gallons is proposed.

OPTION 2 – SURFACE DRIP IRRIGATION FOR INCREASED FLOW

The existing pressure distribution system will be used to dispose of the wastewater generated from the existing production of 85,000 gallons of wine per year. The remaining wastewater from the 17,000 gallon per year production increase will be treated using a High Strength Membrane BioReactor to the required standards and will be beneficially reused via surface drip for vineyard irrigation. An analysis of the increased process wastewater flow can be found under Option 1.

Septic Tank
The septic tank will serve to buffer peak flows and strengths from overwhelming the system and impairing treatment. This tank has been designed with baffles near the outlet. This tank will provide three days storage and will also serve to function as a primary settling basin. This tank will be 1,500 gallons.

Treatment Tank
The treatment tank will serve to treat wastewater flows using a High Strength Membrane Bio-Reactor (HSMBR) unit. This tank will provide 23.5 days storage. This tank will be 10,000 gallons. Flow to this tank will be metered to ensure that the HSMBR system is not overloaded.

Pump Tank
The pump tank will serve to hold treated wastewater prior to pumping to the holding tanks. This tank will house dual pumps. This tank will be 1,000 gallons.

Holding Tank and Dispersal Field
To provide a preliminary estimate of the amount of storage tanks required, we have prepared a monthly water balance, as shown in Appendix 4. Monthly wastewater production is based on a percentage of the total annual wastewater production. The amount of water to be applied is estimated by the typical vine water demand. The irrigation will be applied to areas of vineyards outside well setback requirements. The area available for irrigation is shown in Appendix 4. An area of 8.7 acres of vineyard and 2 acres of cover crop has been used to calculate the storage capacity required. Based on monthly analysis 0 gallons of storage is required. Storage capacity of 10,000 gallons is proposed.

During the summer months all of the treated wastewater will be used for irrigation. During the wet winter months, a limited discharge will be consistent with landscape water demand and no discharge will occur within 48-hours of a forecasted rain event and also for 48-hours after a rain event. These irrigation scheduling constraints necessitate installing tanks to store excess water that cannot be discharged during the winter months. All stored water will then be used for irrigation during the summer months.

OPTION 3 – SURFACE DRIP FOR ALL PROCESS WASTEWATER GENERATED

The existing process wastewater septic system will be abandoned in accordance with Napa County Environmental Management requirements. The process wastewater will be treated using a High Strength Membrane BioReactor to the required standards and will be beneficially reused via surface drip for vineyard irrigation.

Septic Tank
The existing septic tanks will serve to buffer peak flows and strengths from overwhelming the system and impairing treatment. These tanks will provide 8,000 gallons or three days storage and will also serve to function as a primary settling basin.

Treatment Tank
The treatment tank will serve to treat wastewater flows using a High Strength Membrane Bio-Reactor (HSMBR) unit. This tank will provide ten days storage. This tank will be 26,000 gallons.

Pump Tank

The pump tank will serve to hold treated wastewater prior to pumping to the holding tanks. This tank will house dual pumps. This tank will be 3,000 gallons.

Holding Tank and Dispersal Field

To provide a preliminary estimate of the amount of storage tanks required, we have prepared a monthly water balance, as shown in Appendix 4. Monthly wastewater production is based on a percentage of the total annual wastewater production. The amount of water to be applied is estimated by the typical vine water demand. The irrigation will be applied to areas of vineyards outside well setback requirements. The area available for irrigation is shown in Appendix 4. An area of 8.7 acres of vineyard and 2 acres of cover crop has been used to calculate the storage capacity required. Based on monthly analysis 43,848 gallons of storage is required. Storage capacity of 50,000 gallons is proposed.

During the summer months all of the treated wastewater will be used for irrigation. During the wet winter months, a limited discharge will be consistent with landscape water demand and no discharge will occur within 48-hours of a forecasted rain event and also for 48-hours after a rain event. These irrigation scheduling constraints necessitate installing tanks to store excess water that cannot be discharged during the winter months. All stored water will then be used for irrigation during the summer months.

OPERATION AND MAINTENANCE

The winery process and domestic wastewater systems will be fully automated and has been designed so minimal input from winery staff is required. Per Napa County guidelines, a Registered Civil Engineer, Registered Environmental Health Specialist, or Licensed Contractor will provide semi-annual monitoring and evaluation of the system. The contract with the responsible party will be provided prior to the final inspection for the system installed.

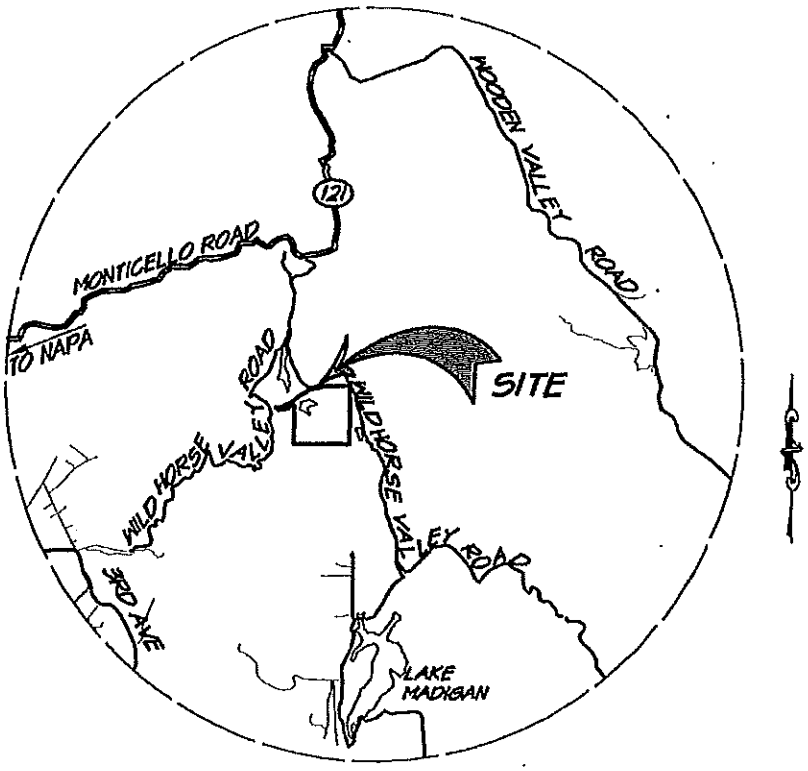
CONCLUSION

This report demonstrates that the increased flow of process wastewater can be treated and disposed of on-site and that the existing domestic wastewater treatment systems can treat and disperse the projected wastewater flows for the increased visitors and employees.

Appendix 1

Vicinity Map
USGS Quad Map

KENZO ESTATE
VICINITY MAP
NAPA CALIFORNIA



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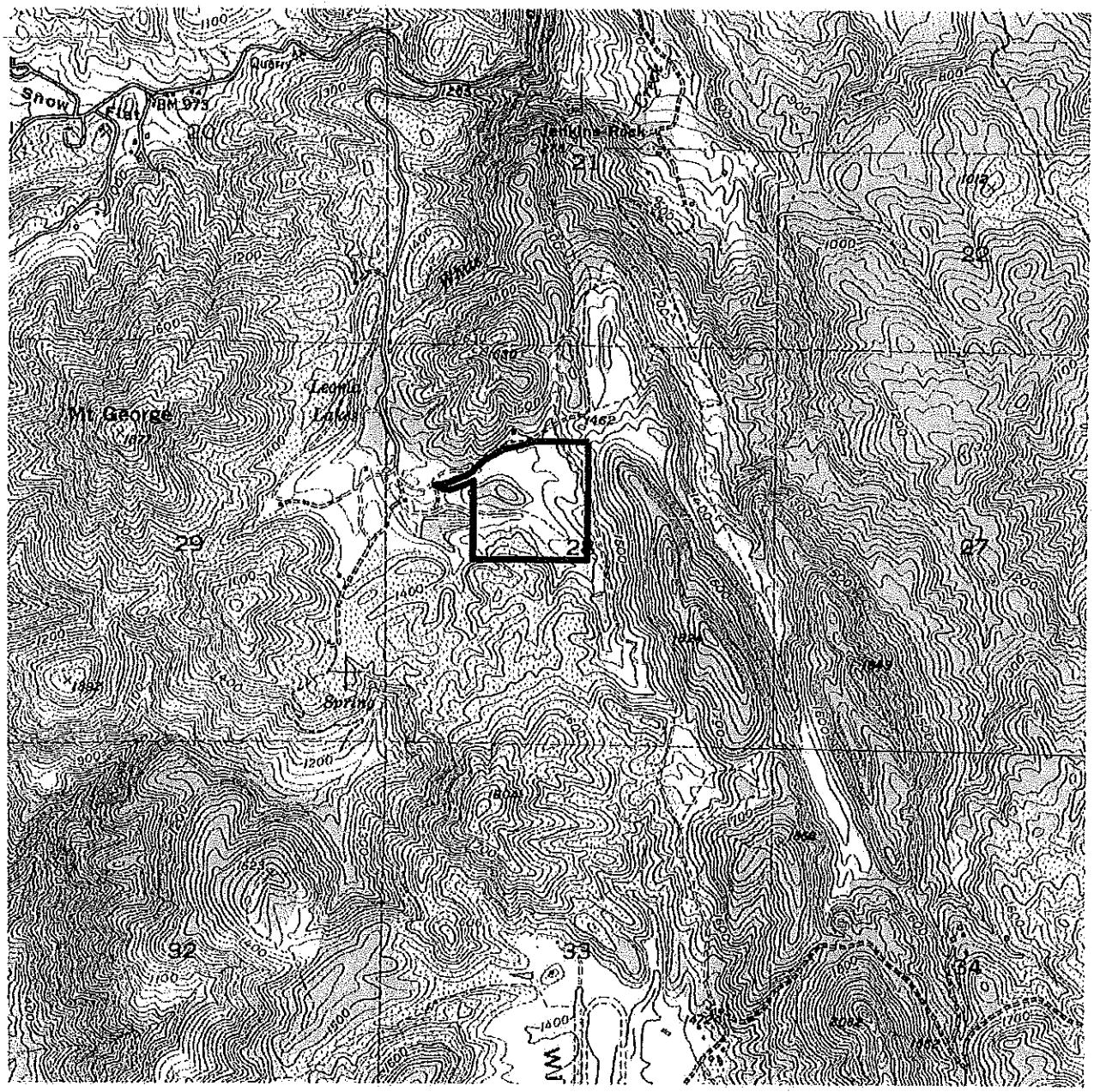
MARCH 12, 2013
4112041.0

KENZO ESTATE
USGS QUAD MAP
NAPA CALIFORNIA



SCALE: 1"=2000'

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Appendix 2

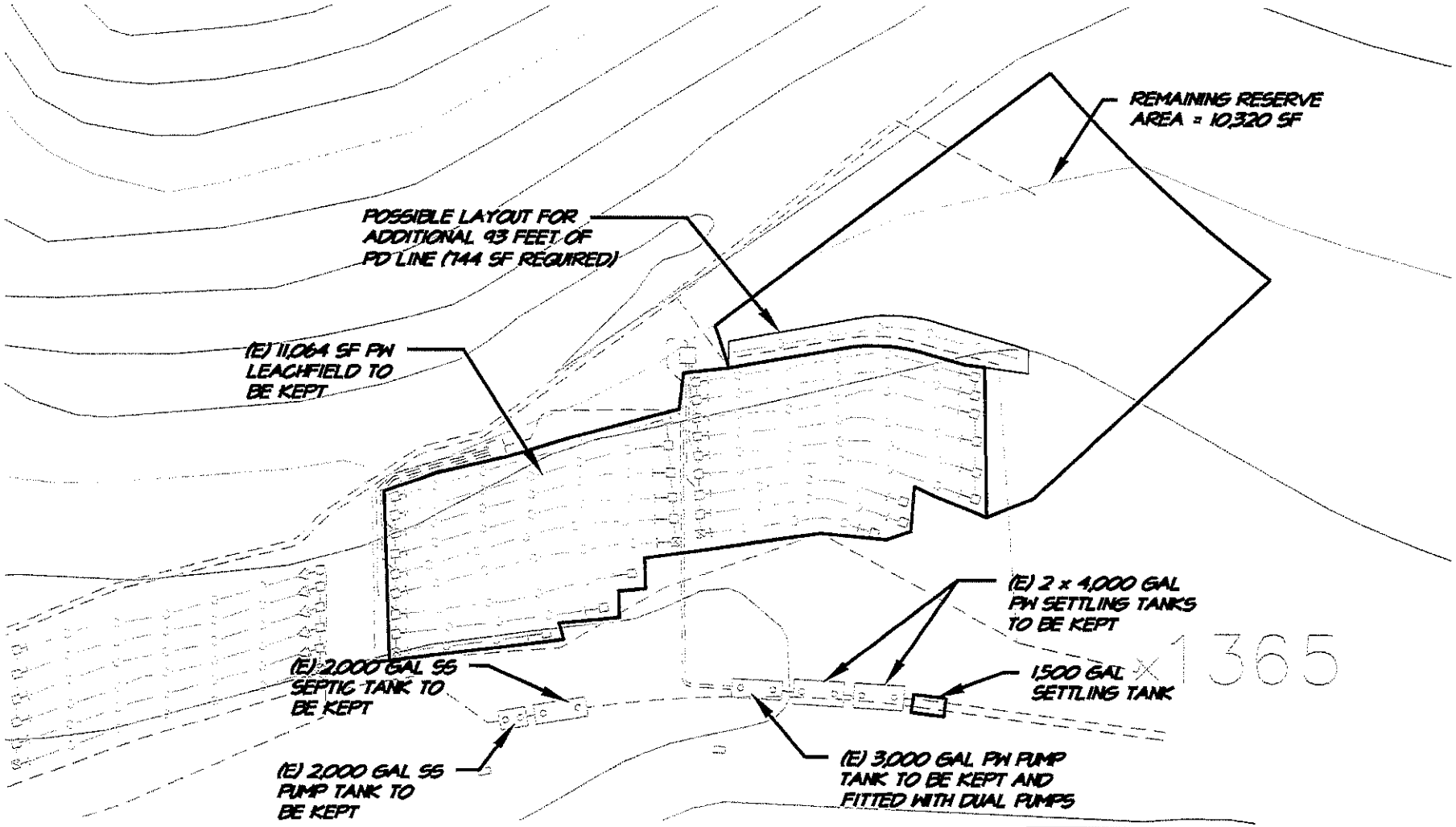
Conceptual Tank Layout and Dispersal Field Exhibit

KENZO ESTATES

PROCESS WASTEWATER OPTION 1

ENLARGE EXISTING PD FEILD WITH VINEYARD IRRIGATION FOR RESERVE AREA

SCALE: 1" = 50'



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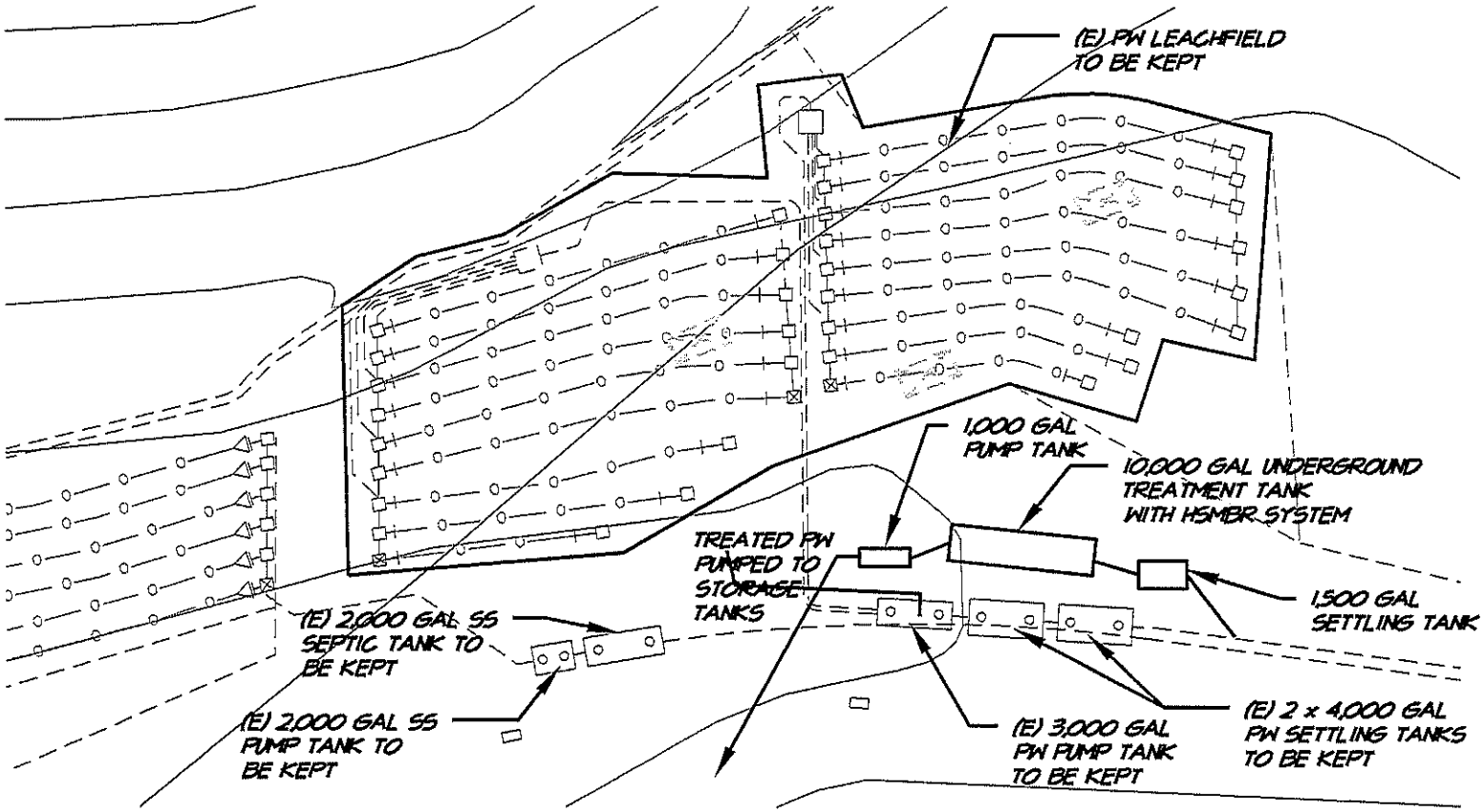
APRIL 20, 2015 4112041.0 PW OPTIONS.dwg

KENZO ESTATES
PROCESS WASTEWATER OPTION 2
ALL WASTEWATER TREATED BY HSMBR AND DISPERSED TO VINES



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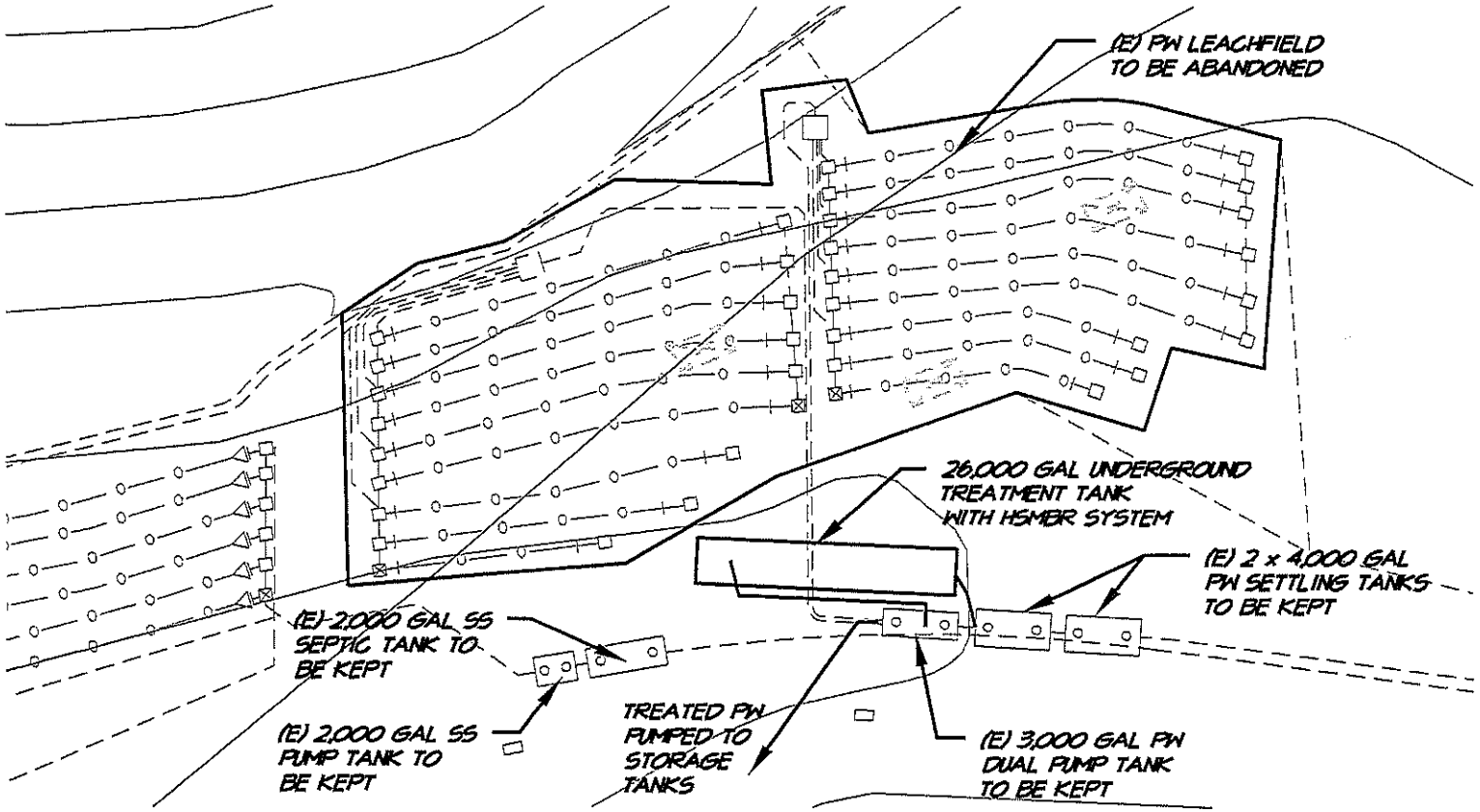
APRIL 03, 2015 4112041.0 PW OPTIONS.dwg

KENZO ESTATES
PROCESS WASTEWATER OPTION 3
INCREASE IN FLOW TREATED BY HSMBR AND DISPERSED TO VINES



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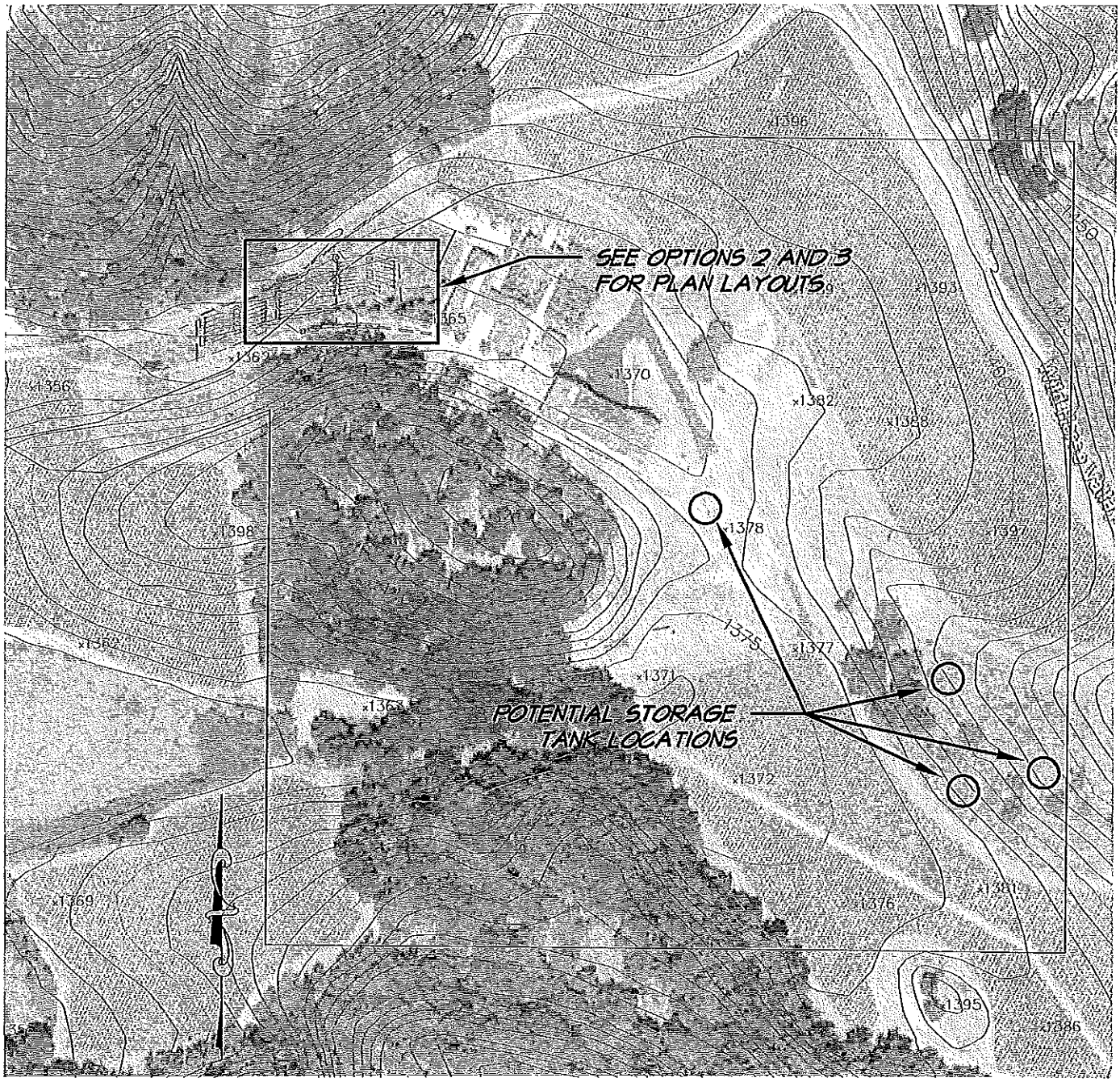
KENZO ESTATES
PW STORAGE TANK OPTIONS



GRAPHIC SCALE

250 0 250 500

(IN FEET)
1 inch = 250 FT

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MAR. 13, 2015 4112041.0 PW OPTIONS.dwg

Appendix 3

Existing Domestic Wastewater System
(Summit 2006 & RSA 2013)

SUMMIT ENGINEERING, INC.
Consulting Civil Engineers
Project No. 2003062
October 19, 2005
Revised April 19, 2006

DESIGN CALCULATIONS

Kenzo Winery
Napa County, California

PROCESS AND SANITARY WASTEWATER MANAGEMENT SYSTEM

GENERAL INFORMATION

The purpose of this report is to provide the background data, calculations and design for the proposed pump stations, septic and settling tanks and pressure distribution (PD) system for the disposal of winery process wastewater (PW) and sanitary sewage (SS) at the Kenzo Winery facility located on 3154 Monticello Road in Napa, California (APN 033-110-060). Two separate PD leachfield systems are presented for PW and SS.

Kenzo Winery has been permitted to construct an 85,000 gallon per year wine production facility. The facility will include a single building for crushing, pressing, receiving, fermenting, and mobile bottling. There will also be one additional building for visitors and tasting at the winery.

The PD leachfield for PW disposal is located on Parcel No. 033-110-060 and the PD leachfield for SS disposal is located on Parcel No. 033-110-008. The PW and SS will flow by gravity to separate settling/septic tanks and then pumped to the respective PD leachfields for disposal. The design criteria for PW and SS leachfield systems are discussed in detail in the following sections.

PROCESS WASTEWATER

SITE EVALUATIONS

A site evaluation was performed and evaluated by Napa County Department of Environmental Management Registered Environmental Health Specialist Sheldon Sapoznik and Summit Engineering on July 27, 2005. The soil profiles indicated soils and depth suitable for leachfield disposal of winery PW from Kenzo Winery. The soils in the area of the proposed leachfield and reserve area were classified as clay loam and silty loam. The acceptable soil depth of 60 inches was found in the proposed primary and reserved leachfield area. 12 inches of imported fill material will be required in the area of the leachfield installation. A percolation rate of 1 to 3 inches per hour was assigned to the onsite soils. Sufficient area is available for system installation and reserve area. The site evaluation report is included in Attachment A, *Soil Profiles for Process Wastewater*.

Design criteria for the PW PD leachfield system are based on the above site evaluations and inspection reports dated July 27, 2005. Using a percolation rate of 20 minutes per inch (mpi) (3 in/hr), the corresponding application rate for a pressure distribution system is 0.657 gal/sf-day. One foot of imported fill material will be applied prior to excavation of the trenches. Trenches will be excavated to 30-inch total depth with 12 inches in fill and 18 inches in native soil. Trenches will include 14-inches of gravel below the 2-inch pipe, 2 inches of gravel over the pipe and 12-inches of backfill, resulting in a trench sidewall area of 2.67 square feet/lineal feet (sf/lf). 6-ft trench spacing will be used. See the construction drawings for additional trench details.

An area providing 100% reserve area for future installation or expansion has been identified on the construction drawings.

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Project No. 2003062
October 19, 2005
Revised April 19, 2006

PW DESIGN FLOWS

PW will be generated from bottling, tank, equipment and floor cleaning. Crushing occurs at the facility. No distillation will occur at the facility; hence there will be no stillage waste. PW is collected at floor and trench drains within the winery and at exterior receiving, interior processing and tank areas. PW is transported by gravity from the winery drains to the settling tanks and pumped to the leachfield.

Design flows are based on full production. Process wastewater will be generated from approximately 500 tons crushed and produced onsite (corresponding to approximately 85,000 gallons of wine). Based on typical flow data from wineries of similar size and characteristics and corresponding calculated PW generation rates, projected flows are calculated as follows:

Annual Volume

Gallons of wine produced = 500 tons processed x 170 gal wine/ton = 85,000 gallons

Generation rate = 6.0 gal PW/gal wine

Total Annual Volume = 85,000 gal wine x 6.0 gal PW/gal wine = 510,000 gal PW

Average Day Flow

510,000 gal PW ÷ 365 days = 1397 gpd PW

Say 1400 gpd PW

Napa County Peak Day Flow (Design Flow)

$$\frac{85{,}000 \text{ gal wine/year} \times 1.5}{60 \text{ days}} = 2{,}125 \text{ gpd PW}$$

PW SETTLING TANKS

The required settling tank size for the winery PW flow per NCEM criteria is calculated as a minimum detention time of 3 days, resulting in:

2,125 gpd x 3 days = 6,375 gal

Two 4,000 gallon settling tanks shall be provided for the PW flow. This provides a detention time of 3.8 days for the design flow and 5.7 days for the average day. An effluent filter will be added to the outlet of each settling tank to further reduce solids passage to the pump station and leachfield.

PD LEACHFIELD

$$\text{Leachline} = \frac{2{,}125 \text{ gal/d}}{2.67 \text{ sf/lf} \times (0.657 \text{ gal/sf/day})}$$

$$= 1{,}210 \text{ lf}$$

A PD leachfield system with 1,360 lf of leachline (8 - 170 lf subfields) is designed to handle the design wastewater flow of 2,125 gal/d.

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October 19, 2005
Revised April 19, 2006

DISTRIBUTION LATERAL

Each distribution lateral will utilize 3/16" diameter orifices. The first orifice hole will be 2'-6" from the beginning of the lateral and the last orifice will be 2-6" from the end of the lateral, with orifice spacing at 3'-6". Each distribution lateral will be 2" diameter. See construction drawings for more details.

PW PUMP SIZING

See Attachment B for a summary of the pump system for PW. Dose volume is based on a minimum of 5 to 10 times the lateral pipe volume. In this case a volume of 177 gallons, approximately 6.3 times the lateral pipe volume is the specified dose quantity. This design utilizes a flow rate of 36.5 gpm with a corresponding pump run time of approximately 4.8 minutes. The theoretical flow rate through the most hydraulically demanding lateral and most remote orifice is 18.2 gpm and 0.8 gpm, respectively.

Head loss calculations were based on a minimum residual head of 3 ft at the most hydraulically remote orifice together with the associated static head, friction head, and minor losses of the system. The system will be installed per the construction drawings, see Sheet WW3. Calculations indicate that the system pump's operating point is 36.5 gpm at 34.4 ft TDH; see Attachment B for pump selection.

Submersible sewage pumps have been specified; see Attachment B. The pumps are sized to meet system requirements. The pumps will be installed in a 3,000 gallon PW pump tank and will operate based on mercury float switch control and timed operation. Three float switches, pump-off, pump-on/high-water alarm, and high-high water alarm will be installed within the PW pump tank at levels consistent with the sequence of operation summarized below. As a safety feature, if the wastewater in the pump tank reaches the high-water level, an audible and visual alarm will sound.

PW SYSTEM OPERATION

PW flows by gravity from the winery to the first settling tank. It then cascades by gravity to the second settling tank. The PW then flows by gravity to the PW pump tank. In the pump tank, there are two submersible pumps connected to individual 2-inch force mains, which connect to a distribution valve. The pumps will alternate each dose cycle. Each time PW is pumped through a distribution valve, the valve alternates to the next subfield when the pump shuts off.

Once every other hour, the pump will activate for a period of 4.8 minutes before deactivation. The pump will deactivate if the level of PW reaches below the 1st switch. The panel will alternate pumps each activation. If the level of PW reaches the 2nd float switch, a high water alarm will sound. This operation will continue until all eight subfields are dosed and the cycle repeats. For additional pump control information, please refer to the wastewater system electrical requirements in Attachment D.

SUMMIT ENGINEERING, INC.
Consulting Civil Engineers
Project No. 2003062
October 19, 2005
Revised April 19, 2006

SANITARY SEWAGE

SITE EVALUATIONS

A site evaluation was performed and evaluated by Napa County Department of Environmental Management Registered Environmental Health Specialist Darell Choate and Summit Engineering on November 30, 2005 for the winery SS disposal. The soil profiles indicated soils and depth suitable for leachfield disposal of winery SS from Kenzo Winery. The soils in the area of the proposed leachfield and reserve area were classified as clay loam and silty loam and ranged in depth from 48 to 66 inches. 12 inches of imported fill material will be required in the area of the leachfield installation. A percolation rate of 3 to 6 inches per hour was assigned to the onsite soils. Sufficient area is available for system installation and reserve area. The site evaluation report is included in Attachment A, *Soil Profiles for Winery Septics*.

Design criteria for the PW PD leachfield system are based on the above site evaluations and inspection reports dated November 30, 2005. Using a percolation rate of 20 minutes per inch (mpi) (3 in/hr), the corresponding application rate for a pressure distribution system is 0.657 gal/sf-day. One foot of imported fill material will be applied prior to excavation of the trenches. Trenches will be excavated to 30-inch total depth with 12 inches in fill and 18 inches in native soil. Trenches will include 14.5-inches of gravel below the 4" inch pipe, 2 inches of gravel over the pipe and 12-inches of backfill, resulting in a trench sidewall area of 1.67 square feet/lineal feet (sf/lf). 6-ft trench spacing will be used. Reserve leachlines in the vicinity of soil profile have been sized using 1.67 sf/lf sidewall area to account for shallower soils. See the construction drawings for additional trench details.

An area providing 100% reserve area for future installation or expansion has been identified on the construction drawings.

SS DESIGN FLOW

SS at the Kenzo Winery consists of typical wastewater generated from typical winery activities. Low flow fixtures will be utilized throughout the new winery resulting in a 25% reduction of SS flow. Anticipated SS flows are projected as follows:

Average Harvest Day w/ Peak Visitation and No Events

10 full time employees x 15 gpcd	=	150
10 visitors x 5 gpcd	=	75
Total	=	225 gpd
X 0.75	=	225 x 0.75 = 168.75 say 170 gpd

Average Harvest Day w/ Average Visitation and a Peak Event

10 full time employees x 15 gpcd	=	150
50 visitors x 5 gpcd	=	250
15 taster x 2.5 gpcd	=	37.5
50 meals x 15 gpcd	=	750
Total	=	1,100 gpd
X 0.75	=	1,100 x 0.75 = 891 gpd

Employee and visitor numbers are expected to be peak for an average harvest day with visitation and a peak event.

SS SEPTIC TANK

The required septic tank size for the winery and residence SW flow based on Napa County Environmental Management criteria is calculated from NCEM Table 13.44.020:

Flow, gal/d	Recommended Minimum Capacity, gal
600	1,200
900	1,500
1,200	2,000
1,500	2,500

One 2,000 gallon septic tank followed by a 1,500 gallon pump tank is more than adequate to handle all winery SS. An effluent filter will be installed at the outlet of the septic tank to reduce solids passage to the pump station and leachfield. A septic tank of this size will provide 2.2 days of detention time at peak flows.

GREASE INTERCEPTOR

Grease interceptor will be located near the proposed kitchen. The sizing criteria of the grease interceptor are summarized below.

Required Grease Interceptor Capacity in gallons = Peak number of meals per hour X Wastewater flow rate X Retention Time X Storage Factor

= 20 meals/hour x 15 gal/meal x 2.5 hour x 1

= 750 gallons

A 750 gallon grease interceptor is proposed at the proposed kitchen.

PD LEACHFIELD (PRIMARY)

$$\text{Leachline} = \frac{891 \text{ gal/d}}{2.67 \text{ sf/lf (0.657 gal/sf/day)}}$$

$$= 508 \text{ lf}$$

A PD leachfield system with 540 lf of leachline (6 - 90 lf subfields) should be adequate to handle the design SS flow of 891 gal/d.

PD LEACHFIELD (RESERVE)

The SS leachfield reserve area available is approximately 710 LF. Refer to the construction drawing sheet WW2. In the vicinity of SS leachfield reserve area soil test pit 1 (SP 1) has an acceptable soil depth of 48". The acceptable soil depths for SP2, SP3 and SP4 are 66".

Approximately 270 LF of leachline can be fit within a 35 ft radius of SP1. At 48" of acceptable soil depth, available trench depth of 24 inch in the vicinity of SP 1 with a sidewall area of 1.67 sf/lf, the SS flow for 270 lf leachline is calculated as follows:

SS Flow in the vicinity of SP 1 = 270 lf x 1.67 sf/lf x 0.657 gal/sf/day

= 296 gpd

SS flow required to be dispose of in the rest of the SS leachfield reserve area = 891 – 296 = 595 gpd

The soil pits in the remaining SS reserve leachfield area have acceptable soil depths of 66", therefore using a sidewall area of 2.67 sf/lf and 30 inch of available trench depth, the leachline required for 595 gpd is determined as follows:

$$\text{Leachlines} = \frac{595 \text{ gal/d}}{2.67 \text{ sf/lf } (0.657 \text{ gal/sf/day})}$$

= 339.1 lf, say 340 lf

Therefore, total leachlines required to accommodate the peak SS flow of 891 gpd will be 610 lf (270 lf + 340 lf).

Approximately, 440 lf of leachline can be fit in the vicinity of SP2, SP3, and SP4 (See construction drawing sheet WW2). Therefore, available area of SS leachfield reserve is approximately 710 lf (440 lf + 270 lf), which meets the 100 percent requirement for reserve area.

DISTRIBUTION LATERAL

Each distribution lateral will be 90 lf and utilize 1/8" diameter orifices. The first orifice hole will be 2'-6" from the beginning of the lateral and the last orifice will be 2-6" from the end of the lateral, with orifice spacing at 3'-6". Each distribution lateral will be 1.5" diameter and include 25 holes.

SS PUMP SIZING

See Attachment C for a summary of the pump system for SS. Dose volume is based on 5 to 10 times the total lateral volume. In this case a volume of 250 gallons is the specified dose quantity. This design utilizes a flow rate of 65.4 gpm with a corresponding pump run time of approximately 3.8 minutes. The theoretical flow rate through the most hydraulically demanding lateral and most remote orifice is 10.9 gpm and 0.4 gpm, respectively.

Head loss calculations were based on a minimum residual head of 5 ft at the most hydraulically remote orifice together with the associated static head, friction head, and minor losses of the system. The system will be installed per the construction drawings; see Sheet WW3. Calculations indicate that the system pump's operating point is 65.4 gpm at 33.3 ft TDH; see Attachment C for pump selection.

A duplex submersible sewage pump system has been specified; see Attachment C. The pumps are sized to meet system requirements. The pumps will be installed in a 1,500 gallon SS pump tank and will operate based on mercury float switch control. Three float switches, pump-off, pump-on/high-water alarm, and high-high water alarm will be installed within the SS pump tank at levels consistent with the sequence of operation summarized below. As a safety feature, if the wastewater in the pump tank reaches the high-water level, an audible and visual alarm will sound.

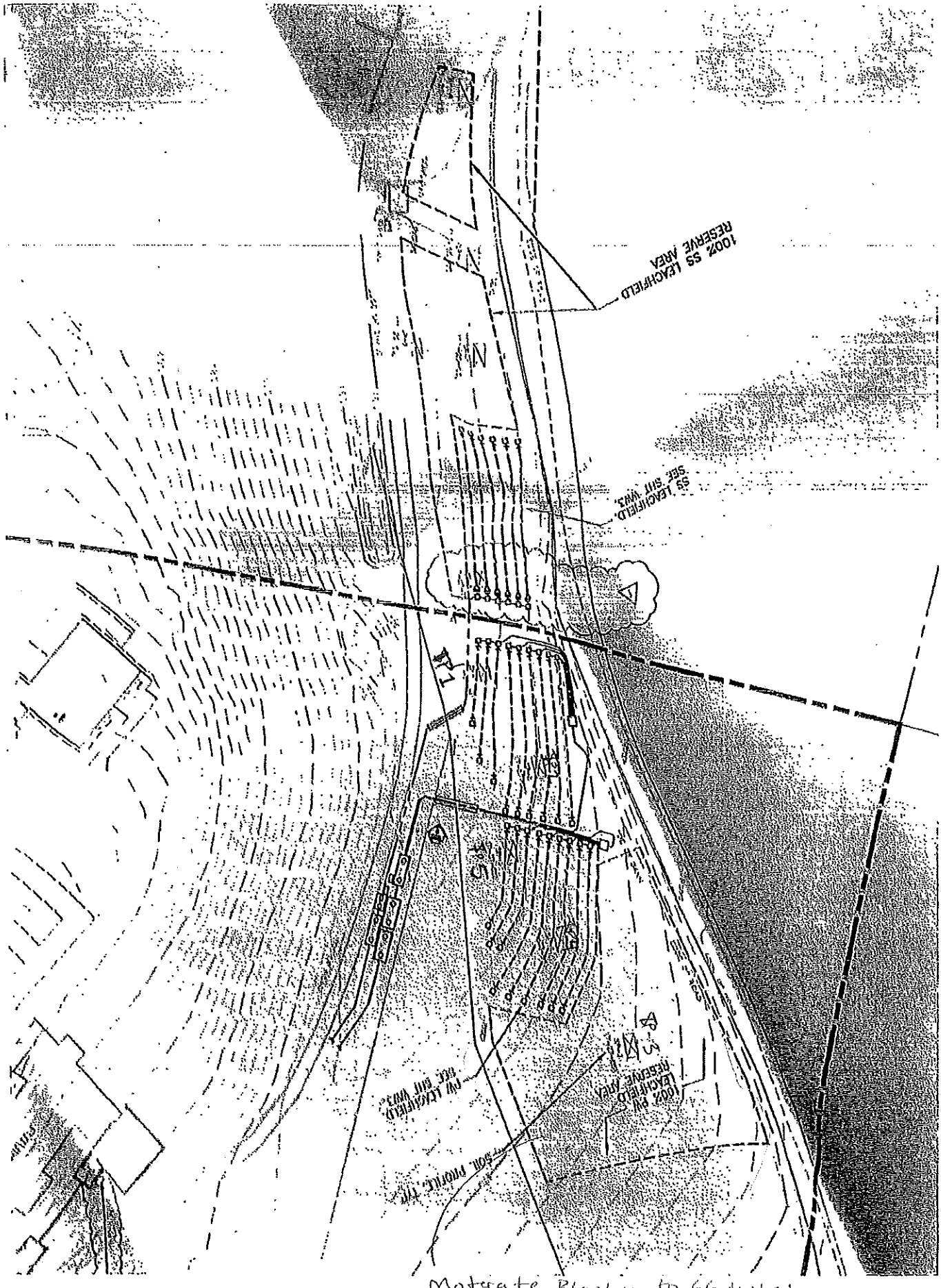
SS SYSTEM OPERATION

SS flows by gravity from the winery to the septic tank. The SS then flows to the SS pump tank. In the SS pump tank, a duplex pumping system will be provided by two submersible pumps connected to a 2-inch force main. Duplex pumping systems eliminate the need for 24 hours storage above the high water

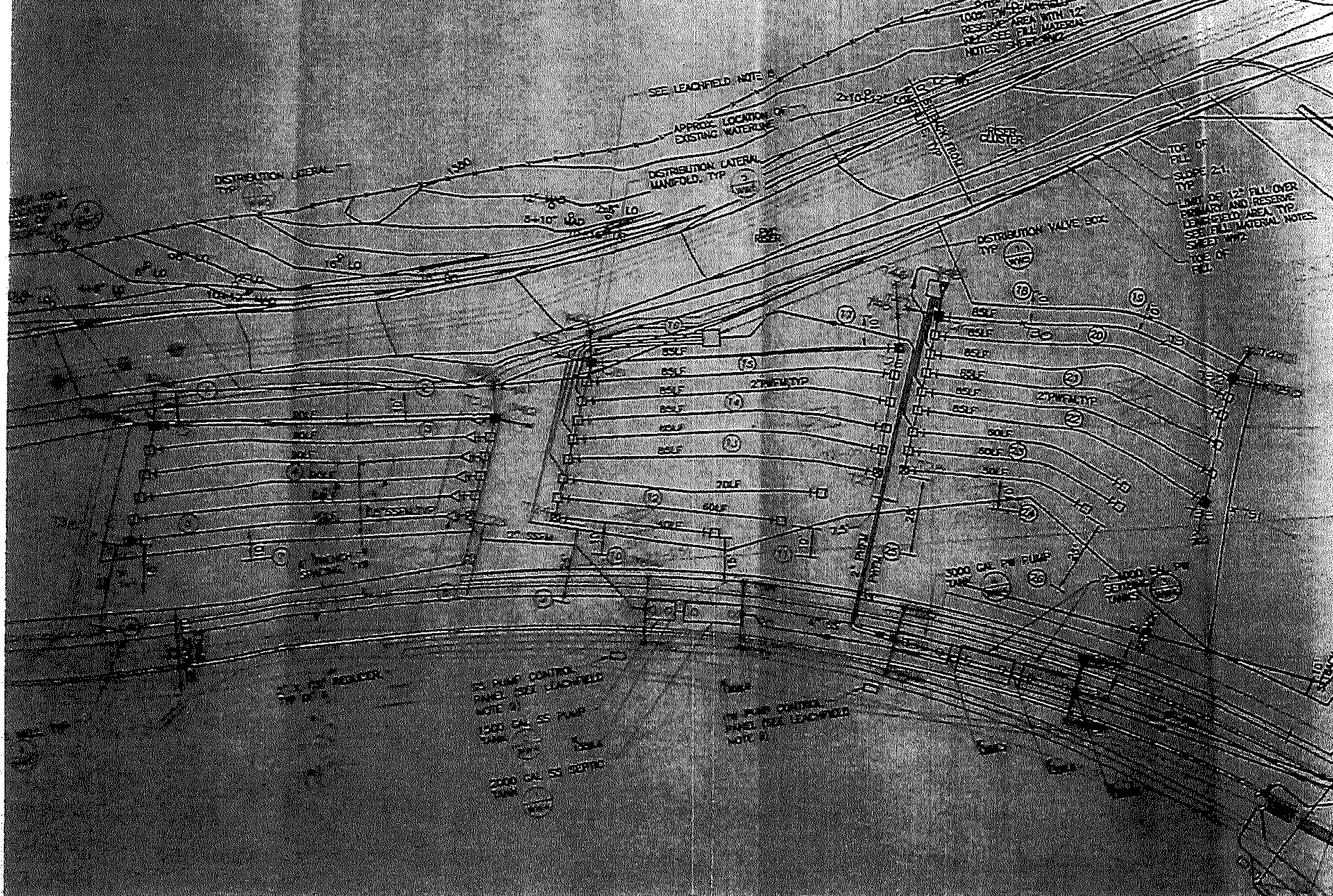
alarm in SS systems. The pumps will alternate each time a pump is activated. The force main will be connected to the SS leachfield. See construction drawings for more details.

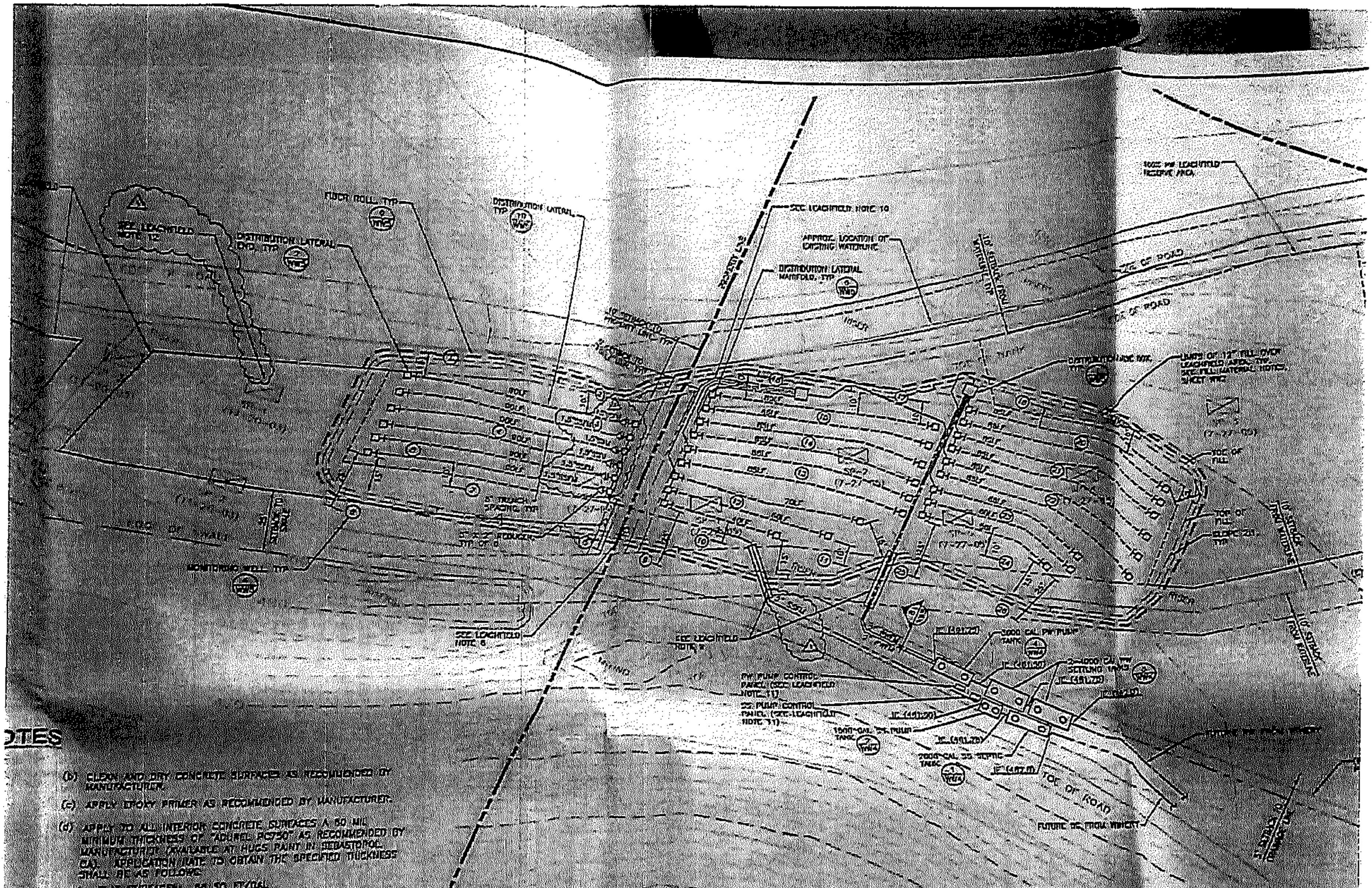
Once every 6.7 hours, the pump will activate for a period of 3.8 minutes before deactivation. The pump will deactivate if the level of SS reaches below the 1st switch or dose time elapses. The panel will alternate pumps each activation. If the level of SS reaches the 2nd float switch, a high water alarm (HWA) will sound. If the SS reaches the level of the 3rd float switch, a high-high water alarm shall sound.

For additional pump control information, please refer to the wastewater system electrical requirements in Attachment D.


100Z SS LEACHFIELD
RESERVE AREA
SS LEACHFIELD
SEE SHT WA3
SOIL PROBE TYP
PW LEACHFIELD
SEE SHT WA3
100Z PW
LEACHFIELD
RESERVE AREA
Moderate Blocky to 66 inches

DRAWING FROM AS-BUILT SET
FROM SUMMIT ENGINEERING





[illegible]OTES

(b) CLEAN AND DRY CONCRETE SURFACES AS RECOMMENDED BY MANUFACTURER.

(c) APPLY EPOXY PRIMER AS RECOMMENDED BY MANUFACTURER.

(d) APPLY TO ALL INTERIOR CONCRETE SURFACES A 50 MIL MINIMUM THICKNESS OF "ADUREL PC750" AS RECOMMENDED BY MANUFACTURER (AVAILABLE AT HUGS PAINT IN SEBASTOPOL, CA). APPLICATION RATE TO OBTAIN THE SPECIFIED THICKNESS SHALL BE AS FOLLOWS:

i. FLAT SURFACES: 65 SQ FT/GAL
ii. VERTICAL SURFACES: 100 SQ FT/GAL

(e) ALLOW MATERIAL TO DRY BETWEEN COATS AS RECOMMENDED BY MANUFACTURER.

(f) RECOAT WITHIN 24 HOURS OR REPAIR SURFACE AS RECOMMENDED BY MANUFACTURER.

[illegible] DAYS [illegible] TIME [illegible] FILLING THE TANK WITH [illegible]

9. DISTRIBUTION VALVE SHALL BE A HYDROTEK DISTRIBUTION VALVE MODEL V6600 WITH 1 1/2" INLET AND 4 - 1 1/2" OUTLETS. VALVE KIT SHALL INCLUDE 1 1/2" CLEAR PIPE FOR EACH SUBFIELD AND UNIONS FOR INLET AND OUTLETS. VALVE AND KIT AVAILABLE THROUGH ORENCO SYSTEMS, INC.

10. [illegible] VALVES SHALL HAVE [illegible] BODY, SOLID WEDGE DISC WITH NON-RISING [illegible] SHALL [illegible] FOR [illegible]

LEACHFIELD NOTES

1. NO HEAVY EQUIPMENT SHALL BE OPERATED OVER LEACHFI[illegible]
2. LEACHLINES ARE TO BE LOCATED ON CONTOUR AS SHOWN[illegible]
3. SOIL PROFILES [illegible] IN LEACHFIELD AREA ARE FROM [illegible] DATED [illegible] BY NAPA COUNTY DEPARTMENT OF ENV[illegible]

CONSULTING CIVIL ENGINEERS
RIECHERS & SPENCE ASSOCIATES

WINERY WASTEWATER DESIGN REPORT

KENZO ESTATE
3200 MONTICELLO ROAD
NAPA, CALIFORNIA

APN 033-110-075

REGISTERED PROFESSIONAL ENGINEER
CHRISTOPHER M. TIBBITS
No. 59361
Exp. 9/30/15
CIVIL ENGINEER
STATE OF CALIFORNIA

PROPERTY OWNER:

Kenzo Estate Inc.
3200 Monticello Road
Napa, California

Project # 4112041.0
July 25, 2013
April 1, 2014

1515 Fourth Street, Napa, CA 94559 www.rsacivil.com 707.252.3301.v 707.252.4966.f

WASTEWATER DESIGN REPORT
KENZO ESTATE

TABLE OF CONTENTS

APPENDICES

1. Vicinity Map & USGS Quad Map
2. Site Evaluation
3. Existing Septic System Plans and As Built Plans
4. Process Wastewater Pump Tank Calculations and Product Information
5. Domestic Wastewater Tank & Geoflow Field Calculations

INTRODUCTION AND PROJECT DESCRIPTION

The owner has approval to construct a new winery production building on 36.13+/- ac parcel located at 3200 Monticello Road, Napa (APN 033-110-075). There will be no increase in production, visitors or employees associated with the new winery production building. Access to the property is an existing driveway connecting to Monticello Road.

The topography on the parcel ranges from steep slopes to mostly level areas. The proposed winery addition will reside on a large, level area of the parcel, backing up to slopes where the existing cave resides. Currently the parcel is used for vineyards and the existing winery. One well exists on the site. Appendix 1 contains a Site Location Map and a USGS Site Map showing the parcel topography, features and boundary.

This report will evaluate the disposal into the existing system for winery process wastewater and proposes a new system for winery domestic wastewater.

EXISTING SEPTIC SYSTEMS

Information from Napa County Environmental Health Department files for the parcel show existing pressure distribution septic systems for the winery domestic and process wastewater. The process wastewater system has been designed for 85,000 gallons per year (2,125 gpd) and the domestic wastewater has been designed for a peak flow of 891 gpd.

CURRENT PERMITS

This report replaces connection to the existing sanitary wastewater system with a new system to serve one new bathroom.

SITE EVALUATION

A site evaluation was conducted on July 27, 2005, under permit number E05-0584, by Summit Engineering, in the location of the existing systems. Appendix 4 contains the Site Evaluation results. An additional site evaluation was conducted by Riechers Spence & Associates on October 30, 2012, under permit E12-00686. This site evaluation investigated the subsurface conditions in the area to the east of the proposed winery building.

The report shows that the test pits contain mostly sandy clay and that each pit has at least an acceptable soil to a depth of 42". Dispersal and reserve areas for the winery domestic and process wastewater is located in the areas represented by test pit #'s 1, 2, 3, 4, 6, and 7.

WINERY DOMESTIC WASTEWATER DESIGN

The use permit modification is proposing no additional employees or visitors. There will be one bathroom for employees in the new building. The tank sizing and float settings are based on use from 7 of 10 employees from the original design, at 15 gpd/employee. Wastewater will

undergo primary and pre-treatment in a Hoot H-600 BNR Aerobic Tank. Final disposal from the Hoot system will be to a subsurface Geoflow Drip Dispersal system. The treatment goal is to meet Napa County discharge limits for discharge of pre-treated effluent to a Drip Dispersal system of 30 mg/l BOD_5 and 30 mg/l TSS.

Hoot Aerobic Treatment System (H-600 BNR)

System sizing, tank sizing, and treatment system settings are based on HOOT manufacturer's specifications to achieve the design treatment goals of 30 mg/l BOD_5 and 30 mg/l TSS. Pump sizing, timer settings and treatment system calculations are found in Appendix 5 of this report.

Treated effluent from the Hoot Aerobic Treatment System tanks will flow to the dosing portion of the tank. The effluent will be pumped out of the pump portion of the tank and through the HOOT headworks to a Geoflow drip dispersal field. The Geoflow system will be evenly time-dosed over the entire 24-hour day by a 1/2 hp, 10 gpm pump in the tank, supplied with the Hoot System. The Hoot Automatic Controller, also supplied with the Hoot System, will control the aeration in the tanks, the pumps, and distribution.

A flow meter for the supply line is included and will measure the volume discharged to the Geoflow system. A second flow meter will be installed to measure the field flush flow returned to the tank. Net discharge will be calculated as the difference between the two meter readings. Calculations for dosing and pump sizing are included in Appendix 5.

Geoflow Drip Dispersal System

The Geoflow field and reserve area will be located as shown on sheet SS2 of the attached plans. Soil depth is at least 42 inches in the primary dispersal field area and reserve areas, therefore, the dispersal field will require no fill placement.

The most restricting soil horizon for the primary area is sandy clay with moderate sub-angular blocky structure. Referring to Table 2 of the Geoflow Design, Installation and Maintenance Guidelines, a Geoflow system installed in sandy clay soil with moderate, sub angular blocky structure will accept 0.3 gal/sf/day. For a total daily flow of 105 gpd this equates to base dispersal area of 350 square feet.

$$Drip\ Dispersal\ Field\ Area = \frac{105\ gpd}{0.3\ gpd/SF} = 350\ square\ feet$$

The Geoflow field will therefore consist of 175 linear feet of Wasteflow PC drip line, 0.5 gallon per hour-per emitter, at 2 foot spacing between emitters and 2 foot spacing between lines. Three lines at 60' will be installed for the system. The lines will be oriented along the contours with supply and flush manifolds at either end of the system, as shown on sheet SS2.0 of the Wastewater Disposal System plans. The field flush return will discharge into the tank where it will be re-treated through the Hoot System.

In addition to the primary dispersal area of 350 square feet, a 200% reserve area is required. The reserve area will be located adjacent to the primary field where the soil application rate is also 0.3 gallons/square foot/day.

$$Drip\ Dispersal\ Field\ Area\ (reserve\ area) = \frac{105\ gpd}{0.3\ gpd/SF} = 350\ square\ feet$$

The requirement for winery domestic wastewater reserve dispersal area is 700 square feet. The total area required for primary and reserve areas is 1050 square feet.

As required for sloping sites, two monitoring wells will be installed within the dispersal field, two will be installed 10 feet uphill, and two will be installed 25 feet downhill. Geoflow field and pump sizing calculations are found in Appendix 5 of this report.

WINERY PROCESS WASTEWATER DESIGN

The use permit modification is proposing no additional production, although production will occur in the new building. The tank sizing and float settings are based on one half of the allowable effluent (1,063 gpd). A 3,000 gallon pump tank will be installed. The pump tank will pump effluent to an existing process wastewater line located east of the existing winery building.

STORMWATER DIVERSION

The proposed crush pad will be located under a covered area. This prevents storm water from entering the process wastewater system.

OPERATION AND MAINTENANCE

The winery domestic wastewater system is fully automated and has been designed so minimal input from winery staff is required. The new pump tank and new HOOT system will also be fully automated. Per Napa County guidelines, a Registered Civil Engineer, Registered Environmental Health Specialist, or Licensed Contractor will continue to provide semi-annual monitoring and evaluation of the system. The contract with the responsible party will be provided prior to the final for the system installed.

CONCLUSION

This report outlines the additions to the existing process wastewater system. There is no increase in production, therefore it is feasible for the new connection to the existing process waste water system.

Appendix 4

Water Balance for Irrigation and Storage
Irrigation Areas Exhibit

Reclaimed Process Wastewater
Water Balance for Irrigation and Storage
Option #1

Project Description		Annual Process Waste Flow Volume		
Project Number:	4114025.0	Wine Production:	11,520	gal/year
Project Name:	Kenzo - Possible Expansion			
Prepared By:	Maggie Schneider	Annual Process Waste per Gallon Wine:	5	gal/year
Date:	February 23, 2015	Total Annual Process Waste Generated:	57,600	gal/year

Vineyard Irrigation Parameters		Landscape Irrigation Parameters		
Acres of irrigated vineyard:	3.00 acres	Crop type / name:		
Row spacing:	7.0 feet	Total irrigated acres of crop:	acres	
Vine spacing:	8.0 feet			
Total number of vines:	2,334 vines			
Water use per vine per month (peak):	26 gal			
Total peak monthly irrigation demand:	60,673 gal			

Monthly Process Wastewater Generation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly process wastewater generated as % of annual total:	4%	6%	6%	5%	6%	7%	9%	10%	14%	14%	11%	8%
Monthly process wastewater generated [gallons]:	2,304	3,456	3,456	2,880	3,456	4,032	5,184	5,760	8,064	8,064	6,336	4,608

Monthly Vineyard Irrigation Water Use

(Based on per-vine water use)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Beginning of month reclaimed water in storage [gallons] (This number brought forward from end of previous month)	0	0	0	0	0	0	0	0	0	0	0	269
Vineyard irrigation as % of peak month irrigation demand:	6%	6%	10%	100%	100%	100%	100%	100%	100%	100%	10%	10%
Irrigation per month per vine (gallons):	2	2	3	26	26	26	26	26	26	26	3	3
Total vineyard irrigation demand [gallons]:	3,640	3,640	6,067	60,673	60,673	60,673	60,673	60,673	60,673	60,673	6,067	6,067
Will vineyard be irrigated with reclaimed water this month?	y	y	y	y	y	y	y	y	y	y	y	y
Process wastewater generated this month, reclaimed for vineyard irrigation [gallons]	2,304	3,456	3,456	2,880	3,456	4,032	5,184	5,760	8,064	8,064	6,067	4,608
Remaining vineyard irrigation demand after using this month's process water [gallons]	1,336	184	2,611	57,793	57,217	56,641	55,489	54,913	52,609	52,609	0	1,459
Drawdown from storage for remaining vineyard irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	269
Well water required to satisfy remaining vineyard irrigation demand	1,336	184	2,611	57,793	57,217	56,641	55,489	54,913	52,609	52,609	0	1,191
Net storage after vineyard irrigation drawdown [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
This month's process wastewater, remaining after vineyard irrigation, available for landscape irrigation[gallons]	0	0	0	0	0	0	0	0	0	0	269	0

Water balance continues on next page for cover crop irrigation.

Monthly Landscape Irrigation Water Use

(Based on evapotranspiration crop demand and irrigated area)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
This month's process wastewater, remaining after vineyard irrigation, available for landscape irrigation[gallons] *(From sheet 1)*	0	0	0	0	0	0	0	0	0	0	269	0
Reference ET (ETo) (in/month) (see note 1)	1.03	1.53	2.93	4.71	5.82	6.85	7.21	6.44	4.87	3.53	1.64	1.17
Crop Coefficient (k_c) (see note 2)	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Crop water demand per acre [inches]	0.82	1.22	2.34	3.77	4.66	5.48	5.77	5.15	3.90	2.82	1.31	0.94
Crop water demand per acre [gallons]	22,374	33,235	63,645	102,310	126,422	148,795	156,615	139,889	105,786	76,678	35,624	25,415
Total crop water demand for irrigated area [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Will landscape be irrigated with reclaimed water this month?	N	Y	Y	N	N	N	N	N	N	Y	Y	N
Process wastewater remaining after vineyard irrigation, reclaimed for landscape irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Landscape irrigation water required from storage or other source [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Drawdown from storage for landscape irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Process wastewater generated this month, unused for irrigation, to be reclaimed and stored [gallons]	0	0	0	0	0	0	0	0	0	0	269	0
Net end-of-month reclaimed water storage after all irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	269	0

End of Water Balance

Peak Monthly Storage = 269 gallons

Notes:

1. Reference ETo from California Irrigation Management Information System
2. Crop Coefficient from Table 1 of "Estimating Irrigation Water Needs of Landscape Plantings in California", University of California Cooperative Extension, August 2000.

Reclaimed Process Wastewater
Water Balance for Irrigation and Storage
Option #2

Project Description		Annual Process Waste Flow Volume		
Project Number:	4114025.0	Wine Production:	17,000	gal/year
Project Name:	Kenzo - Possible Expansion			
Prepared By:	Maggie Schneider	Annual Process Waste per Gallon Wine:	5	gal/year
Date:	February 23, 2015	Total Annual Process Waste Generated:	85,000	gal/year

Vineyard Irrigation Parameters		Landscape Irrigation Parameters		
Acres of irrigated vineyard:	8.70 acres	Crop type / name:		
Row spacing:	7.0 feet	Total irrigated acres of crop:	2.00 acres	
Vine spacing:	8.0 feet			
Total number of vines:	6,767 vines			
Water use per vine per month (peak):	26 gal			
Total peak monthly irrigation demand:	175,951 gal			

Monthly Process Wastewater Generation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly process wastewater generated as % of annual total:	4%	6%	6%	5%	6%	7%	9%	10%	14%	14%	11%	8%
Monthly process wastewater generated [gallons]:	3,400	5,100	5,100	4,250	5,100	5,950	7,650	8,500	11,900	11,900	9,350	6,800

Monthly Vineyard Irrigation Water Use

(Based on per-vine water use)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Beginning of month reclaimed water in storage [gallons] (This number brought forward from end of previous month)	0	0	0	0	0	0	0	0	0	0	0	0
Vineyard irrigation as % of peak month irrigation demand:	6%	6%	10%	100%	100%	100%	100%	100%	100%	100%	10%	10%
Irrigation per month per vine (gallons):	2	2	3	26	26	26	26	26	26	26	3	3
Total vineyard irrigation demand [gallons]:	10,557	10,557	17,595	175,951	175,951	175,951	175,951	175,951	175,951	175,951	17,595	17,595
Will vineyard be irrigated with reclaimed water this month?	y	y	y	y	y	y	y	y	y	y	y	y
Process wastewater generated this month, reclaimed for vineyard irrigation [gallons]	3,400	5,100	5,100	4,250	5,100	5,950	7,650	8,500	11,900	11,900	9,350	6,800
Remaining vineyard irrigation demand after using this month's process water [gallons]	7,157	5,457	12,495	171,701	170,851	170,001	168,301	167,451	164,051	164,051	8,245	10,795
Drawdown from storage for remaining vineyard irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Well water required to satisfy remaining vineyard irrigation demand	7,157	5,457	12,495	171,701	170,851	170,001	168,301	167,451	164,051	164,051	8,245	10,795
Net storage after vineyard irrigation drawdown [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
This month's process wastewater, remaining after vineyard irrigation, available for landscape irrigation[gallons]	0	0	0	0	0	0	0	0	0	0	0	0

Water balance continues on next page for cover crop irrigation.

Monthly Landscape Irrigation Water Use

(Based on evapotranspiration crop demand and irrigated area)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
This month's process wastewater, remaining after vineyard irrigation, available for landscape irrigation[gallons] *(From sheet 1)*	0	0	0	0	0	0	0	0	0	0	0	0
Reference ET (ETo) (in/month) (see note 1)	1.03	1.53	2.93	4.71	5.82	6.85	7.21	6.44	4.87	3.53	1.64	1.17
Crop Coefficient (k_c) (see note 2)	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Crop water demand per acre [inches]	0.82	1.22	2.34	3.77	4.66	5.48	5.77	5.15	3.90	2.82	1.31	0.94
Crop water demand per acre [gallons]	22,374	33,235	63,645	102,310	126,422	148,795	156,615	139,889	105,786	76,678	35,624	25,415
Total crop water demand for irrigated area [gallons]	44,747	66,469	127,290	204,620	252,843	297,590	313,230	279,778	211,572	153,357	71,248	50,829
Will landscape be irrigated with reclaimed water this month?	N	Y	Y	N	N	N	N	N	N	Y	Y	N
Process wastewater remaining after vineyard irrigation, reclaimed for landscape irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Landscape irrigation water required from storage or other source [gallons]	0	66,469	127,290	0	0	0	0	0	0	153,357	71,248	0
Drawdown from storage for landscape irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Process wastewater generated this month, unused for irrigation, to be reclaimed and stored [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Net end-of-month reclaimed water storage after all irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	0

End of Water Balance

Peak Monthly Storage = **0 gallons**

Notes:

1. Reference ETo from California Irrigation Management Information System
2. Crop Coefficient from Table 1 of "Estimating Irrigation Water Needs of Landscape Plantings in California", University of California Cooperative Extension, August 2000.

Reclaimed Process Wastewater
Water Balance for Irrigation and Storage
Option #3

Project Description		Annual Process Waste Flow Volume		
Project Number:	4114025.0	Wine Production:	102,000	gal/year
Project Name:	Kenzo - Possible Expansion			
Prepared By:	Maggie Schneider	Annual Process Waste per Gallon Wine:	5	gal/year
Date:	February 23, 2015	Total Annual Process Waste Generated:	510,000	gal/year

Vineyard Irrigation Parameters		Landscape Irrigation Parameters		
Acres of irrigated vineyard:	8.70 acres	Crop type / name:		
Row spacing:	7.0 feet	Total irrigated acres of crop:	2.00 acres	
Vine spacing:	8.0 feet			
Total number of vines:	6,767 vines			
Water use per vine per month (peak):	26 gal			
Total peak monthly irrigation demand:	175,951 gal			

Monthly Process Wastewater Generation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly process wastewater generated as % of annual total:	4%	6%	6%	5%	6%	7%	9%	10%	14%	14%	11%	8%
Monthly process wastewater generated [gallons]:	20,400	30,600	30,600	25,500	30,600	35,700	45,900	51,000	71,400	71,400	56,100	40,800

Monthly Vineyard Irrigation Water Use

(Based on per-vine water use)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Beginning of month reclaimed water in storage [gallons] (This number brought forward from end of previous month)	23,205	33,048	0	0	0	0	0	0	0	0	0	0
Vineyard irrigation as % of peak month irrigation demand:	6%	6%	10%	100%	100%	100%	100%	100%	100%	100%	10%	10%
Irrigation per month per vine (gallons):	2	2	3	26	26	26	26	26	26	26	3	3
Total vineyard irrigation demand [gallons]:	10,557	10,557	17,595	175,951	175,951	175,951	175,951	175,951	175,951	175,951	17,595	17,595
Will vineyard be irrigated with reclaimed water this month?	y	y	y	y	y	y	y	y	y	y	y	y
Process wastewater generated this month, reclaimed for vineyard irrigation [gallons]	10,557	10,557	17,595	25,500	30,600	35,700	45,900	51,000	71,400	71,400	17,595	17,595
Remaining vineyard irrigation demand after using this month's process water [gallons]	0	0	0	150,451	145,351	140,251	130,051	124,951	104,551	104,551	0	0
Drawdown from storage for remaining vineyard irrigation [gallons]	0	0	0	0	0	0	0	0	0	0	0	0
Well water required to satisfy remaining vineyard irrigation demand	0	0	0	150,451	145,351	140,251	130,051	124,951	104,551	104,551	0	0
Net storage after vineyard irrigation drawdown [gallons]	23,205	33,048	0	0	0	0	0	0	0	0	0	0
This month's process wastewater, remaining after vineyard irrigation, available for landscape irrigation[gallons]	9,843	20,043	13,005	0	0	0	0	0	0	0	38,505	23,205

Water balance continues on next page for cover crop irrigation.

Monthly Landscape Irrigation Water Use

(Based on evapotranspiration crop demand and irrigated area)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
This month's process wastewater, remaining after vineyard irrigation, available for landscape irrigation[gallons] *(From sheet 1)*	9,843	20,043	13,005	0	0	0	0	0	0	0	38,505	23,205
Reference ET (ETo) (in/month) (see note 1)	1.03	1.53	2.93	4.71	5.82	6.85	7.21	6.44	4.87	3.53	1.64	1.17
Crop Coefficient (k_c) (see note 2)	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Crop water demand per acre [inches]	0.82	1.22	2.34	3.77	4.66	5.48	5.77	5.15	3.90	2.82	1.31	0.94
Crop water demand per acre [gallons]	22,374	33,235	63,645	102,310	126,422	148,795	156,615	139,889	105,786	76,678	35,624	25,415
Total crop water demand for irrigated area [gallons]	44,747	66,469	127,290	204,620	252,843	297,590	313,230	279,778	211,572	153,357	71,248	50,829
Will landscape be irrigated with reclaimed water this month?	N	Y	Y	N	N	N	N	N	N	Y	Y	N
Process wastewater remaining after vineyard irrigation, reclaimed for landscape irrigation [gallons]	0	20,043	13,005	0	0	0	0	0	0	0	38,505	0
Landscape irrigation water required from storage or other source [gallons]	0	46,426	114,286	0	0	0	0	0	0	153,357	32,743	0
Drawdown from storage for landscape irrigation [gallons]	0	33,048	0	0	0	0	0	0	0	0	0	0
Process wastewater generated this month, unused for irrigation, to be reclaimed and stored [gallons]	9,843	0	0	0	0	0	0	0	0	0	0	23,205
Net end-of-month reclaimed water storage after all irrigation [gallons]	33,048	0	0	0	0	0	0	0	0	0	0	23,205

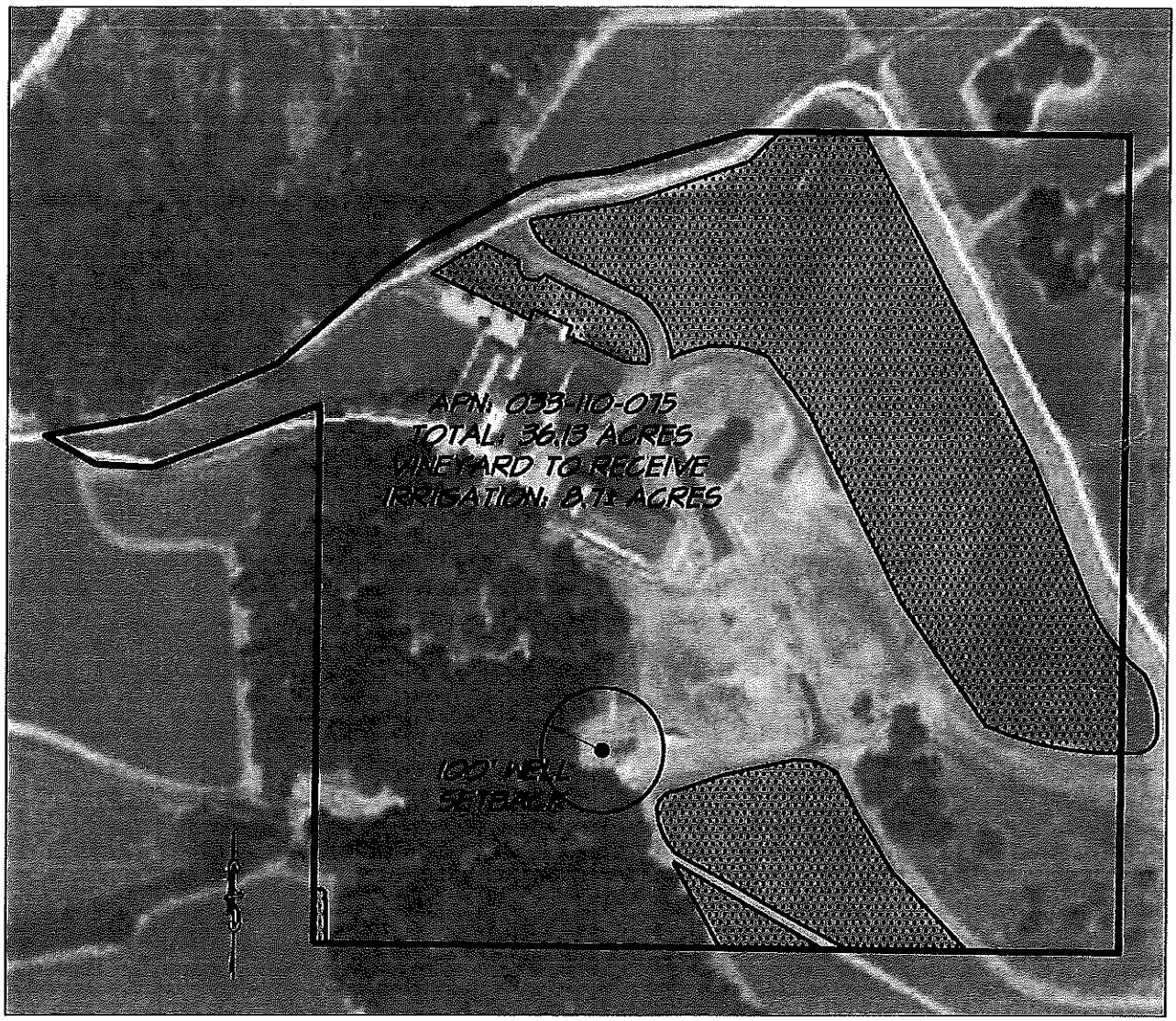
End of Water Balance

Peak Monthly Storage = 33,048 gallons

Notes:

1. Reference ETo from California Irrigation Management Information System
2. Crop Coefficient from Table 1 of "Estimating Irrigation Water Needs of Landscape Plantings in California", University of California Cooperative Extension, August 2000.

KENZO ESTATES
PW VINEYARD IRRIGATION



GRAPHIC SCALE

250 0 250 500

(IN FEET)
1 inch = 250 FT

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