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Wastewater Feasibility Study

Scarlett Winery P16-0428-UP
Planning Commission Hearing - October 2, 2019

BARTELT ENGINEERING

ONSITE WASTEWATER DISPERSAL FEASIBILITY STUDY FOR SCARLETT WINERY 1052 PONTI ROAD, NAPA COUNTY, CA APN 030-280-010

As required by Napa County Planning, Building and Environmental Services (PBES), this study outlines the feasibility of providing onsite wastewater dispersal for a potential winery and hospitality/administration building on the above referenced parcel located at 1052 Ponti Road, Napa, CA 94558.

PROJECT DESCRIPTION

The 47.88± acre parcel is currently developed with a residence, guest house, irrigation/frost protection pond, miscellaneous structures associated with vineyard operations and 38.0± acres of vineyard. The residence and guest house each have existing conventional gravity type wastewater dispersal systems that will not be modified as part of this feasibility study.

It is our understanding that the project proposes to construct a hospitality/administration building and a full crush winery on the above referenced parcel with the intent of the facility having the capability of producing 30,000 gallons of wine per year. Along with the proposed wine production at the site, the project proposes a moderate staffing and marketing plan. The project proposes six (6) full-time employees, three (3) part-time employees and two (2) seasonal (harvest) employees. The project also proposes to offer private tour and tasting appointments for a maximum number of 15 guests per day and 64 guests per week. Furthermore, the Applicant plans to offer one (1) food and wine pairing lunch event per month for parties up to 10 persons and one (1) food and wine pairing dinner event per month for parties up to 10 persons. Additionally, the Applicant intends to host one (1) wine club release event per year for groups of up to 100 persons, with up to five (5) additional event staff, and one (1) wine club release event per year for groups of up to 200 persons, with up to ten (10) additional event staff. One (1) 125 person large event with five (5) additional event staff per year is also being proposed at the winery.

Table 1 summarizes the proposed staffing plan:

TABLE 1: STAFFING PLAN SUMMARY

Description	Number of Employees	Frequency
Full-time Employees	6 per day	Daily
Part-time Employees	3 per day	Daily
Harvest/Seasonal Employees	2 per day	Daily

Table 2 summarizes the proposed marketing plan:

TABLE 2: MARKETING PLAN SUMMARY			
Description	**Frequency**	**Number of Guests**	**Number of Event Staff**
Private Tours & Tastings with Food	3 per day	5 per appointment	0 per day
Food & Wine Pairings (Lunch)	1 per month	10 per event	0 per day
Food & Wine Pairings (Dinner)	1 per month	10 per event	0 per day
Wine Club / Release Events	1 per year	100 per event	5 per day
	1 per year	200 per event	10 per day
Large Event	1 per year	125 per event	5 per day

As part of our services, representatives from Bartelt Engineering have reviewed the planned operational methods for the winery with our Client, reviewed the parcel files at Napa County Environmental Health, held conversations with Napa County PBES staff, performed a reconnaissance of the site to view existing conditions and conducted a site evaluation on November 23, 2015 to evaluate the feasibility of installing a new onsite wastewater dispersal system to serve the proposed winery and hospitality/administration building.

This study and the associated Use Permit Drawings will demonstrate that the proposed winery and hospitality/administration building improvements and staffing and marketing plan can feasibly be developed and that all wastewater can be treated and dispersed onsite.

WASTEWATER ANALYSIS

All plumbing fixtures in the winery and hospitality/administration building will be water saving fixtures per the California Plumbing Code as adopted by the Napa County Building Division.

Winery Process Wastewater Flow

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

Harvest Peak Winery PW Flow=

$$\frac{30{,}000 \text{ gallons of wine}}{\text{year}} \times \frac{1.5 \text{ gallons of water}}{1 \text{ gallon of wine}} \times \frac{1 \text{ year}}{45 \text{ days of crush}} =$$

Harvest Peak Winery PW Flow = 1,000 gallons per day (gpd)

Non-Harvest Peak Winery PW Flow=

$$\left(\frac{30{,}000 \text{ gallons of wine}}{\text{year}}\right) \times \left(\frac{4.5 \text{ gallons water}}{1 \text{ gallon of wine}}\right) \times \left(\frac{1 \text{ year}}{320 \text{ days}}\right) =$$

Non-Harvest Peak Winery PW Flow = 422 gpd

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Winery Sanitary Wastewater Flow

The sanitary wastewater (SW) generated at the winery and hospitality/administration building including full-time employees, part-time employees, seasonal (harvest) employees and guests and can be itemized as follows:

Employees[1]:

- 6 Full-Time Employees x 15 gpd per employee = 90 gpd
- 3 Part-Time x 15 gpd per employee = 45 gpd
- 2 Harvest Season x 15 gpd per employee = 30 gpd

Guests[2,3]:

- Private Tours and Tasting with Food:
  - (15 guests per day) x (5 gpd per guest) = 75 gpd
- Food and Wine Pairings - Lunch:
  - (10 guests per event) x (13 gpd per guest) = 130 gpd per event
- Food and Wine Pairings - Dinner:
  - (10 guests per event) x (15 gpd per guest) = 150 gpd per event
- Wine Club Event:
  - (100 guests per event) x (15 gpd per guest)* = 1,500 gpd per event
  - (5 event staff per event) x (15 gpd per staff person) = 75 gpd per event
- Wine Club Release Event:
  - (200 guests per event) x (8 gpd per guest)* = 1,600 gpd per event
  - (10 event staff per event) x (15 gpd per staff person) = 150 gpd per event
- Large Event:
  - (125 guests per event) x (8 gpd per guest)* = 1,000 gpd per event
  - (5 event staff per event) x (15 gpd per staff person) = 75 gpd per event

***Note:** This feasibility study assumes that portable toilets are utilized during any event hosting greater than 75 guests.*

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

The total proposed harvest season peak SW flow is the combination of the winery and hospitality/administration building SW flows during the months of August through October (harvest). The total proposed non-harvest season peak SW flow is the combination of the

[1] Represents a maximum. The number of employees may vary with harvest and non-harvest seasons.
[2] Volume rate accounts for 3 gpd to 8 gpd from the commercial kitchen and 3 gpd from restroom use
[3] Represents a maximum as event may occur during harvest or non-harvest seasons

winery and hospitality/administration building SW flows during the months of November through July (non-harvest).

Table 3A uses the marketing schedule to calculate the SW flows generated by employees and guests during daily event sequences in harvest and non-harvest seasons.

Wastewater flows related to marketing events listed in the same column indicate the events may occur on the same day. For example, Private Tours and Tastings with Food can occur on the same day as Food and Wine Pairings - Lunch during both harvest and non-harvest seasons; however, no other events can occur on the same day when a Wine Club, Wine Club Release or Large event is scheduled regardless of the season.

Table 3A: Harvest and Non-Harvest Season Daily Sanitary Wastewater Flows

	Daily Occurrence (gpd)							
	Harvest				Non-Harvest			
Employees	165	165	165	165	135	135	135	135
Private Tours & Tastings w/ Food	75	75	75	-	75	75	-	-
Food & Wine Pairings - Lunch	-	130	130	-	-	130	-	-
Food & Wine Pairings - Dinner	-	-	150	-	-	150	-	-
Wine Club Event(s)	-	-	-	1,575	-	-	-	-
Wine Club Release Event(s)	-	-	-	-	-	-	1,750	-
Large Event(s)	-	-	-	-	-	-	-	1,075
Total	240	370	520	1,740	210	490	1,885	1,210

Design Wastewater Flows

The greatest practical harvest and non-harvest season peak PW and SW flows are summarized in the following table:

Table 3B: Harvest and Non-Harvest Season Peak Wastewater Summary

Wastewater Source	Harvest (gpd)	Non-Harvest (gpd)
Sanitary Wastewater	1,740	1,885
Process Wastewater	1,000	422
Combined Wastewater	2,740	2,307

The greatest total proposed wastewater flow is the combination of the greatest winery's PW flow and the hospitality/administration building's SW flow that occurs in the same season and on the same day. Therefore, the project's wastewater treatment system will be designed for a treatment capacity of 2,740 gpd which is based on the flows outlined in the above table.

WASTEWATER TREATMENT AND DISPERSAL METHODS

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

Proposed Preferred Option: Combined Wastewater Pressure Distribution System

Bartelt Engineering proposes to dispose of the winery's PW and SW utilizing a new alternative sewage treatment system (ASTS) and dispersing of the wastewater effluent via a Pretreated Effluent (PTE) Pressure Distribution (PD) system.

The proposed winery's wastewater conveyance, treatment and dispersal system would consist of several steps. The floor of the proposed winery, the covered work area, trash enclosure, and pomace storage area would be sloped so that all PW is collected in trench drains and floor drains. The drains would be fitted with baskets to collect a majority of the larger debris. Collected PW in the trench drains and floor drains would gravity flow into a septic tank (or series of septic tanks) equipped with an effluent filter for solids removal.

The winery and hospitality/administration building SW will gravity flow to a sanitary wastewater septic tank fitted with filters for solids removal. From the individual septic tanks, the SW and PW effluent will utilize gravity flow to combine in a single recirculation/dose tank where the effluent will undergo pretreatment before being dispersed into the primary field through a PD system. The hospitality/administration building's commercial kitchen wastewater will gravity flow to a separate grease interceptor before combining with sanitary wastewater in the recirculation/dose tank.

Combined Pressure Distribution System Primary Area

Based on the site evaluation performed by Bartelt Engineering on November 23, 2015, test pits #6 and #8 showed similar results and are acceptable for a PD system with pretreatment. Pretreatment allows the engineer to choose between increasing the soil hydraulic loading rate or decreasing the minimum depth from the trench bottom to the limiting layer from 36 inches to 24 inches. This design chooses to use the decreased depth to the limiting layer. The site evaluation determined that the soil in the area has an acceptable soil depth of 59 inches of Clay Loam (CL) soils. For CL soil, Napa County recommends a soil hydraulic loading rate[4] of 0.60 gal/sf/day and 24 inches of useable soil below the trench bottom for an ASTS with pretreatment. The trench design for the proposed PD system is as follows (from trench top to bottom):

- 12 inches of native soil backfill
- Two (2) inches of drain rock above the distribution lateral
- 18 inches of drain rock from trench bottom to the top of the distribution lateral

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

The total recommended trench depth is 32 inches and the effective infiltrative surface area is 3 lineal feet (lf) per square foot (ft^2). The required total trench length for the PD system is calculated below:

$$\text{Required Trench Length} = \frac{\text{design flow rate}}{(\text{soil application rate}) \times (\text{effective surface area})}$$

Therefore,

$$\left(\frac{2{,}740 \frac{\text{gal}}{\text{day}}}{0.6 \frac{\text{gal}}{\text{day}/\text{ft}^2} \times 3.0 \frac{\text{ft}^2}{\text{lf}}} \right) = 1{,}523 \text{ lf}$$

To make the best use of the available dispersal field area we recommend the system consist of six (6) subfields, each subfield containing three (3) laterals with each lateral 100 feet long, for a total of 300 lf of trench per subfield and a system total of 1,800 lf of leach line.

Based on the existing ground slope of less than 5%, the minimum trench spacing is five (5) feet between trenches or 6.5 feet between laterals; therefore, the minimum required primary dispersal field area is approximately 11,850 square feet. However, the primary dispersal field is proposed to be installed between existing vinerows spaced at an average of 9.4 feet between rows; therefore, the proposed primary dispersal field area is calculated below:

$$(100 \text{ lf}) \left[\left(\frac{9.4 \text{ ft}}{\text{lateral spacing}}\right) \times (18 \text{ lateral spaces}) + 1.5 \text{ ft}\right] = 17{,}070 \text{ square feet.}$$

<u>100% Replacement Area</u>

Based on the site evaluation performed by Bartelt Engineering on November 23, 2015, test pits #5 and #7 showed similar results and are acceptable for a 100% replacement area for a PD system with pretreatment. Pretreatment allows the engineer to choose between increasing the soil hydraulic loading rate or decreasing the minimum depth from trench bottom to limiting layer from 36 inches to 24 inches. This design chooses to use the decreased depth to the limiting layer. The site evaluation determined that the soil in the area has an acceptable soil depth of 48 inches of Clay Loam (CL) soils. For CL soil, Napa County recommends a soil hydraulic loading rate of 0.60 gal/sf/day and 24 inches of useable soil below the trench bottom for an Alternative Sewage Treatment System (ASTS) with pretreatment. The trench design for the proposed PD system is as follows (from trench top to bottom):

- Eight (8) inches of acceptable soil cover
- Four (4) inches of native soil backfill
- Two (2) inches of drain rock above the distribution lateral
- 18 inches of drain rock from trench bottom to the top of the distribution lateral

The total recommended trench depth is 32 inches and the effective infiltrative surface area is 3 lineal feet (lf) per square foot (ft^2). The required total trench length for the PD system is calculated below:

Replacement Trench Length $= \dfrac{\text{design flow rate}}{(\text{soil application rate}) \times (\text{effective surface area})} =$

$$\frac{2{,}740\,\frac{\text{gal}}{\text{day}}}{0.6\,\frac{\text{gal}}{\text{day/ft}^2} \times 3.00\,\frac{\text{ft}^2}{\text{lf}}} = 1{,}523 \text{ lf}$$

To make the best use of the available dispersal field area we recommend the system consist of six (6) subfields, each subfield containing three (3) laterals with each lateral 100 feet long, for a total of 300 lf of trench per subfield and a system total of 1,800 lf of leach line.

Based on the existing ground slope of less than 5%, the minimum trench spacing is five (5) feet between trenches or 6.5 feet between laterals; therefore, the minimum required primary dispersal field area is approximately 11,850 square feet. However, the primary dispersal field is proposed to be installed between existing vinerows spaced at an average of 9.4 feet between rows; therefore, the proposed primary dispersal field area is calculated below:

$$(100 \text{ lf}) \left[\left(\frac{9.4 \text{ ft}}{\text{lateral spacing}}\right) \text{x } (18 \text{ lateral spaces}) + 1.5 \text{ ft}\right] = 17{,}070 \text{ square feet.}$$

Proposed Alternative Option: Separate Process and Sanitary Wastewater Systems

Under the proposed alternative option, process wastewater would be treated by transporting process wastewater effluent to the irrigation/frost protection pond while pretreated sanitary wastewater effluent would be dispersed through a pressure distribution dispersal system. The system is designed for the peak wastewater flow which occurs during the non-harvest season. The wastewater pond is sized to treat the peak process wastewater flow generated during harvest.

Sanitary Wastewater Effluent Pressure Distribution Dispersal Field and Replacement Area

The sanitary wastewater primary and replacement dispersal fields under the proposed alternative option utilizes the same areas and conditions outlined under the preferred option, including pretreatment. Using the conditions detailed in preferred option the field sizes for the primary and replacement fields are as follows:

Primary and Replacement Field Trench Lengths =

$$\frac{\text{design flow rate}}{(\text{effective surface area}) \ (\text{soil application rate})} =$$

$$\frac{1{,}885\,\frac{\text{gal}}{\text{day}}}{0.6\,\frac{\text{gal}}{\text{day/ft}^2} \times 3.00\,\frac{\text{ft}^2}{\text{lf}}} = 1{,}048 \text{ lf}$$

To make the best use of the available dispersal field area we recommend the system consist of three (3) subfields, each subfield containing four (4) laterals with each lateral 100 feet long, for a total of 400 lf of trench per subfield and a system total of 1,200 lf of leach line.

Based on the existing ground slope of less than 5%, the minimum trench spacing is five (5) feet between trenches or 6.5 feet between laterals. Therefore, the minimum required primary and replacement dispersal field areas are approximately 7,950 square feet. However, the proposed layout of the primary dispersal field is to be orientated between existing vinerows spaced at an average of 9.4 feet between rows; therefore, the proposed primary and replacement dispersal field areas are calculated below:

$$(100 \text{ lf}) \left[\left(\frac{9.4 \text{ ft}}{\text{lateral spacing}}\right) x \, (12 \text{ lateral spaces}) + 1.5 \text{ ft}\right] = 11{,}430 \text{ square feet.}$$

Process Wastewater Evaporation

The proposed alternative option would treat process wastewater at the irrigation/frost protection pond using an aerator; however, the pond could utilize evaporation as an effective wastewater treatment alternative without any additional treatment. An analysis of monthly process wastewater flows, precipitation and average evaporation concluded that pumping process wastewater to the existing irrigation/frost protection pond for treatment is feasible since the average evaporation volume is greater than the combined process wastewater and rainfall volume amounts. See the supporting tables provided herein for details of the analysis.

WASTEWATER TREATMENT TANK SIZING

Septic Tanks

Under the proposed preferred option, the sanitary wastewater tank(s) will require a minimum hydraulic retention volume capacity of 5,000 gallons combined, which is sized to provide approximately two (2) days of retention time during both peak non-harvest season and peak harvest season. The process wastewater tank will require a minimum hydraulic retention volume capacity of 3,000 gallons combined, which is sized to provide approximately three (3) days retention during peak process wastewater flow. Each septic tank will have filters installed at each of the outlets to aid in the screening of suspended solids and the reduction of BOD in the wastewater effluent stream.

Under the proposed alternative option, the sanitary wastewater septic tank(s) should have a minimum hydraulic retention volume capacity of 5,000 gallons combined, which is sized to provide approximately (2) days of retention time during both peak non-harvest season and peak harvest season. The proposed process wastewater septic tank(s) will have a minimum volume of 3,000 gallons combined, which is sized to provide three (3) days of hydraulic retention time during peak PW flows. Each septic tank will have filters installed at each of the outlets to aid in the screening of suspended solids and the reduction of BOD in the wastewater effluent stream.

Grease Interceptor

During Large Events, the kitchen is assumed to prepare one (1) meal per guest per event with multi-service utensils. During this event, hours of operation for the kitchen are also assumed to be less than eight (8) hours per day. The grease interceptor tank would be sized per the following formula[5]:

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

Grease Interceptor (KW flows only) = (200 guests x 1 meal/hour) x (5 gpd per meal) x (2.5) x (1)
= 2,500 gallons; 2,500 gallons recommended

Recirculation/Dose Tanks

The proposed preferred option will require that the recirculation/dose tank have a volume capacity of 3,000 gallons to provide for greater than one (1) day of combined septic and process wastewater peak flow capacity. The recirculation/dose tank will utilize a duplex pump system rather than being sized for an extra day of peak wastewater storage.

The proposed alternative option will require that the sump tank for the process wastewater pond have a volume capacity of 1,500 gallons which is sized to provide one and a half days (1.5) of storage capacity. The sump tank will utilize a duplex pump system rather than being sized for an extra day of peak process wastewater storage above the operating range.

OPERATION AND MAINTENANCE

Per Napa County requirements, all Alternative Sewage Treatment Systems (ASTS), which include winery wastewater treatment systems with pretreatment, are required to have a Service Provider. The Service Provider can be a Registered Civil Engineer, Registered Environmental Health Specialist or Licensed Contractor. The pretreatment system manufacturer can also provide operation and maintenance services for their own system. The Service Provider would be assigned prior to operation and final approval of the installed wastewater system(s).

CONCLUSIONS

The parcel will be able to support the proposed 30,000 gallon winery and hospitality/administration building by using a pressure distribution wastewater dispersal system to dispose of sanitary wastewater and process wastewater, or by using a pressure distribution system to dispose of sanitary wastewater only and converting the existing irrigation/frost protection pond into a wastewater evaporation pond to treat process wastewater.

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

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

ATTACHMENTS

Proposed Wastewater Treatment Diagram (Preferred and Alternative)

Table 1 – Process Wastewater Flow

Table II – Rainfall Rates

Table III – Pond Balance

Test Pit Exhibit

Site Evaluation Report, Soil Texture Analysis Chart and Laboratory Test Results

USDA NRCS Custom Soil Resource Report

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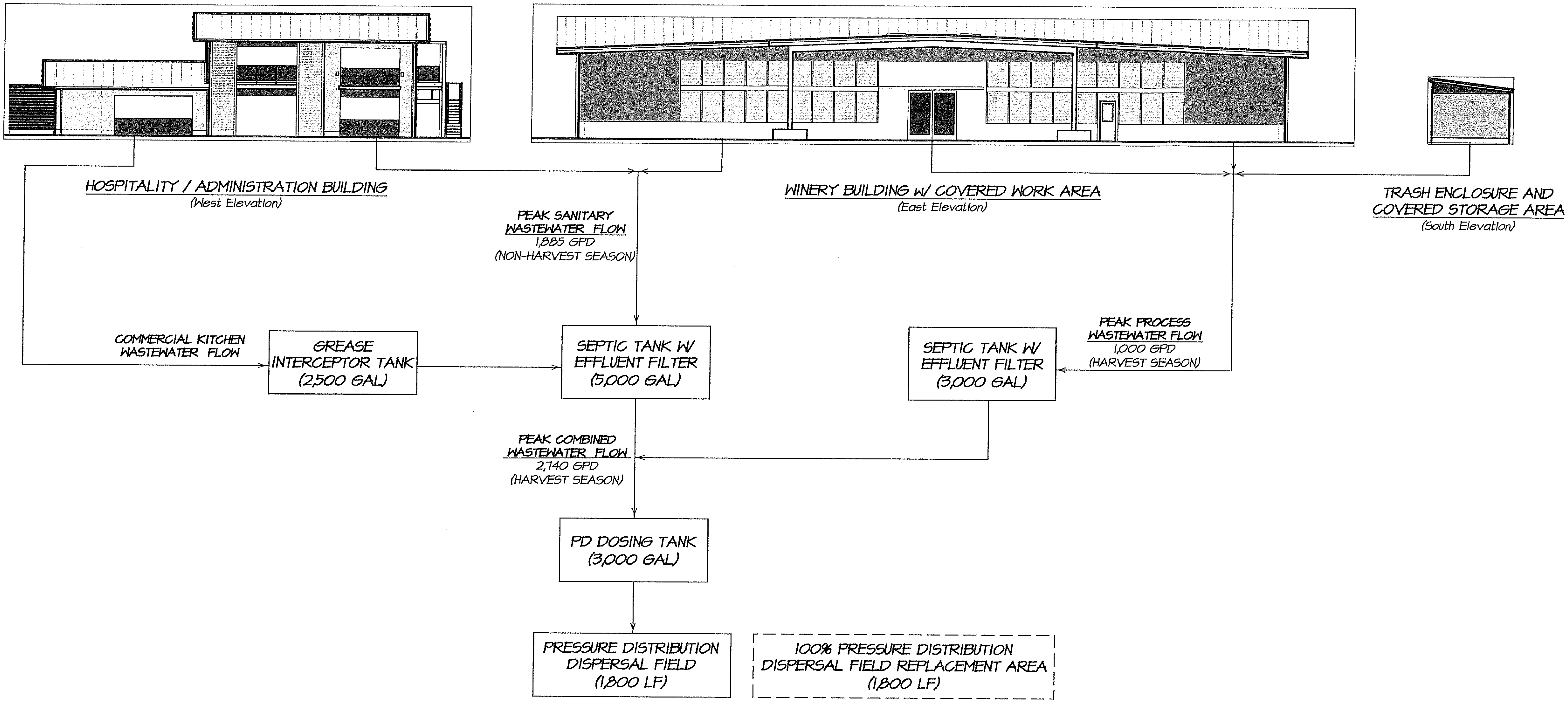
REFERENCES

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

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

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

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



Note: Elevations provided by Osborn Slegert Architecture.

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PROPOSED PREFERRED OPTION WASTEWATER TREATMENT DIAGRAM

NOT TO SCALE

Scarlett Winery
1052 Ponti Road
Napa County, CA
APN 030-280-010
Job No. 15-02
February 2017
Sheet 1 of 2

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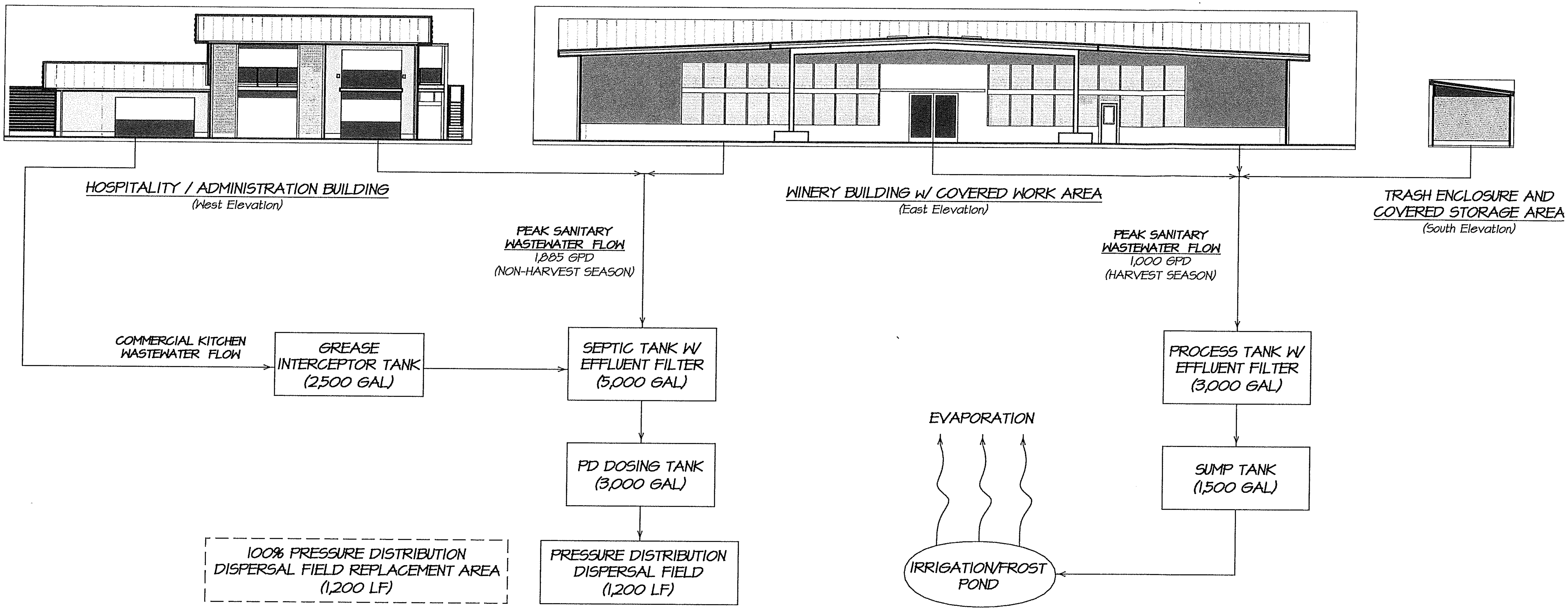

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PROPOSED ALTERNATIVE OPTION WASTEWATER TREATMENT DIAGRAM

NOT TO SCALE

Scarlett Winery
1052 Ponti Road
Napa County, CA
APN 030-280-010
Job No. 15-02
February 2017
Sheet 2 of 2

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Scarlett Winery
Process Wastewater Flow
Table I

Total annual wine production (gallons):	**30,000**
Harvest water usage per gallon of wine (gallons):	1.5
Length of Harvest (days):	45.0
Harvest process wastewater flow (gallons per day):	**1,000**
Non-harvest water usage per gallon of wine (gallons):	4.5
Length of Non-Harvest (days):	320
Non-harvest process wastewater flow (gallons per day):	**422**

MONTHLY WASTEWATER FLOW (gallons/month)

Process Wastewater Flow		
Month	**Wastewater Flow**	**Days in Month**
September	12,656	30
October (start of crush)	31,000	31
November	20,750	30
December	13,078	31
January	13,078	31
February	11,813	28
March	13,078	31
April	12,656	30
May	13,078	31
June	12,656	30
July	13,078	31
August	13,078	31
TOTALS	180,000	365

Notes:

> Wastewater monthly proportioning is based on industry average
>The annual water usage per gallon of wine is assumed to be 6 gallons.

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Scarlett Winery
Rainfall Rates
Table II

MONTHLY RAINFALL (inches/month)

Rainfall Depth (Inches)			
Month	Site Rainfall	10-year Rainfall	Average Evaporation
September	0.40	0.56	6.94
October	2.10	2.94	4.58
November	3.50	4.90	1.98
December	5.60	7.84	1.33
January	7.70	10.78	1.22
February	6.70	9.38	1.72
March	3.70	5.18	3.03
April	1.90	2.66	4.66
May	0.50	0.70	7.12
June	0.10	0.14	8.80
July	0.10	0.14	10.58
August	0.10	0.14	9.65
TOTALS	32.40	45.36	61.61

Notes:

> Site rainfall = Napa, CA (Oakville 1W Weather Station 1948 - 1981).
See www.worldclimate.com

> 10 year rainfall = Site rainfall x 1.4

> Pan evaporation data obtained from the California Climate Data Archive for Lake Berryessa (#705) x 0.80. Website: http://www.wrcc.dri.edu/

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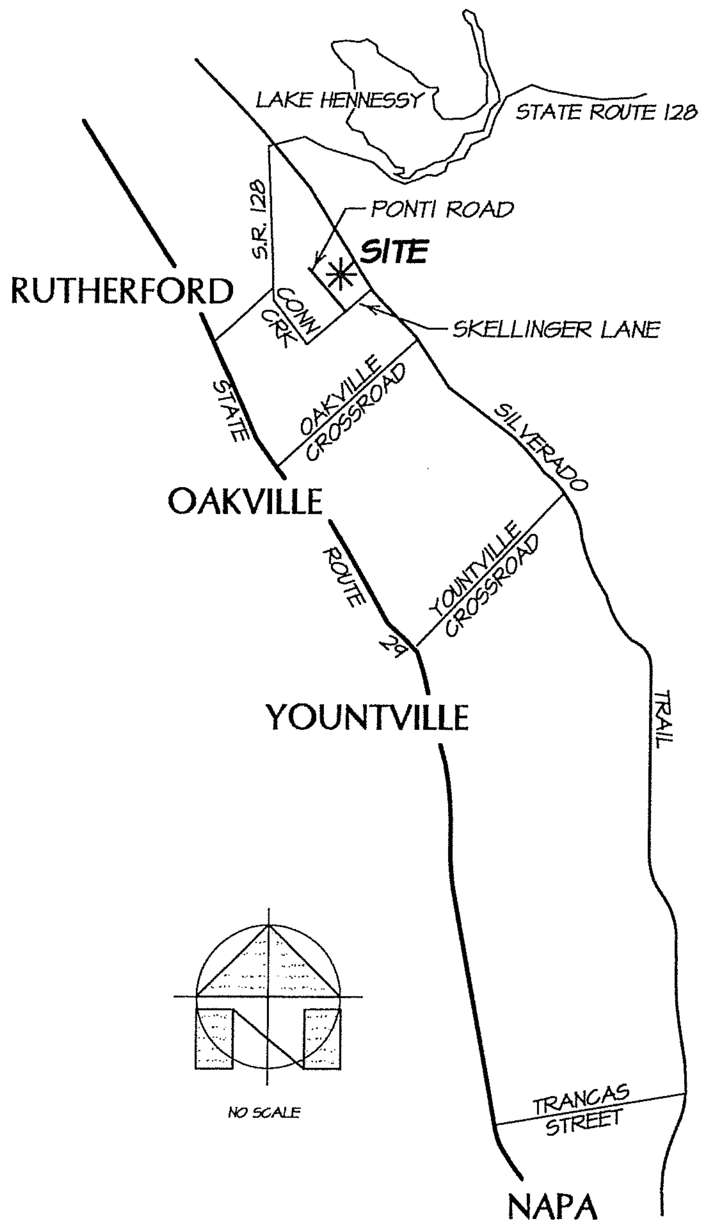
Scarlett Winery
Pond Balance
Table III

Pond Balance (gallons)					
Month	Pond Volume	Wastewater Flow	10 year Rainfall	Average Evaporation [1]	10-yr Ending Balance
September [2,3]	673,245	12,656	15,709	194,680	506,930
October	506,930	31,000	82,473	128,478	491,925
November	491,925	20,750	137,454	55,543	594,587
December	594,587	13,078	219,927	37,309	790,283
January	790,283	13,078	302,399	34,223	1,071,537
February	1,071,537	11,813	263,127	48,249	1,298,226
March	1,298,226	13,078	145,309	84,997	1,371,616
April	1,371,616	12,656	74,618	130,722	1,328,169
May	1,328,169	13,078	19,636	199,729	1,161,154
June	1,161,154	12,656	3,927	246,857	930,881
July	930,881	13,078	3,927	296,789	651,097
August	651,097	13,078	3,927	270,701	397,402
	TOTALS	**180,000**	**1,272,433**	**1,728,276**	

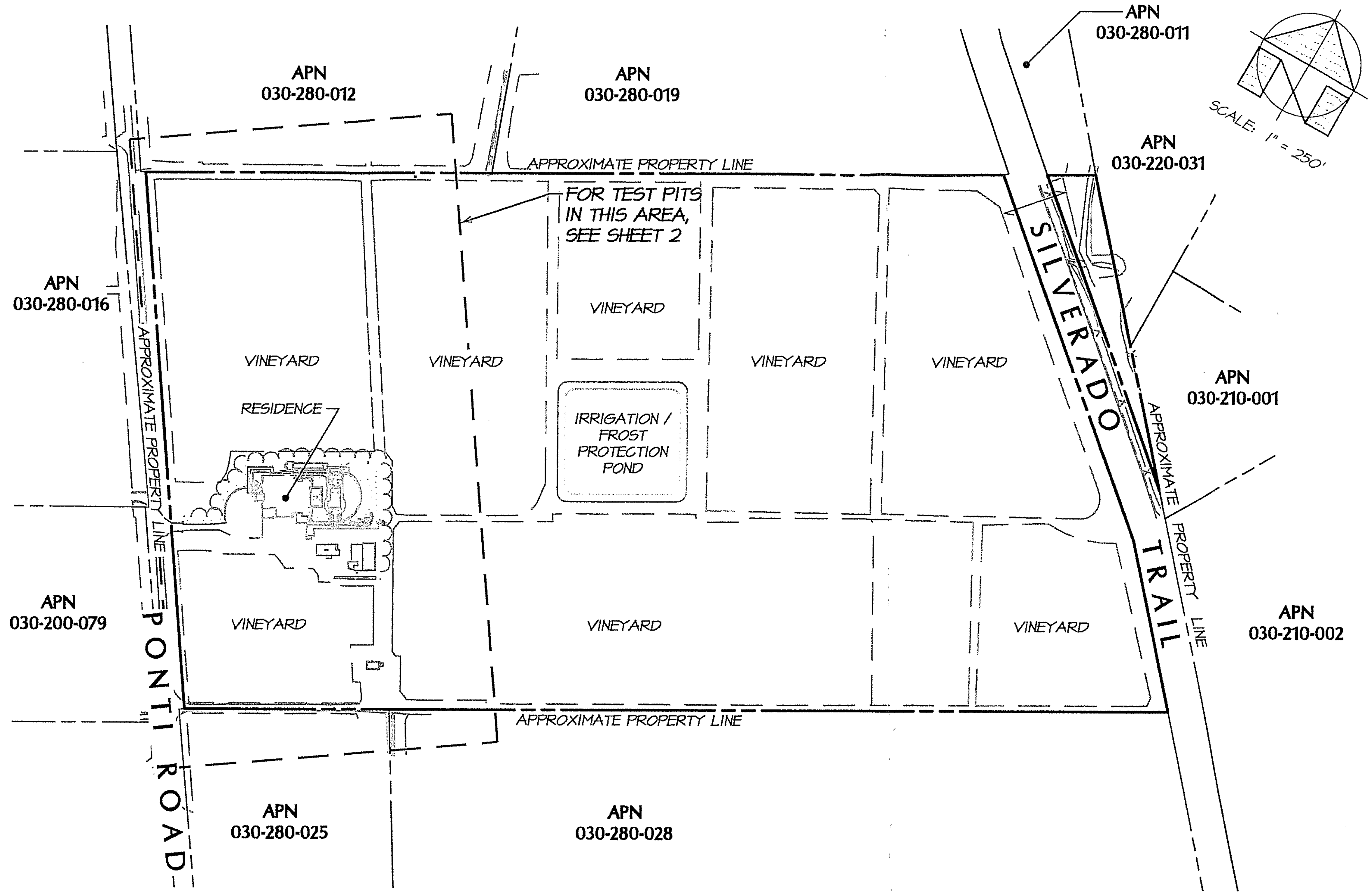
Note:

1) Evaporation volume was determined using an estimated water surface area of 45,000 square feet (derived from aerial imagery).
2) The initial water depth (September) was assumed to be 2-feet with a volume of 673,245
3) Actual September balance will vary based on seasonal rainfall and evaporation rates.



LOCATION MAP

NO SCALE



NOTES:

1. PROPERTY LINES WERE TAKEN FROM THE NAPA COUNTY GEOGRAPHIC INFORMATION SYSTEM MAPS.

OVERALL SITE PLAN TEST PIT EXHIBIT

SCALE: 1" = 250'

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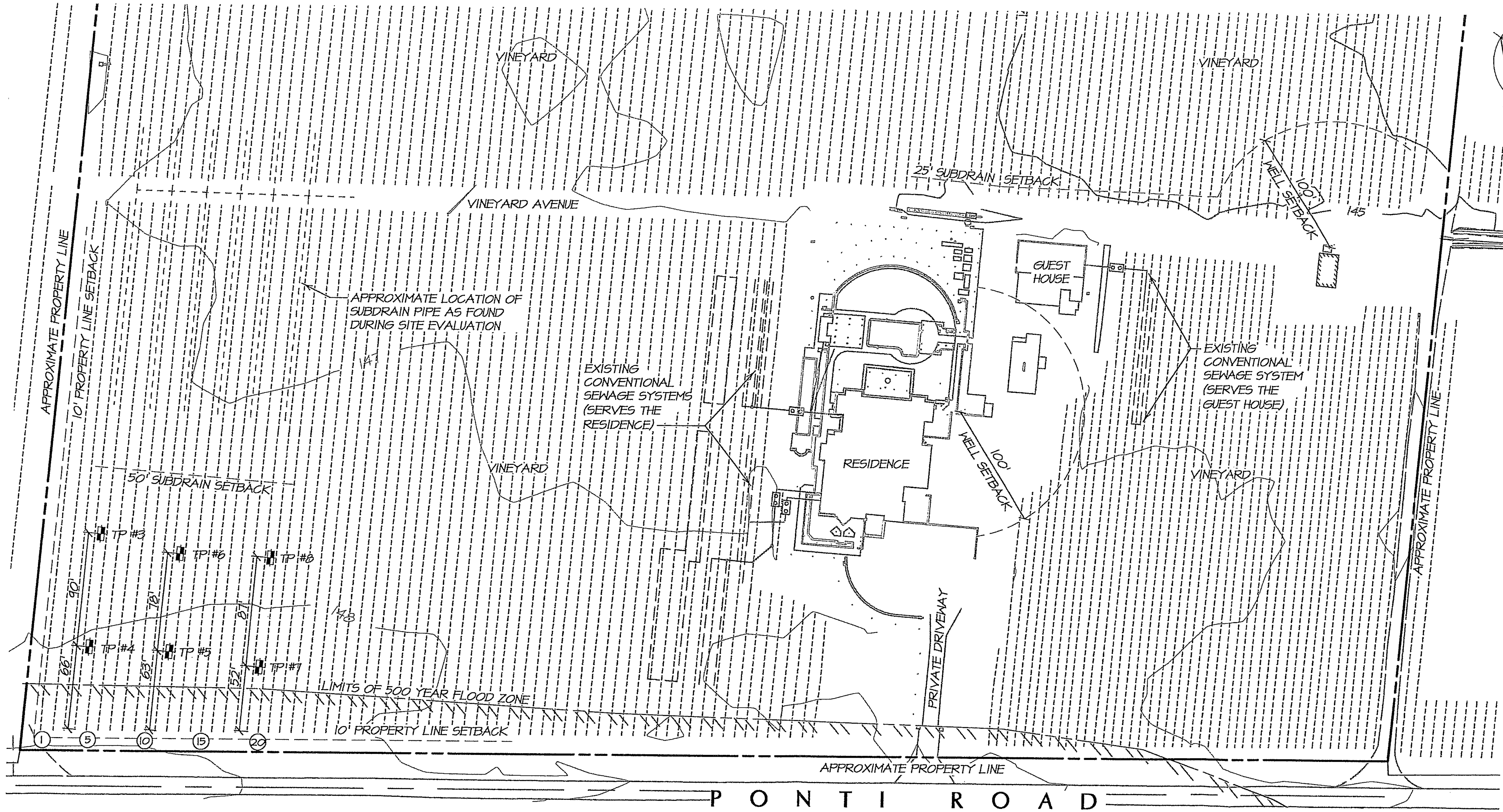

TEST PIT LOCATION MAP

SCALE: 1" = 80'

TEST PIT EXPLORATION NOTES:

1. REPRESENTS TEST PIT LOCATION.
2. (1) REPRESENTS VINE ROW LOCATION FROM THE END OF THE VINEYARD BLOCK.
3. TEST PITS WERE EXCAVATED BY HAROLD SMITH & SONS USING A MINI-EXCAVATOR WITH A 24" BUCKET ON NOVEMBER 24, 2015 AND WITNESSED BY A REPRESENTATIVE FROM BARTELT ENGINEERING AND NAPA COUNTY ENVIRONMENTAL HEALTH.
4. EXISTING CONVENTIONAL SEWAGE SYSTEMS SHOWN HEREON ARE BASED ON RECORD DRAWINGS AND WERE NOT FIELD VERIFIED.

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Napa County, CA
APN 030-280-010
Job No. 15-02
September 2016
Sheet 2 of 2

3/21/17 - 4:39 PM, kellyp, S:\LAND PROJECTS\2013-2017\1502\2015 USE PERMIT\CA... XHIBITS_SUPERSEDED\2016_09\1502_TP.DWG

Napa County Department of
Environmental Management

REVISED
SITE EVALUATION REPORT

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

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

PLEASE PRINT OR TYPE ALL INFORMATION

Property Owner Alsace Co, LP	☒ New Construction ☐ Addition ☐ Remodel ☐ Relocation ☐ Other:
Property Owner Mailing Address 3200 Danville Blvd, Suite 220 Alamo, CA 94507	☐ Residential - # of Bedrooms: Design Flow: gpd
City: Napa State: CA Zip: 94558	☒ Commercial – Type: Winery Sanitary Waste: 2,000 gpd Process Waste: 1,000 gpd
Site Address/Location 1052 Ponti Road, Napa County, CA	☐ Other: Sanitary Waste: gpd Process Waste: gpd

Evaluation Conducted By:

Company Name Bartelt Engineering	Evaluator's Name Paul N. Bartelt, P.E.	Signature (Civil Engineer, R.E.H.S., Geologist, Soil Scientist)
Mailing Address: 1303 Jefferson Street, 200 B		Telephone Number (707) 258-1301
City: Napa State: CA Zip: 94559		Date Evaluation Conducted November 23, 2015

Primary Area See below	Expansion Area See below
Acceptable Soil Depth: 59 inches Test pits #: 6 & 8	Acceptable Soil Depth: 48 inches Test pits #: 5 & 7
Soil Application Rate (gal. /sq. ft. /day): 0.60	Soil Application Rate (gal. /sq. ft. /day): 0.60
System Type(s) Recommended: Pressure Distribution	System Type(s) Recommended: Pressure Distribution
Slope: <1 %. Distance to nearest water source: 100+ feet	Slope: <! %. Distance to nearest water source: 100+ feet
Hydrometer test performed? No ☐ Yes ☒ (attach results)	Hydrometer test performed? No ☐ Yes ☒ (attach results)
Bulk Density test performed? No ☒ Yes ☐ (attach results)	Bulk Density test performed? No ☒ Yes ☐ (attach results)
Groundwater Monitoring Performed? No ☒ Yes ☐ (attach results)	Groundwater Monitoring Performed? No ☒ Yes ☐ (attach results)

Site constraints/Recommendations:

A site evaluation was conducted on November 23, 2015 by Paul Bartelt, Michael Grimes and Cameron Smith of Bartelt Engineering. Test pits were excavated by Harold Smith & Sons with a mini-excavator having a 24 inch bucket. Maureen Bown of Napa County Environmental Health visited the site to inspect soil conditions. Test pits # 3 through 8 showed suitable soil for the installation of an Alternative Sewage Treatment System (ASTS) Subsurface Drip dispersal field within the area tested with required replacement area.

Test Pit # 1

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

Test Pit # 2

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

Test Pit # 3 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-49*		0-15	CL	SSB	H	F	S/P	MF, MVF	CF, FVF, FM	None
49-59*	C	0-15	CL	SSB	H	F	S/P	FF, FVF	FF	None
Slope = <1 %. Acceptable soil depth observed: 59 inches. Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System STE 0.6 gal/sf/day for ASTS PTE 0.75 gal/sf/day for ASTS Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates) Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)										
No refusal at 59 inches deep. No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated December 16, 2015.										

Test Pit # 4

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-48		0-15	CL	SSB	SH	FRB	SS/P	FM, CF, CVF	CVF, FF, FM	None
48-66	G	0-15	CL	SSB	H	F	S/P	CF, CVF	CF, FM	None

Slope = <1 %. Acceptable soil depth observed: 66 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 66 inches deep.
No groundwater observed.

Test Pit # 5 * Hydrometer Test Performed

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-48*		0-15	CL	SSB	SH	FRB	SS/P	FM, CF, CVF	CF, CVF, FM	None
48-65*	D	0-15	C	SSB	H	F	S/P	CF, CVF	CVF, FF	None

Slope = <1 %. Acceptable soil depth observed: 65 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 65 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated December 16, 2015.

Test Pit # 6

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-59		0-15	CL	SSB	H	F	S/P	CF, CVF	CF, FM	None

Slope = <1 %. Acceptable soil depth observed: 59 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 59 inches deep.
No groundwater observed.

Test Pit # 7

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottli
					Side Wall	Ped	Wet			
0-48*	-	0-15	CL	SSB	SH	FRB	SS/P	FM, CF, CVF	CF, CVF, FM	None
48-61	G	0-15	C	SSB	H	F	S/P	CF, CVF	CVF, FF	None

Slope = <1 %. Acceptable soil depth observed: 61 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 61 inches deep.
No groundwater observed. *See attached Soil Texture Analysis by Bouyoucos Hydrometry Method prepared by RGH Consultants, Inc. dated December 16, 2015.

Test Pit # 8

Horizon Depth (Inches)	Boundary	%Rock	Texture	Structure	Consistence			Pores	Roots	Mottling
					Side Wall	Ped	Wet			
0-48	-	0-15	CL	SSB	SH	FRB	SS/P	FM, CF, CVF	CF, CVF, FM	None
48-60	G	0-15	CL	SSB	H	F	S/P	CF, CVF	CVF, FF	Non

Slope = <1 %. Acceptable soil depth observed: 60 inches.
Assigned soil application rate = STE 0.25 gal/sf/day for a Conventional – Standard System
STE 0.6 gal/sf/day for ASTS
PTE 0.75 gal/sf/day for ASTS
Subsurface Drip = 0.6 gal/sf/day (per Napa County Soil Application Rates)
Subsurface Drip = 0.6 gal/sf/day (per recommended Geoflow Drip Loading Rates)

No refusal at 60 inches deep.
No groundwater observed.

Table of Abbreviations

Boundary	Texture	Structure	Consistence			Pores	Roots	Mottling
			Side Wall	Ped	Wet			
A=Abrupt <1" C=Clear 1"-2.5" G=Gradual 2.5"-5" D=Difuse >5"	S=Sand LS=Loamy Sand SL=Sandy Loam SCL=Sandy Clay Loam SC=Sandy Clay CL=Clay Loam L=Loam C=Clay SiC=Silty Clay SiCL=Silty Clay Loam SiL=Silt Loam Si=Silt	W=Weak M=Moderate S=Strong ― G=Granular PL=Platy Pr=Prismatic C=Columnar AB=Angular Blocky SB=Subangular Blocky ― M=Massive C=Cemented	L=Loose S=Soft SH=Slighty Hard H=Hard VH=Very Hard ExH=Extremely Hard	L=Loose VFRB=Very Friable FRB=Friable F=Firm VF=Very Firm ExF=Extremely Firm	NS=NonSticky SS=Slightly Sticky S=Sticky VS=Very Sticky ― NP=NonPlastic SP=Slightly Plastic P=Plastic VP=Very Plastic	<u>Quantity:</u> F=Few C=Common M=Many <u>Size:</u> VF=Very Fine F=Fine M=Medium C=Coarse	<u>Quantity:</u> F=Few C=Common M=Many <u>Size:</u> VF=Very Fine F=Fine M=Medium C=Coarse VC=Very Course	<u>Quantity:</u> F=Few C=Common M=Many <u>Size:</u> F=Fine M=Medium C=Coarse VC=Very Course ExC=Extremely Coarse <u>Contrast:</u> Ft=Faint D=Distinct P=Prominent

Attach additional sheets as needed

Alternative Sewage Treatment System Soil Application Rates

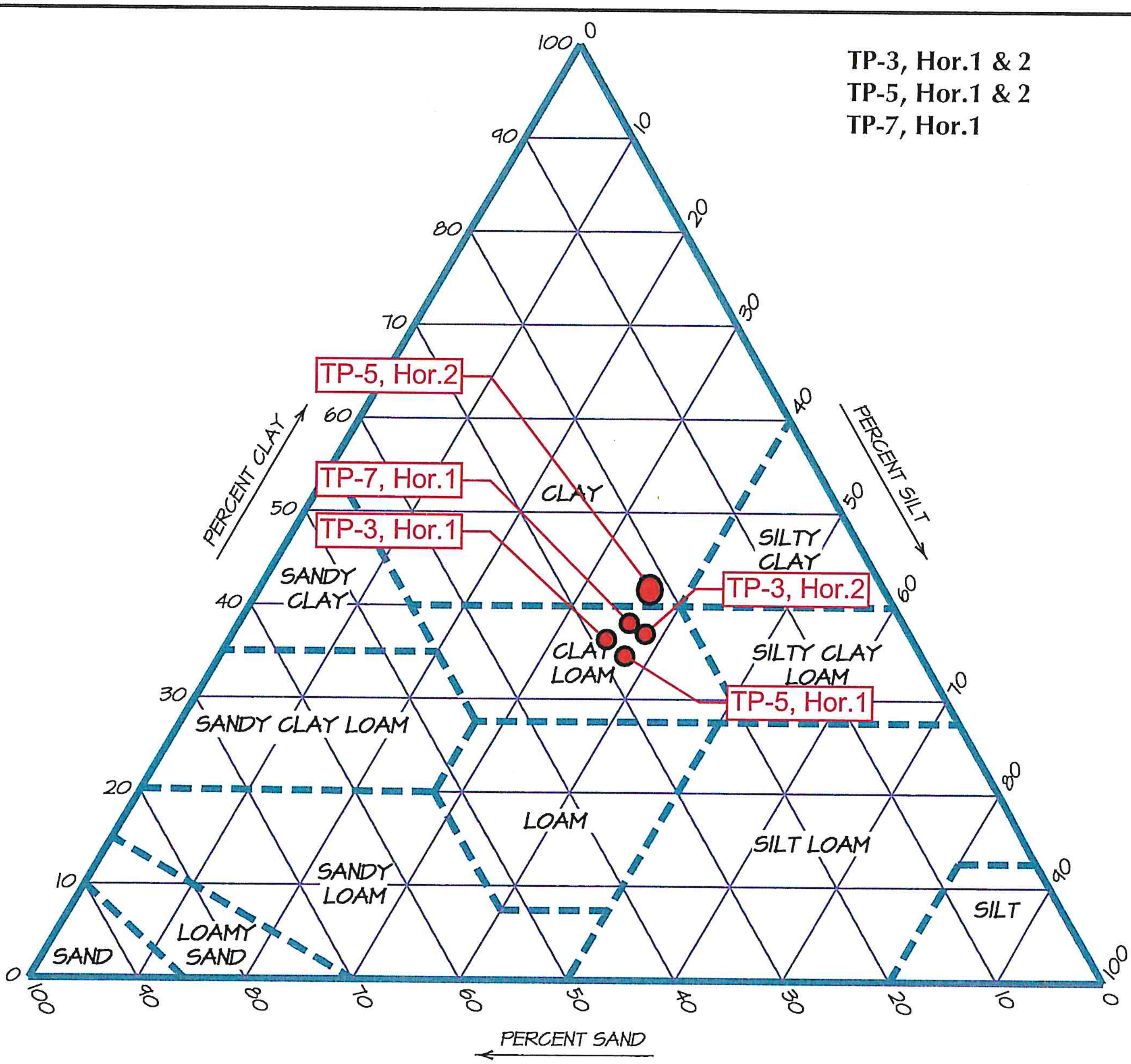
TEXTURE	STRUCTURE		APPLICATION RATE (Gal/ft²/day)	
	Shape	Grade	STE[1]	PTE[1,2]
Coarse Sand, Sand, Loamy Coarse Sand	Single grain	Structureless	1.0	1.2
Fine Sand, Loamy Fine Sand	Single grain	Structureless	0.6	1.0
Sandy Loam, Loamy Sand	Massive	Structureless	0.35	0.5
	Platy	Weak	0.35	0.5
	Prismatic, blocky, granular	Weak	0.5	0.75
		Moderate, Strong	0.8	1.0
Loam, Silt Loam, Sandy Clay Loam, Fine Sandy Loam	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak, moderate	0.5	0.75
		Strong	0.8	1.0
Sandy Clay, Silty Clay Loam, Clay Loam	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak, moderate	0.35	0.5
		Strong	0.6	0.75
Clay, Silty Clay	Massive	Structureless		
	Platy	Weak, moderate, strong		
	Prismatic, blocky, granular	Weak		
		Moderate, strong	0.2	0.25

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

MINIMUM SURFACE AREA GUIDELINES TO DISPOSE OF 100 GPD OF SECONDARY TREATED EFFLUENT FOR SUBSURFACE DRIP DISPERSAL SYSTEMS					
		Soil Absorption Rates		Design Application Rate (Gal/ft²/day)	Total Area Required Sq. ft./100 gallons per day
Soil Class	Soil Type	Est. Soil Perc. Rate minutes/inch	Hydraulic Conductivity inches/hour		
I	Coarse sand	1 – 5	>2	1.400	71.5
I	Fine sand	5 – 10	1.5 – 2	1.200	83.3
II	Sandy loam	10 – 20	1.0 – 1.5	1.000	100.0
II	Loam	20 – 30	0.75 – 1.0	0.700	143.0
III	Clay loam	30 – 45	0.5 – 0.75	0.600	167.0
III	Silt - clay loam	45 – 60	0.3 – 0.5	0.400	250.0
IV	Clay non-swell	60 – 90	0.2 – 0.3	0.200	500.0
IV	Clay - swell	90 – 120	0.1 – 0.2	0.100	1000.0

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

SOIL TEXTURE ANALYSIS CHART
BY BOUYOUCOS HYDROMETER METHOD



INSTRUCTIONS:

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

NOTE:

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

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

Scarlett Winery
1052 Ponti Road
Napa County, CA
APN 030-280-010

Job No. 15-02 September 2016

RGH CONSULTANTS

Experience is the difference

December 16, 2015
File: 9147.64

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

Subject: Laboratory Test Results
Soil Texture Analysis by
Bouyoucos Hydrometry Method
1052 Ponti Road, # 15-02

Dear Mr. Bartelt:

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

Size/Density	TP-3 Hor. 1
+ #10 Sieve	1.7 %
Sand	27.6 %
Clay	36.2 %
Silt	36.2 %
Db g/cc	--

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

Yours very truly,

RGH GEOTECHNICAL

George Fotou
Laboratory Manager

RGH
CONSULTANTS

Experience is the difference

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File: 9147.64

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

Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
1052 Ponti Road, # 15-02

Dear Mr. Bartelt:

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

Size/Density	**TP-3 Hor. 2**
+ #10 Sieve	0.6 %
Sand	23.6 %
Clay	37.4 %
Silt	39.0 %
Db g/cc	--

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

Yours very truly,

RGH GEOTECHNICAL

George Fotou
Laboratory Manager

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Dear Mr. Bartelt:

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

Size/Density	**TP-5 Hor. 1**
+ #10 Sieve	0.3 %
Sand	28.6 %
Clay	33.4 %
Silt	38.0 %
Db g/cc	--

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

Yours very truly,

RGH GEOTECHNICAL

George Fotou
Laboratory Manager

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Napa, CA 94559

Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
1052 Ponti Road, # 15-02

Dear Mr. Bartelt:

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

Size/Density	TP-5 Hor. 2
+ #10 Sieve	0.1 %
Sand	20.6 %
Clay	42.4 %
Silt	37.0 %
Db g/cc	--

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

Yours very truly,

RGH GEOTECHNICAL

George Fotou
Laboratory Manager

RGH
CONSULTANTS

Experience is the difference

December 16, 2015
File: 9147.64

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

Subject: **Laboratory Test Results**
Soil Texture Analysis by
Bouyoucos Hydrometry Method
1052 Ponti Road, # 15-02

Dear Mr. Bartelt:

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

Size/Density	**TP-7 Hor. 1**
+ #10 Sieve	0.1 %
Sand	25.4 %
Clay	37.4 %
Silt	37.2 %
Db g/cc	--

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

Yours very truly,

RGH GEOTECHNICAL

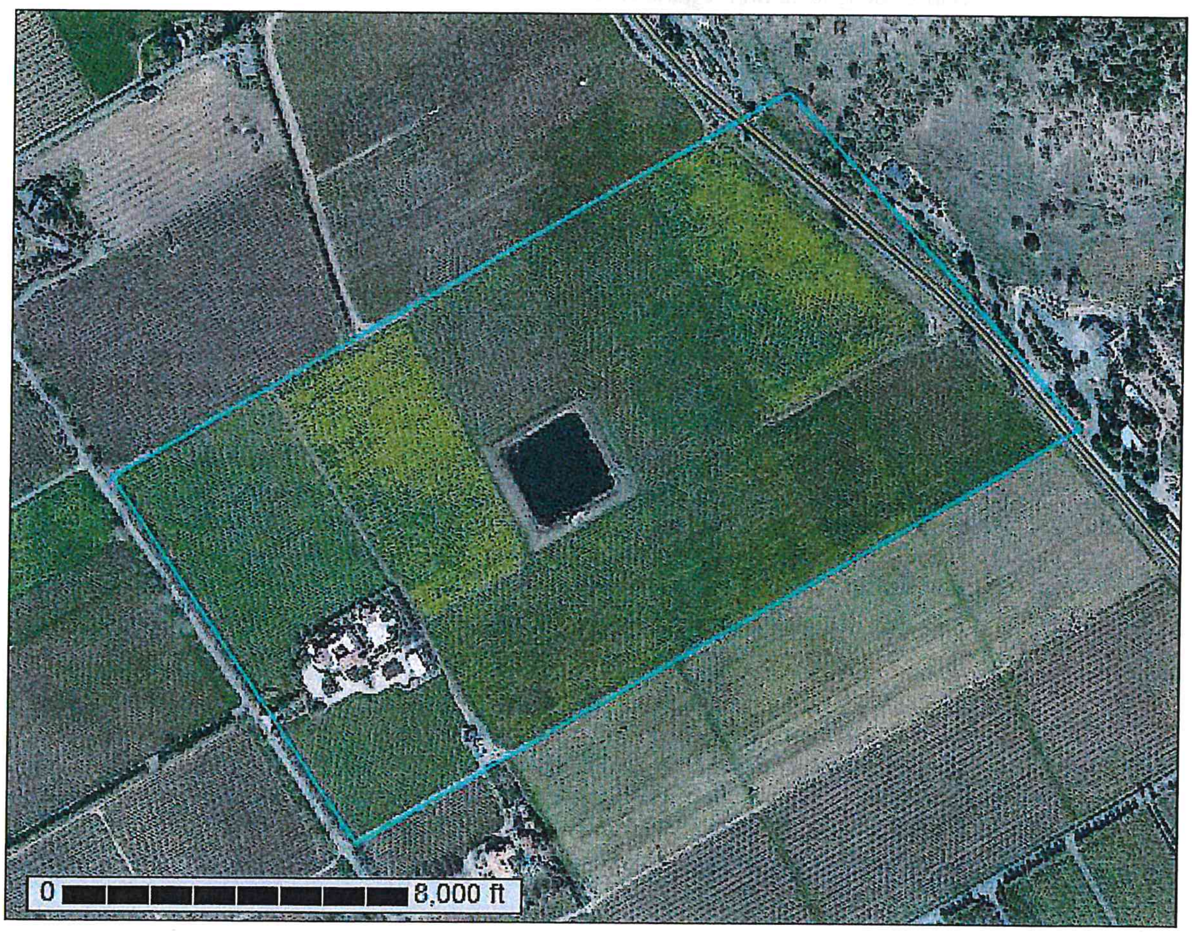
George Fotou
Laboratory Manager

USDA United States Department of Agriculture

NRCS Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Napa County, California



November 4, 2015

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map


122° 23' 15" W
122° 22' 32" W
38° 28' 10" N
38° 27' 48" N
553500
553600
553700
553800
553900
554000
554100
554200
554300
554400
4258000
4257900
4257800
4257700
4257600
4257500
168
110
Silverado
170
104
116
118
Ponti Rd
Skellinger Ln
Map Scale: 1:4,790 if printed on A landscape (11" x 8.5") sheet.
Meters
0 50 100 200 300
Feet
0 200 400 800 1200
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Napa County, California
Survey Area Data: Version 8, Sep 23, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 4, 2012—Feb 17, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Napa County, California (CA055)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
104	Bale clay loam, 0 to 2 percent slopes	16.1	32.2%
110	Boomer-Forward-Felta complex, 30 to 50 percent slopes	3.0	6.0%
116	Clear Lake clay, drained, 0 to 2 percent slopes, MLRA 14	9.0	18.0%
118	Cole silt loam, 0 to 2 percent slopes	16.5	33.1%
168	Perkins gravelly loam, 2 to 5 percent slopes	5.4	10.7%
170	Pleasanton loam, 0 to 2 percent slopes	0.0	0.0%
Totals for Area of Interest		**50.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Napa County, California

104—Bale clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hdk4
Elevation: 20 to 400 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 220 to 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Bale and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bale

Setting

Landform: Alluvial fans, flood plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from rhyolite and/or alluvium derived from igneous rock

Typical profile

H1 - 0 to 24 inches: clay loam
H2 - 24 to 60 inches: stratified gravelly sandy loam to loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B

Minor Components

Clear lake

Percent of map unit: 3 percent
Landform: Depressions

110—Boomer-Forward-Felta complex, 30 to 50 percent slopes

Map Unit Setting

National map unit symbol: hdkb
Elevation: 100 to 5,500 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 54 to 55 degrees F
Frost-free period: 210 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Boomer and similar soils: 40 percent
Forward and similar soils: 35 percent
Felta and similar soils: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Boomer

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from igneous rock

Typical profile

H1 - 0 to 4 inches: loam
H2 - 4 to 44 inches: clay loam, gravelly clay loam
H2 - 4 to 44 inches: weathered bedrock
H3 - 44 to 59 inches:

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very high (about 14.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C

Description of Forward

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from rhyolite

Typical profile

H1 - 0 to 4 inches: gravelly loam
H2 - 4 to 35 inches: loam, gravelly loam
H2 - 4 to 35 inches: weathered bedrock
H3 - 35 to 59 inches:

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B

Description of Felta

Setting

Landform: Terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from tuff and/or alluvium derived from metavolcanics

Typical profile

H1 - 0 to 7 inches: very gravelly loam
H2 - 7 to 26 inches: very gravelly clay loam
H3 - 26 to 60 inches: very gravelly sandy clay loam

Properties and qualities

Slope: 30 to 50 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B

116—Clear Lake clay, drained, 0 to 2 percent slopes, MLRA 14

Map Unit Setting

National map unit symbol: 2vbt2
Elevation: 10 to 800 feet
Mean annual precipitation: 15 to 31 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 250 to 275 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Clear lake, drained, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clear Lake, Drained

Setting

Landform: Basin floors
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Basin alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

Ap - 0 to 6 inches: clay
Bss1 - 6 to 26 inches: clay
Bss2 - 26 to 36 inches: clay
C - 36 to 60 inches: clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 36 to 72 inches

Frequency of flooding: Rare
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 4 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.5 to 3.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 7.0
Available water storage in profile: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: D

Minor Components

Unnamed

Percent of map unit: 5 percent
Landform: Alluvial flats

Campbell, sicl

Percent of map unit: 3 percent

Sunnyvale, sic

Percent of map unit: 2 percent

118—Cole silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hdkl
Elevation: 100 to 1,500 feet
Mean annual precipitation: 25 to 30 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Cole and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cole

Setting

Landform: Alluvial fans, flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale and/or alluvium derived from igneous rock

Typical profile

H1 - 0 to 8 inches: silt loam

H2 - 8 to 64 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 36 to 60 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C

Minor Components

Clear lake

Percent of map unit: 3 percent
Landform: Alluvial fans

168—Perkins gravelly loam, 2 to 5 percent slopes

Map Unit Setting

National map unit symbol: hdm6
Elevation: 60 to 1,700 feet
Mean annual precipitation: 30 to 40 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Perkins and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Perkins

Setting

Landform: Terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous rock

Typical profile

H1 - 0 to 29 inches: gravelly loam
H2 - 29 to 60 inches: gravelly clay loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C

170—Pleasanton loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hdm8
Elevation: 2,400 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 59 to 63 degrees F
Frost-free period: 220 to 260 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Pleasanton and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pleasanton

Setting

Landform: Alluvial fans, flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 11 inches: loam
H2 - 11 to 66 inches: loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: C

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